Year 7
Mathematics
Unit 2 – Student

Name: _____

Class: _____

Contents

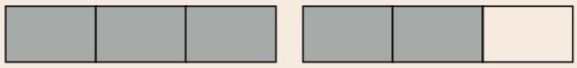
fractura *n.* a breach or break (Latin)

fracture *n.*

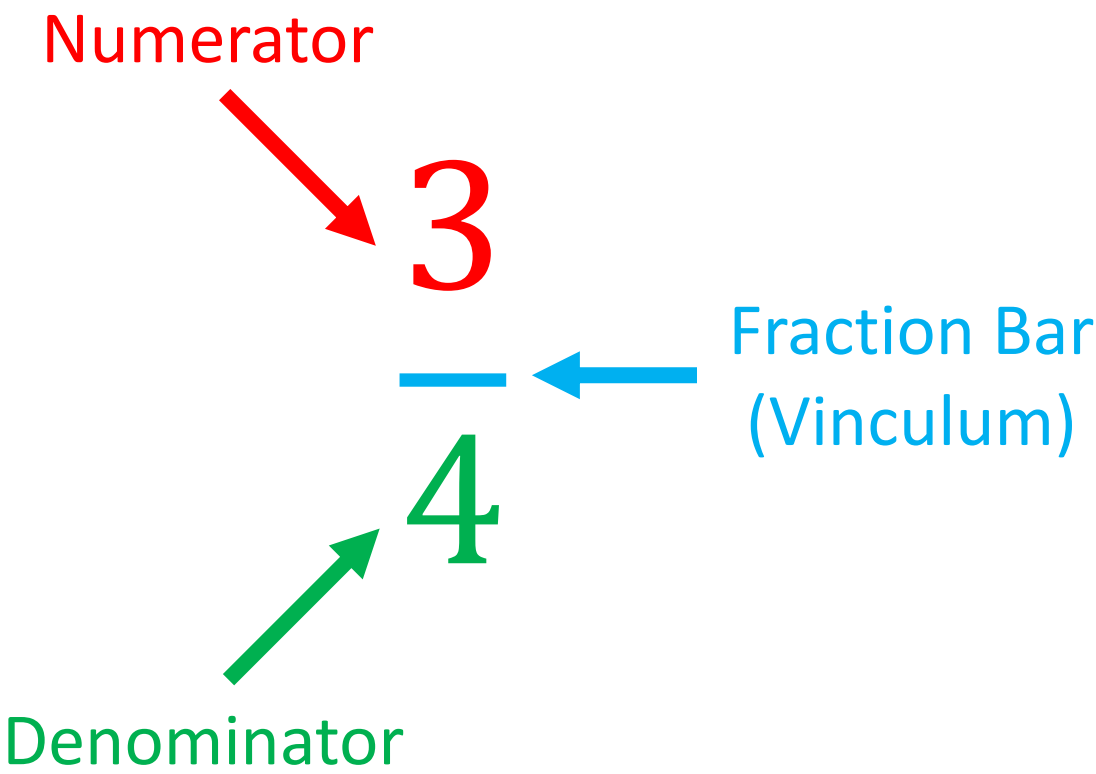
1. An instance of breaking or a place where something is broken.
2. A break in a bone.

fraction *n.*

1. In everyday English, a part of a whole, especially a very small part e.g. *she only spends a fraction of her time doing any work.*
2. In mathematics, a ratio of two numbers written as a numerator and denominator separated by a horizontal line.



$\frac{5}{3}$ or $1\frac{2}{3}$ bars are shaded

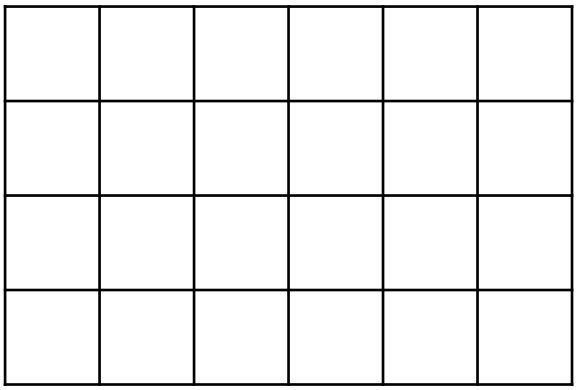


1.1 Shading Fractions

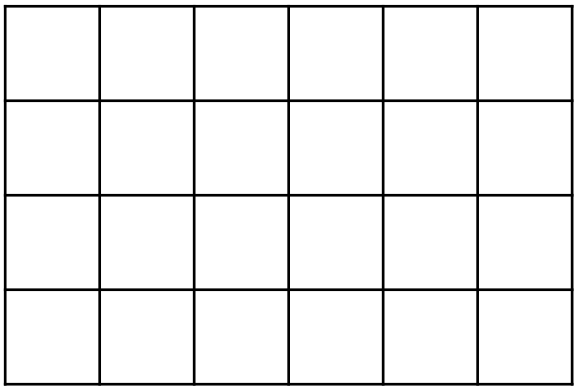
Fractions can be illustrated by dividing a shape into equal parts, and shading a certain number of these parts. The denominator is the number of equal parts that diagram has been cut into, and the numerator is the number of equal parts that has been shaded.

Worked Example

a) Shade $\frac{5}{24}$ of the shape

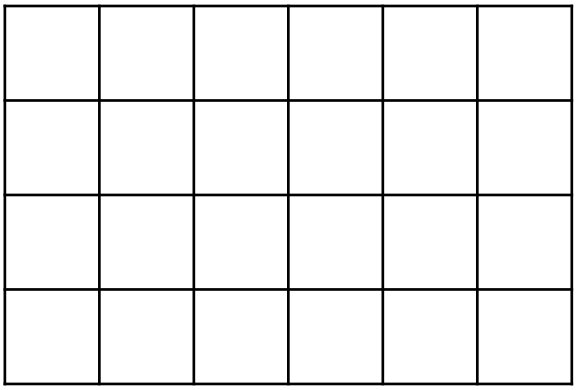


b) Shade $\frac{5}{6}$ of the shape

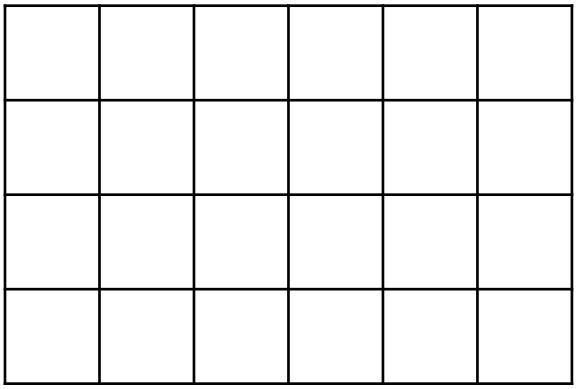


Your Turn

a) Shade $\frac{7}{24}$ of the shape



b) Shade $\frac{3}{4}$ of the shape



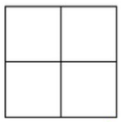
Fluency Practice

Question 1: Shade in each shape by the fraction given.

(a)

Shade in $\frac{1}{3}$

(b)

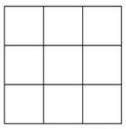


Shade in $\frac{1}{4}$

(c)

Shade in $\frac{2}{3}$

(d)



Shade in $\frac{5}{9}$

(e)

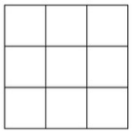
Shade in $\frac{2}{7}$

(f)

Shade in $\frac{4}{5}$

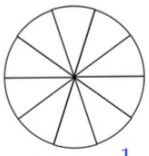
Question 2: Shade in each shape by the fraction given.

(a)



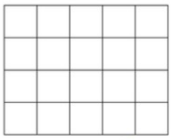
Shade in $\frac{2}{3}$

(b)



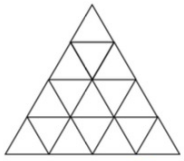
Shade in $\frac{1}{5}$

(c)



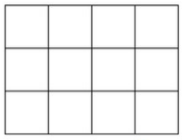
Shade in $\frac{3}{4}$

(d)



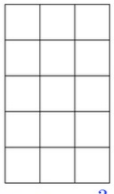
Shade in $\frac{1}{4}$

(e)



Shade in $\frac{2}{3}$

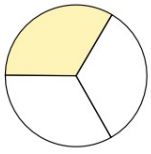
(f)



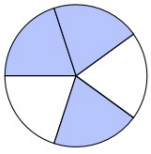
Shade in $\frac{3}{5}$

Question 3: Write down the fraction of each shape that is shaded.

(a)



(b)



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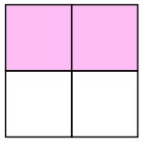
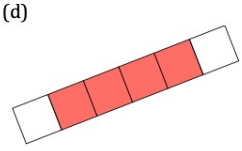
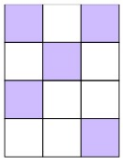


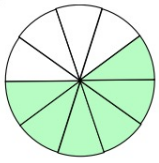
(d)



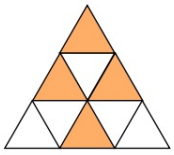
(e)



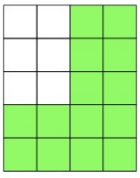
(f)



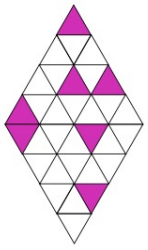
(g)



(h)

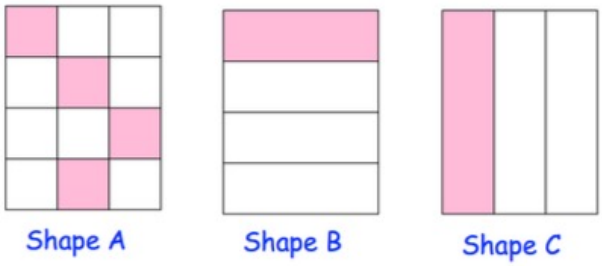


(i)



Extension

Question 1: Which shape is the odd one out?
Explain your answer.

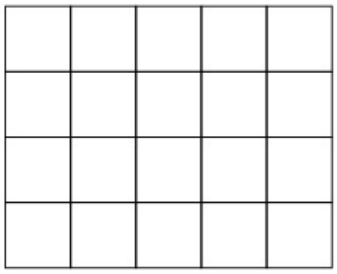


Question 2: Jamie is trying to shade $\frac{1}{3}$ of the grid.

Each square he decides to shade, he must shade in fully.

Can he successfully shade in $\frac{1}{3}$ of the grid?

Explain your answer.



1.2 Equivalent Fractions

Equivalent fractions are two or more fractions that have the same value, even though they have different numerators and denominators. Equivalent means equal.

Equivalent fractions help you to:

- Simplify and compare fractions.
- Add and subtract fractions.
- Share things equally between people, like pizza and sweets.

Worked Example	Your Turn
Multiply these fractions so they have a denominator of 8 a) $\frac{1}{2}$ b) $\frac{3}{4}$	Multiply these fractions so they have a denominator of 12 a) $\frac{1}{2}$ b) $\frac{3}{4}$

Fluency Practice

Question 1: Find the missing numbers

(a) $\frac{2}{3} = \frac{\quad}{6}$ (b) $\frac{1}{5} = \frac{\quad}{20}$ (c) $\frac{3}{4} = \frac{\quad}{12}$ (d) $\frac{5}{7} = \frac{10}{\quad}$

(e) $\frac{\quad}{5} = \frac{15}{25}$ (f) $\frac{4}{\quad} = \frac{12}{21}$ (g) $\frac{3}{10} = \frac{\quad}{50}$ (h) $\frac{7}{8} = \frac{14}{\quad}$

(i) $\frac{3}{4} = \frac{30}{\quad}$ (j) $\frac{\quad}{8} = \frac{55}{88}$ (k) $\frac{2}{9} = \frac{10}{\quad}$ (l) $\frac{2}{3} = \frac{\quad}{18}$

(m) $\frac{1}{20} = \frac{5}{\quad}$ (n) $\frac{5}{6} = \frac{\quad}{18}$ (o) $\frac{3}{8} = \frac{9}{\quad}$ (p) $\frac{7}{12} = \frac{\quad}{36}$

Question 2: Find the missing numbers

(a) $\frac{6}{7} = \frac{42}{\quad}$ (b) $\frac{9}{20} = \frac{63}{\quad}$ (c) $\frac{5}{12} = \frac{35}{\quad}$ (d) $\frac{7}{8} = \frac{\quad}{64}$

(e) $\frac{4}{\quad} = \frac{32}{72}$ (f) $\frac{3}{4} = \frac{\quad}{52}$ (g) $\frac{7}{25} = \frac{140}{\quad}$ (h) $\frac{\quad}{15} = \frac{42}{105}$

(i) $\frac{11}{16} = \frac{88}{\quad}$ (j) $\frac{2}{9} = \frac{\quad}{108}$ (k) $\frac{13}{25} = \frac{\quad}{375}$ (l) $\frac{9}{\quad} = \frac{81}{144}$

Intelligent Practice

Multiply these fractions so they have a denominator of 30

1) $\frac{1}{15}$

2) $\frac{1}{10}$

3) $\frac{1}{6}$

4) $\frac{1}{5}$

5) $\frac{1}{3}$

6) $\frac{1}{2}$

7) $\frac{3}{6}$

8) $\frac{3}{5}$

9) $\frac{3}{10}$

10) $\frac{3}{15}$

11) $\frac{8}{15}$

12) $\frac{80}{150}$

Multiply these fractions so they have a denominator of 24

1) $\frac{2}{12}$

2) $\frac{2}{8}$

3) $\frac{2}{6}$

4) $\frac{2}{4}$

5) $\frac{2}{3}$

6) $\frac{3}{2}$

7) $\frac{4}{2}$

8) $\frac{6}{2}$

9) $\frac{6}{3}$

10) 2

11) 1

12) 0

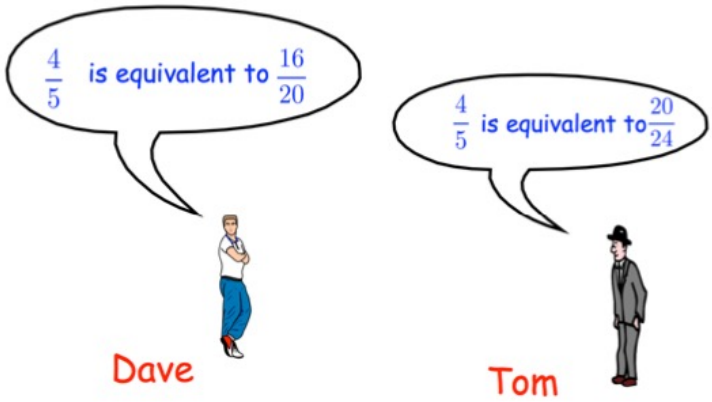
Extension

Question 1: Write down 3 different fractions that are equivalent to $\frac{1}{2}$

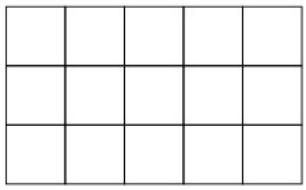
Question 2: Write down 3 different fractions that are equivalent to $\frac{3}{5}$

Question 3: Write down 3 different fractions that are equivalent to $\frac{7}{12}$

Question 4: Dave and Tom are discussing fractions.
Is either man correct?



Question 5: Use the grid to explain why $\frac{3}{4}$ cannot be written as a fraction with a denominator of 15.



Question 6: Macey has completed her maths homework.
Can you explain what she has done wrong?

(a) $\frac{3}{4} = \frac{4}{16}$

(b) $\frac{3}{5} = \frac{6}{15}$

(c) $\frac{7}{8} = \frac{35}{5}$

(d) $\frac{2}{8} = \frac{16}{40}$

1.3 Simplifying Fractions

You can simplify a fraction if the numerator and denominator can both be divided by the same number.

Worked Example	Your Turn
Simplify: a) $\frac{6}{20}$ b) $\frac{12}{20}$	Simplify: a) $\frac{6}{18}$ b) $\frac{12}{18}$

Fluency Practice

Question 1: Simplify fully

(a) $\frac{2}{4}$ (b) $\frac{6}{9}$ (c) $\frac{6}{8}$ (d) $\frac{5}{15}$ (e) $\frac{4}{6}$ (f) $\frac{9}{12}$

(g) $\frac{10}{15}$ (h) $\frac{9}{15}$ (i) $\frac{8}{12}$ (j) $\frac{10}{14}$ (k) $\frac{15}{35}$ (l) $\frac{6}{21}$

(m) $\frac{18}{22}$ (n) $\frac{16}{20}$ (o) $\frac{9}{24}$ (p) $\frac{20}{30}$ (q) $\frac{8}{28}$ (r) $\frac{300}{500}$

Question 2: Cancel down each fraction to its simplest form

(a) $\frac{14}{35}$ (b) $\frac{8}{64}$ (c) $\frac{18}{24}$ (d) $\frac{75}{100}$ (e) $\frac{24}{80}$ (f) $\frac{6}{42}$

(g) $\frac{36}{66}$ (h) $\frac{18}{45}$ (i) $\frac{70}{120}$ (j) $\frac{49}{56}$ (k) $\frac{22}{110}$ (l) $\frac{18}{72}$

(m) $\frac{60}{140}$ (n) $\frac{45}{135}$ (o) $\frac{40}{360}$ (p) $\frac{64}{100}$ (q) $\frac{85}{35}$ (r) $\frac{48}{36}$

Question 3: Simplify fully

(a) $\frac{145}{225}$ (b) $\frac{190}{570}$ (c) $\frac{200}{288}$ (d) $\frac{230}{495}$ (e) $\frac{54}{333}$ (f) $\frac{96}{123}$

Intelligent Practice

Simplify (if possible)

1) $\frac{2}{12}$

2) $\frac{3}{12}$

3) $\frac{4}{12}$

4) $\frac{5}{12}$

5) $\frac{10}{12}$

6) $\frac{20}{24}$

7) $\frac{15}{18}$

8) $\frac{35}{42}$

9) $\frac{35}{49}$

10) $\frac{35}{56}$

11) $\frac{56}{35}$

12) $\frac{35}{35}$

13) $\frac{5}{5}$

14) $\frac{0}{5}$

15) $\frac{15}{5}$

16) $\frac{14}{4}$

17) $\frac{13}{3}$

18) $\frac{12}{2}$

19) $\frac{12}{1}$

20) $\frac{12}{18}$

21) $3\frac{12}{18}$

22) $6\frac{12}{18}$

23) $\frac{612}{18}$

24) $\frac{603}{18}$

Extension

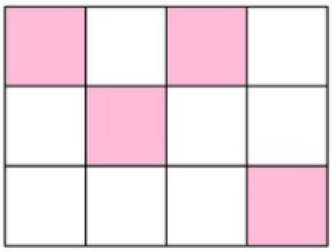
Question 1: Which fractions below are equivalent to $\frac{2}{3}$?

$$\frac{4}{6} \quad \frac{6}{8} \quad \frac{8}{12} \quad \frac{9}{12} \quad \frac{10}{15}$$

Question 2: James says that $\frac{1}{3}$ of the grid is shaded

Cara says $\frac{4}{12}$ of the grid is shaded.

Explain how they are both correct.



Question 3: Given that $5 \times 13 = 65$ and $7 \times 13 = 91$ simplify fully $\frac{65}{91}$

Question 4: Freddy has 40 cupcakes.
20 of the cupcakes are chocolate.
10 of the cupcakes are lemon.
8 of the cupcakes are strawberry.
The rest of the cupcakes of vanilla.

(a) What fraction of the cupcakes are chocolate?
Give the fraction in its simplest form.

(b) What fraction of the cupcakes are lemon?
Give the fraction in its simplest form.

(c) What fraction of the cupcakes are strawberry?
Give the fraction in its simplest form.

(d) What fraction of the cupcakes are vanilla?
Give the fraction in its simplest form.

Question 5: There are 200 students in a primary school.
80 students wear glasses.
What fraction of the students wear glasses?
Give the fraction in its simplest form.

Question 6: Sarah has £240 and she gives her mum £80.
What fraction of the money does Sarah have left?
Give the fraction in its simplest form.

Worked Example	Your Turn
Express 50p as a fraction of £4. Give your answer in its simplest form.	Express 20p as a fraction of £10. Give your answer in its simplest form.

Fluency Practice

Question 1: Give each answer as a simplified fraction

(a) Write 5 days as a fraction of 20 days

(b) Write £6 as a fraction of £8

(c) Write 10p as a fraction of 30p

(d) Write 6kg as a fraction of 12kg

(e) Write 9cm as a fraction of 15cm

(f) Write 25 days as a fraction of 35 days

(g) Write 8p as a fraction of 40p

(h) Write 52p as a fraction of 90p

(i) Write 30ml as a fraction of 110ml

(j) Write 360kg as a fraction of 480kg

Question 2: Give each answer as a simplified fraction

(a) Write 2 days as a fraction of 1 week

(b) Write 40p as a fraction of £3

(c) Write 5 minutes as a fraction of 2 hours

(d) Write 2 months as a fraction of 1 year

(e) Write 500g as a fraction of 40kg

(f) Write 750ml as a fraction of 3 litres

(g) Write 8g as a fraction of 4kg

(h) Write 920mm as a fraction of 12m

(i) Write £1.85 as a fraction of £1.20

(j) Write 50 seconds as a fraction of 1 hour

Extension

Question 1: There are 30 students in a class.
20 students have brown hair.
What fraction of the class have brown hair?
Give your answer in its simplest form.

Question 2: A bag contains red and white sweets.
There are 12 red sweets and 8 white sweets.
What fraction of the sweets are white?
Give your answer in its simplest form.

Question 3: Over one day, Rebecca spends 6 hours sleeping.
What fraction of the day is Rebecca awake?
Give your answer in its simplest form.

Question 4: John has 12 pieces of card, each with a letter written on it.

C	O	R	B	E	T	T	M	A	T	H	S

(a) What fraction of the letters are the letter T?
(b) What fraction of the letters are the letter A?
(c) What fraction of the letters are vowels?
(d) What fraction of the letters are **not** the letter T?

Question 5: Jemima receives £5 pocket money.
She spends £1.75 on a magazine and 80p on a drink.

(a) What fraction of the pocket money has she spent?
(b) What fraction of the pocket money does Jemima have left?

Question 6: In a town in Cornwall, it rained for 18 days during April.
What fraction of the month did it rain?

Question 7: Barry is saving money towards a new motorbike that costs £4,000.
Each month, he saves £5 more than the previous month.
In January he saves £60.
Over the first year of saving money, what fraction of the cost has he saved?

Question 8: In Victoria's class, there are 30 students.
Explain why Victoria must be wrong.

Question 9: Nigel has completed his homework.
Can you spot any mistakes?

In a bag there are 80 beads.
There are 35 yellow beads.
There are 17 red beads.
The rest of the beads are white.

$$35 + 17 = 52$$
$$80 - 52 = 38$$

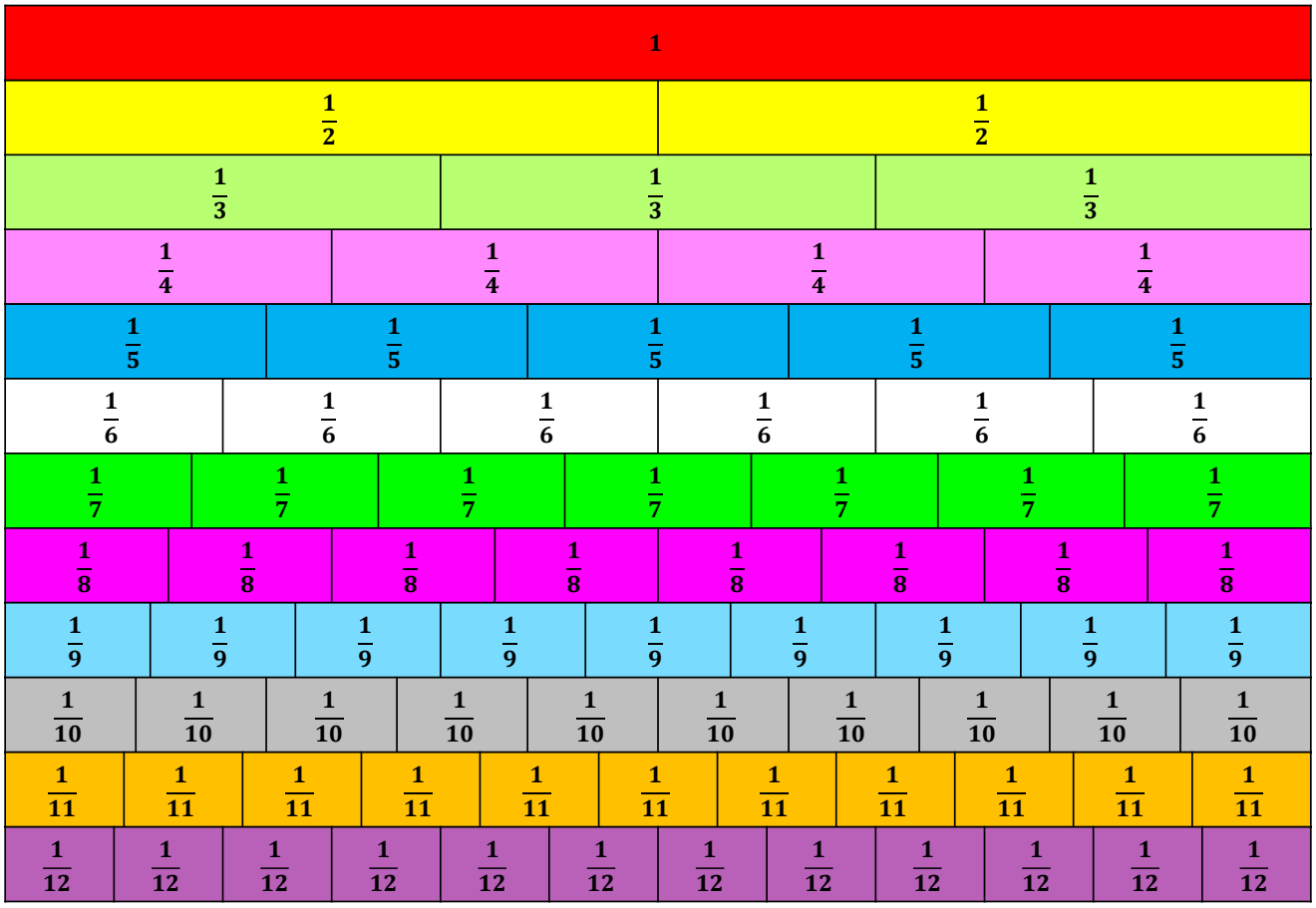
Work out what fraction of the beads are white.
Give your answer in its simplest form.

$$\frac{38}{80} = \frac{19}{40}$$

1.4 Comparing and Ordering Fractions

Comparing fractions is important because it shows you how much of the whole is being represented within each fraction.

Imagine you were sharing a cake. You would not want someone to get a much bigger piece than you! When cutting cakes, you visually compare fractions to make sure everyone gets an equal slice.



Worked Example	Your Turn
Circle the biggest fraction: a) $\frac{3}{5}$ or $\frac{2}{5}$ b) $\frac{3}{5}$ or $\frac{3}{4}$ c) $\frac{3}{5}$ or $\frac{7}{10}$ d) $\frac{3}{5}$ or $\frac{4}{7}$	Circle the biggest fraction: a) $\frac{4}{7}$ or $\frac{6}{7}$ b) $\frac{3}{10}$ or $\frac{3}{7}$ c) $\frac{2}{3}$ or $\frac{5}{9}$ d) $\frac{2}{3}$ or $\frac{3}{5}$

Fluency Practice

Section A – using common denominators, circle the biggest fraction in each question.

1) $\frac{5}{8}$ *or* $\frac{3}{8}$ 2) $\frac{3}{8}$ *or* $\frac{5}{8}$ 3) $\frac{5}{8}$ *or* $\frac{3}{4}$ 4) $\frac{10}{16}$ *or* $\frac{3}{4}$

5) $\frac{2}{3}$ *or* $\frac{7}{12}$ 6) $\frac{5}{6}$ *or* $\frac{11}{12}$ 7) $\frac{5}{6}$ *or* $\frac{9}{12}$ 8) $\frac{4}{5}$ *or* $\frac{20}{25}$

Section B – using common numerators, circle the biggest fraction in each question.

1) $\frac{3}{10}$ *or* $\frac{3}{5}$ 2) $\frac{3}{5}$ *or* $\frac{3}{10}$ 3) $\frac{3}{8}$ *or* $\frac{6}{15}$ 4) $\frac{9}{24}$ *or* $\frac{6}{15}$

5) $\frac{2}{3}$ *or* $\frac{8}{11}$ 6) $\frac{18}{21}$ *or* $\frac{6}{8}$ 7) $\frac{18}{25}$ *or* $\frac{6}{8}$ 8) $\frac{4}{5}$ *or* $\frac{20}{25}$

Section C – using either method, circle the biggest fraction in each question.

1) $\frac{3}{10}$ *or* $\frac{6}{15}$ 2) $\frac{5}{6}$ *or* $\frac{7}{12}$ 3) $\frac{2}{3}$ *or* $\frac{5}{7}$ 4) $\frac{2}{3}$ *or* $\frac{4}{7}$

5) $\frac{4}{7}$ *or* $\frac{12}{20}$ 6) $\frac{14}{21}$ *or* $\frac{7}{15}$ 7) $\frac{11}{14}$ *or* $\frac{5}{7}$ 8) $\frac{3}{5}$ *or* $\frac{4}{7}$

Section D Circle the fractions that are bigger than a half

$$\frac{4}{10} \quad \frac{5}{10} \quad \frac{6}{10} \quad \frac{2}{5} \quad \frac{3}{5} \quad \frac{4}{5} \quad \frac{3}{7} \quad \frac{5}{9} \quad \frac{6}{14} \quad \frac{8}{15} \quad \frac{22}{43}$$

What method did you use? This could be a useful first step when ordering several fractions.

Worked Example	Your Turn
Arrange the following fractions in ascending order: a) $\frac{3}{10}, \frac{5}{10}, \frac{1}{10}, \frac{4}{10}$ b) $\frac{1}{2}, \frac{3}{5}, \frac{3}{4}, \frac{7}{10}$	Arrange the following fractions in ascending order: a) $\frac{5}{8}, \frac{7}{8}, \frac{3}{8}, \frac{6}{8}$ b) $\frac{1}{2}, \frac{5}{6}, \frac{3}{4}, \frac{7}{8}$

Fluency Practice

Question 1: Arrange the following sets of fractions in order, from smallest to largest

(a) $\frac{6}{7}, \frac{1}{7}, \frac{2}{7}, \frac{5}{7}$ (b) $\frac{3}{10}, \frac{9}{10}, \frac{1}{10}, \frac{7}{10}$ (c) $\frac{2}{9}, \frac{8}{9}, \frac{5}{9}, \frac{1}{9}$

Question 2: Arrange the following sets of fractions in order, from smallest to largest

(a) $\frac{1}{5}, \frac{3}{10}, \frac{2}{5}, \frac{1}{10}$ (b) $\frac{1}{8}, \frac{1}{4}, \frac{5}{8}, \frac{3}{4}$ (c) $\frac{5}{9}, \frac{2}{3}, \frac{7}{9}, \frac{1}{3}$

(d) $\frac{3}{5}, \frac{13}{20}, \frac{2}{5}, \frac{9}{20}$ (e) $\frac{5}{6}, \frac{7}{12}, \frac{5}{12}, \frac{11}{12}$ (f) $\frac{7}{20}, \frac{23}{60}, \frac{9}{20}, \frac{29}{60}$

Question 3: Arrange the following sets of fractions in order, from smallest to largest

(a) $\frac{2}{3}, \frac{11}{15}, \frac{7}{15}, \frac{3}{5}$ (b) $\frac{13}{20}, \frac{3}{4}, \frac{7}{10}, \frac{11}{20}$ (c) $\frac{1}{2}, \frac{2}{3}, \frac{7}{12}, \frac{5}{6}$

(d) $\frac{13}{16}, \frac{3}{4}, \frac{5}{8}, \frac{11}{16}$ (e) $\frac{3}{50}, \frac{7}{100}, \frac{1}{10}, \frac{9}{200}$ (f) $\frac{13}{20}, \frac{4}{5}, \frac{7}{10}, \frac{23}{40}$

Question 4: Arrange the following sets of fractions in order, from smallest to largest

(a) $\frac{3}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{3}$ (b) $\frac{1}{4}, \frac{3}{8}, \frac{1}{6}, \frac{5}{12}$ (c) $\frac{9}{20}, \frac{5}{12}, \frac{3}{10}, \frac{17}{30}$

(d) $\frac{3}{25}, \frac{1}{10}, \frac{1}{8}, \frac{7}{50}$ (e) $\frac{27}{40}, \frac{3}{5}, \frac{5}{8}, \frac{6}{15}$ (f) $\frac{7}{20}, \frac{1}{3}, \frac{3}{8}, \frac{2}{5}$

Maths Venns

Bigger than $\frac{1}{2}$
If you think a region is impossible to fill, convince me why!
Denominator is 12
Simplifies
A
B
C
D
E
F
G
H
Think of a fraction that could belong in each of the regions

Maths Venns

Smaller than $\frac{3}{4}$
If you think a region is impossible to fill, convince me why!
Has a numerator of 2
Bigger than $\frac{1}{2}$
Think of a fraction that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns

Smaller than $\frac{1}{3}$
If you think a region is impossible to fill, convince me why!
Does not simplify
Bigger than $\frac{1}{4}$
Think of a fraction that could belong in each of the regions
A
B
C
D
E
F
G
H

1.5 Improper Fractions and Mixed Numbers

$2\frac{1}{2}$ is an example of a mixed number. This is when whole numbers and fractions are written together.

The same fraction can also be shown as an improper fraction, $\frac{5}{2}$. This is worth the same amount as the mixed number, but does not separate between whole numbers and parts. Improper fractions have numerators which are bigger than or equal to the denominators.

Improper fractions are sometimes called top-heavy fractions.

Frayer Model – Improper Fraction

Definition	**Characteristics**
A fraction where the numerator is greater than or equal to the denominator.	• Positive improper fractions are greater than or equal to 1.
Examples	**Non Examples**
• $\frac{16}{8}$ • $\frac{101}{52}$ • $\frac{5}{3}$ • $\frac{8}{4}$ • $\frac{12}{2}$ • $\frac{20}{11}$ • $\frac{2}{1}$ • $\frac{1}{1}$ • 1	• $\frac{8}{26}$ • $\frac{2}{3}$ • $\frac{7}{9}$ • $\frac{9}{14}$ • $\frac{3}{14}$ • $1\frac{1}{2}$ • $15\frac{5}{6}$ • $3\frac{2}{3}$ • $10\frac{6}{7}$ • $5\frac{2}{5}$ • $6\frac{11}{12}$

Frayer Model – Mixed Number

Definition	**Characteristics**
A number made up of an integer and fractional part.	• Is the result of adding the integer and fraction parts. • Negative signs apply to both the integer and fractional parts.
Examples	**Non Examples**
• $1\frac{1}{2}$ • $15\frac{5}{6}$ • $3\frac{2}{3}$ • $10\frac{6}{7}$ • $5\frac{2}{5}$ • $6\frac{11}{12}$	• $\frac{8}{4}$ • $\frac{2}{1}$ • $\frac{7}{5}$ • $\frac{3}{2}$ • $\frac{1}{1}$ • 1 • $\frac{8}{26}$ • $\frac{2}{3}$ • $\frac{7}{9}$ • $\frac{9}{14}$ • $\frac{3}{14}$

Worked Example	Your Turn
Convert $\frac{6}{5}$ into a mixed number	Convert $\frac{13}{5}$ into a mixed number

Fluency Practice

Question 1: Change these improper fractions into mixed numbers

(a) $\frac{7}{3}$ (b) $\frac{7}{5}$ (c) $\frac{5}{2}$ (d) $\frac{8}{7}$ (e) $\frac{5}{3}$

(f) $\frac{10}{3}$ (g) $\frac{23}{2}$ (h) $\frac{11}{4}$ (i) $\frac{11}{8}$ (j) $\frac{9}{4}$

(k) $\frac{13}{10}$ (l) $\frac{13}{6}$ (m) $\frac{16}{7}$ (n) $\frac{51}{10}$ (o) $\frac{34}{11}$

(p) $\frac{29}{12}$ (q) $\frac{60}{11}$ (r) $\frac{47}{15}$ (s) $\frac{101}{9}$ (t) $\frac{99}{20}$

(u) $\frac{12}{9}$ (v) $\frac{35}{10}$ (w) $\frac{18}{4}$ (x) $\frac{50}{6}$ (y) $\frac{40}{15}$

Intelligent Practice

Convert the following improper fractions into mixed numbers:

1) $\frac{7}{4}$

2) $\frac{9}{4}$

3) $\frac{9}{8}$

4) $\frac{18}{8}$

5) $\frac{36}{8}$

6) $\frac{36}{4}$

7) $\frac{36}{2}$

8) $\frac{37}{2}$

9) $\frac{37}{3}$

10) $\frac{37x}{3}$

11) $\frac{74x}{3}$

12) $\frac{74x}{3x}$

Worked Example	Your Turn
Convert $1\frac{1}{3}$ into an improper fraction	Convert $2\frac{1}{3}$ into an improper fraction

Fluency Practice

Question 2: Change these mixed numbers into improper fractions

(a) $2\frac{1}{5}$ (b) $3\frac{1}{2}$ (c) $1\frac{3}{4}$ (d) $3\frac{2}{3}$ (e) $1\frac{2}{5}$

(f) $2\frac{4}{7}$ (g) $1\frac{1}{3}$ (h) $2\frac{3}{10}$ (i) $4\frac{3}{4}$ (j) $1\frac{7}{12}$

(k) $3\frac{9}{10}$ (l) $2\frac{3}{50}$ (m) $3\frac{5}{8}$ (n) $8\frac{3}{8}$ (o) $1\frac{14}{32}$

(p) $2\frac{19}{24}$ (q) $12\frac{1}{9}$ (r) $5\frac{4}{15}$ (s) $4\frac{11}{12}$ (t) $13\frac{7}{16}$

Intelligent Practice

Convert the following mixed numbers into improper fractions:

1) $1\frac{1}{5}$

2) $2\frac{1}{5}$

3) $3\frac{1}{5}$

4) $3\frac{2}{5}$

5) $3\frac{3}{5}$

6) $3\frac{3}{10}$

7) $3\frac{3}{9}$

8) $4\frac{3}{9}$

9) $4\frac{x}{9}$

10) $4\frac{9}{x}$

Extension

Question 1: Match up the improper fractions and mixed numbers.

$2\frac{1}{4}$	$2\frac{1}{3}$	$1\frac{3}{4}$	$3\frac{2}{3}$

$\frac{7}{4}$	$\frac{11}{3}$	$\frac{7}{3}$	$\frac{9}{4}$

Question 2: Arrange these improper fractions in order, starting with the smallest.

$$\frac{23}{4}, \frac{37}{7}, \frac{11}{2}$$

Question 3: Write down a mixed number between $3\frac{3}{11}$ and $3\frac{2}{5}$

Question 4: Gregory feeds his cat $\frac{2}{5}$ of a can of cat food each day.

Work out how many cans of cat food are eaten each fortnight.

Give your answer as a mixed number.

Question 5:

13	9	21	5	2

Using the cards, create an improper fraction that is:

(a) between 1 and 2
(b) between 2 and 3
(c) between 4 and 5
(d) between 5 and 10
(e) greater than 10

1.6 Adding and Subtracting Fractions

Fractions with the same denominators can be added (or subtracted) by adding (or subtracting) the numerators.

If two fractions do not have the same denominator, then find a common denominator by making equivalent fractions.

Which Denominator?

$\frac{2}{3} - \frac{1}{3} = \frac{\quad}{\quad} - \frac{\quad}{\quad}$

$\frac{2}{3} - \frac{1}{6} = \frac{\quad}{\quad} - \frac{\quad}{\quad}$

$\frac{2}{3} + \frac{1}{6} = \frac{\quad}{\quad} - \frac{\quad}{\quad}$

$\frac{2}{9} + \frac{1}{6} = \frac{\quad}{\quad} - \frac{\quad}{\quad}$

$\frac{2}{9} + \frac{1}{5} = \frac{\quad}{\quad} - \frac{\quad}{\quad}$

Questions

$\frac{3}{5} + \frac{3}{5} = \_\_ + \_\_$

$\frac{3}{5} + \frac{1}{5} = \_\_ + \_\_$

$\frac{3}{5} - \frac{1}{5} = \_\_ - \_\_$

$\frac{3}{5} - \frac{1}{10} = \_\_ - \_\_$

$\frac{3}{5} - \frac{3}{10} = \_\_ - \_\_$

$\frac{3}{5} - \frac{3}{25} = \_\_ - \_\_$

$\frac{3}{10} - \frac{3}{25} = \_\_ - \_\_$

$\frac{3}{25} - \frac{3}{10} = \_\_ - \_\_$

$\frac{3}{25} - \frac{3}{20} = \_\_ - \_\_$

$\frac{3}{25} - \frac{3}{4} = \_\_ - \_\_$

$\frac{3}{5} - \frac{3}{4} = \_\_ - \_\_$

$\frac{3}{6} - \frac{3}{4} = \_\_ - \_\_$

Worked Example	Your Turn
Calculate: a) $\frac{2}{5}+\frac{1}{3}$ b) $\frac{2}{5}-\frac{1}{3}$	Calculate: a) $\frac{2}{3}+\frac{1}{5}$ b) $\frac{2}{3}-\frac{1}{5}$

Intelligent Practice

Calculate:

1) $\frac{1}{7}+\frac{2}{5}$

2) $\frac{2}{5}+\frac{1}{7}$

3) $\frac{2}{5}+\frac{2}{7}$

4) $\frac{2}{5}+\frac{2}{3}$

5) $\frac{1}{4}+\frac{2}{3}$

6) $\frac{3}{4}+\frac{2}{3}$

7) $\frac{3}{4}+\frac{2}{5}$

8) $\frac{3}{40}+\frac{2}{5}$

9) $\frac{3}{4}+\frac{3}{5}$

10) $\frac{3}{4}+\frac{6}{10}$

11) $\frac{2}{5}-\frac{1}{7}$

12) $\frac{1}{7}-\frac{2}{5}$

13) $\frac{2}{5}-\frac{2}{7}$

14) $\frac{2}{3}-\frac{2}{5}$

15) $\frac{2}{3}-\frac{1}{4}$

16) $\frac{2}{3}-\frac{3}{4}$

17) $\frac{3}{4}-\frac{2}{3}$

18) $\frac{3}{4}-\frac{2}{20}$

19) $\frac{3}{4}-\frac{3}{5}$

20) $\frac{3}{4}-\frac{9}{15}$

Worked Example	Your Turn
Calculate: a) $2\frac{1}{2}+3\frac{2}{5}$ b) $2\frac{1}{2}-1\frac{2}{5}$	Calculate: a) $2\frac{1}{3}+3\frac{2}{5}$ b) $2\frac{1}{3}-1\frac{2}{5}$

Intelligent Practice

Calculate:

1) $1\frac{1}{2}+1\frac{1}{3}$

2) $1\frac{1}{2}+1\frac{1}{4}$

3) $1\frac{1}{2}+1\frac{1}{5}$

4) $2\frac{1}{2}+2\frac{1}{5}$

5) $2\frac{1}{7}+1\frac{1}{3}$

6) $1\frac{x}{2}+1\frac{2x}{x}$

7) $2\frac{1}{2}-1\frac{1}{3}$

8) $2\frac{1}{2}-1\frac{1}{4}$

9) $2\frac{1}{2}-2\frac{1}{4}$

10) $2\frac{1}{4}-2\frac{1}{2}$

11) $3\frac{1}{5}-2\frac{1}{2}$

12) $2\frac{2x}{2}-1\frac{x}{2}$

Fluency Practice

Question 1: Work out the following additions and subtractions.
Give your answers as simplified fractions.

(a) $\frac{2}{5}+\frac{1}{2}$ (b) $\frac{2}{7}+\frac{1}{2}$ (c) $\frac{1}{3}+\frac{1}{2}$ (d) $\frac{4}{5}-\frac{2}{3}$

(e) $\frac{8}{9}-\frac{1}{3}$ (f) $\frac{2}{3}+\frac{1}{6}$ (g) $\frac{3}{10}+\frac{2}{5}$ (h) $\frac{3}{8}+\frac{1}{4}$

(i) $\frac{7}{15}-\frac{1}{5}$ (j) $\frac{3}{4}-\frac{2}{5}$ (k) $\frac{3}{10}+\frac{3}{8}$ (l) $\frac{2}{5}+\frac{4}{7}$

(m) $\frac{11}{15}-\frac{1}{6}$ (n) $\frac{5}{11}+\frac{1}{4}$ (o) $\frac{3}{14}+\frac{1}{3}$ (p) $\frac{11}{13}-\frac{1}{2}$

(q) $\frac{7}{20}+\frac{2}{5}$ (r) $\frac{8}{9}-\frac{3}{5}$ (s) $\frac{11}{18}+\frac{1}{6}$ (t) $\frac{39}{100}-\frac{7}{20}$

(u) $\frac{4}{15}+\frac{5}{12}$ (v) $\frac{2}{3}-\frac{9}{16}$ (w) $\frac{19}{30}+\frac{1}{8}$ (x) $\frac{7}{12}+\frac{3}{14}$

Question 2: Work out the following additions.
Give your answers as simplified fractions.
If necessary, give any answers as mixed numbers.

(a) $\frac{3}{4}+\frac{1}{2}$ (b) $\frac{5}{9}+\frac{2}{3}$ (c) $\frac{7}{10}+\frac{1}{3}$ (d) $\frac{4}{5}+\frac{3}{4}$

(e) $\frac{19}{20}+\frac{4}{5}$ (f) $\frac{5}{9}+\frac{13}{18}$ (g) $\frac{5}{12}+\frac{9}{10}$ (h) $\frac{4}{7}+\frac{7}{8}$

Question 3: Work out the following additions and subtractions.
Give your answers as simplified fractions.
If necessary, give any answers as mixed numbers.

(a) $1\frac{1}{2}+\frac{2}{3}$ (b) $\frac{7}{9}+1\frac{1}{3}$ (c) $1\frac{3}{5}-\frac{3}{4}$ (d) $1\frac{5}{8}-1\frac{1}{4}$

(e) $2\frac{1}{2}+1\frac{1}{3}$ (f) $2\frac{2}{9}-1\frac{1}{3}$ (g) $2\frac{2}{9}+\frac{5}{6}$ (h) $1\frac{5}{12}+1\frac{5}{8}$

(i) $3\frac{1}{10}+2\frac{2}{3}$ (j) $1\frac{8}{9}-\frac{4}{7}$ (k) $3\frac{2}{3}-1\frac{11}{20}$ (l) $4\frac{8}{15}+3\frac{1}{3}$

Extension

Question 1: In a car park, $\frac{2}{3}$ of the cars are red.

$\frac{1}{5}$ of the cars are blue.

What fraction of the cars are red or blue?

Question 2: This week Harry spent $\frac{1}{2}$ of his pocket money on a ticket for a football match.

He also spent $\frac{1}{8}$ of his pocket money on a scarf at the match.

(a) What fraction of his pocket money has Harry spent?

(b) What fraction of his pocket money does Harry have left?

Question 3: On an airplane, the passengers may have chicken, vegetable or tomato soup.
Half of the passengers choose chicken soup
A third of the passengers choose tomato soup.

(a) What fraction of the passengers choose vegetable soup?

There are 240 passengers on the airplane.

(b) How many passengers choose vegetable soup?

Question 4: Patrick has a bag of sugar that contains $\frac{5}{6}$ kg

He uses $\frac{3}{5}$ kg of sugar to make a cake.

How much sugar does Patrick have left?

Question 5: Work out $\frac{1}{6} + \frac{1}{2} + \frac{2}{9}$

Extension

Question 6: Jasmine has a bottle that contains $\frac{7}{10}$ litre of orange juice.

She pours out some orange juice and now has $\frac{1}{4}$ litre left.

How much orange juice did Jasmine pour out?

Question 7: In school, pupils study one language.
They choose either French, Spanish or Italian.

$\frac{3}{20}$ of the pupils study Italian and $\frac{5}{8}$ of the pupils study French

What fraction of the pupils study Spanish?

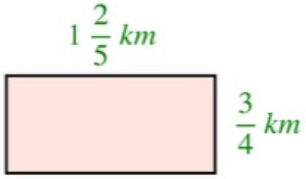
Question 8: Shown below is a "magic square"
Each column, row and diagonal has the same total.
Work out the missing fractions.

$\frac{1}{10}$		$\frac{3}{10}$
$\frac{9}{20}$		
$\frac{1}{5}$	$\frac{3}{20}$	

Question 9: Lenny says $\frac{7}{11} + \frac{2}{3} = \frac{9}{14}$

Explain what he has done incorrectly and work out the correct answer.

Question 10: Work out the perimeter of this rectangle.



Question 11: The distance from Newtown to Milton is $7\frac{2}{3}$ miles.

The distance from Milton to Redville is $2\frac{2}{5}$ miles

Work out the distance from Newtown to Redville.

1.7 Multiplying Fractions

When multiplying fractions, multiply the numerators together and multiply the denominators together, then simplify, or it is sometimes easier to simplify first.

Worked Example	Your Turn
Calculate: $\frac{2}{3} \times \frac{1}{6}$	Calculate: $\frac{2}{3} \times \frac{5}{6}$

Intelligent Practice

Calculate:

1) $\frac{2}{3} \times \frac{1}{10}$

2) $\frac{1}{3} \times \frac{1}{10}$

3) $\frac{4}{3} \times \frac{1}{10}$

4) $\frac{4}{3} \times \frac{10}{10}$

5) $\frac{4}{3} \times \frac{2}{2}$

6) $\frac{4}{3} \times \frac{2}{1}$

7) $\frac{4}{3} \times \frac{3}{1}$

8) $\frac{4}{3} \times \frac{3}{4}$

9) $\frac{2}{3} \times \frac{3}{2}$

10) $\frac{2}{2} \times \frac{3}{3}$

11) $\frac{2}{3} \times \frac{1}{3}$

12) $\frac{2}{3} \times \frac{10}{3}$

13) $\frac{2}{3} \times \frac{100}{3}$

14) $\frac{2}{3} \times \frac{3}{100}$

15) $\frac{2}{7} \times \frac{7}{100}$

16) $\frac{2}{37} \times \frac{37}{100}$

Worked Example	Your Turn
Calculate: a) $\frac{2}{5} \times \frac{25}{18}$ b) $4\frac{1}{5} \times 5\frac{5}{7}$	Calculate: a) $\frac{2}{5} \times \frac{25}{16}$ b) $4\frac{1}{5} \times 6\frac{3}{7}$

Intelligent Practice

Calculate:

1) $\frac{2}{9} \times \frac{3}{4}$

2) $\frac{2}{9} \times \frac{3}{8}$

3) $\frac{4}{9} \times \frac{3}{16}$

4) $\frac{4}{27} \times \frac{3}{16}$

5) $\frac{4}{27} \times \frac{9}{16}$

6) $\frac{8}{27} \times \frac{9}{16}$

7) $\frac{8}{27} \times \frac{15}{16}$

8) $\frac{16}{27} \times \frac{15}{16}$

9) $\frac{27}{8} \times \frac{16}{15}$

10) $3\frac{3}{8} \times \frac{16}{15}$

11) $3\frac{3}{8} \times 1\frac{1}{15}$

12) $3\frac{3}{8} \times 1\frac{2}{30}$

fraction multiplying, with cancelling

(1) $\frac{2}{3} \times \frac{3}{4}$

(2) $\frac{4}{5} \times \frac{5}{6}$

(3) $\frac{5}{6} \times \frac{9}{10}$

(4) $\frac{6}{7} \times \frac{14}{15}$

(5) $\frac{8}{9} \times \frac{27}{28}$

(6) $\frac{6}{7} \times \frac{35}{36}$

(7) $\frac{14}{15} \times \frac{20}{21}$

(8) $\frac{11}{12} \times \frac{21}{22}$

(9) $\frac{24}{25} \times \frac{15}{16}$

(10) $\frac{33}{34} \times \frac{17}{18}$

(11) $\frac{32}{33} \times \frac{15}{16}$

(12) $\frac{51}{52} \times \frac{16}{17}$

(13) $\frac{34}{35} \times \frac{50}{51}$

(14) $\frac{56}{57} \times \frac{27}{28}$

(15) $\frac{54}{55} \times \frac{44}{45}$

(16) $\frac{48}{49} \times \frac{63}{64}$

you should find that the results fit an overall rule

can you find other examples fitting this pattern?

Challenge:

$$\frac{1}{3} \times \frac{2}{4} \times \frac{3}{5} \times \frac{4}{6} \times \frac{5}{7} \times \cdots \times \frac{998}{1000} =$$

Extension

Worked Example	Your Turn
Calculate: $1\frac{1}{3} \times \frac{2}{5}$	Calculate: $\frac{1}{3} \times 1\frac{2}{5}$

Intelligent Practice

Calculate:

1) $1\frac{1}{2} \times \frac{1}{4}$

2) $\frac{1}{4} \times 1\frac{1}{2}$

3) $\frac{3}{4} \times 1\frac{1}{2}$

4) $2\frac{1}{2} \times \frac{3}{4}$

5) $2\frac{1}{2} \times \frac{3}{5}$

6) $2\frac{1}{2} \times \frac{4}{5}$

7) $2\frac{1}{3} \times \frac{4}{5}$

8) $4\frac{1}{3} \times \frac{4}{5}$

9) $4\frac{1}{3} \times 1\frac{4}{5}$

10) $4\frac{1}{5} \times 1\frac{4}{5}$

11) $4\frac{1}{5} \times 1\frac{4}{7}$

12) $4\frac{1}{5} \times 2\frac{4}{7}$

Fluency Practice

Question 1: Work out each of the following multiplications.
Give each answer in its simplest form.

(a) $\frac{1}{2} \times \frac{1}{5}$ (b) $\frac{1}{2} \times \frac{3}{4}$ (c) $\frac{1}{4} \times \frac{3}{5}$ (d) $\frac{1}{3} \times \frac{1}{3}$

(e) $\frac{5}{6} \times \frac{1}{2}$ (f) $\frac{3}{4} \times \frac{1}{4}$ (g) $\frac{2}{3} \times \frac{1}{7}$ (h) $\frac{5}{8} \times \frac{1}{3}$

(i) $\frac{2}{3} \times \frac{1}{2}$ (j) $\frac{1}{3} \times \frac{3}{4}$ (k) $\frac{3}{10} \times \frac{1}{2}$ (l) $\frac{2}{5} \times \frac{1}{4}$

(m) $\frac{2}{7} \times \frac{3}{4}$ (n) $\frac{5}{7} \times \frac{1}{10}$ (o) $\frac{7}{12} \times \frac{2}{3}$ (p) $\frac{6}{7} \times \frac{2}{3}$

(q) $\frac{6}{7} \times \frac{2}{9}$ (r) $\frac{3}{10} \times \frac{5}{6}$ (s) $\frac{6}{15} \times \frac{3}{4}$ (t) $\frac{3}{5} \times \frac{11}{15}$

(u) $\frac{9}{20} \times \frac{10}{11}$ (v) $\frac{21}{30} \times \frac{2}{3}$ (w) $\frac{12}{25} \times \frac{5}{8}$ (x) $\frac{8}{9} \times \frac{3}{16}$

Question 2: Work out the following multiplications
Give your answers as simplified fractions.
If any answers are top heavy fractions, write as mixed numbers.

(a) $\frac{1}{5} \times 3$ (b) $7 \times \frac{1}{8}$ (c) $\frac{1}{10} \times 4$ (d) $30 \times \frac{1}{2}$

(e) $8 \times \frac{3}{4}$ (f) $\frac{2}{3} \times 12$ (g) $5 \times \frac{1}{3}$ (h) $8 \times \frac{2}{5}$

(i) $\frac{4}{5} \times 20$ (j) $\frac{2}{7} \times 8$ (k) $8 \times \frac{5}{4}$ (l) $\frac{1}{5} \times 360$

Question 3: Work out the following divisions.
Give your answers as simplified fractions.
If any answers are top heavy fractions, write as mixed numbers.

(a) $1\frac{2}{3} \times \frac{1}{4}$ (b) $\frac{2}{5} \times 1\frac{1}{4}$ (c) $\frac{3}{4} \times 1\frac{1}{2}$ (d) $2\frac{1}{2} \times \frac{7}{10}$

(e) $\frac{1}{4} \times 3\frac{1}{3}$ (f) $1\frac{2}{3} \times 1\frac{1}{4}$ (g) $4\frac{3}{5} \times 1\frac{2}{3}$ (h) $1\frac{2}{11} \times \frac{8}{9}$

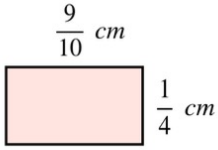
(i) $2\frac{5}{6} \times 2\frac{1}{5}$ (j) $1\frac{1}{9} \times 3\frac{3}{10}$ (k) $3\frac{1}{8} \times 2\frac{1}{2}$ (l) $2\frac{6}{7} \times 3\frac{1}{5}$

Extension

Question 1: Work out $\frac{4}{5} \times 1\frac{1}{2} \times \frac{7}{8}$

Question 2: Work out the missing number $\square \div \frac{7}{15} = \frac{2}{3}$

Question 3: Find the area of this rectangle.
Include suitable units.



Question 4: Alexis has a pet dog, Maxi.

Each day, Maxi eats $\frac{2}{3}$ of a can of dog food.

Alexis is buying dog food for one week.

How many cans of dog food should Alexis buy?

Question 5: Kelly spends $\frac{1}{4}$ of her savings on driving lessons.

Kelly then spends $\frac{2}{3}$ of her remaining savings on a new car.

What fraction of her savings has Kelly spent?

Question 6: Work out $\frac{9}{10} + \left(\frac{5}{7}\right)^2$

Question 7: A wall measures $3\frac{3}{4}\ m$ by $4\frac{1}{3}\ m$

Each can of paint cover 2.5m² and costs £5.50

Work out the cost of painting the wall.

Question 8: Callum has completed his maths homework.
Can you spot any mistakes?

Work out

$\frac{1}{3} \times \frac{1}{6}$

$\frac{2}{18} = \frac{1}{9}$

Work out

$1\frac{3}{10} \times 2\frac{1}{2}$

$\frac{13}{10} \times \frac{5}{2} = \frac{75}{20}$

$60\frac{15}{20}$

$60\frac{3}{4}$

1.8 Reciprocals

The reciprocal of a number is the number you would have to multiply it by to get the answer 1.

Worked Example	Your Turn
Write the reciprocals of: a) 6 b) $\frac{1}{6}$ c) $\frac{5}{6}$	Write the reciprocals of: a) 7 b) $\frac{1}{7}$ c) $\frac{2}{7}$

Fluency Practice

Question 1: Find the reciprocal of each of the following

(a) 2 (b) $\frac{1}{4}$ (c) $\frac{2}{3}$ (d) $\frac{3}{10}$ (e) $\frac{5}{2}$ (f) $\frac{1}{3}$

(g) 5 (h) $\frac{4}{5}$ (i) $\frac{2}{9}$ (j) $\frac{20}{19}$ (k) $\frac{1}{12}$ (l) $\frac{13}{8}$

(m) $\frac{4}{3}$ (n) 1

Question 2: Find the reciprocal of each of the following

(a) $1\frac{1}{2}$ (b) $1\frac{7}{10}$ (c) $2\frac{1}{3}$ (d) $4\frac{2}{3}$ (e) $1\frac{4}{9}$ (f) $6\frac{5}{6}$

Question 3: Find the reciprocal of each of the following

(a) 0.5 (b) 0.8 (c) 2.5 (d) 0.02 (e) 1.9 (f) 1.375

Extension

Question 1: Find the missing numbers

(a) $\square \times \frac{1}{4} = 1$

(b) $\square \times 6 = 1$

(c) $\frac{3}{4} \times \frac{4}{3} = \square$

(d) $\frac{2}{9} \times \square = 1$

Question 2: Michael says that the reciprocal of a number is always larger than the number.
Show Michael is wrong.

Question 3: Helen is thinking of a number.
She then writes the reciprocal of the number.
It is the same as her starting number.
What number did Helen think of?

Question 4: What number does not have a reciprocal?

1.9 Dividing Fractions

For dividing fractions, keep the first fraction as it is, change the divide sign to a multiply and flip the second fraction upside down.

Worked Example	Your Turn
Calculate: $\frac{1}{5} \div \frac{1}{3}$	Calculate: $\frac{1}{5} \div \frac{2}{3}$

Intelligent Practice

Calculate:

1) $\frac{1}{4} \div \frac{1}{3}$

2) $\frac{1}{4} \div \frac{1}{5}$

3) $\frac{1}{4} \div \frac{1}{8}$

4) $\frac{1}{4} \div \frac{3}{8}$

5) $\frac{1}{4} \div \frac{3}{7}$

6) $\frac{1}{4} \div \frac{3}{6}$

7) $\frac{3}{6} \div \frac{1}{4}$

8) $\frac{5}{6} \div \frac{1}{4}$

9) $\frac{6}{6} \div \frac{1}{4}$

10) $\frac{6}{6} \div \frac{1}{2}$

11) $\frac{6}{6} \div \frac{1}{3}$

12) $\frac{5}{6} \div \frac{1}{3}$

13) $\frac{5}{6} \div \frac{3}{3}$

14) $\frac{1}{6} \div \frac{3}{3}$

15) $\frac{1}{6} \div \frac{8}{8}$

16) $\frac{1}{6} \div \frac{8}{1}$

Worked Example	Your Turn
Calculate: a) $\frac{1}{5} \div 2$ b) $2 \div \frac{1}{5}$	Calculate: a) $\frac{2}{5} \div 2$ b) $2 \div \frac{2}{5}$

Intelligent Practice

Calculate:

1) $\frac{2}{5} \div 3$

2) $\frac{3}{5} \div 3$

3) $\frac{5}{3} \div 3$

4) $\frac{3}{6} \div 3$

5) $\frac{5}{6} \div 3$

6) $\frac{10}{12} \div 3$

7) $\frac{10}{12} \div 30$

8) $\frac{5}{6} \div 30$

9) $\frac{5}{6} \div 15$

10) $\frac{10}{6} \div 15$

11) $\frac{8}{6} \div 15$

Calculate:

1) $3 \div \frac{2}{5}$

2) $3 \div \frac{3}{5}$

3) $3 \div \frac{5}{3}$

4) $3 \div \frac{3}{6}$

5) $3 \div \frac{5}{6}$

6) $3 \div \frac{10}{12}$

7) $30 \div \frac{10}{12}$

8) $30 \div \frac{5}{6}$

9) $15 \div \frac{5}{6}$

10) $15 \div \frac{10}{6}$

11) $15 \div \frac{8}{6}$

Worked Example	Your Turn
Calculate: $2\frac{2}{3} \div \frac{1}{5}$	Calculate: $2\frac{2}{3} \div \frac{2}{5}$

Intelligent Practice

Calculate:

1) $\frac{2}{3} \div 2\frac{1}{5}$

2) $1\frac{2}{3} \div 2\frac{1}{5}$

3) $2\frac{2}{3} \div 2\frac{1}{5}$

4) $2\frac{2}{3} \div 1\frac{1}{5}$

5) $\frac{2}{5} \div 2\frac{1}{3}$

6) $3\frac{2}{5} \div 2\frac{1}{3}$

7) $3\frac{2}{5} \div 3\frac{1}{3}$

8) $\frac{2}{5} \div 3\frac{2}{3}$

9) $-\frac{3}{5} \div 2\frac{3}{4}$

10) $\frac{4}{5} \div -2\frac{4}{15}$

11) $-2\frac{4}{5} \div -2\frac{4}{15}$

12) $-2\frac{4}{5} \div -3\frac{8}{15}$

13) $\frac{2}{7} \div 2\frac{2}{7}$

14) $2\frac{2}{7} \div -2\frac{2}{7}$

15) $-4\frac{2}{7} \div -2\frac{2}{7}$

16) $-4\frac{2}{7} \div -1\frac{2}{7}$

Fluency Practice

Question 1: Work out the following divisions.
Give your answers as simplified fractions.
If any answers are top heavy fractions, write as mixed numbers.

(a) $\frac{1}{5} \div \frac{2}{3}$ (b) $\frac{3}{4} \div \frac{4}{5}$ (c) $\frac{1}{2} \div \frac{7}{8}$ (d) $\frac{2}{3} \div \frac{5}{6}$

(e) $\frac{1}{10} \div \frac{4}{9}$ (f) $\frac{6}{11} \div \frac{5}{6}$ (g) $\frac{2}{5} \div \frac{13}{15}$ (h) $\frac{3}{8} \div \frac{7}{9}$

(i) $\frac{3}{5} \div \frac{1}{2}$ (j) $\frac{7}{9} \div \frac{2}{3}$ (k) $\frac{8}{15} \div \frac{7}{10}$ (l) $\frac{9}{10} \div \frac{1}{3}$

(m) $\frac{5}{6} \div \frac{3}{4}$ (n) $\frac{13}{20} \div \frac{8}{11}$ (o) $\frac{4}{17} \div \frac{3}{16}$ (p) $\frac{5}{7} \div \frac{10}{19}$

Question 2: Work out the following divisions
Give your answers as simplified fractions.
If any answers are top heavy fractions, write as mixed numbers.

(a) $\frac{3}{4} \div 2$ (b) $\frac{4}{7} \div 8$ (c) $\frac{11}{20} \div 3$ (d) $\frac{9}{40} \div 5$

(e) $4 \div \frac{2}{3}$ (f) $2 \div \frac{3}{4}$ (g) $12 \div \frac{2}{3}$ (h) $5 \div \frac{2}{9}$

Question 3: Work out the following divisions.
Give your answers as simplified fractions.
If any answers are top heavy fractions, write as mixed numbers.

(a) $\frac{2}{3} \div 1\frac{4}{5}$ (b) $1\frac{1}{2} \div 1\frac{9}{10}$ (c) $2\frac{3}{7} \div \frac{1}{2}$ (d) $2\frac{1}{3} \div 5\frac{1}{2}$

(e) $3 \div 2\frac{1}{8}$ (f) $4\frac{1}{3} \div 2\frac{9}{10}$ (g) $6\frac{5}{6} \div 2$ (h) $1\frac{5}{12} \div 2\frac{2}{11}$

Extension

Question 1: Work out the missing number $\frac{9}{11} \times \square = \frac{3}{4}$

Question 2: Work out

(a) $\frac{4}{5} \div \frac{3}{10} \div \frac{1}{8}$

(b) $\frac{7}{9} + \frac{1}{2} \div \frac{3}{5}$

Question 3: James shares $\frac{5}{8}$ of a cake between 6 people.

What fraction of the cake do they each receive?

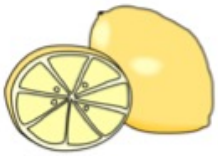
Question 4: John has 12 cans of dog food.
He has two dogs and he gives each dog $\frac{2}{3}$ of a can of dog food each day.

Does he have enough dog food to last one week?

Question 5: Alisha has $\frac{7}{8}$ litres of lemonade.

She is pouring glasses that each contain $\frac{1}{5}$ litres.

How many full glasses can she pour?



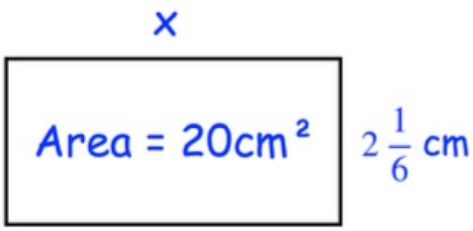
Question 6: Helen is cutting lengths of string from a roll that is $9\frac{1}{3}$ metres long.

Each length of string is $\frac{1}{9}$ metres long.

How many lengths of string can Helen cut from the roll?

Extension

Question 7: Shown is a rectangle.
Find the value of x



Question 8: Lee has completed his homework.
Can you spot any mistakes?

Work out

$$\frac{2}{3} \div \frac{8}{11}$$

Give your answer as a fraction in its simplest form.

$$\frac{2}{3} \times \frac{8}{11}$$

$$= \frac{16}{33}$$

Work out

$$1\frac{4}{7} \div 1\frac{1}{4}$$

Give your answer as a mixed number.

$$\frac{11}{7} \div \frac{5}{4}$$

$$= \frac{11}{7} \times \frac{4}{5} = \frac{44}{35}$$

1.10 Fractions of Amounts

When we find a fraction of an amount, we are working out how much that 'part' is worth within the whole.

You can see fractions of amounts all around us:

- Shops have sales that say, "$\frac{1}{2}$ price!" or "$\frac{1}{3}$ free!"
- You might use fractions when baking, for example, "add half a teaspoon of salt" or "use a $\frac{1}{4}$ of a kilogram of flour".

Worked Example	Your Turn
Calculate: a) $\frac{3}{4}$ of 24 b) $\frac{7}{4}$ of 24	Calculate: a) $\frac{2}{3}$ of 24 b) $\frac{5}{3}$ of 24

Intelligent Practice

Calculate:

1) $\frac{1}{5}$ of 60

2) $\frac{1}{5}$ of 30

3) $\frac{2}{5}$ of 30

4) $\frac{20}{5}$ of 30

5) $\frac{20}{50}$ of 30

6) $\frac{20}{50}$ of 300

7) $\frac{2}{5}$ of 300

8) $\frac{2}{5}$ of 3

9) $\frac{3}{5}$ of 2

10) $\frac{3}{2}$ of 5

11) $\frac{2}{3}$ of 5

12) $\frac{2}{3}$ of $\frac{1}{2}$

Fluency Practice

Question 1: Work out each of the following

(a) $\frac{1}{2}$ of 10 (b) $\frac{1}{3}$ of 18 (c) $\frac{1}{5}$ of 20 (d) $\frac{1}{4}$ of 24

(e) $\frac{1}{9}$ of 27 (f) $\frac{1}{10}$ of 160 (g) $\frac{1}{8}$ of 80 (h) $\frac{1}{7}$ of 49

(i) $\frac{1}{2}$ of 9 (j) $\frac{1}{5}$ of 65 (k) $\frac{1}{12}$ of 72 (l) $\frac{1}{11}$ of 132

Question 2: Work out each of the following

(a) $\frac{2}{3}$ of 15 (b) $\frac{7}{10}$ of 20 (c) $\frac{2}{5}$ of 30 (d) $\frac{3}{4}$ of 32

(e) $\frac{3}{5}$ of 45 (f) $\frac{2}{7}$ of 28 (g) $\frac{3}{8}$ of 88 (h) $\frac{3}{10}$ of 120

(i) $\frac{5}{9}$ of 63 (j) $\frac{13}{20}$ of 60 (k) $\frac{2}{7}$ of 91 (l) $\frac{4}{15}$ of 120

Question 3: Work out each of the following.
Include suitable units.

(a) $\frac{1}{3}$ of £21 (b) $\frac{3}{4}$ of 100kg (c) $\frac{2}{3}$ of 27cm (d) $\frac{7}{8}$ of 32 seconds

(e) $\frac{2}{5}$ of 90 miles (f) $\frac{5}{6}$ of £150 (g) $\frac{5}{12}$ of 240ml (h) $\frac{9}{10}$ of 310 students

(i) $\frac{1}{8}$ of a day (j) $\frac{4}{5}$ of 1km (k) $\frac{3}{7}$ of 2 weeks (l) $\frac{1}{500}$ of 1m

Question 4: Work out each of the following.

(a) $\frac{3}{10}$ of 32 miles (b) $\frac{2}{5}$ of 9kg (c) $\frac{1}{3}$ of 8 litres (d) $\frac{3}{5}$ of £7

(e) $\frac{1}{8}$ of 50cm (f) $\frac{1}{5}$ of 4931km (g) $\frac{3}{4}$ of £57 (h) $\frac{2}{9}$ of 211km

Question 5: Work out the largest of each of the following pairs.

(a) $\frac{1}{3}$ of 21 *or* $\frac{1}{2}$ of 12 (b) $\frac{1}{6}$ of 30 *or* $\frac{2}{3}$ of 9 (c) $\frac{2}{5}$ of 65 *or* $\frac{3}{4}$ of 32

(d) $\frac{1}{5}$ of 2m *or* $\frac{3}{4}$ of 60cm (e) $\frac{3}{8}$ of a day *or* $\frac{1}{10}$ of 85 hours

(f) $\frac{7}{15}$ of 480 *or* $\frac{2}{3}$ of 453 (g) $\frac{3}{10}$ of 395 *or* $\frac{2}{7}$ of 420

Extension

Question 1: James has 20 sweets.

$\frac{3}{4}$ of the sweets are red.

How many sweets are red?

Question 2: In a class, there are 24 students.

$\frac{1}{8}$ of the students wear glasses.

How many students wear glasses?

Question 3: There are 40 apples in a crate.

$\frac{3}{5}$ of the apples are bad.

How many good apples are there?

Question 4: On Wednesday, James slept for $\frac{3}{8}$ of the day

(a) How many hours did James spend sleeping?

(b) For how many hours was James awake?

(c) What fraction of the day was James awake?

Question 5: Declan won £6000 in a competition.

He invests $\frac{2}{5}$ of the money.

How much money did Declan invest?

Question 6: Katie has £1200.

She gives $\frac{1}{3}$ of the money to her sister.

Then Katie gives $\frac{1}{4}$ of the remaining money to her brother.

How much money does Katie have left?

Question 7: The attendance at a Sheffield United match is 15,291

$\frac{2}{9}$ of the crowd are children.

How many adults attended the match?

Extension

Question 8: There are 194 students in a primary school.

Mr Wallace says that exactly $\frac{1}{4}$ of the students are left handed.

Explain why Mr Wallace must be wrong.

Question 9: Connor has saved £450.

He spends $\frac{1}{5}$ of the £450 on a new tyre for his car.

Connor spends $\frac{2}{3}$ of the £450 on a new guitar.

What fraction of the £450 does Connor have left?

Question 10: The size of a jar of coffee is increased by one-fifth.
The new size is later reduced by one-fifth.
Is the new jar smaller, the same size or larger than the original?
Explain how you worked out your answer.

Question 11: A company earns £3,178,784 in 2016.

$\frac{4}{7}$ of the income is spent on salaries.

How much money does the company spend on salaries in 2016?

1.11 Increasing or Decreasing by a Fraction

When finding a fraction of an amount, the key rule to remember is to divide the amount by the denominator and multiply your answer by the numerator.

If asked to increase or decrease an amount by a fraction make sure you add or subtract from the original amount at the end of the question!

Worked Example	Your Turn
a) Increase 60 by $\frac{1}{5}$	a) Increase 60 by $\frac{4}{5}$
b) Decrease 100 by $\frac{1}{5}$	b) Decrease 200 by $\frac{3}{5}$

Fluency Practice

Question 1:

(a) Increase 40 by $\frac{1}{2}$

(b) Increase 18 by $\frac{1}{3}$

(c) Decrease 20 by $\frac{1}{4}$

(d) Increase 30 by $\frac{1}{5}$

(e) Decrease 24 by $\frac{1}{8}$

(f) Decrease 70 by $\frac{1}{10}$

(g) Increase 120 by $\frac{1}{3}$

(h) Decrease 80 by $\frac{1}{5}$

(i) Increase 72 by $\frac{1}{9}$

Question 2:

(a) Increase 12 by $\frac{2}{3}$

(b) Decrease 40 by $\frac{3}{10}$

(c) Increase 30 by $\frac{2}{5}$

(d) Decrease 16 by $\frac{3}{4}$

(e) Increase 90 by $\frac{7}{10}$

(f) Decrease 14 by $\frac{3}{7}$

(g) Increase 48 by $\frac{5}{8}$

(h) Decrease 54 by $\frac{2}{9}$

(i) Increase 84 by $\frac{3}{4}$

(j) Increase 275 by $\frac{2}{5}$

(k) Decrease 240 by $\frac{3}{8}$

(l) Increase 324 by $\frac{7}{9}$

Question 3:

(a) Increase 60cm by $\frac{3}{10}$

(b) Decrease 120kg by $\frac{1}{4}$

(c) Increase 400ml by $\frac{2}{5}$

(d) Increase 14g by $\frac{1}{5}$

(e) Decrease 50 litres by $\frac{1}{8}$

(f) Increase 130ml by $\frac{3}{4}$

(g) Increase £76 by $\frac{2}{5}$

(h) Increase 92cm by $\frac{3}{20}$

(i) Increase 1.4kg by $\frac{7}{8}$

Intelligent Practice

1) Increase 24 by $\frac{1}{3}$
2) Increase 24 by $\frac{2}{3}$
3) Increase 12 by $\frac{1}{3}$
4) Increase 12 by $\frac{2}{3}$
5) Increase 12 by $\frac{20}{3}$
6) Increase 120 by $\frac{20}{30}$
7) Increase 64 by $\frac{1}{8}$
8) Increase 64 by $\frac{3}{8}$
9) Increase 64 by $\frac{30}{8}$
10) Increase 6.4 by $\frac{3}{8}$
11) Increase £800 by $\frac{1}{4}$
12) Increase £800 by $\frac{5}{4}$

1) Decrease 28 by $\frac{1}{7}$
2) Decrease 28 by $\frac{5}{7}$
3) Decrease 14 by $\frac{1}{7}$
4) Decrease 14 by $\frac{2}{7}$
5) Decrease 14 by $2\frac{6}{7}$
6) Decrease 140 by $\frac{20}{70}$
7) Decrease 36 by $\frac{1}{4}$
8) Decrease 36 by $\frac{3}{4}$
9) Decrease 16 by $\frac{1}{4}$
10) Decrease 16 by $\frac{3}{4}$
11) Decrease 150kg by $\frac{1}{5}$
12) Decrease 1.50kg by $\frac{1}{5}$

Extension

Question 1: Annie is paid £300 per week.
She is going to get a pay rise and her pay will increase by a $\frac{1}{5}$
What will her weekly pay be after the pay rise?

Question 2: Last season, the number of points a rugby team scored was 420.

This season, the number of points they scored increased by $\frac{2}{3}$

How many points did the team score this season?

Question 3: A jam jar usually contains 420g of jam.

A special edition jar contains $\frac{3}{10}$ more jam.

How much extra jam is in the special edition jar?

Question 4: Find the missing values

(a) 60 reduced by a $\frac{1}{3}$ is the same as 50 reduced by a ?

(b) 72 increased by a $\frac{3}{4}$ is the same as ? reduced by a $\frac{1}{10}$

Question 5: In 1990, the number of birds that live on an island was 1,200.

By 2010, the number of birds that live on the island increased by $\frac{9}{4}$

How many birds live on the island in 2010?

Question 6: Tia is training for a marathon using a special training programme.

Each month she runs $\frac{2}{5}$ more miles than she did in the previous month.

In January, Tia ran 15 miles.

(a) How many miles did Tia run in February?

(b) How many miles did Tia run in March?

David says that Tia will not follow the special training programme forever.

(c) Explain why David is right.

1.12 Reverse Fractions of Amounts

Worked Example	Your Turn
Find the value of x: a) $\frac{2}{5}$ of x is 12 b) $\frac{6}{5}$ of x is 12	Find the value of x: a) $\frac{3}{4}$ of x is 15 b) $\frac{5}{4}$ of x is 15

Intelligent Practice

Find the value of x:

1) $\frac{1}{2}$ of x is 6

2) $\frac{1}{3}$ of x is 6

3) $\frac{1}{4}$ of x is 6

4) $\frac{1}{4}$ of x is 3

5) $\frac{3}{4}$ of x is 3

6) $\frac{3}{4}$ of x is 30

7) $\frac{5}{4}$ of x is 30

8) $\frac{5}{4}$ of x is 20

9) $\frac{5}{4}$ of x is 200

10) $\frac{5}{4}$ of x is 2

11) $\frac{5}{4}$ of x is 5

12) $\frac{x}{4}$ of 4 is 5

13) $\frac{x}{4}$ of 4 is 20

14) $\frac{x}{4}$ of 8 is 20

15) $\frac{x}{6}$ of 8 is 20

Fluency Practice

Question 1: Find the original number for each question below.

(a) $\frac{1}{2}$ of a number is 7, what is the number? (b) $\frac{1}{3}$ of a number is 4, what is the number?

(c) $\frac{1}{4}$ of a number is 8, what is the number? (d) $\frac{1}{5}$ of a number is 9, what is the number?

(e) $\frac{1}{2}$ of a number is 12.5, what is the number? (f) $\frac{1}{3}$ of a number is 27, what is the number?

(g) $\frac{1}{10}$ of a number is 2.6, what is the number? (h) $\frac{1}{12}$ of a number is 8, what is the number?

Question 2: Find the original number for each question below.

(a) $\frac{2}{3}$ of a number is 12, what is the number? (b) $\frac{2}{5}$ of a number is 10, what is the number?

(c) $\frac{2}{7}$ of a number is 6, what is the number? (d) $\frac{3}{10}$ of a number is 60, what is the number?

(e) $\frac{4}{9}$ of a number is 12, what is the number? (f) $\frac{2}{3}$ of a number is 3, what is the number?

(g) $\frac{3}{4}$ of a number is 27, what is the number? (h) $\frac{5}{12}$ of a number is 35, what is the number?

Question 3: Find the original number for each question below.

(a) A number is increased by $\frac{1}{3}$ to 16. What was the number?

(b) A number is increased by $\frac{1}{5}$ to 36. What was the number?

(c) A number is decreased by $\frac{1}{4}$ to 21. What was the number?

(d) A number is decreased by $\frac{1}{10}$ to 162. What was the number?

(e) A number is increased by $\frac{2}{5}$ to 49. What was the number?

(f) A number is increased by $\frac{3}{8}$ to 22. What was the number?

(g) A number is decreased by $\frac{4}{5}$ to 12. What was the number?

(h) A number is decreased by $\frac{13}{20}$ to 1400. What was the number?

Extension

Question 1: Rebecca is $\frac{1}{3}$ of Barry's age.

Barry is $\frac{1}{6}$ of Neville's age.

If Rebecca is 4 years old, how old is Neville?

Question 2: A new snack bar contains 7.5g of sugar.

$\frac{3}{10}$ of the snack bar is sugar.

Work out the mass of the snack bar.

Question 3: In a class, $\frac{2}{7}$ of the students have blonde hair.

There are 20 students without blonde hair.

How many students are in the class?

Question 4: The height of a tree increased by $\frac{4}{15}$ during 2016.

The tree is 2.47m by the end of 2016.

Work out the height of the tree at the beginning of 2016.

Question 5: Laura invested some money.

In the first year, the amount of money increased by $\frac{1}{20}$

In the second year, the amount of money increased by $\frac{1}{5}$

In the third year, the amount of money decreased by $\frac{1}{4}$

Was the investment a success?

1.13 Review and Problem Solving

Worked Example	Your Turn
Calculate: a) $\frac{2}{3} \times \frac{1}{5}$ b) $\frac{2}{3} - \frac{1}{5}$ c) $\frac{2}{3} \div \frac{1}{5}$	Calculate: a) $\frac{1}{6} \times \frac{3}{4}$ b) $\frac{1}{6} - \frac{3}{4}$ c) $\frac{1}{6} \div \frac{3}{4}$

Intelligent Practice

Calculate:

1) $\frac{3}{4}+\frac{1}{3}$

2) $\frac{3}{4}\times\frac{1}{3}$

3) $\frac{3}{4}\div\frac{1}{3}$

4) $\frac{1}{3}\div\frac{3}{4}$

5) $\frac{1}{3}-\frac{3}{4}$

6) $1\frac{1}{3}-\frac{3}{4}$

7) $1\frac{1}{3}-\frac{3}{4}\times\frac{2}{5}$

8) $\frac{3}{4}$ of $\frac{2}{5}$

9) $\frac{3}{4}$ more than $\frac{2}{5}$

10) Increase $\frac{3}{4}$ by $\frac{2}{5}$

11) Decrease $\frac{3}{4}$ by $\frac{2}{5}$

12) $\left(\frac{3}{4}\right)^2$

13) $\left(3\frac{3}{4}\right)^2$

14) $\frac{3}{\frac{3}{4}}$

Fill in the Blanks

Question	With a Common Denominator	Unsimplified Answer	Simplified Answer (where possible)
$\frac{1}{3}+\frac{1}{6}$	$\frac{2}{6}+\frac{1}{6}$	$\frac{3}{6}$	$\frac{\square}{\square}$
$\frac{1}{4}+\frac{2}{3}$	$\frac{3}{12}+\frac{\square}{12}$	$\frac{\square}{12}$	$\frac{\square}{12}$
$\frac{2}{5}+\frac{1}{4}$	$\frac{\square}{20}+\frac{\square}{20}$	$\frac{\square}{20}$	$\frac{\square}{20}$
$\frac{5}{6}-\frac{1}{2}$	$\frac{\square}{6}-\frac{\square}{6}$	$\frac{\square}{6}$	$\frac{\square}{\square}$
$\frac{7}{8}-\frac{2}{3}$	$\frac{21}{\square}-\frac{16}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{7}{9}-\frac{3}{4}$	$\frac{\square}{\square}-\frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{\square}{\square}+\frac{\square}{\square}$	$\frac{\square}{35}+\frac{14}{35}$	$\frac{24}{35}$	$\frac{24}{35}$
$\frac{\square}{\square}-\frac{\square}{\square}$	$\frac{\square}{\square}-\frac{5}{\square}$	$\frac{6}{20}$	$\frac{\square}{\square}$
$\frac{\square}{\square}+\frac{\square}{\square}$	$\frac{\square}{\square}+\frac{7}{24}$	$\frac{\square}{\square}$	$\frac{2}{3}$
$\frac{13}{15}-\frac{\square}{\square}$	$\frac{26}{\square}-\frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{7}{10}$
$\frac{3}{10}+\frac{\square}{\square}+\frac{\square}{\square}$	$\frac{\square}{\square}+\frac{5}{20}+\frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{9}{10}$
$\frac{\square}{\square}+\frac{\square}{\square}-\frac{\square}{\square}$	$\frac{5}{\square}+\frac{\square}{\square}-\frac{8}{\square}$	$\frac{\square}{36}$	$\frac{2}{3}$

Fill in the Blanks

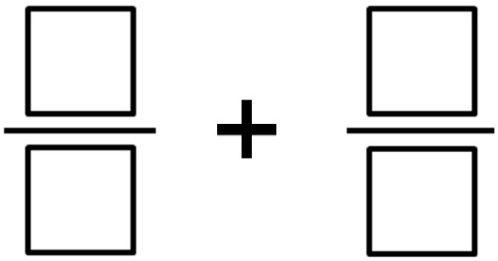
Division	Equivalent Multiplication	Unsimplified Answer	Simplified Answer (where possible)
$\frac{2}{3} \div 6$	$\frac{2}{3} \times \frac{1}{6}$	$\frac{2}{18}$	$\frac{\square}{\square}$
$\frac{2}{5} \div 4$	$\frac{2}{5} \times \frac{1}{4}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{5}{8} \div 10$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{7}{10} \div \frac{3}{4}$	$\frac{7}{10} \times \frac{4}{3}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{6}{11} \div \frac{2}{3}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{1}{10} \div \frac{4}{5}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{7}{10} \div \frac{3}{4}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{\square}{\square}$	$\frac{2}{9} \times \frac{6}{5}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{\square}{\square}$	$\frac{3}{8} \times \frac{\square}{\square}$	$\frac{12}{24}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{2}{5}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{15}{20}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{\square}{\square}$	$\frac{5}{12} \times \frac{\square}{\square}$	$\frac{10}{12}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \square$	$\frac{\square}{\square} \times \frac{1}{3}$	$\frac{\square}{\square}$	$\frac{3}{10}$

Fill in the Gaps

Q	Original Amount	Fraction Of	New Amount	Change
1	£60	$\frac{1}{4}$		
2	£60		£20	
3	£60			− £20
4		$\frac{2}{3}$	£20	
5	£30		£12	
6		$\frac{2}{5}$	£18	
7			£18	− £45
8		$\frac{6}{7}$		− £45
9	£315			− £0
10	£315	$\frac{8}{7}$		
11	£315		£585	
12	£315			+ £780.75

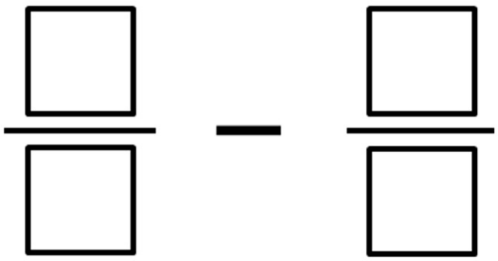
Four Digits, Two Fractions

where can you place the digits 2 , 3 , 4 and 5
(all used, once only)
to make the result of the fraction sum
(i) as large as possible
(ii) as small as possible



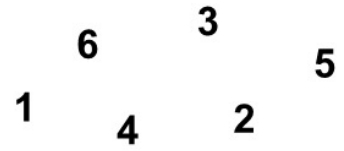
for another set of four consecutive digits?

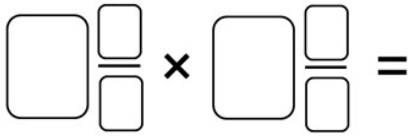
where can you place the digits 2 , 3 , 4 and 5
(all used, once only)
to make the result of the fraction sum
(i) as large as possible
(ii) as small as possible



for another set of four consecutive digits?

mixed number multiplying





- the left hand-side must use all of the digits, 1 to 6
- the two fractions must be proper fractions (i.e. less than 1)
- the fractions could cancel down – that doesn't matter

(1) what is the smallest number that can be made? (smaller than 4⅓)

(2) what is the largest number that can be made? (larger than 36¼)

(3) how can these whole numbers be made?

(a) $1\frac{\square}{\square} \times 3\frac{\square}{\square} = 6$

(b) $6\frac{\square}{\square} \times 1\frac{\square}{\square} = 12$

(c) $\square\frac{2}{6} \times \square\frac{\square}{\square} = 14$

(d) $\square\frac{\square}{\square} \times \square\frac{\square}{\square} = 28$

(5) can you find *two* ways to make $20\frac{4}{5}$?

(6) can you find *two* ways to make $14\frac{17}{20}$?

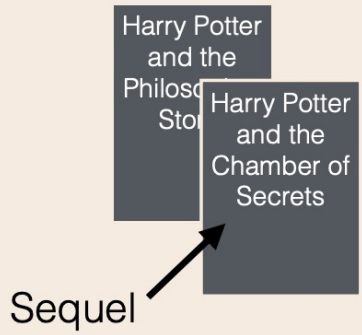
2 Sequences

A **sequence** is simply an ordered list of items (possibly infinitely long), usually with some kind of pattern.

Each item in a sequence is called a **term**.

sequor *v.* to follow (Latin)

sequel *n.*
1. Something that follows as a continuation, especially a literary or cinematic work.



sequence *n.*
1. An ordered list of objects.

Examples:

5, 8, 11, 14, 17,…
3, 6, 12, 24, 48,…
▲, ■, ⬟, ⬢,…
{1},{1,1},{1,1,1},…
a, $3a + 1$, $5a + 2$,…

Special Sequences

Find the next two terms in each sequence and name the sequence:

- $1, 3, 5, 7, 9, \ldots$
- $2, 4, 6, 8, 10, \ldots$
- $1, 4, 9, 16, 25, \ldots$
- $1, 8, 27, 64, 125, \ldots$
- $2, 4, 8, 16, 32, \ldots$
- $1, 3, 6, 10, 15, \ldots$
- $1, 1, 2, 3, 5, \ldots$
- $2, 3, 5, 7, 11, \ldots$
- $1, 11, 21, 1211, 111221, \ldots$

https://www.youtube.com/watch?v=PgqEaUT8Qo0&feature=youtu.be&t=780

2.1 Finding the Next Term

Fluency Practice

Use the common difference to work out the next term:

1) $13, 20, 27, 34, \ldots$

2) $7, 11, 15, 19, \ldots$

3) $6, 11, 16, 21, \ldots$

4) $9, 17, 25, 33, \ldots$

5) $12, 16, 20, 24, \ldots$

6) $10, 16, 22, 28, \ldots$

7) $-4, 4, 12, 20, \ldots$

8) $8, 13, 18, 23, \ldots$

9) $27, 35, 43, 51, \ldots$

10) $7, 12, 17, 22, \ldots$

11) $8, 15, 22, 29, \ldots$

12) $5, 9, 13, 17, \ldots$

13) $24, 21, 18, 15, \ldots$

14) $72, 63, 54, 45, \ldots$

15) $12, 10, 8, 6, \ldots$

16) $24, 16, 8, 0, \ldots$

17) $-1, -3, -5, -7, \ldots$

18) $-49, -58, -67, -76, \ldots$

19) $-18, -21, -24, -27, \ldots$

20) $-8, -6, -4, -2, \ldots$

21) $-9.5, -15.5, -21.5, -27.5, \ldots$

22) $7.5, 17.5, 27.5, 37.5, \ldots$

23) $-15, -9.5, -4, 1.5, \ldots$

Fluency Practice

Question 3: Each sequence below increases/decreases by the same amount each time. Find the missing terms.

(a) $4, \square, 8, 10, \ldots$

(b) $2, 5, \square, 11, \ldots$

(c) $5, 9, \square, 17, \ldots$

(d) $25, \square, 37, 43, \ldots$

(e) $15, 24, \square, 42, \ldots$

(f) $34, \square, 24, 19, \ldots$

(g) $18, \square, 40, 51, \ldots$

(h) $1, \square, \square, 19, \ldots$

(i) $3, \square, \square, 27, \ldots$

(j) $18, \square, \square, 39, \ldots$

(k) $6, \square, \square, \square, 42, \ldots$

2.2 Constant Difference

What is the constant difference in the sequence?

- The 17^{th} term is 52 and the 18^{th} term is 56

- The 15^{th} term is 61 and the 18^{th} term is 76

- The 10^{th} term is 52 and the 18^{th} term is 76

- The 10^{th} term is 52 and the 22^{nd} term is 76

- The 19^{th} term is 52 and the 18^{th} term is 76

1) What is the constant difference in the sequence?

a) The 7^{th} term is 20 and the 10^{th} term is 32

b) The 7^{th} term is 20 and the 10^{th} term is 35

c) The 7^{th} term is 20 and the 10^{th} term is 38

d) The 7^{th} term is 20 and the 13^{th} term is 38

e) The 7^{th} term is 20 and the 13^{th} term is 41

f) The 7^{th} term is 20 and the 13^{th} term is 44

g) The 7^{th} term is 20 and the 14^{th} term is 48

h) The 7^{th} term is 20 and the 15^{th} term is 52

i) The 7^{th} term is 20 and the 23^{rd} term is 52

j) The 7^{th} term is 20 and the 31^{st} term is 52

k) The 7^{th} term is 20 and the 39^{th} term is 52

l) The 7^{th} term is 52 and the 39^{th} term is 20

m) The 8^{th} term is 52 and the 40^{th} term is 20

n) The 8^{th} term is 51 and the 40^{th} term is 19

o) The 8^{th} term is 60 and the 40^{th} term is 12

2) Fill in the blanks so that the sequence increases by…

a) + 3
b) + 4
c) - 4
d) - 2
e) $+\frac{2}{3}$

15^{th} term = 20 16^{th} term = _____

15^{th} term = 20 19^{th} term = _____

15^{th} term = 20 20^{th} term = _____

20^{th} term = 20 25^{th} term = _____

15^{th} term = _____ 20^{th} term = 20

15^{th} term = 20 ___th term = 80

___th term = 20 20^{th} term = 80

2.3 Term to Term Rule

Some sequences we can generate by stating a rule to say how to generate the next term given the previous term(s).

$\mathbf{3}, \mathbf{7}, \mathbf{11}, \mathbf{15}, \mathbf{19}$ …

What is the rule, in words, for this sequence?
We add 4 each time.

The problem is that this also describes many other sequences.
Can you think of another sequence that adds 4 every time?

We need to both state our **rule** and our **starting term**.

A better rule for this sequence would be:
Start with 3, add 4 each time.

Fluency Practice

State the rule, in words, for each sequence:

1) $13, 20, 27, 34, \ldots$
2) $7, 11, 15, 19, \ldots$
3) $6, 11, 16, 21, \ldots$
4) $9, 17, 25, 33, \ldots$
5) $12, 16, 20, 24, \ldots$
6) $10, 16, 22, 28, \ldots$
7) $-4, 4, 12, 20, \ldots$
8) $8, 13, 18, 23, \ldots$
9) $24, 21, 18, 15, \ldots$
10) $72, 63, 54, 45, \ldots$
11) $12, 10, 8, 6, \ldots$
12) $24, 16, 8, 0, \ldots$
13) $4, 8, 16, 32, \ldots$
14) $64, 32, 16, 8, \ldots$
15) $3, 12, 48, 192, \ldots$
16) $50, 10, 2, 0.4, \ldots$
17) $-1, -3, -5, -7, \ldots$
18) $-49, -58, -67, -76, \ldots$
19) $-18, -21, -24, -27, \ldots$
20) $-8, -6, -4, -2, \ldots$
21) $-9.5, -15.5, -21.5, -27.5, \ldots$
22) $7.5, 17.5, 27.5, 37.5, \ldots$
23) $-15, -9.5, -4, 1.5, \ldots$

Fluency Practice

Question 1: Describe the rule for each sequence below and find the next three terms

(a) 3, 5, 7, 9, ...

(b) 5, 10, 15, 20, ...

(c) 1, 4, 7, 10, ...

(d) 20, 19, 18, 17, ...

(e) 5, 10, 20, 40, ...

(f) 10, 14, 18, 22, ...

(g) 1, 6, 11, 16, ...

(h) 2, 4, 8, 16, ...

(i) 100, 80, 60, 40, ...

(j) 5, 12, 19, 26, ...

(k) 1, 10, 100, 1000, ...

(l) 64, 32, 16, 8, ...

(m) 55, 66, 77, 88, ...

(n) 32, 41, 50, 59, ...

(o) 15, 9, 3, – 3, ...

(p) 2, 2.5, 3, 3.5, ...

(q) 8, 22, 36, 50, ...

(r) 1, 3, 9, 27, ...

Question 2: Describe the rule for each sequence below and find the next term.

(a) 2, 3, 5, 8, ...

(b) 6, 8, 12, 18, ...

(c) 5, 15, 35, 65, ...

(d) 100, 99, 97, 94, ...

(e) 3, 4, 7, 12, ...

(f) 5, 6, 8, 12, ...

Term to Term Rule

What might be the disadvantage of using a term-to-term rule?

To get a particular term in the sequence, we have to generate all the terms in the sequence before it. This is rather slow if you say want to know the 1000^{th} term!

2.4 Linear Sequences

Definition	**Characteristics**
A sequence where the difference between any two adjacent terms is equal.	• Also called arithmetic sequence. • Each term can be found by adding or subtracting the same number to a previous term. • Has position to term rule in the form $an + b$.
Examples	**Non Examples**
• $1, 2, 3, 4, \ldots$ • $-10, -6, -2, 2, \ldots$ • $7, 2, -3, -8, \ldots$ • $3.2, 3.8, 4.4, 5, \ldots$	• $4, 5, 7, 10, \ldots$ • $2, 4, 8, 16, \ldots$ • $1, 1, 2, 3, 5, \ldots$ • $9, 6, 9, 6, \ldots$

Questions

Put the following sequences in the correct column:

- $2, 4, 6, 8, \ldots$
- $-3, -10, -17, -24, \ldots$
- $31, 32, 33, 34, \ldots$
- $1, 4, 9, 16, \ldots$
- $8, 16, 24, 32, \ldots$
- $100, 80, 70, 65, \ldots$
- $7, -7, 7, -7, \ \ldots$
- $7, 15, 23, 31, \ldots$
- $2, 5, 9, 14, \ldots$
- $a, a + 3, a + 6, a + 9, \ldots$
- $7, 2.5, -2, -6.5, \ldots$

Linear Sequences	Not Linear Sequences

2.5 Position to Term Rule

It is sometimes more helpful to be able to generate a term of a formula based on its position in the sequence.

We could use it to say find the 300^{th} term of a sequence without having to write all the terms out!

We use $\boldsymbol{n}$ to mean the **position in the sequence**. So, if we want the 3^{rd} term, $n = 3$.

The **position to term rule** is also called the $\boldsymbol{n^{th}}$ **term rule**.

This year, we will only look at how to work out the position to term rule for linear sequences.

Worked Example	Your Turn
Find the n^{th} term rule: a) $8, 15, 22, 29, 36, \ldots$ b) $-6, 1, 8, 15, 22, \ldots$ c) $36, 29, 22, 15, 8, \ldots$	Find the n^{th} term rule: a) $11, 18, 25, 32, 39, \ldots$ b) $-3, 4, 11, 18, 25, \ldots$ c) $39, 32, 25, 18, 11, \ldots$

Intelligent Practice

A: Positive integers		Sequence	nth term rule
	A1.	5, 8, 11, 14, 17 …	
	A2.	4, 7, 10, 13, 16 …	
	A3.	2, 5, 9, 11, 15 …	
	A4.	2, 6, 10, 14, 18 …	
	A5.	2, 7, 12, 17, 22 …	
	A6.	4, 14, 24, 34, 44 …	
	A7.	−6, 4, 14, 24, 34 …	

B: Including negatives		Sequence	nth term rule
	B1.	1, 3, 5, 7, 9 …	
	B2.	−1, −3, −5, −7, −9 …	
	B3.	−2, −4, −6, −8, −10 …	
	B4.	10, 8, 6, 4, 2 …	
	B5.	−10, −8, −6, −4, −2 …	
	B6.	−5, −4, −3, −2, −1 …	
	B7.	1, 2, 3, 4, 5	

C: Including decimals		Sequence	nth term rule
	C1.	5, 11, 17, 23, 29 …	
	C2.	2.5, 5.5, 8.5, 11.5, 14.5 …	
	C3.	4.5, 7.5, 10.5, 13.5, 16.5 …	
	C4.	0.9, 1.5, 2.1, 2.7, 3.3 …	
	C5.	−0.1, 0.5, 1.1, 1.7, 2.3 …	
	C6.	2.3, 1.7, 1.1, 0.5, −0.1	
	C7.	2.3, 1.6, 0.9, 0.2, −0.5 …	

D: Including factions		Sequence	nth term rule
	D1.	13, 14, 15, 16,17 …	
	D2.	$3\frac{1}{4}, 3\frac{1}{2}, 3\frac{3}{4}, 4, 4\frac{1}{4}, \ldots$	
	D3.	$3, 3\frac{1}{4}, 3\frac{1}{2}, 3\frac{3}{4}, 4, \ldots$	
	D4.	$9, 9\frac{3}{4}, 10\frac{1}{2}, 11\frac{1}{4}, 12, \ldots$	
	D5.	$12, 11\frac{1}{4}, 10\frac{1}{2}, 9\frac{3}{4}, 9, \ldots$	
	D6.	$12, 11\frac{1}{5}, 10\frac{2}{5}, 9\frac{3}{5}, 8\frac{4}{5}, \ldots$	
	D7.	$12\frac{1}{3}, 11\frac{8}{15}, 10\frac{11}{15}, 9\frac{14}{15}, 9\frac{2}{15}, \ldots$	

Fluency Practice

Question 1: Find the n^{th} term for each of the following sequences

(a) 5, 8, 11, 14, ...

(b) 9, 14, 19, 24, ...

(c) 1, 3, 5, 7, ...

(d) 10, 14, 18, 22, ...

(e) 2, 7, 12, 17, ...

(f) 3, 9, 15, 21, ...

(g) 11, 31, 51, 71, ...

(h) 20, 23, 26, 29, ...

(i) 1, 7, 13, 19, ...

(j) 100, 125, 150, 175, ...

(k) 13, 22, 31, 40, ...

(l) 1.5, 2, 2.5, 3, ...

Question 2: Find the n^{th} term for each of the following sequences

(a) 10, 7, 4, 1, ...

(b) 6, 4, 2, 0, ...

(c) 9, 4, -1, -6, ...

(d) 20, 10, 0, -10, ...

(e) 5, -1, -7, -13, ...

(f) 5, 4, 3, 2, ...

(g) -6, -13, -20, -27, ...

(h) -10, -13, -16, -19, ...

(i) 2.5, 2, 1.5, 1, ...

Worked Example	Your Turn
Find the n^{th} term rule: $\frac{5}{12}, \frac{7}{19}, \frac{9}{26}, \frac{11}{33}, \ldots$	Find the n^{th} term rule: $\frac{6}{13}, \frac{8}{20}, \frac{10}{27}, \frac{12}{34}, \ldots$

Fluency Practice

Question 7: Find the n^{th} term for each of the following sequences

(a) $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \ldots \ldots$

(b) $\frac{9}{11}, \frac{13}{16}, \frac{17}{21}, \frac{21}{26}, \ldots \ldots$

(c) $\frac{3}{7}, \frac{6}{12}, \frac{9}{17}, \frac{12}{22}, \ldots \ldots$

(d) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots \ldots$

(e) $\frac{20}{21}, \frac{25}{32}, \frac{30}{43}, \frac{35}{54}, \ldots \ldots$

(f) $\frac{99}{100}, \frac{97}{95}, \frac{95}{90}, \frac{93}{85}, \ldots \ldots$

2.6 Generating Linear Sequences

To generate a term of a linear sequence, substitute n (the position number) into the n^{th} term rule.

Worked Example	Your Turn
Generate the first 5 terms of the following sequence: $5n + 3$	Generate the first 5 terms of the following sequence: $6n - 3$

Intelligent Practice

Generate the first 5 terms of each sequence:

1) $2n$

2) $3n$

3) $4n$

4) $4n + 1$

5) $4n + 7$

6) $4n - 2$

7) $4n - 10$

8) $n - 10$

9) $n + 10$

10) $\frac{1}{2}n + 10$

11) $\frac{1}{2}n + 5$

12) $-\frac{1}{2}n + 5$

13) $-\frac{1}{2}n - 5$

14) $-n - 5$

15) $-7n - 5$

16) $-14n - 10$

Fluency Practice

Question 4: The n^{th} term for some sequences are given below.
Find the first 5 terms for each sequence.

(a) $5n + 3$

(b) $2n + 9$

(c) $3n - 2$

(d) $10n - 6$

(e) $9n + 10$

(f) $n + 8$

(g) $-7n + 20$

(h) $50 - 5n$

(i) $3.5n + 4$

Extension

Here are the nth terms for 6 different linear sequences:

3n + 5	**2n - 1**	**34 – 5n**
n - 6	**33 – 4n**	**3n - 7**

How many of the sequences above do each of the following numbers appear in?

-6, -3, -1, 17, 26, 29

Order the numbers in order of which appears in the most to the least

773 is in the following sequences:

2n + a

3n + b

4n + c

5n + d

6n + e

Find the value of a, b, c, d and e

Maths Venns

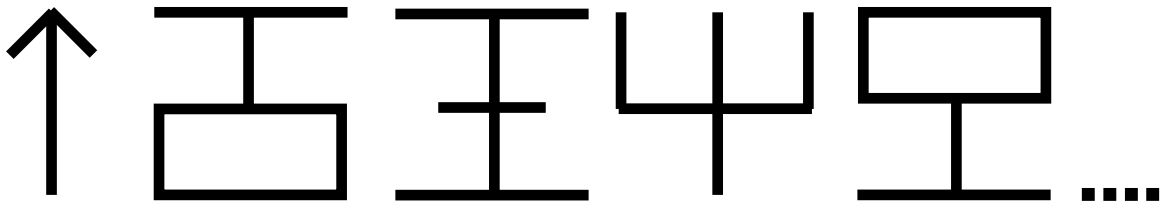
First term is 10
If you think a region is impossible to fill, convince me why!
Sequence contains a multiple of 4
Numbers in the sequence go up
H
B
E
D
G
C
F
A
Think of an nth term sequence rule that could belong in each region

Maths Venns

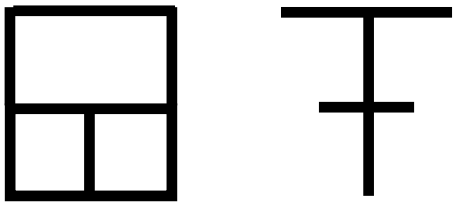
Sequence contains the number 12
If you think a region is impossible to fill, convince me why!
Sequence contains exactly 3 negative terms
Difference between each term is + or - 6
Think of an nth term sequence rule that could belong in each region
A
B
C
D
E
F
G
H

2.7 Patterns

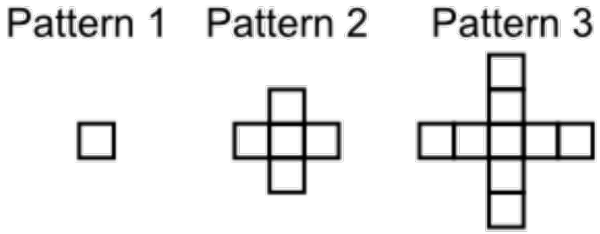
What are the next two pictures in this sequence?



It is the numbers $1, 2, 3, \ldots$ but reflected. Sneaky!



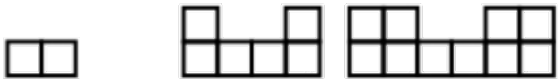
Worked Example



a) Draw the next pattern.
b) How many squares are in the n^{th} pattern?
c) How many squares in the 50^{th} pattern?
d) Which pattern will use 145 squares?

Your Turn

Pattern 1 Pattern 2 Pattern 3



a) Draw the next pattern.
b) How many squares are in the n^{th} pattern?
c) How many squares in the 50^{th} pattern?
d) Which pattern will use 154 squares?

Fluency Practice

Sequences – Patterns Questions

2.8 Review and Problem Solving

Fill in the Blanks

First Five Terms of Sequence					Term-to-Term Rule
6	10	14			
5	3	1			
3		5			
1	3	9			
1.5	1.7		2.1		
	7	2	-3		
80	40	20			
	1		$1\frac{1}{2}$		
8					$add\ 3$
2					$add\ 7$
	4				$subtract\ 2$
		2.5			$add\ 0.5$
			5		$subtract\ 2.5$
	2				$multiply\ by\ 2$
100					$divide\ by\ 10$
-4					$subtract\ 3$

Fill in the Gaps

Q	First 4 terms	nth term rule	term to term rule	1st term	10th term	29th term
1	$5, 9, 13, 17, \ldots$					
2		$4n + 3$				
3	$8, 13, 18, 23, \ldots$					
4		$5n - 3$				
5			$+ 6$	2		
6			$+ 6$		52	
7				-1	26	
8					28	66
9		$8 - 2n$				
10	$7, 6, 5, 4, \ldots$					
11				7	-20	
12					-20	-67.5

Fill in the Blanks

First Five Terms	Term-to-Term Rule	10th Term	30th Term	nth Term	Sum of the First 5 Terms
3, 5, 7, 9, 11				$2n + 1$	
7, 10, 13, 16, 19					
8, ☐ ☐ ☐ ☐	$add\ 5$				
40, 36, 32, 28, 24				$44 - 4n$	
25, 22, 19, 16, 13					
☐ ☐ 7, ☐ ☐	$subtract\ 2$				
☐ ☐ ☐ 27, 31					
☐ ☐ ☐ ☐ ☐		35		$3n +$ ☐	
☐ ☐ ☐ ☐ ☐			20	☐ $- 6n$	
☐ ☐ ☐ ☐ ☐	$add\ 1$				35

3 Written Calculations

3.1 Ordering Decimals

Ordering decimals involves comparing digits in the same columns, starting with the digits in the place value column that is furthest to the left.

To make it easier to compare, make sure all the decimals have the same number of decimal places by adding zeros to the end if you need to.

Worked Example	Your Turn
Write the following numbers in ascending order: a) $0.582, 0.825, 0.528, 0.285$ b) $0.79, 0.8, 0.7, 0.71$ c) $0.5037, 0.5, 0.53, 0.503, 0.5007$	Write the following numbers in ascending order: a) $0.671, 0.716, 0.176, 0.617$ b) $0.6, 0.59, 0.7, 0.61$ c) $0.2089, 0.2, 0.28, 0.208, 0.2009$

Fluency Practice

Question 1: Arrange in order from smallest to largest

(a) 3.7, 3.5, 3.9, 3.4, 3.8

(b) 9.2, 2.9, 5.4, 1.8, 8.7

(c) 4.6, 4.9, 14.1, 0.9, 1.2

(d) 8.13, 8.05, 8.24, 8.09, 8.15, 8.02

(e) 1.53, 1.48, 1.59, 1.44, 2.11, 0.98

(f) 0.59, 1.24, 0.45, 1.34, 0.88, 2.01

Question 2: Arrange in order from smallest to largest

(a) 1.2, 1.08, 1.13, 1.6, 1.29

(b) 5.25, 5.2, 5.19, 5.08, 5.1, 5.21

(c) 40.6, 46.1, 40.49, 40.68, 46, 46.09

(d) 0.24, 0.3, 0.125, 0.2, 0.199, 0.18

(e) 0.82, 0.082, 0.9, 0.807, 0.8

(f) 65, 6.5, 0.65, 7.65, 0.076, 7

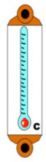
(g) 0.25, 0.3, 0.2, 0.06, 0.19

(h) 7.81, 7.49, 7.9, 7.007, 7.1, 7.107

(i) 10.083, 10.08, 10.009, 10.56, 10.3

(j) 0.342, 0.075, 0.256, 0.34, 0.6, 0.4

Extension



Question 1: Arrange these temperatures in order, from lowest to highest

(a) 11 °C, 10.8°C, 12.3 °C, 15 °C, 12.7 °C

(b) 8.5 °C, 0.7 °C, −3 °C, 0.9 °C, 6 °C, 1.3 °C, −5.1°C

Question 2: Arrange these amounts of money in order, from highest to lowest.

(a) £6.74, £10, £1.99, £8, £3.30, £2

(b) 80p, £1, £0.09, 23p, £2.75, £0.82, £20

Question 3: The distance of various landmarks from Big Ben are listed below. Arrange the landmarks in order, from closest to furthest.

London Eye	0.41 miles
Wembley	11.62 miles
Buckingham Palace	0.8 miles
Trafalgar Square	0.63 miles
Hyde Park	2.27 miles
Thorpe Park	24.7 miles

Question 4: Arrange these measurements in order from largest to smallest

(a) 6.2m, 6.077m, 6.31m, 6.19m, 6.4m, 6.009m

(b) 5kg, 800g, 1.2kg, 90g, 0.6kg

Question 5: The heights of seven footballers are listed below.

1.9m, 1.82m, 1.78m, 1.8m, 1.88m, 1.86m, 1.7m

(a) Arrange the heights in order from smallest to largest.

(b) Write down the median height.

(c) A player is picked at random.
Write down the probability that he is over 1.85m.

Question 6: The lengths of time that it takes to complete a jigsaw are below.

0.5 hours, 1.25 hours, 100 minutes, 0.75 hours, 40 minutes,

2 hours, 1.5 hours, 180 minutes, 61 minutes, 0.25 hours.

(a) Arrange the times in order, from quickest to longest.

(b) What fraction of the people completed the jigsaw in under 1 hour?

(c) What percentage of people took 2 hours or longer?

Maths Venns

Smaller than 0.5
If you think a region is impossible to fill, convince me why!
Ends in a 6
Bigger than 0.4
Think of a number that could belong in each of the regions
A
B
C
D
E
F
G
H

3.2 Adding Decimals

Adding decimals works exactly the same way as adding whole numbers.

When adding decimals it is important to keep the decimal points in line with each other.

Worked Example	Your Turn
Calculate: a) $0.27 + 3$ b) $0.27 + 0.3$ c) $0.27 + 0.9$ d) $0.27 + 0.94$	Calculate: a) $2.27 + 1$ b) $0.17 + 0.4$ c) $0.57 + 0.6$ d) $0.37 + 0.84$

Fluency Practice

Question 1: Work out the answers to the following additions

(a) 4.5 + 2.3 (b) 8.4 + 1.7 (c) 0.7 + 0.5 (d) 2.8 + 10.3

(e) 13.4 + 28.9 (f) 206.2 + 72.8 (g) 6.4 + 15.9 (h) 0.5 + 0.8 + 0.1

(i) 9.7 + 1.4 + 1.3 (j) 16.8 + 3.9 + 102.2 + 87.4

Question 2: Work out these additions

(a) 0.14 + 0.53 (b) 0.35 + 0.65 (c) 2.47 + 3.34 (d) 4.93 + 2.25

(e) 4.77 + 1.84 (f) 10.38 + 6.81 (g) 7.83 + 12.49 (h) 0.56 + 107.08

(i) 9.85 + 2.63 + 0.89 (j) 0.08 + 0.12 + 0.87 + 1.93 + 2.06

Question 3: Complete these additions

(a) 6.5 + 1.73 (b) 0.56 + 1.6 (c) 2.45 + 7.8 (d) 8.67 + 3.9

(e) 9.2 + 4.87 (f) 1.08 + 2.6 (g) 20.6 + 15.84 (h) 41.8 + 5.35

(i) 7.4 + 2.329 (j) 0.018 + 2.39 (k) 9.224 + 8.89 (l) 0.293 + 9.815

(i) 4.52 + 0.3 + 0.79 + 1.4 (j) 0.94 + 4.8 + 12.09 + 5.63

Extension

Question 1: Richard buys a notebook that costs £6.78 and a pen that costs £4.19.
Work out the total cost.

Question 2: Holly is saving money.
In January, she saves £15.15
In February, she saves £8.82
In March, Holly saves £13.37
Work out how much she has saved in total.

Question 3: David drives 4.8 miles to Bristol and a further 6.7 miles to Bath.
Work out how far he drives in total.

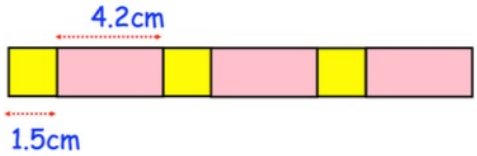
Question 4: Mr Jenkins has three pieces of rope.
The pieces of rope are 2.35m, 1.8m and 3.06m long.
Work out the total length of the pieces of rope.

Question 5: Shown is a rectangle.
Calculate the perimeter.

Question 6: Work out the missing number.

□ - 5.28 = 10.9

Question 7: Shown is a shape made from three identical squares and three identical rectangles.
Calculate the perimeter of the shape.



Question 8: The first four terms of a number sequence are
2.52, 2.71, 2.9, 3.09, ..., ..., ...
Work out the next two terms.

Question 9: Grace is working out 12.4 + 3.18
Can you spot any mistakes?

	1	2	4
+	3	1	8
	4	4	2

Question 10: Neil writes down four numbers with a sum of 50.
All the numbers have two decimal places and no two numbers are the same.
Write down four possible numbers Neil could have written down.

3.3 Subtracting Decimals

Subtracting decimals works exactly the same way as subtracting whole numbers.

When subtracting decimals it is important to keep the decimal points in line with each other.

Worked Example	Your Turn
Calculate: a) $3.27 - 3$ b) $0.27 - 0.1$ c) $0.27 - 0.15$ d) $0.27 - 0.18$	Calculate: a) $2.97 - 2$ b) $0.97 - 0.8$ c) $0.97 - 0.85$ d) $1.97 - 1.88$

Fluency Practice

Question 1: Work out the answers to the following subtractions

(a) 0.9 – 0.1 (b) 0.8 – 0.3 (c) 0.7 – 0.6 (d) 0.5 – 0.2

(e) 1.2 – 0.3 (f) 1.5 – 0.4 (g) 1.8 – 0.6 (h) 1.9 – 1.2

(i) 2.4 – 0.5 (j) 3.8 – 2.5 (k) 4.1 – 1.8 (l) 5.5 – 3.1

(m) 8.7 – 1.3 (n) 9.2 – 5.8 (o) 7.3 – 3.9 (p) 8.5 – 0.9

Question 2: Work out the answers to the following subtractions

(a) 7.7 – 1.5 (b) 8.5 – 4.1 (c) 19.7 – 18.6 (d) 26.2 – 5.2

(e) 54.5 – 23.1 (f) 80.4 – 10.3 (g) 16.6 – 9.2 (h) 85.7 – 50.4

(i) 7.3 – 4 (j) 8.6 – 2 (k) 24.9 – 6 (l) 15.1 – 9

(m) 7 – 1.3 (n) 9 – 3.6 (o) 20 – 4.4 (p) 32 – 8.7

Question 3: Work out these subtractions

(a) 0.39 – 0.23 (b) 0.47 – 0.15 (c) 0.75 – 0.41 (d) 0.99 – 0.65

(e) 0.46 – 0.18 (f) 0.81 – 0.55 (g) 1.24 – 0.72 (h) 2.13 – 1.66

(i) 8.63 – 0.4 (j) 5.55 – 3.1 (k) 8.13 – 0.5 (l) 3.84 – 1.9

(m) 10.4 – 0.15 (n) 5.8 – 1.92 (o) 14.5 – 0.77 (p) 12 – 4.55

Question 4: Complete these subtractions

(a) 40.5 – 19.3 (b) 88.3 – 52.58 (c) 155.73 – 48.89 (d) 203.5 – 51.64

(e) 498 – 70.94 (f) 500 – 384.11 (g) 8200 – 901.3 (h) 10000 – 4901.33

Question 5: Work out each of the following

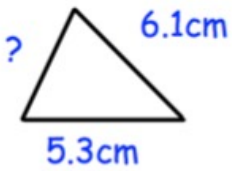
(a) 1.284 – 0.151 (b) 2.028 – 1.115 (c) 39.45 – 6.061

(d) 40.5 – 7.258 (e) 204.1945 – 203.7885 (f) 716 – 409.4822

Extension

Question 1: Paul buys a book that costs £6.89 and pays with a £10 note.
How much change should Paul get?

Question 2: Jennifer has 1.2kg of flour.
She uses 0.75kg of the flour to bake a cake.
How much flour does she have left?



Question 3: The perimeter of the triangle is 16.1cm.
Work out the length of the missing side.

Question 4: The first four terms of a number sequence are

15.8, 15.1, 14.4, 13.7, ___, ___

Work out the next two terms.

Question 5: Find the missing numbers

$8.41 + \square = 25$

$17.27 - \square = 1.89$

Question 6: Maxine buys 3 magazines that cost £1.99, £2.45 and £3.70.
She pays with a £50 note.
Work out how much change she should receive?

Question 7: Angus is working out 7.23 – 1.91
Can you spot any mistakes?

	7	• 2	3	
−	1	• 9	1	
	6	7	2	

7.23 - 1.91 = 672

3.4 Multiplying Decimals

Multiplying decimals works the same way as multiplying whole numbers.

When multiplying decimals, add up the number of digits after the decimal points in the question. This number tells you the number of decimal places you should have in your answer.

Worked Example	Your Turn
Calculate: a) 0.3×0.4 b) 3×0.4 c) 3.8×0.4 d) 60×1.5	Calculate: a) 0.6×0.2 b) 6×0.2 c) 7.6×0.2 d) 20×1.5

Fluency Practice

Question 1: Work out the answers to the following multiplications

(a)	1.2 × 4	(b)	3.2 × 3	(c)	5.3 x 2	(d)	7.3 x 3
(e)	1.6 × 4	(f)	2.9 × 5	(g)	4.2 × 6	(h)	9.5 x 7
(i)	6.7 x 8	(j)	3.8 x 9	(k)	12.8 x 3	(l)	24.3 x 4
(m)	37.5 x 6	(n)	52.8 x 7	(o)	173.2 x 3	(p)	215.8 x 6
(q)	1243.7 x 9	(r)	79.5 x 8				

Question 2: Work out the answers to the following multiplications

(a)	1.26 x 2	(b)	2.63 x 3	(c)	5.14 x 3	(d)	6.28 x 4
(e)	7.53 x 5	(f)	0.38 x 8	(g)	9.62 x 6	(h)	12.38 x 7
(i)	16.42 x 9	(j)	109.34 x 4	(k)	9.08 x 3	(l)	12.04 x 7
(m)	0.383 x 3	(n)	1.442 x 6	(o)	8.291 x 3	(p)	9.623 x 5
(q)	3.706 x 8	(r)	4.953 x 7	(s)	0.482 x 8	(t)	0.085 x 7
(u)	1.3842 x 3	(v)	4.3342 x 6	(w)	8.2039 x 5	(x)	7.3112 x 9
(y)	512.83 x 6	(z)	293.421 x 4				

Question 3: Work out the answers to the following multiplications

(a)	1.24 x 13	(b)	2.51 x 17	(c)	12.5 x 23	(d)	3.28 x 21
(e)	6.35 x 35	(f)	7.65 x 37	(g)	58.2 x 46	(h)	4.23 x 52
(i)	0.28 x 57	(j)	0.817 x 63	(k)	38.43 x 19	(l)	5.45 x 87
(m)	12.32 x 73	(n)	2.3 x 123	(o)	4.7 x 253	(p)	8.6 x 351
(q)	2.03 x 152	(r)	1.02 x 607				

Fluency Practice

Question 4: Work out the answers to the following multiplications

(a)	0.2 x 0.3	(b)	0.7 x 0.2	(c)	0.9 x 0.4	(d)	0.8 x 0.6
(e)	0.7 x 0.7	(f)	0.6 x 0.5	(g)	0.8 x 0.5	(h)	0.5 x 0.4
(i)	0.8 x 0.1	(j)	0.07 x 0.5	(k)	0.04 x 0.2	(l)	0.8 x 0.07
(m)	0.06 x 0.9	(n)	0.04 x 0.06	(o)	0.08 x 0.03	(p)	0.02 x 0.03
(q)	0.003 x 0.6	(r)	0.9 x 0.002	(s)	0.008 x 0.6	(t)	0.005 x 0.4
(u)	0.007 x 0.02	(v)	0.008 x 0.09	(w)	0.04 x 0.004	(x)	0.005 x 0.003
(y)	0.008 x 0.05	(z)	0.009 x 0.008				

Question 5: Work out the answers to the following multiplications

(a)	3.1 x 0.5	(b)	6.3 x 0.3	(c)	5.4 x 0.7	(d)	9.2 x 0.6
(e)	4.8 x 0.9	(f)	2.4 x 3.2	(g)	9.1 x 1.3	(h)	5.5 x 7.7
(i)	1.7 x 4.3	(j)	9.4 x 4.9	(k)	0.13 x 0.7	(l)	0.48 x 0.3
(m)	0.54 x 0.9	(n)	0.18 x 0.17	(o)	8.3 x 0.37	(p)	3.5 x 0.74
(q)	0.94 x 0.02	(r)	0.38 x 0.06	(s)	0.039 x 0.7	(t)	0.084 x 1.2
(u)	8.1 x 0.05	(v)	9.4 x 0.082	(w)	0.0048 x 0.12		

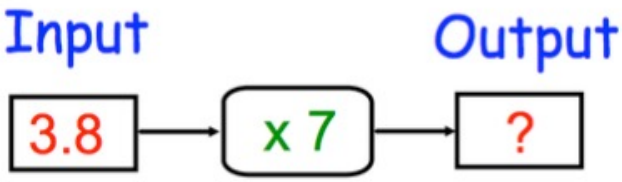
Question 6: Work out the answers to the following multiplications

(a)	1.29 x 1.4	(b)	3.52 x 2.4	(c)	4.92 x 0.34	(d)	8.12 x 0.29
(e)	6.3 x 2.46	(f)	9.2 x 7.15	(g)	0.843 x 1.9	(h)	0.548 x 2.7
(i)	6.18 x 5.1	(j)	18.2 x 6.4	(k)	5.03 x 2.8	(l)	40.8 x 5.3

Extension

Question 1: Regan is paid £6.70 per hour. He works 8 hours in a week.
Work out how much Regan should be paid.

Question 2: Calculate the output



Question 3: Calculate the area of the rectangle

Question 4: A bottle of cola costs £1.29
Calculate the total cost of 6 bottles of cola.

Question 5: Mr and Mrs Jones bring their 5 children to a museum.

Adults	£17.60 each
Children	£7.55 each

Work out the total cost for the family.

Extension

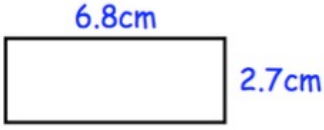
Question 6: Class 8A are going on a trip to a windmill.

The trip costs £3.70 each and there are 26 students in 8A.
How much money should be collected?

Question 7: Mr.Jenkins is building a fence for his garden.
The fence costs £12.60 per metre to build.
The fence is 5.3 metres long.

Work out the total cost of building the fence.

Question 8: Calculate the area of this rectangle.



Question 9: Here are the prices of some fruit in a shop.

Find the total cost of 1.2kg of apples, 3.5kg of oranges and 1.9kg of bananas.

3.5 Dividing Decimals

Dividing decimals by whole numbers works the same way as dividing whole numbers except, just like addition and subtraction of decimals, the decimal point must be kept in line.

Equivalent fractions can be used to divide numbers by decimals.

Worked Example	Your Turn
Calculate: a) $1.2 \div 3$ b) $1.2 \div 0.4$	Calculate: a) $1.2 \div 6$ b) $1.2 \div 0.2$

Fluency Practice

Question 1: Work out

(a) $4.6 \div 2$	(b) $6.5 \div 5$	(c) $9.6 \div 3$	(d) $8.4 \div 4$
(e) $7.2 \div 3$	(f) $6.8 \div 4$	(g) $18.5 \div 5$	(h) $9.6 \div 8$
(i) $14.4 \div 6$	(j) $27.9 \div 9$	(k) $9.1 \div 7$	(l) $36.5 \div 5$
(m) $33.2 \div 4$	(n) $19.2 \div 3$	(o) $27.6 \div 6$	(p) $42.4 \div 8$

Question 2: Work out

(a) $3.96 \div 3$	(b) $0.75 \div 5$	(c) $8.56 \div 4$	(d) $0.528 \div 6$
(e) $5.81 \div 7$	(f) $0.657 \div 9$	(g) $2.176 \div 8$	(h) $0.238 \div 7$
(i) $0.119 \div 7$	(j) $0.072 \div 6$	(k) $2.556 \div 3$	(l) $3.325 \div 5$
(m) $701.2 \div 4$	(n) $9.927 \div 9$	(o) $12.065 \div 5$	(p) $0.16024 \div 4$

Question 3: Work out

(a) $1.3 \div 2$	(b) $2.9 \div 2$	(c) $1.4 \div 5$	(d) $24.3 \div 5$
(e) $5.4 \div 4$	(f) $0.038 \div 5$	(g) $1.4 \div 8$	(h) $2.13 \div 6$
(i) $0.284 \div 8$	(j) $54.3 \div 6$	(k) $47.5 \div 8$	(l) $7.42 \div 3$

Question 4: Work out the following divisions

(a) $8.4 \div 12$	(b) $0.143 \div 11$	(c) $34.5 \div 15$	(d) $0.322 \div 14$
(e) $2.266 \div 22$	(f) $7.68 \div 12$	(g) $0.56 \div 16$	(h) $15.75 \div 25$
(i) $2.12 \div 40$	(j) $77.25 \div 75$	(k) $0.9936 \div 23$	(l) $3.52 \div 110$

Fluency Practice

Question 1: Work out

(a) $6 \div 0.2$	(b) $4 \div 0.5$	(c) $12 \div 0.3$	(d) $2 \div 0.1$
(e) $25 \div 0.5$	(f) $15 \div 0.3$	(g) $0.8 \div 0.2$	(h) $0.9 \div 0.3$
(i) $1.4 \div 0.2$	(j) $3 \div 0.6$	(k) $14 \div 0.7$	(l) $2.4 \div 1.2$
(m) $3.5 \div 0.5$	(n) $45 \div 1.5$	(o) $0.15 \div 0.5$	(p) $0.72 \div 0.2$
(q) $0.48 \div 0.3$	(r) $0.36 \div 0.9$	(s) $0.048 \div 0.2$	(t) $0.095 \div 0.5$
(u) $0.072 \div 0.6$	(v) $1.05 \div 0.5$	(w) $4.29 \div 0.3$	(x) $0.784 \div 0.7$

Question 2: Work out the following

(a) $2 \div 0.05$	(b) $3 \div 0.02$	(c) $6 \div 0.03$	(d) $12 \div 0.04$
(e) $15 \div 0.01$	(f) $60 \div 0.06$	(g) $0.08 \div 0.04$	(h) $0.06 \div 0.02$
(i) $0.4 \div 0.05$	(j) $0.8 \div 0.02$	(k) $0.27 \div 0.09$	(l) $0.28 \div 0.07$
(m) $1.2 \div 0.06$	(n) $4.9 \div 0.07$	(o) $0.058 \div 0.02$	(p) $0.075 \div 0.05$
(q) $1.278 \div 0.06$	(r) $0.0476 \div 0.07$	(s) $360 \div 0.12$	(t) $45 \div 0.15$

Question 3: Work out

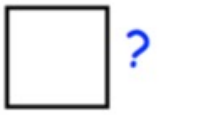
(a) $0.6 \div 0.02$	(b) $34 \div 0.2$	(c) $0.9 \div 0.5$	(d) $2.4 \div 0.08$
(e) $6 \div 0.005$	(f) $12 \div 0.1$	(g) $1.4 \div 0.04$	(h) $0.066 \div 0.3$
(i) $0.06 \div 0.15$	(j) $20 \div 0.004$	(k) $2.672 \div 0.08$	(l) $2.75 \div 0.05$
(m) $0.275 \div 0.005$	(n) $750 \div 2.5$	(o) $5.6 \div 0.004$	(p) $360 \div 1.2$

Extension

Question 1: Four friends share £6.52 equally.
How much do they each receive?

Question 2: James has 3.65m of rope into 5 pieces of equal length.
How long is equal piece of rope?

Question 3: The perimeter of a square is 53.3cm.
Work out the length of equal side.



Question 4: SuperSaver sells 6 eggs for £1.14
TopBuys sells 8 eggs for £1.68
BestBuys sells 12 eggs for £2.64

Which shop is best value?

Question 5: Roger is organising a trip to a museum.
The total price of the tickets is £103.50
The total price for the coach is £64.80
If nine people are going on the trip, how much should they pay each?

Question 6: A shop charges 12p to photocopy one page in full colour.
Sam has photocopied some pages in colour and the total cost is £16.08
How many pages did he photocopy?

Question 7: The perimeter of a regular octagon is 4.096cm
Calculate the length of each side.

Extension

Question 1: A sweet cost £0.04
How many sweets can I buy for £20?

Question 2: Mia has 20 metres of ribbon.
She is cutting it into pieces that are 0.8m long.
How many 0.8m pieces of ribbon will she have?

Question 3: Yasmin has £17 in five pence pieces.
How many five pence pieces does she have?

Question 4: Find the missing numbers

$0.4 \times \square = 20.8$

$0.7 \times \square = 45$

Question 5: A teacher is placing textbooks that are 2.5cm thick on a bookshelf.
The teacher wants to place 60 textbooks on the shelf.
The bookshelf is 160cm long.
Does the teacher have enough room on the bookshelf for the textbooks?

Question 6: A grain of rice has a mass of 0.015g
How many grains are there in 300g of rice?

Question 7: A type of pebble has a mass of 0.8g
How many pebbles are there in 40kg?

Question 8: Use approximations to estimate the answer to the following

(a) $\dfrac{9.89^2}{0.502}$

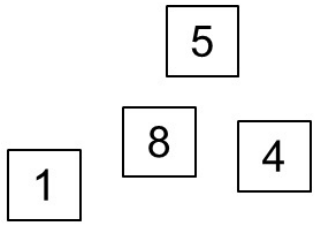
(b) $\dfrac{6.97 \times 201.82}{0.391}$

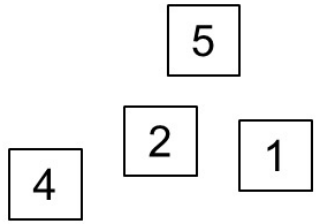
(c) $\dfrac{1802.7 - 397.2}{0.699}$

3.6 Review and Problem Solving

closest

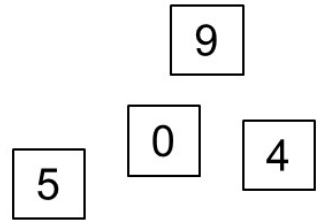
(1) use all four digits and a decimal point to create a number as close to 15 as you can



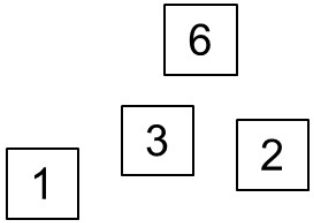
(2) 

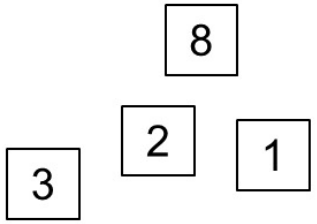
use all four digits and a decimal point to create a number as close to 25 as you can

(3) use all four digits and a decimal point to create a number as close to 5 as you can



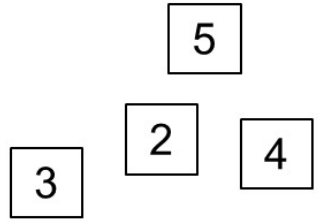
(4) use all four digits and a decimal point to create a number as close to 125 as you can



(5) 

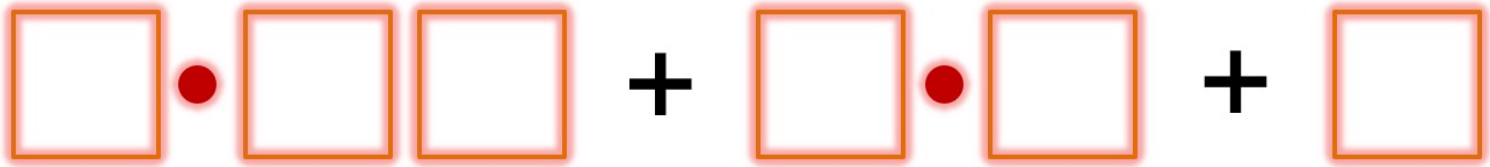
use all four digits and a decimal point to create a number as close to 3.2 as you can

(6) use all four digits and a decimal point to create a number as close to 3.488 as you can



Nearest To

use all the digits **1**, **2**, **3**, **4**, **5**, **6**, in the sum:



try to get these answers:

a) 7.05
b) 10.02
c) 11.91
d) 13.44
e) 11.82

what is the highest possible result?

what is the lowest possible result?

find six pairs of results that are 0.09 apart