



**KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS**



**KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM**

Year 8

2025

Mathematics

2026

Unit 9 Tasks – Part 1

DO NOT WRITE INSIDE



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Unit 9 Tasks – Part 2

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ACADEMY TRUST
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Year 8

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Unit 9 Tasks – Part 3

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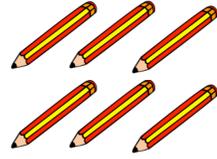
1 Proportion

Fluency Practice

Question 1: Keith buys 6 pencils for 90p



- (a) How much does one pencil cost?
- (b) How much would five pencils cost?
- (c) How much would eleven pencils cost?



Question 2: Jack and Harry are waiters in a restaurant.



They are both paid the same amount of money for each hour that they work.
Jack worked 6 hours and is paid £48
Harry worked 8 hours.
How much money is Harry paid?



Question 3: A car travels 120 miles in 3 hours at a steady speed.



- (a) How far does the car travel in 1 hour?
- (b) How far does the car travel in 8 hours?

Question 4: A plumber charges £140 for a 4 hour job.



How much does the plumber charge for a 3 hour job?

Question 5: Seven candles cost £45.29



How much would 25 candles cost?

Question 6: £50 is worth €56



- (a) How many euros is £1 worth?
- (b) How many euros is £220 worth?

Question 7: If 24 marbles have a mass of 60g, what would the mass of 60 marbles be?



Purposeful Practice

Question 8: Rebecca is making Chilli Con Carne.
Here is a list of ingredients to serve 6 people.



Rebecca wants to make enough Chilli Con Carne for 4 people.

How much of each ingredient does Rebecca need?

serves 6

1.2kg mince
420g tomatoes
3 chillies
600g kidney beans

Question 9: Oscar is making fish pie.
Here is a list of ingredients for 5 people.



Oscar wants to make enough fish pie for 6 people.

How much of each ingredient should Oscar use?

serves 5

500g cod
400g haddock
600ml milk
120g butter
40g flour
1kg potatoes

Apply

Question 1: On a map, 4cm represents 60 miles.
The distance between two towns is 37.5 miles.
On the map, what is the distance between the two towns?

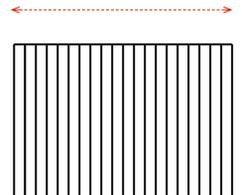


Question 2: Nathan has 20 identical books on a shelf.
The books take up 70cm of space on the shelf.
Nathan removes seven books.



How much space do the remaining books take up?

70cm



Question 3: A car uses 8.4 litres of petrol for a 112 mile journey.
When the tank is full, the car holds 54 litres of petrol.



How far should the car be able to travel on a full tank of petrol?

Question 4: A 345ml tin of paint costs £4.80
A 250ml tin of paint costs £3.35
Which tin is better value for money?



Fluency Practice

learn by heart

Two values are in direct proportion if there is a constant multiplier between them.

Unlike ratios, values in proportion do not have to be the same type of quantity.

examples

1. A 50g carton of yoghurt contains 40 calories.
How many calories are there in each of the following amounts of the same yoghurt?

a) 100 grams

$$\begin{array}{l} \times 2 \left(\begin{array}{l} 50\text{g has } 40 \text{ calories} \\ 100\text{g has } \underline{80} \text{ calories} \end{array} \right) \times 2 \\ 40 \times 2 = 80 \text{ calories} \end{array}$$

b) 250 grams

$$\begin{array}{l} \times 5 \left(\begin{array}{l} 50\text{g has } 40 \text{ calories} \\ 250\text{g has } \underline{200} \text{ calories} \end{array} \right) \times 5 \\ 40 \times 5 = 200 \text{ calories} \end{array}$$

2. Jenny buys 6 apples.
The total cost is £1.50

First divide to find the cost of a smaller number of apples.
Use a common factor of the numbers of apples involved.

a) Work out the cost for 9 apples

$$\begin{array}{l} \div 2 \left(\begin{array}{l} 6 \text{ apples cost } \pounds 1.50 \\ 3 \text{ apples cost } \pounds \underline{0.75} \end{array} \right) \div 2 \\ \times 3 \left(\begin{array}{l} 3 \text{ apples cost } \pounds \underline{0.75} \\ 9 \text{ apples cost } \pounds \underline{2.25} \end{array} \right) \times 3 \end{array}$$

b) Work out the cost for 5 apples

$$\begin{array}{l} \div 6 \left(\begin{array}{l} 6 \text{ apples cost } \pounds 1.50 \\ 1 \text{ apple costs } \pounds \underline{0.25} \end{array} \right) \div 6 \\ \times 5 \left(\begin{array}{l} 1 \text{ apple costs } \pounds \underline{0.25} \\ 5 \text{ apples cost } \pounds \underline{1.25} \end{array} \right) \times 5 \end{array}$$

exercise

1. Complete the total costs for the stationery items.

a) 4 pens cost £1.40

8 pens cost £ _____

b) 2 rulers cost £1.20

6 rulers cost £ _____

c) 10 erasers cost £2.50

5 erasers cost £ _____

d) 3 calculators cost £12.60

1 calculator costs £ _____

e) 2 protractors cost 90p

12 protractors cost £ _____

f) 5 compasses cost £6

1 compass costs £ _____

g) 1 pencil costs 30p

8 pencils cost £ _____

h) 4 pencil sharpeners cost £1.60

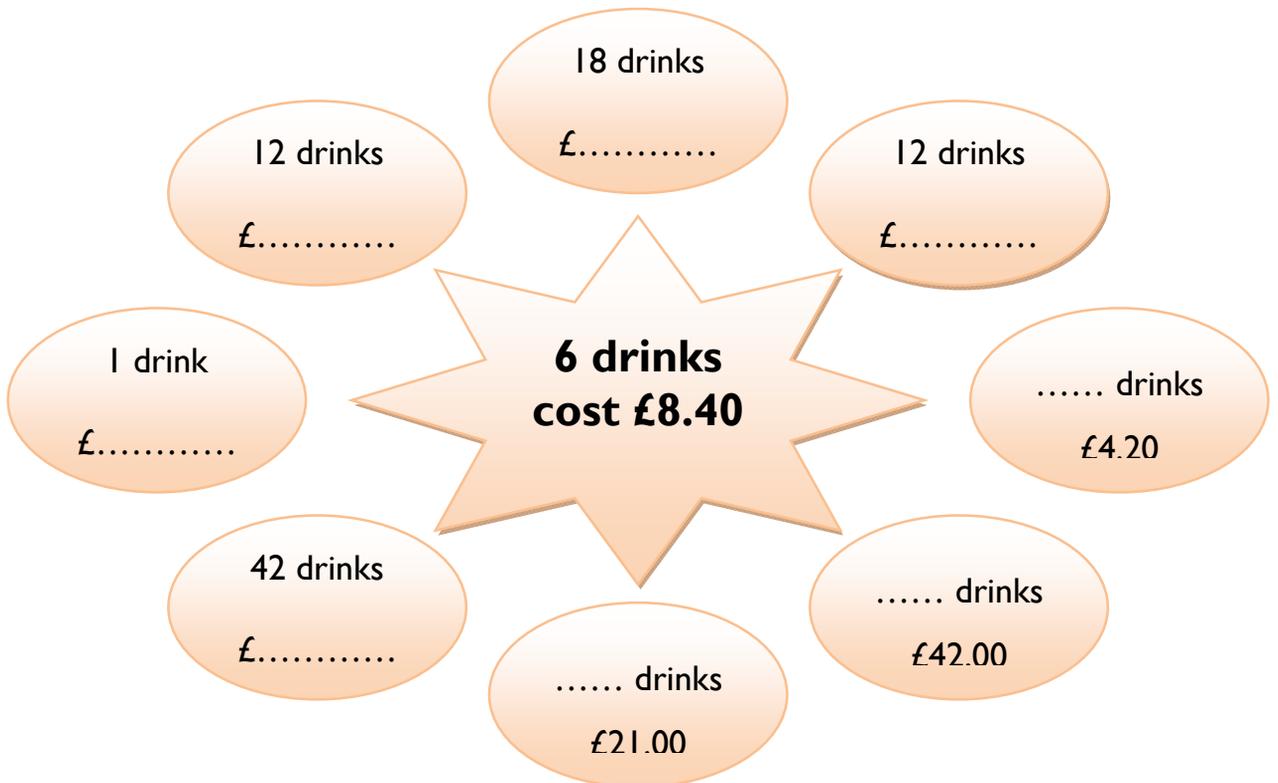
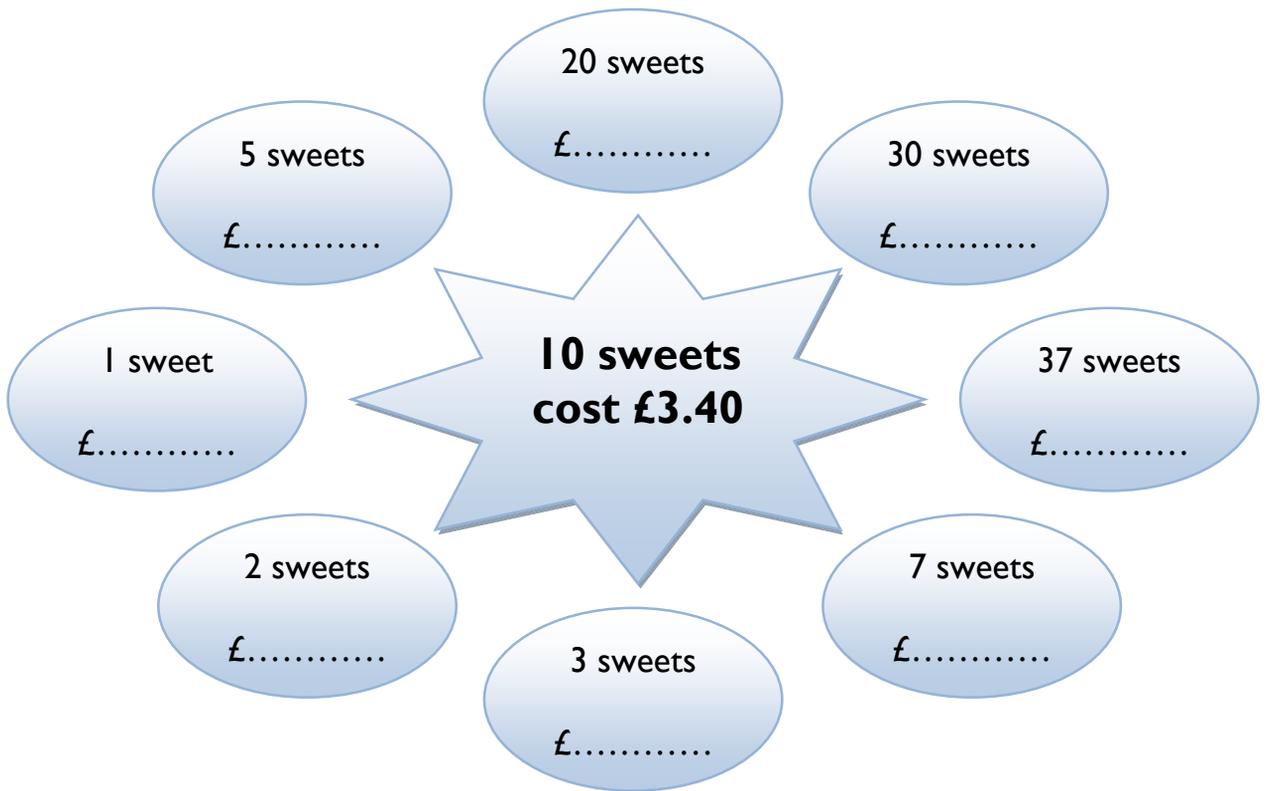
40 pencil sharpeners cost £ _____

Fluency Practice

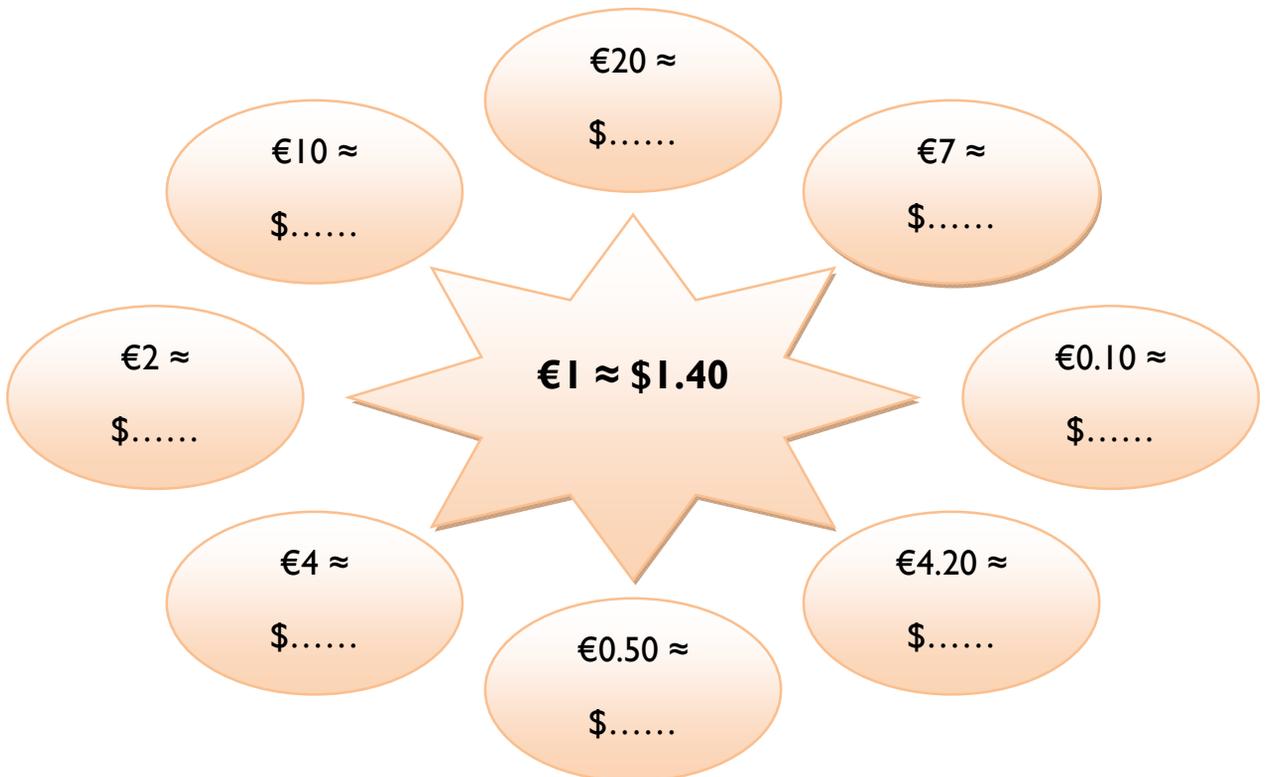
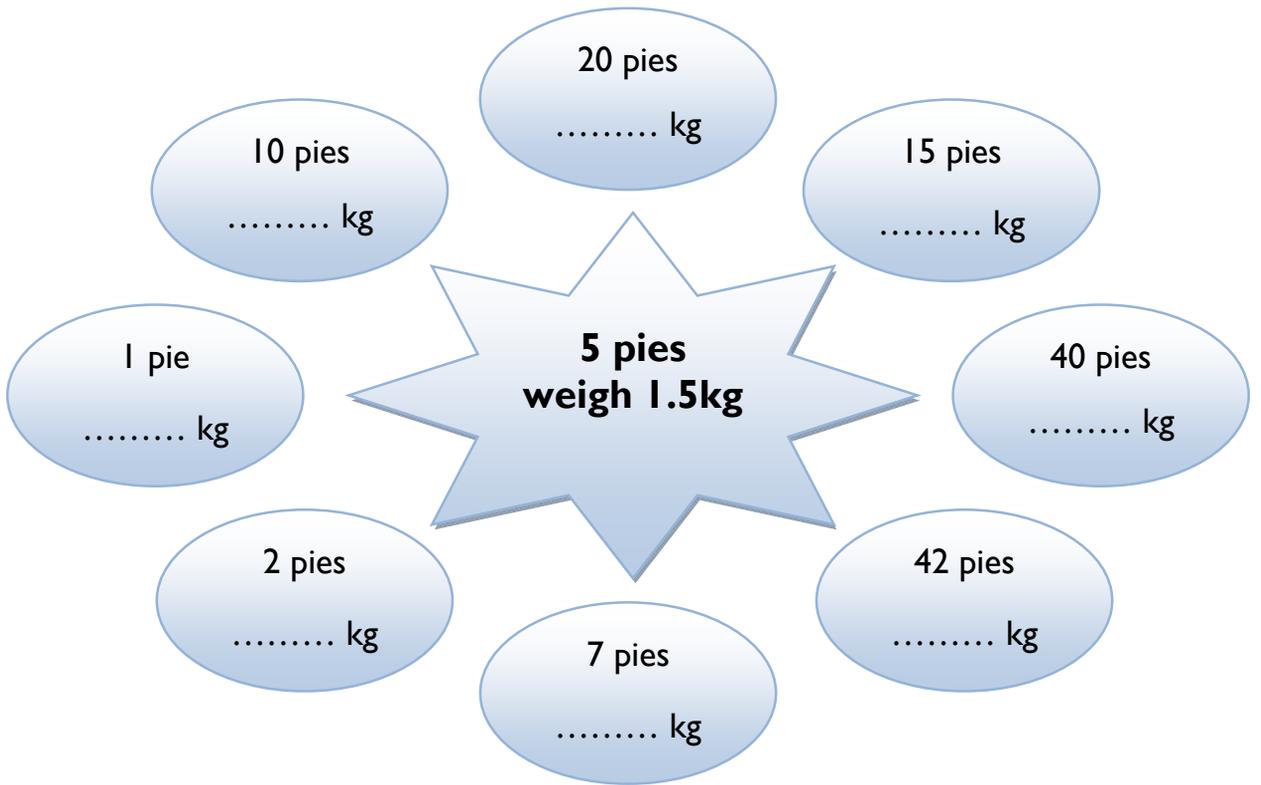
2. Jason can fill 3 glasses with 600ml of squash.
Work out how many litres of squash Jason will need to fill 12 glasses.
3. Rianna pays £20 for 16 litres of petrol.
 - a) How many litres of petrol would Rianna get for £10 ?
 - b) How many litres of petrol would Rianna get for £30 ?
 - c) How much would it cost to buy 1 litre of petrol?
4. Sarah pays £1.80 for 2.5kg of potatoes.
 - a) Work out the cost of 5kg of potatoes.
 - b) Work out the cost of 7.5kg of potatoes.
 - c) Work out the cost of 500g of potatoes
5. Complete the total costs for buying multiple items from a shop.

a) 2 drinks cost £3 1 drink costs £ _____ 5 drinks cost £ _____	b) 3 chocolate bars cost £1.80 1 chocolate bar costs £ _____ 2 chocolate bars cost £ _____
c) 6 sandwiches cost £9.60 2 sandwiches cost £ _____ 8 sandwiches cost £ _____	d) 12 buns cost £2.80 6 buns costs £ _____ 18 buns cost £ _____
e) 4 tins of beans cost £3 ___ tins of beans cost £ _____ 10 tins of beans cost £ _____	f) 8 oranges cost £2.40 ___ oranges cost £1.20 ___ oranges cost £3.60
6. Jim uses 5 litres of soil to fill 8 flower pots.
Work out how many litres of soil he will need to fill 12 flower pots.
7. 1.5kg of meat costs £3.60. Work out the cost of 2.5kg of meat.
8. Lily can clean 6 hotel rooms in 2 hours.
How long will it take for Lily to clean 8 hotel rooms?
9. 100g of apple contains 52 calories.
100g of grapes contains 65 calories.
A fruit pot contains 150g of apple pieces and 60g of grapes.
Work out how many calories there are in the fruit pot.
10. Josie mixes 6 litres of red paint with 15 litres of white paint to make a shade of pink.
She has another 4 litres of red paint. Work out how many litres of white paint Josie should mix with this to make more of the same shade of pink.

Fluency Practice



Fluency Practice



Fluency Practice

Proportion and the Unitary Method

(a)

Three oranges costs 72p. How much does it cost for 5 oranges?

Oranges	Cost
3	72p
1	24p
5	

(b)

Four notebooks have 132 pages. How many pages do 9 notebooks have?

Notebooks	Pages
4	132
1	
9	

(c)

Two dogs need 11 kg of dog food per week. How much dog food do 7 dogs need?

Dogs	Food
2	11 kg
1	
7	

(d)

Six pens costs 84p. How much does it cost for 20 pens?

Pens	Cost
6	84p
1	
20	

(e)

10m of ribbon costs £1.80. How much does 17m of ribbon cost?

Metres	Cost
10	£1.80

(f)

Four cinema tickets costs £23. How much does it cost for three cinema tickets?

Tickets	Cost
4	£23

(g)

Seven glasses contain 1155ml of juice. How much juice does 16 glasses contain?

Glasses	Juice

(h)

Eight pairs of socks costs £18. How much does 5 pairs of socks cost?

Socks	Cost

(i)

Five cups of coffee costs £14.25. How much does 8 cups of coffee cost?

(j)

Nine orangutans need feeding 108 bananas per day. How many bananas do 7 orangutans need per day?

(k)

Celia cycles 10 miles in 45 minutes. How long does it take for Celia to cycle 23 miles?

(l)

14 litres of petrol costs £18.48. How many litres of petrol can be bought for £33?

Purposeful Practice

Instructions: Calculate the cost per pen in the middle box. Complete the remaining boxes changing as little as possible. Try and ensure your answer is a whole number of pence.

		<u>Cost per pen</u>		
		Less	Same	More
<u>Number of pens</u>	More			
	Same		7 pens cost £4.20	
	Less			

Fluency Practice

Question 1: Jake is making scones.
Here is a list of ingredients to make 8 scones.

8 Scones

200g flour
30g caster sugar
50g butter
140ml milk
1 egg

How much of each ingredient would be needed to make:

(a) 16 scones? (b) 4 scones? (c) 24 scones?
(d) 40 scones? (e) 80 scones? (f) 2 scones?

Question 2: Chloe is making ice cream.
She is using the recipe below.

serves 4

300ml double cream
320ml milk
120g caster sugar
1 vanilla pod
4 egg yolks

How much of each ingredient would Chloe need to make enough for:

(a) 8 people? (b) 2 people? (c) 1 person?
(d) 3 people? (e) 6 people? (f) 10 people?

Question 3: Rupert is making a fish pie.
He is using the recipe below.

serves 5

500g cod
400g haddock
600ml milk
120g butter
40g flour
1kg potatoes

How much of each ingredient would Rupert need to make enough for:

(a) 15 people? (b) 1 person? (c) 2 people?
(d) 4 people? (e) 8 people? (f) 11 people?

Purposeful Practice

Apply

Question 1: Tia uses this recipes to make hot cross buns.
Tia is going to use this recipe to make 9 hot cross buns.

(a) How much of each ingredient does Tia need?

Grace uses the same recipe.
She uses 500ml of milk.

(b) How many hot cross buns is Grace making?

makes 12

480g flour
60g caster sugar
200ml milk
1 egg
50g butter
100g currant

Question 2: Timothy is making a Rice Krispie cakes.
A recipe uses 240g of chocolate and 160g of Rice Krispies to make 24 cakes.

(a) Write down the ratio of chocolate to Rice Krispies in its simplest form.

(b) How much Rice Krispies should Timothy use to make 30 cakes?

Question 3: Sarah is making shortbread biscuits.
She has:

600g of butter
300g of caster sugar
1kg of plain flour
500g of cornflour

She has found this list of ingredients for making 8 shortbread biscuits

makes 8

Butter	150g
Caster Sugar	60g
Plain Flour	200g
Cornflour	50g

Sarah wants to make as many shortbread biscuits as possible.
Work out how many shortbread biscuits Sarah can make.

Question 4: Rebecca has a recipe for Chilli Con Carne

She only has 400g of kidney beans

How much of the other ingredients should she use?

serves 6

1.2kg mince
420g tomatoes
3 chillies
600g kidney beans

Purposeful Practice

Question 5: Heather is making chocolate biscuits.
She has:

2kg of flour
1kg of butter
340g of icing sugar
200g of chocolate

Here is the list of ingredients for making 20 biscuits.

makes 20

100g flour
120g butter
80g icing sugar
25g chocolate

Heather wants to make as many biscuits as she can.
Work out how many biscuits Heather can make.

Question 6: David has a full 800ml bottle of car shampoo.
He is going to mix some of the car shampoo with water.

The bottle has this guidance

Car Shampoo - 800ml
Mix $\frac{1}{4}$ of the car shampoo
with 1.8 litres of water

David is going to use 360ml of water.
How much car shampoo should David use?

Question 7: James is making concrete using cement, sand and gravel in the ratio 1 : 2 : 3
James has:

63kg cement
112kg sand
210kg gravel

What is the maximum amount of concrete that James can make?

Fluency Practice

example

The ingredients for making 10 pancakes are shown.

- a) Work out the amount of each ingredient needed to make 15 pancakes.

	Eggs	Flour	Milk
10 pancakes	2	150g	250ml
5 pancakes	1	75g	125ml
15 pancakes	3	225g	375ml

$\div 2$ (from 10 to 5) and $\times 3$ (from 5 to 15) are indicated for the rows.

Ingredients to make 10 pancakes

2 eggs
150g flour
250ml milk

- b) Jude has 6 eggs, 1.5kg of flour and 500ml of milk. He makes as many pancakes as possible.

Which ingredient does Jude run out of first? How many pancakes has he made?

$\times 3$ (from 2 to 6 eggs) → 6 eggs for 30 pancakes
 $\times 10$ (from 150g to 1500g flour) → 1500g flour for 100 pancakes
 $\times 2$ (from 250ml to 500ml milk) → 500ml milk for 20 pancakes

Jude runs out of milk first, after he has made 20 pancakes.

exercise

1. The row of each table shows the amount of ingredients needed for a recipe for the given number of servings. Complete each table.

a)

	Oats	Butter	Sugar	Syrup
12 flapjacks	240g	120g	90g	3 tablespoons
4 flapjacks	80g			
16 flapjacks	320g			

b)

	Flour	Butter	Sugar	Choc chips
25 cookies	275g	225g	110g	75g
5 cookies				
15 cookies				

Fluency Practice

2. Abby is going to make 50 shortbread biscuits.
The box shows the amount of ingredients required to make 20 shortbread biscuits.

- a) Work out the amount of each ingredient Abby needs.
b) Abby already has 250g of butter.
How much more butter does she need?

**Ingredients to make
20 shortbread biscuits**

130g butter
60g sugar
180g flour

3. The box shows the amount of ingredients required to make enough mushroom soup to serve 4 people.
Brendan wants to make enough soup to serve 10 people.

- a) Work out the amount of each ingredient Brendan needs.
b) A packet of mushrooms weighs 350g and costs 95p.
How much will it cost Brendan to buy all the mushrooms he needs for his soup?

**Ingredients to make
mushroom soup
to serve 4 people**

90g butter
2 onions
500g mushrooms
4 tablespoons cream

4. A recipe for biscuits says:

"Use three times as much flour as sugar,
and two times as much butter as sugar."

Jane uses 25g of sugar to make 8 biscuits.

How much sugar, flour and butter will she need to make 24 biscuits?

5. A recipe for making five servings of porridge is shown.

- a) Alex uses the recipe with 900ml of milk.
How many servings of the porridge does Alex make?
b) Chris has 320g of oats and 3 litres of milk.
(i) Work out the greatest number of servings of the porridge Chris can make.
(ii) Which ingredient will Chris have left over, and how much will he have?

**To make porridge to
serve 5 people**

Mix 200g of oats
with 1.5 litres of milk.

6. The box shows the amount of ingredients required to make 24 muffins.

- a) Marie uses the recipe with 600g of flour.
How much sugar does Marie use?
b) Lisa has 500g of sugar, half a litre of milk, 300g of flour,
6 eggs and 100ml of vegetable oil.

Work out the greatest number of muffins Lisa can make.

**Ingredients to make
24 muffins**

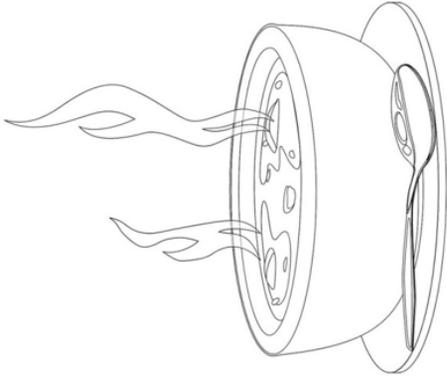
240g sugar
300ml milk
400g flour
2 eggs
120ml vegetable oil

Purposeful Practice

onion soup

onion soup recipe for **8** people:

- 10 onions
- 2 pints of water
- 4 vegetable stock cubes
- 2 dessertspoons butter
- $\frac{1}{2}$ pint cream



- (1) for **4** people
 - (a) how much water is needed?
 - (b) how many stock cubes are needed?
 - (c) how many onions?
- (2) for **12** people
 - (a) how much water is needed?
 - (b) how many stock cubes are needed?
 - (c) how many onions?

- (3) for **20** people
 - (a) how many onions are needed?
 - (b) how many stock cubes are needed?
 - (c) how much water is needed?
- (4) how much cream is needed for
 - (a) 4 people?
 - (b) 12 people?
 - (c) 20 people?

Purposeful Practice

pancakes

250 ml milk
1 egg
140 g flour
5g butter/fat



this recipe is enough for **8** pancakes

- (i) how much milk is needed for **32** pancakes?
- (ii) how much flour is needed for **20** pancakes?

apple crumble

90 g sugar
60 g butter/fat
80 g flour
6 apples

this recipe is enough for **4** people

- how much of each ingredient is needed for **10** people?

trifle

120 g jelly
8 sponge fingers
420 ml custard
180 g tinned fruit

this recipe is enough for **4** people

- (i) how much custard is needed for **6** people?
- (ii) how much tinned fruit is needed for **7** people?

scones

225 g self raising flour
55 g butter
25 g caster sugar
150 ml milk



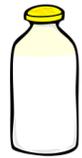
this recipe is enough for **10** scones

- (i) how much flour is needed for **8** scones?
- (ii) how much of each ingredient is needed for **6** scones?

Fluency Practice

Question 1: For each pair, decide which is better value for money.

- (a) 1 ticket for £8 or 3 tickets for £20
- (b) 1 sandwich for £2.50 or 2 sandwiches for £5.20
- (c) 2 pizzas for £12 or 4 pizzas for £28
- (d) 3 doughnuts for 60p or 6 doughnuts for £1
- (e) 6 eggs for 96p or 12 eggs for £1.80
- (f) 1 litre of milk for 67p or 2 litres of milk for £1.35
- (g) 100g of ham for £1.20 or 300g of ham for £3.50
- (h) 5kg of potatoes for £2.50 or 20kg of potatoes for £10.50
- (i) 500ml of lemonade for 89p or 1 litre of lemonade for £1.70



Question 2: For each pair, decide which is better value for money.

- (a) 2 croissants for 48p or 3 croissants for 75p
- (b) 3 cupcakes for £1.05 or 5 cupcakes for £1.70
- (c) 4 pens for £3.50 or 6 pens for £5
- (d) 10 chocolate bars for £4.80 or 15 chocolate bars for £6.90
- (e) 6 chicken wings for £3.50 or 9 chicken wings for £5.30
- (f) 400g of porridge for £1.52 or 500g of porridge for £1.86
- (g) 500ml of lemonade for 94p or 750ml of lemonade for £1.44
- (h) 200 minutes of calls for £7 or 350 minutes of calls for £12.50
- (i) 600g of honey for £4.25 or 1kg of honey for £6.99



Purposeful Practice

Question 3: For each pair, decide which is better value for money.
You may use a calculator.

- (a) 250 sheets of paper for £1.25 or 400 sheets of paper for £2.08
(b) 350g of coffee for £2.45 or 540g of coffee for £3.60
(c) 0.8kg of carrots for £1 or 1.3kg of carrots for £1.70
(d) 345ml of paint for £4.80 or 250ml of paint for £3.35
(e) 0.9 grammes of gold for \$38.20 or 6.5 grammes for gold for \$270
(f) A taxi journey of 8.7 miles for £17 or A taxi journey of 3.3 miles for £7



Apply

Question 1: Mr McClean wants to hire a taxi.
He rings three different taxi companies and asks them for their prices.

A1 Taxis: A 5 mile journey costs £15
Crazy Cabs: A 4 mile journey costs £13
Value Cars: A 10 mile journey costs £28

Order the taxi companies from best to least value for money.

Question 2: Bethany wants to buy 9 chairs.
Which shop is best value for money?

Chair World
2 chairs for £30
or £18 each



Chair'R'us
4 chairs for £58
or £19 each

Land of Chairs
3 chairs for £46
or £20 each

Question 3: Baked beans are sold in different sizes:
415g tin for 75p.
3 x 200g pack for £1.69.
1kg fridge pack for £2.39.
Which is best value for money?



Purposeful Practice

Question 4: Flower pots normally cost £4 each.

Two shops have special offers.

Gardenbase
20% off

Lawn Factory
Buy 5 get 2 free

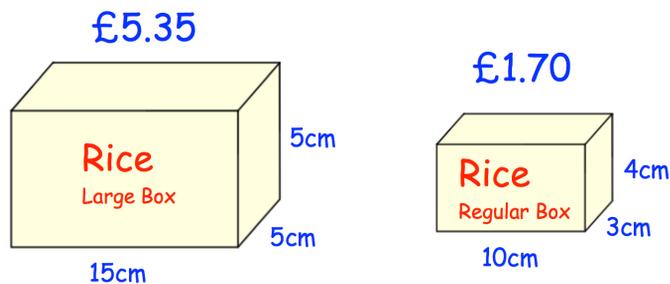
Laura wants to buy 30 flower pots.
Which shop should Laura buy them from?

Question 5: A cereal bar is sold in packs of 4, 6 or 8.

The 4 pack of cereal bars costs £1.80 and it is the least value for money.
The 8 pack of cereal bars cost £3.52 and it is the best value for money.

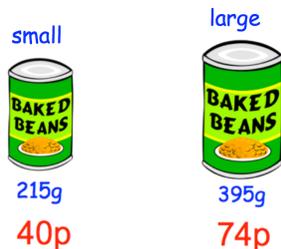
Work out (a) the lowest price of the 6 pack of cereal bar
(b) the highest price of the 6 pack of cereal bar

Question 6: A shop sells two different boxes of rice.
Work out which box is best value for money.



Question 7: Phil has completed his maths homework.
Can you spot any mistakes?

Which can is best value for money?



small: $215 \div 40 = 5.375$
large: $395 \div 74 = 5.3378$

The large is better value for money as it costs less per gram

Fluency Practice

(a) 1000ml of lemonade costs 60p. 440ml of lemonade costs 35p. Which is better value for money?

(b) 95m of rope costs £7.40. 80m of rope costs £6.90. Which is better value for money?

(c) 5 litres of paint costs £3.40. 2 litres costs £1.60. Which is better value for money?

(d) Which is better value? 200 ml juice at 19p or 1.1 litre juice at 97p.

(e) Which is better value? 9m foil for 89p, 85cm foil for 8p, or 4m foil for 50p?

(f) The supermarket sells three sizes of shampoo. Which is the best value shampoo?

400ml	300ml	200ml
£3.59	£2.99	£2.19

(g) Plants are sold in three different sizes of tray.

A small tray of 30 plants costs £6.50.

A medium tray of 40 plants costs £8.95.

A large tray of 50 plants costs £10.99.

Kaz wants to buy the tray of plants that is the best value for money. Which size of tray of plants should she buy?

You must show all your working out.

(h) Ketchup is sold in three different sizes of bottle. A **small** bottle contains 342g of ketchup and costs 88p. A **medium** bottle contains 570g of ketchup and costs £1.95. A **large** bottle contains 1.5 kg of ketchup and costs £3.99. Which bottle is the best value for money?

Fluency Practice

Best Buys Problems

(a)

Four bars of soap costs £1.72. Nine bars of soap costs £3.96. Which is better value for money?

Bars	Cost
4	£1.72
1	£0.43

Bars	Cost
9	£3.96
1	

(b)

Five muffins costs £6.80. Twelve muffins costs £16.08. Which is better value for money?

Muffins	Cost
5	£6.80
1	

Muffins	Cost
12	£16.08
1	

(c)

A large pack of 18 toilet rolls costs £6.30. A small pack of 5 toilet rolls costs £1.95. Which is better value for money?

Rolls	Cost
18	£6.30
1	

Rolls	Cost
5	£1.95
1	

(d)

Shop A sells packs of 6 juices for £1.74. Shop B sells packs of 5 juices for £1.55. Which shop is better value for money?

Juices	Cost

Juices	Cost

(e)

A shop has two offers: 3 cookies for 96p or 10 cookies for £3.25. Which offer is better value for money?

Cookies	Cost

Cookies	Cost

(f)

Tim can choose between a pack of 4 pens for £1.59 or a pack of 5 pens for £1.95. Which is better value?

Pens	Cost

Pens	Cost

(g)

Two pints of milk costs £1.25. Five pints of milk costs £2.99. Which is better value for money?

(h)

Saim buys 3 brownies for £4.99. Tanvi buys 5 brownies for £7.95. Who is getting better value for money?

(i)

Luci finds two offers - play 9 holes of mini-golf for £12.50 or 20 holes of mini-golf for £27.50. Which of the offers is better value for money?

Fluency Practice

learn by heart

If an item is for sale in two or more different sizes, you can work out which is better value for money using direct proportion.

examples

If one size is a multiple of the other, find the cost of buying the larger quantity using smaller packs.

1. A pack of 6 eggs costs £1.30
A pack of 18 eggs costs £3.75

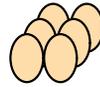
Which size pack gives better value for money?

$$18 \div 6 = 3$$

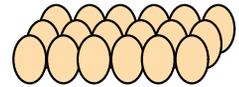
3 small packs give 18 eggs.

With small packs:

$$\begin{array}{l} \times 3 \left(\begin{array}{l} 6 \text{ eggs cost } \pounds 1.30 \\ 18 \text{ eggs cost } \underline{\pounds 3.90} \end{array} \right) \times 3 \end{array}$$



Pack of 6 eggs
£1.30



Pack of 18 eggs
£3.75

The large pack gives better value for money, as the cost for 18 eggs is less with a large pack (£3.75) than with small packs (£3.90).

2. A large bottle of lemonade (1.5 litres) costs £2.40
A small bottle of lemonade (750ml) costs £1.10

Which size bottle gives better value for money?

$$1.5 \text{ litres} = 1500\text{ml}$$

$$1500 \div 750 = 2$$

2 small bottles contain 1.5 litres.

With small bottles,

$$\times 2 \left(\begin{array}{l} 750\text{ml costs } \pounds 1.10 \\ 1.5 \text{ litres cost } \underline{\pounds 2.20} \end{array} \right) \times 2$$



1.5 litres
£2.40



750ml
£1.10

The small bottle gives better value for money, as the cost for 1.5 litres is less with small bottles (£2.20) than with a large bottle (£2.40).

exercise

1. Work out which quantity of each item is better value for money.

a) Oranges

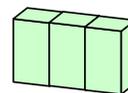


Pack of 4
£1.20

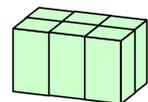


Pack of 12
£3.80

b) Apple juice



3 cartons
£1.65

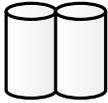


6 cartons
£2.95

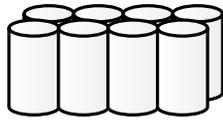
Fluency Practice

2. Work out which quantity of each item is better value for money.

a) Kitchen roll



2 rolls
75p



8 rolls
£2.80

b) Chocolate

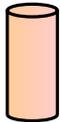


Single
60p



5 bars
£2.60

c) Shampoo



200ml
£2.20



400ml
£4.50

d) Baked beans

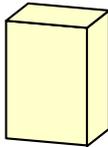


450g
£2.50

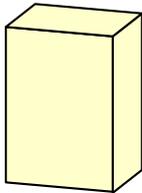


150g
80p

e) Cereal



750g
£1.90



1.5kg
£3.60

f) Water



2 litres
£3.40



500ml
90p

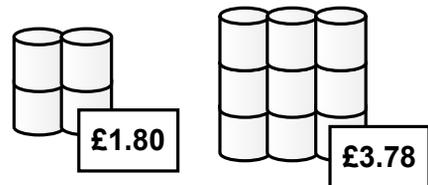
D Value for money 2

examples

Use direct proportion to find the cost of an equivalent amount for each size.

1. A pack of 4 toilet rolls costs £1.80
A pack of 9 toilet rolls costs £3.78

Which size pack gives better value for money?



Small pack

$$\div 4 \left(\begin{array}{l} 4 \text{ rolls cost } \pounds 1.80 \\ 1 \text{ roll costs } \underline{\pounds 0.45} \end{array} \right) \div 4$$

Large pack

$$\div 9 \left(\begin{array}{l} 9 \text{ rolls cost } \pounds 3.78 \\ 1 \text{ roll costs } \underline{\pounds 0.42} \end{array} \right) \div 9$$

The large pack gives better value for money, as the cost per roll is less with a large pack (42p) than with a small pack (45p).

Fluency Practice

2. A box containing 800g of cereal costs £2.40
 A box containing 1.4kg of cereal costs £3.50

Which size box gives better value for money?

$$1.4\text{kg} = 1400\text{g}$$

A common factor of 800 and 1400 is 200.

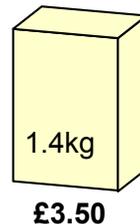
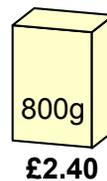
Small box

$$\begin{array}{l} 800\text{g costs } \pounds 2.20 \\ \div 4 \left(\begin{array}{l} 200\text{g costs } \underline{\pounds 0.55} \end{array} \right) \div 4 \end{array}$$

Large box

$$\begin{array}{l} 1.4\text{kg costs } \pounds 3.50 \\ \div 7 \left(\begin{array}{l} 200\text{g costs } \underline{\pounds 0.50} \end{array} \right) \div 7 \end{array}$$

The large box gives better value for money, as the cost per 200g is less with a large pack (50p) than with a small pack (55p).



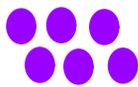
exercise

1. Work out which quantity of each item is better value for money.

- a) Plums

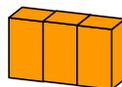


Pack of 4
£1.20

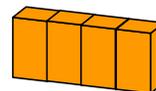


Pack of 6
£1.65

- b) Juice



3 cartons
£1.35

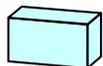


4 cartons
£1.92

- c) Fish fingers

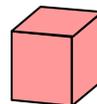


Pack of 15
£2.85

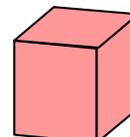


Pack of 10
£1.80

- d) Tea bags



120 bags
£1.56

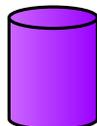


200 bags
£2.60

- e) Drinking chocolate



150g
£2.10



250g
£3.60

- f) Cola

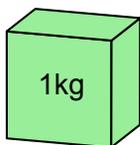


330ml
66p

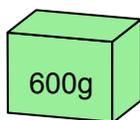


250ml
40p

- g) Washing powder



£3.80

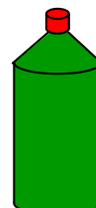


£2.10

- h) Washing up liquid



200ml
96p



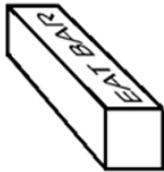
500ml
£2.30

Purposeful Practice

ratio

which is the best buy?

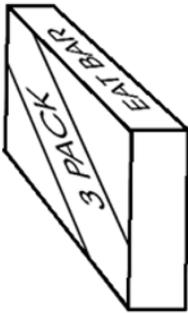
(1)



28p



52p



81p

(2)



500g

£1.25



1kg

£2.48



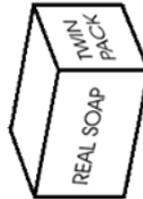
2kg

£4.98

(3)



83p



£1.68



£2.50

(4)



500g

£2.21



300g

£1.32



200g

87p

Purposeful Practice

£2.00 £3.55 £5.30
80 tea bags 150 tea bags 220 tea bags

what do each of these calculations tell you?

$$200 \div 80 \qquad 355 \div 150$$

$$150 \div 3.55$$

$$530 \div 220$$

$$2 \div 8$$

$$5.30 \div 22$$

$$220 \div 5.30$$

$$80 \div 2.00$$

$$3.55 \div 15$$

Fluency Practice



Question 1: Given £1 = 5 zloty convert each of the following into Polish zloty

- (a) £4 (b) £9 (c) £20 (d) £35 (e) £70 (f) £410 (g) £88

Question 2: Given £1 = 5 zloty convert each of the following into UK pounds

- (a) 15 zł (b) 35 zł (c) 250 zł (d) 180 zł (e) 715 zł (f) 900 zł (g) 95 zł

Question 3: Given £1 = 25 Mexican Peso convert each of the following into Pesos

- (a) £4 (b) £20 (c) £25 (d) £40 (e) £37 (f) £66 (g) £360

Question 4: Given £1 = 25 Mexican Peso convert each of the following into UK pounds

- (a) \$75 (b) \$250 (c) \$825 (d) \$4000 (e) \$9200 (f) \$38000 (g) \$1275

Question 5: Given £1 = \$1.50 convert each of the following into US dollars.

- (a) £3 (b) £5 (c) £7 (d) £20 (e) £40 (f) £50 (g) £100

Question 6: Given £1 = \$1.50 convert each of the following into UK pounds

- (a) \$3 (b) \$6 (c) \$15 (d) \$45 (e) \$300 (f) \$12 (g) \$33



Question 7: Given £1 = ₺4.25 convert each of the following into Turkish lira.

- (a) £9 (b) £15 (c) £9.60 (d) £73 (e) £853 (f) £9500 (g) 80p

Purposeful Practice

Question 8: Given £1 = ₺4.25 convert each of the following into UK pounds.

(a) ₺29.75 (b) ₺76.50 (c) ₺110.50 (d) ₺2550 (e) ₺5100 (f) ₺0.85 (g) ₺4.59

Question 9: Given £1 = €1.28 convert each of the following into euros.

(a) £6 (b) £4.50 (c) £13 (d) £58 (e) £190 (f) £5730 (g) £809

Question 10: Given £1 = €1.28 convert each of the following into pounds.

(a) €64 (b) €153.60 (c) €1152 (d) €0.32 (e) €44.80 (f) €140.80 (g) €2.24

Apply

Question 1: Nicola went to Italy. She changed £800 into euros (€).
The exchange rate was £1 = €1.40
Change £800 into euros.

Question 2: A new TV in Tokyo costs ¥53380
The exchange rate is £1 = ¥157
How much is the TV in pounds?



Question 3: In Lisbon, a watch costs €80.
In Liverpool, the same watch costs £65.
The exchange rate is £1 = €1.25

Work out the difference in cost.

Question 4: Below are the prices of the same car in different countries.
£1 = €1.18 £1 = ¥140 £1 = \$1.25

USA	Ireland	England	Japan
\$20000	€17500	£15000	¥3000000

In which country is the car the best value?



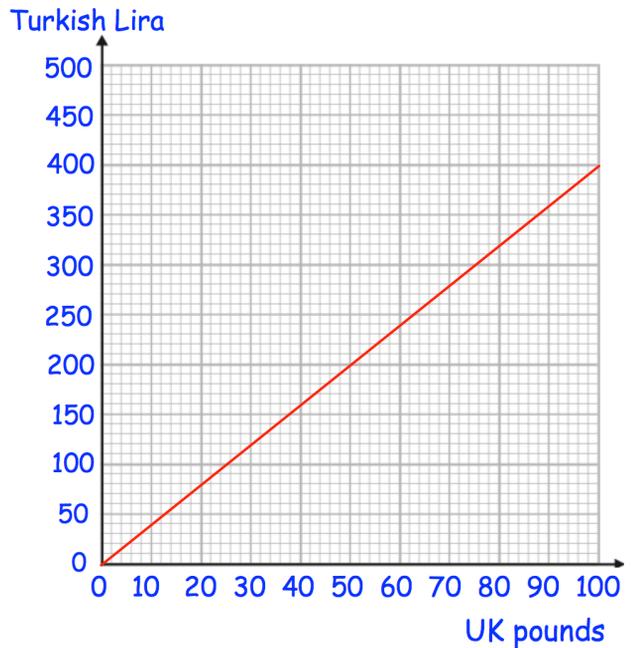
Purposeful Practice

Question 5: Martina wants to convert £300 into Euros.
The Post Office only has €20 notes.
The exchange rate is £1 = €1.17

- (a) How many €20 notes will Martina receive?
- (b) How much will it cost Martina?

Question 6: Shown is a conversion graph to convert between GB pounds and Turkish lira.

- (a) Convert £90 into Turkish lira.
- (b) Convert 100 lira into pounds.
- (c) Convert £250 into Turkish lira.
- (d) Convert 800 lira into pounds.



Question 7: Below is a conversion graph to convert between GB pounds and Polish złoty.

Jack has £400 and 1200 złoty
His hotel bill is 2000 złoty

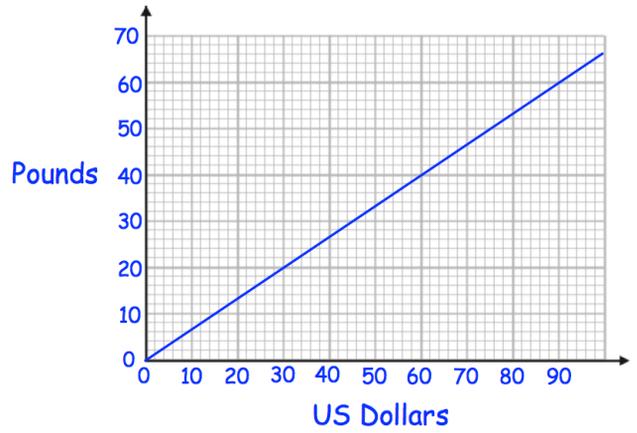
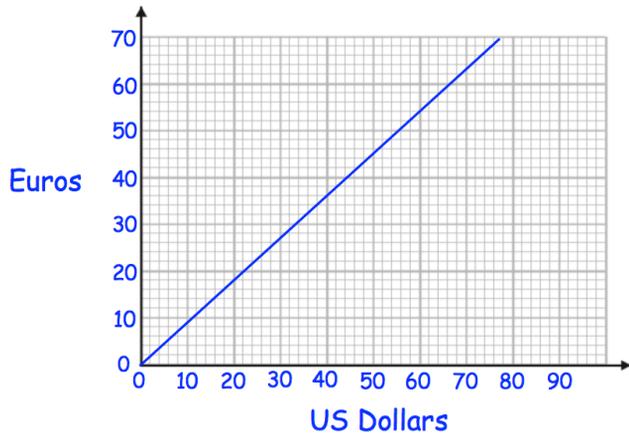
He pays the bill with 1200 złoty and
some of the pounds.

Work out how many pounds he has left.



Purposeful Practice

Question 8: Convert £160 into Euros



Fluency Practice

1 UK pound = 1.17 Euros.

Complete the table.

UK Pounds	Euros
1	1.17
10	
	117
25	
	58.5
80	

1 US dollar = 74.3 Indian rupees

Complete the table.

US Dollars	Indian Rupees
1	74.3
15	
	600
65	
	1350

1 Euro = 109.74 Japanese yen

(a) A flight costs 225 euros. How much is this in Japanese yen?

(b) What is 175 Japanese yen in Euros?

(c) The same TV costs 265 euros in France and 30000 Yen in Japan. Which is cheapest?

1 US dollar = 31.85 Taiwan dollars

1 Taiwan dollar = 1.46 Indian rupees

(a) Convert 27.85 US dollars to Taiwan dollars.

(b) A mobile phone costs 10000 Indian rupees. How much is this in Taiwan dollars?

(c) What is 75 Indian rupees in US dollars?

Fluency Practice

FOREX

You are at Heathrow Airport, looking at the **FOREIGN EXCHANGE** board.

We sell		We Buy	
£1	\$ 1.27	USD	£0.75
	€ 1.12	EUR	£0.80
	\$ 1.82	AUD	50p
	¥ 136	JPY	0.6p
	¥ 9	CNY	£0.10
	K 120	KES	£0.08
	0.49	OMR	£1.73



Unlike many shops, every transaction is rounded to the cent (2 dp).

- A) Tim is travelling to China.
He wants to exchange £200 into CNY. How many Yuan does he get?
- B) Helen is travelling to Kenya.
She wants to exchange £50 into KES. How many Shillings does she get?
- C) How many USD does £45 buy?
- D) How many Japanese Yen does £122 buy?
- E) How many KES does 40p buy?
- F) Rashid wants to get rid of his British money before returning to Oman.
How many Rial does he get for £6.28?
- G) Sophie has returned from Australia with \$270 AUD.
How much GBP will she get?
- H) Haurto has arrived from Japan and found ¥1200 in his pocket.
How much GBP can he exchange this for?
- I) Sam is visiting a friend in France and only wants €300 spending money.
To the nearest £, how much should she exchange?
- J) On arrival in Nairobi, Max will need 5500 KES for the visa.
How much GBP does he need to exchange to pay for this?



- K) Jenny returns from the USA with \$54.24
How many GBP can she exchange this for?
- L) Bill returns from Oman with 5.27 OMR.
How many GBP can she exchange this for?
- M) Lucy is travelling to America. She exchanges £260 but misses her flight!
If she exchanges her Dollars back to Pounds, how much will she get?
How much profit does the shop make?
- N) If a customer exchanged £64.20 to Euros, then immediately exchanged these Euros for Pounds, how much money would they lose?
- O) Richard is on a transfer, travelling from Kenya to Australia.
He has 4250 Kenyan Shillings but the shop won't change them directly to AUD, he has to buy GBP first. How many Dollars does he get?
- P) Exchange 515 CNY to USD (you must convert to GBP first).
- Q) Exchange €12.47 to JPY (you must convert to GBP first).
- R) After exchanging her Euros, Kelly got £56
How many Euros did she exchange?
- S) After exchanging his JPY, Doug got £150
How many Yen did he exchange?
- T) A week ago Michael exchanged £450 and went on holiday to Italy.
He has returned and exchanged his remaining EUR for £30.
How many Euros did he spend on holiday?
- U) Ash exchanged her Pounds to Dollars (Australian). She actually wanted US Dollars! She exchanged the money back to Pounds and then to USD. In all the fuss she missed her flight and had to change the USD into GBP! The exchange gave her £90.
How much money did she lose (not including the flight)?

Fluency Practice

learn by heart

If two quantities are inversely proportional, when one of the quantities is multiplied by a value, the other is divided by the same value.

When the two quantities are multiplied, the result is always the same constant.

examples

1. Machines in a factory are being used to make an order of scarves.
With 5 identical machines working, the order will be completed in 30 minutes.

a) How long would it take to complete the order if 10 machines were used?

$$\begin{array}{l} \times 2 \left\{ \begin{array}{l} 5 \text{ machines would take } 30 \text{ minutes} \\ 10 \text{ machines would take } \underline{15} \text{ minutes} \end{array} \right. \div 2 \end{array}$$

b) How long would it take to complete the order if 2 machines were used?

$$\begin{array}{l} \div 5 \left\{ \begin{array}{l} 5 \text{ machines would take } 30 \text{ minutes} \\ 1 \text{ machine would take } \underline{150} \text{ minutes} \end{array} \right. \times 5 \\ \times 2 \left\{ \begin{array}{l} 1 \text{ machine would take } 150 \text{ minutes} \\ 2 \text{ machines would take } \underline{75} \text{ minutes} \end{array} \right. \div 2 \end{array}$$

$$75 \text{ minutes } \left(1\frac{1}{4} \text{ hours}\right)$$

2. y is inversely proportional to x .
Work out the missing values in the table.

x	5	2	
y	6		10



x	5	2	3
y	6	15	10

Two inversely proportional quantities always multiply to the same constant.

$$5 \times 6 = 30$$

$$2 \times \underline{\quad} = 30$$

$$\underline{\quad} \times 10 = 30$$

Here you can work out that the constant is **30** from the first pair of values.

exercise

1. Using 6 pumps, it takes 4 hours to drain a pond of water. Complete the following:

a) 6 pumps would take 4 hours
12 pumps would take ___ hours

b) 6 pumps would take 4 hours
3 pumps would take ___ hours

c) 6 pumps would take 4 hours
1 pump would take ___ hours

d) 6 pumps would take 4 hours
2 pumps would take ___ hours

Fluency Practice

2. With 8 construction workers, a road can be built in 12 days. Complete the following:

a) 8 workers would take 12 days
4 workers would take ___ days

b) 8 workers would take 12 days
16 workers would take ___ days

c) 8 workers would take 12 days
2 workers would take ___ days
6 workers would take ___ days

d) 8 workers would take 12 days
1 worker would take ___ days
3 workers would take ___ days

3. A farmer has a store of food, that can feed 12 sheep for 15 days.

a) For how many days would he be able to feed 6 sheep with the store of food?

b) For how many days would he be able to feed 18 sheep with the store of food?

4. At a speed of 600mph, it takes a plane 3 hours to travel between London and Berlin.

a) How long would the journey take at a speed of 200mph?

b) To complete the journey in $1\frac{1}{2}$ hours, at what speed would a plane need to travel?

5. It takes 1 hour and 20 minutes to fill a pool using 4 taps.
Work out how long it would take with 5 taps.

6. With a team of 3 workers, a wall can be built in $7\frac{1}{2}$ hours.
Work out how long it would take with 5 workers.

7. Complete each table, in which x and y are inversely proportional.

a)

x	4	3		24
y	6		12	

b)

x	12		3	
y	5	10		2

c)

x	8	10		1.6
y	5		8	

d)

x	6	4		10
y	8		15	

8. A company director has an amount of money to give to his staff as bonuses.
The company has 5 office workers and 15 warehouse workers.
If the money is shared equally between the warehouse workers, each receives £120.

a) If the money is instead shared equally between the office workers, how much will each office worker receive?

b) If the money is instead shared equally between the office workers and the warehouse workers, how much will each worker receive?

Fluency Practice

Proportional or Not?

- 1) Decide if these real-life situations describe **directly proportional** or **inversely proportional** relationships.
How might they **not** be proportional?

Peter rides 20 km in an hour.
How far will he travel in 3 hours?

It takes Jack and Joe 3 hours to build a wall.
How long would it take 3 people to build the wall?

Ash invests £200 and gets 3% interest per year.
How much will she have after 5 years?

Heidi can eat 3 mini-pizzas in 30 minutes.
How long would it take Heidi to eat 50 mini-pizzas?

A taxi charges £3 pick-up fee and £2 per mile.
How much will it cost to travel 10 miles?

- 2) For the proportional relationships, calculate an answer.

Direct Proportion: When one variable increases so does the other.
Inverse Proportion: When one variable increases the other *decreases*.

Jan gets paid £30 for 2 hours' work.
How much will she get paid for 3 hours' work?

A 4-person band can play the song 'Wonderwall' in 3 minutes.
How long would it take a 3-person band to play the song?

A PC with 2GB of RAM can load a game in 1 minute.
How long would it take a PC with 6GB of RAM to load the game?

3 kg of dog food costs £9.
How much does 30 kg of dog food cost?

A construction crew can build a single floor of a building in 1 month.
How long will it take to build a 20-floor building?

3 machines can make 120 widgets in 2 hours.
How long does it take 5 machines to make 200 widgets?

Fluency Practice

Machines	Proportion	Time
15	100%	8 hours
?	100%	4 hours

Machines	Proportion	Time
15	100%	8 hours
?	100%	16 hours

Machines	Proportion	Time
15	100%	8 hours
?	100%	40 hours

Machines	Proportion	Time
15	100%	8 hours
5	100%	?

Machines	Proportion	Time
15	100%	8 hours
3	100%	?

Machines	Proportion	Time
15	100%	8 hours
150	10%	?

Machines	Proportion	Time
15	100%	8 hours
15	?	4 hours

Machines	Proportion	Time
15	100%	8 hours
15	?	6 hours

Machines	Proportion	Time
15	100%	8 hours
15	?	1 hours

Machines	Proportion	Time
15	100%	8 hours
15	25%	?

Machines	Proportion	Time
15	100%	8 hours
15	10%	?

Machines	Proportion	Time
15	100%	8 hours
15	10%	?

Fluency Practice

Machines	Proportion	Time
15	100%	8 hours
	50%	
9	50%	?

Machines	Proportion	Time
15	100%	8 hours
	25%	
10	25%	?

Machines	Proportion	Time
15	100%	8 hours
20	75%	?

Machines	Proportion	Time
15	100%	8 hours
12	20%	?

Machines	Proportion	Time
15	100%	8 hours
15	50%	
5	50%	?

Machines	Proportion	Time
15	100%	8 hours
15	50%	?
30	50%	

Machines	Proportion	Time
15	100%	8 hours
15	25%	
3	25%	?

Machines	Proportion	Time
15	100%	8 hours
15	25%	
12	25%	?

Fluency Practice

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 18 of the machines break down after 3 hours. The other machines carry on working until the order is complete.

Machines	Proportion	Time
20	100%	12 hours
20	25%	3 hours
20	75%	
2		

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 16 of the machines break down after 3 hours. The other machines carry on working until the order is complete.

Machines	Proportion	Time
20	100%	12 hours
20	25%	3 hours
4		

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 5 of the machines break down after 3 hours. The other machines carry on working until the order is complete.

Machines	Proportion	Time
20	100%	12 hours
15		

Fluency Practice

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 5 of the machines break down after 9 hours. The other machines carry on working until the order is complete.

Machines	Proportion	Time

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 8 of the machines break down after 9 hours. The other machines carry on working until the order is complete.

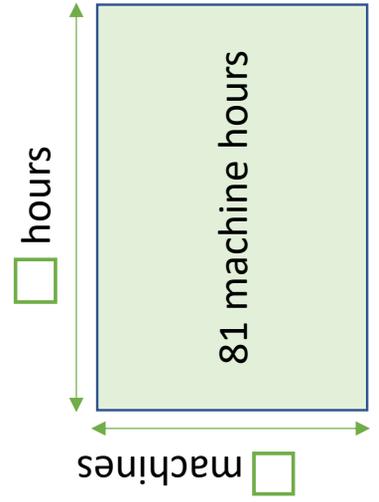
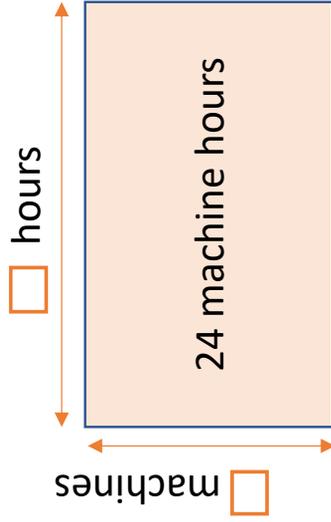
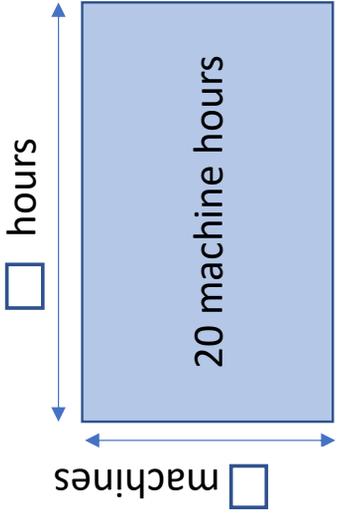
Machines	Proportion	Time

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 8 of the machines break down after 4 hours. The other machines carry on working until the order is complete.

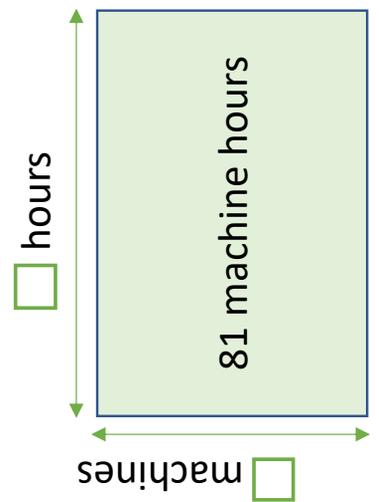
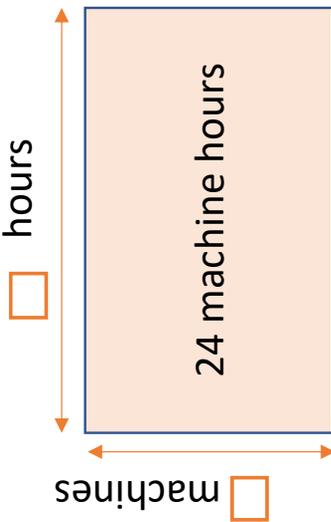
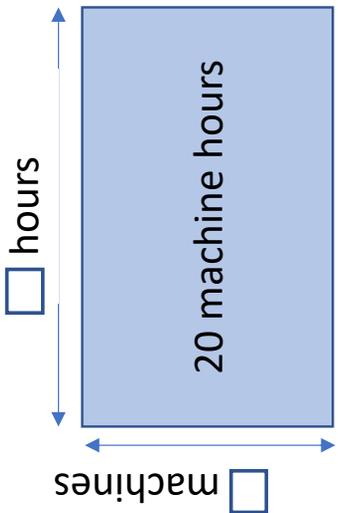
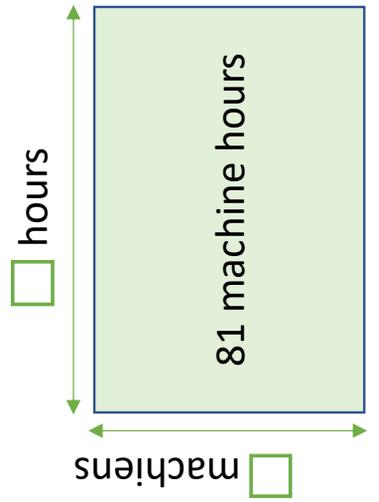
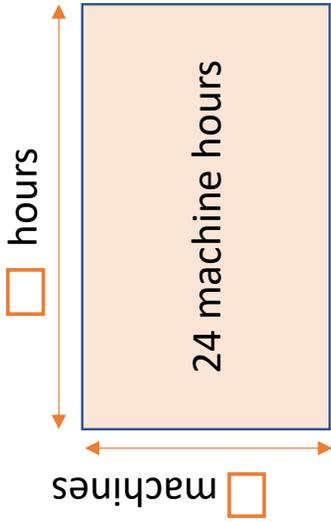
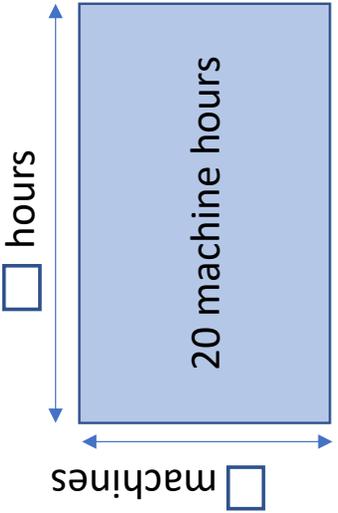
Machines	Proportion	Time

Fluency Practice

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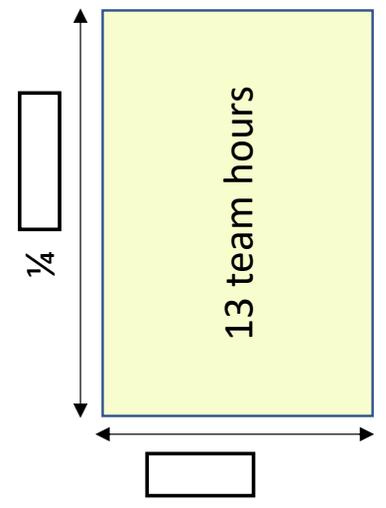
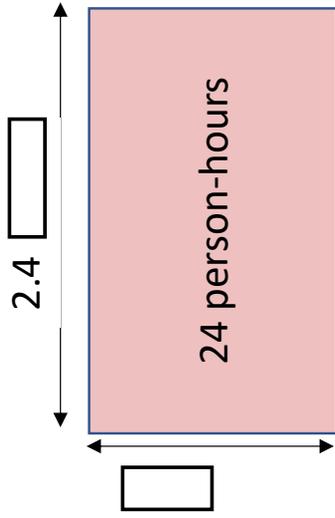
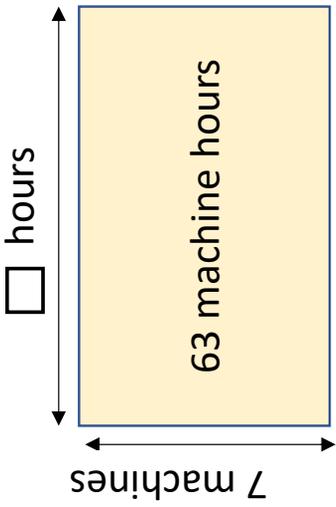
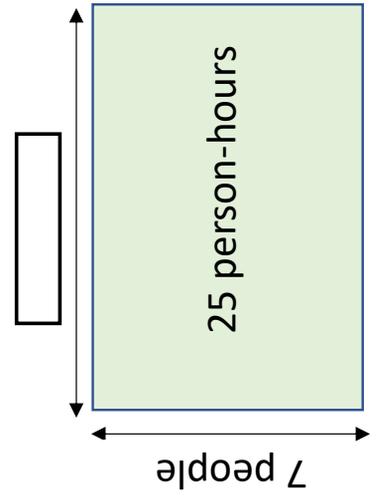
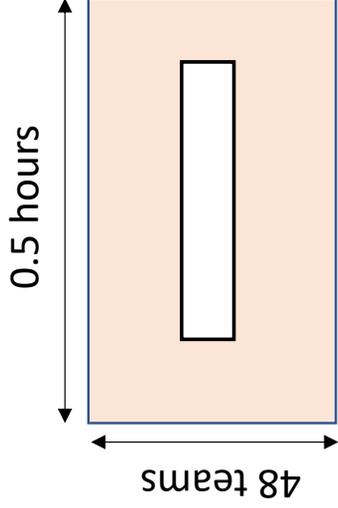
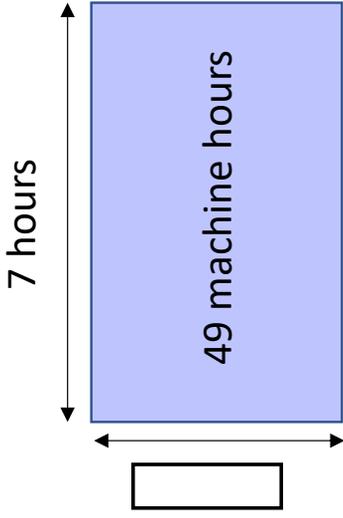


Fill the gaps with 12 distinct numbers:

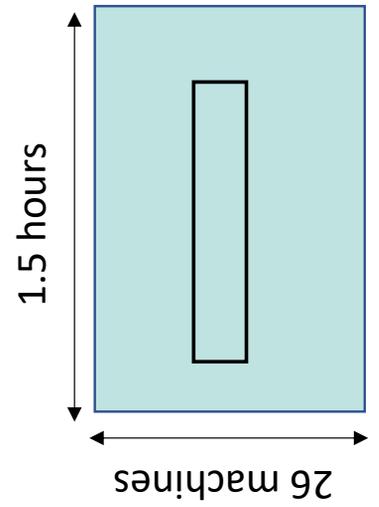
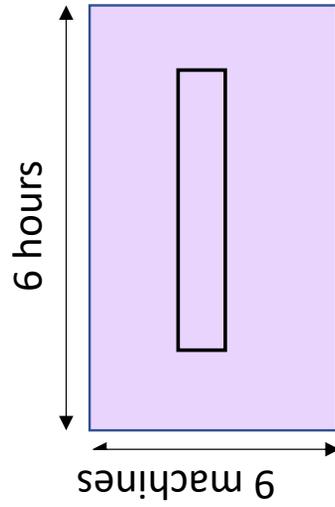
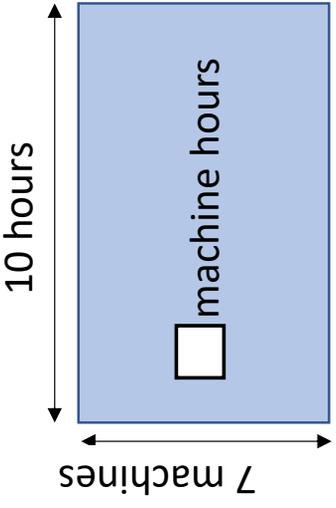


Fluency Practice

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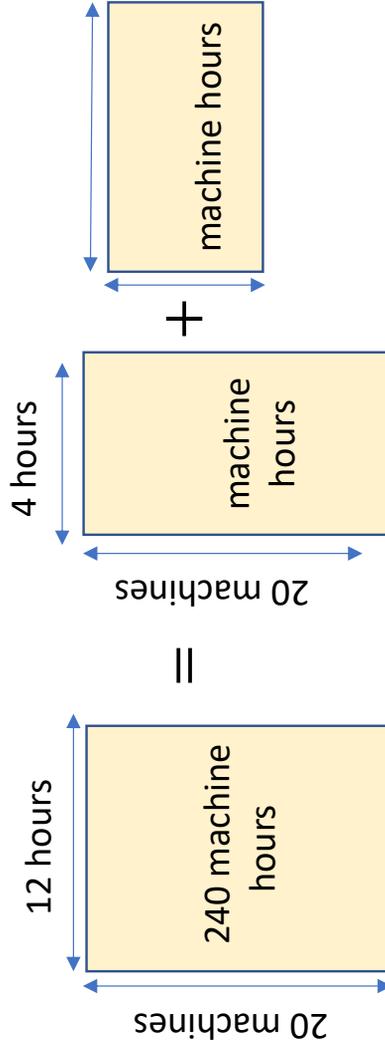
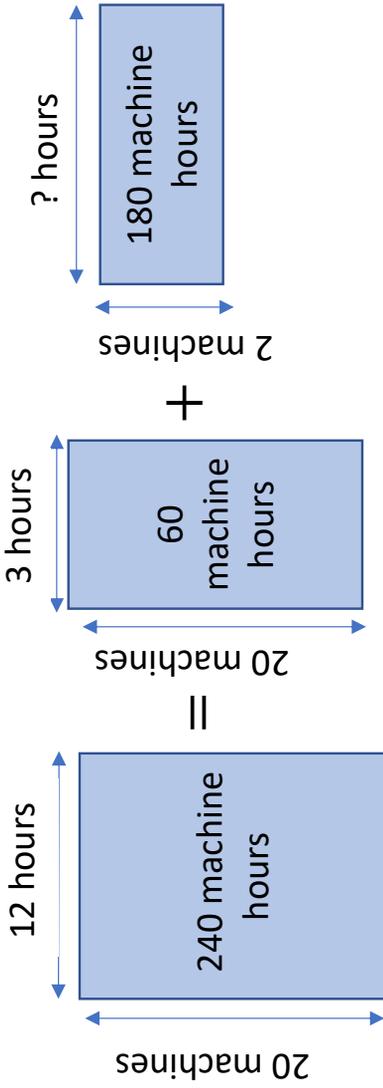


Fill in the gaps

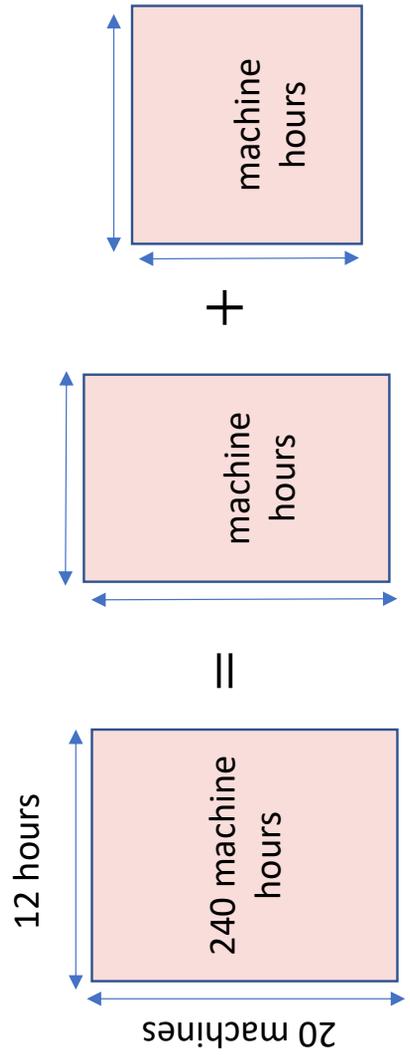


Fluency Practice

20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 18 of the machines break down after 3 hours. The other machines carry on working until the order is complete.



20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 16 of the machines break down after 4 hours. The other machines carry on working until the order is complete.



20 machines work at the same rate. Together, the 20 machines can complete an order in 12 hours. 12 of the machines break down after 10 hours. The other machines carry on working until the order is complete.

Fluency Practice

Q	Include any assumptions you make when answering these questions.	Answers
1	It takes 5 cleaners 3 hours to clean an office. How long would it take 6 cleaners?	
2	It costs £5 to travel 3 miles on journey. How much does it cost to travel 6 miles?	
3	It takes 5 workers 3 hours to complete a job. How long would it take 2 workers?	
4	It costs £5 per hour for a job. How much does it cost for a 3-hour job?	
5	A person lays 200 bricks in 1 hour. How long would it take one person to lay 350 bricks?	
6	It takes 200 people 1 hour to lay bricks for a wall. How long would it take 500 people?	
7	It takes 21 hours for 36 workers to build a 140m statue. How long would it take the same 36 workers to build a similar 120m statue?	
8	It takes 21 hours for 36 workers to build a 140m statue. How many workers would it take to build a similar statue of 50m in 18 hours?	
9	3 cats catch 2 rats in 1 minute. How long will it take 3 cats to catch 100 rats?	
10	3 cats catch 3 rats in 3 minutes. How long will it take 100 cats to catch 100 rats?	

Purposeful Practice

<p>1) Anne can build a wall in 4 days. Bob can build the same wall in 12 days. If they both work together, then how many days will be required to build the wall?</p>	<p>2) Vincent and Leonardo can paint a bungalow together in 3 days. If Vincent alone can paint the bungalow in 12 days, in how many days can Leonardo alone complete the same paint work?</p>
<p>3) Bob is twice as efficient as Anne, and it would take him only 9 days to build a wall. If they both work together, then how many days will be required to build the wall?</p>	<p>4) 6 workers can pack 12 boxes in 7 days by working for 8 hours a day. In how many days can 14 workers pack 18 boxes, working for 9 hours a day?</p>
<p>5) Anne is twice as efficient as Bob and together they can build a wall in 20 days. In how many days could Anne alone build the wall?</p>	<p>6) If Anne can build a wall in 5 days, which would take Bob 12 days to complete and Cleo 20 days to build. How long will they take to complete the wall, if they work together?</p>
<p>7) 4 adults and 5 children can build a wall in 20 days, while 5 adults and 4 children can build the wall in 16 days. In how many days can 4 adults and 3 children build the wall?</p>	<p>8) Salvador and Claude can paint a house in 20 days. Claude and Frida can paint the house in 6 days. If Salvador, Claude and Frida together can paint the house in 8 days, how long would it take just Salvador and Frida?</p>

Fluency Practice

(a) Four highlighter pens cost £3.16. What is the cost of 7 highlighter pens?	(b) A cake recipe for 5 people uses 45g of sugar and 120g of flour. How much sugar and flour is needed to make a cake for 8 people?	(c) Three volunteers take 8 days to build a wall. If four volunteers were to build the same wall, how long would it take?	(d) Which is better value for money – 4 packs of tissues for £1.15 or 9 packs of tissues for £2.50?
(e) If a van travels at 60 km/h, it completes the journey in 25 minutes. How long will the journey take if the van travels at 20 km/h?	(f) 1 kg of carrots costs 65p. How much would it cost for 600g of carrots?	(g) Six bars of chocolate costs £1.15. Five bars of chocolate costs 95p. Which is the better value for money?	(h) It takes 40 minutes for 4 hoses to fill a pool. How long would it take to fill the pool if five hoses were used?
(i) It takes four hours to re-turf a lawn with an area of 20 m ² . How long would it take to re-turf a lawn with an area of 35 m ² ?	(j) Hari buys enough food to feed his two hamsters for 9 days. He then adopts another hamster. How many days will his hamster food last now?	(k) It takes a team of 4 builders 15 days to build a garage. If the garage needs to be completed in six days, how many more builders are required?	(l) A recipe for 8 pancakes requires 2 eggs and 120g flour. Marcia has 6 eggs and 300g flour. How many pancakes can she make?

Fluency Practice

(a)	There are 40 pens and 15 pencils in a pot. Write down the ratio of pens to pencils in its simplest form.
(b)	There are 60 adults and 12 children on a bus. Write the ratio of adults to children in the form $n:1$
(c)	1 Euro is equivalent to £1.20. Convert 220 Euros into Pounds.
(d)	A table has width 80 cm and length 1.96 m. Write the ratio of the width to length in the form $1:n$.
(e)	A soup recipe which serves 5 people requires 175g of carrots. Work out the amount of carrots required to make soup which serves 12 people.
(f)	The ratio of red sweets to green sweets in a jar is 7:2. If there are 18 green sweets, how many red sweets are there?
(g)	Work out the largest share when £425 is divided in the ratio 9:8.
(h)	Amjit, Bella and Chris share \$1250 in the ratio 6:8:11. Work out how much Chris receives.
(i)	Which is better value for money – 4 cakes for £1.25, 5 cakes for £1.49 or 6 cakes for £1.89?
(j)	In a jumble sale, Del, Eric and Fajar earned some money in the ratio 6:9:5. Eric earned £36 more than Del. How much did Fajar earn?
(k)	The ratio of black squares to grey squares is 7:3. The ratio of white squares to grey squares is 9:5. Find the ratio of black squares to white squares in its simplest form.
(l)	The ratio of counters in bag A to bag B is 7:2. Five counters are taken from bag A and added to bag B. The ratio of counters in bag A to bag B is now 8:3. Find the number of counters now in bag A and in bag B.

Fluency Practice

- (a) Three pens cost 15p. How much do 7 pens cost?
- (b) Four ice creams cost 80p. How much do nine ice creams cost?
- (c) Typing four pages takes 24 minutes. How long does it take to type 13 pages?
- (d) Jim walks three miles in 45 minutes. How long does it take for him to walk 5 miles?

- (a) 5 boxes of cereal weigh 800g. How much do 11 boxes of cereal weigh?
- (b) A car travels 175 miles in 5 hours. How far does it travel in 7 hours?
- (c) Julie runs 5 km in 25 minutes. How long does it take her to run 8.5 km?
- (d) Larry earns £29.60 for four hours work. How much would he earn for 7.5 hours work?

- (a) A call centre job pays £55.38 for working a 6 hour day. A receptionist job pays £76.80 for working an 8 hour day. Which job pays the better hourly rate?
- (b) At Aldi, 8 tomatoes cost £1.44, whereas at Lidl 6 tomatoes cost 96p. Which shop is better value for money?
- (c) A corner shop charges £1.85 for 4 pints of milk. A petrol station charges 49p for 1 pint of milk. A supermarket charges £1.05 for 2.5 pints of milk. Which is better value for money?

- (a) Fred takes 40 minutes to walk two dogs. How long does it take Fred to walk three dogs?
- (b) A choir with 8 members sings Ave Maria in 5 minutes. How long does it take a choir with 10 members to sing the same song?

Fluency Practice

- (a) 4 bottles of cola cost £3.60. How much do 9 bottles of cola cost?
- (b) 5 jars of coffee cost £9. How much do 4 jars cost?
- (c) 8 bottles of washing up liquid cost £12. How much will 5 bottles cost?
- (d) 3 rolls of Sellotape cost £2.40. How much will 5 rolls of Sellotape cost?

- (e) It takes 4 people 2 days to paint a wall. How long would it take if 8 people painted the wall?
- (f) It takes 14 hours for a tap with a flow of 18 litres per minute to fill a reservoir with water. How long will it take if its flow is reduced to 7 litres per minutes?
- (g) If 6 builders take 80 days to build a house. How many builders must be employed to build the house in just 16 days?

- (h) One kilogram of cheese costs £9.68. Chris buys 650 g of this cheese. How much does he pay?
- (i) On 1st May 2012, the cost of 5.7 grams of gold was 15 960 rupees. Work out the cost, in rupees, of 4.6 grams of gold on the same day.
- (j) 4 people take 3 hours to paint a fence. How long would it take 5 people to paint the same fence? Give your answer in hours and minutes.

- (k) Sam and two friends put letters in envelopes on Monday. The three of them take two hours to put 600 letters in envelopes. Working at the same rate, how much longer would it take four people to put 1000 letters in envelopes than it would take five people?

Purposeful Practice

1. Factual recall

Complete the function machines



2. Carry out a routine procedure

The following tables follow a direct proportion, fill in the missing values

x	0	2	4	12
y		8		24

x	1	2	5	11
y			15	21

x	2	3		9
y			21	27
				42

3. Classify some mathematical object

Tick the scenarios that follow a direct proportion

<input type="checkbox"/>	The number of sweets bought at a shop and the price.
<input type="checkbox"/>	The ages of a brother and a sister.
<input type="checkbox"/>	The number of builders and the time to complete a building
<input type="checkbox"/>	The speed of a runner and the distance the runner travels.

4. Interpret a situation or answer

8 pens at a shop cost £2.40.

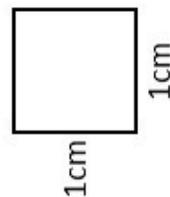
Calculate the cost of...

- a) 16 pens
- b) 36 pens
- c) 111 pens

5. Prove, show, justify

The following table represents the length and perimeter of a square. By filling in the table show that the length of a square is directly proportional to the perimeter of the square.

l	1	2	5	10	20
P					



Direct Proportion

6. Extend a concept

Now fill in this table for the area of the squares.

l	1	2	5	10	20
A					

Is the area of the square directly proportional to its length?

7. Construct an instance

Construct 3 different ways of solving the following problem.

6 cans of soda cost £3.60, find the price of 20.

8. Criticise a fallacy

A student answers the following question.

6 apples cost £3.

Find the price of 15 apples.

$$+9 \left\{ \begin{array}{l} 6 \text{ apples} = £3 \\ 15 \text{ apples} = £12 \end{array} \right. +9$$
 Is the student correct? Explain.

Fluency Practice

1

Prices

A) At the supermarket, 3 apples cost £1.20
How much do 7 apples cost?



Apples	1	2	3	6	7
Price			120		

B) Jeff buys 8 doughnuts for his friends and pays £2
If Jeff bought 11 doughnuts, how much will he pay?



Dough.	1	2	4	8	10	11
Price						

Best Buys

At BestCo 8 pies cost £3.20

At Mega Mart 20 pies cost £7

At Supa-Save Mart 30 pies cost £9.60

Which shop is cheaper?

BestCo					
Pies	1	2	4	8	
Price				320	

Mega Mart

Pies	1	5	10	20	
Price					

Supa-Save

Pies	1	2	3	30	
Price				960	

Recipes

D)



To make 20 mini-onion pizzas,
we need these ingredients:
600 grams of onions
700 grams of flour
300 grams of tomatoes
460 grams of cheese

Find how much of each ingredient we need to make 24 mini-pizzas.

Mini-Pizzas	1	2	4	20	24
Onions (g)				600	
Flour (g)				700	
Tomatoes (g)				300	
Cheese (g)				460	

Exchange Rates

E) For £1 you can buy 6.1 Malaysian Ringgit (the currency in Malaysia).

£1 = 6.1 Malaysian Ringgit

Complete the ratio table to show how many Ringgit you can get for £80

British £	1	10	20	40	80
Ringgit	6.1				

F)

£1 = 11.6 Swedish Krona

Complete the ratio table to show how many Krona you can get for £25

British £	1	5	10	20	25
Krona	11.6				

Fluency Practice

②

Prices



A) 16 tins of beans cost £6.88
How much do 10 tins cost?

Tins	1	2	4	8	10	16
Price						688

B) 30 pencils cost £3.90

How much do 25 pencils cost?



Pencils	1	2	3	10	20	25	30
Price							390

D

Recipes



To make 40 'to-go' Pasta Pots,
we need these ingredients:

- 2.2 kg of pasta
- 1.04 kg of sauce
- 480 grams of chopped veg.
- 300 grams of spice

Find how much of **each ingredient** we need to make **45 pots**.

Mini-Pizzas	1	2	4	40	45
Pasta (g)					
Sauce (g)					
Veg (g)					
Spice (g)					

Best Buys

At SuperMart 60 protractors cost £16.20

At Big Box 25 cost £5.75

At BestCo 36 cost £8.64

Which shop is cheaper?

SuperMart	1	2	3	6	60
Prot.					1620
Price					

Big Box

Prot.	1	2	5	10	25	50
Price						

BestCo

Prot.	1	3	9	18	36
Price					

E

Exchange Rates

For £1 you can buy 48 Taiwanese Dollars (the currency in Taiwan).

£1 = 48 Taiwan Dollar

Complete the ratio table to show how many Dollars you can get for £6.50

British £	0.5	1	2	4	6.50
Dollars		48			

F

£1 = 24.2 South African Rand

Complete the ratio table to show how many Rand you can get for £60.50

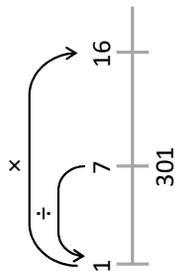
British £	0.5	1	3	30	60	60.50
Rand						

Fluency Practice

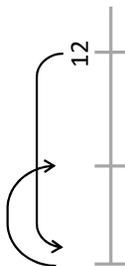
①

Prices

- A) 7 pens cost £3.01
How much do 16 pens cost?



- B) 12 mini-pizzas cost £22.32
How much do 5 pizzas cost?



- C) 6 pasties cost £8.70
How much do 10 pasties cost?

- D) 12 pork pies cost £10.68
How much do 9 pies cost?

Best Buys

- E) A packet of 10 protractors costs £3.40
A packet of 25 protractors costs £7.25
Which packet size is cheaper **per protractor**?

	1
340	10
	25
	725

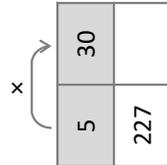
- F) At **Mega-Mart** Mark buys
12 cookies for £6.96
At **Go Save** Abe buys
20 cookies for £12.60

	1
	12
	20
	30

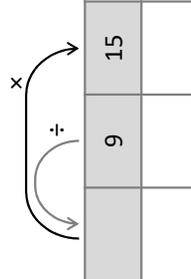
Tif wants to buy 30 cookies (for friends).
How much will that cost
at the cheaper store?

Recipes

- G) A recipe for 5 rolls says we need 227 g of flour.
If we want to make 30 rolls,
how much flour do we need?



- H) A recipe for 9 cupcakes says we
need 324 g of sugar.
If we want to make 15 cupcakes,
how much sugar do we need?



- I) If we need 420 ml of milk for
15 pancakes, how much milk do
we need for 25 pancakes?
- J) If 189 g of sugar is in
18 cans of soda,
how much sugar is in 7 cans?

Exchange Rates

1 British Pound is worth 43 Thai Baht

$$\text{£}1 = \text{฿}43$$

£25 = ฿
£3.50 = ฿
55p = ฿

฿400 = £
฿230 = £
฿35 = £

- K) Complete these
currency conversions.

£1 = \$1.4

US Dollar

£1 = ¥146

Japanese Yen

- L) Jess is travelling from Wales to Japan. She exchanges £350 into Yen.
She comes home with 17520 Yen.

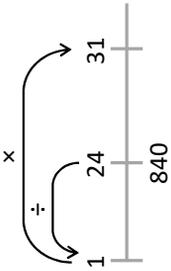
How many British pounds did she spend in Japan?
She converts the Yen into Pounds and then into Dollars.
How many dollars does she have for her trip to the USA?

Fluency Practice

②

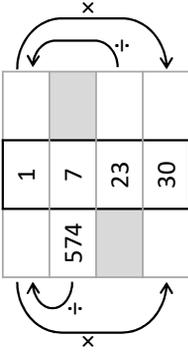
Prices

- A)** 24 protractors cost £8.40
How much do 31 protractors cost?
- B)** 5 pencils cost 85p
How much do 32 pencils cost?
- C)** 40 rulers cost £19.20
How much do 12 rulers cost?
- D)** 32 calculators cost £207.04
How much do 10 calculators cost?



Best Buys

- E)** At **Mega-Mart** Ahmed buys 7 candy bars for £5.74
At **Go Save** Jay buys 23 candy bars for £17.25



Si wants to buy 30 candy bars.
How much will that cost at the cheaper store?

- F)** At **Mega-Mart** Rahul buys 15 cupcakes for £14.40
At **Go Save** Emma buys 26 cupcakes for £26.78

Trey wants to buy 18 cupcakes.
How much cheaper is it to buy these at the cheaper store?

Recipes

28 Mini-cakes
728 g of butter
490 g of sugar
2.7 kg of flour

Find the ingredients needed to make 35 cakes.

1	28	35

40 Flapjacks
328 g of toffee
560 g of sugar
2.25 kg of oats

Find the ingredients needed to make 15 flapjacks.

Exchange Rates

£1 = \$1.43 1 British Pound is worth 1.43 USA dollars.

£52 = \$ \$200 = £

£13.50 = \$ \$25.50 = £

87p = \$ 58 cents = £

I) Complete these currency conversions.

£1 = KD 0.42 Kuwaiti Dinar

£1 = R19.56 South African Rand

- J)** Ken buys a laptop in Kuwait. He spends KD 165.
Ben buys the same model laptop in South Africa for 7432 Rand.
As a percentage, how much more did one person pay for the laptop?

Purposeful Practice

Find the wages for one person in each given question.

5 cleaners take 4.5 hours to clean an office.

3 cleaners are hired to do the same job.

If each cleaner is paid £8.50 per hour, how much will each cleaner be paid per day?

6 builders take 12 hours to complete a job.

4 builders are hired to do the same job.

If each builder is paid £11.50 per hour, how much will each builder be paid per day?

3 carpenters take 14 hours to fit skirting board to a new office block.

7 carpenters are hired to do the same job.

If each carpenter is paid £14.50 per hour plus a fixed cost of £20 each, how much will each carpenter be paid per day?

2 window cleaners take 4.5 hours to clean a full street of windows.

3 window cleaners are hired to do the same job.

If each window cleaner is paid £10 per hour plus a fixed cost of £5 each, how much will each window cleaner be paid per street?

5 electricians take 3.5 hours to fit the electrics in a new house.

2 electricians are hired to do the same job.

If each electrician is paid £60 per house plus £5 per hour, how much will each electrician be paid per house?

5 builders take 9.5 hours to build a new garden patio on a new housing estate.

19 builders are hired to do the same job.

If each builder is paid £20 per hour plus a £15 bonus, how much will each builder be paid per job?

Fluency Practice

Find the:		Answers
Q 1	It costs £7 to buy 10 identical pumps. How much do 8 of the pumps cost?	
2	It takes 7 hours for 10 identical pumps to fill a water tank. How many hours does it take 8 of these pumps to fill a water tank of the same size? Assume all pumps work at the same rate.	
3	A cleaner earns £10 per hour. How much do they earn in 5 hours?	
4	It takes 10 hours for a cleaner to clean a house. How long would it take 5 cleaners? Assume all cleaners work at the same rate.	
5	A tap releases water at a rate of 8 litres per minute. How much water is released in 20 minutes?	
6	A tap takes 8 minutes to fill a container. How long would 20 identical taps take to fill the same container? Assume all taps are flowing at the same rate.	
7	5 workers take 3 hours to paint a room. How long would it take them to paint 4 identical rooms?	
8	5 workers take 3 hours to paint a room. How long would it take 4 workers to paint the same room? Assume all painters work at the same rate.	

2 Averages and Range

Intelligent Practice

Find the range of:

1) 1, 1, 3, 5, 10

2) 2, 2, 4, 6, 11

3) 4, 4, 8, 12, 22

4) 4, 4, 8, 12, 20

5) 4, 4, 8, 10, 20

6) 1, 4, 8, 10, 17

7) 0.1, 0.4, 0.8, 1.7

8) $-1, -4, -8, -10, -17$

Intelligent Practice

Find the mode of:

1) 10, 5, 3, 1, 1

2) 1, 1, 3, 5, 10

3) 2, 2, 6, 10, 20

4) 2, 2, 6, 10, 6

5) 2, 2, 6, 10, 6, 10

6) 2, 2, 6, 10, 6, 2

7) 2, 3, 6, 10, 5, 1

8) 2, 2, 2, 2, 2, 2

Intelligent Practice

Find the median of:

1) 10, 5, 3, 1, 1

10) 3, 4, 5, 6, 7, 8

2) 1, 1, 3, 5, 10

11) 2, 3, 4, 5, 6, 7, 8

3) 2, 2, 6, 10, 20

12) 1, 2, 3, 4, 5, 6, 7, 8

4) 3, 3, 7, 11, 21

13) 2, 4, 5, 6, 7, 8

5) 3, 3, 7, 11, 210

14) 2, 3, 4, 6, 7, 8

6) -33, 3, 7, 11, 210

15) 2, 3, 4, 6, 7, -8

7) 33, 3, 7, 11, 210

16) 2, -3, 4, -6, 7, -8

8) 33, 3, -7, 11, 210

9) 3, 4, 5, 6, 7

Fluency Practice

Find the median from the following lists of data:

- 1) 1, 2, 3, 4, 5
- 2) 1, 2, 3
- 3) 1.5, 2.5, 3.5, 4.5, 5.5
- 4) x , $2x$, $3x$, $4x$, $5x$
- 5) -1, -2, -3, -4, -5
- 6) 382, 383, 384, 385, 386
- 7) 196, 195, 194, 193, 192
- 8) 11, 12, 13, 14, 15, 16, 17
- 9) 1, 1, 1, 1, 1, 1, 1
- 10) $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$
- 11) 10, 6, 1, 5, 13
- 12) 10, 6, 5, 1, 13

Fluency Practice

1 Calculate the median of the following sets:

a) 1, 4, 5, 9, 11

f) 0.3, 0.03, 3.3, 3.03

b) 7, 2, 9, 10, 11

g) $\sqrt{81}$, 2^3 , $\sqrt[3]{27}$, 4^2

c) 7, 6, 10, 2

h) $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$

d) 102, 58, 92, 21

i) $3 \times 4 - 2$, $(4 + 2) \times 2$,
 $2 - 3 \times (-2)$, $8 \div 4 \times 5$

e) 9, -5, -11, 0, -2

j) The median of the factors of 18.

Intelligent Practice

Find the mean of:

1) 1, 4, 7, 9, 9

10) 26, 12, 16, 6, 15, 21

2) 2, 5, 8, 10, 10

11) 12, 16, 15, 21

3) 0, 3, 6, 8, 8

12) 12, 12, 16, 16, 15, 15, 21, 21

4) 0, 3, 6, 8, 3

13) 3.6, 4.8, 4.5, 6.3

5) 10, 3, 6, 8, 3

14) $-6, -8, -7.5, -10.5$

6) 0, 13, 6, 8, 3

15) $12^2, 16^2, 15^2, 21^2$

7) 13, 6, 8, 3

8) 26, 12, 16, 6

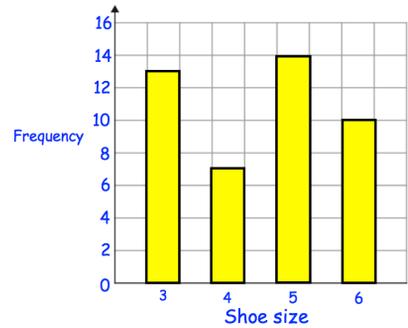
9) 26, 12, 16, 6, 15

Fluency Practice

Question 1: Work out the mode for each of the following

- (a) 5, 6, 6, 7, 8, 10 (b) 1, 1, 1, 4, 6, 8, 12 (c) 5, 5, 7, 7, 7, 8, 8, 9
- (d) 5, 7, 3, 5, 8, 9, 10, 2 (e) 8, 3, 3, 4, 6, 8, 13, 3, 18 (f) 12, 14, 15, 17, 15
- (g) 2.3, 2.6, 2.8, 2.7, 2.8, 2.7, 2.4, 2.3, 2.1, 2.3 (h) -2, -1, 5, 8, -2, 2, -1, 9, -1, 1, 2, -1

Question 2: The bar chart shows the shoe sizes of a group of students.



- (a) How many students in total are there?
- (b) What is the modal shoe size?

Question 3: Work out the mode for each of the following

- (a) 8, 1, 1, 7, 2, 1, 5, 9, 4, 1, 5, 5, 9, 6, 4, 3, 2, 3, 1, 1, 9, 8, 7, 3, 2, 4, 5, 1, 1, 9, 1
- (b) 8, 9, 7, 3, 4, 7, 9, 3, 4, 5, 1, 2, 2, 1, 3, 0, 0, 8, 1, 4, 7, 8, 6, 6, 3, 3, 3, 1, 3, 3, 5

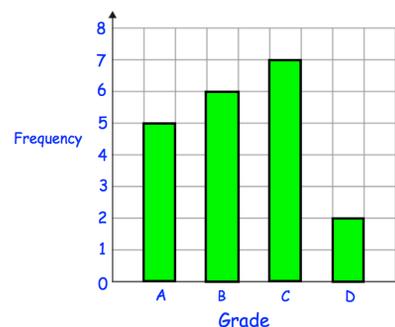
Question 4: The tally chart shows the favourite sport of the students in a class.

- (a) What is the modal sport?
- (b) How many students are in the class?
- (c) How many more students liked football than rugby?

Sport	Tally
Rugby	
Football	+++ +++
Hockey	+++ +++
Cricket	

Question 5: Mrs Green gives her class a test. The results are shown in the bar chart below.

- (a) What is the modal grade?
- (b) How many students sat the test?
- A grade C or above is a "pass."
- (c) What fraction of the students passed the test?



Fluency Practice

Question 1: Work out the median for the each of the following

(a) 5, 1, 4, 6, 8

(b) 9, 1, 3, 6, 7, 8, 9

(c) 6, 4, 7, 1, 3, 8, 1, 10

(d) 7, 3, 8, 9, 6, 5

(e) 9, 8, 6, 6, 6, 7, 1, 2, 6, 8

(f) -4, 5, -7, -1, 2, 0, 9

(g) 20, 30, 10, 20, 40, 50, 60, 10, 80, 30

(h) 49, 34, 12, 10, 53, 20, 65, 34, 90, 100, 33

(i) 6.2, 6.8, 6.6, 7.2, 6.4, 7.4, 5.8

(j) 124, 53, 39, 230, 155, 180

Question 2: Shown are the ages and weights of 5 dogs.

					
	Fido	Lucky	Toto	Barney	Tess
Age	4	12	7	9	1
Weight	14kg	9kg	30kg	16kg	8kg

(a) Which dog has the median age?

(b) Which dog has the median weight?

Question 3: The height of some footballers are listed below:

1.81m, 1.78m, 1.88m, 1.79m, 1.86m, 1.85m, 1.78m, 1.93m

(a) Work out the median height

(b) What is the modal height?

Question 4: Write down five numbers with a median of 7

Question 5: Write down eight numbers with a median of 10

Question 6: Write down four different numbers with a median of 4.5

Question 7: Write down six different numbers with a median of 0

Fluency Practice

Question 1: Find the mean for each of the sets of data below

- (a) 4, 9, 7, 10, 5 (b) 2, 8, 6, 3, 12, 7, 4 (c) 3, 2, 1, 3, 2, 2, 1, 3, 1, 2, 3, 2, 1
(d) 1, 8, 7, 5, 6, 4, 7, 6 (e) 20, 30, 24, 32 (f) 12, 8, 14, 5, 1, 3, 0, 8, 10, 11
(g) 9, -3, -6, 5, 0 (h) 1.4, 2.8, 2.4, 2.5, 2.8, 3.1, 1.1

Question 2: A basketball team plays 8 matches.
The number of points they score in each match are:

62, 68, 67, 79, 82, 50, 74, 62

- (a) Work out the mean number of points scored
(b) Write down the modal number of points scored
(c) Write down the median number of points scored



Question 3: Mr Holland gives his class a test. The results are:
34%, 44%, 75%, 21%, 98%, 86%, 71%, 76%, 63%, 55%

- (a) Work out the mean mark
(b) Work out the median mark
(c) How many students scored above the mean mark?

Question 4: Five houses on a street are sold in 2016. They sell for
£175,000 £184,000 £150,000 £201,000 £191,000

Calculate the mean price.

Question 5: The mean of four numbers is 10. Three of the numbers are 9, 11 and 7.
Work out the fourth number.

Question 6: The mean of six numbers is 5. Five of the numbers are 6, 6, 5, 3 and 1.
Work out the sixth number.

Question 7: The mean of five numbers is 8.2. Four of the numbers are 8, 10, 12 and 10.
Work out the fifth number.

Fluency Practice

Question 1: Find the range for each of the following

- (a) 5, 9, 1, 5, 7, 4, 3 (b) 6, 7, 10, 8, 9, 9 (c) 21, 15, 19, 24, 30, 26
(d) 210, 250, 260, 180, 240 (e) 6.2, 7.3, 8.8, 1.5, 4.1 (f) 3, 1, 2, 1, 3, 4, 5, 0, 1
(g) -5, 1, 3, 6, -8, 1 (h) -6, -10, -2, -9 (i) 0, 7, 9, -21, 10, -4
(j) 7, 9, -2, 13, 9, 8, 20, -8, 1 (k) -10, -6, -15, -9, -8, -7, 8, -3

Question 2: The range for a list of numbers is 7. The smallest value is 4.
What is the largest value in the list?

Question 3: The range for a list of numbers is 8. The largest value is 13.
What is the smallest value in the list?

Question 4: The range for a list of numbers is 1. The largest value is 4.
What is the smallest value in the list?

Question 5: The range for a list of numbers is 27. The smallest value is 87.
What is the largest value in the list?

Question 6: The number of points that Randalstown Rugby Club scored in eight matches are
24, 17, 19, 35, 9, 43, 15, 30.

- (a) Work out the range of the number of points scored.
(b) Work out the median of the number of points scored.

Question 7: The table shows the midday temperature over five days.
Each temperature is in degrees celsius.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Temperature	-4	1	-6	1	-2

- (a) Work out the range of the temperatures.
(b) Work out the mean temperature.

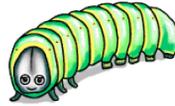
Purposeful Practice

Apply

Question 1: The length of nine caterpillars are listed below

9cm 4cm 8cm 10cm 7cm 5cm 13cm 10cm 6cm

- (a) Find the mode
- (b) Find the median
- (c) Find the mean
- (d) Find the range



Question 2: James plays six games of darts.
His scores are 120, 71, 80, 14, 90, 117



Should James use the mean or the median to give him the highest average score?

Question 3: Shown are the weights of 3 puppies.

- (a) Work out range of the weights
- (b) Work out the median weight
- (c) Work out the mean weight



Question 4: The amount of water in some containers are:

2 litres, 330ml, 0.08 litres, 0.7 litres, 75ml, 5000ml, 0.15 litres

- (a) Work out the median
- (b) Find the range

Question 5: The median height of 11 footballers is 1.85m.
Only one footballer has a height of 1.85m
How many footballers have a height under 1.85m?



Question 6: Write down seven numbers that have a range of 10 and a mean of 12.

Question 7: Write down six numbers that have a median of 8, a mean of 9 and a range of 13

Question 8: Five numbers have a range of 14.
Four of the numbers are 20, 22, 31 and 25.
Work out the two different possible values for the fifth number.

Purposeful Practice

Question 9: Belfast Giants have played 5 matches and the mean number of goals scored is 3. When they play the 6th match, the mean increases to 4.

How many goals were scored in the 6th match?

Question 10: James is a car salesman.

He has a target of selling 5 cars a day from Monday to Friday. Over Monday to Thursday, he has sold a mean of 6 cars a day. How many cars must he sell on Friday to meet his target?



Question 11: A teacher surveys a group of students.

He asks how much pocket money they receive each week. They respond

£5 £8 £4 £50 £6 £8 £7.50 £10 £8 £7

- (a) Work out the median
- (b) Work out the mean
- (c) Which average, the median or the mean, is most suitable for this data?

Question 12: A set of six numbers have a median of 9.

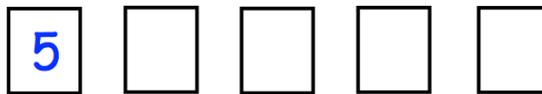
All of the numbers are even.

The range of the numbers is 8.

The mode of the numbers is 6.

Write down a possible set of six numbers.

Question 13: Shown below are five cards which are arranged in order from smallest to largest



The range of the cards is 6.

The median of the cards is 7.

The mean of the cards is 8.

Work out the 4 missing numbers.

Fluency Practice

Q	Find the:	Answers
1	mean of 3, 4, 4, 5, 6, 8, 12	
2	median of 3, 4, 4, 5, 6, 8, 12	
3	mode of 3, 4, 4, 5, 6, 8, 12	
4	mean of 1, 1, 1, 2, 2, 3, 4, 5, 8	
5	median of 1, 1, 1, 2, 2, 3, 4, 5, 8	
6	mode of 1, 1, 1, 2, 2, 3, 4, 5, 8	
7	mean of $x, x + 1, x + 1, x + 2, x + 3, x + 5, x + 9$	
8	median of $x, x + 1, x + 1, x + 2, x + 3, x + 5, x + 9$	
9	mode of $x, x + 1, x + 1, x + 2, x + 3, x + 5, x + 9$	
10	mean of $2y, 2y, 2y, 2y + 1, 2y + 1, 2y + 2, 2y + 3, 2y + 4, 2y + 7$	
11	median of $2y, 2y, 2y, 2y + 1, 2y + 1, 2y + 2, 2y + 3, 2y + 4, 2y + 7$	
12	mode of $2y, 2y, 2y, 2y + 1, 2y + 1, 2y + 2, 2y + 3, 2y + 4, 2y + 7$	

Intelligent Practice

Data	Mean	Median	Mode	Range
2, 2, 4, 5, 7				
2, 2, 4, 5, 12				
3, 3, 5, 6, 13				
6, 6, 10, 12, 26				
6, 6, 10, 18, 20				
6, 6, 13, 15, 20				
6, 6, 13, 15, 20, 24				
0, 6, 6, 13, 15, 20, 24				

Fluency Practice

Data	Mean	Median	Mode	Range
1, 2, 3, 4, 5				
10, 20, 30, 40, 50				
0.1, 0.2, 0.3, 0.4, 0.5				
-1, -2, -3, -4, -5				
1a, 2a, 3a, 4a, 5a				
£1, £2, £3, £4, £5				
5, 2, 1, 4, 3				
2, 3, 4, 5, 6				
1, 2, 3, 4, 10				
0, 3, 3, 4, 5				
0, 0, 6, 4, 5				
-3, -2, -1, 0, 1, 2, 3				
1, 2, 3, 4, 500				
0, 1, 2, 3, 4, 5				
0, 0, 1, 2, 3, 4, 5				
1, 2, 3, 4, 5, 6				
0.4, 2.1, 0.9, 1.7, 2.9				
$\frac{1}{2}, \frac{1}{5}, \frac{1}{10}$				
$4x, 2x, 7x, 3x, 9x$				
$3a + b, b, 6a$				

Intelligent Practice

Find the missing number:

- 1) 4, 2, 8, ? Mean = 4
- 2) 4, 2, 8, ? Mean = 5
- 3) 5, 3, 9, ? Mean = 5
- 4) 10, 6, 18, ? Mean = 10
- 5) 10, 6, 18, ? Mean = 20
- 6) 10, 6, 18, ?, 20 Mean = 20
- 7) 10, 6, 18, ?, 0 Mean = 20

Intelligent Practice

- 1) Four exams, mean mark is 22. First three scores are 20, 28 and 25. What is the fourth score?
- 2) Four numbers have a mean of 2.2. The first three are 2.0, 2.8 and 2.5. What is the fourth number?
- 3) Five exams, mean mark is 22. First four scores are 20, 28, 25 and 17. What is the fifth score?
- 4) Five exams, mean mark is 44. First four scores are 40, 56, 50 and 34. What is the fifth score?
- 5) Five numbers have a mean of 11. The first four are 10, 14, 12 and 9. What is the fifth number?
- 6) Four numbers have a mean of 15. The first three are 15, 15 and 15. What is the fourth number?
- 7) Four numbers have a mean of 15. The first three are 20, 20 and 20. What is the fourth number?
- 8) Four numbers have a mean of 15. The first three are 30, 30 and 30. What is the fourth number?

Fluency Practice

(a) In a class of 30 students, 12 are boys and 18 are girls. In a science test the mean score for girls was 72 and the mean score for boys was 65. Find the mean score for the whole class to 1 d.p.

	Number	Mean	Total
Girls	18	72	
Boys	12	65	
Overall	30		

(b) A farmer has 40 cows and 60 sheep. The mean weight of the cows is 950 kg and the mean weight of the sheep is 140 kg. Find the mean weight of all the animals the farmer has.

(c) A team of 14 athletes has a mean 100 m sprint time of 14.8 seconds. Another member joins the team with a 100 m time of 12.9 seconds. Find the new mean time of all 15 athletes to 1 decimal place.

(d) Form 7A has 24 students and their mean age is 11.7 years. When the age of their form tutor is added, the mean goes up to 13.1 years. Find the age of the form tutor.

(e) Aleena records the number of people using a library per day over January and February. Across January a total of 1680 people visited the library and across both months the mean was 62.8 people. Given that it was a leap year, find the mean number of people who visited the library per day in February.

(f) The mean height of a sports team of 15 defenders or attackers is 183 cm. The mean height of the defenders is 187 cm and for the attackers it is 181 cm. How many attackers and defenders are there in the team?

Fluency Practice

		Answers
Q		
1	Students take a spelling test. The scores were 13, 12, 17, 18 and 16. Work out the mean score.	
2	Students take a spelling test. The scores were 13, 12, 17, 18, 16 and x . Given the mean score was 15 find x .	
3	Students take a spelling test. The mean score of 5 students is 15. A new student takes the test and scores 9. Work out the new mean score?	
4	Students take a spelling test. The mean score of 5 students is 15. A new student takes the test and the mean score increases to 16. Work out the new student's score.	
5	Students take a spelling test. There are 20 students in Class X. The mean score of Class X is 15. There are 24 students in Class Y. The mean score of Class Y is 18. Work out the mean score of both classes combined.	
6	Students take a spelling test. There are 20 students in Class X. The mean score of Class X is 15. There are 24 students in Class Y. The mean score of all the students is 9. Work out the mean score of class Y.	
7	Students take a spelling test. There are 20 students in Class X. The mean score of Class X is 15. There are 24 students in Class Y. The mean score of class Y is 18. There are 12 students in class Z. The mean score of class Z is 4. Work out the mean score of all three classes combined.	
8	Students take a spelling test. The mean score of class X is 15. There are 24 students in Class Y. The mean score of class Y is 18. There are 12 students in class Z. The mean score of class Z is 4. The mean score of all three classes combined is 17. Work out how many students were in class X	
9	Students take a spelling test. There are a students in class X. The mean score of class X is x . There are b students in Class Y. The mean score of class Y is y . There are c students in class Z. The mean score of class Z is z . Work out the mean score of all three classes combined.	

Problem Solving

Can you find...

4 numbers with a mean
of 5

5 numbers with a mode
of 6 and a median of 8

5 numbers with a mode
of 3 and a mean of 6

6 numbers with a range
of 2 and a median of 4

4 numbers with a range
of 6, a mean of 4 and a
median of 3

4 numbers with a range
of 1 and a median of 1

5 numbers with a mean
of 6, a median of 7 and a
mode of 8

5 numbers with a range
of 5, a mean of 4 and a
median of 3

6 numbers with a range
of 4, a mean of 9, a
median of 9 and no mode

Problem Solving

Give an Example

Mode, Median and Range

A	Three integers with a range of 4 and a median of 5	
B	Three integers with a mode of 3 and a range of 1	
C	Three integers with a mode of 7 and a median of 7	
D	Three integers with a median of 4 and no mode	
E	Three decimals with a median of 2.4 and a range of 1.2	
F	Three negative integers with a median of -4 and a range of 5	
G	Four positive integers with a mode of 5 and a median of 5	
H	Four positive integers with a median of 3 and a mode of 4	
I	Four positive integers with a range of 3 and no mode	
J	Four negative integers with a median of -6 and a mode of -4	
K	Four integers with two modes which are 8 and 9	
L	Four decimals with a range of 3.7, a median of 4.8 and a mode of 4.4	
M	Four integers with a median of 0 and a mode of -3	
N	Four positive integers with a range of 2, a median of 2 and a mode of 2	
O	Four fractions with a median of $\frac{3}{4}$, a mode of $1\frac{1}{4}$ and a range of $\frac{3}{2}$	

Fluency Practice

- 1 (a) Calculate the mean and range of these two data sets:

A	5	10	0	1	9	5
B	5	6	4	3	7	5

(b) Make two valid comments about the two sets.

- 2 (a) Calculate the mean and range of these two data sets:

A	4	6	7	8	5	6
B	5	7	7	8	9	6

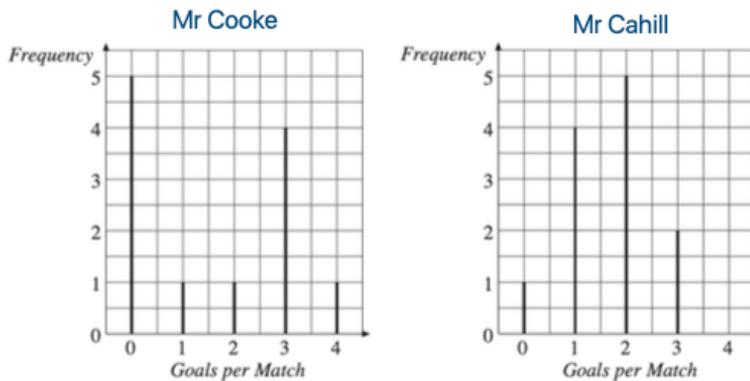
(b) Make two valid comparisons about the two sets.

- 3 (a) Calculate the mean and range of these two data sets:

A	4	6	10	3	5	2
B	6	7	9	9	5	3

(b) Make two valid comments about the two sets.

- 4 The two vertical line diagrams show the number of goals scored per match by two top footballers.



- (a) Calculate the mean and range for each player.
 (b) Make two valid comparisons about the two players.
 (c) Which of these players would you like to have playing for your team? Explain why.

- 5 Miss McKeown's class decide to have a times table competition with Miss Hutton's class. Their scores for each class are listed below.

	Miss McKeown		Miss Hutton
10	1 5 8 5 7	5	5 7 6 7 8
2	6 8 7 5 9	5	4 3 3 2 5
2	4 8 0 5 3	4	5 6 5 4 6
5	10 2 5 7 1	7	7 6 4 3 5
5	5 3 3 0 9	3	5 5 6 4 5

- (a) Calculate the mean and range for each class
 (b) Make two valid comparisons about the two classes.

Fluency Practice



Comparing using Range & Mean

The tables show data from 2 weather stations over 10 days in February.
Calculate the **mean & range** for each of the 6 statistics in both countries.
What comparisons can you make between the weather in the two countries?

Moscow (Russia)

Day Temperature (°C)

4	8	5	2	8
10	12	9	7	5

Night Temperature (°C)

-2	2	3	-3	-1
0	4	2	-1	4

Wind speed (kmph)

7	6	2	0	0
3	5	0	2	4

Rainfall (mm)

15	7	0	0	0
4	0	5	0	2

Direct Sunlight (hours)

5.6	6	4.2	1.7	1.2
4.5	7.5	4	2	0.8

Snowfall (cm)

0	0	5.8	4.6	12.7
3.7	8.1	5.2	3.3	4.4

Berlin (Germany)

Day Temperature (°C)

8	9	8	7	6
14	14	11	8	8

Night Temperature (°C)

6	8	7	7	-5
3	5	2	8	4

Wind speed (kmph)

11	14	27	18	16
8	21	15	4	19

Rainfall (mm)

17	14	18	22	7
0	0	15	12	17

Direct Sunlight (hours)

4.6	7	7.1	6	6.5
5	6.2	4.8	5.4	7.2

Snowfall (cm)

0	0	0	0	14.2
1.3	0	0	0	0



Purposeful Practice

Girls are Better at Maths?

Mr. John's Class			Miss Helen's Class		
Gender	Mark	Grade	Gender	Mark	Grade
M	85	A	F	76	B
F	91	A*	F	71	B
M	60	C	F	65	C
F	62	C	M	63	C
F	79	B	F	82	A
F	55	D	F	89	A
M	45	E	M	77	B
M	49	E	F	65	C
M	88	A	M	56	D
F	86	A	F	70	B
F	45	E	F	81	A
M	68	C	F	81	A
F	90	A*			
F	91	A*			

Questions

- Do you think the data suggests girls are better?
- Does the average help us decide?
- Which class did better? Which class would you rather be in? Why?
- What does the range tell us about the classes? Or the genders? Is it important?

Purposeful Practice

Instructions: Complete the remaining boxes by making the minimum change possible to the centre box. If there are boxes that cannot be filled in, say why.

Person number with highest mean score

	Less	Same	More
More			
Same		Person 1: 20, 24, 32, 42, 45 Person 2: 33, 35, 37, 42, 50, 53 Person 3: 23, 27, 30, 49	
Less			

Person number with lowest range

Fluency Practice

1 Find the *mean*, *median* and *mode* of each set of numbers:

(a) 4 4 6 8 5

(b) 6 7 7 7 7 5 6 2 9 8

(c) 8 4 3 3 5 7

(d) 6 6 7 7 4 9 1 7 10

2 The owner of a shoe shop recorded the sizes of the feet of all the customers who bought shoes in his shop in one morning. These sizes are listed below:

8 7 4 5 9 13 10 8 8 7

6 5 3 11 10 8 5 4 8 6

(a) What are the *mean*, *median* and *mode* shoe sizes?

(b) Which of these values would be most sensible for the shop owner to use when ordering shoes for his shop? Explain your choice.

3 One day the number of minutes that trains were late to arrive at a station was recorded. The times are listed below:

0 7 0 0 1 2 5 0 0 0

6 0 1 52 0 10 1 1 8 22

(a) Calculate the *mean*, *median* and *mode* of these data.

(b) Explain which value would be the best to use to argue that the trains arrive late too often.

(c) Explain who might use the mode and why it might be an advantage to them.

Purposeful Practice

4 Calculate the indicated average for each set of data and explain if that sort of average is sensible or not.

- | | | | |
|----------------------------|--------|----------------------------|--------|
| (a) 2, 3, 5, 7, 8, 10 | Mean | (b) 0, 1, 2, 2, 2, 4, 6 | Mode |
| (c) 1, 4, 7, 8, 10, 11, 12 | Median | (d) 2, 3, 6, 7, 10, 10, 10 | Mode |
| (e) 2, 2, 2, 2, 4, 6, 8 | Median | (f) 1, 2, 4, 6, 9, 30 | Median |

5 Calculate the range for each set of data below and decide whether it is a suitable measure of spread. Explain your answer.

- | | | |
|-----------------------|----------------------------|---------------------|
| (a) 1, 2, 4, 7, 9, 10 | (b) 1, 10, 10, 10, 10, 10 | (c) 1, 1, 1, 2, 10 |
| (d) 1, 3, 5, 6, 7, 10 | (e) 1, 1, 1, 7, 10, 10, 10 | (f) 5, 8, 9, 10, 14 |

6 Create three sets of data where, one for each of the following, where the given average would be the most appropriate one to describe your data:

- (a) The mean
- (a) The median
- (a) The mode

Purposeful Practice

Choosing an Average to Use: Mean, Median & Mode

For each data set, which average would represent the data best?

A restaurant records the meals each customer buys.



A zoo recorded the weight of each of its penguins.



Hugh asked 50 students about their travel to school.



10 friends took a science test:
1 person got more than double the score of the next best person!



To see if a dice was fair,
Mae rolled it 200 times!

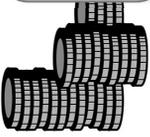


Over one month, nearly half of the people who took a driving test failed!



At MegaCorp Industries:

50 people earn between £20,000 & £40,000,
20 people earn between £40,000 & £50,000,
1 person earns over £120,000



50 Year 9 students took a maths test,
but 5 of the students were 30 minutes late &
scored very low marks!



A group of friends compared their lunch purchases.



A clothes shop records how much each customer spends.



In a 5 km race most of the runners finished in around
18 minutes. Dale finished with a time of 12:56



Jen records the eye-colour
of everyone in her class.



Dr Greene recorded the daily
temperature in Ozburg for 6 months.



Intelligent Practice

Data	Mean	Median	Mode	Range
2, 2, 4, 5, 7				
2, 2, 4, 5, 12				
3, 3, 5, 6, 13				
6, 6, 10, 12, 26				
6, 6, 10, 18, 20				
6, 6, 13, 15, 20				
6, 6, 13, 15, 20, 24				
0, 6, 6, 13, 15, 20, 24				

Fluency Practice

Data	Mean	Median	Mode	Range
1, 2, 3, 4, 5				
10, 20, 30, 40, 50				
0.1, 0.2, 0.3, 0.4, 0.5				
-1, -2, -3, -4, -5				
1a, 2a, 3a, 4a, 5a				
£1, £2, £3, £4, £5				
5, 2, 1, 4, 3				
2, 3, 4, 5, 6				
1, 2, 3, 4, 10				
0, 3, 3, 4, 5				
0, 0, 6, 4, 5				
-3, -2, -1, 0, 1, 2, 3				
1, 2, 3, 4, 500				
0, 1, 2, 3, 4, 5				
0, 0, 1, 2, 3, 4, 5				
1, 2, 3, 4, 5, 6				
0.4, 2.1, 0.9, 1.7, 2.9				
$\frac{1}{2}, \frac{1}{5}, \frac{1}{10}$				
4x, 2x, 7x, 3x, 9x				
3a + b, b, 6a				

Fluency Practice

Find the range of

- (a) 9, 12, 6, 14, 11, 7
- (b) 5, 3, 9, -4, 2, 1
- (c) 1, 0, 1, 1, 0, 0, 1

Find the mode of

- (a) 9, 5, 6, 1, 6, 3, 2
- (b) 5, 2, 5, 3, 5, 4, 3, 3
- (c) 3, 7, 5, 9, 12

Find the median of

- (a) 8, 12, 11, 15, 9
- (b) 6, 1, 9, 8, 11
- (c) 19, 2, 14, 8, 11, 10, 4, 15

Find the mean of

- (a) 13, 4, 7
- (b) 4, 10, 15, 8, 5
- (c) 5, -2, 0, 8, 3

(a) Five integers have a mean of 8. The integers are 7, 3, 10, 13, x . Find the value of x .

(b) Six integers have a range of 13. The integers are 5, 9, 7, 12, 3, x . Find the value of x .

(a) Four numbers have a mean of 9 and a median of 6. The four numbers are 2, 5, a , b . Find the value of a and b .

(b) Three integers have a mean of 5 and a range of 10. Find the three integers.

(a) Three different, positive integers have a mean of 8 and a median of 11. Find the three numbers.

(b) Four integers have a mode of 5, a mean of 7, and a median of 5.5. Find their values.

Fluency Practice

Find the mode, median and range of each of these sets of data:

- (a) 6, 8, 6, 5, 10
- (b) 4, 7, 7, 2, 5, 6, 5
- (c) 6.2, 4.9, 5.3, 5.1, 6.7
- (d) 0, -3, 4, -2, -3, 2, 8
- (e) 7, 11, 10, 11
- (f) 12.5, 10.8, 11.7, 12.5

The ages of two five-a-side teams are recorded as:

Rovers: 27, 23, 32, 21, 23

United: 28, 27, 25, 29, 27

Compare the mode, median and range of the ages for each team.

The test scores of class A and class B are recorded as:

Class A: 19, 18, 12, 19, 17

20, 14, 19, 15, 16

Class B: 18, 15, 16, 11, 15

18, 14, 18, 17, 19

Compare the mode, median and range of the scores for each class.

A set of four numbers has a range of 5 and a median of 6. Three of the numbers are 4, 5 and 9. Find the fourth number.

A set of five numbers has a mode of 7, a range of 6 and a median of 9. Three of the numbers are 7, 12 and 13. Find the remaining two numbers.

Purposeful Practice

Find the mean of each of these sets of data:

- (a) 8, 5, 10, 9
- (b) 6.3, 6.3, 6.3, 6.3
- (c) 18, 13, 11, 18, 14
- (d) 7, -3, 0, 5, -1
- (e) 7.8, 6, 7.2, 6.7, 4.8, 7.4, 7, 5.1
- (f) 11, 6, 14, 13, 8, 9

Find the mean of each of these sets of data:

- (a) Four numbers with a total of 20
- (b) Five numbers with a total of 40
- (c) Ten numbers with a total of 45

Find the total of each of these sets of numbers.

- (a) Six numbers with a mean of 8
- (b) Five numbers with a mean of 7.8
- (c) Ten numbers with a mean of 2.2

The science test scores of class 7A and 7B are given below.

7A: 13, 8, 18, 19, 9, 12, 19, 17, 20, 17

7B: 15, 16, 15, 12, 18, 17, 20, 18, 7, 10

Compare the mean test scores of the two classes.

Find the missing numbers in these sets of data when given the mean.

- (a) $Mean = 6$ 5, 8, 3, 6, ?
- (b) $Mean = 8.2$ 9, 7, 8, 5, ?
- (c) $Mean = 3$ -1, 7, 3, ?
- (d) $Mean = 4.5$ 7, 4, 5, 3, 3, ?

Four numbers have a range of 7, a mean of 8, a mode of 6 and a median of 6.5. Find the four numbers.

Fluency Practice

learn by heart

Measures of the average of a data set:

Mean

The result if all the values were shared evenly.

Find the total and divide by the number of values.

Median

The middle value when values are ordered

If there are two middle numbers, add them and divide by 2.

Mode

The most common value or values.

There can be one or two modes, or otherwise no mode.

A measure of the spread of a data set:

Range *The difference between the largest and smallest values.*

exercise

- Work out the mean of each data set:
a) 8 9 2 7 1 3 b) 1.4 1.7 1.1 6.2 c) -7 2 16 -4 0
- Four potatoes together weigh 760g. Work out the mean weight of the potatoes.
- A data set contains the following values: 324, 412, 376, 380.
Without calculating, decide which of the following is the mean of the data set.
a) 1492 b) 318 c) 415.5 d) 373
- Work out the median of each data set:
a) 12 3 7 3 5 b) 8 -2 6 1 -5 -2 c) 4.3 2.3 7.3 9.3
- Christopher has a twin brother aged 12 and two older brothers aged 18 and 14.
Work out the median age of the four brothers.
- Work out the mode of each data set:
a) 4 7 6 7 7 6 b) 2.1 2.5 2.3 2.9 c) 8 2 7 2 6 8
- Work out the range of each data set:
a) 1 9 2 6 3 b) 9 12 58 5 8 6 c) 1.4 1.9 0.8 2.1

Fluency Practice

8. The ages of the members of two quiz teams are shown.

Team A: 32 29 24 32 28

Team B: 63 35 19 19

- a) Work out the mean age for each team.
 - b) Work out the median age for each team.
 - c) Which team has the higher mean age?
 - d) Which team has the higher median age?
 - e) Work out the range of ages for each team.
 - f) Which team has the largest spread of ages?
9. Jake records the number of miles he ran each day for a week: 7 0 8 0 10 5 26
Which of the mean, median or mode is highest for this dataset?

10. Complete the following statements:

- a) A data set has 5 values with a total of 35. The mean is ____.
 - b) A data set has 5 values with a total of _____. The mean is 9.
 - c) A data set has 10 values with a total of _____. The mean is 4.5.
 - d) A data set has _____ values with a total of 54. The mean is 9.
11. Each data set is ***in order from smallest to largest***.
Work out the missing values based on the given rule.

A	2	4	4	___	7	8	8	no mode
B	5	6	7	___	8	8		median = 7
C	3	6	___	17				mean = 8
D	2	4	7	8	___			range = 9
E	5	5	___	6	6	7		mode = 5
F	3	___	8	9				median = 6
G	2	3	3	4	___			mean = 4
H	___	7	7	8	12	13		range = 14

Problem Solving

Below are 12 sets of data and their means. Work out which numbers the letters stand for.

Mean

1.	4	4	4	4	4	a
2.	8	3	2	7	5	b
3.	30	19	11	20	c	20
4.	9	10	10	11	d	15
5.	5	10	e	15	2e	12
6.	5	5	f	10	f + 6	8
7.	g	g	9	11	13	9
8.	h	2	h + 2	4	5	3
9.	i	2i	3i	12	14	10
10.	j-2	j-1	j	j+1	j+2	14
11.	4	6	6	k	12	k
12.	10	13	m-3	m	2m	m

Problem Solving

Mean box fill task

Write 5 numbers with a mean of 12

Change one of the numbers so the mean is 13

Change a different number so the mean is 10

Keep four numbers so the mean is as high as possible

Keep three numbers so the mean is as low as possible

Add one number so the mean stays the same

Add one number so the mean increases by 1

Change two numbers so the mean stays the same

Change one numbers so the mean increases by 0.4

Could you find a different way to complete it with your same starting numbers?

Could you complete it in a way such that there is never a decimal in any of the boxes?

Problem Solving

In all these questions only use numbers which are *positive integers* (or zero).

1 Find five numbers with a mean of 10.

How many possibilities can you find?

2 Find five numbers with a mean of 10 and with a median that isn't 10.

3 Find five numbers with a mean of 10 and no mode.

4 Find five numbers with a mean of 10, a median of 7 and a mode of 7.
(Hint: start with 7 in the middle)

5 Find five numbers with a mean of 4, a mode of 5, a median of 5 and a range of 5.

6 Find five numbers with a mean of 6, a mode of 8, a median of 6 and a range of 5.

7 Find five numbers with a mean of 9, a mode of 7, a median of 8 and a range of 7.

Challenge

Can you find four positive integers such that $\text{mean} < \text{mode} < \text{median}$?
Explain your answer.

What if they don't have to be positive integers?

What other statistical inequalities can you make definite statements about?

Problem Solving

I have a set of numerical values which could be anything, and I want to know whether each of these statements (separately) is possible or impossible.

Can it apply to the *mean*, the *median*, the *mode* or the *range*?

If it's possible, give an example; if impossible, try to say why.

<i>statement</i>	<i>mean</i>	<i>median</i>	<i>mode</i>	<i>range</i>
There isn't one.				
It's equal to zero.				
It's the highest value.				
It's the lowest value.				
It's greater than any of the values.				
It's less than any of the values.				

What if ...?

You have a set of values and you've worked out the mean.

What will happen to the mean if ...

- 1 you add 10 to all the values?
- 2 you subtract 10 from all the values?
- 3 you multiply all the values by 10?
- 4 you divide all the values by 10?
- 5 you square all the values?

Make up some numbers and try it.

Try to explain your answers.

Purposeful Practice

James has two possible ways of getting to school:

- A** He can catch a bus into the town centre and another bus out; or
- B** He can walk in a different direction and then just catch one (different) bus.

He isn't sure which way is quicker so he decides to time his journey from leaving his front door to arriving at the school gate. He times 20 journeys by route **A** and 20 by route **B**.

Here are his results (in minutes).

Route A

24	18	14	19	22	23	18	15	22	30
30	26	22	27	16	22	26	19	19	27

Route B

25	18	21	18	28	21	17	19	26	24
25	24	21	17	20	22	24	20	24	18

Work out the mean, median, mode and range for the times for route **A** and for route **B**.

Which route do you think James should use, and why?

Problem Solving

Question 1

The mean, median and mode of the numbers in the boxes below are the same. What is the missing number?

7 7 5 7 ?

Question 2

The six-member squad for the Ladybirds five-a-side team consists of a 2-spot ladybird, a 10-spot, a 14-spot, an 18-spot, a 24-spot and a pine ladybird (on the bench). The average number of spots for members of the squad is 12. How many spots has the pine ladybird?

Question 3

Karen was given a mark of 72 for Mayhematics. Her average mark Mayhematics and Mathemagics was 78. What was her mark for Mathemagics?

Question 4

It is well known that the Pobble has no toes, and that the three-toed sloth has 12 toes (3 on each of its 4 feet). A synchronised swimming team is made up of 7 Pobbles and 5 three-toed sloths. What is the mean number of toes per team member?

Question 5

The range of a list of integers is 20, and the median is 17. What is the smallest possible number of integers in the list?

Question 6

On four tests, each marked out of 100, my average was 85. What is the lowest mark I could have scored on any one test?

Question 7

The mean score of the students who took a mathematics test was 6. Exactly 60% of the students passed the test. The mean score of the students who passed the test was 8. What was the mean score of the students who failed the test?

Question 8

What value of x makes the mean of the first three numbers in this list equal to the mean of the last four?

15 5 x 7 9 17

Question 9

Viola has been practising the long jump. At one point, the average distance she had jumped was 3.80 m. Her next jump was 3.99 m and that increased her average to 3.81 m. After the following jump, her average had become 3.82 m. How long was her final jump?

Question 10

When one number was removed from the set of positive integers from 1 to n , inclusive, the mean of the remaining numbers was 4.75. What number was eliminated?

Problem Solving

<p>(1)</p> <p>Fill the gap to make the mean equal to 9.</p>	<p>(2)</p> <p>Fill the gap to make the mode equal to half the range.</p>	<p>(3)</p> <p>Fill the gap in two different ways to make the range equal to the median.</p>
<p>(8)</p> <p>Fill in the gap to make the range 10 times the size of the mean.</p>	<p><u>Averages</u></p> <p><input type="text"/> 3 , <input type="text"/> 9 , <input type="text"/> 7 , <input type="text"/></p>	<p>(4)</p> <p>Fill the gap in two different ways to make the range equal to 9.</p>
<p>(7)</p> <p>What values could fill the gap to make the range less than the median?</p>	<p>(6)</p> <p>Fill the gap to make the mean and median add up to as close to 11 as possible.</p>	<p>(5)</p> <p>Fill the gap to make the mean, median, mode and range four consecutive numbers.</p>

Problem Solving

wiped out

1 2 3 4 5 6

one of the numbers from
1 2 3 4 5 6 is wiped out
the mean of what is left is

3.6

which number was
crossed out?

one of the numbers with
consecutive numbers 1 up
to a number is wiped out

the mean of what is left is
6.8333333333333333...

which number was
crossed out?
from how many?

1234567

one of the numbers from
1 2 3 4 5 6 7 is wiped out
the mean of what is left is

4.0

which number was
crossed out?

one of the numbers with
consecutive numbers 1 up
to a number is wiped out

the mean of what is left is
25.76

which number was
crossed out?
from how many?

1 2 3 4 5
6 7 8 9 10
11 12 13 14 15

one of the numbers from
1 to 15 is wiped out
the mean of what is left is
7.714285714...

which number was
crossed out?

one of the numbers with
consecutive numbers 1 up
to an even number is wiped
out

the mean of what is left is a
whole number (integer)

which numbers could have
been crossed out?
why?

Problem Solving

averages and range (positive integers)

1) 3 numbers:
mean = 3
mode = 2

2) 3 numbers:
mean = 7
mode = 10

3) 3 numbers:
mean = 8
median = 10
range = 8

4) 3 numbers:
mean = 6
median = 7
range = 11

5) 3 numbers:
mode = 7
median = 7
mean = 6

6) 3 numbers:
mean = 13
range = 8

find three sets

7) 4 numbers:
mean = 4
mode = 1
median = 2

8) 4 numbers:
mean = 9
mode = 6
median = 7

9) 4 numbers:
mean = 6
median = $6\frac{1}{2}$
range = 11

10) 4 numbers:
mean = $7\frac{1}{2}$
mode = 6
median = 7

11) 4 numbers:
mean = 10
range = 12
mode = 13

12) 4 numbers:
mean = 8
range = 8
median = 7

find three sets

13) 4 numbers:
mean = 4
range = 6
median = 3

find two sets

14) 5 numbers:
range = 5
mean = 6
median = 7
mode = 8

15) 5 numbers:
range = 9
mean = 4
mode = 3

16) 5 numbers:
range = 6
mean = 4
mode = 2

17) 5 numbers:
range = 5
mean = 4
median = 3

18) 5 numbers:
range = 10
mean = 7
mode = 7

find three sets

19) 5 numbers:
range = 5
mean = 5
mode = 5
median = 5

find two sets

20) 5 numbers:
range = 10
mean = 10
mode = 10
median = 10

find three sets

21) 5 numbers:
range = 10
mean = 4
mode = 1
median = 2

22) 6 numbers:
range = 10
mean = 4
mode = 1
median = 2

23) range = 10
mean = 4
median = 2
mode = 1

- a) 4 numbers
- b) 5 numbers
- c) 6 numbers

24) 5 numbers:
2, 5, n, 2n, 5n
mean =
2 × median - 1

find n

Problem Solving

Find numbers to complete this grid!

			range of 2
			mode of 8
			mean of 5
mean of 6	range of 4	median of 6	

Problem Solving

For each set of numbers find: (i) the mean, (ii) the median, (iii) the range.

Leave your answers in their simplest form.

a) $\frac{1}{2}$	g) $\frac{5}{7}$	m) $\frac{2}{5}$	$\frac{1}{10}$
b) $\frac{1}{2}$	h) $\frac{2}{3}$	n) $\frac{2}{3}$	$\frac{1}{5}$
c) $\frac{1}{2}$	i) $1\frac{2}{3}$	o) $1\frac{1}{8}$	$\frac{1}{2}$
d) $\frac{1}{5}$	j) $3\frac{1}{3}$	p) $-\frac{2}{3}$	$\frac{1}{8}$
e) $\frac{1}{3}$	k) $2\frac{1}{2}$	q) $2\frac{2}{3}$	$\frac{1}{3}$
f) $\frac{4}{15}$	l) $5\frac{1}{7}$	r) $-2\frac{1}{8}$	$-1\frac{1}{7}$
	1	$\frac{9}{10}$	$4\frac{5}{6}$
	1	$\frac{1}{3}$	$5\frac{5}{8}$
	$3\frac{3}{4}$	$\frac{1}{4}$	
	$\frac{1}{10}$	$-\frac{3}{4}$	
	$-\frac{1}{2}$	$-\frac{5}{7}$	
	$-\frac{1}{12}$	$-2\frac{5}{6}$	
	$-\frac{2}{5}$	$2\frac{1}{2}$	
	$9\frac{6}{7}$	$-2\frac{1}{6}$	
	$5\frac{1}{4}$		

Purposeful Practice

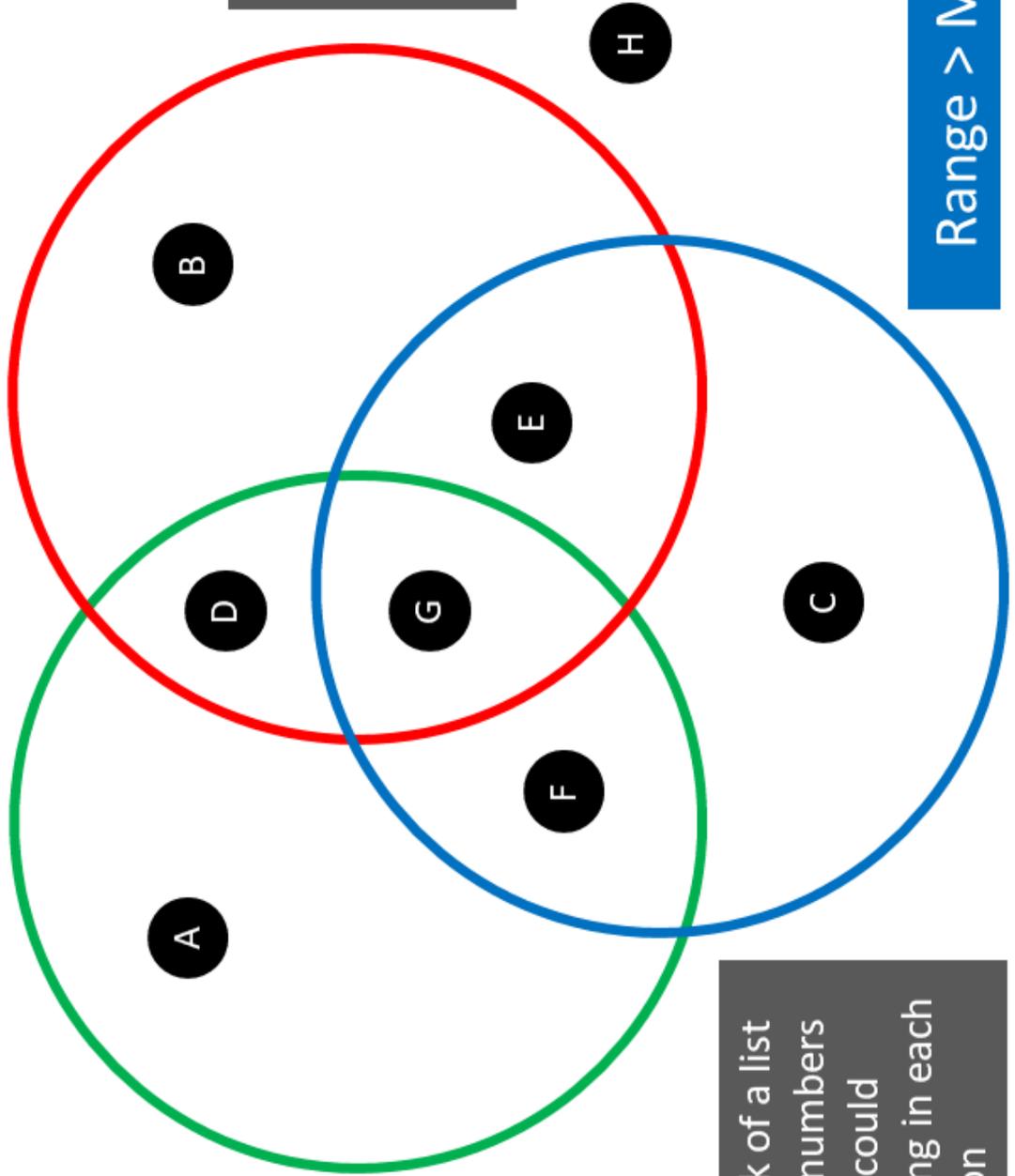
Instructions: Complete the remaining boxes by making the minimum change possible to the centre box. If there are boxes that cannot be filled in, say why.

		Mean		
		Less	Same	More
Median	More			
	Same		3, 3, 5, 6, 8, 11	
	Less			

Problem Solving

Median = 5

Mode = 4



If you think a region is impossible to fill, convince me why!

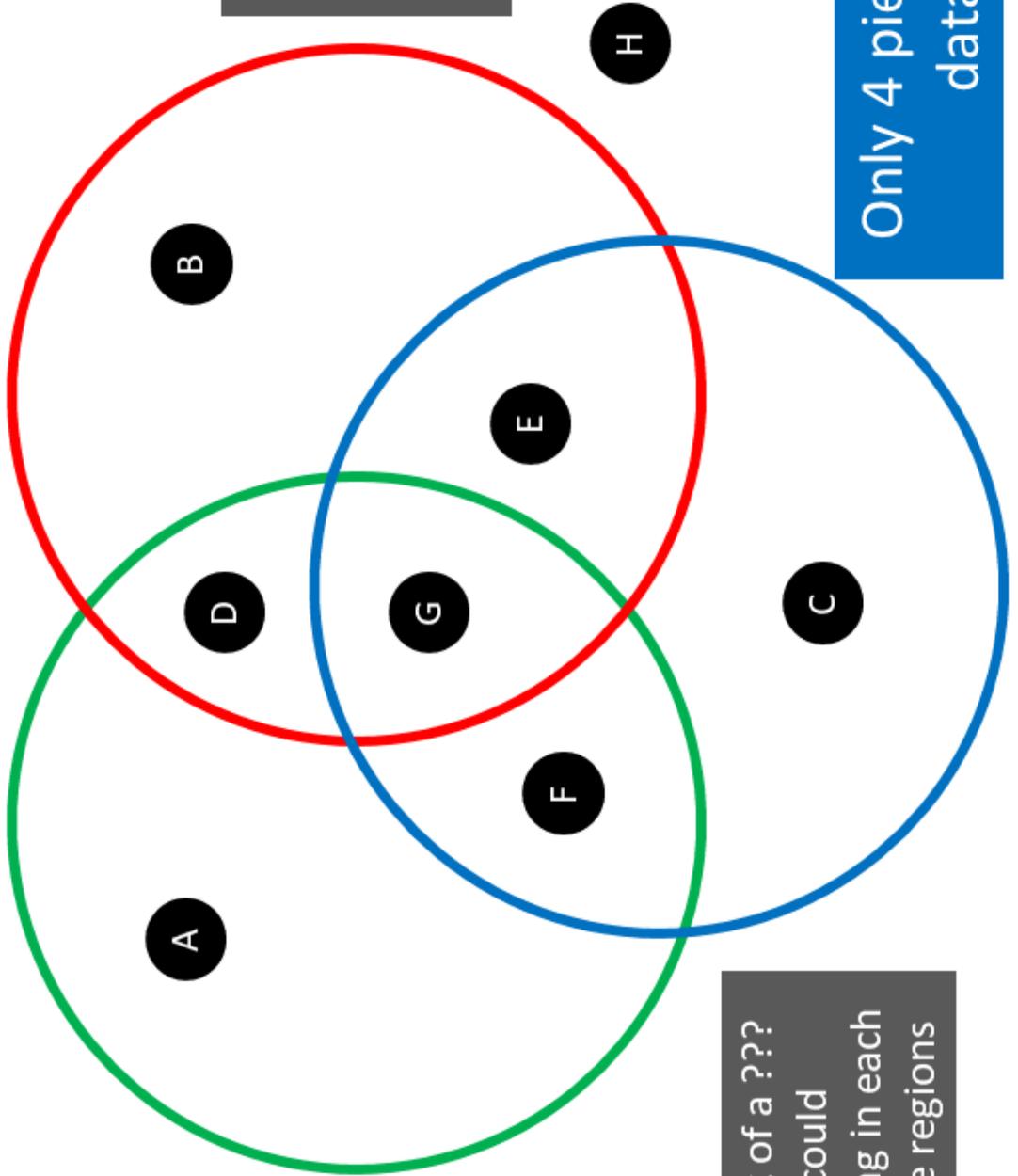
Think of a list of 5 numbers that could belong in each region

Range > Mean

Problem Solving

Median = 5

Range > mode



If you think a region is impossible to fill, convince me why!

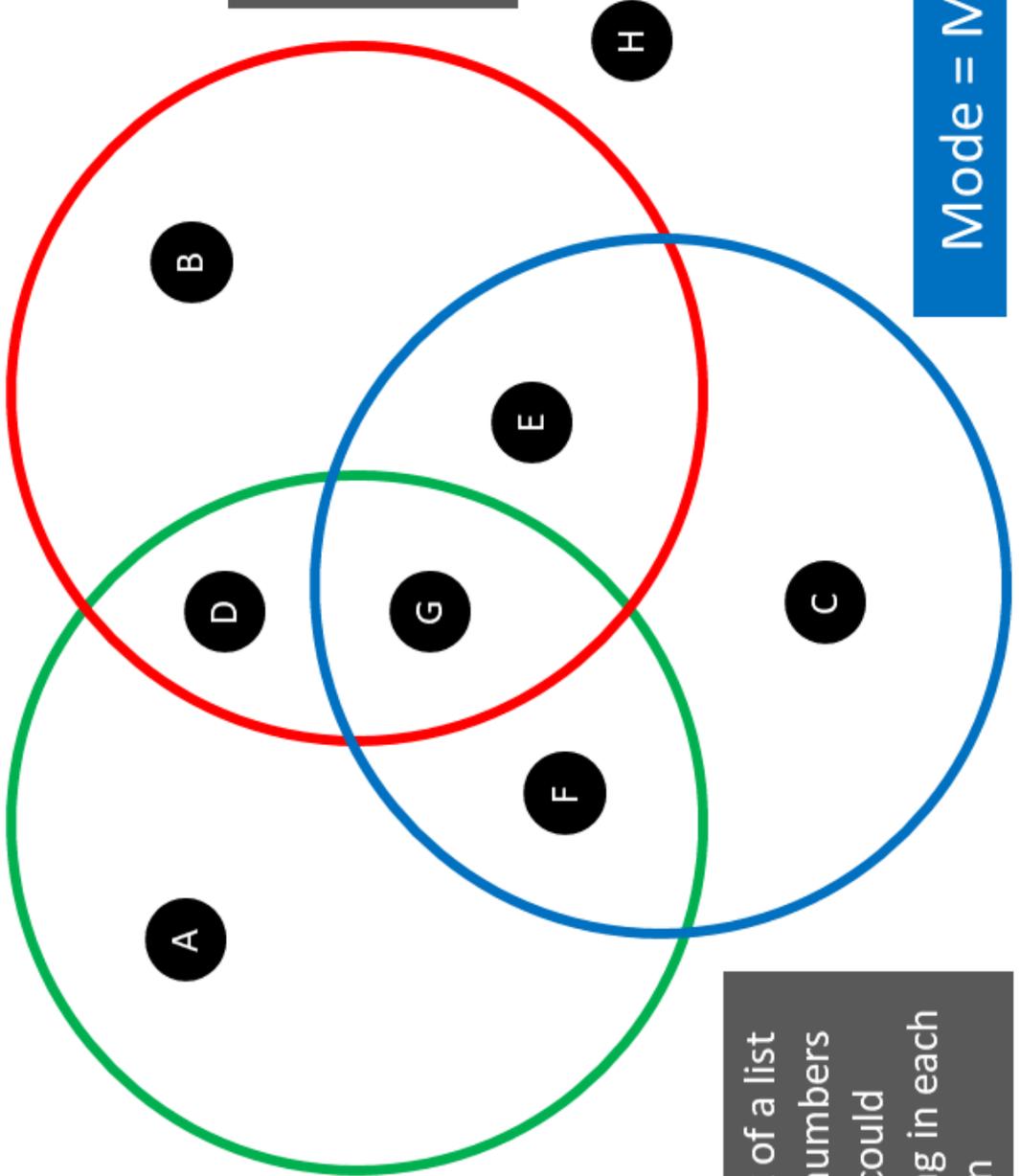
Only 4 pieces of data

Think of a ??? that could belong in each of the regions

Problem Solving

Median > Range

Mean > Median



If you think a region is impossible to fill, convince me why!

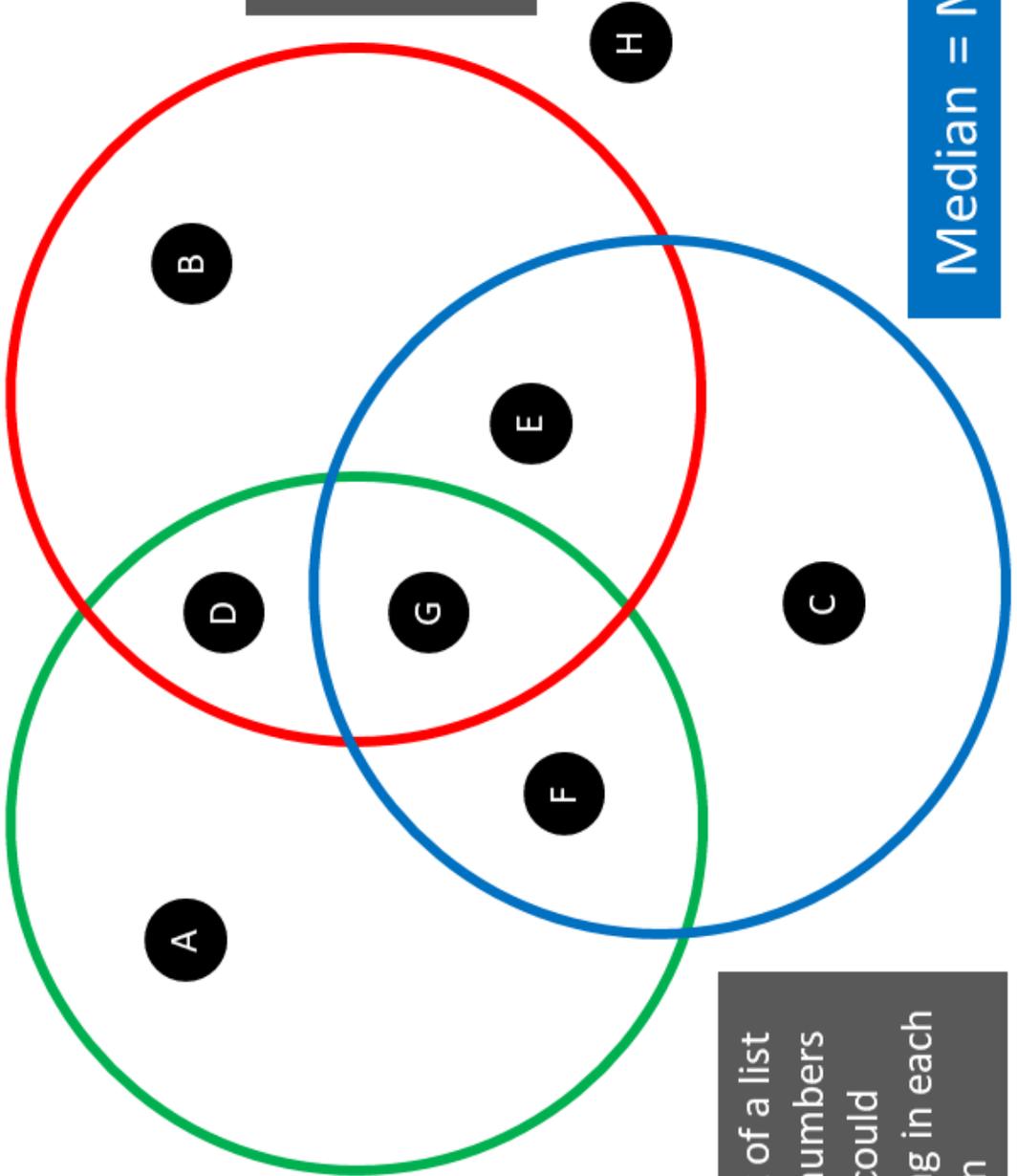
Think of a list of 5 numbers that could belong in each region

Mode = Mean

Problem Solving

Range < Mean

No mode



If you think a region is impossible to fill, convince me why!

Think of a list of 5 numbers that could belong in each region

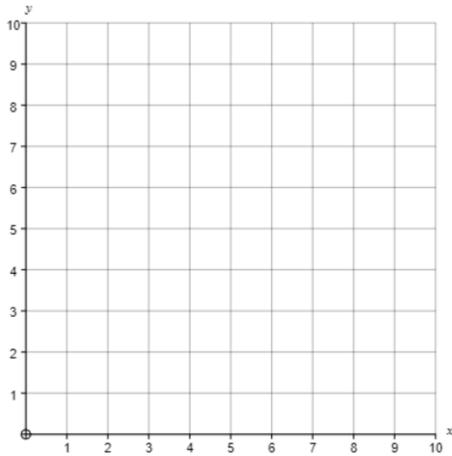
Median = Mean

3 Coordinates

Fluency Practice

Plotting Coordinate Letters

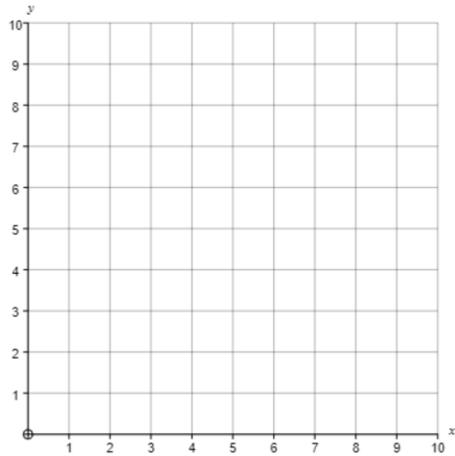
(a)



Join the following points in order:
 $(2, 5)$ $(3, 5)$ $(3, 9)$ $(2, 9)$ $(2, 5)$

Join the following points in order:
 $(5, 6)$ $(5, 5)$ $(6, 5)$ $(6, 2)$ $(7, 2)$ $(7, 5)$ $(8, 5)$
 $(8, 6)$ $(5, 6)$

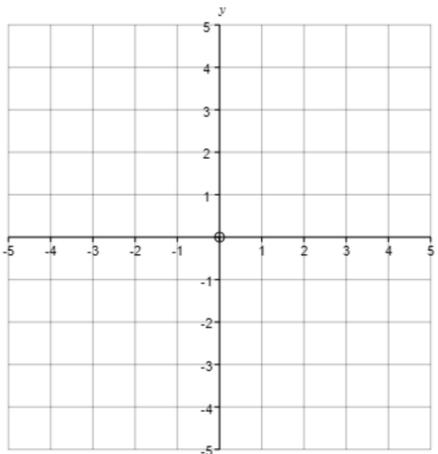
(b)



Join the following points in order:
 $(5, 5)$ $(5, 6)$ $(3, 6)$ $(3, 9)$ $(2, 9)$ $(2, 5)$ $(5, 5)$

Join the following points in order:
 $(6, 1)$ $(7, 1)$ $(7, 4)$ $(8, 4)$ $(8, 1)$ $(9, 1)$ $(9, 5)$
 $(6, 5)$ $(6, 1)$

(c)

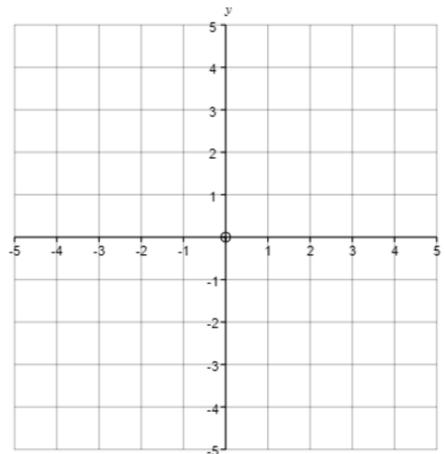


Join the following points in order:
 $(2, -2)$ $(3, -2)$ $(3, 1)$ $(4, 1)$ $(4, 2)$ $(1, 2)$
 $(1, 1)$ $(2, 1)$ $(2, -2)$

Join the following points in order:
 $(-4, -1)$ $(-3, -1)$ $(-3, 1)$ $(-1, 1)$ $(-1, 4)$
 $(-4, 4)$ $(-4, -1)$

Join the following points in order:
 $(-3, 2)$ $(-2, 2)$ $(-2, 3)$ $(-3, 3)$ $(-3, 2)$

(d)



Join the following points in order:
 $(-4, -2)$ $(-1, -2)$ $(-1, 2)$ $(-4, 2)$ $(-4, -2)$

Join the following points in order:
 $(-3, -1)$ $(-2, -1)$ $(-2, 1)$ $(-3, 1)$ $(-3, -1)$

Join the following points in order:
 $(1, -3)$ $(4, -3)$ $(4, 3)$ $(1, 3)$ $(1, 0)$ $(3, 0)$
 $(3, -2)$ $(1, -2)$ $(1, -3)$

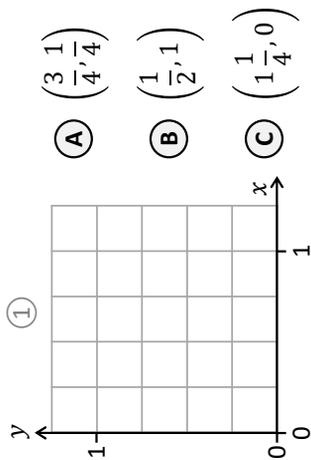
Join the following points in order:
 $(2, 1)$ $(3, 1)$ $(3, 2)$ $(2, 2)$ $(2, 1)$

Rearrange the letters to make a related mathematical word.

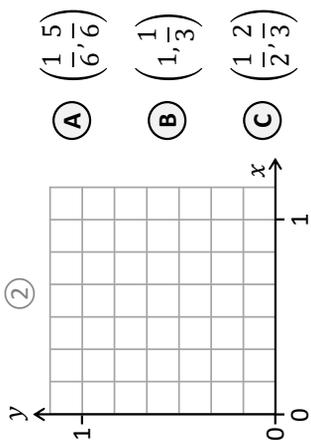
Fluency Practice

Plotting Fractional Coordinates

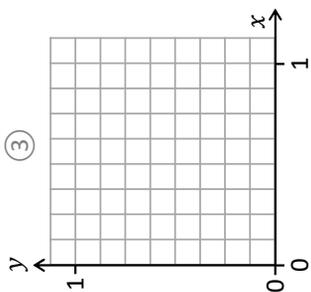
Plot each point!



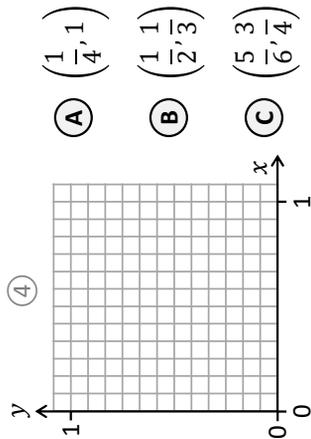
- (A) $(\frac{3}{4}, \frac{1}{4})$
- (B) $(\frac{1}{2}, 1)$
- (C) $(1\frac{1}{4}, 0)$



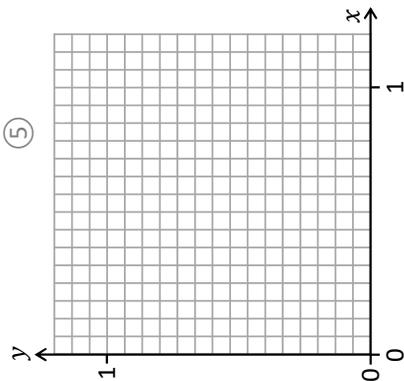
- (A) $(\frac{1}{6}, \frac{5}{6})$
- (B) $(1, \frac{1}{3})$
- (C) $(\frac{1}{2}, \frac{2}{3})$



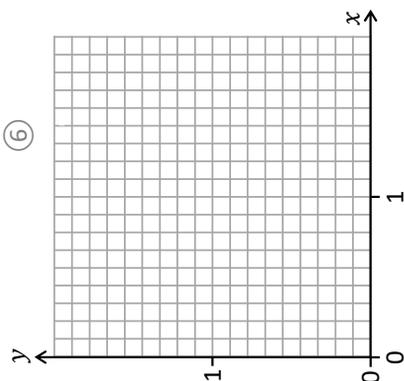
- (A) $(0, \frac{1}{4})$
- (B) $(\frac{3}{8}, \frac{1}{2})$
- (C) $(\frac{3}{4}, \frac{3}{4})$



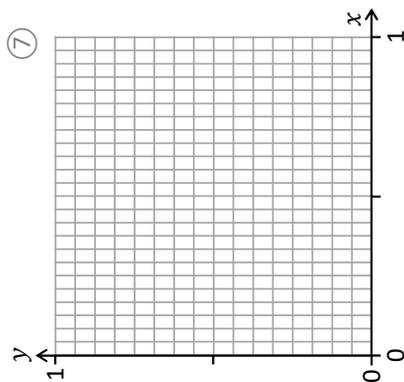
- (A) $(\frac{1}{4}, 1)$
- (B) $(1, \frac{1}{2})$
- (C) $(\frac{5}{6}, \frac{3}{4})$



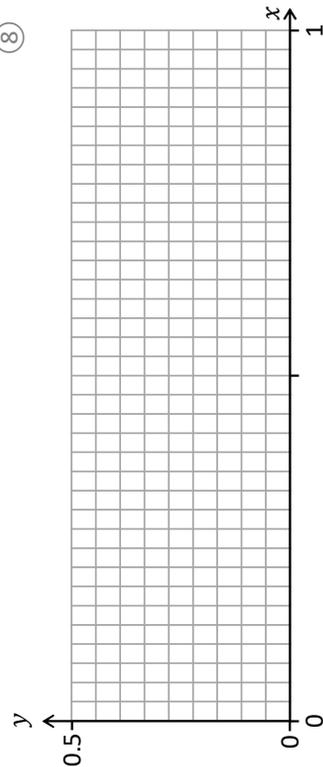
- (A) $(\frac{1}{3}, \frac{1}{15})$
- (B) $(\frac{4}{5}, \frac{2}{3})$
- (C) $(1\frac{1}{5}, \frac{2}{5})$



- (A) $(1\frac{1}{3}, \frac{2}{9})$
- (B) $(1\frac{2}{3}, \frac{2}{3})$
- (C) $(\frac{1}{9}, \frac{1}{18})$



- (A) $(\frac{1}{8}, \frac{1}{4})$
- (B) $(\frac{5}{8}, \frac{1}{8})$
- (C) $(\frac{5}{6}, \frac{3}{4})$

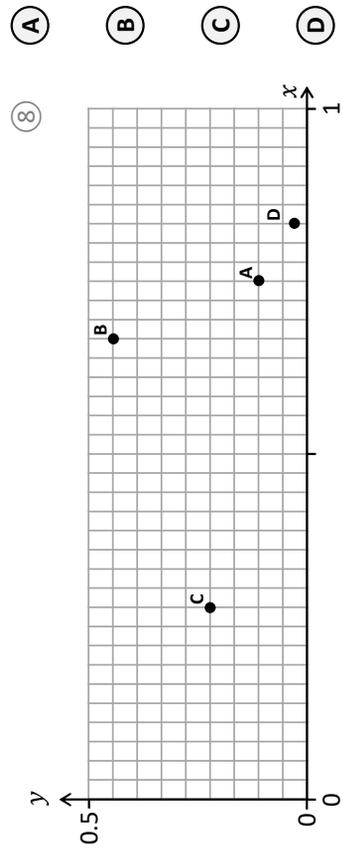
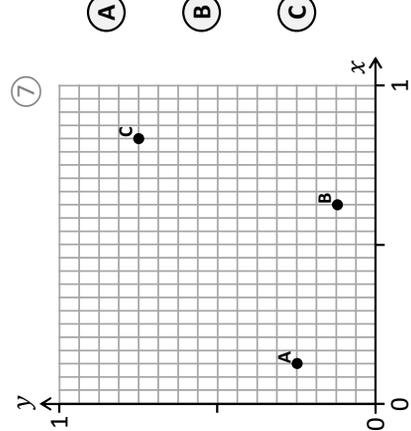
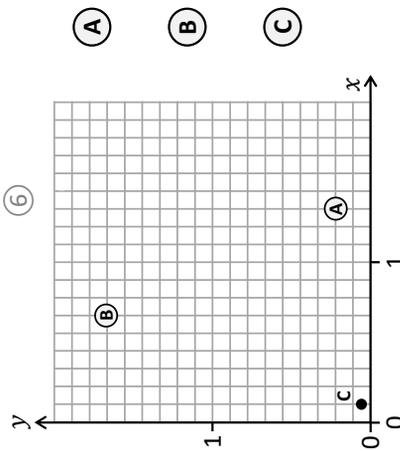
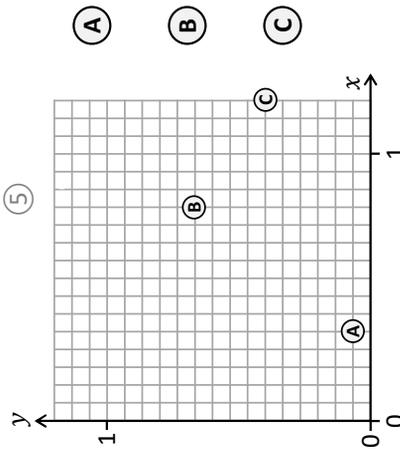
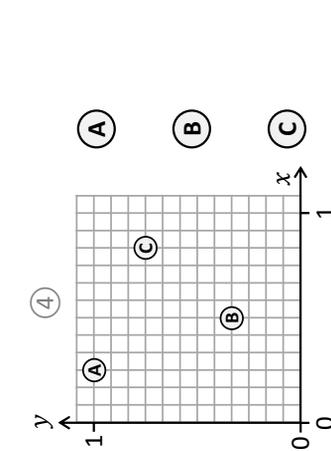
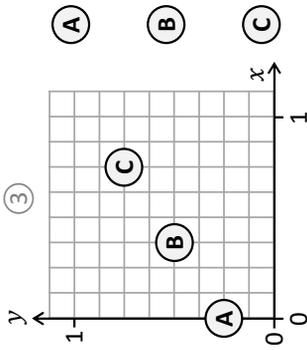
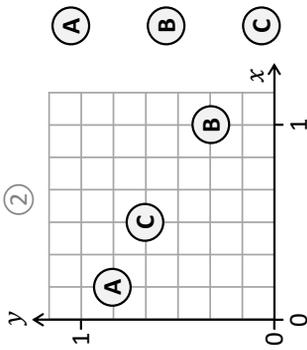
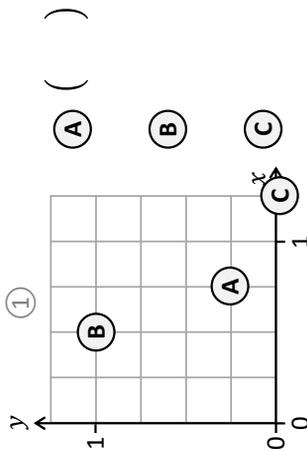


- (A) $(\frac{3}{4}, \frac{1}{9})$
- (B) $(\frac{2}{3}, \frac{4}{9})$
- (C) $(\frac{5}{18}, \frac{2}{9})$
- (D) $(\frac{5}{6}, \frac{1}{36})$

Fluency Practice

Reading Fractional Coordinates

Express each point using simplified fractional coordinates.



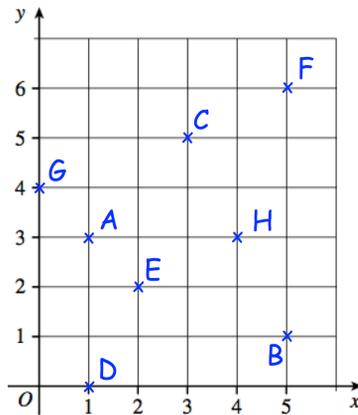
Purposeful Practice

Finding x and y values.

a) The x -value of $(3,4)$ increased by 12.	b) The y -value of $(0, 4)$ decreased by 10
c) The x -value of $(3,4)$ plus the y -value of $(-2, 7)$.	d) The sum of the x -value of $(1, 2)$ and the y -value of $(0, 9)$.
e) The product of the x -value of $(6, 2)$ and the y -value of $(1, 4)$.	f) The sum of the x -value of $(-4, 9)$ and the y -value of $(3, 2)$.
g) The product of the x -value of $(-4, 9)$ and the y -value of $(3, 2)$.	h) The sum of the x -value of $(-4, 9)$ and the y -value of $(-3, -2)$.

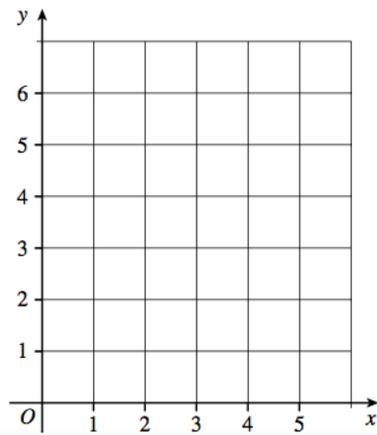
Fluency Practice

Question 1: Write down the coordinates of the points A, B, C, D, E, F, G and H.

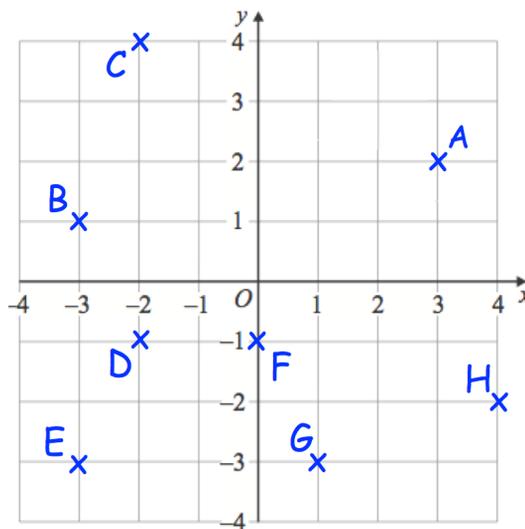


Question 2: Make a copy of the grid shown and then plot the points:

- (a) A (3, 1)
- (b) B (2, 5)
- (c) C (5, 4)
- (d) D (1, 1)
- (e) E (4, 0)
- (f) F (0, 1)
- (g) G (3, 3)
- (h) H (0, 0)



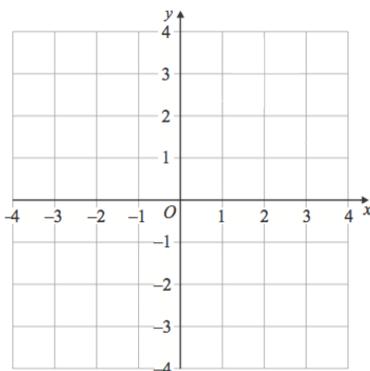
Question 3: Write down the coordinates of the points A, B, C, D, E, F, G and H.



Purposeful Practice

Question 4: Make a copy of the grid shown and then plot the points:

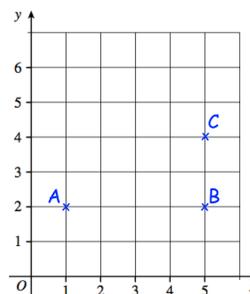
- (a) A (1, 4)
- (b) B (-1, 1)
- (c) C (-3, -4)
- (d) D (2, -1)
- (e) E (-2, 0)
- (f) F (-1, -2)
- (g) G (3, -2)
- (h) H (0, -4)
- (i) I (-2, 2)
- (j) J (-4, -1)
- (k) K (0, 1)



Apply

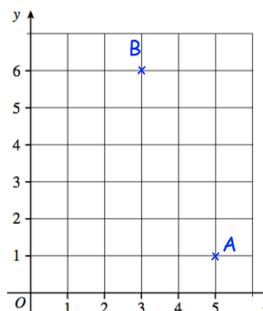
Question 1: Three points are shown on a grid.
ABCD is a rectangle.

- (a) Plot D
- (b) Write down the coordinates of the point D



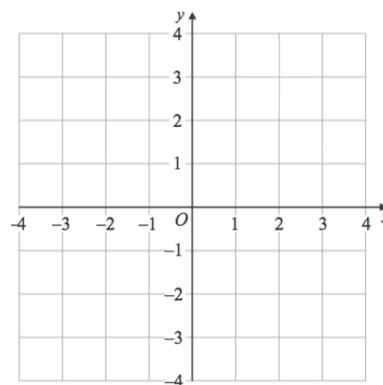
Question 2: Two points are shown on a grid
ABC is an isosceles triangle.

- (a) Plot C
- (b) Write down the coordinates of the point C



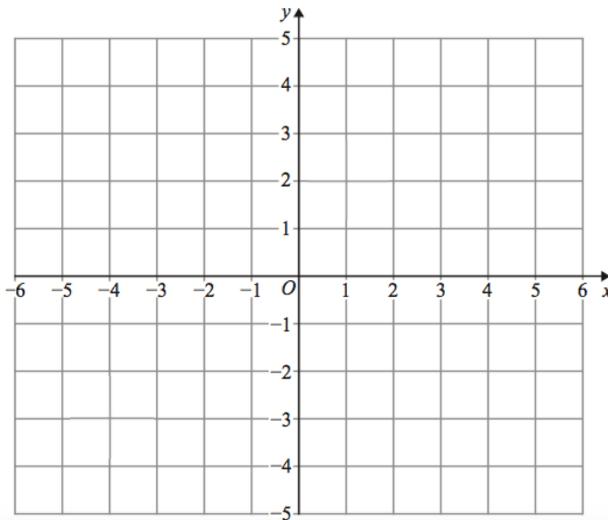
Question 3: Make a copy of the grid shown.

- (a) Plot the point A (-3, -2)
- (b) Plot the point B (1, -2)
- (c) Plot the point C (3, 1)
- (d) Plot the point D (-1, 1)
- (e) What type of quadrilateral is ABCD?



Purposeful Practice

For each question 4-5 below, you will need copies of this grid.



Question 4: (a) Plot the following coordinates

$(3, 0)$ $(-3, -2)$ $(1, -4)$ $(1, 2)$ $(-3, 0)$ $(-1, -4)$ $(3, -2)$ $(-1, 2)$

(b) Join the shapes to make a polygon.

(c) Name the polygon that you have drawn.

Question 5: (a) Plot the coordinates A $(-4, 1)$, B $(1, -2)$ and C $(2, 1)$

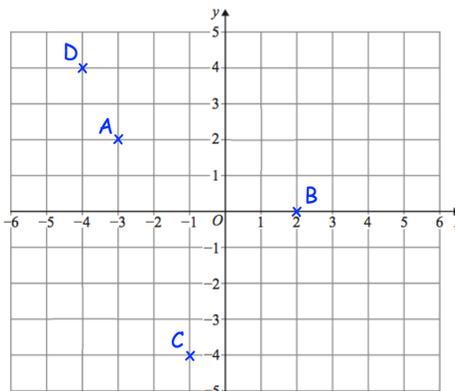
(b) ABCD is a kite.

(c) Plot D

(d) Write down the coordinates of the point D.

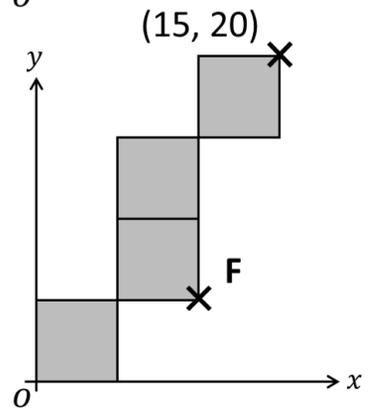
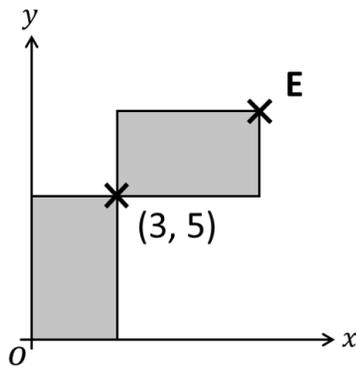
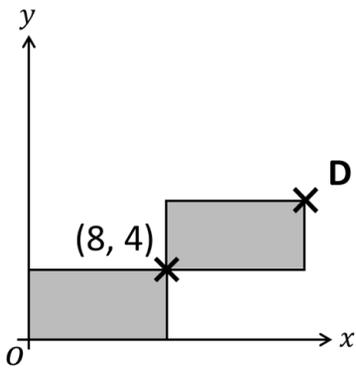
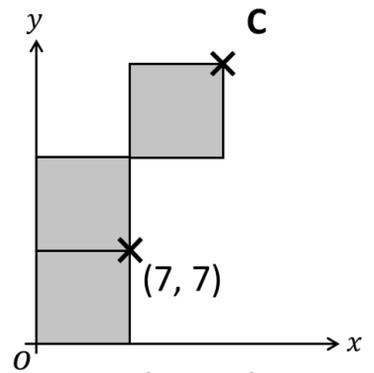
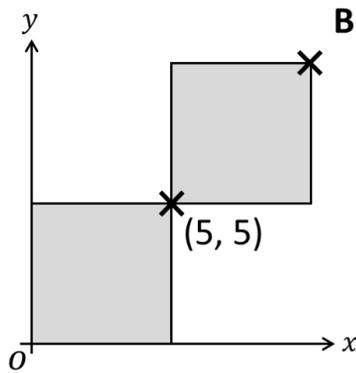
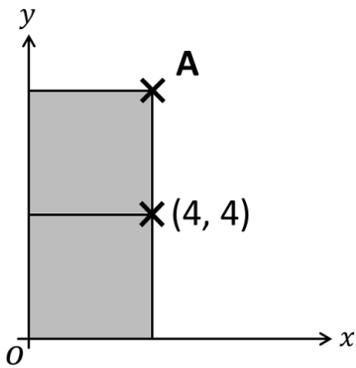
Question 6: James has been asked to plot the coordinates A $(-3, 2)$, B $(0, 2)$, C $(-1, -4)$ and D $(4, -4)$

Can you spot any mistakes?

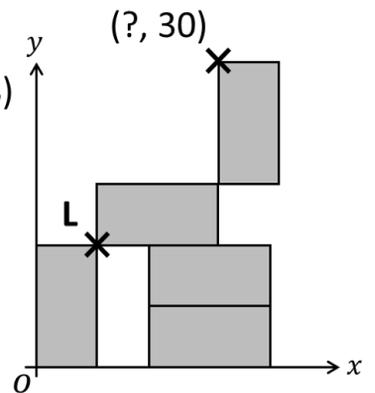
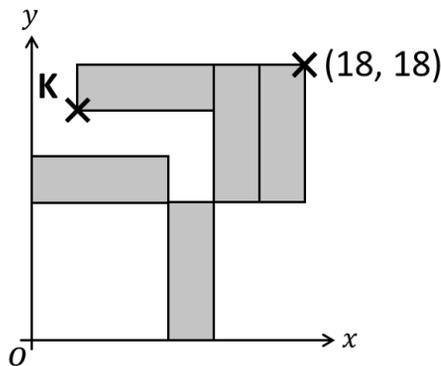
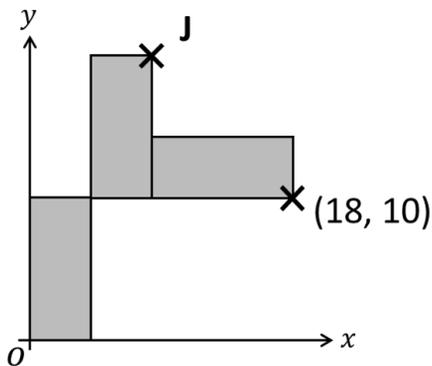
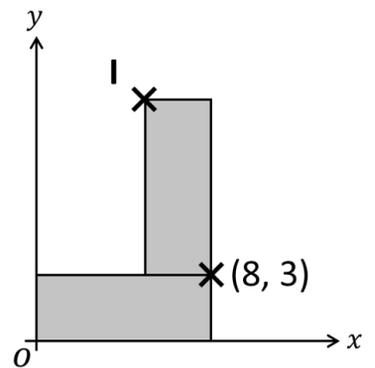
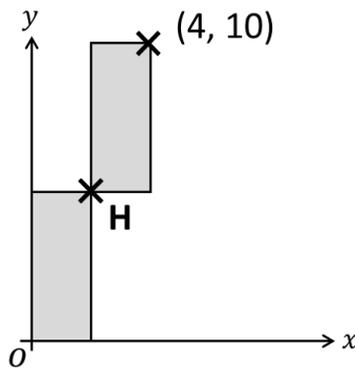
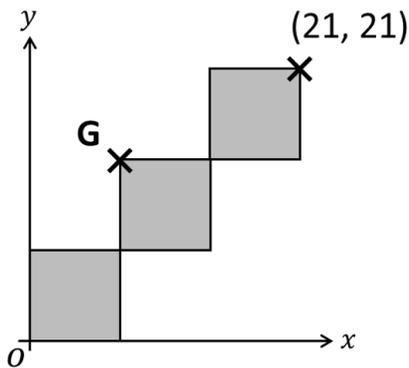


Fluency Practice

The shapes for each question are **congruent**. Calculate the coordinates of points **A** to **F**.



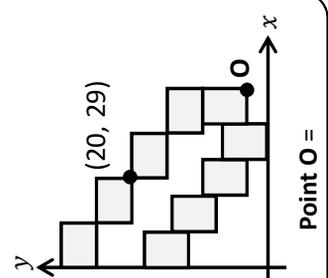
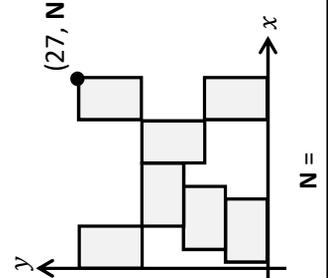
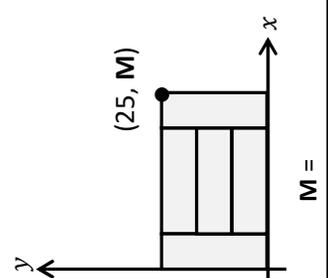
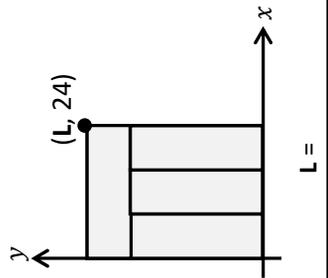
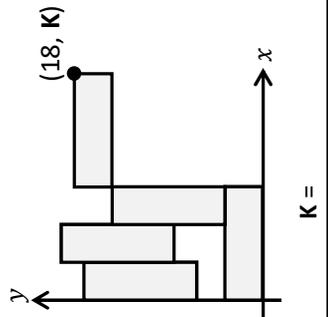
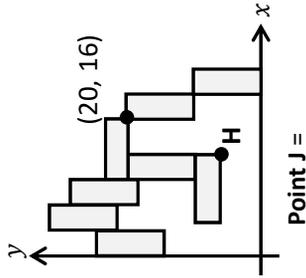
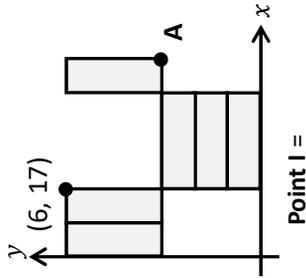
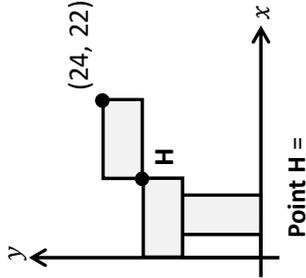
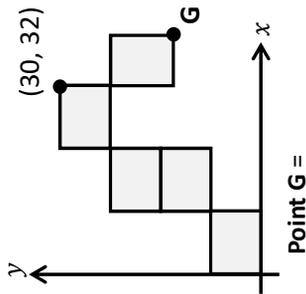
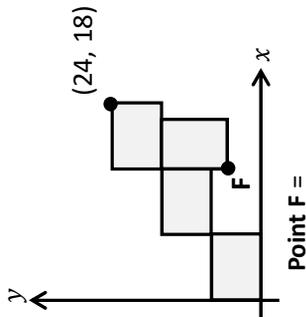
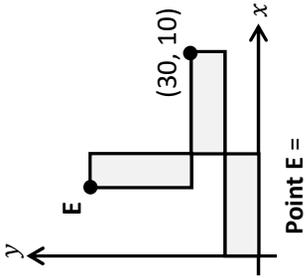
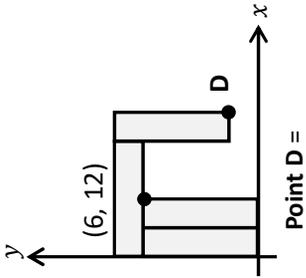
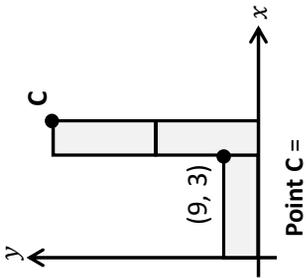
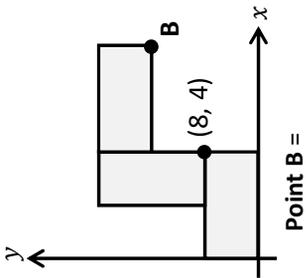
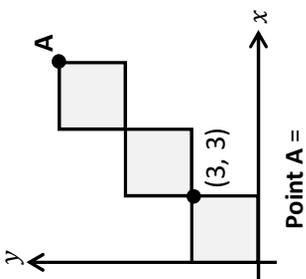
The shapes for each question are **congruent**. Calculate the coordinates of points **G** to **L**.



Fluency Practice

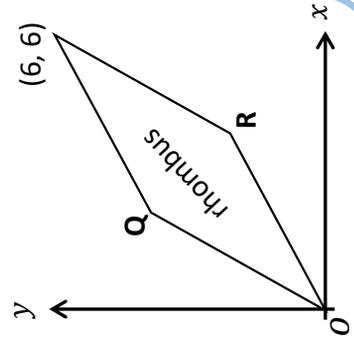
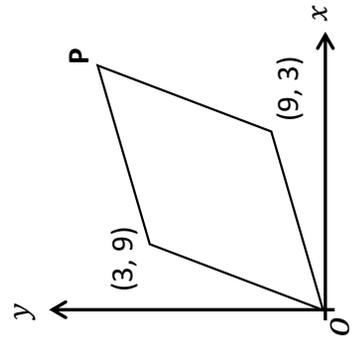
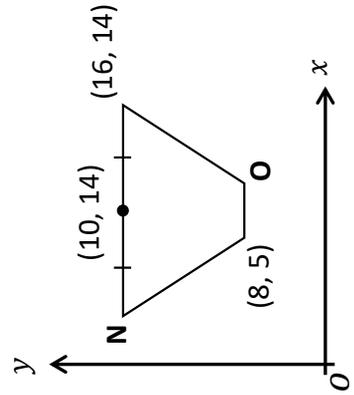
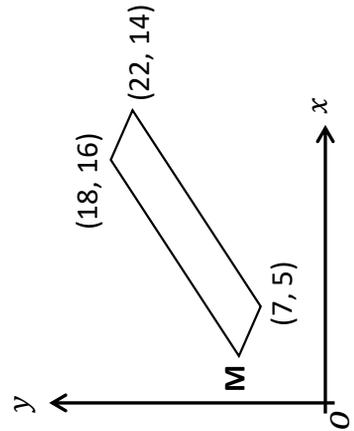
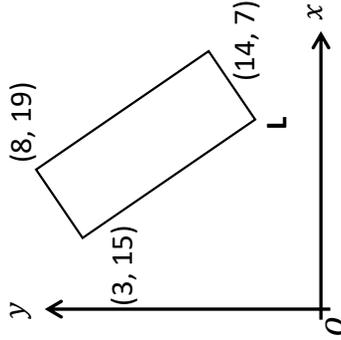
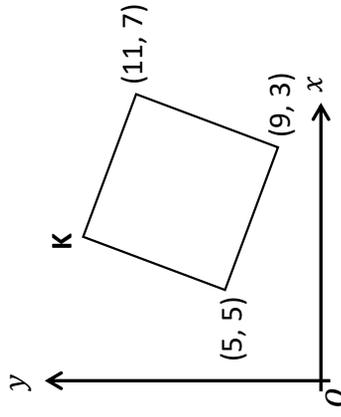
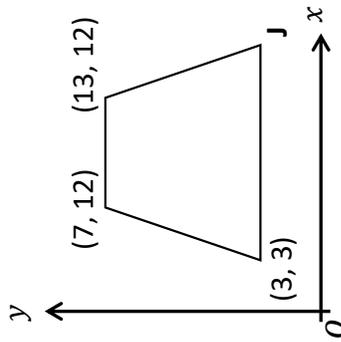
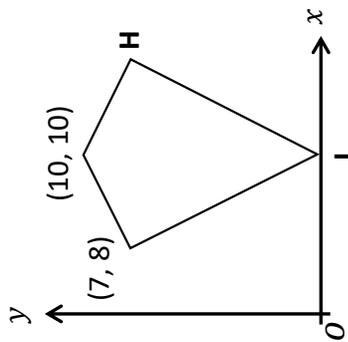
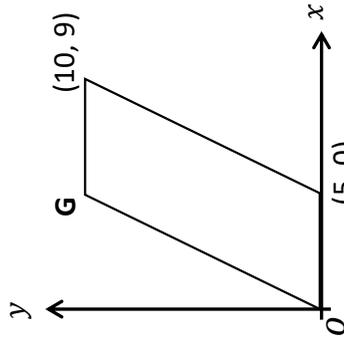
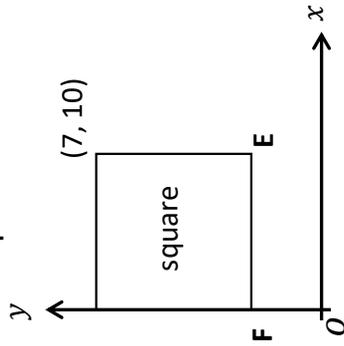
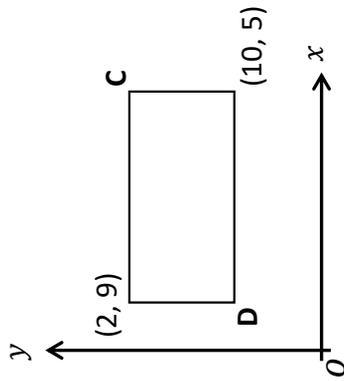
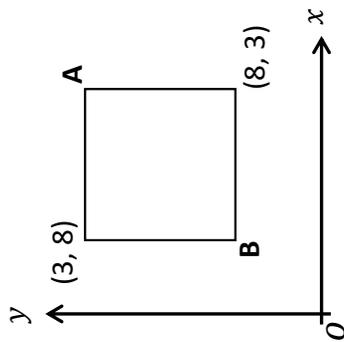
Coordinates & Shape

Find the labelled coordinates, or coordinate. For each diagram, the shapes are congruent.



Fluency Practice

What are the coordinates of the points **A** to **F**?

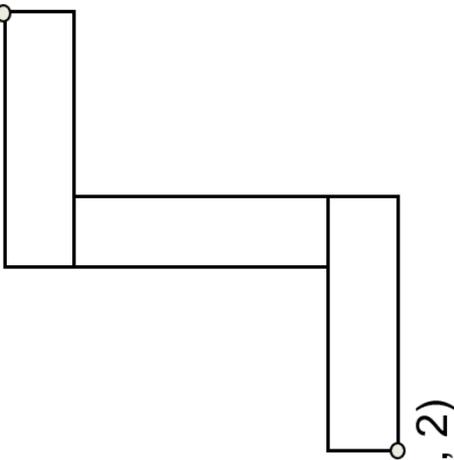


Purposeful Practice

rectangles on a grid how long and wide are each of the rectangles?

(1)

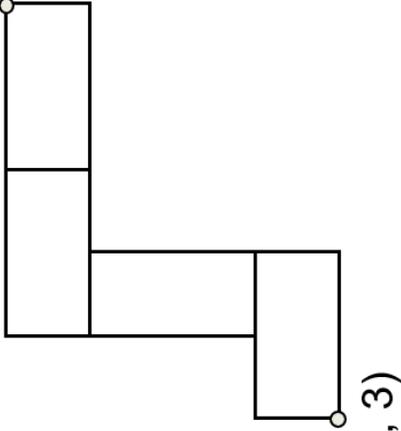
(13, 13)



(1, 2)

(2)

(19, 18)

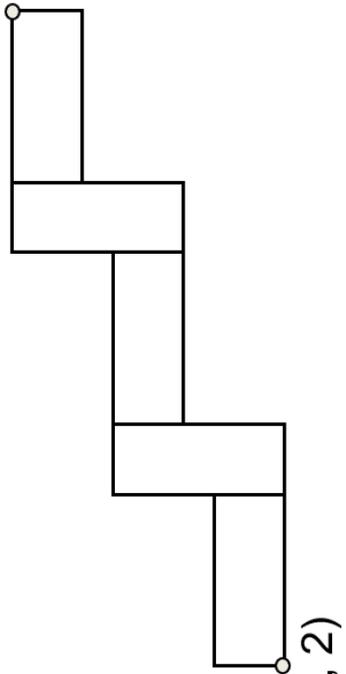


(2, 3)

the rectangles in
each question
are all congruent

(3)

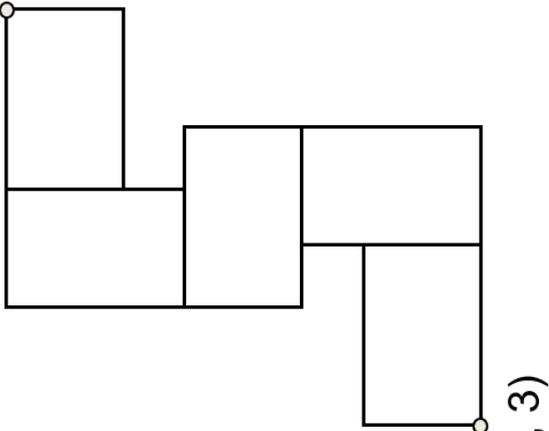
(28, 13)



(1, 2)

(4)

(12, 14)

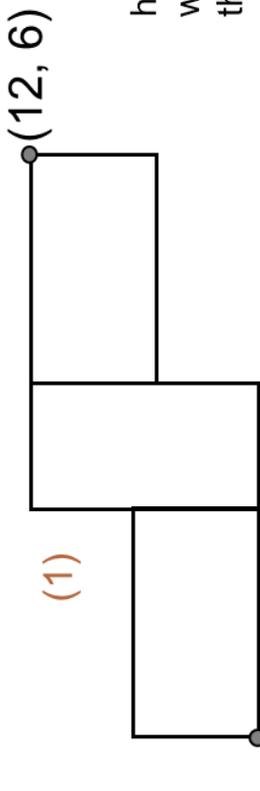


(2, 3)

Purposeful Practice

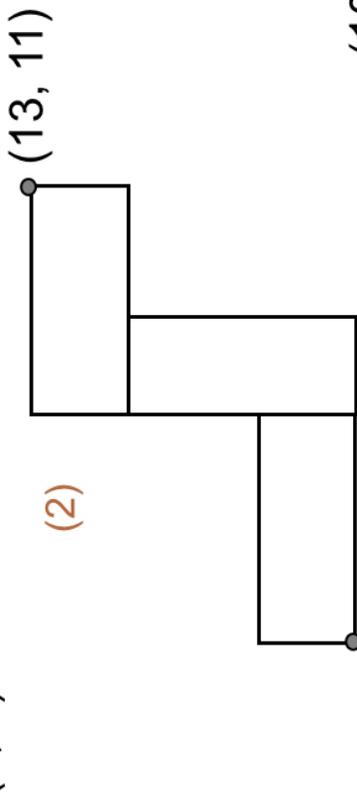
rectangles on a grid

(1)

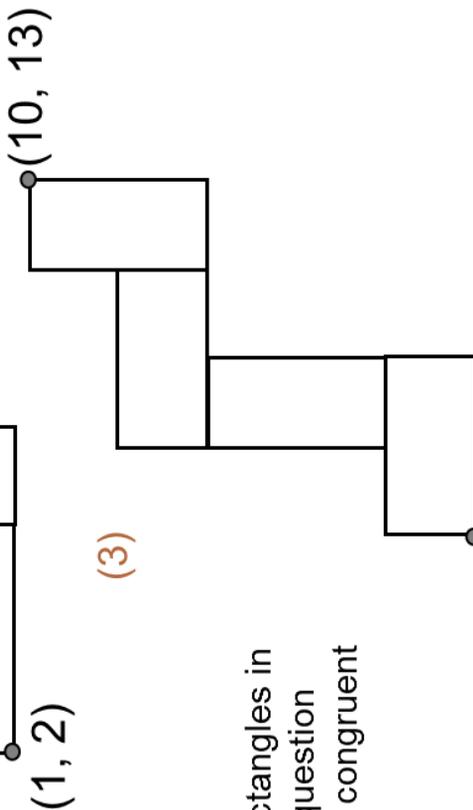


how long and wide are each of the rectangles?

(2)

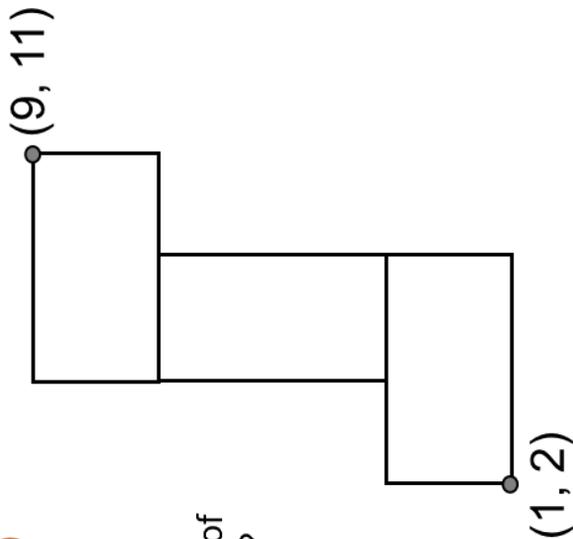


(3)

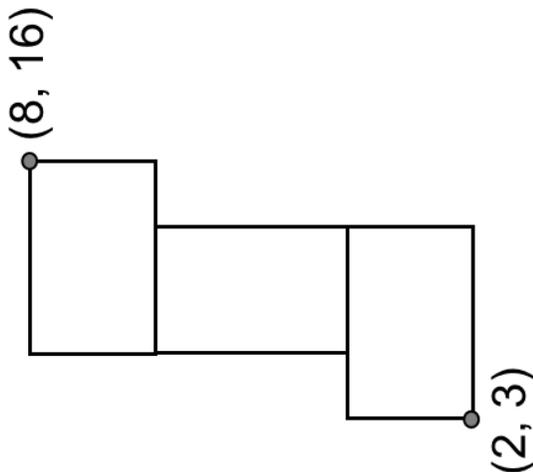


the rectangles in each question are all congruent

(4)



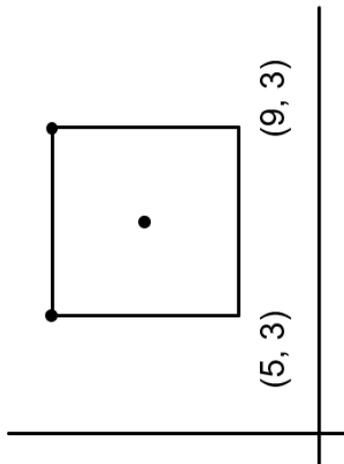
(5)



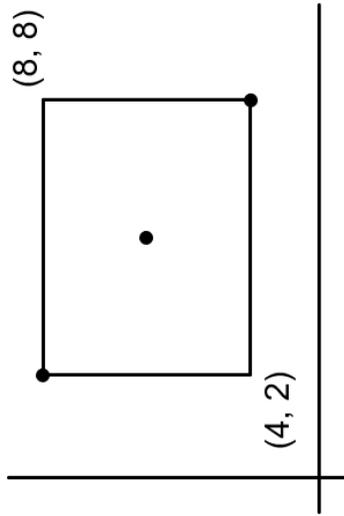
Purposeful Practice

find the missing coordinates of the given shapes (i)

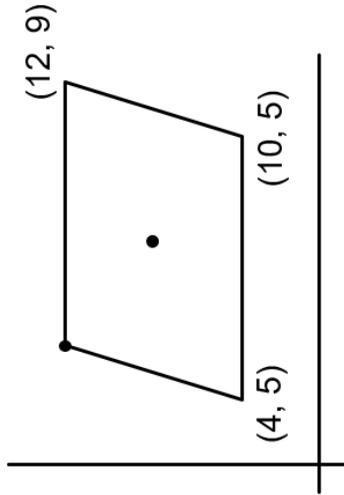
(1) a square



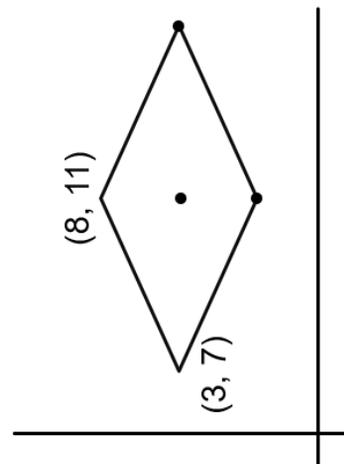
(2) a rectangle



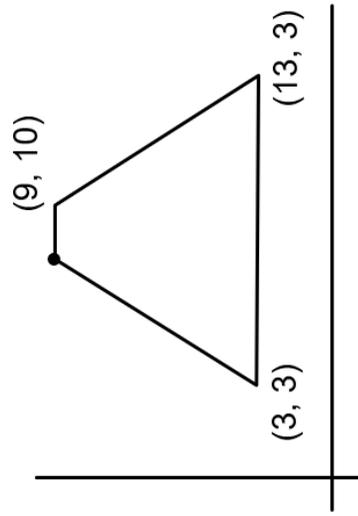
(3) a parallelogram



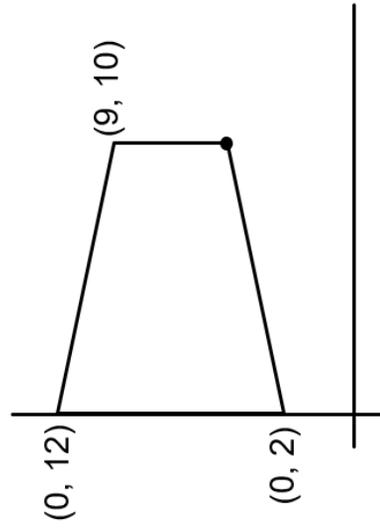
(4) a rhombus



(5) an isosceles trapezium



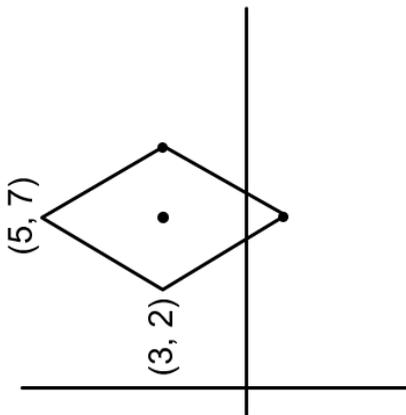
(6) an isosceles trapezium



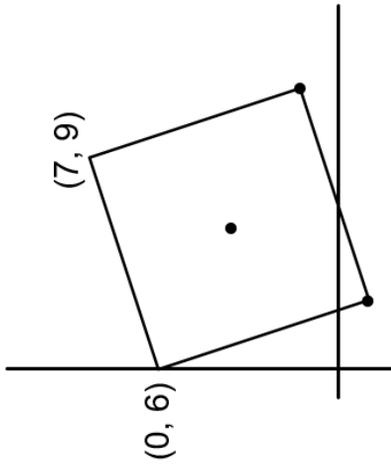
Purposeful Practice

find the missing coordinates of the given shapes (ii)

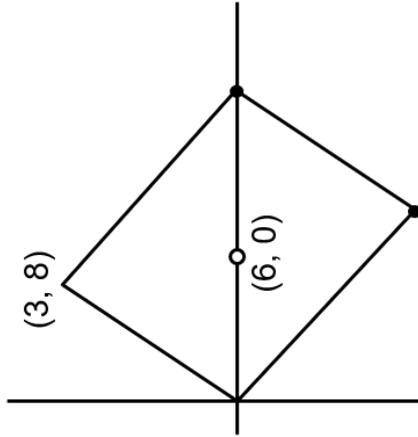
(7) a rhombus



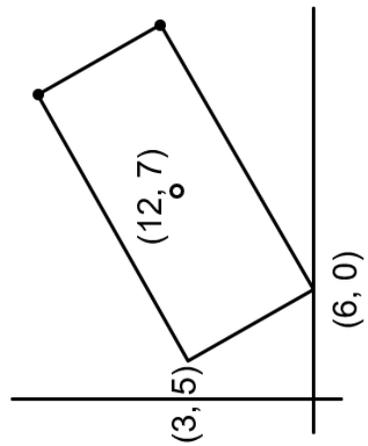
(8) a square



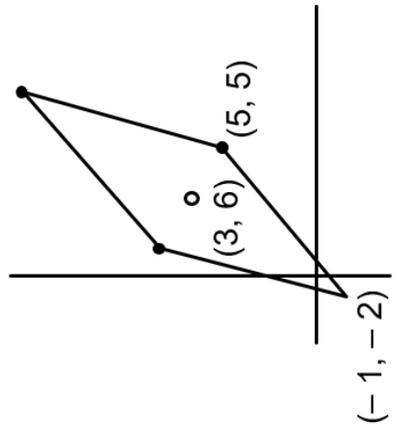
(9) a parallelogram



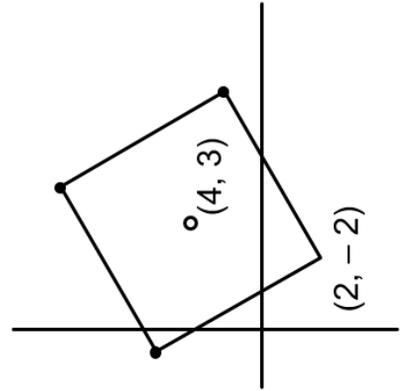
(10) a rectangle



(11) a rhombus



(12) a square



Fluency Practice

learn by heart

Co-ordinates are written (x, y)

The x value of a co-ordinate is the first number in the bracket and tells us how far along the x axis the point is.

The x axis is horizontal

The y axis is vertical

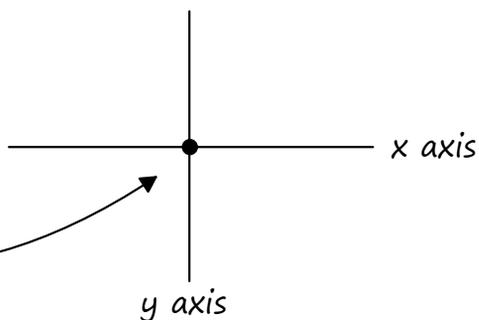
The **origin** is the point $(0, 0)$

$(5, 10)$

x

y

The y value of a co-ordinate is the 2nd number in the bracket and tells us how far up the y axis the point is.



exercise 7b

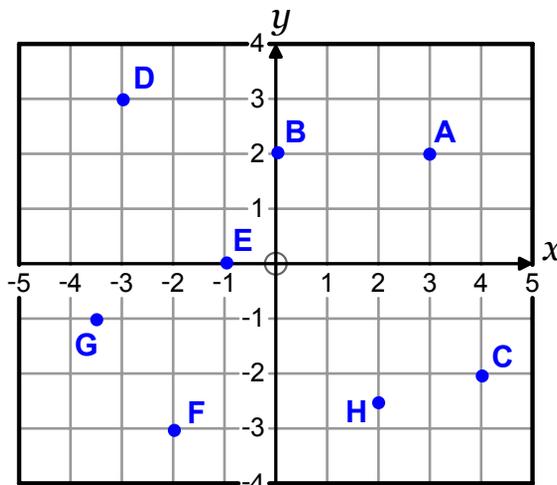
1. State the coordinates of each point on the grid.

A (,) B (,)

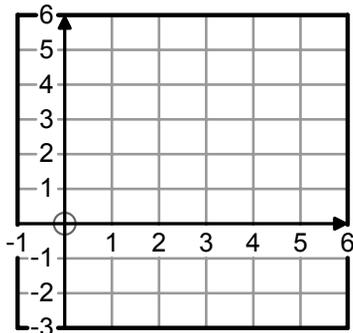
C (,) D (,)

E (,) F (,)

G (,) H (,)

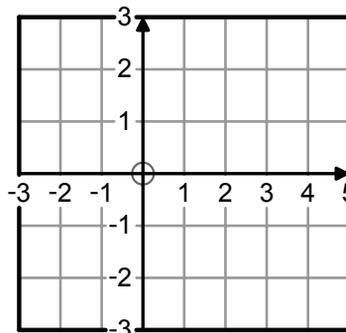


2. a) On the grid, plot the points $(0, 3)$, $(5, 5)$ and $(5, 1)$.



b) Join up your points.
What type of triangle does it make?

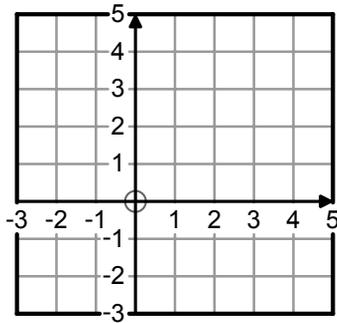
3. a) On the grid, plot the points $(-2, 2)$, $(4, -1)$ and $(-2, -1)$.



b) Join up your points.
What type of triangle does it make?

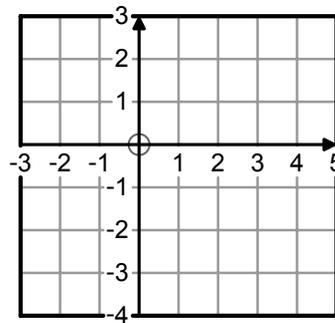
Fluency Practice

4. a) On the grid, plot the points (2,4), (4, -1), (2, -2) and (0,-1).



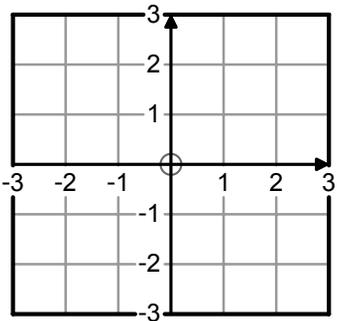
- b) Join up your points.
What shape does it make?

5. a) On the grid, plot the points (-2,0), (1, 2), (4,0) and (1, -2)



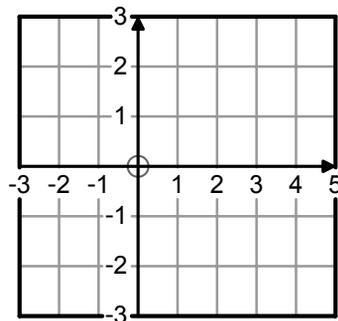
- b) Join up your points.
What shape does it make?

6. a) On the grid, plot the points (-2,-1), (-1,2), (1,2) and (2,-1).



- b) Join up your points.
What shape does it make?

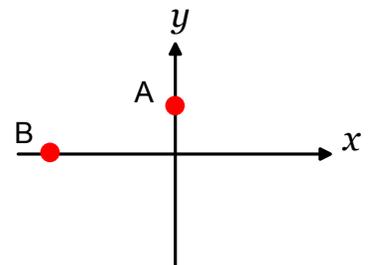
7. a) On the grid, plot the points (-2,-1), (1,-1), (3,2) and (0,2)



- b) Join up your points.
What shape does it make?

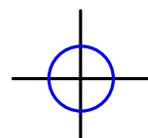
8. The grid shows two of the co-ordinates listed below.
Can you work out which two?

Point A = _____ Point B = _____



9. A circle is drawn with its centre on the origin.
The circle has a diameter of 12 units.
Which of these points will lie on the circumference of the circle?

a) (12, 0) b) (0, 12) c) (6, 0) d) (6, 6)



Fluency Practice

learn by heart

Co-ordinates are written (x,y) .
The first numbers in the pair is the x -value, the second number is the y -value.

example

Which co-ordinate has an x value of -5 ?
A) $(4,-5)$ B) $(5,-5)$ C) $(-5,5)$ D) $(5,5)$

The x value is the first number, so the answer is C.

exercise 7c

1. Fill in the table:

Co-ordinate	$(5,2)$	$(-3,5)$	$(0,2)$	$(-2,0)$	$(0, 2.5)$
x value					
y value					

2. Which of these co-ordinates has a y -value of -3 ? Select 2 answers.

- a) $(0, 3)$ b) $(3, 0)$ c) $(-3, 0)$ d) $(0, -3)$ e) $(3, -3)$

3. Which co-ordinate has an x -value of -2 ?

- a) $(-2, 2)$ b) $(2, -2)$ c) $(0, 2)$ d) $(0, -2)$

4. Which of these co-ordinates have $x = 3$? Circle all that apply.

- a) $(-4,3)$ b) $(3,1)$ c) $(-3,1)$ d) $(3,-3)$

5. In which co-ordinates below is x a negative number? Choose 2 answers.

- a) $(-5, 10)$ b) $(5, -10)$ c) $(5, 10)$ d) $(-10, 5)$

6. For which of the co-ordinates below does $x = y$? Choose 2 answers:

- a) $(-3, -3)$ b) $(-3, 3)$ c) $(0, 0)$ d) $(-3, 0)$ e) $(0, 3)$

7. Circle the co-ordinates below where $x + y = 10$.

- a) $(4,5)$ b) $(3,7)$ c) $(-2,12)$ d) $(-1,9)$

8. In which co-ordinates below is $x < 0$? Circle all that apply.

- a) $(-5, 10)$ b) $(5, -10)$ c) $(5, 10)$ d) $(-10, 5)$

9. Write down the co-ordinate with an x value of 6 and a y value of -3 .

Fluency Practice

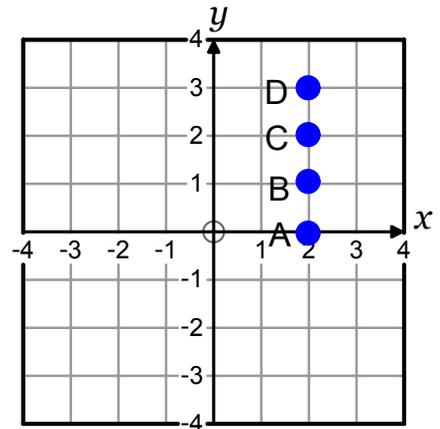
10. Write down the co-ordinates of the points on this grid.
What do they have in common?

A = (,)

B = (,)

C = (,)

D = (,)



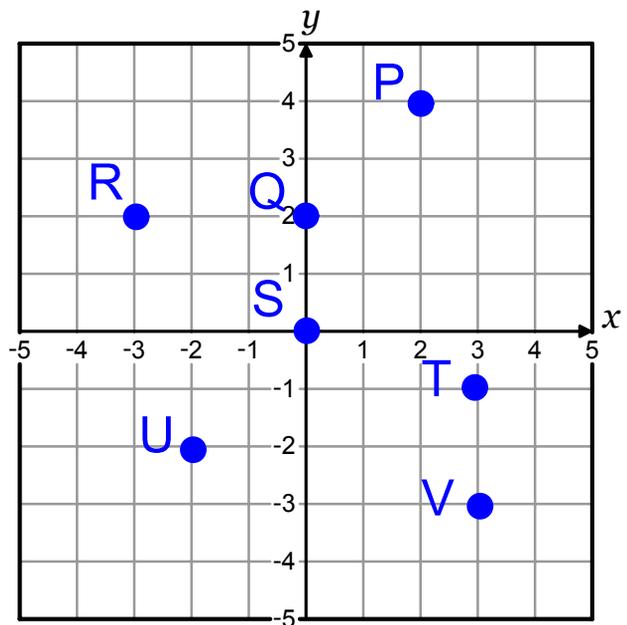
11. True or false?

- The co-ordinate (3,-4) has a positive x value.
- The co-ordinate (0,-4) is below the x axis.
- For the co-ordinate (-2,6), $x = 6$.
- For the co-ordinate (-2,0), $y = 0$
- A co-ordinate can not be a decimal
- The co-ordinate (0,-2) has a negative y value

12. Seven points are shown on the coordinate grid.

Decide which points follow each rule:

- $x = 3$
- $y = x$
- $y = 2$
- $y = -x$
- $y > 2$
- $x \leq -1$
- $x + y = 2$
- $x = 0$



Fluency Practice

learn by heart

We can find the horizontal distance between two points by looking at the difference in their x co-ordinates.

We can find the vertical distance between two points by looking at the difference in their y co-ordinates.



The horizontal distance between these points is 5 units ($8 - 3 = 5$)

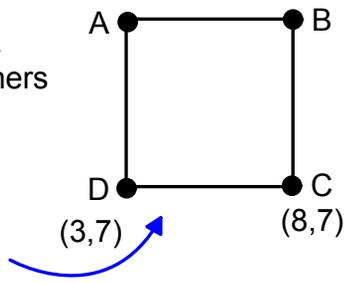
examples

Work out the co-ordinates of A and B for the corners of this **square**.

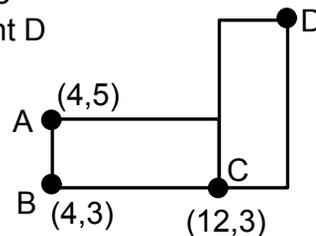
Side DC must be 5 units long because D is 3 along, but C is 8 along ($8 - 3 = 5$)

Therefore all sides are 5 units, so we need to go up 5 units from a height of 7.

So A = (3, 12) and B = (8, 12)



Two **identical** rectangles are shown. Work out the co-ordinates of point D



AB = 2 units
BC = 8 units
Each rectangle is 2 by 8

So we need to go along 2 units from C and then up 8 units, so point D is (14,11)

exercise 7d

1. Work out the distance AB in each diagram:

a)



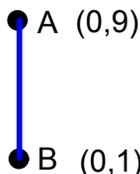
b)



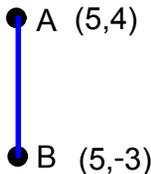
c)



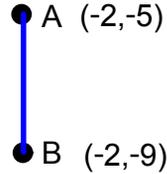
d)



e)



f)



2. What is the distance between (-4,5) and (6,5)?

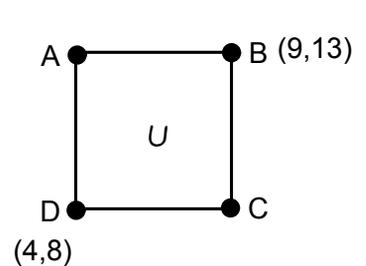
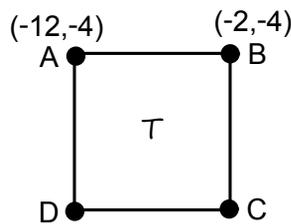
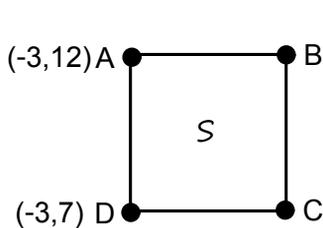
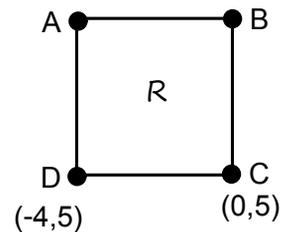
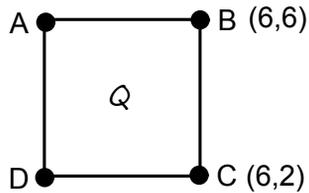
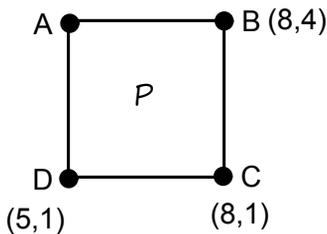
3. What is the distance between (-5,2) and (-5,-15)?

Fluency Practice

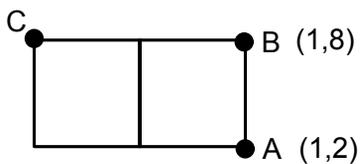
4. The diagram shows a rectangle.
Work out the co-ordinates of point D.



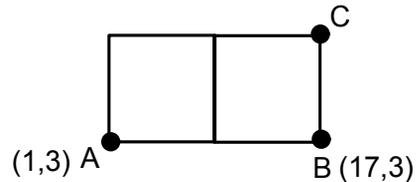
5. Work out the missing co-ordinates in each square:



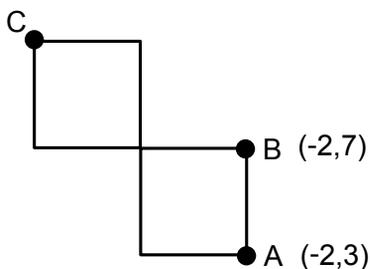
6. The diagram shows two identical squares. Work out the co-ordinates of point C.



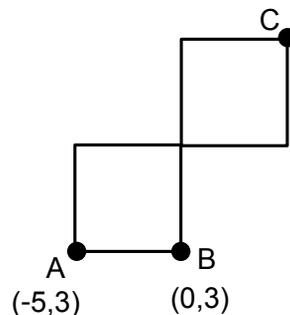
7. The diagram shows two identical squares. Work out the co-ordinates of point C.



8. The diagram shows two identical squares. Work out the co-ordinates of point C.

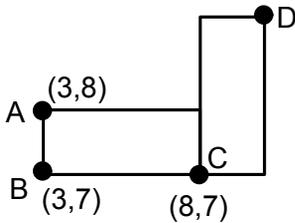


9. The diagram shows two identical squares. Work out the co-ordinates of point C.

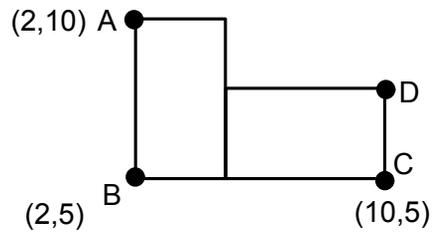


Fluency Practice

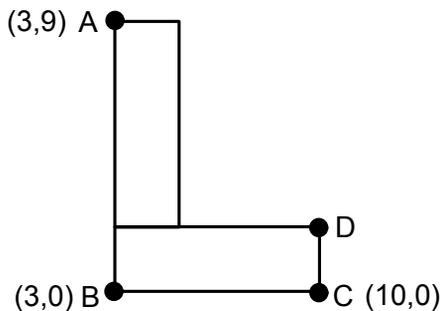
10. The diagram shows two **identical** rectangles. Work out the co-ordinates of point D.



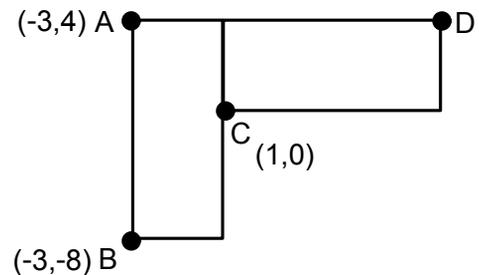
11. The diagram shows two **identical** rectangles. Work out the co-ordinates of point D.



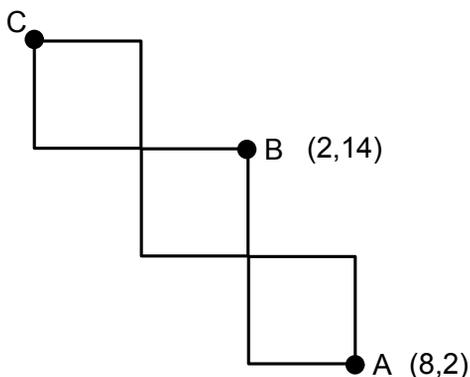
12. The diagram shows two **identical** rectangles. Work out the co-ordinates of point D.



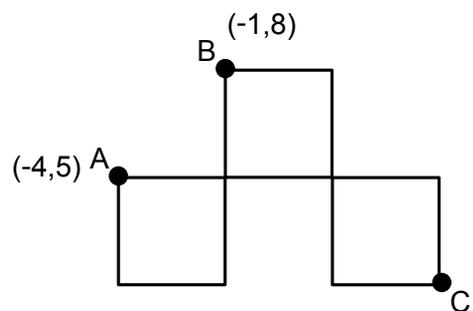
13. The diagram shows two **identical** rectangles. Work out the co-ordinates of point D.



14. The diagram shows **three identical squares**. Work out the co-ordinates of point C.



15. The diagram shows **three identical squares**. Work out the co-ordinates of point C.

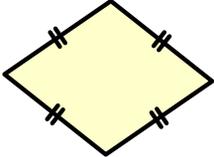


16. Three vertices of a square have co-ordinates (7,2), (10,2) and (10,5).
What is the fourth co-ordinate?
17. Opposite vertices of a square have co-ordinates (8,3) and (3,-2).
What are the other two co-ordinates?

Fluency Practice

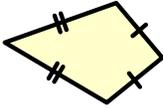
recall

Rhombus



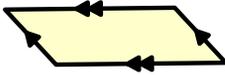
Four equal sides

Kite



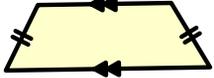
Two pairs of equal sides

Parallelogram



Opposite sides parallel

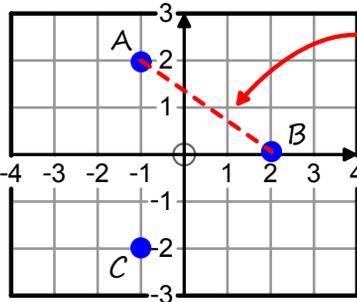
Isosceles Trapezium



One pair of parallel sides, other pair equal length

example

Plot point D so that ABCD is a rhombus.



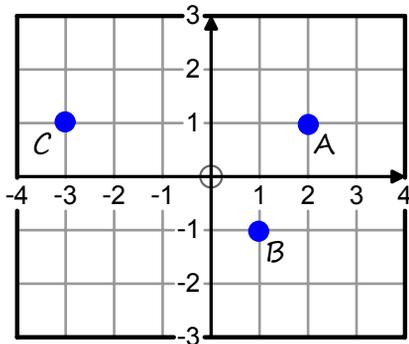
We can think of this distance as 3 across (horizontal) and 2 down (vertical).

To be a rhombus, all the sides must follow this same journey - 3 horizontally and 2 vertically. This will make the sides the same length.

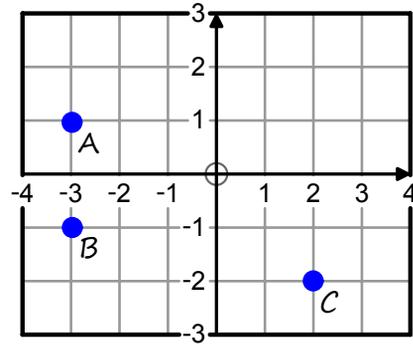
So point D must be at $(-4, 0)$.

exercise 7e

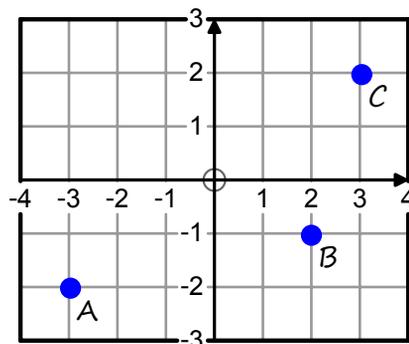
1. Plot point D so that ABCD is a kite. Join up your points.



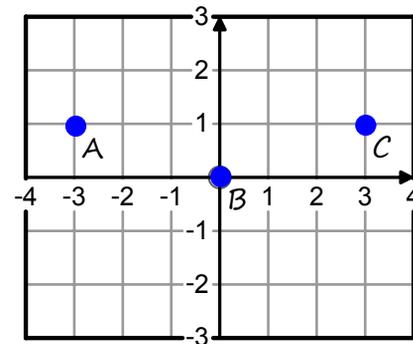
2. Plot point D so that ABCD is an isosceles trapezium. Join up your points.



3. Plot point D so that ABCD is a parallelogram. Join up your points.

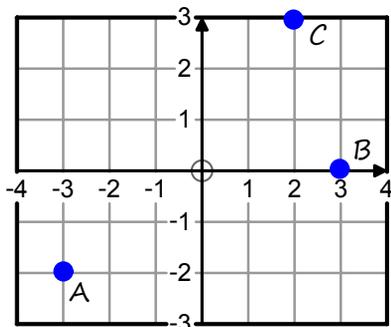


4. Plot point D so that ABCD is a rhombus. Join up your points.

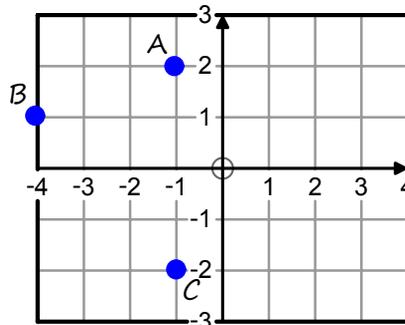


Purposeful Practice

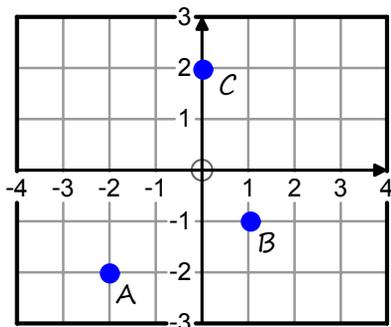
5. Plot point D so that ABCD is a rectangle. Join up your points.



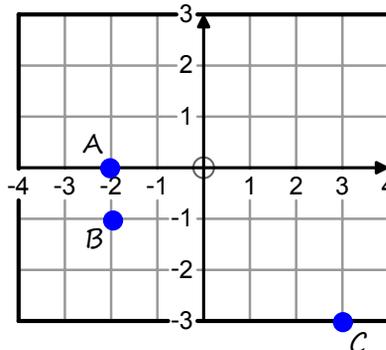
6. Plot point D so that ABCD is a kite. Join up your points.



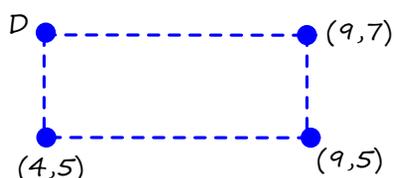
7. Plot point D so that ABCD is a square. Join up your points.



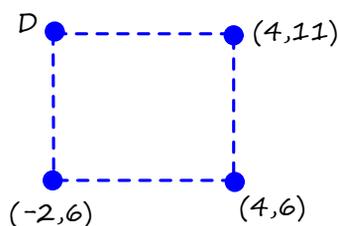
8. Plot point D so that ABCD is an isosceles trapezium. Join your points.



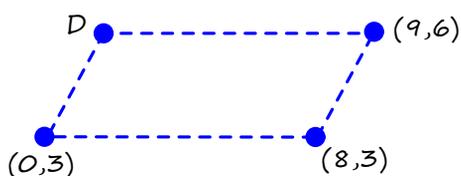
9. The diagram shows three corners of a rectangle. What would be the co-ordinate of point D, the 4th corner?



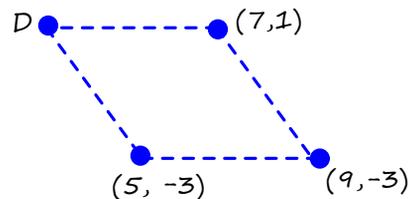
10. The diagram shows three corners of a rectangle. What would be the co-ordinate of point D, the 4th corner?



11. The diagram shows three corners of a parallelogram. What would be the co-ordinate of point D, the 4th corner?



12. The diagram shows three corners of a parallelogram. What would be the co-ordinate of point D, the 4th corner?



Purposeful Practice

13. If the points $(-6, 0)$, $(-6, 2)$ and $(4, 2)$ are 3 corners of a rectangle, what is the co-ordinate of the 4th corner?

a) $(6, 2)$ b) $(6, -2)$ c) $(4, -2)$ d) $(0, 4)$ e) $(4, 0)$

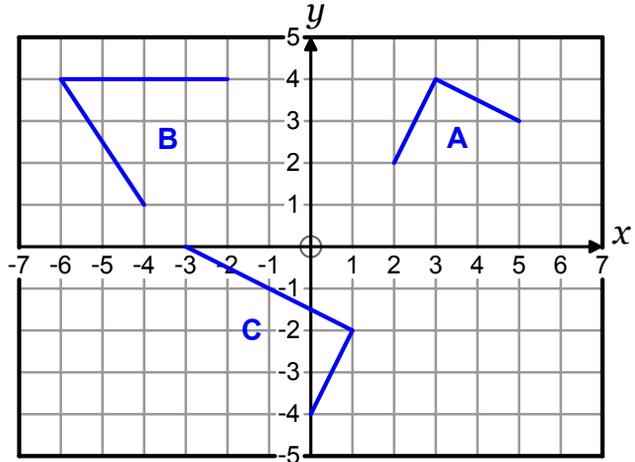
14. Each quadrilateral has two sides shown on the grid.

Complete the shapes and give the coordinates of the fourth vertex of each shape.

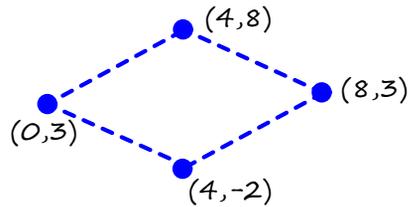
A Square (,)

B Parallelogram (,)

C Rectangle (,)

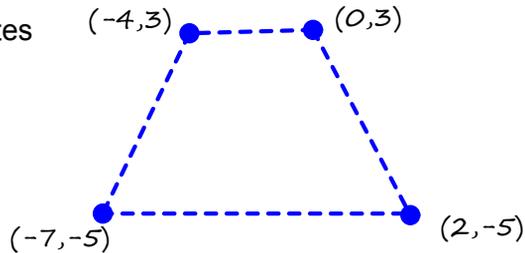


15. The diagram shows the co-ordinates of the corners of a quadrilateral (not drawn accurately).



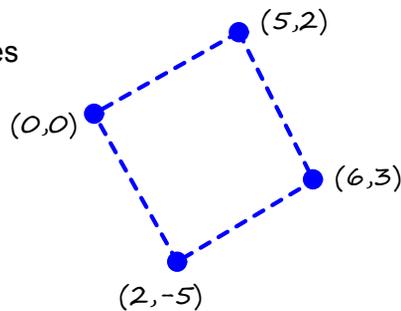
Is this quadrilateral a **rhombus**?
Explain your answer.

16. The diagram shows the co-ordinates of the corners of a quadrilateral (not drawn accurately).



Is this quadrilateral an **isosceles trapezium**?
Explain your answer.

17. The diagram shows the co-ordinates of the corners of a quadrilateral (not drawn accurately).



Is this quadrilateral a **square**?
Explain your answer.

Purposeful Practice

Which co-ordinates
make a:

Square

Rectangle

Trapezium

Kite

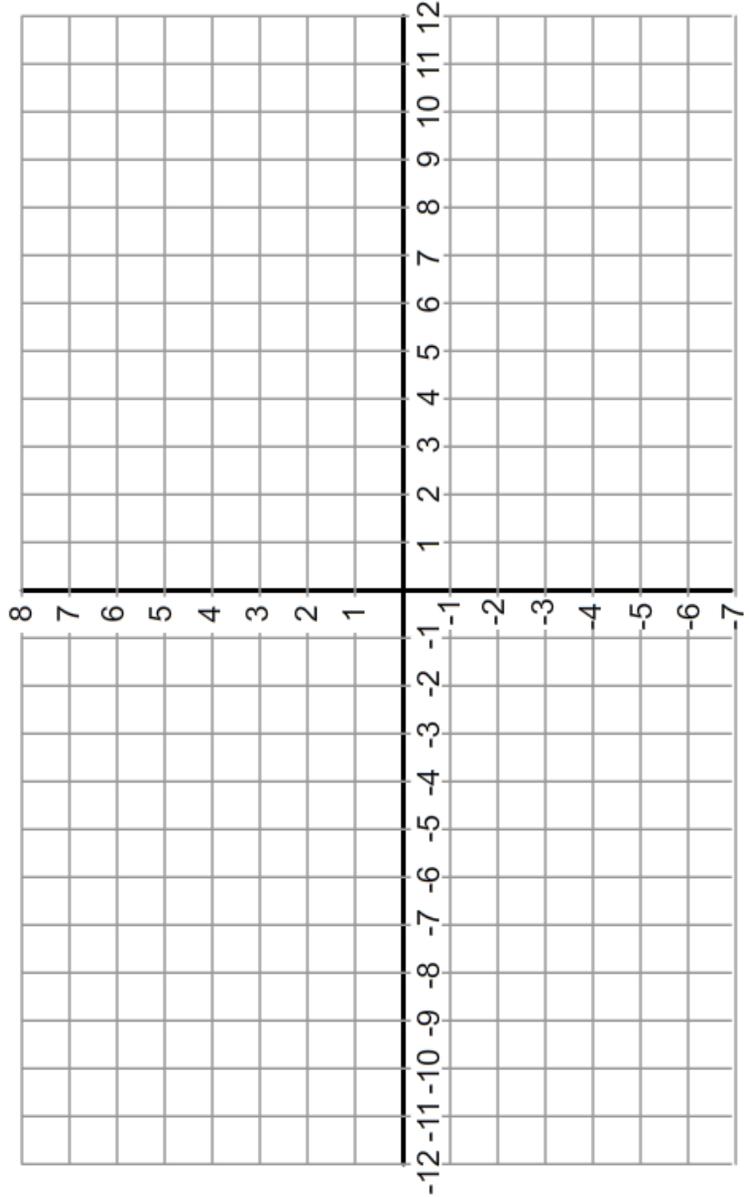
Pentagon

Isosceles Triangle

Scalene Triangle

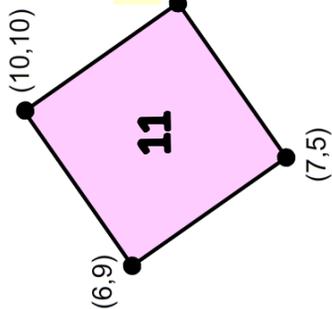
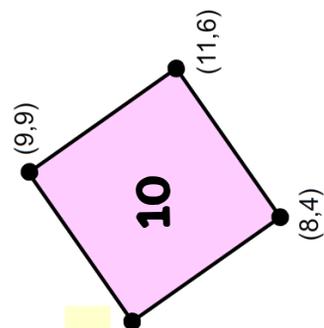
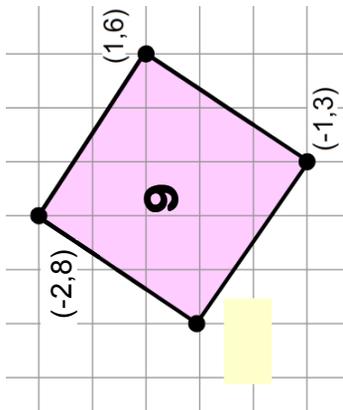
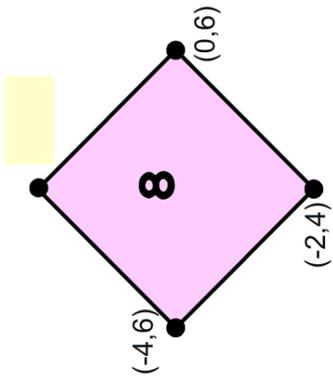
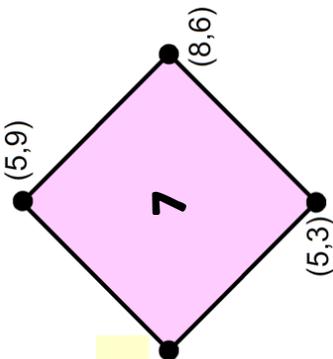
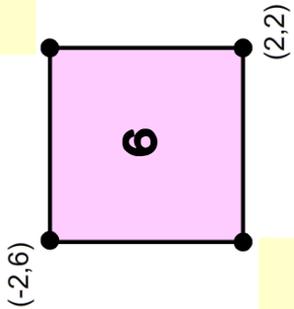
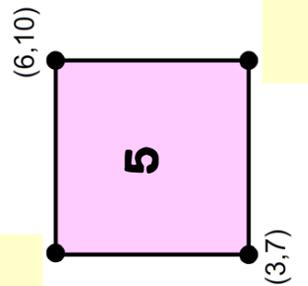
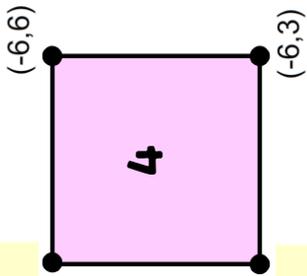
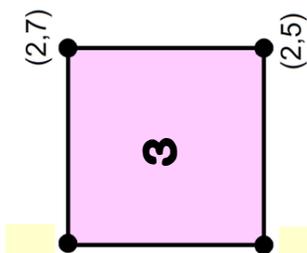
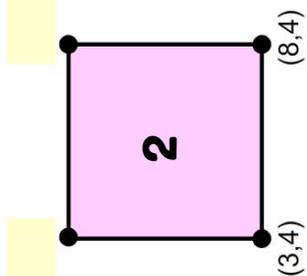
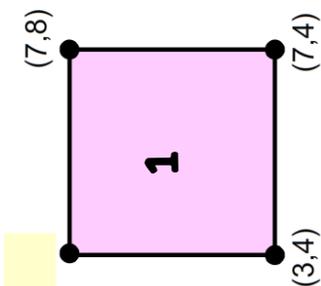
Plot these co-ordinates:

A = (-10, 1) G = (-9,5) M = (9,5) S = (-4, 1) Y = (6, -2)
B = (-2, 4) H = (9, 2) N = (8,-6) T = (4,0) Z = (4, 6)
C = (-6,7) I = (2, -3) O = (10,-2) U = (6,2) \$ = (-3,6)
D = (-4, -7) J = (-8, -4) P = (-4, -2) V = (5,1)
E = (2, -4) K = (6,5) Q = (2, -7) W = (11,0)
F = (-6, 1) L = (8,8) R = (8,0) X = (12, 5)



Purposeful Practice

All of these shapes are squares. Label their missing corners.



Hint: Try drawing right angled triangles around the squares.

4 Charts

Fluency Practice

Question 1: Draw a bar chart for each of these tables.

Sport	Frequency
Cricket	4
Football	3
Hockey	6
Rugby	1

Country	Frequency
China	12
Japan	18
South Korea	6
Thailand	6

Colour	Frequency
Blue	15
Green	8
Red	21
Yellow	3

Question 2: Draw a bar chart for each of these tables

Year	Students
7	36
8	35
9	25
10	24
11	16

Grade	Students
A	80
B	120
C	200
D	100
E	40
U	20

Animal	Frequency
Cat	12000
Dog	13000
Fish	1000
Horse	2000
Rabbit	7000

Question 3: Draw a dual bar chart for each table below

	Boys	Girls
Year 7	8	4
Year 8	6	6
Year 9	5	7

	Tea	Coffee
Monday	14	7
Tuesday	17	8
Wednesday	15	5
Thursday	11	10
Friday	9	15

Apply

Question 1: Matthew is a milkman.

The table below shows information about how many pints of milk he delivers in one village.

Day	Mon	Tues	Wed	Thurs	Fri	Sat
Pints Delivered	65	40	60	45	70	25

- (a) Draw a bar chart to represent this information.
 (b) How many pints of milk did he deliver in total?

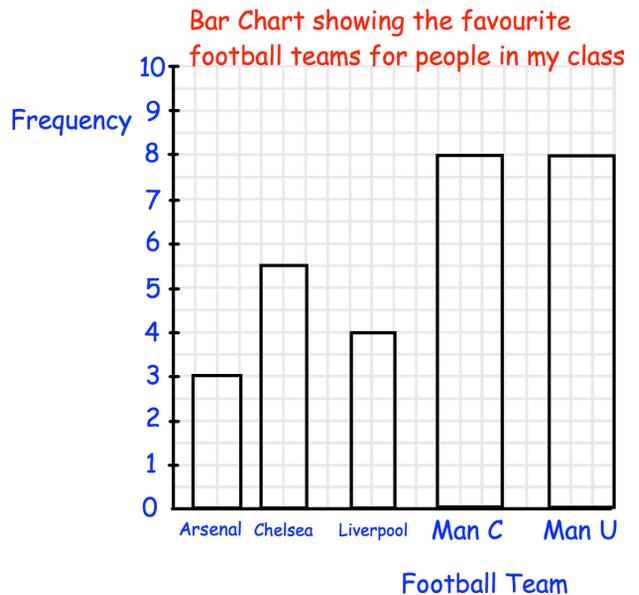
Purposeful Practice

Question 2: Shannon has drawn a bar chart to show the favourite football teams of the people in her class.

Shannon has made some mistakes.

- Explain what her mistakes are.
- Draw a correct bar chart for this information

Football Team	Frequency
Arsenal	3
Chelsea	5
Liverpool	4
Man City	8
Man United	8

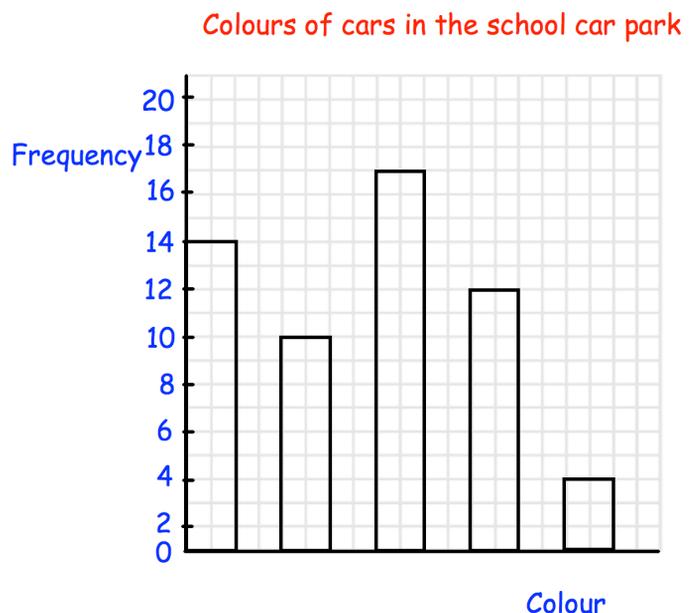


Question 3: Gareth has drawn a bar chart to show the colours of cars in a car park.

Gareth has made some mistakes.

- Explain what his mistakes are.
- Draw a correct bar chart for this information

Colour	Frequency
Blue	14
Red	9
Silver	17
White	12
Green	4



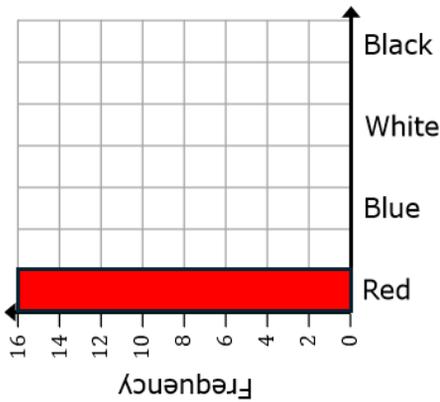
Fluency Practice

Constructing Bar Charts

(a)

The table shows the number of different coloured cars recorded one day. Complete the bar chart to represent the data.

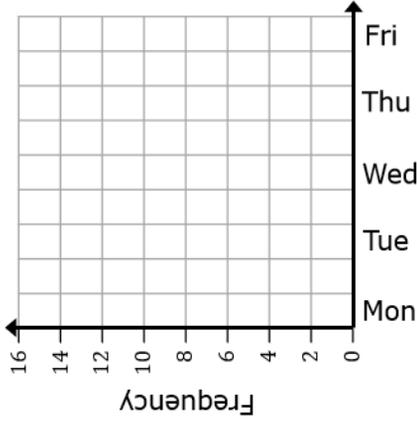
Colour	Frequency
Red	16
Blue	2
White	9
Black	14



(b)

The table shows the number of students receiving merits on each day of a week. Draw a bar chart to represent the data.

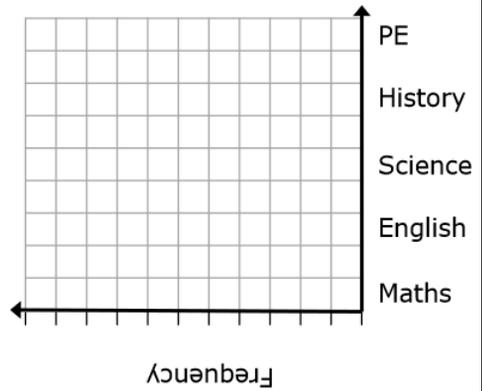
Day	Frequency
Monday	14
Tuesday	7
Wednesday	10
Thursday	0
Friday	9



(c)

40 children were surveyed about their favourite subject at school. Complete the table and draw a bar chart.

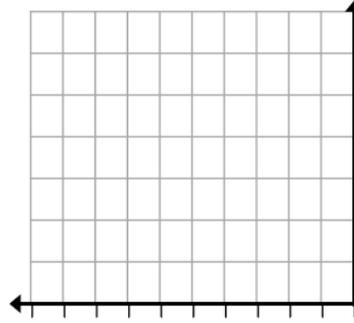
Subject	Frequency
Maths	9
English	6
Science	11
History	
PE	4



(d)

The table shows the number of books read by students in a month. They read 50 books in total. Ava read twice as many books as Cerys. Complete the table and draw a bar chart.

Student	Frequency
Ava	
Bola	20
Cerys	9
Dinah	



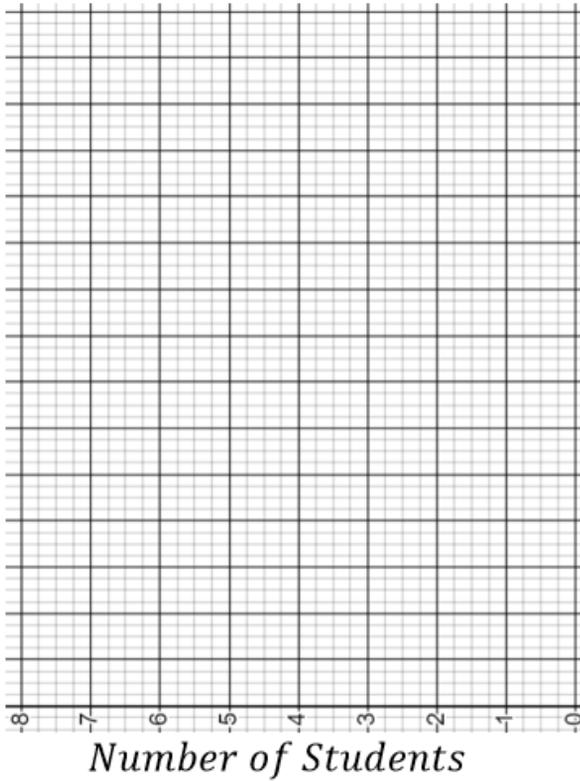
Fluency Practice

Drawing Comparative Bar Charts

(a)

The table shows the favourite sports of two Year 7 classes, 7A and 7B, when surveyed. Draw a comparative bar chart to represent this information. Include a key.

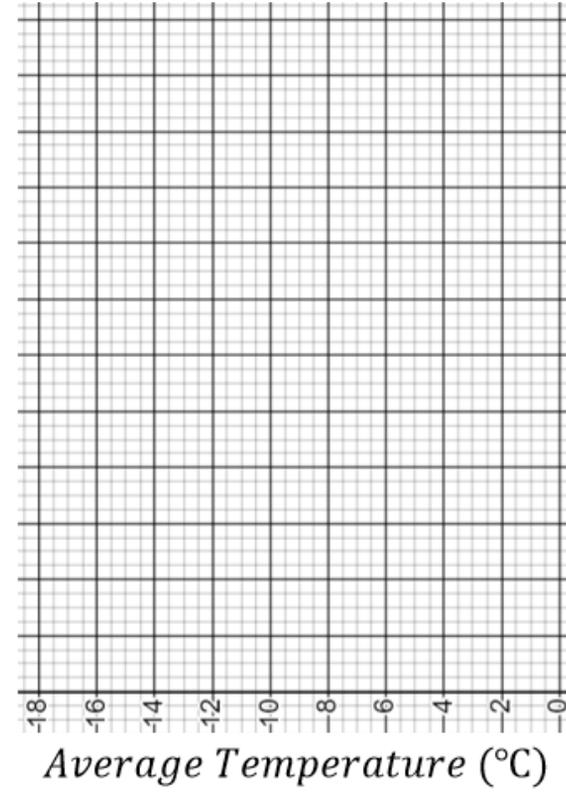
Class	Football	Tennis	Cricket	Netball	Other
7A	7	3	2	4	4
7B	5	4	4	5	2



(b)

The table shows the average temperature in °C in Manchester and London in each of the seasons. Draw a comparative bar chart to represent this information. Include a key.

City	Spring	Summer	Autumn	Winter
Manchester	7	16	8	4
London	11	18	9	6



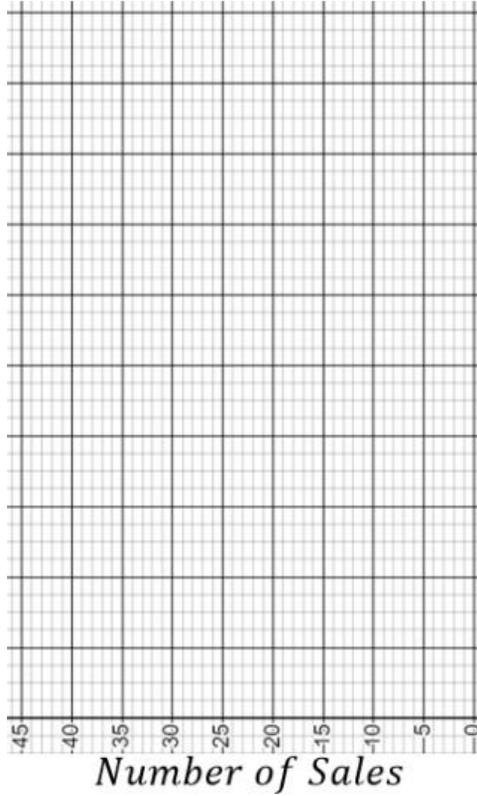
Fluency Practice

Drawing Composite Bar Charts

(a)

The table shows the number of ice creams and soft drinks sold over a week by an ice cream van. Draw a composite bar chart to represent this information. Include a key.

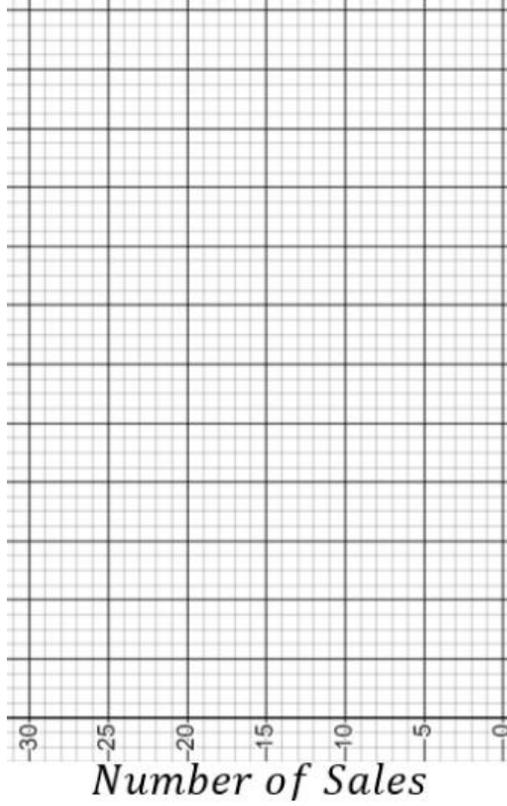
	Mon	Tue	Wed	Thu	Fri
Ice Cream	22	36	28	16	24
Soft Drink	12	8	10	16	10



(b)

The table shows the recorded sales of TVs, laptops and mobile phones in a shop each month for 6 months. Draw a composite bar chart to represent this information. Include a key.

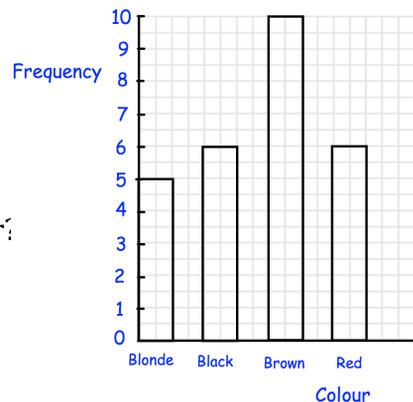
	Jan	Feb	Mar	Apr	May	Jun
TV	4	2	5	8	4	5
Laptop	10	5	6	5	9	12
Phone	16	6	8	11	8	12



Fluency Practice

Question 1: The bar chart shows information about the hair colour of students in 7C.

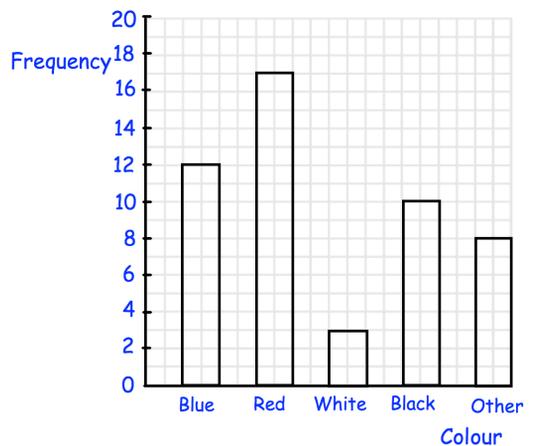
Hair colour of students in class 7C



- What is the most common hair colour in 7C?
- How many students had black hair?
- What hair colour is the least popular in 7C?
- How many more students had brown than red hair?
- How many students are in 7C?

Question 2: Nicole recorded the colours of cars in a car park. She then drew a bar chart to show the results.

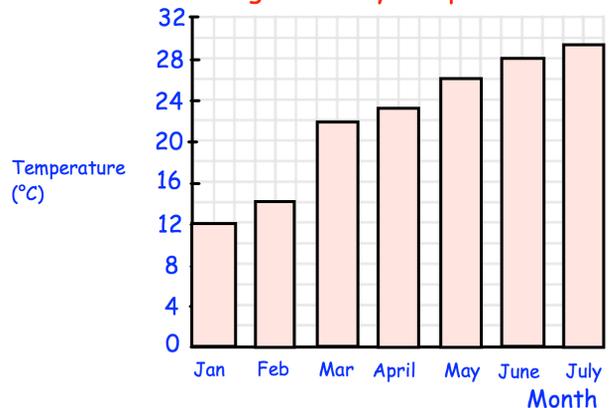
Colours of cars in the school car park



- What is the most common colour of car?
- How many cars were blue?
- How many cars were white?
- How many more cars were red than black?
- Why do you think there is a bar called "other?"
- How many cars were in the car park?

Question 3: The bar chart shows information about the average temperature on an island.

Average monthly temperature

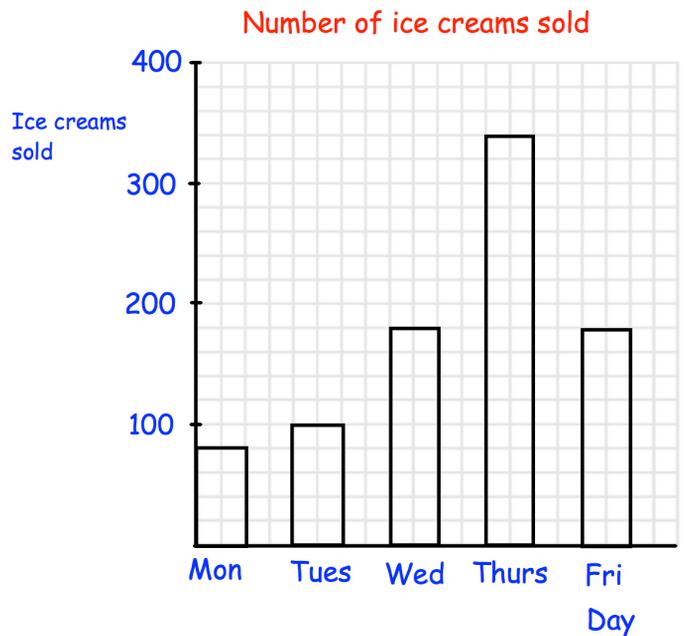


- What was the average temperature in March?
- Which month had an average temperature of 26°C?
- What is happening to the average temperatures between Jan and July?
- Between which two months was there the greatest rise in temperature?

Fluency Practice

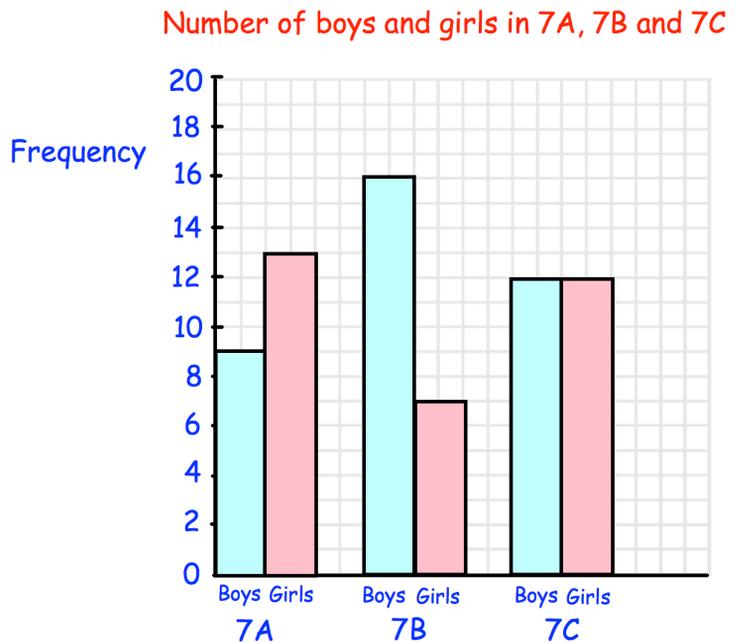
Question 4: The bar chart shows information about the number of ice creams sold in a shop.

- How many ice creams were sold on Tuesday?
- On which day were the least number of ice creams sold?
- Why do you think so many ice creams were sold on Thursday?
- On which two days were the same number of ice creams sold?
- How many ice creams were sold in total?



Question 5: The dual bar chart shows information about the number of boys and girls in three tutor groups, 7A, 7B and 7C.

- How many boys are there in 7B?
- Which tutor group has 12 girls?
- Which tutor group has more girls than boys?
- Which tutor group has the same number of boys and girls?
- Which tutor group has the most students?
- How many more girls than boys are there in 7A?
- How many boys are there in Year 7?
- How many students are there in Year 7?
- Are there more boys or girls in Year 7?



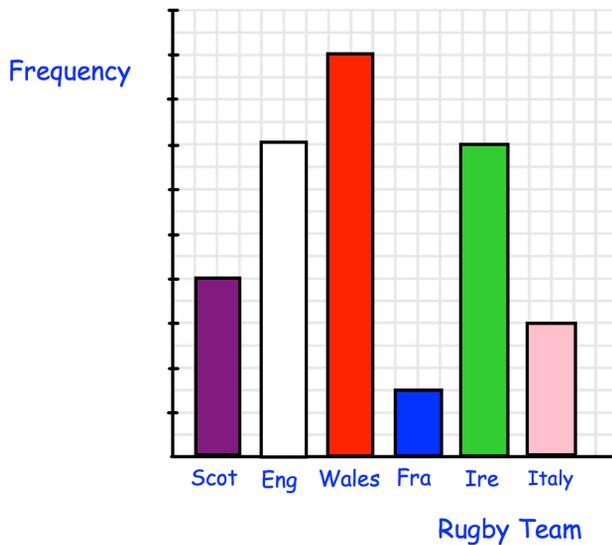
Purposeful Practice

Apply

Question 1: Nigel has asked his friends which country they support in the Six Nations. He has shown the results in a bar chart.

The bar chart is accurately drawn, but Nigel has forgotten to label the frequencies. Nigel does remember that 9 people supported France.

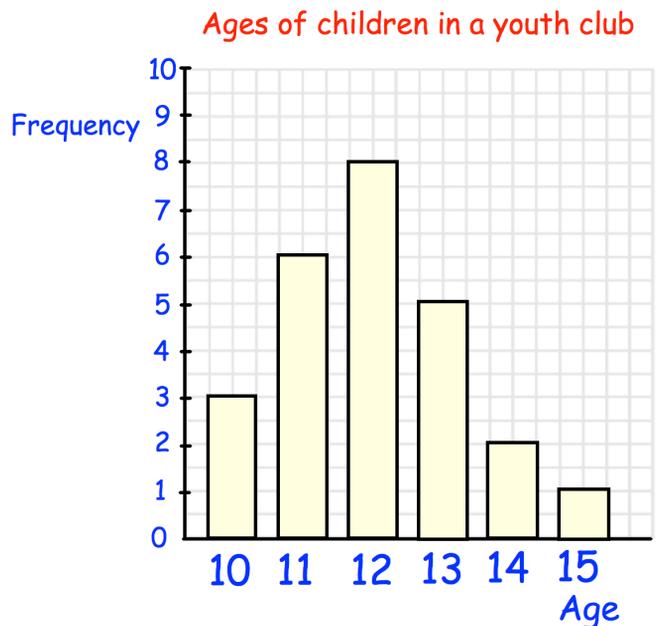
Find the missing frequencies.



Rugby Team	Frequency
Scotland	
England	
Wales	
France	9
Ireland	
Italy	

Question 2: The bar chart shows the ages of children in a youth club.

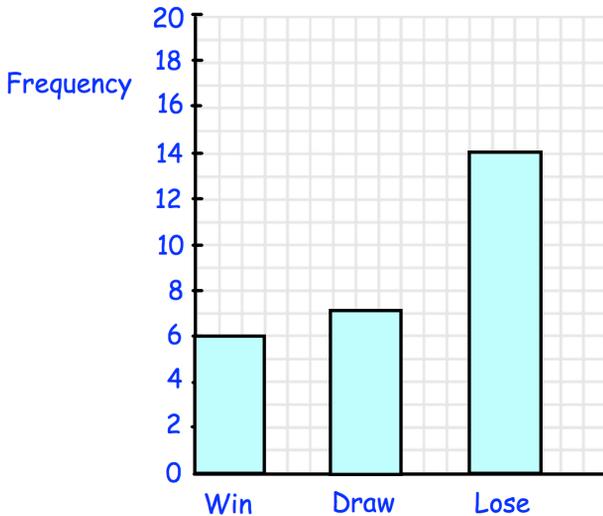
- What is the modal age?
- What is the range of the ages?
- What fraction of the children are 11?
- What percentage of the children are older than 13?



Purposeful Practice

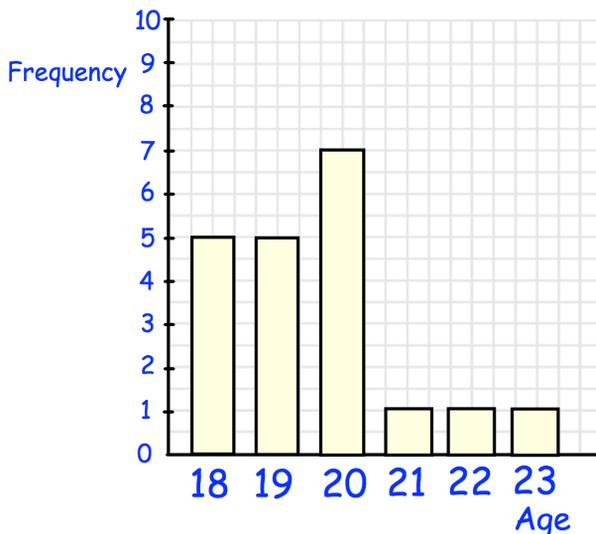
Question 3: Peterborough Pirates are an ice hockey team. They play in a league where a win earns 5 points, a draw earns 2 point and a loss earns -1 points. The bar chart shows information about their results in 2016. The table shows the final points for the other 9 teams in the league. In which position did Peterborough Pirates finish?

Peterborough Pirates results



Belfast Giants:	50 points
Cardiff Devils:	23 points
Coventry Blaze:	49 points
Edinburgh Capitals:	51 points
Manchester Storm:	12 points
Nottingham Panthers:	28 points
Sheffield Steelers:	55 points
Swindon Wildcats:	33 points
Telford Tigers:	32 points

Question 4: Shown are the ages of 20 friends. Work out the mean age.



Fluency Practice

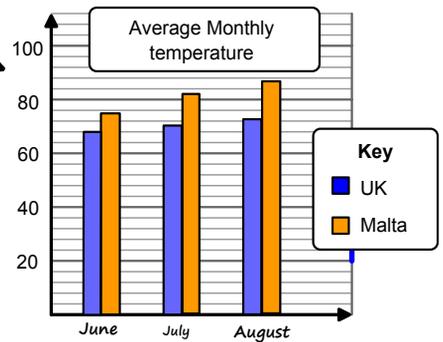
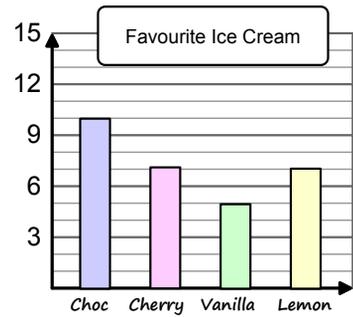
learn by heart

If we are drawing a bar chart and the x axis represents **discrete or qualitative data**, there can be gaps between the bars. This is because there can only be a limited number of values on the x axis, and the gaps in between the bars are meaningless.

Where the data is **continuous**, such as height, time or distance, a bar chart with touching bars would be drawn. A bar chart must have bars that are equal in width. Later on we will learn about histograms, which are charts we draw when we need bars of different widths.

If two or more data sets are being compared, a **comparison bar chart, or dual bar chart**, can be drawn, where each category has multiple bars.

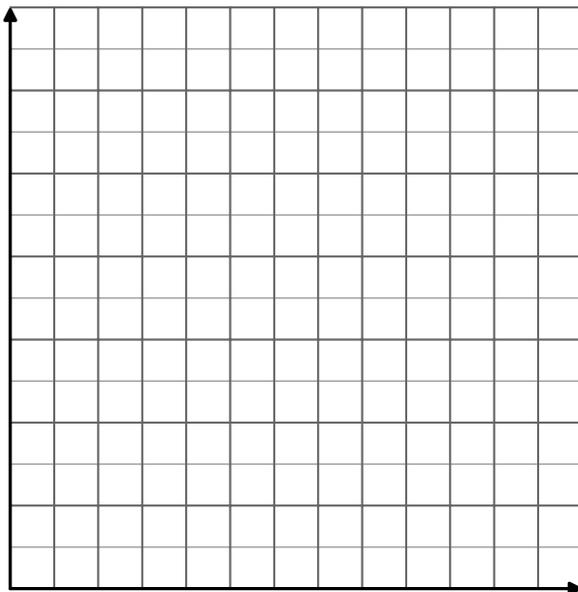
A **composite** bar chart is created when each bar is split into different categories.



exercise 8e

- Jenny asked her classmates how many people lived in their household.

Draw a bar chart to show the results.

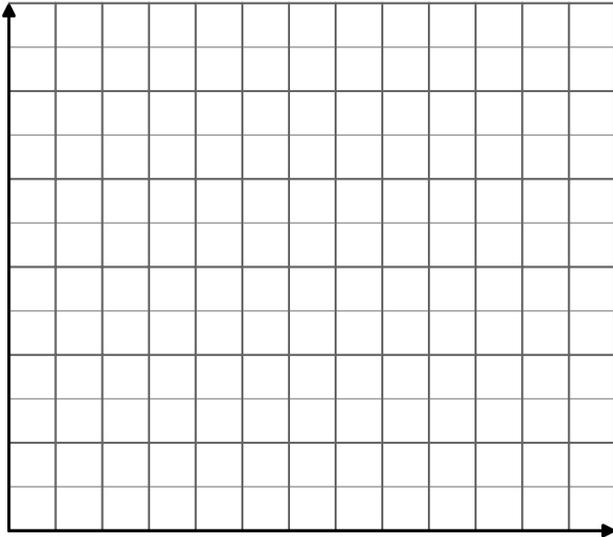


Number of People	Frequency
1	0
2	1
3	9
4	12
5	3
6+	3

Fluency Practice

2. Paul asked a group of students how many bars of chocolate they eat each month.

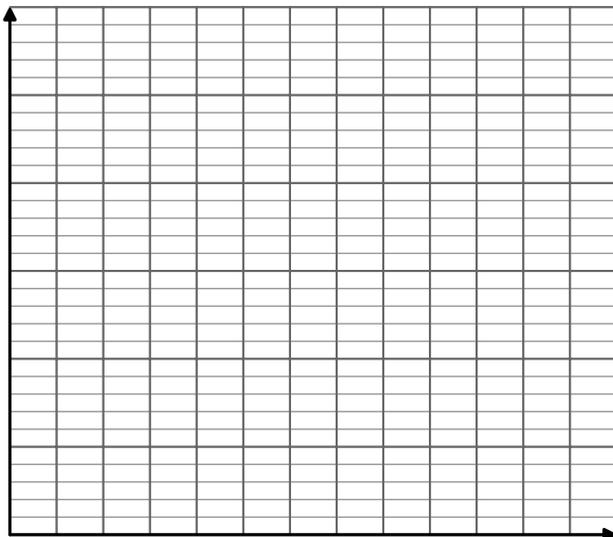
Draw a bar chart of the results.



Number of Chocolate Bars	Frequency
0-4	1
5 - 9	5
10 - 14	5
15 -19	4
20-24	8
25+	10

3. Dana recorded the heights of a set of recently planted trees.

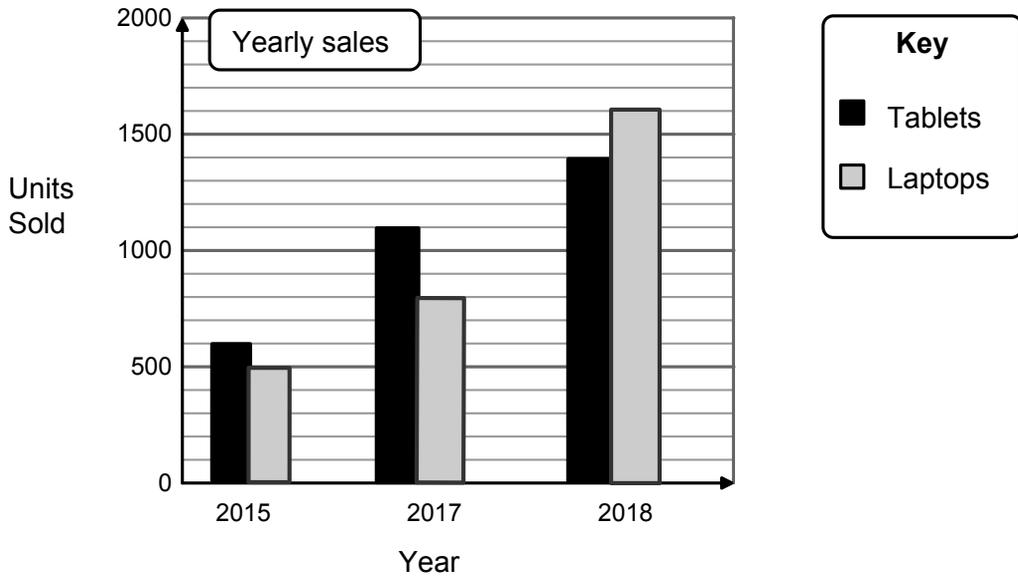
Draw a bar chart of her results.



Tree Heights (cm)	Frequency
$0 \leq h < 30$	5
$30 \leq h < 60$	30
$60 \leq h < 90$	25
$90 \leq h < 120$	1

Fluency Practice

4. The chart shows the number of tablets and laptops sold by a technology company.



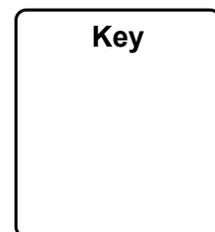
- In which year did they sell the most tablets?
- In which year did laptop sales exceed tablet sales?
- How many more tablets than laptops were sold in 2017?
- The company also sells phones. The table shows how many phones they sold each year. Add this information to the bar chart.

2015	2017	2018
300	500	100

5. The table shows the quantity of wheat, barley and oats a firm produced over a number of years (in 1000kg). Draw a comparison bar chart to show the data.



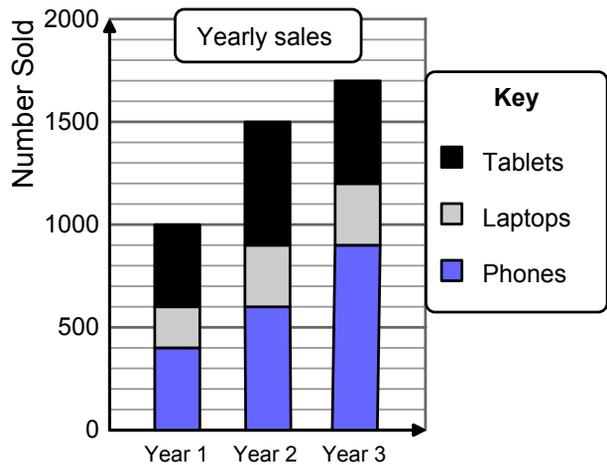
	Wheat	Barley	Oats
2006	8	10	9
2007	11	7	11
2008	13	7	10
2009	14	4	9



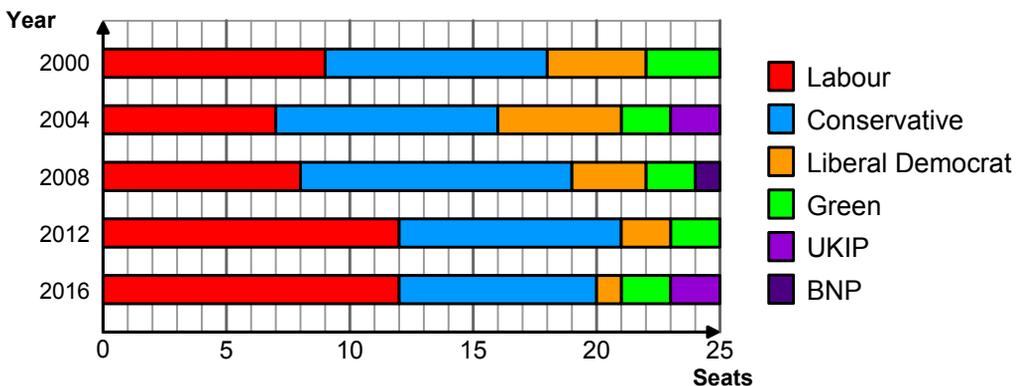
Fluency Practice

6. The composite bar chart shows the number of sales of items by a new company in its first three years.

- Work out the total number of laptops sold in the three years.
- True or false? The number of sales of each item increased every year.
- "The chart shows the company made the greatest profit from sales of phones." Do you agree?



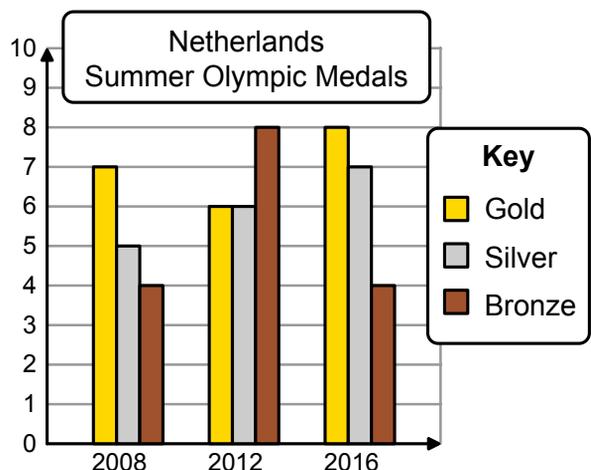
7. The chart shows the number of seats in the London Assembly allocated to different political parties in 5 elections.



- Which party had the most seats in 2004?
- Did Labour achieve more than 50% of the seats in any election?
- In which year did the Liberal Democrats have 4% of all the seats?

8. The chart shows the number of medals won by the Netherlands at three summer Olympic games.

- More gold medals were won overall than bronze medals. How many more?
- Work out the percentage of the medals won in 2012 that were gold.
- Did the team ever achieve more than 50% gold medals?



Problem Solving

Draw a bar graph using the following information and squared paper.

- 24 children were asked to choose their favourite colour.
- A quarter of the children chose red.
- Two children chose green.
- The number of children who like pink is double the number of children who like green.
- Orange is as popular as green.
- The number of children who like blue is half the number of children who like red.
- No children like brown.
- An eighth of the children like purple.
- The rest of the children like yellow.

Purposeful Practice

Instructions: Complete the remaining boxes by making the minimum change possible to the centre box. If there are boxes that cannot be filled in, say why.

Total Frequency

	Less	Same	More
More			
Same			
Less			

Modal score

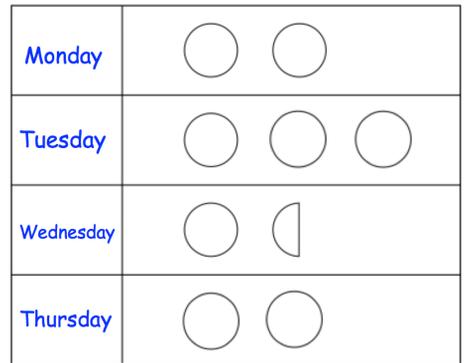
Fluency Practice

Question 1: James is revising for an exam.

The pictogram shows how many hours he spent revising over four days.

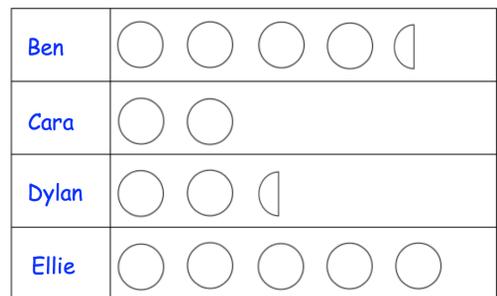
Key ○ represents 2 hours

- (a) How many hours did James spend revising on Monday?
- (b) How many hours did James spend revising on Wednesday?
- (c) On which day did James spend 6 hours revising?
- (d) How many hours did James spend revising in total?



Question 2: The pictogram shows how much money 4 friends raised for charity.

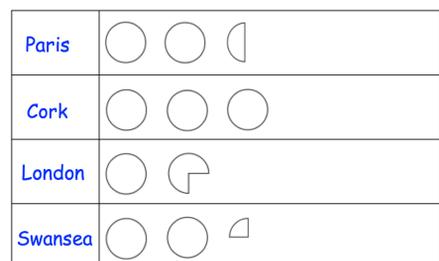
- (a) Who raised the most money for charity?
- (b) Who raised the least money for charity?
- (c) How much money did Dylan raise?
- (d) How much more did Ellie raise than Cara?
- (e) How much more did Ellie raise than Dylan?
- (f) How much money did the friends raise in total?



Key ○ represents £10

Question 3: The pictogram shows the number of hours of sunshine in four cities for a day in May.

- (a) Which city had the most sunshine?
- (b) How many hours of sunshine did Swansea have?
- (c) How many more hours of sunshine did Paris have than London?



Key ○ represents 4 hours

Fluency Practice

Question 4: Draw a pictogram for each of the following tables.
Use a suitable key.

(a)

Sport	Frequency
Badminton	20
Judo	15
Squash	25
Table Tennis	5

(b)

Day	Cars sold
Monday	6
Tuesday	8
Wednesday	3
Thursday	10
Friday	7

(c)

Position	Players
Goalkeepers	3
Defenders	18
Midfielders	16
Forwards	14

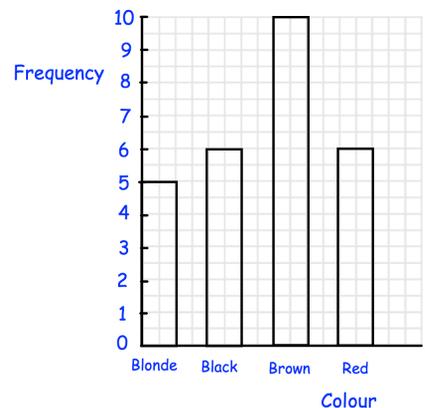
(d)

Shoe Size	Frequency
4	6
5	9
6	15
7	12
8	6

(e)

	Tweets
Hollie	50
Nick	120
Chris	70
Becky	80

Hair colour of students in class 7C



Apply

Question 1: The bar chart above shows the hair colour of students in class 7C
Draw a pictogram to represent the information shown in the bar chart.

Question 2: The pictogram below shows the results of Bath City over a season.
Each win is worth 3 points.
Each draw is worth 1 point.
Each lose is worth 0 points.
How many points did Bath City earn over the season?

Win	○ ○ ○ ○ ○
Draw	○ ◐
Loss	○ ○ ○ ◐

Key ○ represents 2 matches

Purposeful Practice

Question 3: Hannah has been asked to draw a pictogram for this information.

	Population
Milton	4,000
Leek	9,000
Redville	4,500
Newtown	5,000
Donhampton	2,000

Hannah has decided to use the key

Key  represents 10 people

- (a) Explain why her key is not suitable
- (b) Suggest a more suitable key
- (c) Draw a pictogram using your key from (b)

Question 4: The pictogram shows some information about the colour of sweets in a bag.

There are twice as many red sweets than green sweets.

There are 30% more white sweets than blue sweets.

There are 6 more red sweets than white sweets.

Complete the pictogram.

Red	
White	
Green	
Blue	

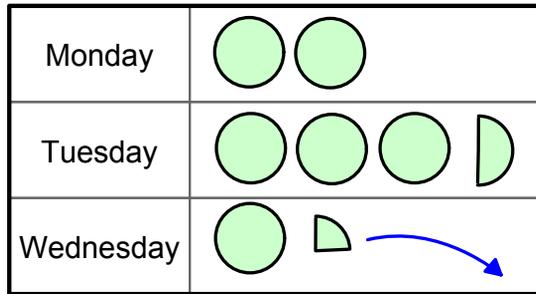
Key  represents 8 sweets

Fluency Practice

learn by heart

We can use diagrams and charts to help us see patterns or features of sets of data.

A pictogram can be used to highlight the frequency of different items. This pictogram shows the number of cakes sold each day at a bakery:



key
 = 12 cakes

On Wednesday they sold
 $12 \text{ cakes} + 3 \text{ cakes} = 15 \text{ cakes}$

exercise 8d

1. The table shows how many students take part in after school clubs during the week.

Monday	Tuesday	Wednesday	Thursday
8	10	14	9

Complete the pictogram.

key
 = 4

Monday	
Tuesday	
Wednesday	
Thursday	

2. The pictogram and the table both show how many phones were sold each day last week by a phone shop.

Monday	Tuesday	Weds	Thurs
20	45	25	

The pictogram and the frequency table are both incomplete.

Work out the missing information and fill them in, including the key

Mon	
Tues	
Wed	
Thur	

key
 = ____ phones

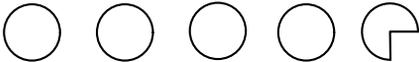
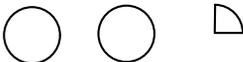
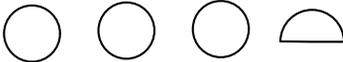
Fluency Practice

3. The pictogram shows how a group of 52 students travel to school.

The number travelling by car has not yet been included.

Complete the pictogram.

key  = 4 people

Walk	
Bus	
Train	
Car	

4. The pictogram shows the favourite chocolate of a group of students.

The number who chose snickers & twix have not yet been included.

Use the clues below to complete the pictogram and the key.

Clues

- A) 26 students said either wispa or bounty
- B) 36 students said snickers
- C) 72 students took part in the survey.

Wispa	
Snickers	
Twix	
Bounty	

key  =

5. The pictogram shows the number of merits each form group in year 7 received last week.

Use the clues below to complete the pictogram and the key.

Clues

- A) Form A and B together received 50% of the total merits.
- B) Form D received 10 merits more than Form E.
- C) Form C received the most merits.
- D) 160 merits were received in total.

Form A	
Form B	
Form C	
Form D	
Form E	

key
 =

Fluency Practice

Question 1: Draw a pie chart for each set of data below

(a)

Method of Transport	Frequency
Car	8
Bus	11
Walk	12
Cycle	5

(b)

Rugby Team	Frequency
England	20
France	5
Ireland	15
Scotland	25
Wales	25

(c)

Colour	Frequency
Blue	25
Green	14
Red	21

(d)

Grade	Frequency
A	10
B	15
C	13
D	5
E	2

(e)

Make	Frequency
Ford	8
Mazda	14
Volkswagen	21
Fiat	20
Honda	9

(f)

Sport	Frequency
Cricket	7
Football	16
Gaelic Football	48
Hockey	33
Judo	4
Rugby	72

(g)

Language	Frequency
French	14
German	4
Polish	9
Spanish	3

(h)

Opinion	Frequency
Yes	3
No	11
Undecided	4

(i)

Drink	Frequency
Tea	410
Coffee	120
Fruit Juice	140
Water	50

Question 2: Draw a pie chart for each set of data below
You may use a calculator.

(a)

Holiday Destination	Frequency
France	102
Ireland	78
Portugal	24
Spain	36

(b)

Year Group	Frequency
7	5
8	17
9	20
10	8

(c)

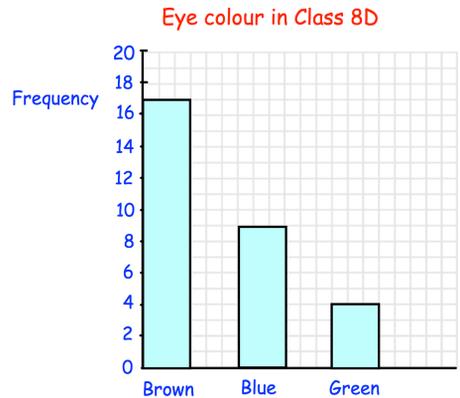
Meal	Frequency
Chinese	54
Indian	49
Italian	17
Thai	8

Fluency Practice

Apply

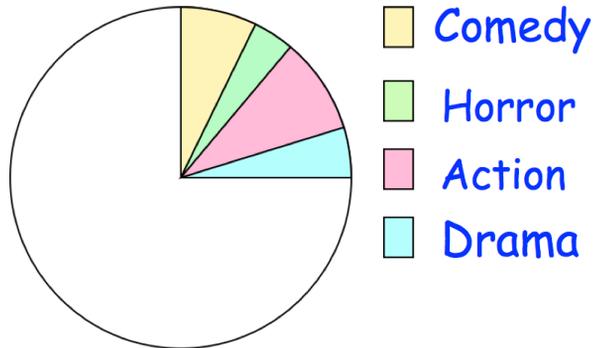
Question 1: Anne-Marie has drawn a bar chart to show the eye colours in class 8D.

- How many students are there in class 8D?
- Show this information in a pie chart.
- What fraction of the students have brown eyes?
- What fraction of the students have blue eyes?
- What fraction of the students have green eyes?



Question 2: Bill has drawn a pie chart to show his friends' favourite genre of film.

Genre	Frequency
Comedy	26
Horror	14
Action	33
Drama	17



- Can you explain to Bill what he has done wrong?
- Draw a correct pie chart for Bill.

Question 3: Erin is calculating the size of each angle for a pie chart.

- Can you spot what Erin has done wrong?
- Calculate the correct angles
- Draw a correct pie chart for Erin

Destination	Frequency	
Employment	15	$\times 0.2 = 3^\circ$
Apprenticeship	11	$\times 0.2 = 2.2^\circ$
Further Education	40	$\times 0.2 = 8^\circ$
Gap Year	6	$\times 0.2 = 1.2^\circ$

$$15 + 11 + 40 + 6 = 72$$

$$72 \div 360 = 0.2^\circ \text{ per person}$$

Fluency Practice

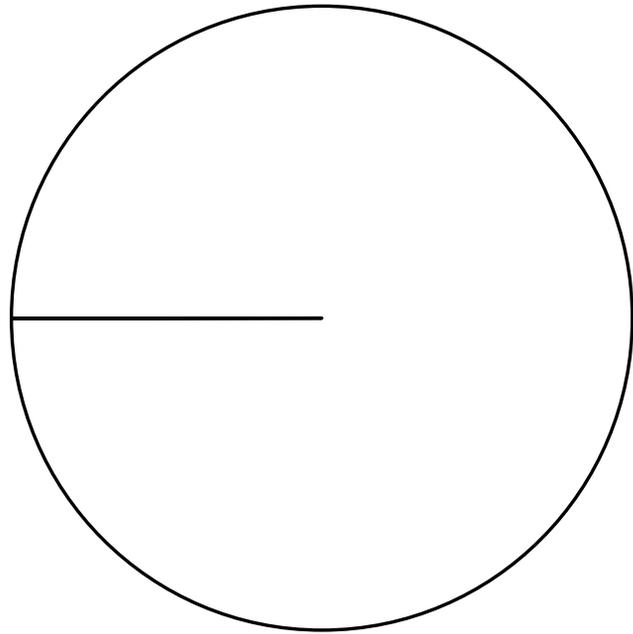
Drawing Pie Charts

(a)

In a survey, 90 students are asked to name their favourite fruit. The results are shown in the table below.

- (a) Complete the table by calculating the angle for each fruit.
 (b) Draw and label the pie chart.

Fruit	Banana	Apple	Orange	Pineapple	Other
Number of Students	32	15	25	10	8
Angle					

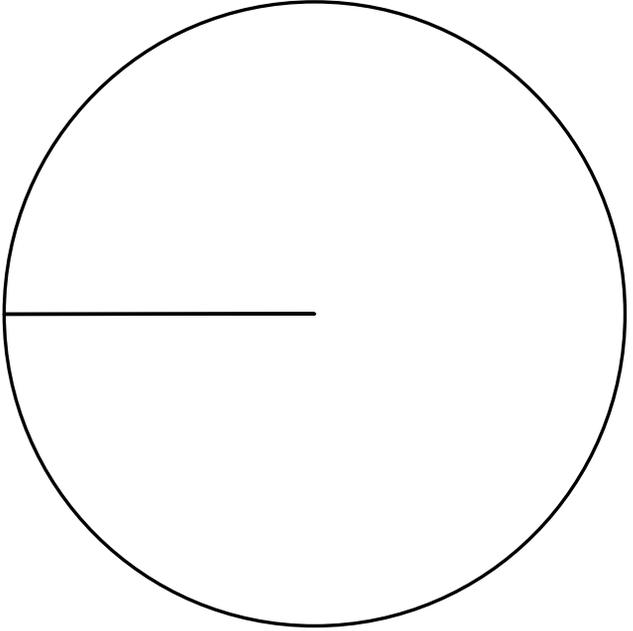


(b)

The table shows the number of votes received by each candidate in a school election.

- (a) Complete the table by calculating the angle for each candidate.
 (b) Draw and label the pie chart.

Name	Tess	Kammy	David	Iqra	Mae
Number of Votes	26	32	14	48	24
Angle					



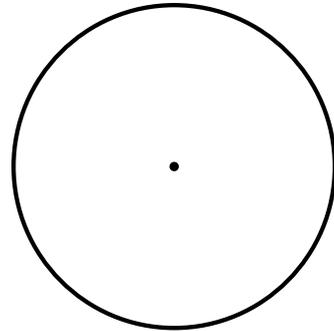
Fluency Practice

drawing pie charts

Construct a pie chart for each table of data.

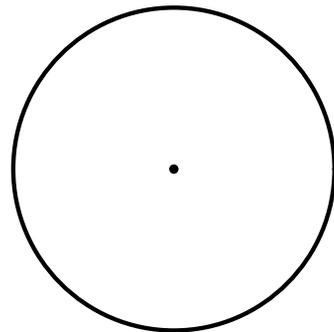
- 1 The table shows how a group of 60 pupils travel to school.

Transport	Frequency
Car	27
Bike	8
Bus	19
Other	6



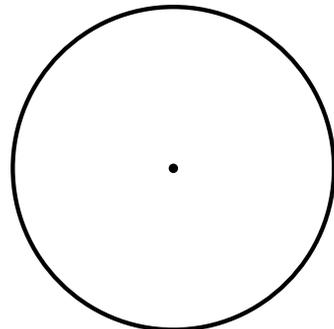
- 2 The table shows some people's favourite fruits.

Fruit	Frequency
Apple	10
Banana	6
Orange	3
Other	5



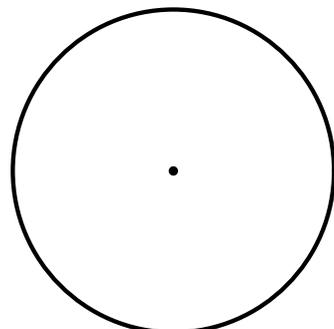
- 3 The table shows some people's favourite film genres.

Genre	Frequency
Thriller	9
Comedy	18
Horror	7
Action	11



- 4 The table shows the languages studied by some pupils at a school.

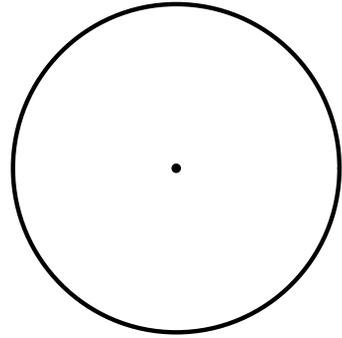
Language	Frequency
French	54
German	36
Spanish	30



Fluency Practice

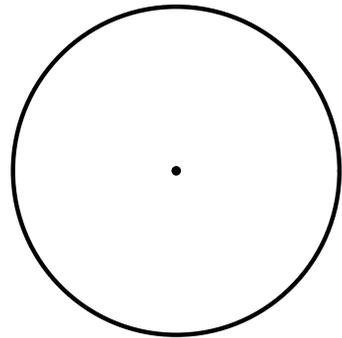
- 5 The table shows some people's pets.

Pet	Frequency
Cat	18
Dog	21
Fish	9
Other	6



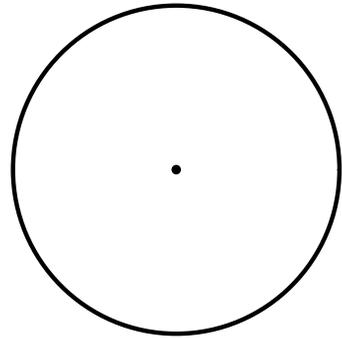
- 6 The table shows some diner's choices of dessert.

Dessert	Frequency
Ice Cream	80
Apple Pie	105
Cheesecake	125
Waffles	140



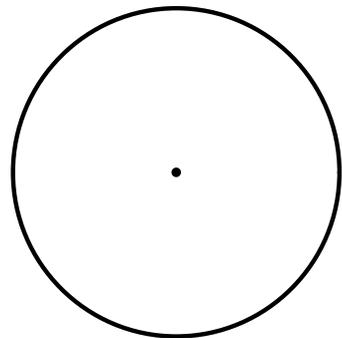
- 7 The table shows the types of medals won by a country at an Olympic Games.

Medal	Frequency
Gold	6
Silver	13
Bronze	11



- 8 The table shows some people's choices of activity at an activity camp.

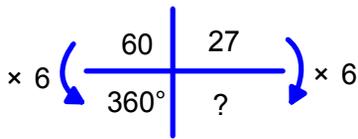
Activity	Frequency
Archery	34
Abseiling	22
Kayaking	14
Climbing	10



Fluency Practice

learn by heart

To draw a pie chart, we will need to work out the angle for each sector of the circle.

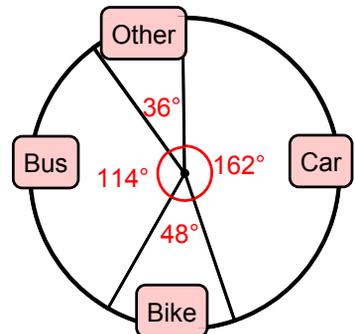


Since 60 people is 360° , each frequency is multiplied by 6 to find its angle

example

The table shows how a group of 60 pupils travel to school. Draw a pie chart to represent this data.

Transport	Frequency	
Car	27×6	162°
Bike	8	48°
Bus	19	114°
Other	6	36°

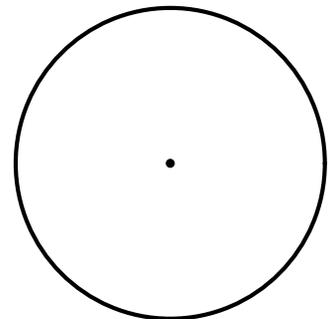


exercise 8h

1. The table shows the types of medals won by a country at an Olympic Games.

Draw a pie chart of the data.

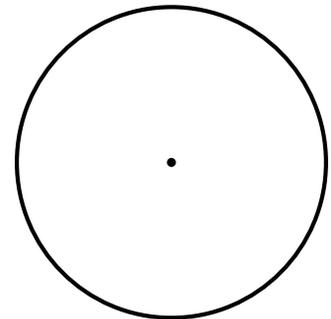
Medal	Frequency
Gold	6
Silver	13
Bronze	11



2. The table shows some people's choices of activity at an activity camp.

Draw a pie chart of the data.

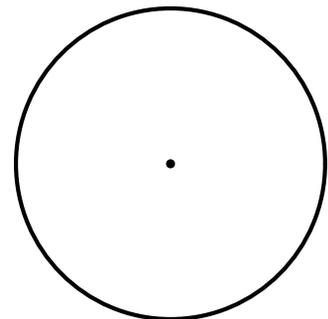
Activity	Frequency
Archery	34
Abseiling	22
Kayaking	14
Climbing	10



3. The table  extra challenge shows some people's pets.

Draw a pie chart of the data.

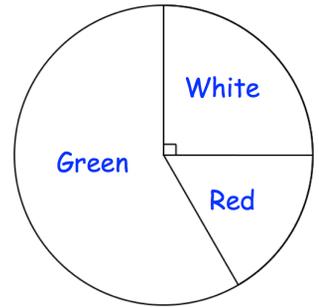
Pet	Frequency
Cat	18
Dog	21
Fish	9
Other	6



Fluency Practice

Question 1: This pie chart shows the colour of sweets in a bag.

- (a) What is the most common colour of sweet?
- (b) What is the least common colour of sweet?
- (c) What fraction of the sweets are white?



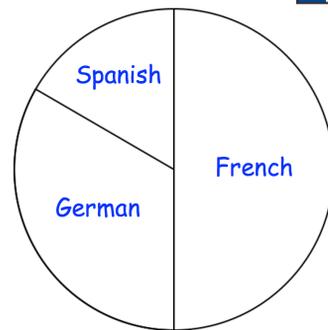
Question 2: The students in a school study one language.
The pie chart shows the languages studied.

- (a) What is the most popular language?
- (b) What is the least popular language?
- (c) What fraction of the students studied French?



There are 300 students that attend the school.

- (d) How many students study French?

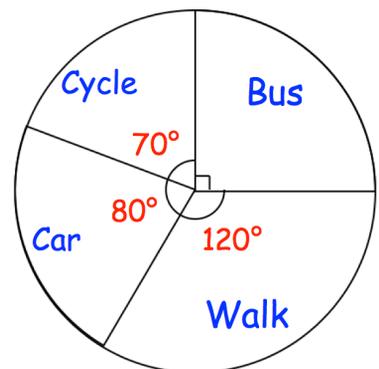


Question 3: The pie charts shows how a group of students travel to school.

- (a) What is the most common method of travel?
- (b) What is the least common method of travel?
- (c) What fraction of the students caught the bus?
- (d) What fraction of the students walked?

There are 36 students in the group.

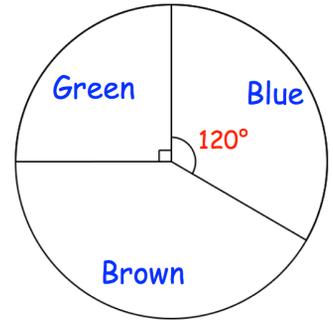
- (e) How many students caught the bus?
- (f) How many students walked?



Fluency Practice

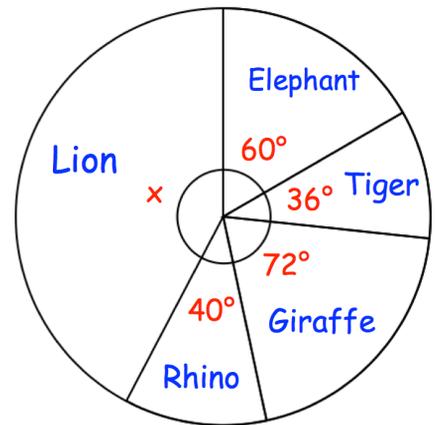
Question 4: There are 24 students in a class.
The pie chart shows information about their eye colour.

- (a) How many students have green eyes?
- (b) How many students have blue eyes?
- (c) How many students have brown eyes?



Question 5: 90 students went on a school trip to Longleaf Safari Park.
They were asked their favourite animals.
The pie chart shows the results.

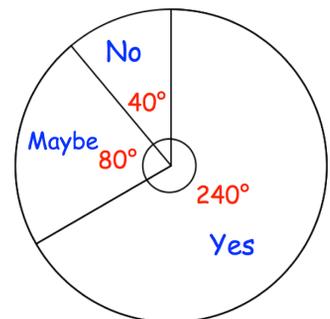
- (a) What fraction of the students chose elephant?
- (b) What fraction of the students chose tiger?
- (c) What fraction of the students chose giraffe?
- (d) What fraction of the students chose rhino?
- (e) Find x



- (f) How many students chose elephant?
- (g) How many students chose tiger?
- (h) How many students chose giraffe?
- (i) How many students chose rhino?
- (j) How many students chose lion?

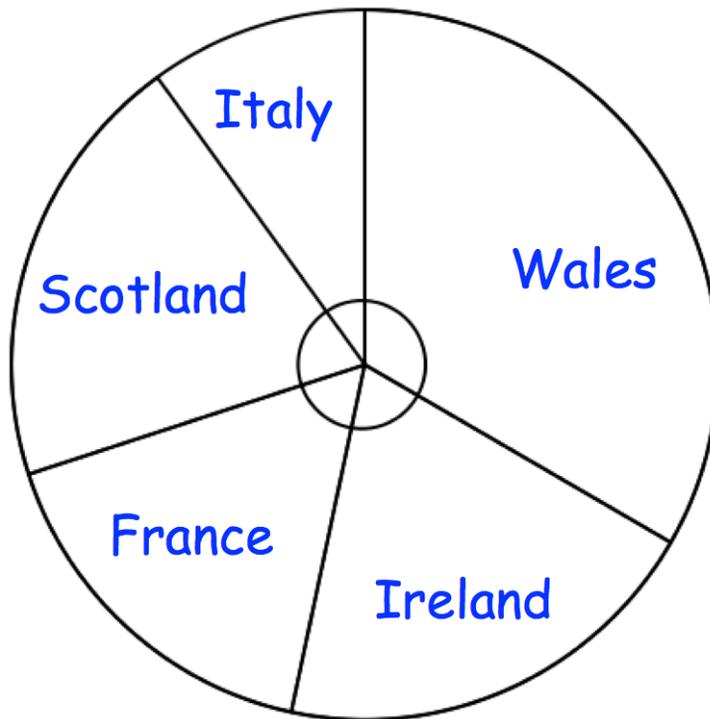
Question 6: 90 students were asked if they wanted to attend a history trip.
The results are shown in the pie chart.

- (a) How many students said No?
- (b) What fraction of the students said Yes?
- (c) How many students said Yes?
- (d) How many students said Maybe?



Purposeful Practice

Question 7: The pie chart below show the holiday destinations of 270 people.
The pie chart is **drawn accurately**.

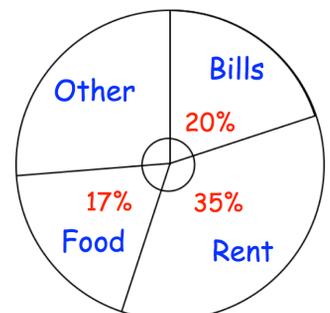


- (a) How many people are going to Wales? (b) How many people are going to Ireland?
(c) How many people are going to France? (d) How many people are going to Scotland?
(e) How many people are going to Italy?

Apply

Question 1: The pie chart shows how Rosie spent her pay last month.
She was paid £1200.

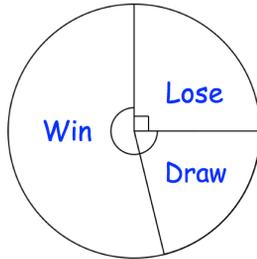
- (a) What percentage of her pay did Rosie spend on Other?
(b) How much money did Rosie pay on Bills?
(c) How much money did Rosie pay on Rent?



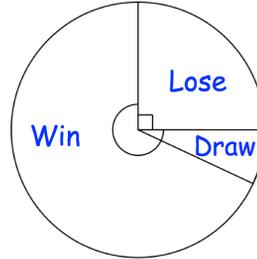
Purposeful Practice

Question 2: A school has a football team and a rugby team.
The pie charts show information about their results last season.

Rugby Team



Football Team

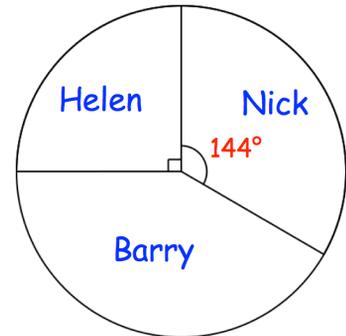


For each statement choose if they are **true**, **false** or **cannot tell**.

- (a) The rugby team and football team both lost a quarter of their matches.
- (b) The rugby team won more matches than they lost.
- (c) The football team won more matches than the rugby team.
- (d) The rugby team drew a larger proportion of their matches than the football team.
- (e) The football team played 10 games last season.

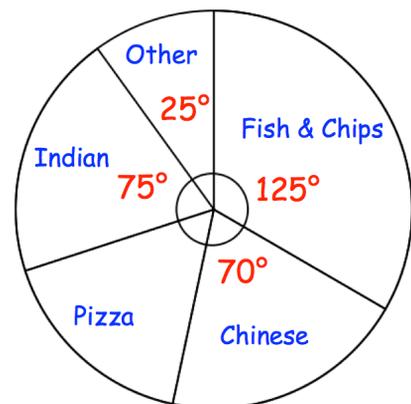
Question 3: Barry won £420 in a competition.

The pie chart shows how he shared the money with his brother, Nick, and sister, Helen.



With the money Barry kept for himself, he spent some and invested some, in the ratio 5:2. How much money did Barry invest?

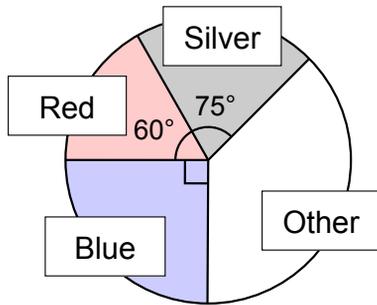
Question 4: The pie chart shows information about the visitors to restaurants in a town. 375 people had fish and chips. How many people had pizza?



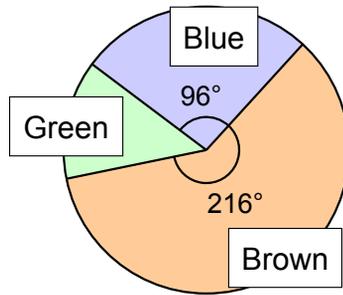
Fluency Practice

1. For each pie chart, work out the frequency for each category.

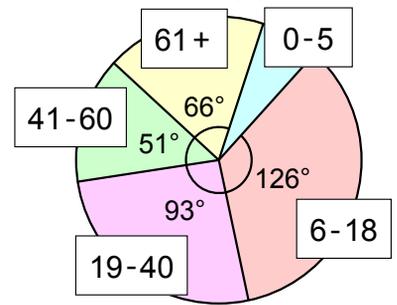
a) The colours of 48 cars sold.



b) The eye-colours of 15 children.



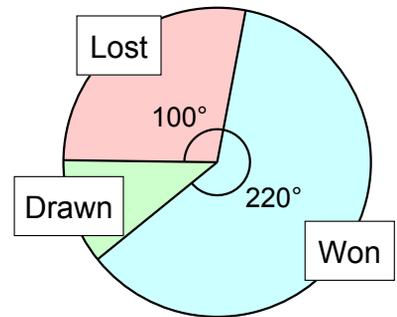
c) The ages of 240 visitors to a swimming pool.



2. The pie chart shows the proportion of matches won, drawn and lost by a football team in a season. The team played a total of 18 matches.

The number of league points for a team is:
3 points for each win, plus 1 point for each draw

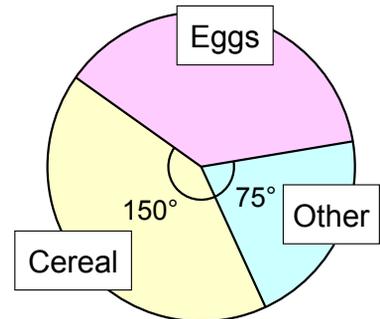
Work out the total league points for the team.



3. The pie chart shows the breakfasts eaten one morning by guests at a hotel. 30 of the guests chose cereal.

a) How many guests were there in total?

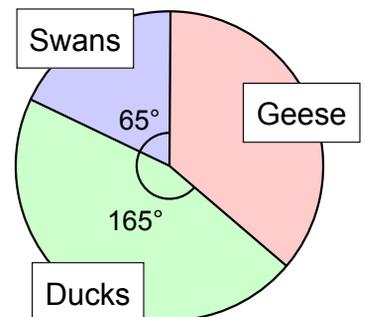
b) How many guests chose eggs?



4. The pie chart shows the types of birds at a lake. There are 26 swans at the lake.

a) Work out how many ducks are at the lake.

b) Work out how many geese are at the lake.

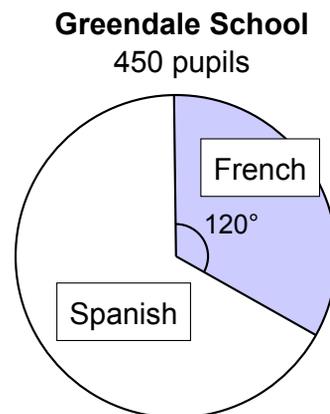
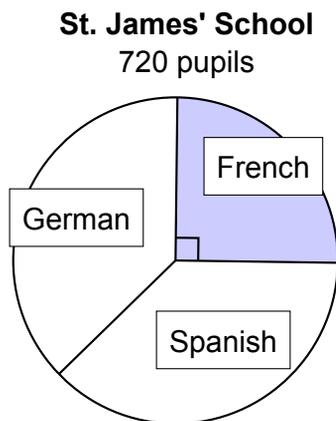


Fluency Practice

5. At both St James' School and Greendale School, all pupils study one foreign language.

Hassan says the pie charts show that there are more pupils studying French at Greendale than at St. James'.

Show that Hassan is wrong.



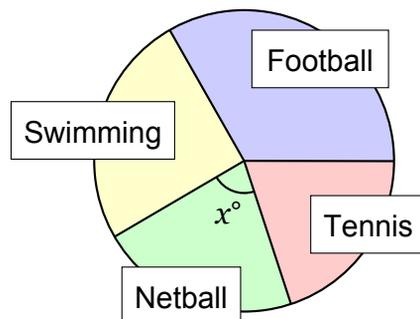
6. Some pupils were asked to choose a sport to take part in. The results are shown in the pie chart.

$\frac{1}{3}$ of the pupils chose Football.

$\frac{1}{4}$ of the pupils chose Swimming.

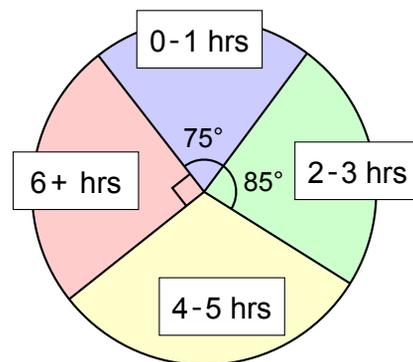
$\frac{1}{5}$ of the pupils chose Tennis.

Work out x , the angle for Netball in the pie chart.



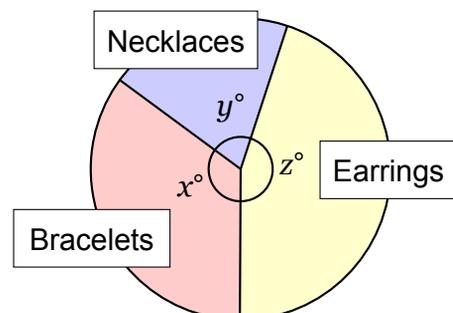
7. Lewis asked some people how much time they spent watching television one day. The pie chart shows the results.

Given that 240 people said '0-1 hours', work out how many people said '4-5 hours'.



8. Maria sells bracelets, necklaces and earrings. One month, 35% of her sales were bracelets and the ratio of necklaces to earrings sold was 4 : 9.

Work out the angles x , y and z in the pie chart for Maria's sales for the month.



Fluency Practice

learn by heart

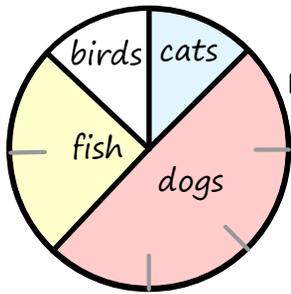
Pie charts are useful when we want to know the fraction of the whole each option takes up. For example, a pie chart might show us quickly that more than half of people voted for a particular group.

To interpret a pie chart it is important to remember that a full turn is 360° , half a turn is 180° and 90° is a quarter turn.

example

The pie chart shows the favourite animals of a group of children. 7 children liked cats. How many children liked dogs?

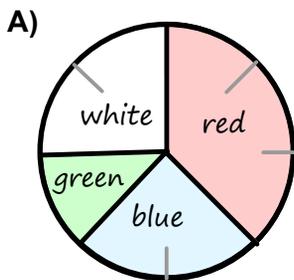
*cats = 1 section
dogs = 4 sections,
so $4 \times 7 = 28$ children*



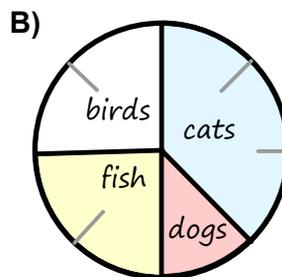
We can easily see here that approximately 50% of children liked dogs, and about $\frac{1}{4}$ liked fish.

exercise 8f

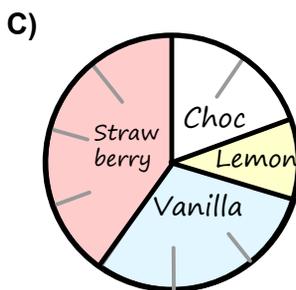
1. For each pie chart, complete the frequency table:



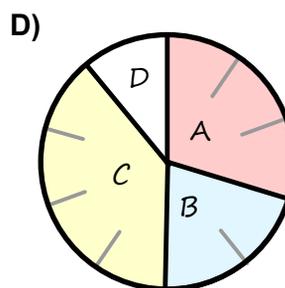
Colour	Frequency
Red	
Blue	
Green	
White	18



Animal	Frequency
Cat	15
Dog	
Fish	
Bird	



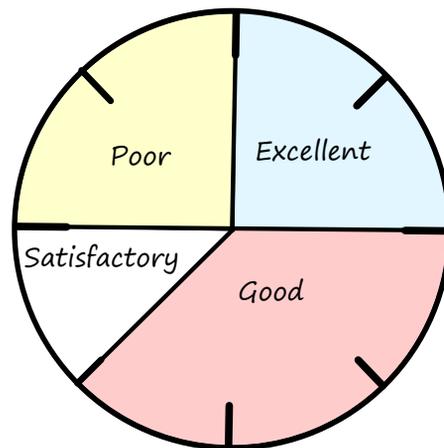
Flavour	Frequency
Choc	
Lemon	9
Vanilla	
Strawberry	



Option	Frequency
A	
B	7
C	
D	

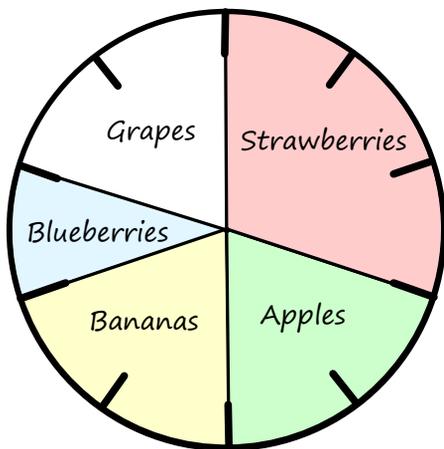
Fluency Practice

2. The pie chart shows how people rated a service. 120 people were asked. Look at the pie chart and decide whether each statement is true or false:



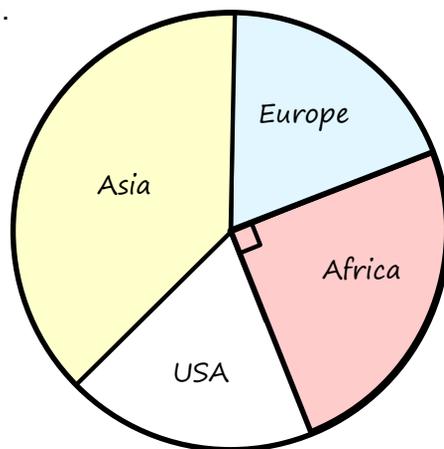
- 90 people thought the service was excellent
- $\frac{1}{4}$ of the people thought the service was poor
- 50% believed the service was good
- $\frac{1}{8}$ of the people believed the service was satisfactory

3. This pie chart shows the favourite fruits of a group of children. 80 children were asked. Work out:



- How many children said blueberries?
- How many children said strawberries?
- What fraction of the children said bananas?
- What percentage of the children said blueberries?
- How many **more** children said strawberries than blueberries?

4. The pie chart shows where some students were born. 60 students were asked. Look at the pie chart and decide whether each statement is true or false:



- 30 people were from Asia
- $\frac{1}{4}$ of the people were from Europe
- 15 people were from Africa
- More than 15 people were from the USA

Fluency Practice

learn by heart

In a pie chart, the total number of items covers 360° - the full turn. We can use this to work out how many degrees each item gets. For example, a pie chart for 80 people would mean that $80 \text{ people} = 360^\circ$, so each person gets $(360 \div 80 =) 4.5^\circ$. We would then multiply the frequency of each option by 4.5° to find the angle for each sector.

example

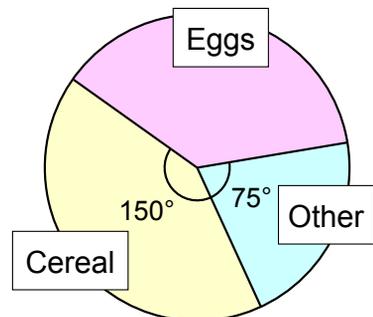
The pie chart shows the breakfasts eaten one morning by guests at a hotel.

30 of the guests chose cereal.

- a) How many guests were there in total?

$$\begin{array}{c} 30 \quad ? \\ \times 5 \quad \times 5 \\ \hline 150^\circ \quad 360^\circ \end{array}$$

*If 30 guests is 150°
and $30 \times 5 = 150$
Then $? \times 5 = 360$,
so 72 guests in total*

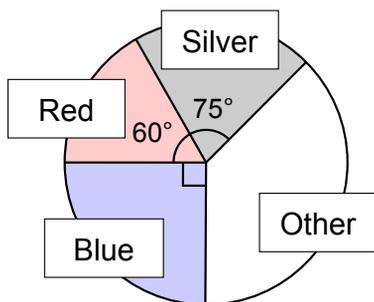


- b) How many guests chose eggs?

*The angle for eggs is $360 - 75 - 150 = 135^\circ$
 $? \times 5 = 135$, the answer is 27 people*

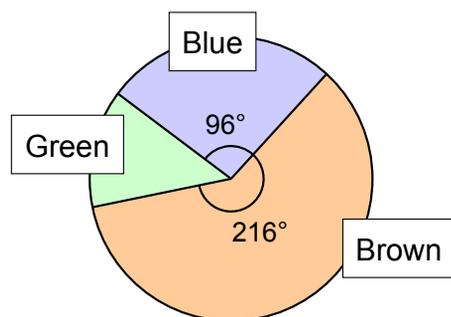
exercise 8g

1. The pie chart shows the colours of 48 cars sold. Complete the frequency table.



Colour	Frequency
Blue	
Red	
Silver	
Other	

2. The pie chart shows the eye-colours of 15 children. Complete the frequency table.



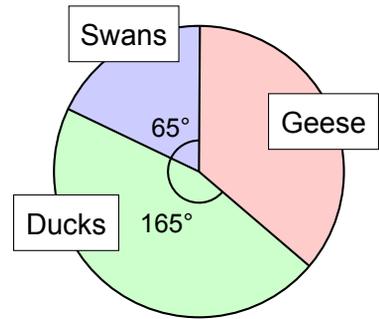
Colour	Frequency
Blue	
Green	
Brown	

Fluency Practice

more challenging  extra challenge

2. The pie chart shows the types of birds at a lake.
There are 26 swans at the lake.

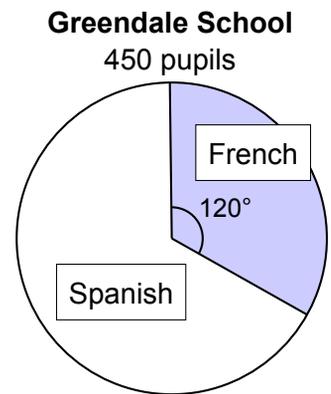
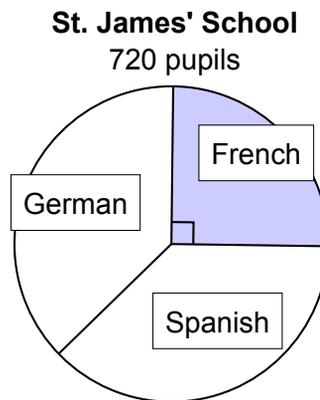
- a) Work out how many ducks are at the lake.
b) Work out how many geese are at the lake.



3. At both St James' School and Greendale School, all pupils study one foreign language.

Hassan says the pie charts show that there are more pupils studying French at Greendale than at St. James'.

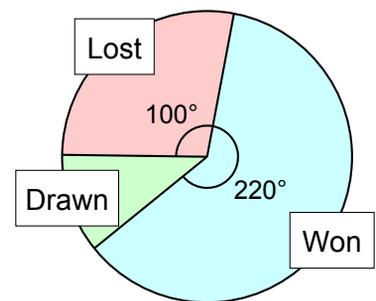
Show that Hassan is wrong.



4. The pie chart shows the proportion of matches won, drawn and lost by a football team in a season.
The team played a total of 18 matches.

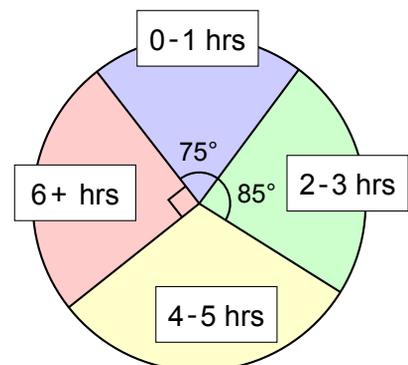
The number of league points for a team is:
3 points for each win, plus 1 point for each draw

Work out the total league points for the team.



5. Lewis asked some people how much time they spent watching television one day.
The pie chart shows the results.

Given that 240 people said '0-1 hours',
work out how many people said '4-5 hours'.

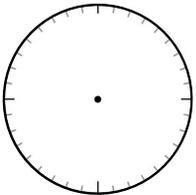


Fluency Practice

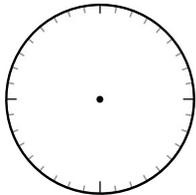
Pie Equations

Form & solve equations to find the size of each sector.

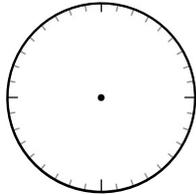
football	x
rugby	$3x$



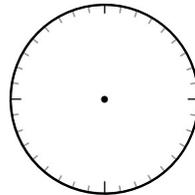
art	$x + 60$
drama	x



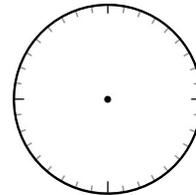
sci-fi	$x + 60$
crime	x
thriller	x



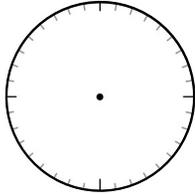
pass	$2x + 30$
fail	x



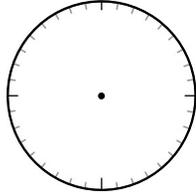
french	$x - 40$
german	x



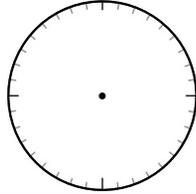
adult	$x - 60$
child	$2x$



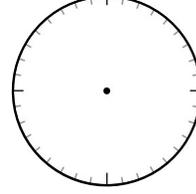
PC	$2x + 60$
mobile	$x + 20$
console	x



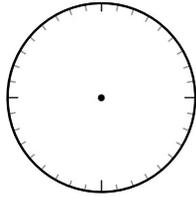
science	$2x + 30$
geography	$2x - 30$
history	$2x$



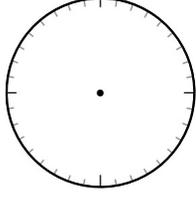
climbing	$2x + 40$
hiking	$3x + 10$
kayaking	$2x$
sailing	$x - 10$



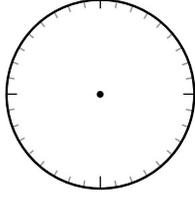
cycle	$4x - 15$
bus	$x - 25$
walk	$2x - 20$



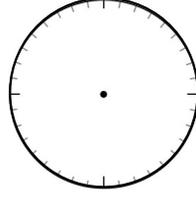
maths	$5x$
english	$160 - x$



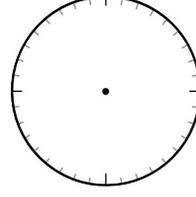
petrol	$2x - 100$
electric	$360 - x$



books	x
movies	$0.5x$

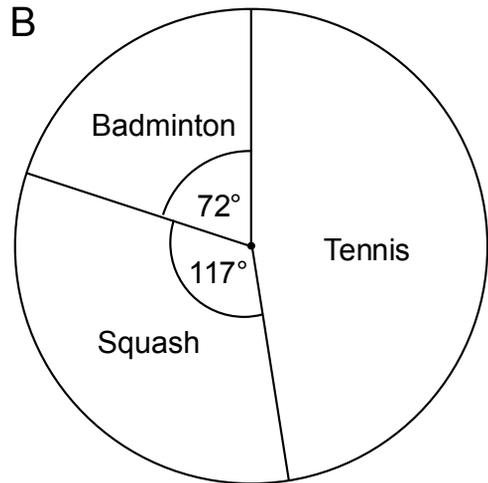
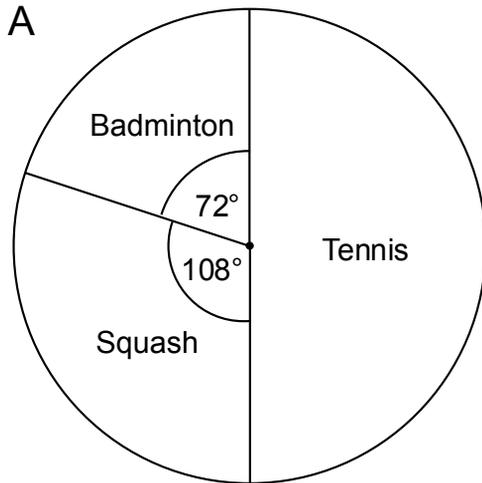


house	$\frac{x + 30}{2}$
flat	x



Problem Solving

1.

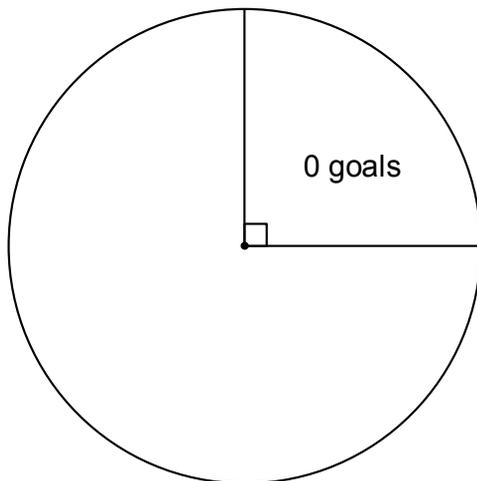


A group of children had to choose to play one of three sports – tennis, squash or badminton. Pie chart A shows their choices.

One of the children changes sport. Pie chart B shows their choices after this change.

Use the pie charts to work out how many children chose to play badminton.

2.



The diagram shows an incomplete pie chart for the number of goals a football team scored in matches during one season.

In these matches, the team scored 1 goal 50% more often than it scored 0 goals.

The team scored 2 goals in the same number of matches as it scored 0 goals.

The team scored 3 goals in three fewer matches than it scored 0 goals.

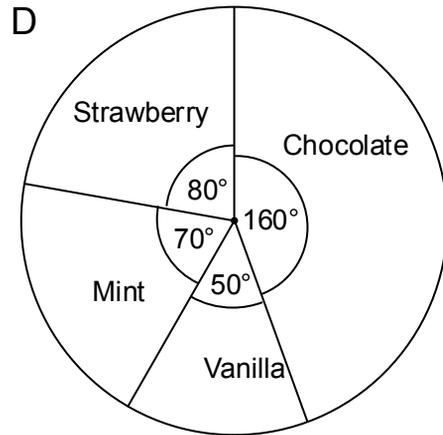
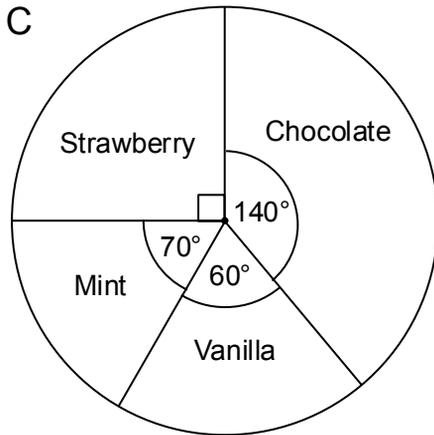
The team never scored more than 3 goals.

a) Copy and complete the pie chart.

b) Work out the total number of matches the team played in the season.

Problem Solving

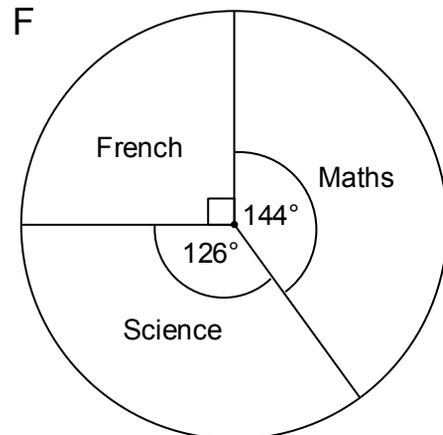
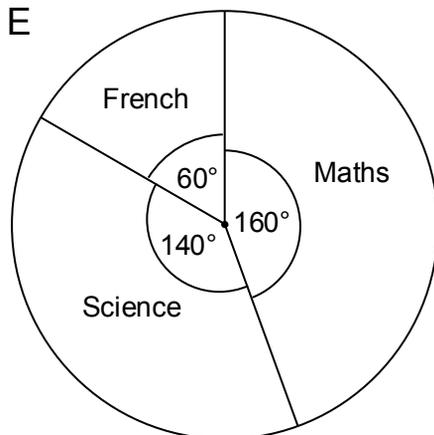
3.



A group of children each had an ice cream. Pie chart C shows their choices. The next day, the same group of children each had an ice cream. Pie chart D shows their choices.

Work out the smallest number of children there could be in the group.

4.



Pie chart E shows the number of students at revision classes for Maths, Science and French. The next week, all the same students attend. There are also two extra students who both attend the French revision class. Pie chart F represents the numbers in the second week.

Work out how many students attended the Maths revision class.

5. A focus group consists of people who are asked their views on current issues. The group are asked what they think about proportional representation.

When most of the group have responded, a pie chart is drawn showing the results. The angle of the sector representing “*Strongly For*” is 99° .

There are five more members of the group. Two of these five are “*Strongly For*”. When these five are added, the pie chart is revised and the angle of the sector representing “*Strongly For*” is now 104° .

Work out how many of the whole group are “*Strongly For*” proportional representation.

Fluency Practice

Question 1: Draw ordered stem and leaf diagrams for the following sets of data.
Remember to include a suitable key.

- (a) 35, 50, 38, 44, 53, 41, 39, 45, 48, 55
- (b) 18, 42, 5, 28, 33, 9, 15, 38, 32, 9, 11, 24, 40, 29, 24
- (c) 153, 144, 148, 140, 149, 145, 144, 142, 158, 135, 140, 139, 160
- (d) 3.4kg, 1.9kg, 2.8kg, 3.1kg, 5.1kg, 3.9kg, 4.8kg, 4.5kg, 2.2kg, 3.7kg,

Question 2: The stem and leaf diagram below shows the ages of a group of people.

- (a) How many people are there in the group?

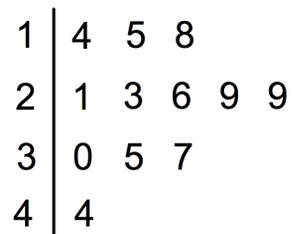
Key: 1|4 means 14 years old

- (b) How old is the youngest member of the group?

- (c) How old is the oldest member of the group?

- (d) How many people are under 20?

- (e) How many people are over 25?



Question 3: The stem and leaf diagram below shows heights of Mrs Smith's flowers.

- (a) How many flowers does Mrs Smith have?

Key: 0|9 means 9cm

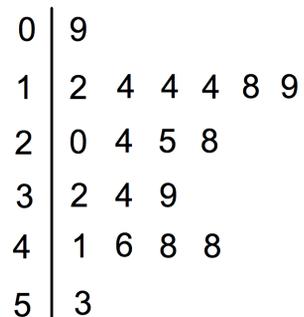
- (b) What is the height of the shortest flower?

- (c) What is the height of the tallest flower?

- (d) How many flowers have a height of 14cm?

- (e) How many flowers have a height greater than 40cm?

- (f) What fraction of the flowers have a height under 20cm?



Fluency Practice

Question 4: Fiona recorded the times it took 11 students to run 200 metres. The times are measured in seconds and are:

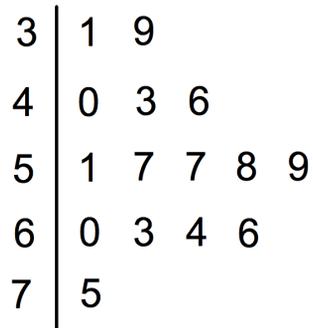
27 38 42 35 43 49
50 37 38 41 48

- (a) Draw an ordered stem and leaf diagram to show this information.
- (b) Work out the median time.
- (c) Work out the range of the times
- (d) How many students finished the race in under 40 seconds?

Question 5: The following stem and leaf diagram shows times taken for 15 people to complete a jigsaw.

Key: 3|1 means 31 minutes

- (a) Write down the modal time taken.
- (b) Write down the median time taken.
- (c) Write down the range of times taken.
- (d) What fraction of the people took over one hour?

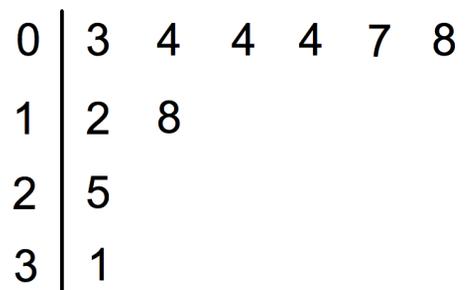


Apply

Question 1: The stem and leaf diagram shows the weights of 10 books that are placed on a book shelf.

Key: 0|3 means 0.3kg

- (a) Write down the modal weight.
 - (b) Find the median weight.
 - (c) Find the range of the weights.
- The bookshelf can hold 12kg.
- (d) Will the bookshelf be able to support the 10 books?



Fluency Practice

Question 2: The stem and leaf diagram shows the heights of 14 students on a school trip to a theme park.

(a) Find the median height.

Key: 13|5 means 135cm

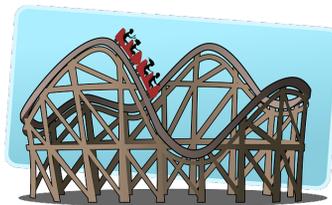
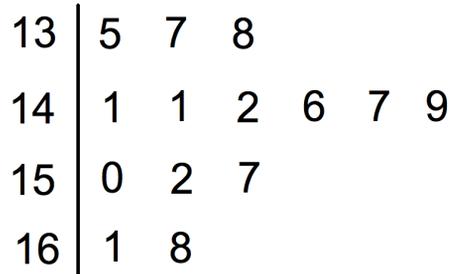
(b) Work out the range of the heights

A “fast pass” allows one of the students to go on a ride at the theme park without queueing.

One of the students is picked at random to win a “fast pass” for a ride.

To go on the ride, the student must be at least 140cm tall.

(c) Write down the probability that the student who wins the “fast pass” cannot go on the ride.



Question 3: This dual stem and leaf diagram shows the results for the students in Mr Turner’s class.

(a) How many boys are there in the class?

(b) How many girls are there in the class?

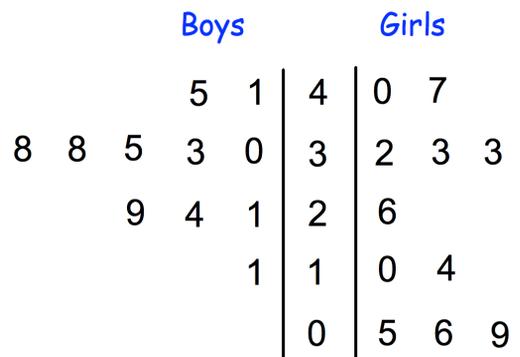
(c) What was the highest mark in the class?

(d) Find the range of the boys’ results

(e) Find the median of the girls’ results

(f) Find the modal mark for the whole class.

(g) Compare the boy’s and girls’ results.



Boys Key: 9|2 means 29 marks

Girls Key: 2|6 means 26 marks

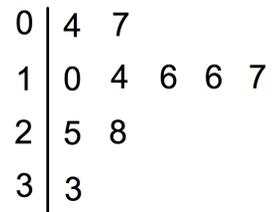
Fluency Practice

Question 4: The stem and leaf diagram shows the time taken 10 students to answer a puzzle

(a) Work out the range

Key: 0|4 means 4 seconds

(b) Work out the median



Another student answers the puzzle in 38 seconds.

(c) Tick the box to show how this will effect the range

The range will decrease

The range will stay the same

The range will increase

(d) Tick the box to show how this will effect the median

The median will decrease

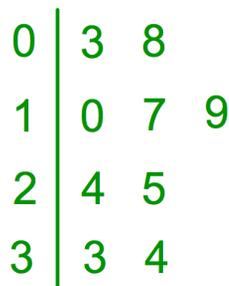
The median will stay the same

The median will increase

Question 5: Amelia has been asked to draw a stem and leaf diagram.
Can you spot any mistakes?

Draw an ordered stem and leaf for:

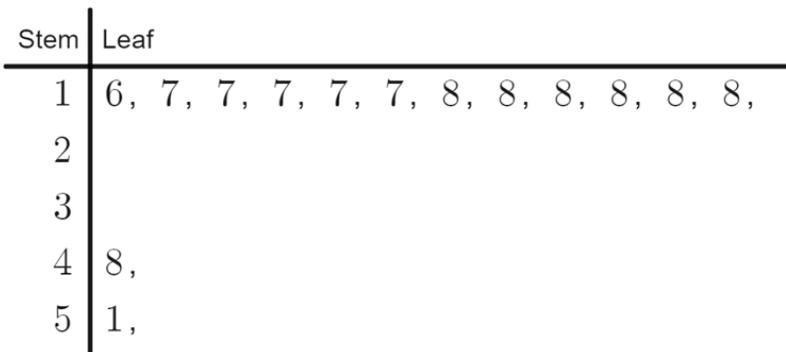
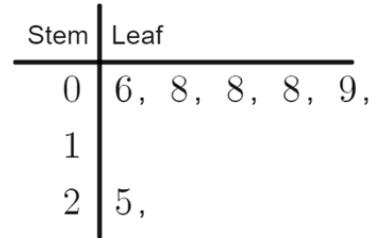
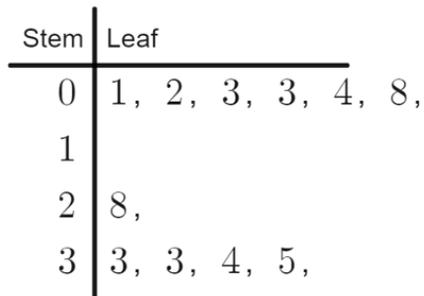
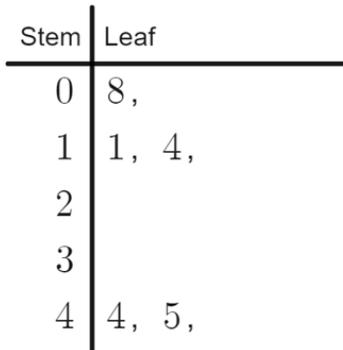
24 19 28 8 17 33 34 10 3 25



Fluency Practice

Match each stem-and-leaf plot to the correct group

- An 18th birthday party
- A 3rd birthday party
- A family dinner
- A swimming class and their teacher



Further questions

How many friends has the 18-year-old invited to their party? Who else is there?

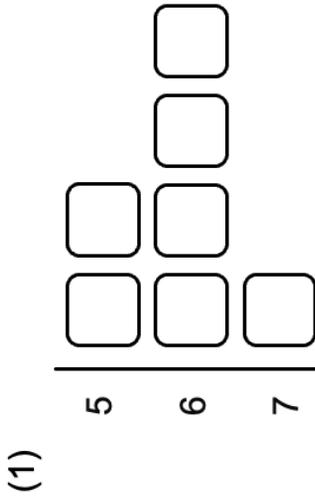
How many students are in the swim class and how old is their teacher?

How many children are in the family and what are their ages?

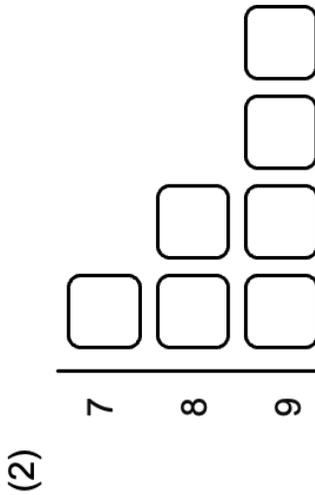
How old could the 3-year-old's parents be?

Problem Solving

the digits from 0 to 9 inclusive are used in an ordered stem and leaf diagram:

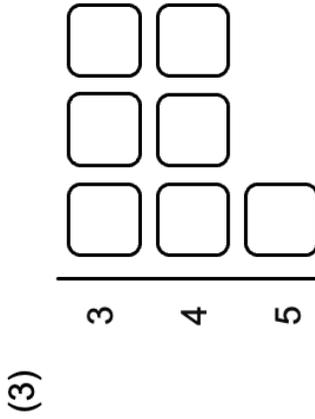


highest = 74
range = 16

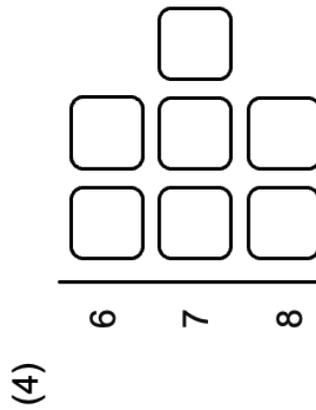


median = 92
lowest = 74

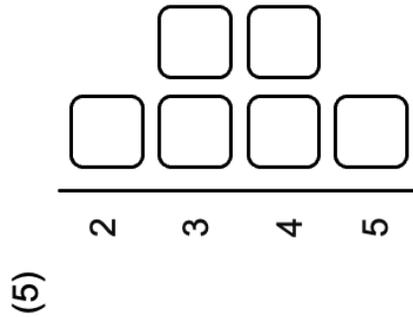
find where the other digits go



median = 47
range = 26

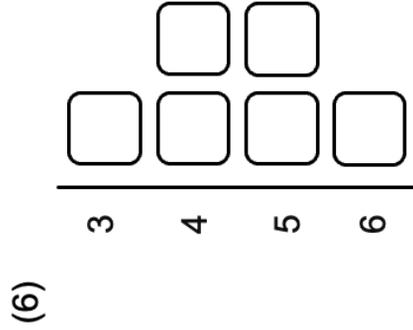


highest = 81
range = 16
median = 73



lowest = 27
range = 23
median = 42

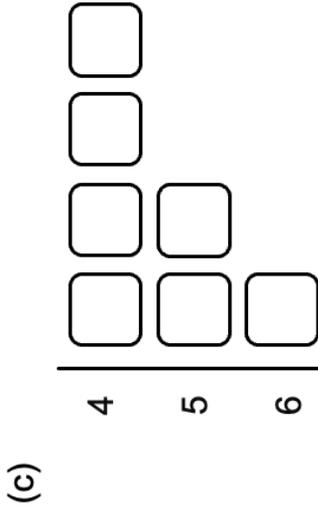
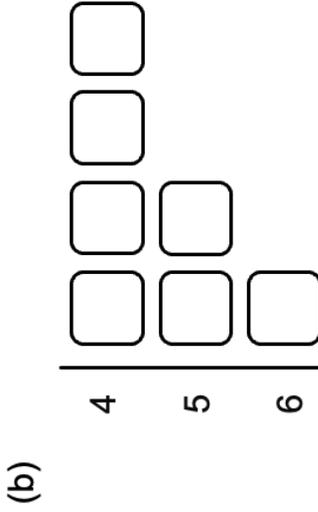
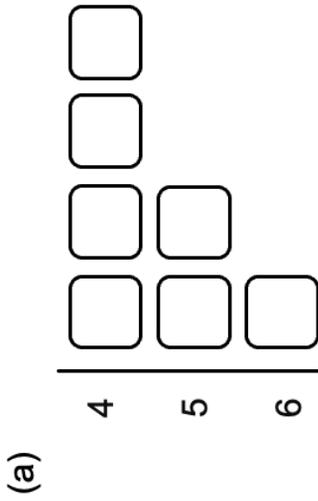
2 solutions



highest = 60
range = 28
median = $49\frac{1}{2}$

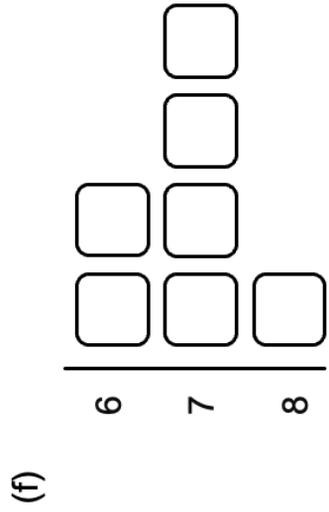
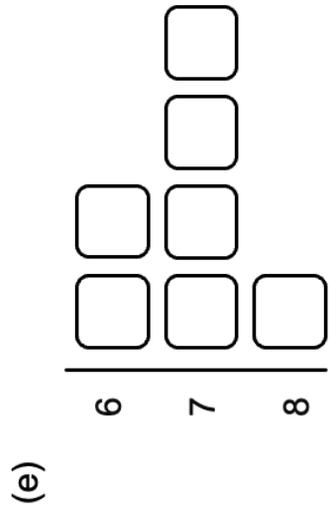
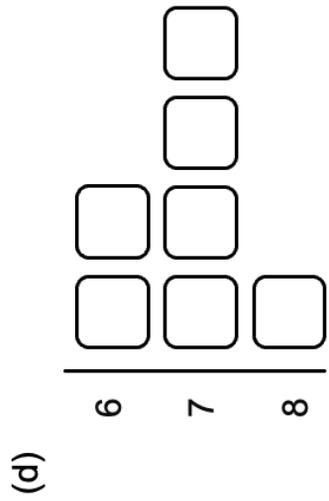
Problem Solving

the digits from 0 to 9 inclusive are used in an ordered stem and leaf diagram:



create your own examples

what are the means of your data sets for (a), (b) and (c)?



what are the means of your data sets for (d), (e) and (f)?

Fluency Practice

Completing Two-Way Tables

(a)

The table shows the preferred fast food of 11 and 12 year olds.

	Burger	Pizza	Total
11 years	11		20
12 years		13	
Total			50

(b)

The table shows the favourite ice cream of Year 5 and 6 students.

	Chocolate	Vanilla	Total
Year 5		23	
Year 6	18		46
Total			100

(c)

The table shows the preferred subject of two Year 9 classes.

	Geography	History	Total
9A		16	
9B	17		28
Total	33		

(d)

The table shows the favourite colour of different year groups.

	Red	Green	Blue	Total
Year 1	12	8		30
Year 2			9	
Total	23			56

(e)

The table shows the preferred snack of Year 10 form groups.

	Cookie	Crisps	Fruit	Total
10A			7	25
10B		10		
Total	18	19	12	

(f)

The table shows the different colours of cats and dogs in a pet rescue centre.

	Black	White	Brown	Total
Dog			21	54
Cat	12	16		
Total		30		100

(g)

The table shows the favourite sport of different year groups.

	Football	Netball	Rugby	Total
Y9		43	18	
Y10	48		22	112
Y11	56			
Total		106	65	350

(h)

The table shows the different activities of members of a fitness centre by age

	Swim	Cycle	Gym	Total
<18		8		36
18-40		19	42	
>40	13	24		58
Total	40		73	

(i)

The table shows the mode of transport to school by year group.

	Bus	Car	Tram	Total
Y7	27			78
Y8		38	22	
Y9	35	30		
Total		114	43	240

Fluency Practice

Constructing Two-Way Tables

Constructing Two-Way Tables																																																										
(a)	(b)	(c)																																																								
<p>A teacher asked two of her classes, 7A and 7B whether they were left or right handed.</p> <p>In 7A, there were a total of 32 students and 11 of them were left-handed.</p> <p>In 7B there were 19 right-handed students.</p> <p>Across both classes, there was a total of 23 left-handed students.</p> <p>(a) Complete a two-way table to show this information.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr style="background-color: #f0d0d0;"> <th></th> <th>Left</th> <th>Right</th> <th>Total</th> </tr> <tr> <th style="background-color: #f0d0d0;">7A</th> <td></td> <td></td> <td></td> </tr> <tr> <th style="background-color: #f0d0d0;">7B</th> <td></td> <td></td> <td></td> </tr> <tr> <th style="background-color: #f0d0d0;">Total</th> <td></td> <td></td> <td></td> </tr> </table>		Left	Right	Total	7A				7B				Total				<p>A librarian surveyed 100 people of different ages to find out their preferred type of fiction – crime, romance or fantasy.</p> <p>Of the 36 under 40s who answered the survey, 11 preferred crime fiction.</p> <p>A total of 28 people preferred romance novels.</p> <p>Of the people who were aged 40 or over, 9 preferred romance and 22 preferred fantasy fiction.</p> <p>(a) Complete a two-way table to show this information.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr style="background-color: #f0d0d0;"> <th></th> <th>Crime</th> <th>Romance</th> <th>Fantasy</th> <th>Total</th> </tr> <tr> <th style="background-color: #f0d0d0;">Under 40s</th> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th style="background-color: #f0d0d0;">40 or over</th> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th style="background-color: #f0d0d0;">Total</th> <td></td> <td></td> <td></td> <td></td> </tr> </table>		Crime	Romance	Fantasy	Total	Under 40s					40 or over					Total					<p>A teacher recorded the mock exam grades received for A-level Mathematics by students in each of her two classes.</p> <p>There were two more students in class Y than in class X.</p> <p>Class X contained 28 students and received 11 B grades.</p> <p>Students in class Y receives twice as many A grades as those in class X.</p> <p>The total number of students who got grade C was 15, and 7 of these students were in class Y.</p> <p>(a) Complete a two-way table to show this information.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr style="background-color: #d0f0d0;"> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> <tr> <th style="background-color: #d0f0d0;"></th> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th style="background-color: #d0f0d0;"></th> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th style="background-color: #d0f0d0;"></th> <td></td> <td></td> <td></td> <td></td> </tr> </table>																				
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40 or over																																																										
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<p>(b) A student is chosen at random. Find the probability that they are left-handed.</p> <p>(c) A right-handed student is chosen at random. Find the probability that they are in 7A.</p>	<p>(b) A person is chosen at random. Find the probability that they are under 40 and prefer either romance or fantasy fiction.</p> <p>(c) A person who prefers crime fiction is chosen at random. Find the probability that they are aged 40 or over.</p>	<p>(b) A member of class X is chosen at random. Find the probability that they received a grade B or a grade C.</p> <p>(c) All students that obtained a grade C will be required to re-sit their exam. If a student is chosen at random, what is the probability that they will not have to resit their exam?</p>																																																								

Intelligent Practice

240 students in total.
 There are 16 more boys than girls altogether.
 The ratio Maths : English = 2 : 3
 A third as many girls have English as have Maths.

	Maths	English	Total
Boys			
Girls			
Total			

240 students in total.
 There are 16 more boys than girls altogether.
 The ratio Maths : English = 2 : 3
 A third as many girls have Maths as have English.

	Maths	English	Total
Boys			
Girls			
Total			

120 students in total.
 There are 8 more boys than girls altogether.
 The ratio Maths : English = 2 : 3
 A third as many girls have Maths as have English.

	Maths	English	Total
Boys			
Girls			
Total			

120 students in total.
 There are 16 more boys than girls altogether.
 The ratio Maths : English = 2 : 3
 A third as many girls have English as have Maths.

	Maths	English	Total
Boys			
Girls			
Total			

120 students in total.
 There are 16 more boys than girls altogether.
 The ratio Maths : English = 3 : 2
 A third as many girls have English as have Maths.

	Maths	English	Total
Boys			
Girls			
Total			

120 students in total.
 There are 16 more boys than girls altogether.
 The ratio Maths : English = 3 : 1
 A third as many girls have English as have Maths.

	Maths	English	Total
Boys			
Girls			
Total			



Purposeful Practice

Finding Probability from Two-Way Tables

(a)

The two-way table shows some information about the favourite subjects of some Year 10 and 11 students.

	Art	Music	Drama	Total
Year 10			33	88
Year 11	49	24		
Total		45		180

- (a) Complete the two-way table.
- (b) A student is chosen at random. Find the probability that their favourite subject is Music.
- (c) A student is chosen at random. Find the probability that they are a Year 11 student whose favourite subject is Drama.

(c)

The two-way table shows some information about the favourite fruits of two reception classes.

	Apple	Orange	Banana	Total
Class 1		11		28
Class 2	6		9	
Total	10	21		

- (a) Complete the two-way table.
- (b) A student is chosen at random. Find the probability that they are a student from Class 1 who likes bananas.
- (c) A student from Class 2 is chosen at random. Find the probability that their favourite fruit is apple.

(b)

The two-way table shows the favourite holiday destination of some people in their twenties.

	France	Italy	Spain	Total
Age 20 to 24		28		148
Age 25 to 29	44			110
Total		59	136	

- (a) Complete the two-way table.
- (b) A person is chosen at random. Find the probability that they are aged between 25 and 29.
- (c) A person is chosen at random. Find the probability that they are aged 20 to 24 and their favourite destination is Spain.

(d)

The two-way table shows some information about languages studied by Year 7 and 8 students.

	French	German	Spanish	Total
Year 7		45		145
Year 8		52	73	
Total	86			310

- (a) Complete the two-way table.
- (b) A student is chosen at random. Find the probability that they are a Year 8 student who studies French or German.
- (c) A student who studies Spanish is chosen at random. Find the probability that they are in Year 7.

Purposeful Practice

100 students each chose one activity.

(a) Copy and complete the two-way table.

	Painting	Karate	Singing	Total
Year 7		12		42
Year 8			30	
Total	27	18		100

(b) A student is chosen at random. Find the probability that they are a Year 8 who chose karate.

(c) A Year 7 student is chosen at random. Find the probability that they chose painting.

150 sixth formers visit a school canteen.

Students choose burger or chilli. 59 out of the 85 students who have burger are Year 13. There are 72 Year 12 students.

(a) Draw a two-way table.

(b) A student is chosen at random from those who preferred chilli. Find the probability that they are a Year 12.

100 people study one language at an adult college. Some people study French. Some people study Spanish. The rest of the people study Italian. 54 of the people are 40 or under. 20 of the 29 people who study Spanish are over 40. 31 people study Italian. 15 over 40s study French.

(a) Draw a two-way table.

(b) A person is chosen at random. Find the probability that they are an over 40 who studies Italian.

100 people visit a leisure centre. They are either going swimming, to play tennis, to play badminton, or to the gym. 21 out of the 40 going to the gym are adults. 19 adults and 6 children are going swimming. 13 out of the 20 people playing badminton are children. Twice as many children play tennis as adults.

(a) Draw a two-way table.

(b) An adult is chosen at random. Find the probability they play badminton.

Purposeful Practice

Two-Way Tables

- 1) After school on Tuesday,
 14 Year 9s played football. 12 Year 9s played basketball.
 17 Year 10s played football. 11 Year 10s played basketball.
 Complete the two-way table with this information.

	Football	Basketball	Total
Year 9			
Year 10			
Total			

- a) How many students were there in total?
 b) How many Year 9s were there in total?
 c) How many students played Football in total?

- 2) 60 students were asked if they prefer Maths, Science or English.
 Complete the two-way table.

	Maths	Science	English	Total
Year 7	12	8		
Year 8	11	10		35

- a) How many Year 7 students were asked?
 b) How many students preferred Maths?
 c) How many Year 7 students preferred English?

- 3) 40 adults & 50 children people were asked how they prefer to keep fit.
 Complete the two-way table.

	Running	Gym	Sport	N/A
Adults	17	10		4
Children		6	21	
Total	37			

- a) How many adults prefer running?
 b) How many adults prefer going to the gym or playing sport?
 c) As a fraction of the total, how many prefer playing sport?

- 4) 100 mixed Year 7, 8 & 9 students were asked how they got to school.
 For Year 7s: 12 walked, 9 cycled, 7 took a bus and 2 took a car.
 For the 30 Year 8s: 5 walked, 11 cycled & 9 took a bus
 15 of the Year 9 students cycled to school.
 In total, 33 students walked and 22 took the bus.



Complete a two-way table with this information.

- a) As a percentage, how many students took a car?
 b) Out of all the Year 7s, what fraction walked?
 c) Of the students that cycled, what fraction were Year 9?
 5) Children under 13, Teenagers, Adults & Pensioners were asked how much money they spend a day on snacks.

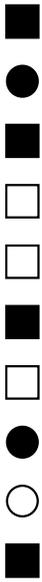
	0-99p	£1-1.99	£2+	Total
Child (<13)		4		14
Teenager	4	8	2	
Adult	5			
Pensioner		5	4	11
Total	14	22		50

- a) As a fraction, how many people spend £2 or more a day?
 b) As a fraction, how many teenagers spend less than £1 per day?
 c) As a percentage, how many people spend £1 or more per day?
 d) As a percentage, how many people older than 12 spend less than £2 per day?

Purposeful Practice

Two Way Tables

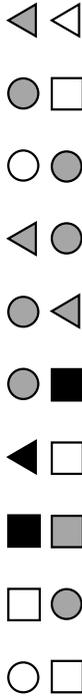
1) Complete the two-way table.



Colour	Shape		
	Square	Circle	Total
Black	4		
White	3		
Total			

- How many shapes are there in total?
- How many squares are there?
- How many black squares are there?

3) Summarise the data using the two-way table.

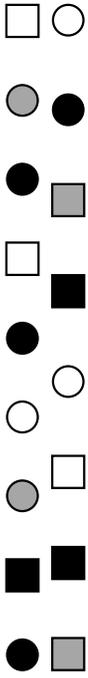


Colour	Shape		
	Square	Circle	Triangle
Black			
Grey			
White			
Total			

When answering, simplify your fractions.

- What fraction of the shapes are grey?
- What fraction of the shapes are triangles?
- What fraction of the shapes are white squares?
- What fraction of the circles are grey?

2) Sort the data (the shapes) using the two-way table.



Colour	Shape		
	Square	Circle	Total
Black			
Grey			
White			
Total			

- How many shapes are there in total?
- How many black shapes are there?
- What fraction of the total shapes are black?

4) This two-way table has been completed for you.

Colour	Shape			
	Square	Circle	Triangle	Pentagon
Yellow	2	8	2	9
Green	4	2	0	1
Blue	2	2	4	0
Total	8	12	6	10

- What fraction of the shapes are triangles?
- What fraction of the shapes are green squares?
- What fraction of the circles are yellow?
- What fraction of the yellow shapes are pentagons?

Purposeful Practice

Analysing Two-Way Tables: True or False?

A survey about people going to school/work.

	Bus	Cycle	Total
Adult	14	9	23
Child	19	12	31
Total	33	21	54

a)

54 people were surveyed. 45 children were surveyed.
33 people took the bus to school/work.

A survey about how people watch movies.

	Online	Cinema	Total
UK	15	9	24
France	9	16	25
Total	24	25	49

e)

38% of people in France watched movies online. $\frac{5}{8}$ of people that watched online were from the UK.

A survey of animals at a zoo.

	Male	Female	Total
Healthy	27	15	42
Unhealthy	9	2	11
Total	36	17	53

b)

27 animals are male & healthy. There are 37 female animals.
Most male animals are healthy.

A survey about how people play computer games.

	Online	Offline
Child	26	24
Adult	14	36

f)

A higher percentage of children play online than offline. 40% more adults play offline than children that play offline.

A survey about the quality of roads near a city.

	OK	Inadequate	Total
Motorway	31	9	40
Street	53	7	60
Total	84	16	100

c)

18% of all the roads were inadequate. 60% of the roads were streets.
9% of the motorways were inadequate.

A survey about a wild monkey troop.

	Juvenile	Adult
Male	6	8
Female	4	12

g)

There are more adult males than juvenile males. Males are a larger proportion of adults than they are of juveniles.

A survey about some students' favourite hobby.

	Year 9	Year 10	Total
Sport	15	8	23
Art	30	24	54
Total	45	32	77

d)

$\frac{1}{3}$ of Year 9s said Sport. 25% of Year 10 students said Sport.
Most people that said Sport were Year 10.

A survey about where people live.

	Under 40	40+
House	9	4
Flat	11	6

h)

Compared to those older than 40, more people under 40 live in a flat.

Purposeful Practice

a MEGA 2-way table

A children's education charity asked students across 5 countries about their favourite subject at school.

	France	Germany	UK	USA	Australia	Total
Maths	5	3	6	2	4	
English	3	2	7	5	5	22
Science	2	8	5	6	0	21
Geography	7	1	4	3		
History	9	2	4	0	6	21
Technology	0	3	5	2	2	12
Art	1	5	6		2	
Drama	4		3	1	7	23
Total		32		23	34	

Complete the two-way table and answer these questions with simplified fractions.

- What fraction of all the students chose Maths?
- What fraction of all the students were from the UK?
- What fraction of all the students were German and chose Science?
- What fraction of the UK students chose Geography?
- What fraction of German students chose Drama?
- What fraction of students that chose Art were from USA?
- What fraction of students that chose History were from France?
- What percentage of the students were from the Germany?

Purposeful Practice

a MEGA 2-way table



The government asked a sample of young people about which sport/activity was their favourite.

	Age							Total
	12	13	14	15	16	17	18	
Football	15		11	18	27	3	16	102
Rugby	7	9	15	7	8	9	2	57
Tennis	8	0	6	5	16	19		
Cricket	7	21	15	9	17	16	9	94
Badminton	21	17		9	14	6	3	78
Running	8	15	13	18	15	12	19	
Basketball	3	8	11	17		19	22	92
Netball	5	9	13	22	12	10	14	
Swimming		16	7	18	15	9	4	93
Cycling		3	6	7	13	11	18	58
Total			105	130			121	

What percentage...

- a) ... of all the people chose Tennis? 5.5% 7.6% 8.2%
- b) ... of all the people were 14? 12.7% 14.1% 18.3%
- c) ... of all the people were 12 and preferred badminton 3.8% 2.5%
- d) ... of 15 year olds preferred cycling? 4.5% 5.4% 6.3%
- e) ... of those that preferred netball were 13? 10.6% 13.5%
- f) ... of those that preferred football were over 16? 17.7% 18.6%

“Compared to 14 year olds, more 16 year olds preferred running.”

Do you agree?

Purposeful Practice

TWO-WAY TABLES & EQUATIONS

A A scientist surveyed 40 trees in a local wood.

	Oak	Beech
Algebraic	x	$2x$
Healthy	$2x$	$3x$
Unhealthy		
Total		

	Oak	Beech	Total
Numeric			
Healthy			
Unhealthy			
Total			

What fraction of the total were unhealthy beech trees?

B A barber shop recorded 34 customers.

	Adult	Child
Long	$x + 10$	x
Short	x	x
Total		

	Adult	Child	Total
Long			
Short			
Total			

What fraction of the total were long-haired adults?

C A computer game company surveyed 45 players.

	Mobile	Console
Child	$2x$	$x + 20$
Teen	x	$x + 10$
Total		

	Mobile	Console	Total
Child			
Teen			
Total			

What fraction of console gamers were teens?

D A clothes shop recorded 95 sales.

	Sport	Casual
Branded	$3x$	$2x$
Not Branded	$x - 5$	$4x$
Total		

	Sport	Casual	Total
Branded			
Not Branded			
Total			

What percentage of branded clothes were casual?

E Mr Gregson looked at the results of 32 students.

	Pass	Fail
Science	$x + 4$	$x - 3$
English	$x + 11$	$2x$
Total		

	Pass	Fail	Total
Science			
English			
Total			

What fraction of the total passed Science?

F The weights of 86 penguins at the zoo were checked.

	Under	OK
Juvenile	$2x - 8$	$3x + 10$
Adult	$2x$	$x + 12$
Total		

	Under	OK	Total
Juvenile			
Adult			
Total			

What fraction of underweight penguins were adults?

G A train company recorded 43 trains over 7 days.

	On Time	Late
Week	$8x - 8$	$20 - x$
Weekend	$5x$	$2x + 3$
Total		

	On Time	Late	Total
Week			
Weekend			
Total			

What percentage of late trains were on the weekend?

H A restaurant records the drinks of $(3x + 44)$ customers.

	Soda	Juice
Medium	$15 - x$	$3x + 7$
Large	$4x - 4$	$10 - x$
Total		

	Soda	Juice	Total
Medium			
Large			
Total			

What fraction of sodas were medium?

Purposeful Practice



Gaming Report

A games company compiles a report on its users. Each figure is one thousand players (e.g. 2 = 2000 players)
Use the information to complete each **two-way table** and **ratio**.

SUB SIM

a French : German = 1:2
PC players : Mobile players =

	French	German	Total
PC	3		
Mobile		4	
Total			24

Rei's Revenge II

b UK PC players : UK Mobile players =
UK : USA = 3:4

	UK	USA	Total
PC		17	29
Mobile			
Total			35

Battlers of Akkalan

c Adult German players : Teen German players =
USA : German = 6:5

	USA	German	Total
Adult	12		17
Teen		10	
Total	18		

Crazy Castle

d PC : Mobile =
Online PC players : Online Mobile players = 4:3

	Online	Offline	Total
PC			
Mobile		10	
Total	21		45

3D TRACTOR SIMULATOR

e Adult Online : Adult Offline =
Adult Online : Teen Online =

	Online	Offline	Total
Adult			
Teen	24		35
Total	60		99

Mystic Maze

f Teen Console : Teen PC =
PC : Console =

	Adult	Teen	Total
PC			32
Console		22	
Total	26		62

Super Truck Derby

g Under 10 hrs p/w : Over 10 hrs p/w = 4:9
Adult Under 10 hrs p/w : Adult Over 10 hrs p/w =

	<10 hr p/week	>10 hr p/week	Total
Adult	40		88
Teen	8		
Total			

Chess 247

h Online PC : Online Console = 7:11
Offline Console : Online Console =

	Offline	Online	Total
PC			87.5
Console			66.5
Total	46		

Virtua-Farmer

i UK : French = 8:5
French PC : French Mobile = 8:1

	UK	French	Total
PC		40	
Mobile	12		
Total			

Purposeful Practice

Two-Way Tables & Probability



- 1) After school on Tuesday,
 14 Year 9s played football. 12 Year 9s played basketball.
 17 Year 10s played football. 11 Year 10s played basketball.

Complete the two-way table with this information

	Football	Basketball	Total
Year 9			
Year 10			
Total			

- a) How many students played Basketball?
 b) How many students were there in total?
 c) If a student was picked at random, what is the probability they play Basketball? (express your answer as a fraction)

- 2) 60 students were asked if they prefer Maths, Science or English.
 Complete the two-way table.

	Maths	Science	English	Total
Year 7	12	8		
Year 8	11		10	35

- a) If a student was picked at random, what is:
 $P(\text{They prefer Maths})$?
 b) If we picked **only from** Year 7s, what is:
 $P(\text{They prefer English})$?

- 3) 40 adults & 50 children people were asked how they prefer to keep fit.
 Complete the two-way table.

	Running	Gym	Sport	N/A
Adults	17	10		4
Children		6	21	
Total	37			

- a) From everyone, what is $P(\text{They prefer to play sport})$?
 b) From only those that prefer going to the gym, what is $P(\text{Adult})$?

- 4) 100 mixed Year 7, 8 & 9 students were asked how they got to school.
 For Year 7s: 12 walked, 9 cycled, 7 took a bus and 2 took a car.
 For the 30 Year 8s: 5 walked, 11 cycled & 9 took a bus
 15 of the Year 9 students cycled to school.
 In total, 33 students walked and 22 took the bus.

Complete a two-way table with this information.

- a) What is $P(\text{Cycled and are in Year 9})$?
 b) What is $P(\text{Year 7 and walked})$?
 c) Of those that took a car, what is $P(\text{Year 7})$?

- 5) Children under 13, Teenagers, Adults & Pensioners were asked how much money they spend a day on snacks

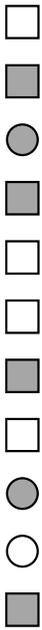
	0-99p	£1-1.99	£2+	Total
Child (<13)		4		14
Teenager	4	8	2	
Adult	5			
Pensioner		5	4	11
Total	14	22		50

- a) Find $P(\text{A person who spends £2 or more a day})$
 b) Find $P(\text{A teenager who spends more than £1 per day})$
 c) From those older than 12, $P(\text{A person who spends less than £2 per day})$

Purposeful Practice

Two Way Tables & Probability

1) Complete the two-way table.

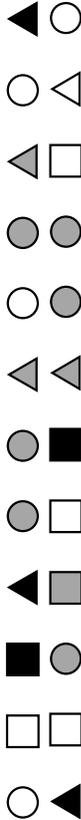


Colour	Shape		
	Square	Circle	Total
Grey	4		
White			
Total			

- How many shapes are there in total?
- How many white squares are there?
- What is the probability it is a white square?

If you picked a shape at random...

3) Summarise the data using the two-way table.

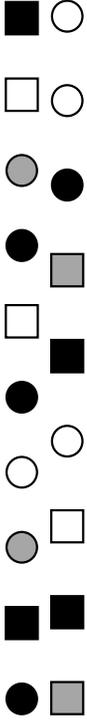


Colour	Shape		
	Square	Circle	Triangle
Black			
Grey			
White			
Total			

When answering, simplify your fractions.
If you picked a shape at random...

- What is $P(\text{grey or black})$?
- If you picked a black shape, what is the probability it is a square?
- If you picked a circle, what is the probability it is grey?

2) Sort the data (the shapes) using the two-way table.



Colour	Shape		
	Square	Circle	Total
Black			
Grey			
White			
Total			

If you picked a shape at random...

- What is $P(\text{grey circle})$?
- $P(\text{circle}) = ?$
- $P(\text{black}) = ?$

4) This two-way table has been completed for you.

Colour	Shape			
	Square	Circle	Triangle	Pentagon
Yellow	2	8	2	9
Green	4	2	0	1
Blue	2	2	4	0
Total	8	12	6	10

- What is $P(\text{not yellow})$?
- From circles, what is $P(\text{yellow})$?
- From yellow shapes, what is $P(\text{pentagon})$?
- What is $P(\text{A blue shape or a triangle})$?

Problem Solving

two way tables 1

Use the clues to complete the table of data.

	Vanilla	Chocolate	Strawberry	Total
Girls				
Boys				
Total				

The table shows the ice cream preferences of 44 children.

$\frac{3}{4}$ of the girls liked strawberry ice cream.

None of the girls liked Chocolate ice cream.

6 boys liked vanilla ice cream.

There were 4 more girls than boys.

$\frac{1}{4}$ of the children liked chocolate ice cream.

Problem Solving

Two Way tables: true or false?

Use the information in the table to work out which of these statements are true. There are 8 in total.

Survey Results: Children who play sports

	Plays a Team Sport	Plays an Individual Sport	Does not play sport	Total
Year 7		18		96
Year 8			35	94
Year 9	20	32		98
Total	60	100		288

A. $\frac{1}{3}$ of the children who completed the survey are in year 7.

D. $\frac{1}{3}$ of the children in year 7 play a team sport.

G. There are more children in year 7 than in year 9 who do not play a sport.

J. More than half of the children in year 8 do not play a sport.

B. Half of the children who play an individual sport are in year 8.

E. $\frac{1}{3}$ of the children who play a team sport are in year 9

H. There are equal numbers of children who play team sports and individual sports

K. Less than 10% of the children in year 8 play a team sport.

M. More children in year 7 play team sports than no sports.

C. 11 students in year 8 play a team sport.

F. 50% of the children who do not play sport are in year 8.

I. 128 children did not play any sport at all.

L. More than 50% of children in year 9 play some kind of sport.

N. More than half of the children who play team sports are in year 7.

True Statements: — — — — — — — —

Problem Solving

Two Way tables : Probability

The table shows some information about how 160 children get to school and what they normally have for breakfast.

Use the table to work out the following probabilities - the answers are jumbled up at the bottom.

	Hot breakfast	Cold breakfast	No breakfast	Total
Walks to School	0	6		24
Takes the Bus		14		32
By Car	20		10	
Total	28	94		160

A. The probability of a child arriving to school by car.

B. The probability of a child having no breakfast.

C. The probability that a child walks to school.

D. The probability that a child has some kind of breakfast.

E. The probability that a child who walks to school has a hot breakfast.

F. The probability that a child who takes the bus to school has a cold breakfast.

G. The probability that a child who doesn't eat breakfast gets to school by car.

H. The probability that a child who walks to school has breakfast.

I. The probability that a child who goes to school by car has breakfast.

J. The probability that a child who eats a hot breakfast takes the bus to school.

K. The probability of a child arriving to school by car and not having breakfast.

L. The probability of a child taking the bus to school and having a hot breakfast.

Jumbled Up Answers

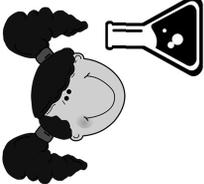
$\frac{13}{20}$ $\frac{61}{80}$ $\frac{7}{16}$ $\frac{2}{7}$ $\frac{47}{52}$ $\frac{5}{52}$ $\frac{5}{19}$ **0** $\frac{1}{4}$ $\frac{1}{20}$ $\frac{3}{20}$ $\frac{19}{80}$

Record your answers here:

Statement	A	B	C	D	E	F	G	H	I	J	K	L
Probability												

Purposeful Practice

Two-Way Tables & Bar Charts

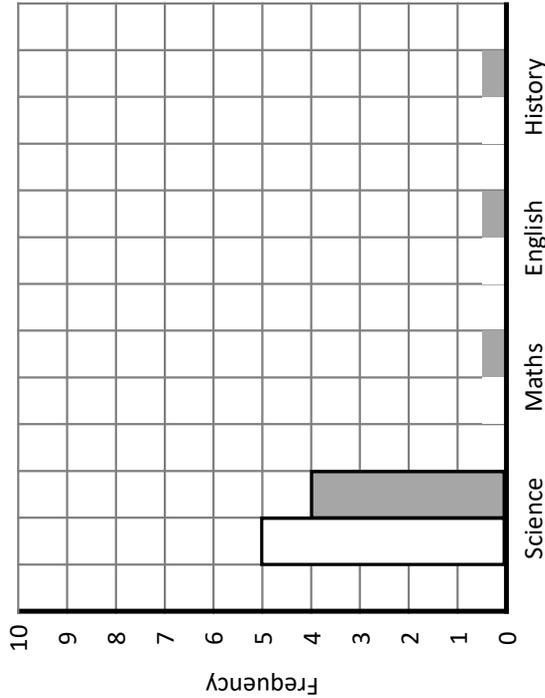


Christine surveyed boys and girls about their favourite subject at school. She put the results into a two-way table.

1) Use the information to complete the bar graph.

	Science	Maths	English	History	Total
Boys	5	5	8	3	
Girls	4	7	3	7	
Total					

Title: _____



Key:
 boys
 girls

2) Give your graph a title.

3) How many students in total said History was their favourite subject?

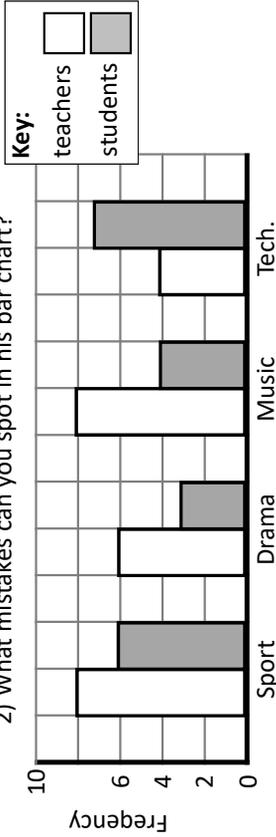
4) How many more students liked English than liked Science?



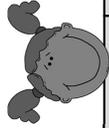
Jason surveyed teachers and students about their hobbies. 1) Complete his two-way table.

	Sport	Drama	Music	Technology	Total
Teachers		5			22
Student	6			7	
Total	16	8		10	46

2) What mistakes can you spot in his bar chart?



Key:
 teachers
 students

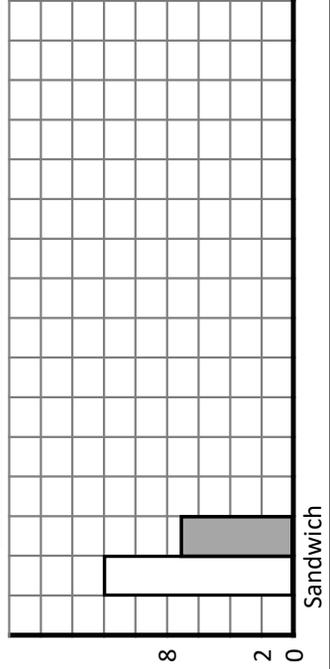


Anna surveyed 50 girls and 50 boys about their lunch.

1) Complete the two-way table and the bar chart for her data.

	Sandwich	Burger	Pasta	Pizza	Salad	Total
Girls				6	7	
Boys	7	8		16	15	
Total		18	19			

Title: _____



Key:
 girls
 boys

Purposeful Practice

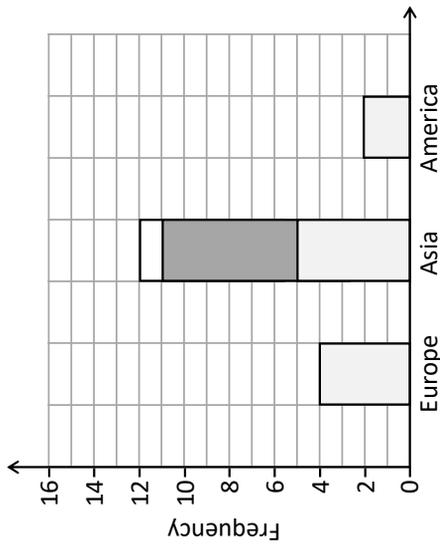
Business Report:

KateZ-SkateZ.com

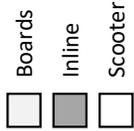
KateZ-SkateZ.com sell 3 different products to 3 different countries. They recorded their sales over one day.

Complete the **two-way table**, **composite bar chart** & **pie charts** for this data.

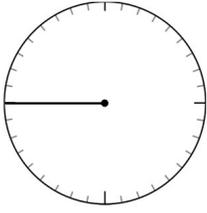
	Europe	Asia	America	Total
Boards		5		
Inline	3		7	
Scooter	3	1	5	
Total				



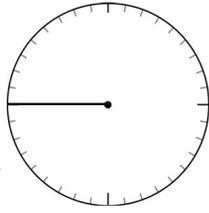
Key:



Sales in Asia
Board, Inline & Scooter



Total Sales
Europe, Asia & America

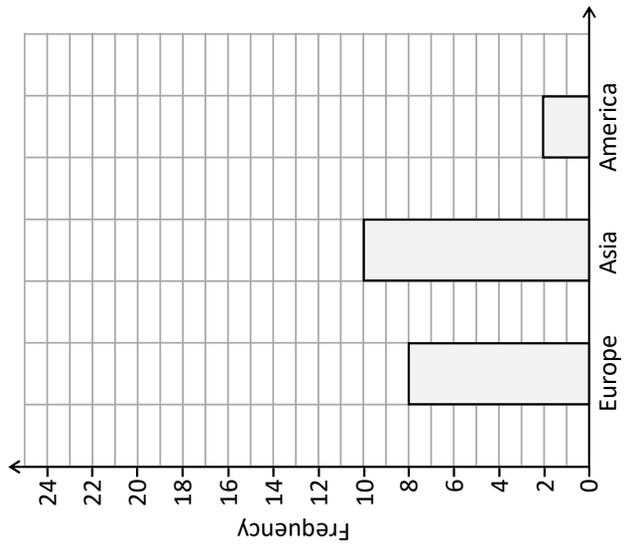


Business Report:

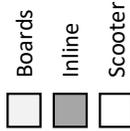
TechBlade.com

Complete the data for TechBlade.com, a competitor.

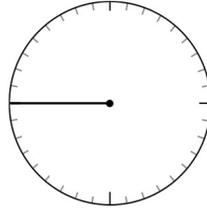
	Europe	Asia	America	Total
Boards			2	
Inline	17	5	10	
Scooter	0			8
Total		20	15	



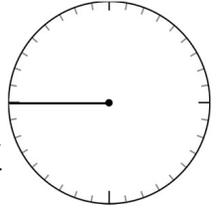
Key:



Sales in Asia
Board, Inline & Scooter



Total Sales
Europe, Asia & America



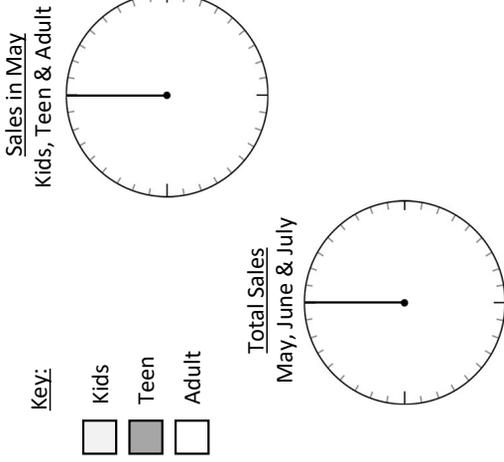
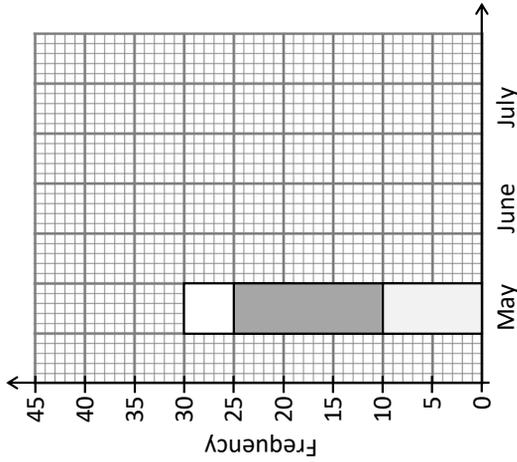
- Which company sold the most scooters in America?
- As a percentage, how many inline skates did KateZ-SkateZ.com sell in Asia?
- Which company made most of its sales in Europe?
- Compare where the companies made their sales. How are the companies the same?

Purposeful Practice

Business Report: **SharpShoeez.com**

Complete the **two-way table**, **composite bar chart** and **pie charts** with this data.

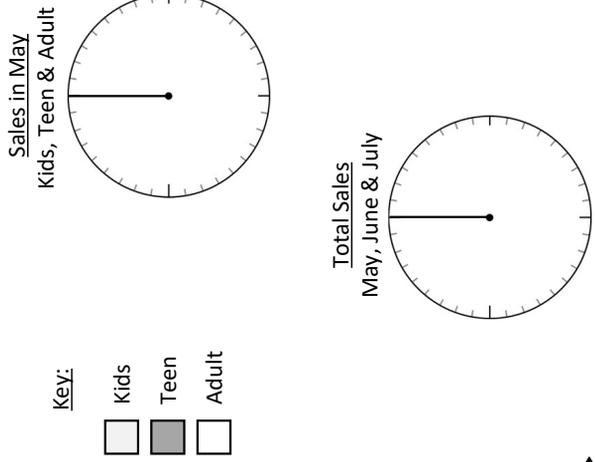
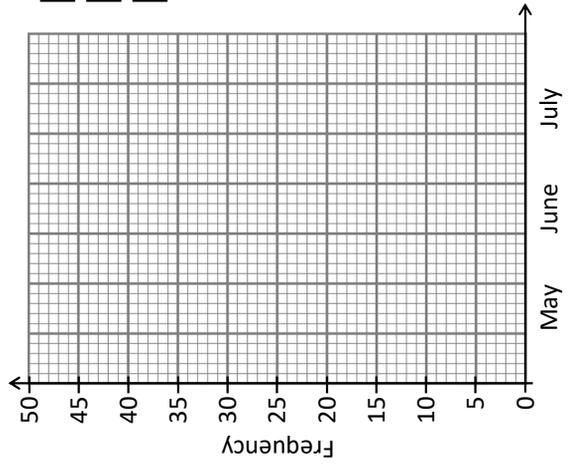
	Kids	Teen	Adult	Total
May				
June		8	11	25
July	7		21	
Total	23	30	37	



Business Report: **TKX-Shoo.com**

Complete the data & diagrams for TKX-Shoo.com.

	Kids	Teen	Adult	Total
May			15	45
June	5			27
July	18		9	
Total	33		33	120



a) Which company sold the most teen shoes in June?

b) What was the biggest change in total sales between months?

c) In May, kids shoes made up a higher proportion of sales for which company?

d) For which company were sales in June a higher percentage of total sales?

Purposeful Practice

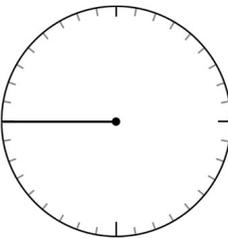
Complete the **two-way tables** then use the data to **represent** the survey findings by **sketching & labelling** the pie charts.

Matix Ltd (a computer game company) records data about players.

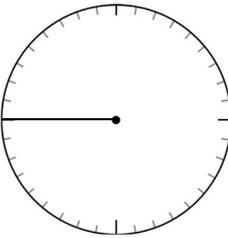


	Adult	Child	Total
PC		20	
Console	15		35
Total	20	40	

Adults
PC & Console

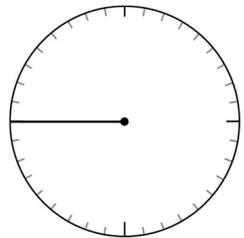


Children
PC & Console

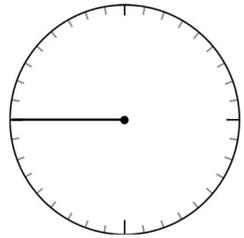


	Adult	Child	Total
Shooter	8		24
Puzzle		25	
Total	13		54

Shooter Games
Adult & Children



Puzzle Games
Adult & Children

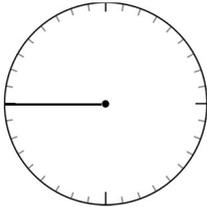


RealTreadz.com
(a shoe company)
records sales.

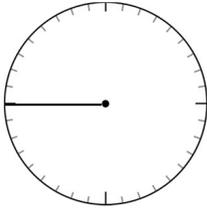


	UK	France	USA	Total
Business	40	17		122
Sport		45	30	
Hiking	5		25	40
Total	60			

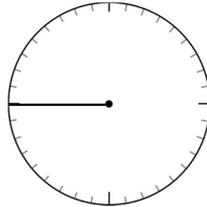
Sport Shoes
UK, France & USA



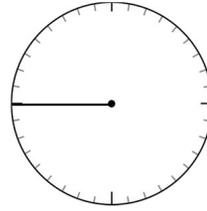
Shoes Sold in UK
Business, Sport & Hiking



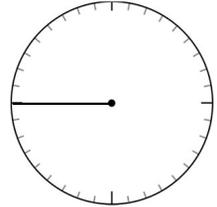
Shoes Sold: Totals - UK & USA



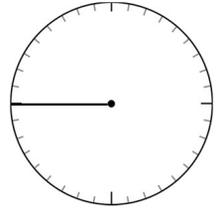
Shoes Sold in USA
Business, Sport & Hiking



Hiking Shoes
UK, France & USA



Shoes Sold in France
Business, Sport & Hiking



Purposeful Practice

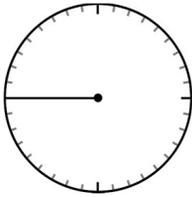
Gen-Z Gamez

Player Survey

Complete each pie chart according to its title.

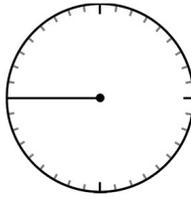
Console Players: UK & USA

	Mobile	Console	Total
UK	17	5	
USA	23	15	
Total			



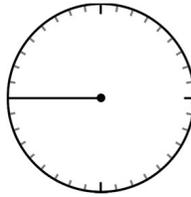
Adult Players: Mobile & Console

	Mobile	Console	Total
Adult		16	36
Child	15	9	
Total	35		60



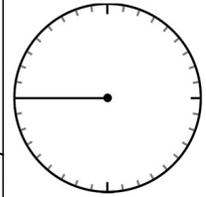
Shooter Players: UK & USA

	Shooter	Roleplay	Total
UK		21	28
USA	5	27	32
Total			60



PC Players in 3 Countries

	Console	PC	Total
Germany	18		23
France		15	50
Italy	9		49
Total	62	60	



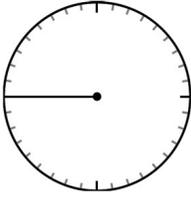
22ND CENTURY TV

Media Survey

Sketch each pie chart according to its title.

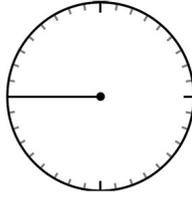
Sport Viewers in 3 Countries

	Drama	Sport	Total
UK	15	21	36
USA			23
AUS	13	7	
Total	37		79



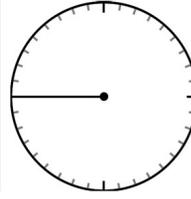
Adult Viewers: News, Drama, Docs

	Children	Adults	Total
News	3		28
Drama		60	103
Docs	15	5	
Total	61	90	



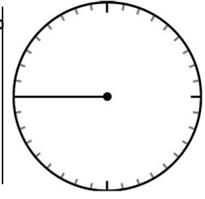
UK Viewers: Device

	UK	USA	Total
TV		75	130
Mobile	35		50
Tablet	30	25	
Total		115	235



Paid Viewers: Age

	Paid	Free	Total
0-18	18	31	49
19-40		17	24
41-60		8	
61+	22	12	34
Total	72		



Fluency Practice

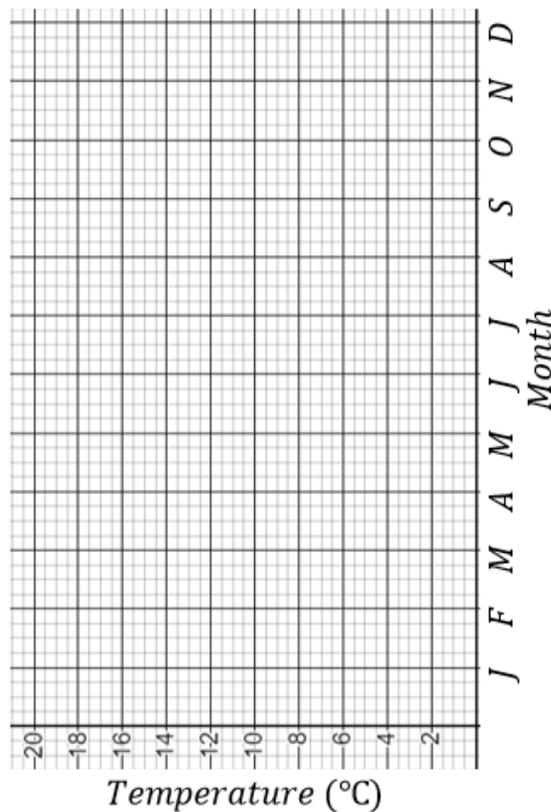
Plotting Line Graphs

(a)

The table shows the maximum and monthly minimum temperatures in °C in Manchester over a year.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Minimum	2	1	2	4	7	10	12	12	10	8	4	2
Maximum	6	7	9	12	15	17	19	19	17	13	9	7

Draw a line graph to represent this information. Include a key.

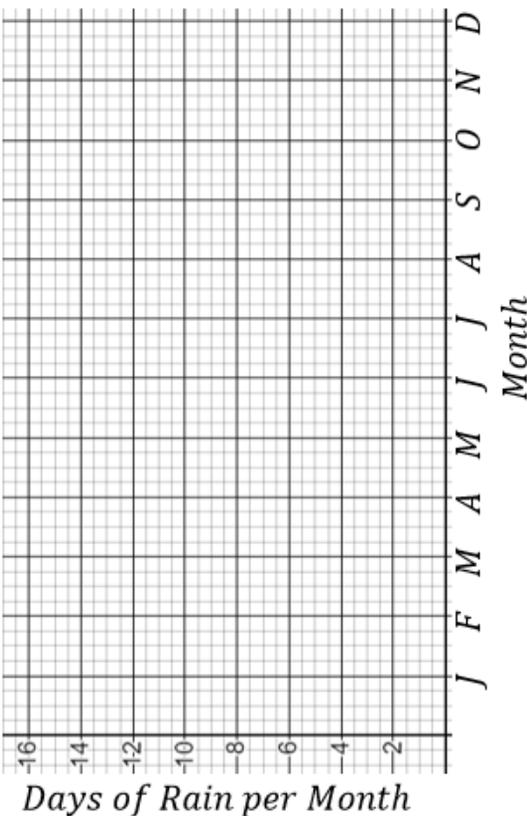


(b)

The table shows the number of rainy days per month in Bolton and London over a year.

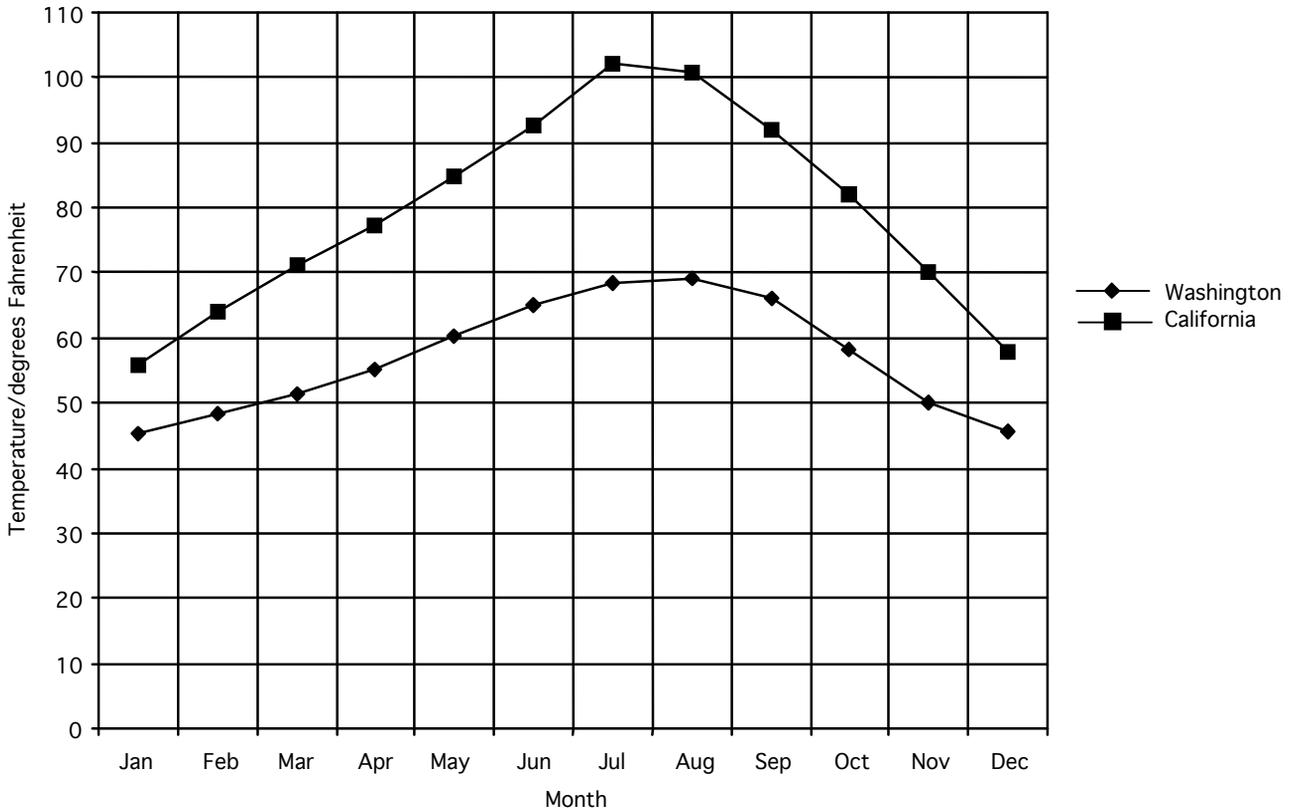
Month	J	F	M	A	M	J	J	A	S	O	N	D
Bolton	14	10	13	12	10	11	11	12	11	14	14	13
London	12	9	10	9	9	8	8	8	9	11	10	10

Draw a line graph to represent this information. Include a key.



Purposeful Practice

This graph shows the highest average temperatures for each month of the year for one place in Washington and one place in California.



1. Write two statements about what is the same and what is different in the two sets of temperatures.

(i) _____

(ii) _____

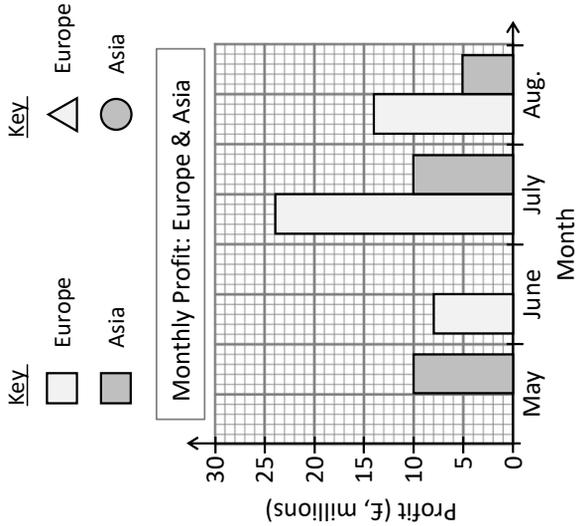
Purposeful Practice

Vertex Ltd Shareholder Report

Vertex Ltd sells TVs & phone in Europe & Asia. Three times every year, its must present a business report to shareholders.

Complete the **Dual Bar Chart & Line Graph** for the company.

- Describe the trend shown in the line graph.
- Should Vertex Ltd try to increase sales in Europe or Asia?
- What was the largest gap between **monthly profits** in Europe & Asia?
- What was the largest gap between **total profits** in Europe & Asia?
- Estimate total European profits after September. Why is this estimate **not** accurate?

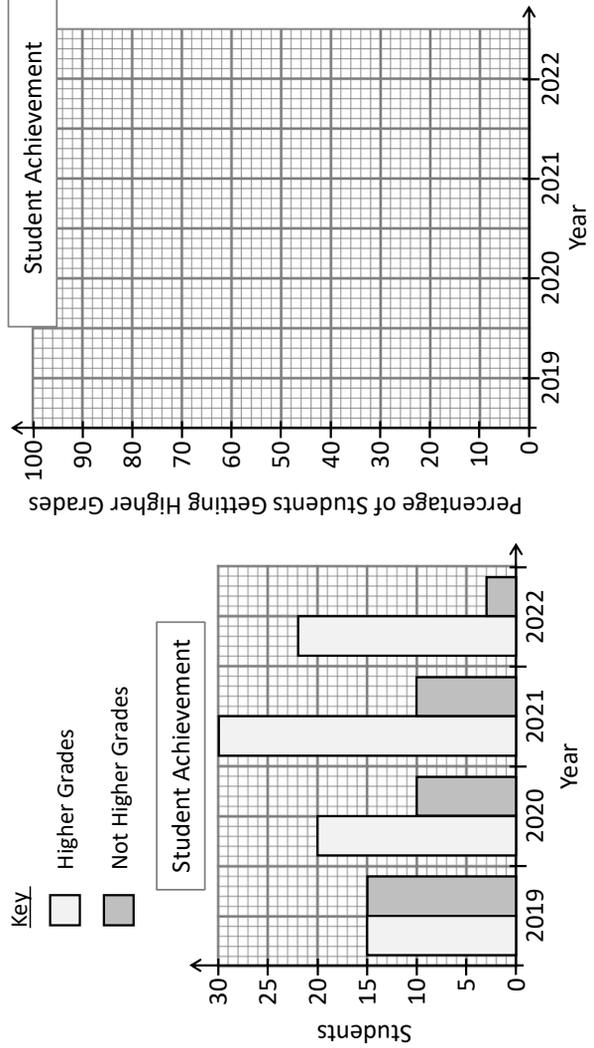


Breckly Secondary Student Attainment

Breckly Secondary is a new school. They record student achievement for its first 4 years.

Complete the **Line Graph** for the results. (How are the two y-axes different?)

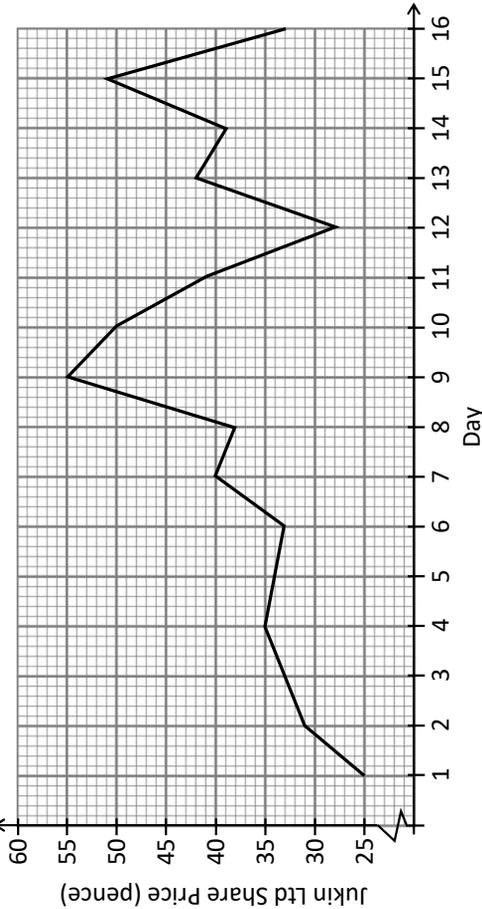
- Which year did most students achieve higher grades?
- Which year was the best performance of the school?
- What trend does the line graph show?
- What might you expect in future years?
- How might you change the line graph, particularly in future years?



Purposeful Practice

Playing the Market

Jukin Ltd is a new company that makes digital kitchen appliances. When the company went public (issued shares) the share price was tracked. Many people bought shares to sell later for a profit...



- Andi bought 100 shares on day 1. He sold them all on day 7. How much profit did he make?
- Betty bought 1000 shares on day 1. She sold them all on day 13. How much profit did she make?
- If Betty sold at the best time, what is the maximum amount of profit she could have made?
- Dave bought 500 shares on day 4 and 500 shares on day 9. He sold them all on day 14. How much money did he lose?
- Elliot bought 250 shares on day 8 and 750 shares on day 11. For Elliot to break even, what does the share price need to be? _____

High Frequency Trading means lots of trades over very short time periods.

The graph shows the first 80 minutes in a trading day.

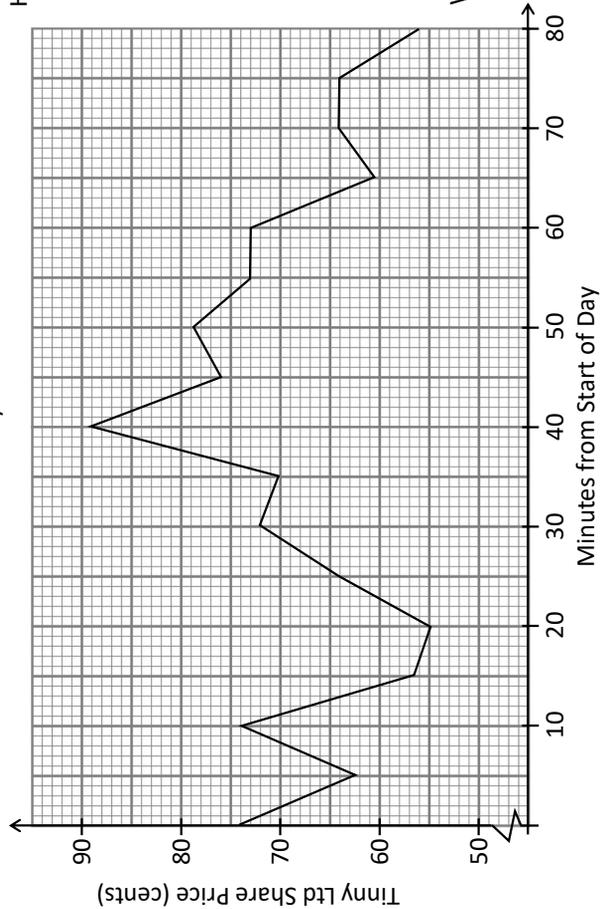
Bought	Sold	\$ Profit?
3000 @ 20 mins	@ 40 mins	
500 @ 12 mins	@ 60 mins	
850 @ 47 mins	@ 54 mins	
6000 @ 33 mins	2 mins later	
4500 @ 42 mins	36 mins later	

After 80 minutes had this trader made a profit?

What was the percentage change in share price over the first 80 minutes?

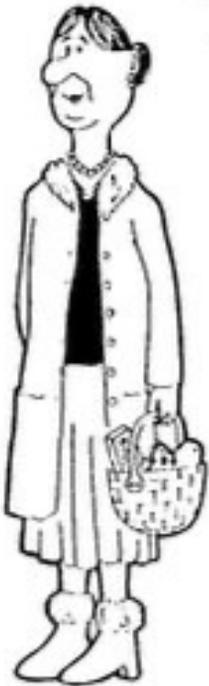
What was the maximum percentage profit that could have been made?

What was the maximum percentage loss that could have been made?



Fluency Practice

Who is represented by each point on the scattergraph, below?



Alice



Brenda



Cathy



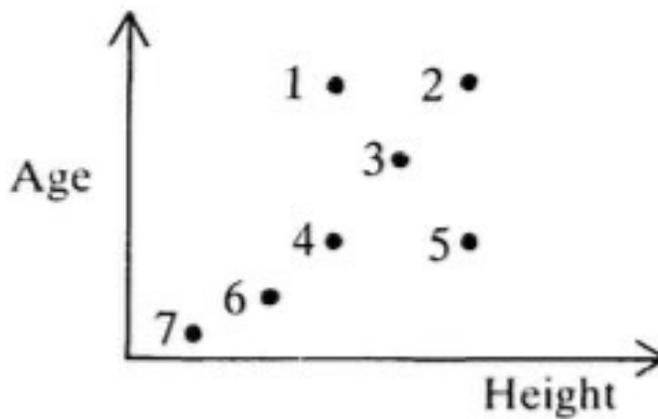
Dennis



Errol

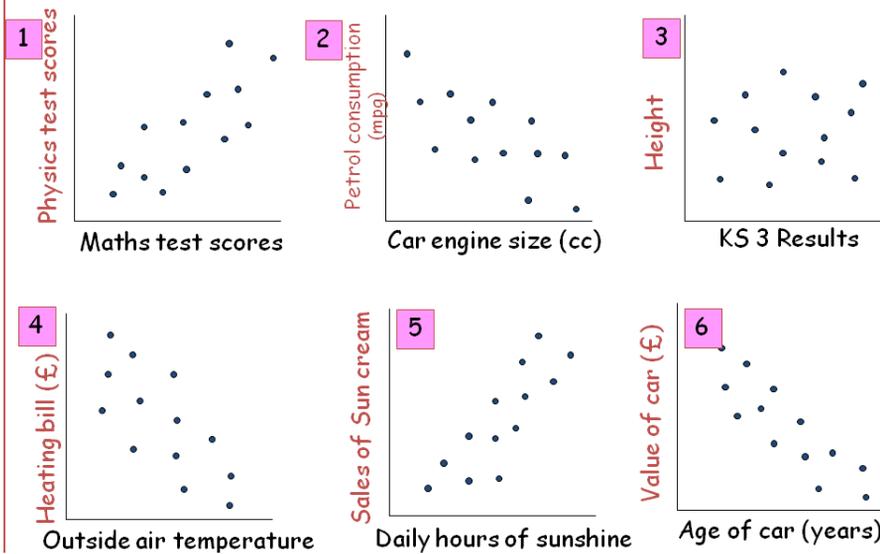


Freda Gavin



Fluency Practice

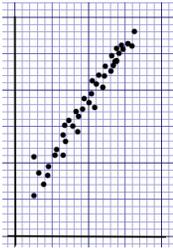
State the type of **correlation** for the scatter graphs below and write a sentence describing the relationship in each case.



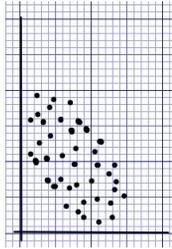
Complete the sentences using **positive/negative/no** and then **increase/decrease/not affected**.

1. There is a correlation between Physics and Maths test scores. As the Maths test results increase the Physics test results
2. There is a correlation between car engine size and petrol consumption.. As the car engine size increases the petrol consumption
3. There is correlation between KS3 results and height. As the KS3 results increase the height of the person is
4. There is a correlation between outside air temperature and the heating bill. As the air temperature increases the heating bill
5. There is a correlation between the daily hours of sunshine and sales of sun cream. As the hours of sunshine increase sales of sun cream
6. There is a correlation between the age of a car and its value. As the car gets older its value

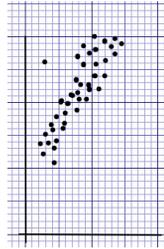
Fluency Practice



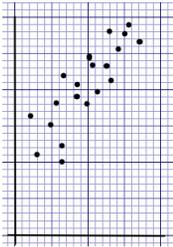
Strong
Moderate
Weak



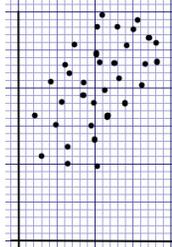
Strong
Moderate
Weak



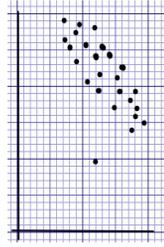
Strong
Moderate
Weak



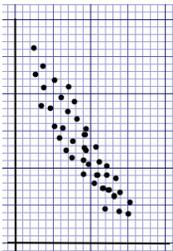
Strong
Moderate
Weak



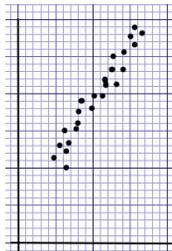
Strong
Moderate
Weak



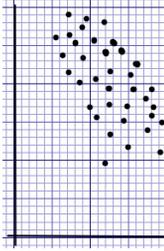
Strong
Moderate
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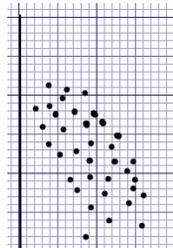
Strong
Moderate
Weak



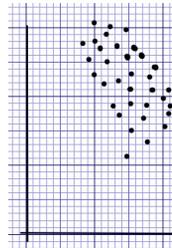
Strong
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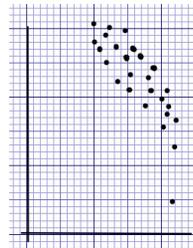
Strong
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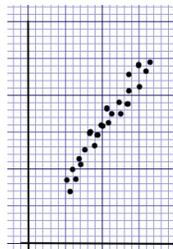
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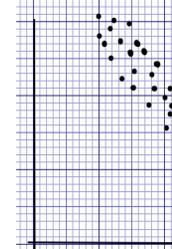
Strong
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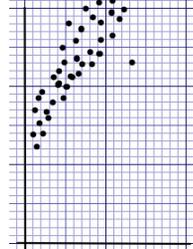
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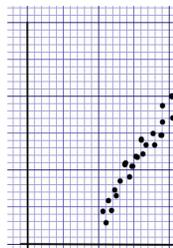
Strong
Moderate
Weak



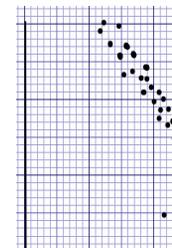
Strong
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Weak



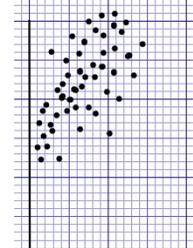
Strong
Moderate
Weak



Strong
Moderate
Weak

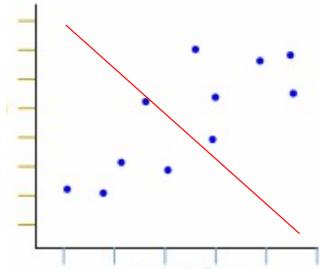


Strong
Moderate
Weak

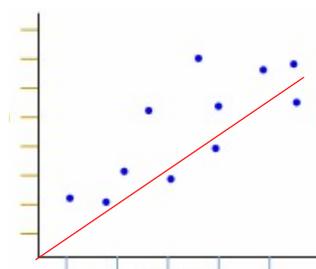


Strong
Moderate
Weak

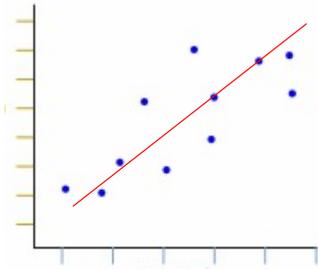
Fluency Practice



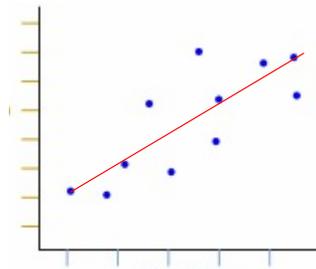
Yes / No



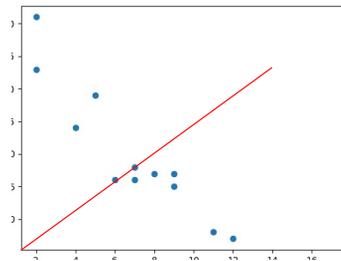
Yes / No



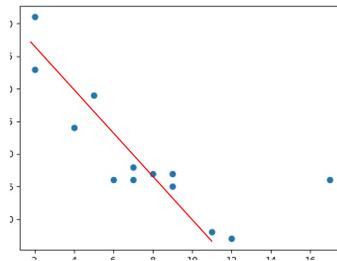
Yes / No



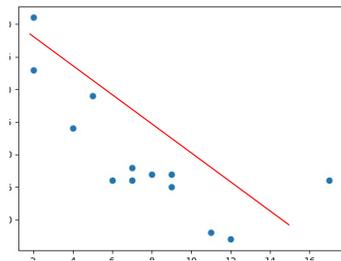
Yes / No



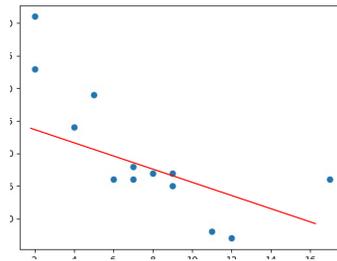
Yes / No



Yes / No



Yes / No

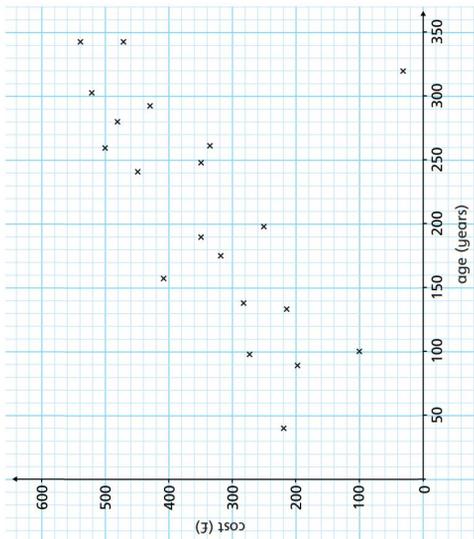


Yes / No

Fluency Practice

1. The scatter graph shows the cost and age of some rare books.

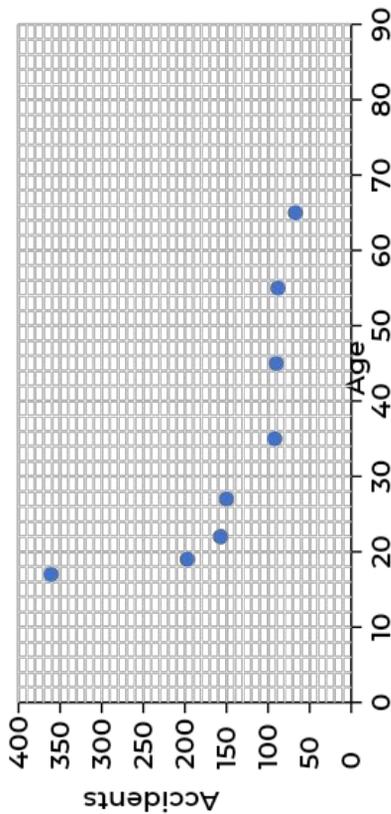
a) Circle the outlier.



b) Describe the correlation.

2. The scatter graph shows the number of accidents per million miles for drivers of different ages.

a) Circle the outlier.

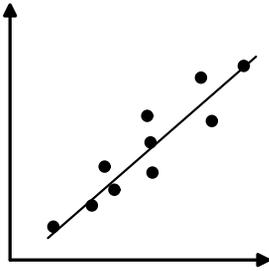


b) Describe the correlation.

Fluency Practice

learn by heart

Positive correlation



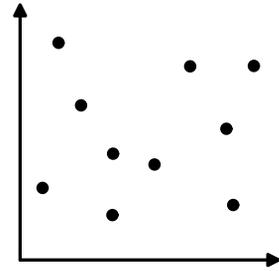
As one variable **increases**, the other **increases**.

Negative correlation



As one variable **increases**, the other **decreases**.

No correlation



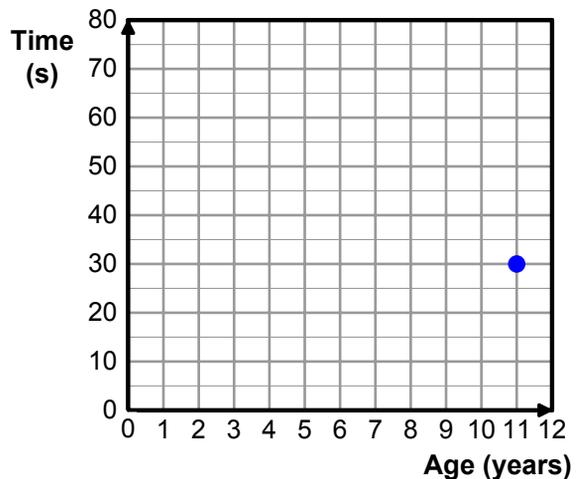
There is **no relationship** between the variables

exercise 8i

1. Some children completed an obstacle course. The children's ages and the time it took them to complete the course are shown in the table,

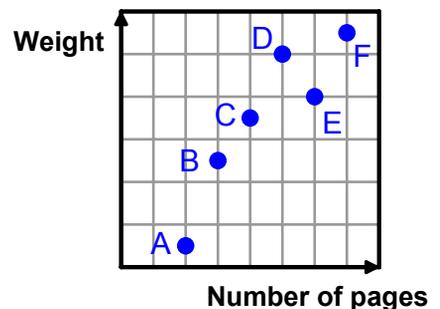
Age (years)	11	8	7	9	5	8	7	11	10	6	6	9
Time (secs)	30	55	60	50	75	50	65	40	35	70	65	40

- Complete the scatter graph for this data.
- Describe the type of correlation.
- Draw a line of best fit.
- Another child took 50 seconds to complete the course. Use the graph to estimate this child's age.



2. The scatter graph shows the weights and number of pages of six books, labelled A to F.

- Draw a line of best fit and describe the type of correlation.
- Jake says "If I pick two books at random, the book with the greater number of pages will be heavier." For which pair of books is this **not** true?

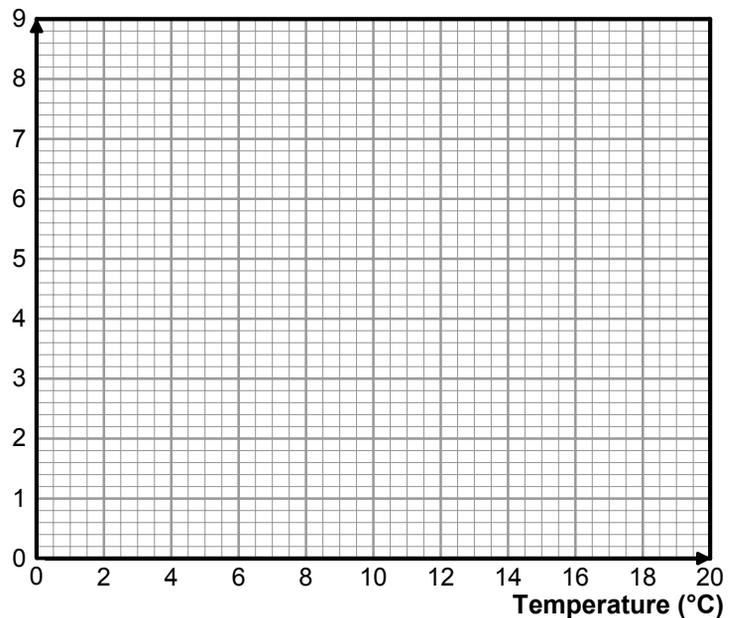


Fluency Practice

3. The table shows some weather data for the UK in 2018. Monthly averages for temperature and hours of sunshine per day are given.

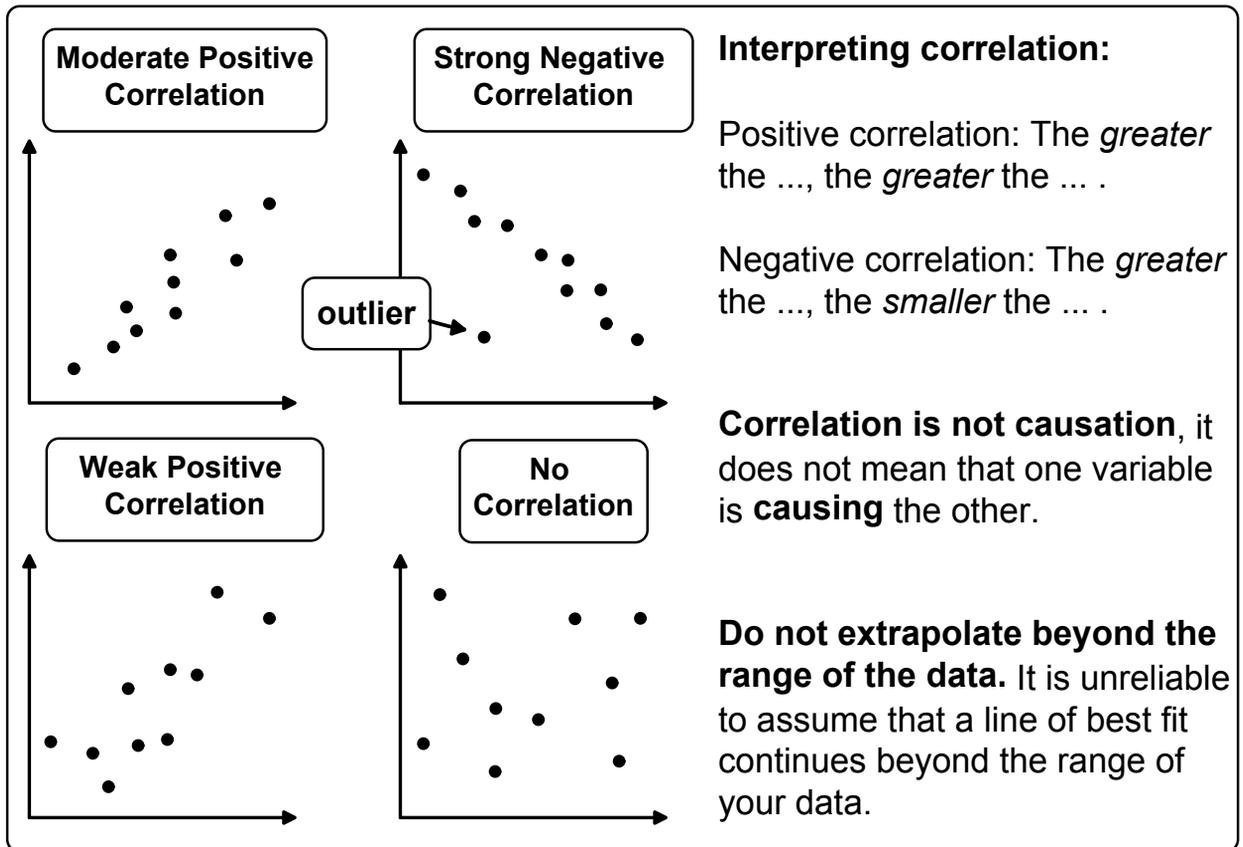
Month	Temp (°C)	Hours of sunshine
Jan	5.3	1.9
Feb	3.1	3.7
Mar	4.9	2.8
Apr	9.5	4.3
May	12.9	7.8
Jun	15.9	8.3
Jul	18.7	8.8
Aug	16.7	5.5
Sep	13.8	5.3
Oct	10.7	4.4
Nov	8.2	2.5
Dec	6.8	1.4

Hours of sunshine



- Complete the scatter graph for this data. *Pay careful attention to the scales.*
 - Draw a line of best fit and describe the type of correlation.
 - A month in a different year had an average temperature of 12°C.
Use the graph to estimate the average hours of sunshine for this month.
 - Another month had an average number of hours of sunshine of 6.4.
Use the graph to estimate the average temperature for this month.
3. For each pair of variables, state whether you would expect positive, negative or no correlation.
- the length of a taxi journey and its cost
 - a pupil's Maths test score and their long jump distance
 - the temperature and the number of umbrellas sold
 - the number of rooms in a house and its selling price
 - the weight of an adult dog and its age
 - the length of time spent practising a piece of music and the number of mistakes made
4. A, B and C are variables.
A and B are negatively correlated. A and C are negatively correlated. Complete:
- Generally, the higher the value of A, the _____ the value of B.
 - Generally, the higher the value of B, the _____ the value of C.

Fluency Practice

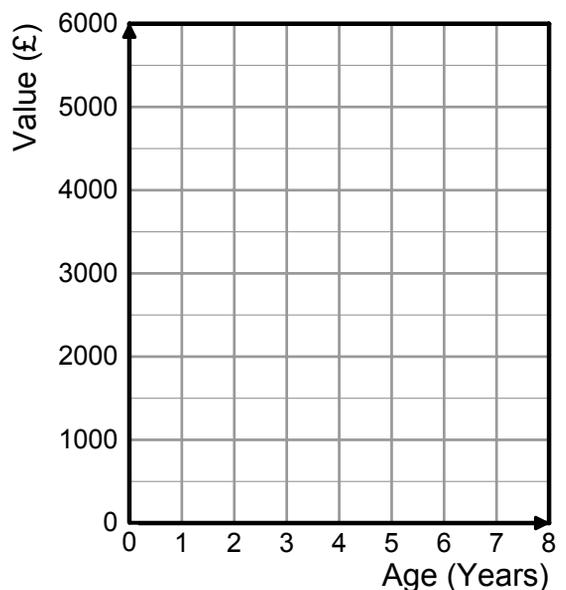


exercise

1. The price and age of 12 used cars is shown in the table.

Age (years)	5	3	7	5	2	6	3	4	2	7	2	5
Value (£)	2500	3000	1500	3000	5000	3000	4000	3500	4500	2000	3000	2000

- Complete the scatter graph for this data.
- Describe the type of correlation.
- Interpret the correlation in context.
- Draw a line of best fit.
- Another car is 4 years old. Estimate the price of this car.
- Another car is less than a year old. Why is it unreliable to estimate its value from the graph?

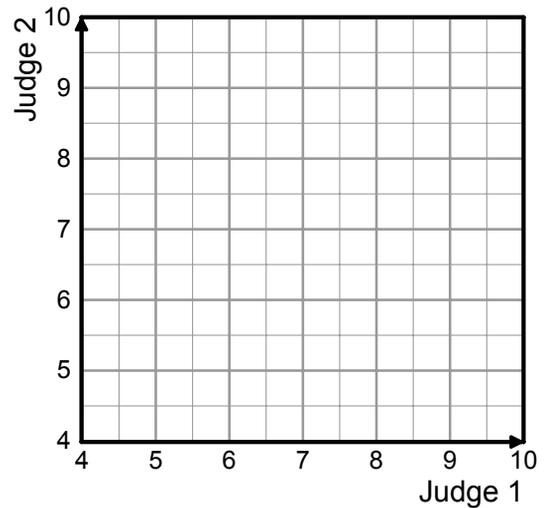


Fluency Practice

2. In a dancing competition, two judges give competitors scores out of 10. The scores given to some competitors are shown in the table.

Judge 1	7.5	8.5	8	5	8	6.5	6	7	9	5.5	7.5	6.5	8.5
Judge 2	8	8	6.5	6	9.5	7.5	6.5	8	8.5	7.5	8.5	5.5	10

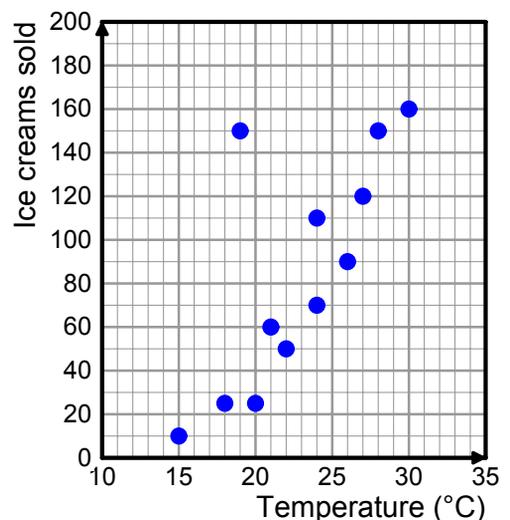
- Complete the scatter graph for this data.
- Describe the type of correlation.
- Draw a line of best fit.
- Another competitor was given a score of 7 by Judge 2. Estimate the score they will receive from Judge 1.
- Which judge was more generous with their scores?



3. For each pair of variables, state whether you would expect there to be positive, negative or no correlation.
- Journey distance and time taken.
 - Shoe size and French exam grade.
 - Weight of an item of jewellery and its value.
 - Maximum day temperature and number of hot chocolates sold.
 - A mobile phone's battery level and the time since it was last charged.

4. The scatter graph shows the number of ice creams sold at a food stall on different days, along with the maximum temperature on that day.

- One of the days is an outlier. What was the temperature on this day?
- For all the other points, identify the type of correlation.
- Draw line of best fit.
- Work out an estimate for the gradient of the line.
- Interpret the gradient.

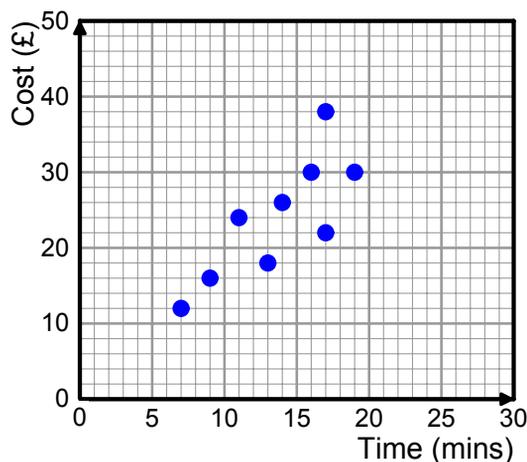


Fluency Practice

5. The scatter graph shows the time taken and cost of a number of taxi journeys.

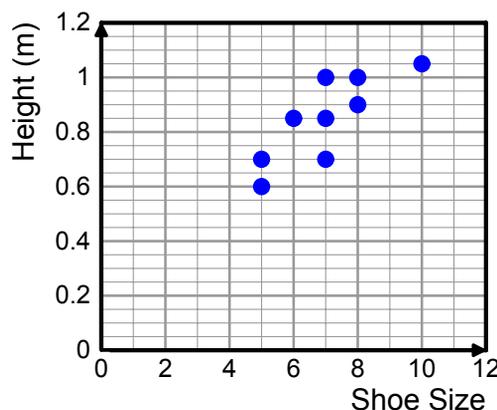
John is going to use the data to estimate the costs of other taxi journeys based on their duration. Which of the following journey times will result in **unreliable** estimates?

- a) 10 mins b) 4 mins
c) 25 mins d) 45 mins



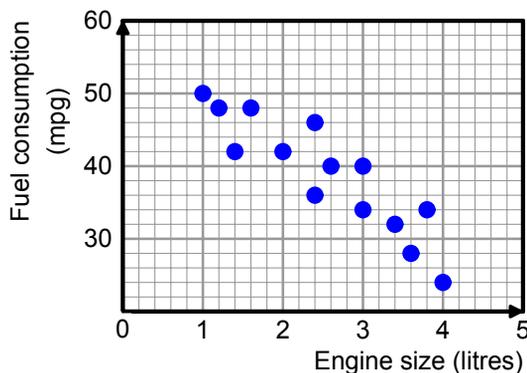
6. Julia draws a scatter graph showing the shoe sizes and heights of some children.

- a) Describe one way in which Julia's scatter graph could be improved.
b) Julia says that the graph shows that a child's height is caused by their shoe size. What mistake has Julia made?

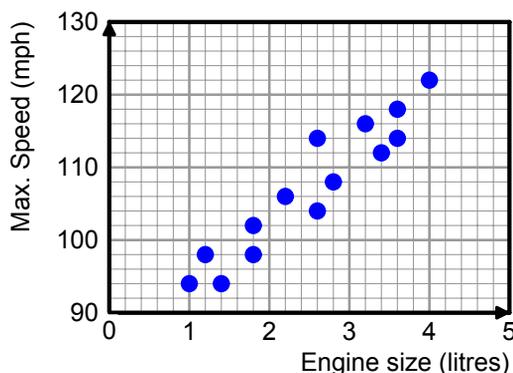


7. The two scatter graphs shows some data related to some cars.

- a) Jenny's car has a fuel consumption rate of 40mpg (miles per gallon.) Use the scatter graphs to estimate the maximum speed of Jenny's car.



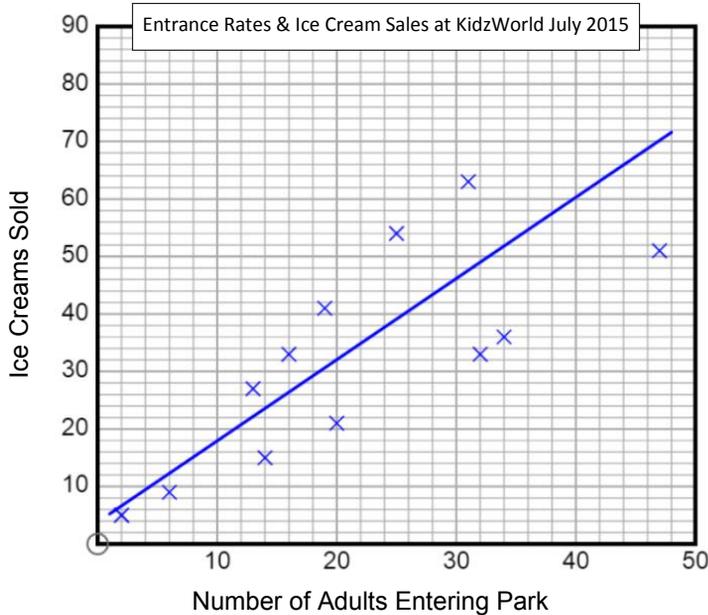
- b) Bob's car has a maximum speed of 120mph. Use the scatter graphs to estimate the fuel consumption rate of Bob's car.



- c) What does the data suggest is the correlation between a car's fuel consumption and its maximum speed?

Purposeful Practice

scatter graphs: true or false?



A. From the graph we can use extrapolation to determine the number of ice creams that would be sold when 25 adults enter the park.

B. From these data we can use interpolation to predict that if 10 adults entered the park, 5 ice creams would be sold.

C. From the graph we can reliably extrapolate the number of ice creams sold when 100 adults enter the park.

D. We can extrapolate from this data that 50 adults entering the park would lead to 74 ice cream sales.

E. To sell 60 ice creams, we can use interpolation to estimate that 40 adults would need to enter the park.

F. The line of best fit is drawn incorrectly because there are more points below it than above it.

G. The graph shows strong positive correlation.

H. The line of best fit is drawn incorrectly because it should begin at (0,0).

A. We can predict from this data that if employees were paid £9.40 per hour, they would produce 11 units per hour.

B. We can conclude from this graph that increasing an employee's hourly rate of pay **causes** an increase in the number of units they produce per hour.

C. This graphs shows there is no relationship between employee earnings and productivity.

D. The graph represents data collected from 18 people.

E. From the line of best fit we can interpolate that an employee earning £6.50 per hour will produce 4.25 units per hour.

F. This data set contains an outlier

G. This graph is misleading because it does not start at 0 on the x axis.

