Year 10
Mathematics
Unit 20

Do Not Write Inside

learn by heart

A function is a type of equation, because it contains an equals sign.

When we plot the graph of a function we can see all the pairs of values that make it true. These are also called the solutions of the equation.

Every function has an infinite number of solutions, but if we take any two functions it is possible that there is just one pair of values that solves both of them. To find this solution we can plot graphs of both functions and see where they cross. This is called solving the equations simultaneously - at the same time.
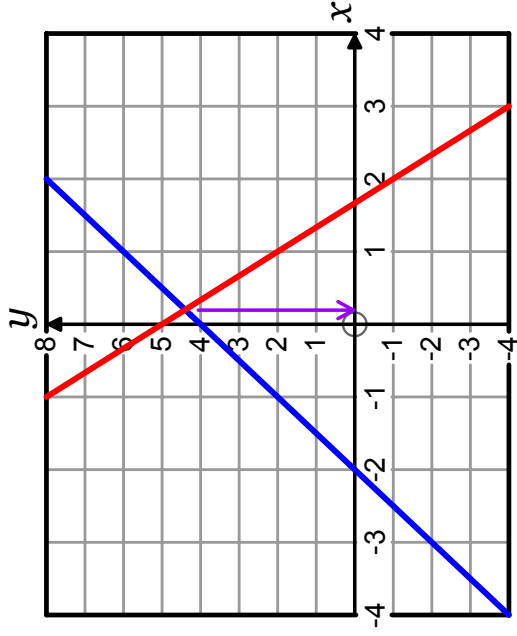
example

By plotting graphs, find estimates for the solution to the simultaneous equations:

$y = 2x + 4$ and $y = 5 - 3x$

First create tables of values and plot each function:

$y = 2x + 4$

x	y
-1	2
0	4
1	6
2	8

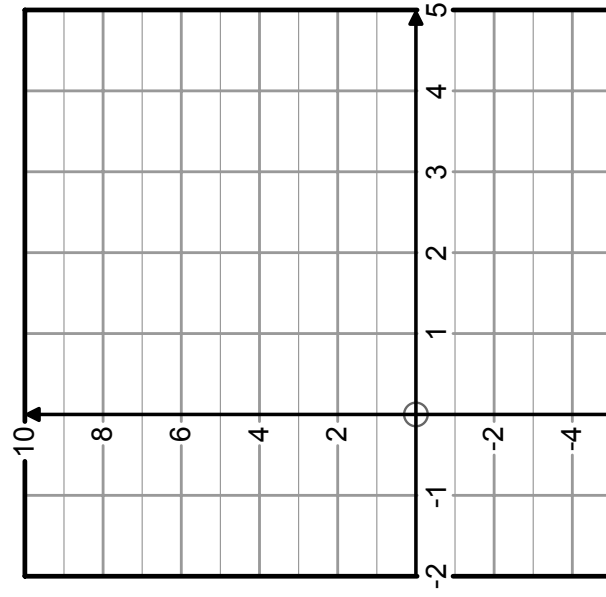$y = 5 - 3x$

x	y
-1	8
0	5
1	2
2	-1

They cross when x is approximately 0.2 and y is approximately 4.2, so x ≈ 0.2, y ≈ 4.2 is an estimate of the solution.

exercise 70

1. By plotting graphs, estimate the solution to the simultaneous equations:
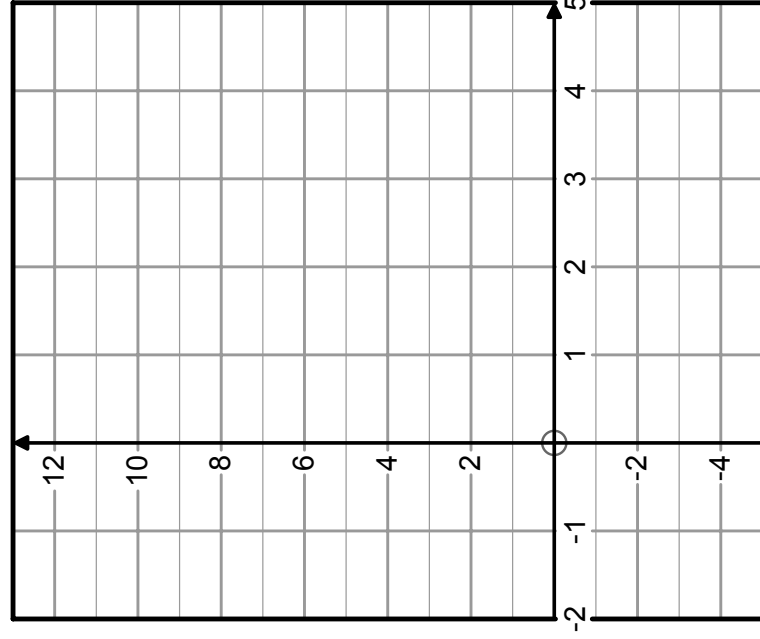
$y = 4x - 5$ and $y = 6 - 2x$

$y = 4x - 5$

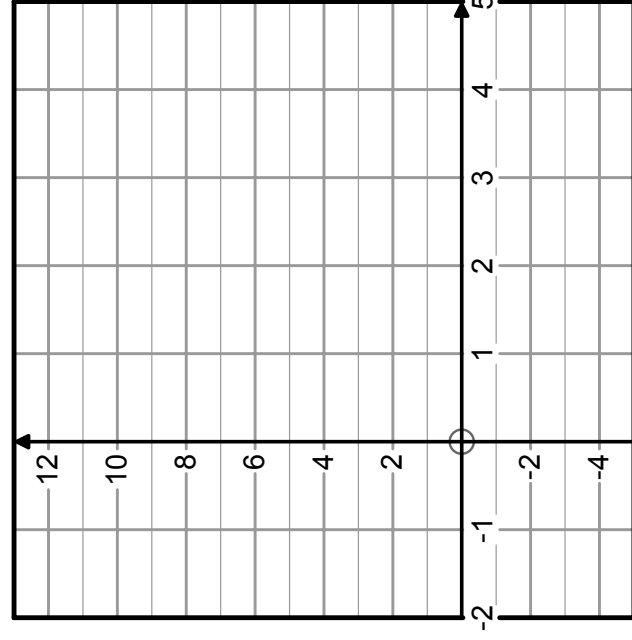| x	y
0	
1	
2	
3	

$y = 6 - 2x$

x	y
-1	
0	
1	
2	

3. By plotting graphs, estimate the solution to the simultaneous equations:
$y = 4x - 5$ and $y = 5 - 2x$

$y = 4x - 5$

x	y
0	
1	
2	
3	

$y = 5 - 2x$

x	y
-1	
0	
1	
2	

2. By plotting graphs, estimate the solution to the simultaneous equations:
$y = 2x - 3$ and $y = 10 - x$

$y = 2x - 3$

x	y
-1	
0	
1	
2	

$y = 10 - x$

x	y
-1	
0	
1	
2	

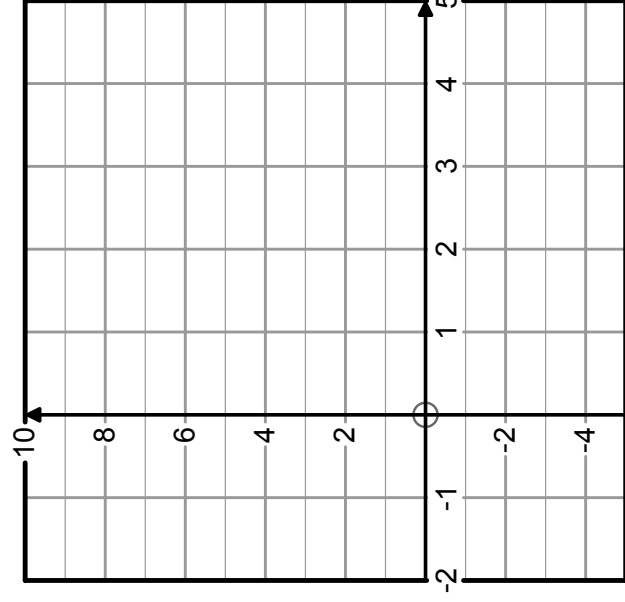**4.** By plotting graphs, estimate the solution to the simultaneous equations:
$y = 8 - x$ and $y = 3x - 1$

$y = 8 - x$

x	y
0	
1	
2	
3	

$y = 3x - 1$

x	y
-1	
0	
1	
2	

Simultaneous Equations

The **coefficients** in these simultaneous equations are already **balanced**.
To **eliminate** a variable, do we need to add or subtract the lower equation?

Choose the **operation** for each and **solve** the equations!

A)

$$5y + 2x = 26$$
$$3y + 2x = 18$$

B)

$$6y - 2x = 2$$
$$3y + 2x = 16$$

C)

$$4y + 5x = 18$$
$$4y - 2x = 4$$

D)

$$3y - 2x = 22$$
$$3y - 6x = 18$$

E)

$$6y + 4x = 50$$
$$2y - 4x = 6$$

F)

$$7y - 3x = 6$$
$$3y - 3x = -6$$

G)

$$2y - 5x = -30$$
$$-3y + 5x = 35$$

H)

$$-2y - 2x = -16$$
$$4y - 2x = 44$$

I)

$$3y - 5x = -12$$
$$-3y - 2x = -30$$

Question 1: Solve the following simultaneous equations by using elimination.

(a) $6x + y = 18$
$4x + y = 14$

(b) $4x + 2y = 10$
$x + 2y = 7$

(c) $9x - 4y = 19$
$4x + 4y = 20$

(d) $2x + y = 36$
$x - y = 9$

(e) $6x - 3y = 12$
$4x - 3y = 2$

(f) $3x - 6y = 6$
$2x - 6y = 3$

(g) $8x + 7y = 39$
$8x + 2y = 34$

(h) $x + 3y = 38$
$x + 6y = 53$

(i) $6x + 3y = 48$
$6x + y = 26$

(j) $2x - 4y = 10$
$2x + 3y = 24$

(k) $5x - 2y = 120$
$5x + y = 165$

(l) $x - 2y = 8$
$x - 3y = 3$

(m) $3x + 2y = 54$
$2x - 2y = 16$

(n) $7x - 4y = 80$
$3x - 4y = -80$

(o) $5x - 2y = -23$
$5x - 6y = -39$

(p) $6x + 2y = -26$
$2x + 2y = -10$

(q) $x - 5y = 65$
$2x - 5y = 85$

(r) $10x - 10y = -40$
$10x + 4y = 16$

Simultaneous equations - elimination 1

1. Solve:

a) $4a + 3b = 44$
   $3a + 3b = 39$

b) $2a + b = 23$
   $a + b = 16$

c) $5a + 2b = 27$
   $5a + 4b = 49$

d) $3a + 2b = 16$
   $4a + 6b = 28$

e) $2a + b = 14$
   $4a + 6b = 36$

f) $6a + 5b = 39$
   $2a + 3b = 17$

2. Explain why it is not possible to solve the pair of simultaneous equations:

$x + y = 9$
$2x + 2y = 18$

3. Select the correct pair of solutions to the simultaneous equations shown in the box:

$p + q = 7$
$5p + 6q = 36$

a) $p = 3$
   $q = 4$

b) $p = 6$
   $q = 1$

c) $p = 1$
   $q = 6$

4. Solve:

a) $2a + 5b = 25$
   $3a + 4b = 27$

b) $3a + 5b = 17$
   $5a + 2b = 22$

c) $4a + 3b = 33$
   $6a + 5b = 51$

d) $2a + 3b = 5$
   $2a + 5b = 11$

e) $3a + 2b = -11$
   $5a + 4b = -21$

f) $3a + 7b = -6$
   $2a + 3b = 1$

5. Match pairs of equations with their solutions:

A $3x + y = 8$
  $3x + 4y = 14$

B $2x + y = -2$
  $3x + 2y = -1$

C $3x + 2y = 11$
  $2x + 3y = 14$

D $4x + 3y = -7$
  $2x + 2y = -6$

E $6x + 5y = 34$
  $4x + 3y = 22$

F $2x + 4y = -12$
  $x + 3y = -9$

G $x + y = 10$
  $2x + 5y = 41$

H $x + 2y = -4$
  $2x + 3y = -7$

P $x = 3$
  $y = 7$

Q $x = 1$
  $y = 4$

R $x = 4$
  $y = 2$

S $x = 2$
  $y = 2$

T $x = -3$
  $y = 4$

U $x = -2$
  $y = -1$

V $x = 2$
  $y = -5$

W $x = 0$
  $y = -3$

Question 2: Solve the following simultaneous equations by using elimination.

(a) $3x + 2y = 23$
$2x - y = 6$

(b) $3x - 3y = 9$
$2x + y = 12$

(c) $4x + 2y = 34$
$3x + y = 21$

(d) $9x - 4y = 59$
$2x - y = 12$

(e) $2x + 8y = 43$
$x + 3y = 18$

(f) $6x + 3y = 45$
$2x - 2y = 12$

(g) $5x + 4y = 130$
$x + 6y = 130$

(h) $10x - 15y = 25$
$x - 2y = 1$

(i) $3x + 8y = 97$
$2x + 4y = 58$

(j) $3x - y = 4$
$5x + 4y = 52$

(k) $4x + 9y = 10$
$2x + 3y = 2$

(l) $5x - 3y = 33$
$3x - 9y = 63$

(m) $2x + 4y = -2$
$4x + 2y = -10$

(n) $8x + 4y = -28$
$3x - 12y = 30$

(o) $15x - 4y = 82$
$5x - 9y = 12$

(p) $12x + 3y = 9$
$2x + 11y = -9$

(q) $9x - 7y = 111$
$x - 2y = 16$

(r) $8x - y = 4$
$3x + 8y = -166$

Question 3: Solve the following simultaneous equations by using elimination.

(a) $2x + 2y = 14$
$5x - 3y = 19$

(b) $2x + 3y = 1$
$7x + 2y = -22$

(c) $5x + 3y = 22$
$2x + 4y = 20$

(d) $5x - 6y = 28$
$4x - 4y = 24$

(e) $3x + 2y = 7$
$2x + 9y = 43$

(f) $3x + 3y = -6$
$4x - 4y = -24$

(g) $3x + 8y = 31$
$5x + 3y = 31$

(h) $7x - 15y = 2.5$
$3x - 2y = 5.5$

(i) $3x + 2y = 53$
$2x + 5y = 72$

(j) $5x - 3y = 18$
$2x + 4y = 54$

(k) $2x + 9y = 11$
$9x + 3y = -63$

(l) $2x - 4y = 4$
$5x - 3y = 24$

(m) $3x + 3y = 42$
$2x + 4y = 38$

(n) $6x + 2y = -2$
$4x - 3y = 29$

(o) $4x - 4y = 8$
$5x - 3y = 18$

(p) $4x + 3y = 9$
$5x + 2y = 13$

(q) $4x - 2y = 18$
$2x - 3y = 15$

(r) $5x + 2y = 38$
$2x - 3y = 19$

Question 4: Solve the following simultaneous equations by rearranging and then using elimination.

(a) $x = 10 - y$
$2x + y = 17$

(b) $x - 4 = y$
$x + 3y = 12$

(c) $2x + 6y = 4$
$x = 12 + 2y$

(d) $3x = 10 + 5y$
$3y = 52 - 4x$

(e) $2x + y - 18 = 0$
$3y = 7x + 80$

(f) $6x + 2y + 6 = 0$
$7x - 5y - 93 = 10$

Simultaneous equations - elimination 2

1. Solve:

a) $4p - 3q = 10$
   $3p + 6q = 24$

b) $8t - 3u = 61$
   $t - u = 7$

c) $2k + 3p = 30$
   $4k - 5p = 16$

d) $-x + 3y = -11$
   $4x + 2y = 16$

e) $-5c + 2d = 21$
   $2c - 3d = -15$

f) $-6x + 4y = -42$
   $-4x - 5y = -5$

2. Select the correct pair of solutions to the simultaneous equations shown in the box:

$$2g + 3h = 0$$
$$3g - h = 11$$

a) $g = 2$
   $h = -1$

b) $g = -6$
   $h = 4$

c) $g = 3$
   $h = -2$

3. Jake and Lucy are trying to solve the simultaneous equations shown.

$$4x + 3y = 20$$
$$3y - 3x = 6$$

Jake **adds** the two equations.
Lucy **subtracts** the two equations.

Who has correctly eliminated one unknown?

4. Solve:

a) $3a + 2b = -13$
   $2a - 3b = -39$

b) $2c + 3d = 7$
   $-c + 6d = -26$

c) $g + 3h = -3$
   $h - 2g = -8$

d) $-3x = y + 8$
   $2x - y = -7$

e) $4u + 3w - 3 = 0$
   $3u - 2w = 32$

f) $-2x + 5y = -14$
   $-2y + 5x = -7$

5. Spot the mistake!

a) $4a + 3b = 18$
   $5a - 3b = 9$

$$\begin{array}{r} 4a + 3b = 18 \\ 5a - 3b = 9 \quad - \\ \hline a \qquad = 9 \end{array}$$

$36 + 3b = 18$

$a = 9, b = -6$

b) $2a + 3b = 4$
   $4a + 5b = 10$

$$\begin{array}{r} 4a + 6b = 4 \\ 4a + 5b = 10 \quad - \\ \hline b = -6 \end{array}$$

$2a - 18 = 4$

$a = 11, b = -6$

c) $-a + 3b = 3$
   $a - b = 1$

$$\begin{array}{r} -a + 3b = 3 \\ a - b = 1 \quad + \\ \hline 4b = 4 \\ b = 1 \end{array}$$

$a - 1 = 1$

$a = 2, b = 1$

Question 1: The cost of buying a coffee and a tea in a cafe is £4.
The cost of buying a coffee and three teas in a cafe is £7.
Work out the cost of buying a coffee and the cost of buying a tea.

Question 2: The sum of Rosemary's age and Hannah's age is 102 years.
The difference between Rosemary's age and Hannah's age is 52 years.
Rosemary is older than Hannah.
Find the age of each woman by using simultaneous equations.

Question 3: Five adult tickets and three child tickets for a movie cost £58.
Two adult tickets and eight child tickets for a movie cost £47.
Find the cost of each type of ticket.

Question 4: Four chairs and two tables cost £218.
Six chairs and seven tables cost £587.
Find the total cost of buying twenty chairs and five tables.

Question 5: A plumber charges a price for each hour, £h, and a fixed charge, £c.
A 5 hour job costs £155 in total.
A 8 hour job costs £230 in total.
How much would a job that lasts 2 hours cost?

Question 6: Barry buys 200 pieces of stationery for £76.
Of the 200 pieces of stationery, x of them are rulers that cost 50p each and y of them are pens that cost 20p each.
Find how many rulers Barry buys and how many pens he buys.

Question 7: In a greengrocers, 4kg of bananas and 3kg of apples costs £7.50
In the same greengrocers, 3kg of bananas and 5kg of apples costs £8.10
How much would 2kg of bananas and 2kg of apples cost?

1. The sum of two numbers is 130, while their difference is 38. Find the two numbers.

2. Becky and Peter's ages add to 53. If Becky is 3 years younger than Peter, what are their ages?

3. A necklace is made from 164 purple and blue beads. There are 8 more purple beads than blue beads. How many of each colour bead are there?
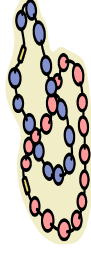
4. Ten Choco bars and six nutty bars cost £5. Three Choco bars and one Nutty bar cost £1.30. Find the cost of each chocolate bar.

5. Some chickens and pigs are in a field. How many of each animal are there if there are 32 heads and 80 legs in total?

6. Peter bought a mixture of large postcards (35p) and small postcards (29p). He bought 20 postcards in total, costing £6.28. How many of each size of postcard did he buy?
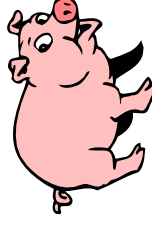
7. Find the value of each of the symbols in the grid:

⭐ ➕ ⭐ ⭐ = 77

⭐ ➕ ➕ ⭐ = 78

➕ ⭐ ⭐ ➕ = 78

➕ ➕ ➕ ⭐ = 79

8. Five apples and three pears cost 86 pence. Seven apples and five pears cost £1.30. Find the cost of each piece of fruit.

9. Two adults and three children went to the cinema, and the total cost was £32.40. Three adults and five children cost £51.20. What were the individual prices of adult and child tickets?
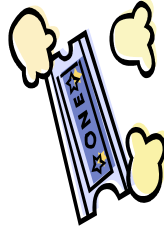
10. A slot machine takes only 20p and 50p coins. The machine contains a total of 140 coins worth £45.10. How many of each type of coin are in the machine?

Simultaneous Equations

$$2x = y \qquad y = x + 8$$
$$\underline{2x = y = x + 8}$$
$$2x = x + 8$$
$$x = 8$$
$$2x = y \qquad 2(8) = 16$$
$$x \longrightarrow (8, 16) \longleftarrow y$$

a) $2x = y \qquad y = x + 4$
$$2x = x + 4$$

b) $3x = y \qquad y = x + 12$

c) $3x = y \qquad y = x - 4$

d) $x + 3 = y$
$$y = 2x - 2$$

e) $x + 7 = y$
$$y = 3x - 9$$

f) $x + 10 = y$
$$y = 3x + 18$$

g) $2x + 9 = y$
$$y = x + 12$$

h) $2x + 6 = y$
$$y = 3x + 4$$

i) $y = 2x + 8$
$$y = 4x - 6$$

j) $y = 2x + 11$
$$y = 5 - x$$

k) $y = \dfrac{x}{2}$
$$y = x - 6$$

l) $y = \dfrac{x}{2} + 3$
$$y = x - 1$$

m) $y = \dfrac{x}{3} + 2$
$$y = 2x - 3$$

n) $2y = 3x + 3$
$$y = x + 4$$

o) $2y = 2x + 10$
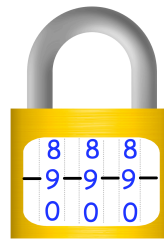$$y = x + 5$$

p) $y = x - 6$
$$3y = 2x - 16$$

q) $2y = 2x - 22$
$$y = \dfrac{x}{2} - 7$$

r) $x + 3 = y$
$$y = \dfrac{x + 11}{2}$$

s) $2y + 10 = 2x$
$$y = 2x - 11$$

t) $2y = 3x - 2$
$$3y = 2x + 7$$

Question 1: Shown is a 3-digit combination padlock.
Each dial can be set to 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

    (a) Work out the total number of different combinations that can be used.

    (b) Work out the total number of different combinations that have three different digits that can be used.

Question 2: A restaurant has 4 starters and 6 main course on its menu.
Hailey orders a starter and a main course.

How many different combinations of starters and main courses are there?

Question 3: A rugby coach is designing a new rugby strip.
She can choose from: 5 different pairs of socks
                              6 different pairs of shorts
         and   14 different jerseys.

How many different strips are possible?

Question 4: Harry picks a 4 digit pin for his credit card.
Each digit is a number 0 to 9.
Harry can repeat digits.

    (a) How many possible codes are there?

Harry chooses not to repeat any digits.

    (b) How many possible codes are there now?

Question 5: Rosie picks a 4-digit **odd** number.

The first digit is 5.
The second digit is a 3 or a 4.
The third digit is prime.

How many different 4-digit numbers could Rosie pick?

Question 6: Oliver picks a 4-digit **even** number that is greater than 3000.
The second digit is a multiple of 4.

How many different numbers could Oliver pick?

Question 7: Sophia is creating a 6-digit code to lock her iPad.

She only uses digits greater than 2.
She only uses each digit once.

How many possible codes can Sophia create?

Question 8: In a class, there are 10 boys and 9 girls.
The teacher has been asked to pick one boy and one girl to win a prize.

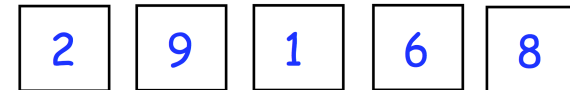How many possible pairs of students can the teacher pick?

Question 9: Jason picks a 5-digit number that is less that 80000.
The first digit is odd.
The fourth and fifth digits are equal.

How many different numbers can Jason pick?

Question 10: A headteacher wants to survey two Year 7 students.
There are 100 students in Year 7.

How many possible pairs of students can the headteacher pick?

Question 11: How many even numbers greater than 40000 can be created using these digits?

2	9	1	6	8

Apply

A. There are 8 runners in a race. In how many different ways could the three medals gold, silver and bronze, be allocated?

B. Car registration plates in Great Britain include a random sequence of three letters. Any letters other than I or Q can be used and the same letter can appear more than once. How many different three letter codes could be used?

C. 12 players take part in a singles table tennis competition. Each player must play each other player once. How many matches will there be in the competition?

D. On a school sports day, there are 6 different team events and 9 different individual events. Pupils must participate in two team events and one individual event. How many different ways are there of doing this?

E. In a class there are 8 boys and 11 girls.
(a) Two students are to be selected at random from the class. How many different pairs can be chosen?
(b) One boy and one girl are to be selected at random from the class. In how many ways can this be done?

F. Two cards are chosen from a standard deck of 52 cards. How many different possible pairs of cards are there?

G. Three cards are picked at random from this set.

1 2 3 4 5 6 7 8 9

(a) In how many different ways could the digits picked be in the order *odd-even-odd*?
(b) In how many different ways could the digits either be in the order *odd-even-odd or even-odd-even*?

H. A form group has 32 members. A form captain, a sports captain and a charity representative are to be chosen. No one can be in more than one of these positions. How many different combinations of results are possible?

I. A team of three is to be chosen from a group of 8 boys and 7 girls. There must be at least one boy and at least one girl in the team. How many possibilities are there?

A. Jake has 5 different pairs of trousers and 8 different shirts. How many different combinations of these could he wear?

B. A badminton club has 23 members, 8 of whom are female. In how many ways can the club select a mixed doubles team consisting of one male and one female?

C. UK banknotes are issued in denominations of £50, £20, £10 and £5. UK coins are issued in denominations of £2, £1, 50p, 20p, 10p, 5p, 2p and 1p. One coin and one banknote are to be selected at random.
(a) In how many different ways could this be done?
(b) In how many of the ways is the total at least £10.50?

D. On a restaurant's menu, there are 5 different starters, 6 main courses and 4 desserts. For a set price, diners can choose either a starter and a main course or a main course and a dessert. How many different combinations are there?

E. In a class there are n boys. There are twice as many girls as boys. One boy and one girl are to be chosen at random. Write a simplified expression for the number of possible combinations.

F. How many different combinations are possible in this supermarket lunch deal?

LUNCH DEAL

Sandwich + Snack + Drink = £3

(5 options) (8 options) (7 options)

G. At a school, students are required to choose one language, one humanities subject and one technology subject to study. There are 4 languages to choose from, 3 humanities and 3 technologies. How many different combinations of subjects could be chosen?

H. An examination paper has three sections, each with six questions. The instructions read: 'Answer one question from each section.' How many different combinations of questions could be answered?

Question 1: On a school trip, students are given a packed lunch.
The students can choose one piece of fruit and one snack.
There are 8 different pieces of fruit and some different snacks.

Altogether there are 104 different ways to choose one piece of fruit and one snack

How many different snacks are there?

Question 2: At a summer camp, children pick a morning, an afternoon and an evening activity.
There are 4 morning and 7 evening activities to pick from.

Altogether there are 224 different ways to choose their activities.

How many afternoon activities are there?

Question 3: In a gym there are

12 exercise classes on a Monday
13 exercise classes on a Wednesday
7 exercise classes on a Friday

Katie is going to attend either

a class on Monday and a class on Friday
or a class on Wednesday and a class on Friday
or a class on Monday, Wednesday and Friday

Work out how many different ways there are to pick which exercises classes Katie is going to attend.

Question 4: A group of 10 people enter a room.
Each person shakes hands, once, with all the other people in the room.

How many handshakes are there in total?

Question 5: A pizza parlour sells 9 different toppings.

Michael orders a pizza with 2 different toppings.

(a) How many different pizzas can he choose from?

Beth orders a pizza with 3 different toppings.

(b) How many different pizzas can she choose from?

John orders a pizza with 4 different toppings.

(c) How many different pizzas can he choose from?

Product Rule for Counting

| 1 | 8 | How many 2-digit numbers can you make with these 2 cards? |

| 1 | 8 | 7 | How does this change if we add a third card? |

| 1 | 8 | 7 | 3 |

A) How many 4-digit numbers can you make using these cards?

* How many choices do you have for the 1st card?

* After you choose a 1st card,
        how many choices do you have for the 2nd card, 3rd card & 4th card?

| 4 | 8 | 3 | 6 | 2 |

B) How many odd 5-digit numbers can you make with these cards?

* One number must be last, how does this affect our choices?

| 7 | 9 | 1 | 5 | 3 |

C) How many numbers greater than 40,000 can you make?

* How many choices are there for the 1st card?

| 5 | 6 | 8 | 3 | 4 | 2 |

D) How many odd 6-digit numbers can you make?

* How many choices are there for the last card?

| 7 | 1 | 6 | 5 | 2 | 9 |

E) How many numbers greater than 300,000 can you make?

| 1 | 6 | 5 | 2 | 7 |

F) How many 5-digit numbers that are a multiple of 2 can you make?

| 7 | 2 | 4 | 3 | 8 |

G) How many odd numbers greater than 50,000 can you make?

* Sum the choices for each starting card.

| 6 | 1 | 9 | 7 | 3 | 2 |

H) How many odd numbers greater than 500,000 can you make?

| 8 | 2 | 5 | 1 | 7 | 4 |

H) How many even numbers smaller than 600,000 can you make?

| 9 | 6 | 7 | 1 |

I) How many 2-digit numbers can we make using these cards?

J) How many 3-digit numbers can we make using these cards?

| 2 | 8 | 1 | 5 | 6 |

K) How many ways can we make 3 numbers from these cards?

L) The number 156 is made. How many different numbers use these same digits?

M) If we don't care about their order (the number they make):
        how many ways can we pick 3 digits from the 5 cards?

Group	Group width
$5 < h \leq 30$	
$5 < t \leq 30$	
$15 < t \leq 30$	
$15 < t \leq 45$	
$20 < t \leq 50$	
$40 < t \leq 100$	
$39 < t \leq 100$	
$39 < t \leq 101$	
$39 < t \leq 51$	
$31 < t \leq 59$	

Group	Group width
$3.1 < t \leq 5.9$	
$3.1 < t \leq 3.9$	
$3.1 < t \leq 3.8$	
$2.9 < t \leq 3.8$	
$-2.9 < t \leq 3.8$	
$-3.8 < t \leq 2.9$	
$-3.8 < t \leq 3.8$	
$-\dfrac{3}{8} < t \leq \dfrac{3}{8}$	
$-\dfrac{2}{8} < t \leq \dfrac{3}{8}$	
$-\dfrac{2}{8} < t \leq \dfrac{3}{7}$	

Frequency	Group width	Frequency density		Frequency	Group width	Frequency density
20	4			60	0.5	
40	4			60	0.4	
10	4			6	0.4	
10	8			8	0.4	
8	10			8	0.8	
6	10			8	0.08	
6	20			8	0.16	
6	5			12	0.16	
6	50			12	16	
60	5			16	12	

Question 1: Draw a histogram for each set of data below.

(a)

Time, t seconds	Frequency
$0 \le t < 2$	10
$2 \le t < 4$	13
$4 \le t < 6$	18
$6 \le t < 10$	16
$10 \le t < 14$	8
$14 \le t < 20$	6

(b)

Length (cm)	Frequency
$0 \le L < 20$	10
$20 \le L < 30$	35
$30 \le L < 40$	65
$40 \le L < 80$	40

(c)

Mass, m kg	Frequency
$40 \le m < 50$	4
$50 \le m < 60$	7
$60 \le m < 70$	13
$70 \le m < 85$	12
$85 \le m < 100$	3
$100 \le m < 120$	3

(d)

Volume, v ml	Frequency
$0 \le v < 100$	400
$100 \le v < 175$	900
$175 \le v < 250$	1275
$250 \le v < 300$	350
$300 \le v < 450$	450
$450 \le v < 600$	150

(e)

Cost, c pounds	Frequency
$0 \le c < 2$	5
$2 \le c < 3$	9
$3 \le c < 3.5$	8
$3.5 \le c < 4$	11
$4 \le c < 5.5$	6
$5.5 \le c < 8$	5

(f)

Force, f N	Frequency
$10 \le f < 19$	3
$19 \le f < 25$	12
$25 \le f < 28$	9
$28 \le f < 31$	4
$31 \le f < 34$	2

Question 1: Mr Smith has drawn a histogram to represent his classes' examination scores.

    (a) Can you explain what Mr Smith has done wrong?
    (b) Draw a correct histogram for Mr Smith

Examination score	Frequency
0 < s ≤ 30	3
30 < s ≤ 50	4
50 < s ≤ 70	10
70 < s ≤ 80	10
80 < s ≤ 90	5
≤ 100	

Histograms: Drawing
Video 157 on www.corbettmaths.com

Corbett
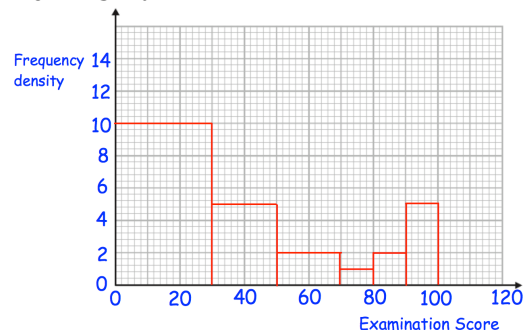
Question 2: The ages of the members of a snooker club are shown in the table below.

(a) Draw a histogram to represent the data.

Ronnie, the manager of the snooker club, says that the average age of the members of the snooker club is under 32.

(b) Work out an estimate of the mean age of the members

(c) Do you agree with Ronnie?
    Explain your answer.

Age, x years	Frequency
20 < x ≤ 24	6
24 < x ≤ 28	10
28 < x ≤ 34	12
34 < x ≤ 40	9
40 < x ≤ 50	7
50 < x ≤ 65	6

Question 3: Christine has drawn a histogram to show the value of some antiques.
    She has made some mistakes.
(a)   Can you spot all the mistakes?

(b)   Draw a correct histogram to represent the data.
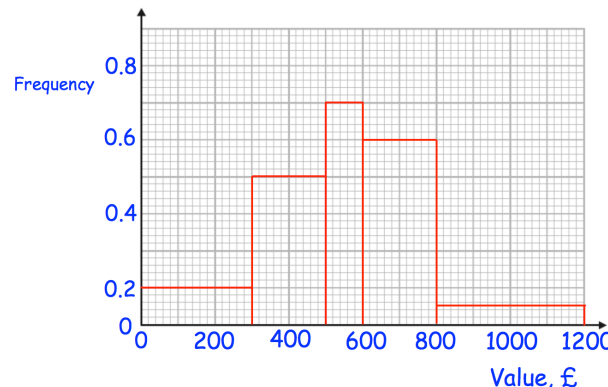
Value, v pounds	Frequency
0 ≤ v < 300	60
300 ≤ v < 500	100
500 ≤ v < 600	70
600 ≤ v < 800	60
800 ≤ v < 1200	40

Question 4: Henry has 20 apples in a crate.
    The masses of the apples are shown in the table.

(a)   Work out an estimate of the mean mass of an apple.

(b)   Draw a histogram to represent the data.

(c)   What fraction of the apples are over 85g?

Henry takes two apples from the crate at random, without replacement.

(d)   Work out the probability that both apples are over 90g.

Mass, m grams	Frequency
50 < m ≤ 70	2
70 < m ≤ 80	3
80 < m ≤ 85	6
85 < m ≤ 90	5
90 < m ≤ 110	4

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Value, v pounds	Frequency
0 ≤ v < 300	60
300 ≤ v < 500	100
500 ≤ v < 600	70
600 ≤ v < 800	60
800 ≤ v < 1200	40

Question 1: The histogram shows information about the time taken to travel to school by students.

Complete the frequency table.

Time taken, minutes	Frequency
0 < t ≤ 10	
10 < t ≤ 15	
15 < t ≤ 20	
20 < t ≤ 25	

Frequency Density

Time taken, minutes
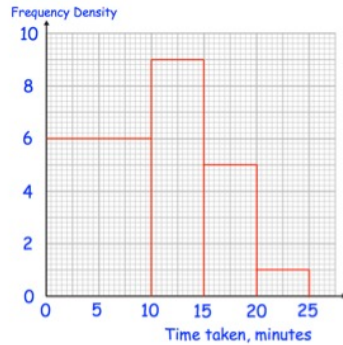
Question 2: The histogram shows information about the temperatures in various locations.

Complete the frequency table.

Temperature, °C	Frequency
0 < t ≤ 6	
6 < t ≤ 10	
10 < t ≤ 12	
12 < t ≤ 16	
16 < t ≤ 24	

Frequency Density

Temperature, °C
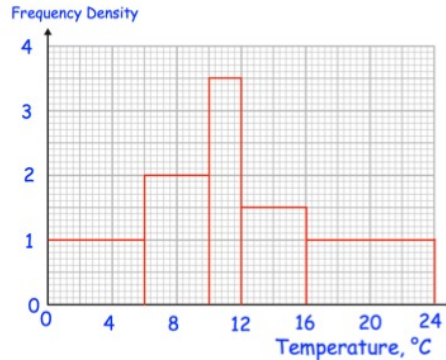
Question 3: The histogram shows information about the salaries of workers in a company.

Complete the frequency table.

Salary, £	Frequency
0 < s ≤ 20000	
20000 < s ≤ 30000	
30000 < s ≤ 35000	
35000 < s ≤ 40000	
40000 < s ≤ 60000	

Frequency Density

Salary, £
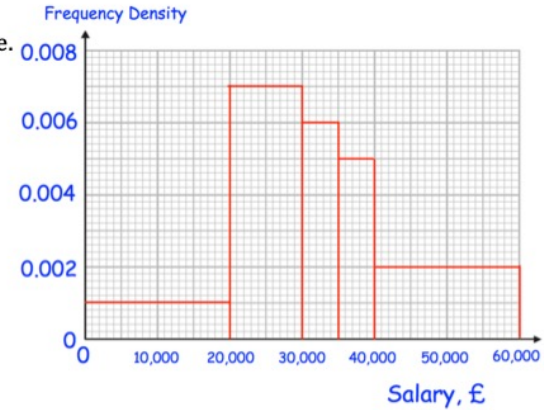
Question 4: The histogram shows information about ages of the people who live in a village.

Complete the frequency table.

Time, seconds	Frequency
0 < t ≤ 10	
10 < t ≤ 15	
15 < t ≤ 17.5	
17.5 < t ≤ 22.5	
22.5 < t ≤ 30	

Frequency Density

Time, seconds
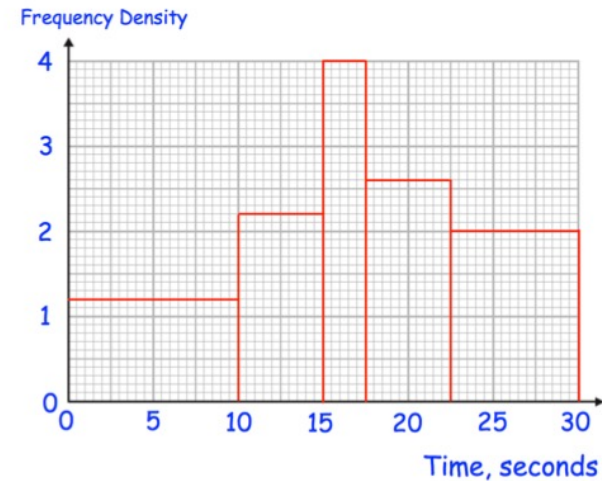
Question 5: The histogram shows information about distances students live from a college.

Frequency Density

(a) How many students attend the college?

(b) How many students live less than 10km from the college?

(c) How many students live between 15km and 20km from the college?

(d) Estimate how many students live more than 25km from the college.

(e) Estimate how many students live less than 5km from the college.

(f) Estimate how many students live between 5km and 12.5km from the college.

(g) Estimate how many students live between 12.5km and 17.5km from the college.

(h) Estimate how many students live between 10km and 14km from the college.

(i) Estimate how many students live between 8km and 16km from the college

(j) Estimate how many students live further than 16km from the college.
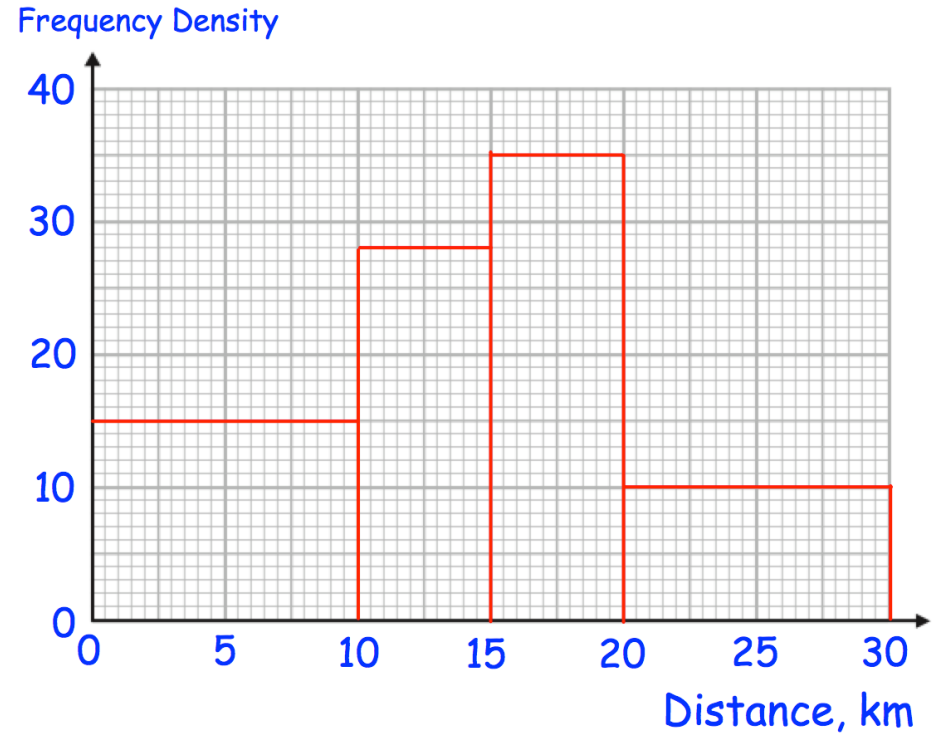
Question 1: An A-level course is marked out of 400 marks.
A teacher has created this histogram to represent the students' results in his college over the past 10 years.
The table shows the marks needed for each grade.

Work out an estimate of the number of students who achieved each grade.

Grade	Marks needed
A*	360
A	320
B	280
C	240
D	200
E	160
U	Below 160
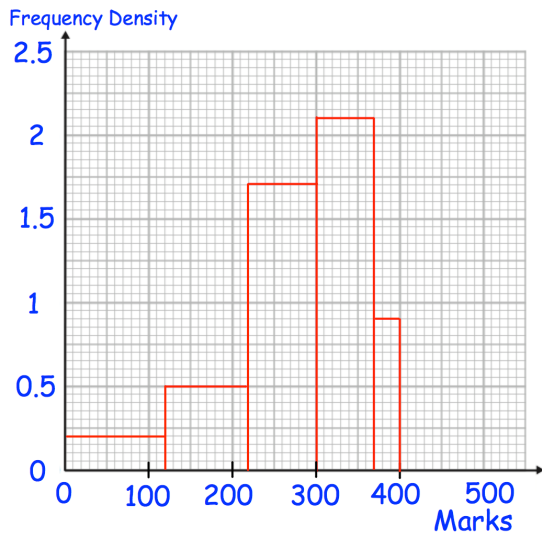
Question 2: There are road works in Antrim, so all the buses this week were late.
The histogram shows information about all the buses.

(a) Estimate what fraction of buses were less than 3 minutes late.

The bus company offers a full refund if the bus is more than 10 minutes late.

(b) Estimate what percentage of passengers will receive a full refund.
Give your answer to two decimal places.
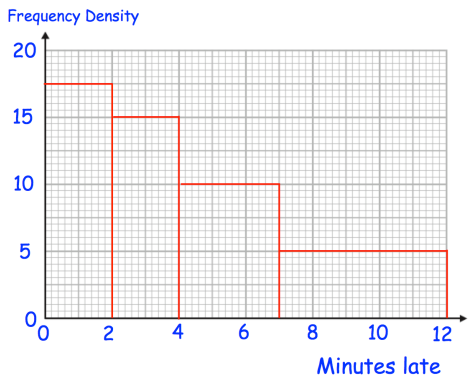
Question 3: 260 people sit a driving theory test.
Their results are shown in this histogram.

10% of the people scored less than x marks.

(a) Find x.

5% of people scored more than y marks.

(b) Find y

70% of people scored less than z marks.

(c) Find z
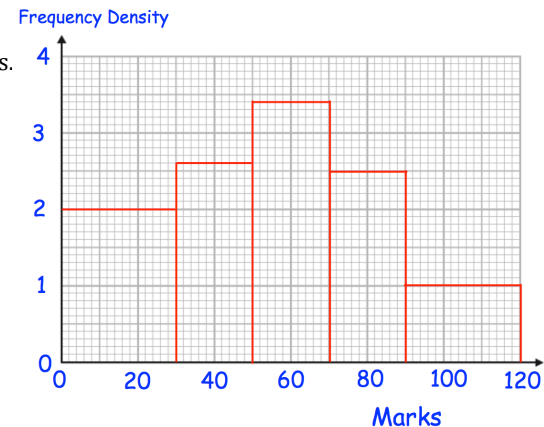
Question 4: The ages of the residents of a village are represented in this histogram

(a) How many people live in the village?

(b) Calculate an estimate of the mean age
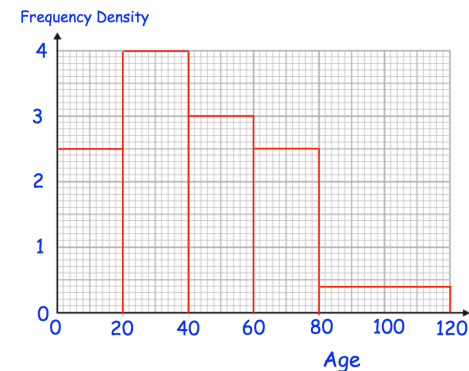
Question 5: The heights of some sunflowers are represented in the histogram.

(a) Find an estimate of the median

(b) Find an estimate of the lower quartile

(c) Find an estimate of the upper quartile

(d) Find an estimate of the interquartile range
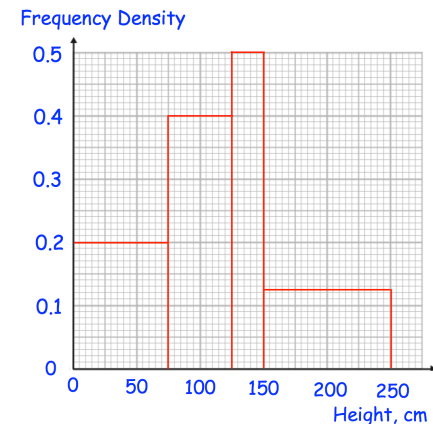
Question 6: The histogram shows the speed, in miles per hour, of cars on a road over 1 hour.
24 cars travelled faster than 40mph.

(a) How many cars travelled slower than 20mph?

(b) How many cars travelled between 20mph and 40mph?

(c) Estimate how many cars travelled between 15mph and 35mph.
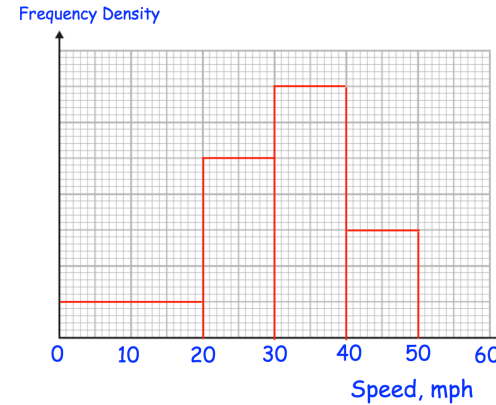
Question 7: The histogram below shows the ages of rugby players.
There are 768 players that are under 26 years old.

Work out an estimate of how many players are over 32.
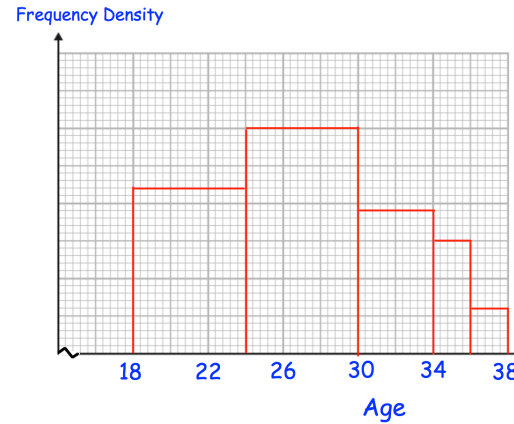
Question 8: The histogram below shows the monthly salaries of employees.
There are 216 people who have a monthly salary of between £1800 and £2100.

Work out an estimate of how many employees have a salary of between £2300 and £2900
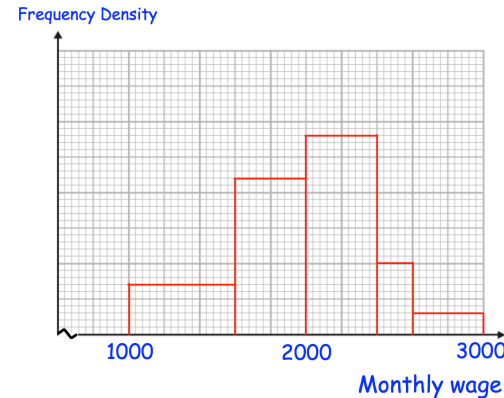
interpreting histograms

1.
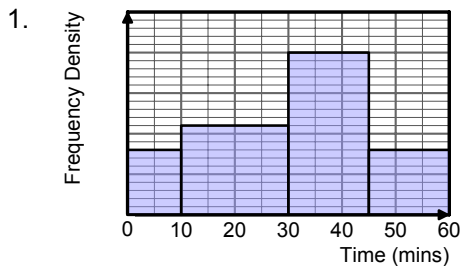
Twelve people waited more than 45 minutes.

How many people waited between 10 and 30 minutes?

2.

Twelve days had an average temperature between 10°C and 15°C.

How many days were surveyed in total?

3.

Twelve parcels weighed between 2kg and 5kg.

How many parcels weighed less than 5kg?

4.
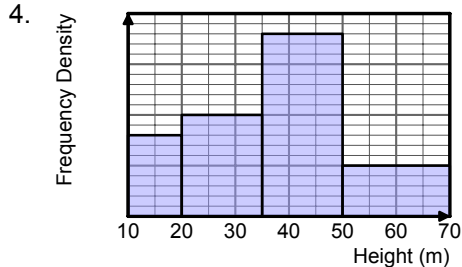
Ten rockets had a height greater than 50m.

How many rockets had a height between 20m and 50m?

5.

Forty rooms have a floor area between 20m² and 40m².

Estimate the number of rooms with a floor area greater than 50m².

6.
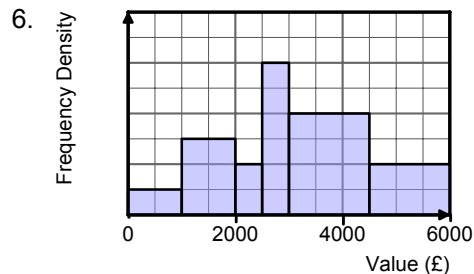
Five used cars were valued at less than £1000.

Estimate the number of used cars valued at less than £4000.

7. The histogram shows the ages of the workers at a company.

a) How many workers are between 20 and 30 years old?

b) True or false: there are more workers aged between 30 and 40 than between 40 and 55.

c) 60% of the workers at the company are female. Work out the number of female workers.
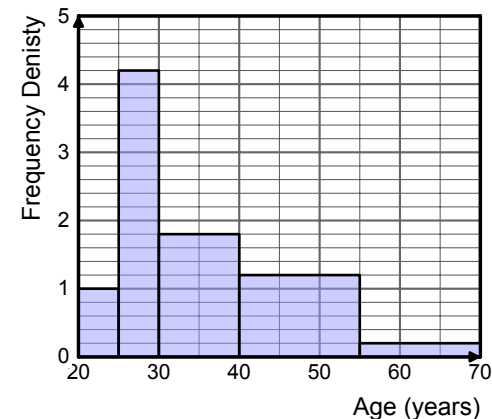
8. The histogram shows the duration of 64 flights offered by an airline.

a) How many of the flights are 3 hours or less in duration?

b) Work out an estimate for the number of flights that take between 2 and 6 hours.

c) Work out an estimate for the median flight time.
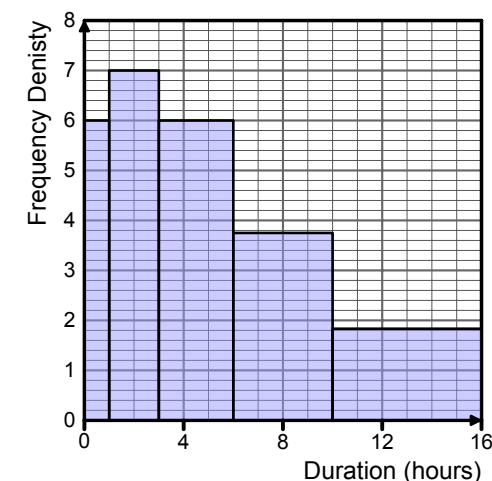
9. In a survey, 600 workers were asked about their salaries. The results are shown in the histogram.

a) Work out an estimate for the median salary of the workers.

A worker is to be chosen at random.

b) Work out the probability that their salary will be at most £15,000.

c) Work out an estimate for the probability that their salary is at least double the median salary.
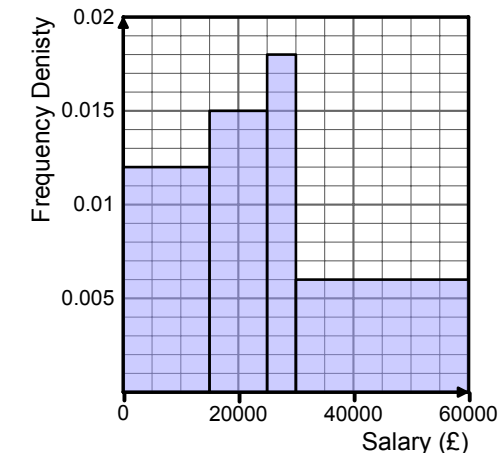
Question 1

Lloyd collects the lengths of 98 animals and records the data in the table below.

Length (z cm)	Frequency
$10 < z \leq 20$	16
$20 < z \leq 35$	45
$35 < z \leq 45$	11
$45 < z \leq 50$	10
$50 < z \leq 70$	16

A histogram was drawn and the class $35 < z \leq 45$ was represented by a rectangle of width 2 cm and height 5.5 cm.

Calculate the width and the height of the rectangle representing the class $20 < z \leq 35$.

Question 2

Lloyd collects the running times of 167 athletes and records the data in the table below.

Time (y seconds)	Frequency
$0 < y \leq 10$	34
$10 < y \leq 15$	32
$15 < y \leq 35$	20
$35 < y \leq 50$	30
$50 < y \leq 55$	6
$55 < y \leq 70$	45

A histogram was drawn and the class $50 < y \leq 55$ was represented by a rectangle of width 2 cm and height 9 cm.

Calculate the width and the height of the rectangle representing the class $0 < y \leq 10$.

Question 3

Lenny collects the heights of 115 plants and records the data in the table below.

Height (y cm)	Frequency
$20 < y \leq 35$	30
$35 < y \leq 40$	19
$40 < y \leq 45$	16
$45 < y \leq 55$	14
$55 < y \leq 60$	29
$60 < y \leq 80$	7

A histogram was drawn and the class $55 < y \leq 60$ was represented by a rectangle of width 1 cm and height 7.25 cm.

Calculate the width and the height of the rectangle representing the class $45 < y \leq 55$.

Question 4

Lesley collects the heights of 119 plants and records the data in the table below.

Height (x cm)	Frequency
$60 < x \leq 80$	22
$80 < x \leq 90$	12
$90 < x \leq 105$	15
$105 < x \leq 110$	25
$110 < x \leq 125$	45

A histogram was drawn and the class $105 < x \leq 110$ was represented by a rectangle of width 2.5 cm and height 6.25 cm.

Calculate the width and the height of the rectangle representing the class $60 < x \leq 80$.

Question 1: Draw a frequency polygon for each table of information below.

(a)

Goals	Frequency
0	7
1	10
2	12
3	3
4	1

(b)

Days absent	Frequency
0	16
1	5
2	4
3	2
4	1
5	2

(c)

Day	Customers
Monday	14
Tuesday	12
Wednesday	16
Thursday	21
Friday	25
Saturday	8

Question 2: Draw a frequency polygon for each table of information below.

(a)

Marks	Frequency
$0 < m \leq 10$	8
$10 < m \leq 20$	11
$20 < m \leq 30$	23
$30 < m \leq 40$	19
$40 < m \leq 50$	15

(b)

Time, seconds	Frequency
$0 < t \leq 5$	10
$5 < t \leq 10$	50
$10 < t \leq 15$	75
$15 < t \leq 20$	80
$20 < t \leq 25$	45
$25 < t \leq 30$	35

(c)

Mass, kg	Frequency
$0 < m \leq 1$	7
$1 < m \leq 2$	13
$2 < m \leq 3$	15
$3 < m \leq 4$	6
$4 < m \leq 5$	17
$5 < m \leq 6$	12

Question 3: For each frequency polygon, complete the frequency table.

(a)
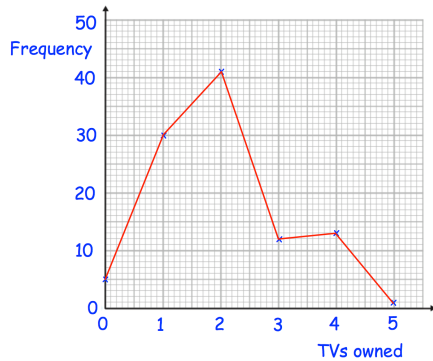
TVs owned	Frequency
0	
1	
2	
3	
4	
5	

(b)
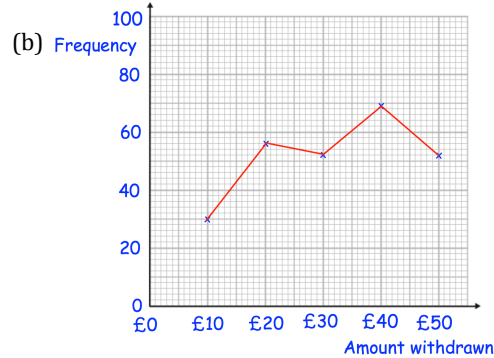
Amount Withdrawn	Frequency
£10	
£20	
£30	
£40	
£50	

Question 4: For each frequency polygon, complete the frequency table.

(a)
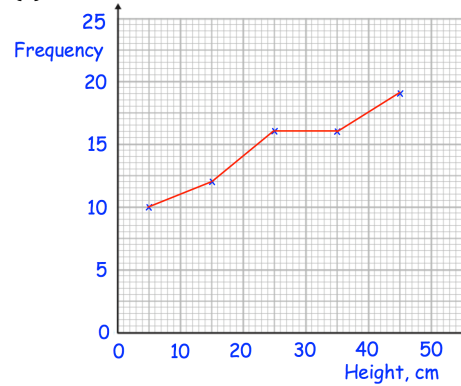
Length, cm	Frequency
$0 < x \leq 10$	
$10 < x \leq 20$	
$20 < x \leq 30$	
$30 < x \leq 40$	
$40 < x \leq 50$	

(b)
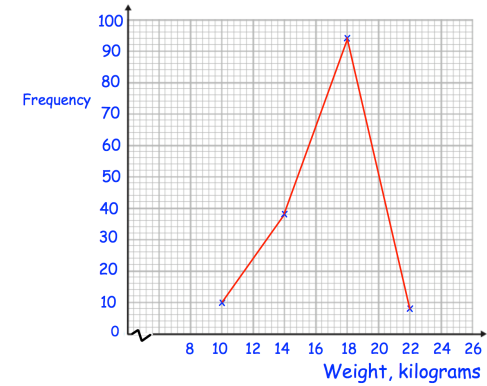
Weight, kg	Frequency
$8 < w \leq 12$	
$12 < w \leq 16$	

Apply

Question 1: Tia asked her friends how many times they visited the cinema last month. The frequency polygon shows her results.

(a) How many people visited the cinema twice?

(b) What is most popular number of times that her friends visited the cinema?

(c) What is the most number of times that somebody visited the cinema?

(d) How many people did Tia survey in total?
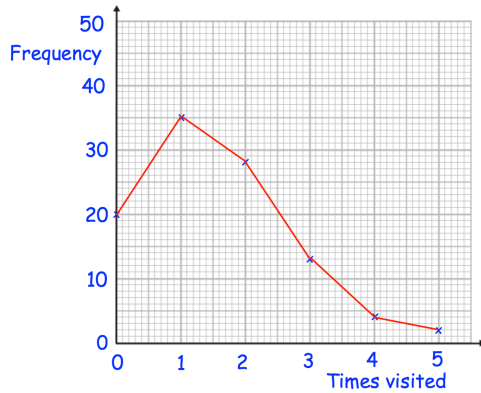
Question 2: Henry surveyed 50 people. This frequency polygon shows their shoe sizes.

(a) What is the modal shoe size?

(b) What is the range of the shoe sizes?

(c) What fraction of the people surveyed have size 5 shoes?

(d) What percentage of the people surveyed have size 7 shoes?

(e) Henry picks somebody at random to win a prize.
Write down the probability that the winner has size 6 shoes.
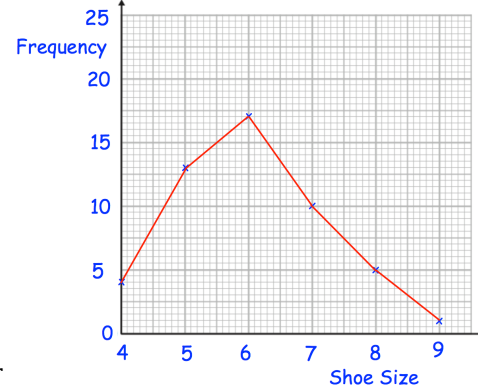
Question 3: Roy is a striker for Rovers. The frequency polygon shows the number of goals scored in each game over 20 games he has played.

(a) Work out the median number of goals scored per game.

(b) Work out the mean number of goals scored per game.

(c) A journalist asks him for the "average" number of goals scored per game.
Which average should he use?
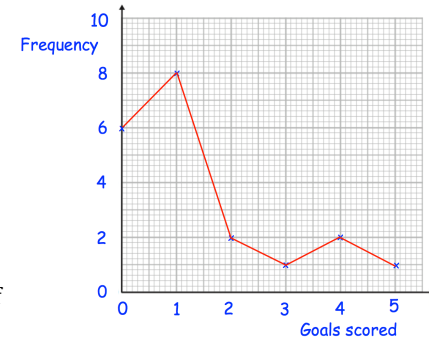
Question 4: The frequency polygons show the amount of time that 30 students in year 7 and 30 students in year 11 spent on their last maths homework.

Compare the time spent on homework by the year 7s and the year 11s.
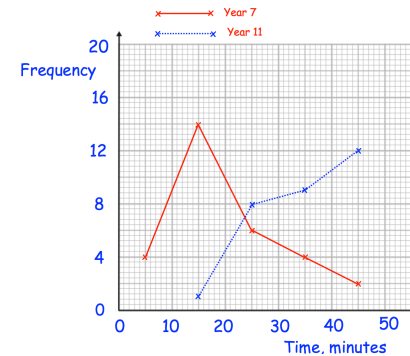
cumulative frequency

learn by heart

The **cumulative frequency** works like a 'running total'. It tells you the number of pieces of data up to and including a particular value.

example

The length of a number of television adverts is given in the frequency table.
Work out the cumulative frequencies.

Frequency Table

Time t (s)	Frequency
$0 < t \leq 10$	7
$10 < t \leq 20$	12
$20 < t \leq 30$	10
$30 < t \leq 40$	8
$40 < t \leq 50$	3

Cumulative Frequency Table

Time t (s)	Cumulative Frequency
$t \leq 10$	7
$t \leq 20$	19
$t \leq 30$	29
$t \leq 40$	37
$t \leq 50$	40

The second row tells you that 19 adverts lasted less than or equal to 20 seconds.

exercise

1. The widths of some birds are recorded and shown in the frequency table.

Width w (mm)	Frequency
$10 < w \leq 20$	2
$20 < w \leq 30$	6
$30 < w \leq 40$	14
$40 < w \leq 50$	18
$50 < w \leq 60$	7
$60 < w \leq 70$	4

Width w (mm)	Cumulative Frequency
$w \leq 20$	
$w \leq 30$	
$w \leq 40$	
$w \leq 50$	
$w \leq 60$	
$w \leq 70$	

a) Complete the cumulative frequency table for the data.

b) How many of the eggs had a width less than or equal to 40mm?

c) How many eggs had widths up to and including 60mm?

d) How many eggs were included in the data?

2. The hourly wages of the workers at a company are shown in the tables.

Hourly wage W (£)	Frequency
$4 \leq W < 8$	15
$8 \leq W < 12$	11
$12 \leq W < 16$	5
$16 \leq W < 20$	

Hourly wage W (£)	Cumulative Frequency
$W < 8$	
$W < 12$	
$W < 16$	
$W < 20$	33

a) Complete the tables.

b) How many workers are at the company?

c) How many workers earn less than £8 per hour?

d) How many workers earn £8 or more per hour?

3. The air temperature at midnight on a number of days was recorded. The data is shown in the cumulative frequency table.

Temperature T (°C)	Cumulative Frequency
$T \leq 0$	3
$T \leq 5$	9
$T \leq 10$	17
$T \leq 15$	21
$T \leq 20$	25

a) How many times was the temperature less than or equal to 5°C?

b) How many times was the temperature greater than 15°C?

c) How many times was the temperature in the range $10°C < T \leq 15°C$?

d) How many times was the temperature in the range $5°C < T \leq 15°C$?

4. The test scores of some pupils are shown in the cumulative frequency table.

| Score, x%	Cumulative Frequency
$x \leq 20$	2
$x \leq 40$	11
$x \leq 60$	25
$x \leq 80$	34
$x \leq 100$	40

a) How many pupils scored more than 80%?

b) How many pupils scored more than 40%?

c) How many pupils scored between 20% and 60%?

d) What fraction of the pupils scored 60% or less?

e) What percentage of the pupils scored 80% or less?

5. At a company, 30% of the workers earn less than £22,000. 88% of the workers earn less than £48,000. What percentage of workers have:

a) *salary* $\geq$ £48,000

b) £22,000 $\leq$ *salary* < £48,000

m𝛂ths

Cumulative frequency

Question 1:   Some students complete a quiz.
The cumulative frequency graph shows their results

(a) How many students completed the quiz?

(b) Complete the frequency table below.

(c) What percentage of the students scored above
     20 marks?

Marks	Frequency
0 < m ≤ 5	
5 < m ≤ 10	
10 < m ≤ 15	
15 < m ≤ 20	
20 < m ≤ 25	
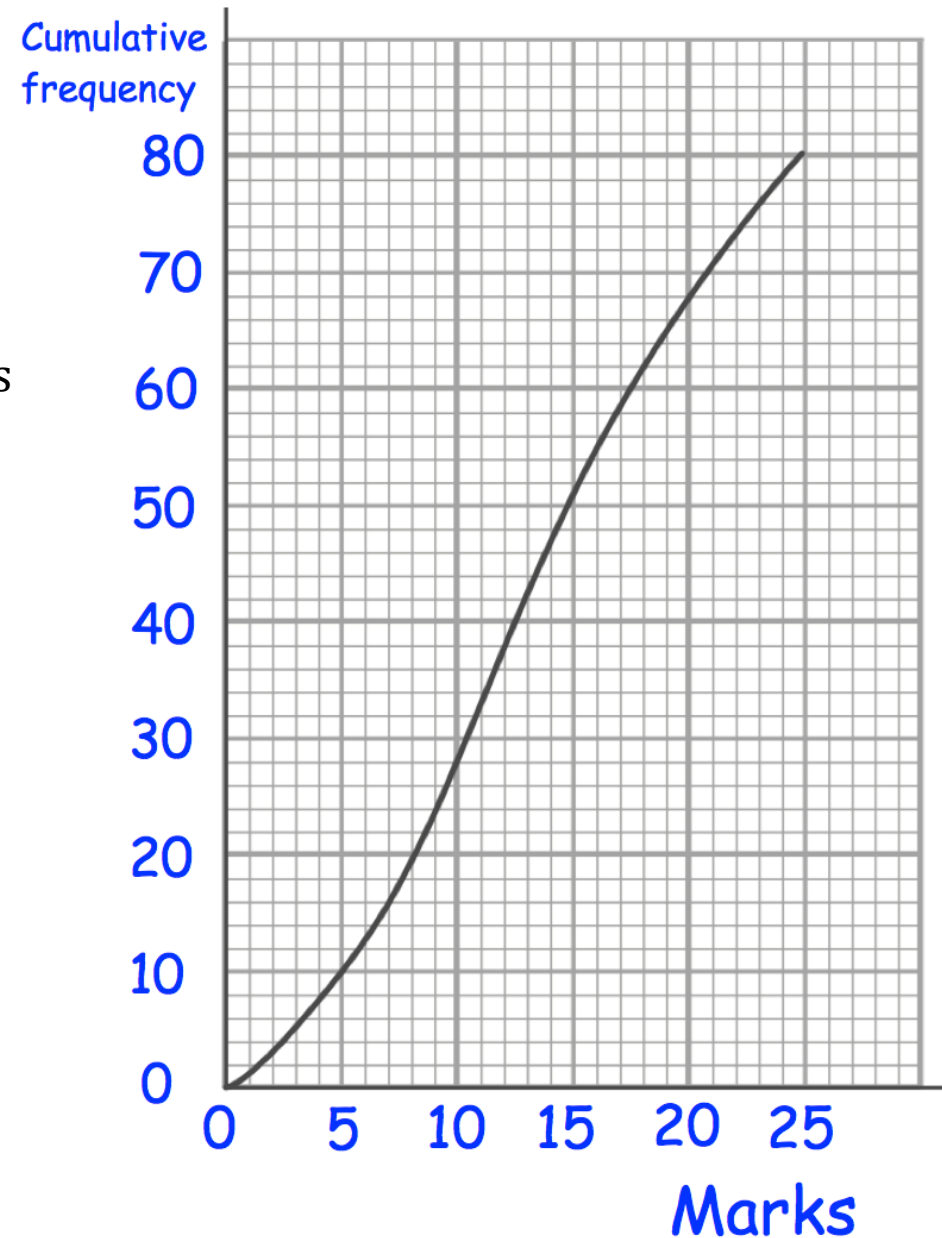
A company has 72 employees, all of whom are at least 20 years of age.

The number of employees aged from 20 to 30 is equal to the number of employees aged over 50.

The number of employees aged over 30 but no more than 40 is twice the number of employees aged over 50.

One third of the company's employees are over 40.

The company's oldest employee is exactly 60.

Construct a cumulative frequency graph for the ages of the employees.

Interpreting the Shapes of Cumulative Frequency Graphs

Each of these cumulative frequency graphs show the test scores for different science classes.

How can we describe the results represented by each graph?   How do the results relate to the median?

Most students scored very high or very low marks.

Nearly all students scored near the median.

Most students scored high marks
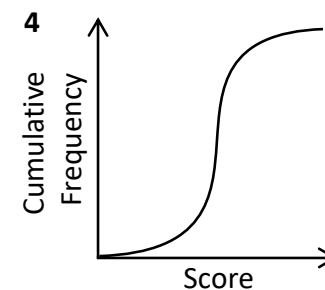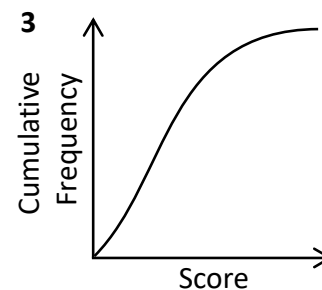
High median score.

Few students scored high marks

Low median score.
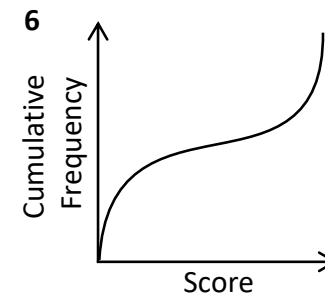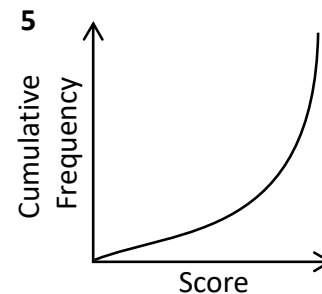
Most students scored near the median.
There are equal amounts of high & low scores.

Even distribution of students across the range of scores.
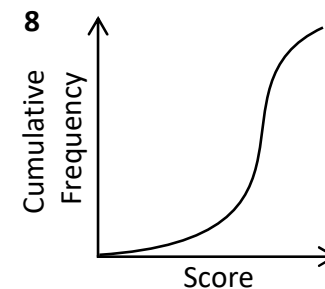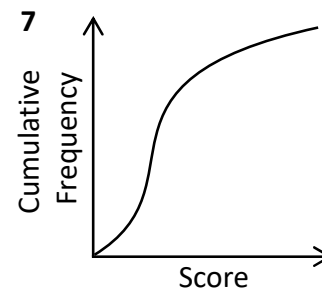
Find the lower quartile, upper quartile and interquartile range for each of these sets of data:

a) 4, 5, 7, 8, 8, 8, 9, 10, 10

b) 8, 9, 11, 12, 12, 12, 14, 14, 15, 17

c) 7.1, 7.2, 7.4, 7.4, 7.5

d) 19, 29, 31, 21, 28, 27, 24

e) 0.6, 0.23, 0.2, 0.7, 0.14, 0.1, 0.68

f) 20, 31, 25, 45, 46, 20, 34, 31

For each statement, decide if its possible and suggest 7 values that fit the description						
The interquartile range is equal to the range						
The interquartile range is equal to the median						
The interquartile range is larger than the range						
The upper quartile is equal to the median						
The median is 0 and the interquartile range is 5						
The range is negative						
The upper quartile is 1 and the range is 5						

Question 1: Draw a box plot for each of the following.

(a)

Lowest Value	2
Lower Quartile	7
Median	9
Upper Quartile	10
Highest Value	13

(b)

Lowest Value	23
Lower Quartile	30
Median	32
Upper Quartile	34
Highest Value	45

(c)

Lowest Value	60
Lower Quartile	85
Median	100
Upper Quartile	110
Highest Value	170

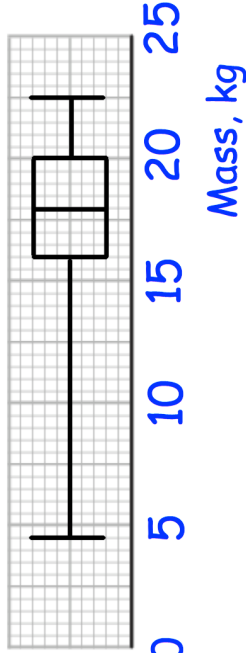Question 2: For each box plot below, find the (i) median, (ii) interquartile range, (iii) range

(a)

Score

(b)

Length, cm

(c)

Distance, km

(d)

Mass, kg
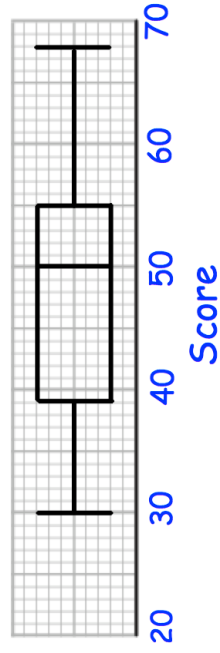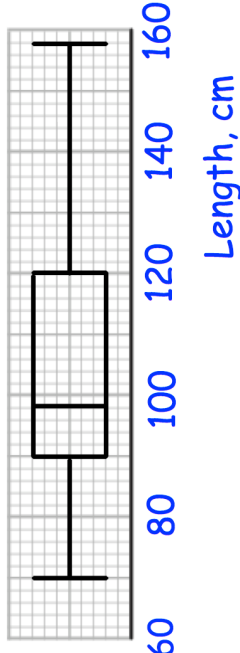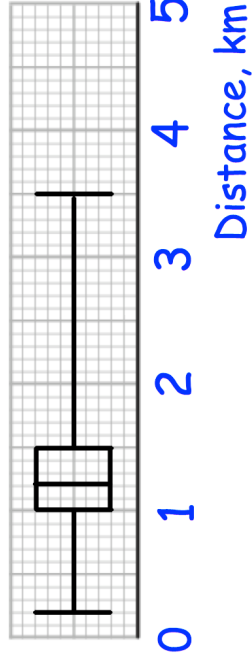
Question 3: Draw a box plot for each of the following.

(a)

Lower Quartile	3.4
Median	3.9
Upper Quartile	4.1
Highest Value	5.4
Range	3.7

(b)

Lowest Value	6
Median	14
Upper Quartile	16
Range	20
Interquartile Range	5

(c)

Lower Quartile	115
Median	135
Highest Value	160
Range	70
Interquartile Range	25

Question 4:   Draw a box plot for each set of data

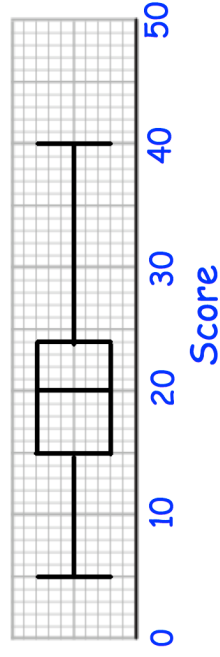(a)   8, 10, 13, 14, 14, 15, 15, 16, 18, 19, 21, 22, 24, 29, 35

(b)   40, 80, 90, 90, 100, 120, 130

(c)   5.9, 7.3, 7.8, 8, 8.4, 8.7, 8.9, 8.9, 9, 9.1, 9.1, 9.3, 9.5, 9.6, 9.9, 10.5, 10.9

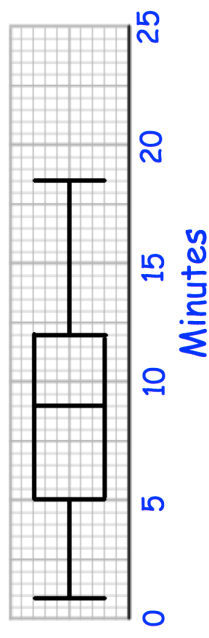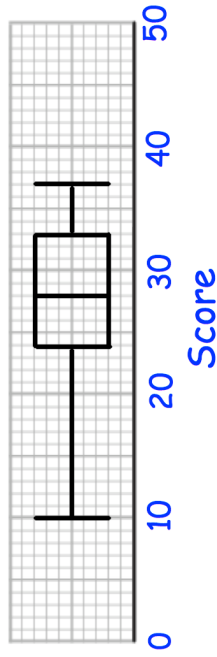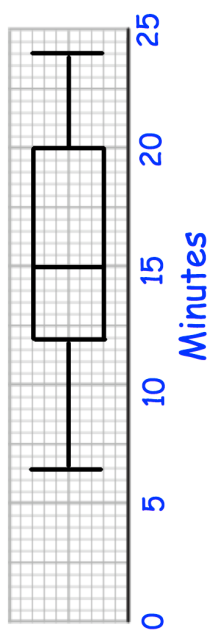Question 5:   Compare the distributions of each pair of box plots below.

(a)

7A results — Score

7B results — Score

(b)

Time taken to complete puzzle – Children — Minutes

Time taken to complete puzzle – Adults — Minutes

(c)

Length of red squirrels — Centimetres
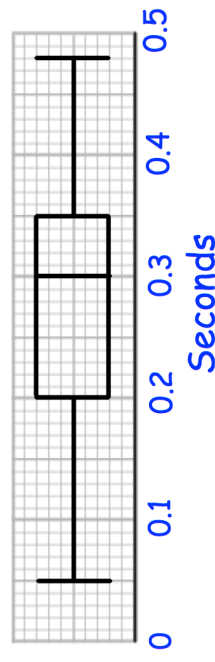
Length of grey squirrels — Centimetres

(d)

Reaction Times – Group A — Seconds
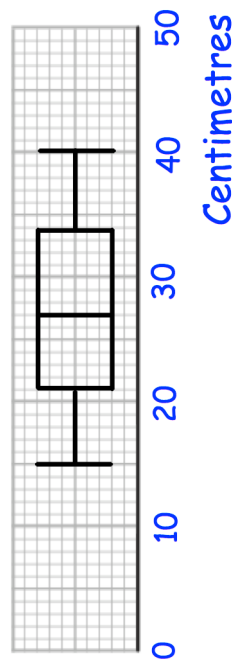
Reaction Times – Group B — Seconds
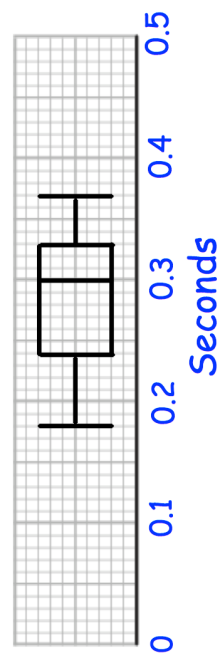
Question 1: Gareth and Wayne are two footballers.
The table shows information about the number of passes they make in each game over a season.

	Gareth	Wayne
Lowest Value	5	2
Lower Quartile	12	11
Median	16	19
Upper Quartile	24	
Highest Value		57
Interquartile Range		25
Range	38	

(a) Find the missing values from the table

(b) Using the same scale, draw box plots to represent the data.

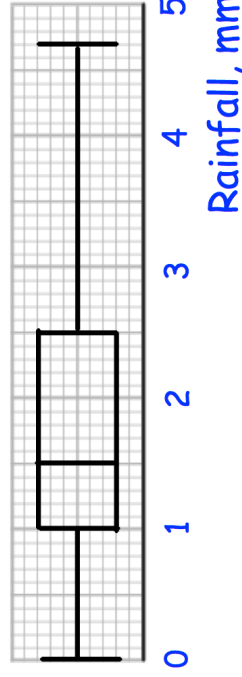(c) Compare and contrast the two box plots

Question 2: Rosie is going on holiday to an island.
The box plots below show information about the daily average rainfall in May and June on the island.

Average daily rainfall: May
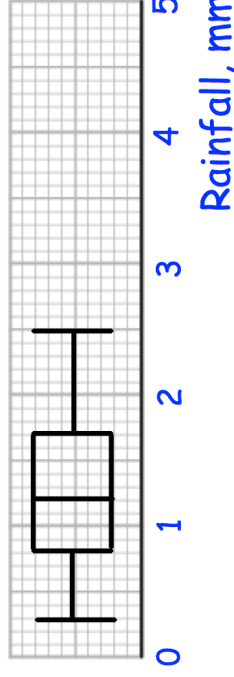
Rainfall, mm

Average daily rainfall: June


Rainfall, mm

(a) What was the median rainfall in May?

(b) What was the highest rainfall in June?

(c) What percentage of days in June had over 2.5mm of rain?

(d) What percentage of days in May had over 2.5mm of rain?

(e) What percentage of days in May had under 1.2mm of rain?

(f) When would you recommend Rosie visits the island?
Explain your answer.

Question 3: Mr Jones is an estate agent on the Isle of Man.
He has created this table to show information about the prices of houses he has sold.

Explain how you know he has made a mistake.

Median	£375,000
Range	£235,000
Interquartile Range	£590,000

Question 4: The box plot show information about the masses of apples in a crate.

Mass, grams

0   30   60   90   120   150
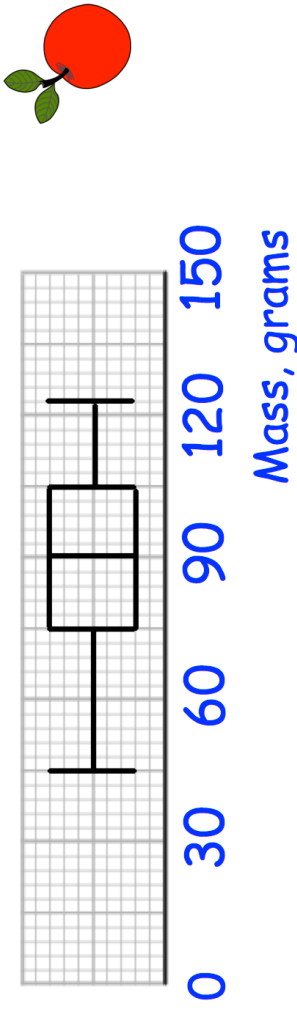
Jack is going to select apples at random from the crate.
After selecting each apple, he records its mass and returns it to the crate before picking another.
Work out the probability that:

(a) Jack picks two apples, both under 75g

(b) Jack picks two apples, both over 90g

(c) Jack picks two apples, both over 105g

(d) Jack picks two apples, one under 90g and one over 105g

(e) Jack picks three apples, all over 105g

(f) Jack picks three apples, two over 105g and one under 75g.

example

The **quartiles** of a data set are the values one quarter and three quarters of the way through the data.
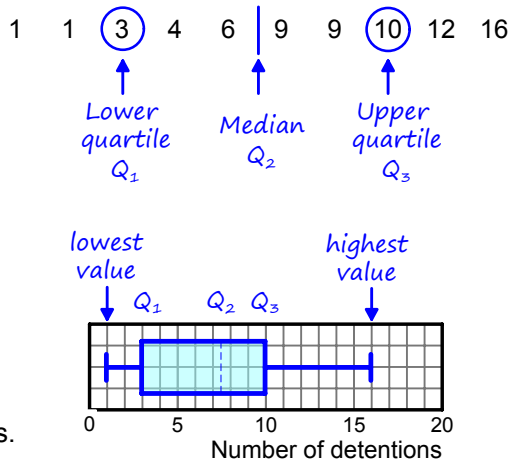
The **interquartile range** (IQR) is the difference between the upper and lower quartiles.

$$IQR = Q_3 - Q_1$$

The quartiles can be used to draw a **boxplot** for the data. This shows how the data is spread across the range of values.

1   1   ③   4   6 | 9   9   ⑩   12   16

Lower quartile Q_1 Median Q_2 Upper quartile Q_3

lowest value Q_1 Q_2 Q_3 highest value

Number of detentions

exercise

1. For each data set, work out Q_1, Q_2, Q_3 and the interquartile range.

   a) 7   9   11   14   16   16   18
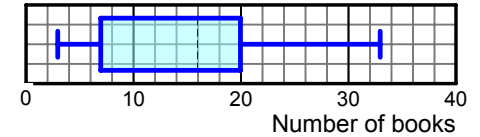
   b) 2   2   4   5   7   8   8   9   10   10   11   11   12

   c) 0.4   0.7   1.0   1.5   1.7   1.7   2.2   2.6

   d) 29   31   34   34   35   39   47   51   52   58   65   82

2. Work out the median and quartiles and construct a box plot:

   a) Number of customers each hour

   | 2 | 3 | 5 | 7 | 7 | 9 |
   | 9 | 9 | 9 | 13 | 14 | 19 |

   Number of customers

   b) Maximum day temperature (°C)

 | 12 | 12 | 14 | 16 | 19 | 20 | 21 |
   | 23 | 24 | 28 | 28 | 29 | 31 | 31 |
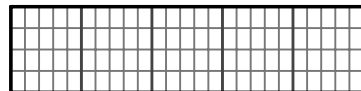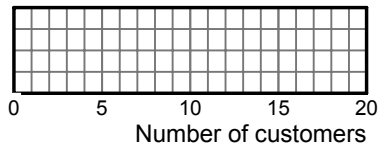
3. A group of people were asked how many books they read in a year. The boxplot shows the results.
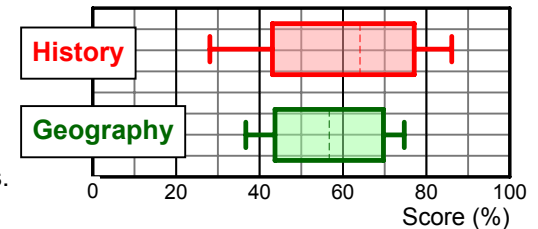
   a) State the median.

   b) Work out the range.

   c) Work out the interquartile range.

   d) What percentage of the people had read more than 20 books?

   e) What percentage of the people had read more than 7 books?

   Number of books

4. Two teams took part in a charity run. The times taken for members of the teams to complete the run are shown in the box plots.

   Team A

   Team B

   Time (mins)
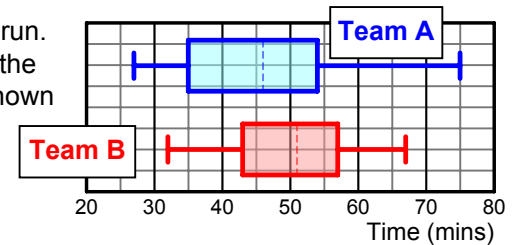
   a) On average, which team's members were quicker? Justify your answer.

   b) Which team had a smaller overall spread of times? Justify your answer.

   c) Which team had a smaller spread of the middle 50% of times.

5. The results of a class of pupils in exams for two subjects are shown in the box plots.

   History

   Geography

   Score (%)

   Compare the distributions of exam results in the two subjects.

6. Which boxplot matches each statement?

The median is 23mins	The interquartile range is 26mins
The boxplot with the smallest range	The IQR is less than half of the range.
At least 25% of the data values are greater than 40mins.	At least $\frac{3}{4}$ of the data values are less than 35mins.

   A

   B

   C

   Time (mins)
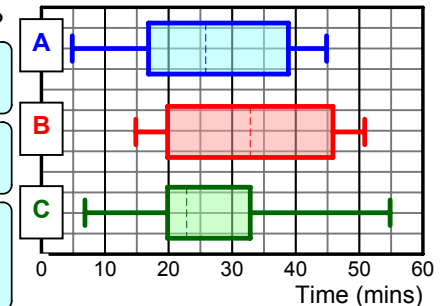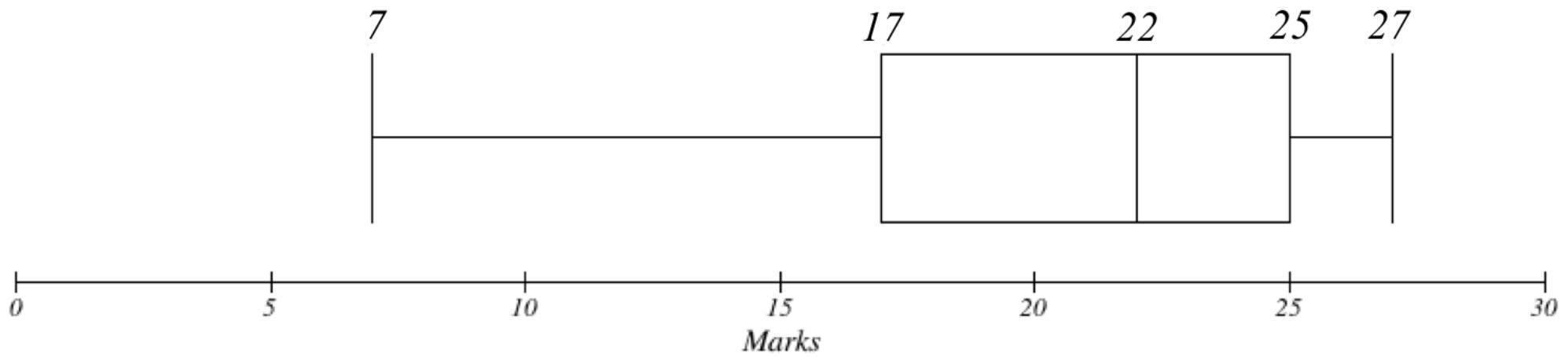
The boxplot above shows the distribution of marks scored in a test by pupils in a Geography class. There are 31 students in the class.

Find upper and lower bounds for the **mean** score achieved by the 31 students.

Sketch it!   Class 9Y2 are taking a maths test. What would the **box plot of their results** look like if…

a)   …the test was far too easy.

0%   100%

b)   …there was a high median & a small interquartile range.

0%   100%

c)   …the distribution was symmetrical.

0%   100%

d)   …the class did well, except George who was late!

0%   100%

e)   …the results were very consistent.

0%   100%

f)   …the results were perfectly distributed.

0%   100%

g)   …the results were low scoring & inconsistent.

0%   100%

h)   …50% of the students got 100%.

0%   100%

i)   …the test was too difficult for most, but Mary got 100%!

0%   100%

j)   …the interquartile range was 20% of the range.

0%   100%

k)   …the lowest result was shared by 25% of the students.

0%   100%

l)   …only the top 50% of students had consistent results.

0%   100%

What interesting results & distributions can you sketch?

Question 1: Draw a line graph for each of the following tables

(a)

Year	Population
1990	40
1995	44
2000	50
2005	62
2010	88
2015	90

(b)

Time	Price
9am	30p
10am	24p
11am	25p
12 noon	27p
1pm	37p
2pm	38p

(c)

Month	Height, cm
1	3
2	5
3	10
4	20
5	35
6	36

Question 2: Sally recorded the number of cars in a car park every two hours. She begun at 9am and finished at 7pm. The line graph shows her results.

(a) When were the most cars in the car park?

(b) How many cars were in the car park at 11am

(c) At what time were there 24 cars in the car park?

(d) Estimate the number of cars in the car park at 10am.

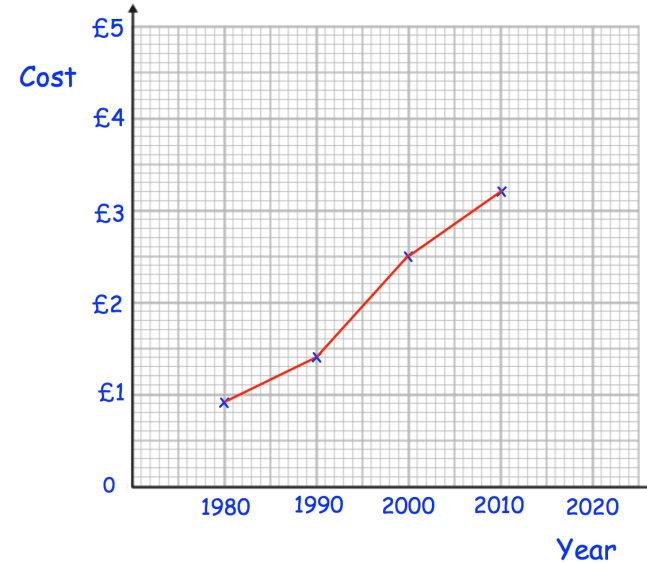(e) How many less cars were in the car park at 3pm than 1pm?
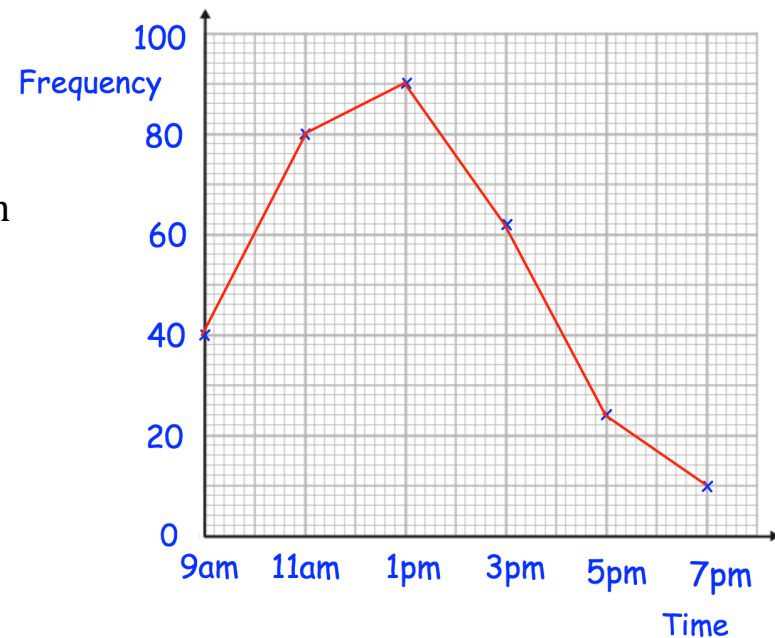
Question 3: The line graph below shows the cost of a coffee in a shop over 30 years.

(a) In which year was the price £2.50?

(b) How much was the price of a coffee in 1990?

(c) Estimate the price of a coffee in 2005.

Carlos says that the price of a coffee will be £3.60 by 2020.

(d) Do you agree with Carlos?
Explain your answer.

Question 4: The table below shows the average temperature in Belfast and Plymouth.

(a) Draw line graphs on the same axes to show the temperatures in Belfast and Plymouth.

|	Belfast	Plymouth
Monday	14°C	17°C
Tuesday	16°C	18°C
Wednesday	15°C	13°C
Thursday	10°C	12°C
Friday	9°C	10°C
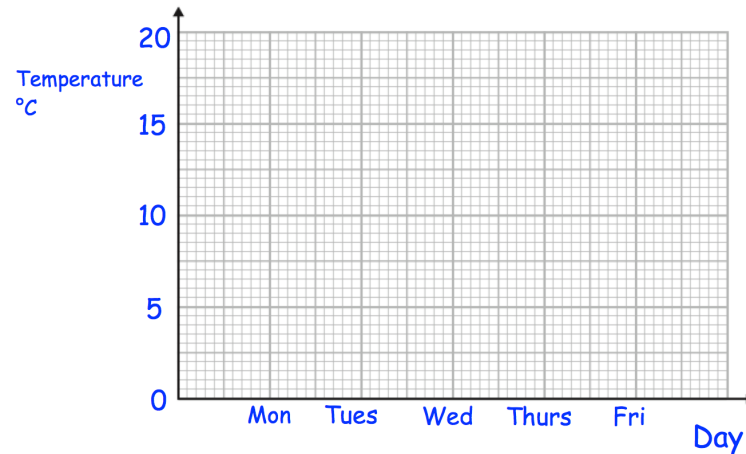
(b) On which day did Belfast have a higher temperature than Plymouth?

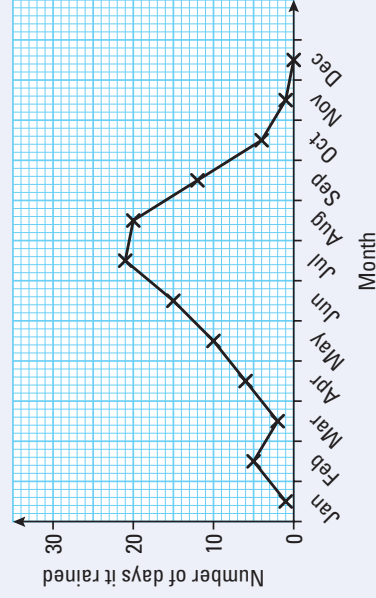(c) Between which two consecutive days did the temperature in Belfast change the most?

1 The graph shows the number of ice creams sold each day during one week.

How many more ice creams were sold on Tuesday than on Monday?

(June 2006)
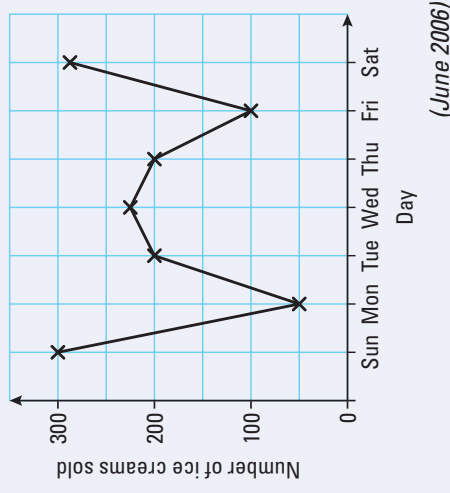
2 The graph shows information about the rainfall in Kathmandu. It shows the number of days it rained each month.


a Write down the number of days it rained in April.

b In which month did it rain most?

One month it rained on exactly 12 days.

c Which month?

(March 2008, adapted)

3 The table shows the number of cars sold by a garage each month from July to December.

July	August	September	October	November	December
28	26	25	21	22	17

a Draw a time series graph to show this information.

b Describe the trend in the number of cars sold at this garage.

4 This graph shows the number of job vacancies in a town from 2006 – 2008.
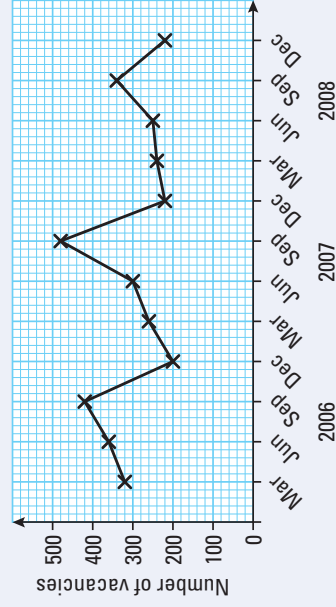
a Describe the seasonal variation in the number of job vacancies.

b Describe the trend in the number of job vacancies over the three years.