1

a) i) How many times 4 is 16? 4   ii) Write their ratio. 16 : 4 = 4 : 1

b) i) How many times 16 is 4? $\frac{1}{4}$ ii) Write their ratio. 4 : 16 = 1 : 4

c) i) How many times $\frac{1}{2}$ is $\frac{2}{3}$? $\frac{4}{3}$ ii) Write their ratio in whole numbers.
$\frac{2}{3} : \frac{1}{2}$ = 4 : 3

d) i) How many times $\frac{2}{3}$ is $\frac{1}{2}$? $\frac{3}{4}$ ii) Write their ratio in whole numbers.
$\frac{1}{2} : \frac{2}{3}$ = 3 : 4

e) i) What part of 8 is 5 ? $\frac{5}{8}$ ii) What part of 5 is 8? $\frac{8}{5}$
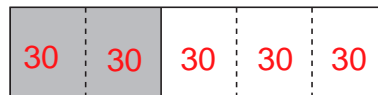

2

B : G
The ratio of boys to girls in a school is 11 : 10.

a) How many girls are in the school if there are 220 boys?   200 girls

b) What percentage of the number of girls is the number of boys? 110%

c) What part of the number of pupils in the school are the boys? $\frac{11}{21}$

3

Paul intends to plant 150 trees in his orchard.

He has divided the orchard into two parts in the ratio 2 : 3.

| 30 | 30 | 30 | 30 | 30 |

How many trees should he plant in: a) the smaller part of the orchard? 60

b) the larger part of the orchard? 90

4

F   D   F   D
From 1 kg of fresh apples you can get 150 g of dried apple.   1000 : 150   20 : 3

a) i) What part of the fresh apples is the dried apple? $\frac{3}{20}$

ii) What percentage of the fresh apples is the dried apple? 15%

b) i) What part of the mass of the fresh apples is lost in the drying process? $\frac{17}{20}$

ii) What percentage of the mass of fresh apples is lost? $\frac{17}{20}$ x 100 = 85%

c) Complete the table.

Mass of fresh apple (kg)	0	5	10	15	20	100	20	10	1
Mass of dried apple (kg)	0	$\frac{3}{4}$	1.5	$\frac{9}{4}$	3	15	3	1.5	0.15

5

Write different plans for each question. Use one of your plans to work out the answer.

3 lb of butter can be made from 25 litres of milk.   1 litre will make 3 lb ÷ 25 = 0.12 lb of butter

a) How much butter can be made from 48 litres of milk?   48 x 0.12 lb = 5.76 lb

b) How much milk produces 17 lb of butter?

$141\frac{2}{3}$ litres of milk produces 17 lb of butter.

1

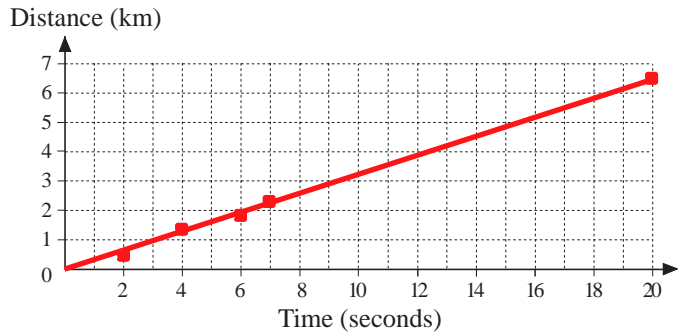The human voice travels through the air at 330 metres per second.

a) Complete the table.

Time (seconds)	1	2	3	4	5	6	6.5	7	$7\frac{1}{4}$	20
Distance (km)	0.33	0.66	0.99	1.32	1.65	1.98	2.145	2.31	2.39	6.6

b) Draw a graph to show the relationship between time and distance.

Distance (km) vs Time (seconds)

c) Fill in the missing words.

The graph is a straight line .

Time and distance are in direct proportion.

2

Different vehicles travelled at different average speeds over a 40 km route.

a) Complete the table to show the time taken at certain average speeds.

Speed (km/h)	40	30	20	16	10	8	5	4	80	120	100
Time (hours)	1	1.33	2	2.5	4	5	8	10	0.5	0.33	0.4

b) Draw a graph in your exercise book to show the relationship between average speed (in km per hour) and time (in hours).

Speed vs Time
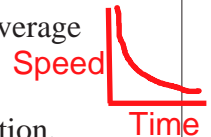
c) Complete the sentence. Speed and time are in Inverse proportion.

3

a) 60 000cl
600 litres of juice are poured into bottles which have a capacity of 75 cl. How many bottles are needed? 800 bottles

b) How many bottles would be needed if the bottles had a capacity of:

i) half a litre 1200 ii) 1 litre 600 iii) 1.5 litres 400 iv) 2 litres?
300 bottles

c) Show the data in a table. What kind of proportion do you notice?
inverse proportion

4

The volume of a cuboid is 240 cm³.

If $a = 10$ cm, complete the table for edges b and c.

$V = 240\,\text{cm}^3$

a	10	10	10	10	10	10	10
b	1	3	6	2.4	4.8	6.6	7
c	24	8	4	10	5	3.6	3.43

5

Which of the formulae has elements which are in: i) direct   ii) inverse proportion?

inverse 100 = e   direct   direct
$\times f$, $A = 8 \times b$, $b = \dfrac{A}{8}$, $8 = \dfrac{A}{b}$, $e = \dfrac{100}{f}$, $f = \dfrac{100}{e}$

direct   inverse   inverse

gravel $\frac{6}{9}$ = 240°

sand $\frac{2}{9}$ = 80°

1

In a mix of concrete, the ratio of gravel to sand to cement is 6:2:1.

a)   Draw a pie chart to show the components of the concrete.   cement $\frac{1}{9}$ = 40°

b)   How much gravel, sand and cement would be in these amounts of concrete:

i)   100 kg   ii)   1 tonne   iii)   7 tonnes   iv)   10 tonnes?

$\left(66\frac{2}{3} : 22\frac{2}{9} : 11\frac{1}{9}\right)\left(666\frac{2}{3} : 222\frac{2}{9} : 111\frac{1}{9}\right)\left(4666\frac{2}{3} : 1555\frac{5}{9} : 777\frac{7}{9}\right)\left(6666\frac{2}{3} : 2222\frac{2}{9} : 1111\frac{1}{9}\right)$all kg

2

If a handspan is 9 inches and an inch is 2.54 cm, calculate the missing values and write them in the table.

In handspans	1	2	3	4	5	6	7	8	9
In inches	9	18	27	26	45	54	63	72	81
In cm	22.86	45.72	68.04	66.04	114.3	137.17 160.02	182.88	205.74	

3

Dianne measured the table with her hand and its length was 6 handspans.

Then she measured the length of the table in metres and it was $\frac{6}{5}$ m.

a)   What is the length of Dianne's handspan in metres?   6 hands = $\frac{6}{5}$ m so 1 hand = $\frac{1}{5}$ m

b)   Write the length of her handspan in centimetres and in millimetres.

20 cm = 200 mm

4

From 1 kg of fresh ham we can get about 625 g of smoked ham.

F   S   F   S
1000 : 625   8 : 5

a)   What percentage of the mass of the fresh ham is lost by smoking?   37.5%

b)   How much smoked ham can we get from 6 kg of fresh ham?   3.75 kg

c)   How much fresh ham is needed to produce 6 kg of smoked ham?   9.60 kg

5

The areas of two rectangular gardens are equal. The first garden is 64 m long and 30 m wide. The length of the second garden is 120% of the length of the first garden.

a)   How wide is the second garden? 25 m

b)   What **part** of the width of the first garden is the width of the second garden?$\frac{25}{30} = \frac{5}{6}$

6

Write different plans to answer each question.

a)   What is 32% of £524.50?   b)   What is 106% of £524.50?

c)   What is p% of £524.50?

a) (32 ÷ 100) x £524.50

b) (106 x £524.50) ÷ 100

c) (p ÷ 100) x £524.50

7

Write different plans to answer each question.

a)   25% of which length is 72.5 cm?   b)   125% of which length is 72.5 cm?

c)   What is the whole length if p% of it is 72.5 cm?   a) 72.5 cm ÷ 25 x 100

c) 72.5 ÷ p x 100 (cm)   b) 72.5 cm ÷ 125 x 100

1

a) What part is:

i) 350 of 400 $\dfrac{7}{8}$ ii) 350 of 250? $\dfrac{7}{5}$

b) What is the ratio between:

i) 350 and 400   ii) 350 and 250?

7:8   7:5

c) What percentage is:

i) 350 of 400   ii) 350 of 250?

87.5%   140%

2

The ratio of the population of 3 cities (A, B and C) is 5 : 7 : 8.

a) Colour this strip in different colours to show the ratio.

A	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	C

b) How many people live in each city if the population of B is 80 000 more than the population of   A?   200 000 : 280 000 : 320 000

c) How many people live in the three cities altogether? 800 000

d) What is the ratio of the population in each city to the total in all three cities?

A 1 : 4   B 7 : 20   C 2 : 5

3

In a garden, 30% of the area is used to grow flowers, 20% of the area is used to grow vegetables and the remaining area is used to grow fruit.

a) Calculate the area of the garden if the vegetable plot is 220 m². 1100 m²

b) Calculate the area used to grow: i)   flowers 330 m²   ii)   fruit. 550 m²

c) What is the ratio of the three different parts of the garden? 2 : 3 : 5

4

Write a plan first, then calculate the result. Write the answer in a sentence.

a) The price of an item was £438 but in the sale the price has been cut by 10%.

i) What is its sale price? 90% of £438 = 90 ÷ 100 x 438 = £394.20

ii) What percentage is the sale price of the original price? 90%

b) 28% of the inhabitants of a village live in blocks of flats.

i) How many people live in houses if 406 people live in flats? 406 ÷ 28 x 72 = 1044

ii) How many people live in this village? 40 628 x 100 = 1450

iii) What percentage of the population of the village live in houses? 72%

c) The price of an item was cut by 10% and it now costs £113.40.

i) What was the original price of the item? £113.40 ÷ 90 x 100 = £126

ii) What percentage is the original price of the reduced price? 111.1%

d) What percentage is 31.5 of 90? 35%

1

Write the ratio of these amounts using the smallest possible **whole** numbers.

a)   0.4, 0.12, 3.3, 4.18   20 : 6 : 165 : 209

b) $\dfrac{3}{5}, \dfrac{2}{3}, \dfrac{1}{6}, \dfrac{11}{15}$ 18 : 20 : 5 : 22

c) $12\dfrac{1}{2}\%$, 42%, 64.5%, 11%   25 : 84 : 129 : 22

2

Solve these problems in your exercise book.

a)   Tom had blackcurrants, gooseberries, loganberries, raspberries and strawberries in his garden. One summer he gathered all the fruit and put it in his freezer. This is the ratio of the fruit in Tom's freezer.   B : G : L : R : S = 6 : 7 : 5 : 4 : 2 If there are 36 lbs of fruit in the freezer, how many lbs of each type of fruit did Tom pick?   9 kg : 10.5 kg : 7.5 kg : 6 kg: 3 kg

b)   In a school with 1350 pupils, the ratio of boys to girls is 11 : 14 and the ratio of teachers to pupils is 2 : 45.

  i)   How many girls and how many boys are in the school?   594 boys
  756 girls

  ii)   How many teachers are in the school? 60

c)   The ratio of *red* to *blue* to *green* beads in a jar is 7 : 13 : 17. If there are 126 *red* beads, how many *blue* and how many *green* beads are in the jar?
  blue 234   green 306

3

A certain distance was covered by 6 different people in different ways.

a)   Complete the table.

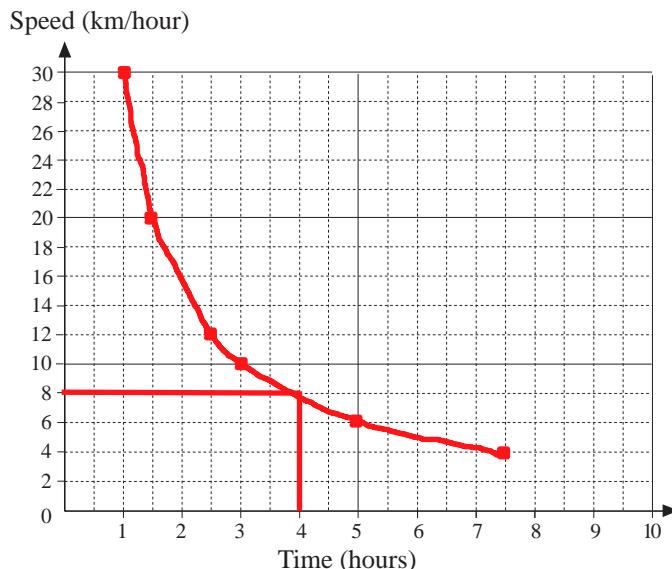| Speed (km/hour)	30	6	20	4	10	12
Time (hours)	1	5	1.5	7.5	3	2.5

b)   What was the distance they all travelled?
  30 km

c)   Show the data in a graph.

d)   Join up the points with a curved line.

e)   What kind of proportion is there between speed and time?
  . . . . . Inverse . . . .

f)   Read from the graph the speed needed to cover the distance in 4 hours.
  8 km/h

Speed (km/hour)

g)   How might the 6 people have travelled the 30 km?   cycled

1 Two *green* marbles and one *pink* marble come out of a machine one after the other in a random order. Calculate the probability of each of these outcomes.

a) The first marble is *pink* . $\frac{1}{3}$ b) The first marble is *green*. $\frac{2}{3}$

c) The order of the three marbles is *green*, *green*, *pink*. $\frac{1}{3}$

d) The order of the marbles is *green*, *pink*, *green*. $\frac{1}{3}$

2 A computer program writes the letters A, B and C in a random order.
What is the probability of each of these outcomes?

a) The first letter is A. $\frac{2}{6} = \frac{1}{3}$ b) The second letter is A. $\frac{2}{6} = \frac{1}{3}$

c) The third letter is C. $\frac{2}{6} = \frac{1}{3}$ d) The order is B, C, A. $\frac{1}{6}$

3 A computer program writes the digits 1, 2, 3 and 4 in a random order.
What is the probability of each of these outcomes?

a) The first digit is 3. $\frac{6}{24}$ b) The first digit is 1. $\frac{6}{24}$

c) The second digit is 3. $\frac{6}{24}$ d) The second digit is 1. $\frac{6}{24}$

e) The last digit is 2. $\frac{6}{24}$ f) The last digit is 4. $\frac{6}{24}$

g) The first two digits are 4, 3 in this order. $\frac{2}{24}$ h) The order is 3, 1, 2, 4. $\frac{1}{24}$

4 A computer program writes 2-digit, positive, whole numbers at random.
What is the probability of each of these outcomes?

a) The number is 37. $\frac{1}{90}$ b) The first digit is 8. $\frac{10}{90} = \frac{1}{9}$

c) The last digit is 5. $\frac{1}{10}$ d) The first digit is 0. 0

e) The last digit is 0. $\frac{9}{90} = \frac{1}{10}$ f) The number is even. $\frac{1}{2}$

5 In a primary school, the number of girls is 176, which is 55% of the total number of pupils at the school.

a) How many boys attend this school? 176 ÷ 55 x 45 = 144

b) How many pupils attend this school? 144 + 176 = 320
320 pupils attend the school.

c) If a computer program prints out the files of all the pupils in a random order, what is the probability of the computer selecting a file belonging to:

i) a girl $\frac{176}{320}$ or $\frac{9}{20}$ ii) a boy? $\frac{144}{320}$ or $\frac{9}{30}$

6 In a drawer there are 2 dark *grey* socks and 3 dark *blue* socks, all the same size. If you take out two socks without looking at them, what is the probability of getting:

a) a pair of dark *grey* socks   b) a pair of dark *blue* socks?
c) two socks of the same colour?

a) $\frac{1}{10}$ or 10% b) $\frac{3}{10}$ or 30% *Give the probabilities as percentages.*

c) $\frac{4}{10}$ or 40%

1

A cash box contains *gold* and *silver* coins. The ratio of *gold* coins to *silver* coins is 47 to 53. The number of *silver* coins is 159.

a)   How many: i)   *gold* coins **141** ii) coins **300** are in the cash box?

b)   If you take out a coin with your eyes shut, what is the probability of the coin being *gold*? *Give your answer as a percentage.* $\dfrac{141}{300}$ x 100 = 47%

2

In a game of *Roulette*, a wheel is spun and a ball comes to rest on one of the numbers 0 to 36. The even numbers from 2 to 36 are *red* numbers.

What is the probability of each of these outcomes?

a)   0 wins $\dfrac{1}{37}$ b)   21 wins $\dfrac{1}{37}$ c)   7 **or** 8 wins $\dfrac{2}{37}$ d)   31 **or** 34 wins $\dfrac{2}{37}$

e)   24 **or** 25 **or** 26 wins $\dfrac{3}{37}$ f) $12 \le n \le 17$ wins $\dfrac{6}{37}$ g) $1 \le n \le 12$ wins $\dfrac{12}{37}$

h)   The winning number gives a remainder of 2 when divided by 3. $\dfrac{12}{37}$

i)   A *red* number wins. $\dfrac{18}{37}$ j)   The numbers 25 to 36 do **not** win. $\dfrac{25}{37}$

3

In a pack of 52 playing cards, there are **13** cards (Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King) in each of **4** suites: Diamonds and Hearts (*red*), Clubs and Spades (*black*).

If you take a card from the pack at random, what is the probability that the card is:

a)   an Ace $\dfrac{4}{52}$ = $\dfrac{1}{13}$ b)   a 9 $\dfrac{1}{13}$ c)   a Club $\dfrac{1}{4}$ d)   a *red* card $\dfrac{1}{2}$

e)   a Queen of Diamonds $\dfrac{1}{52}$ f)   a Jack **or** a King of Spades $\dfrac{5}{52}$

g)   an Ace of Clubs **or** a King of Hearts $\dfrac{1}{26}$ h)   **not** an Ace? $\dfrac{12}{13}$

4

These are the probabilities for certain outcomes when throwing a dice.
Write a question to match each probability.

e.g.

a) $\dfrac{1}{6}$ p(1)   b)   0 p(7)   c) $\dfrac{5}{6}$ p(>1)   d)   1 p(>0)   e) $\dfrac{1}{3}$ p(>4)

f) $\dfrac{1}{2}$ p(even)   g) $\dfrac{2}{3}$ p(>2)   h) $33\dfrac{1}{3}$% p(>4)   i)   50% p(even)   j)   100% p(>0)

5

These are the probabilities of certain outcomes when 4 coins are tossed one after the other. Write an outcome to match each probability.

e.g.

a)   0 5 Tails   b) $\dfrac{1}{16}$ HHHH c) $\dfrac{2}{16}$ TTTH   d) $\dfrac{3}{16}$ HHTH   e) $\dfrac{4}{16}$ HTHH

f) $\dfrac{5}{16}$ THTH   g) $\dfrac{6}{16}$ HHHT   h) $\dfrac{7}{16}$ THTH   i) $\dfrac{8}{16}$ THTT   j) $\dfrac{9}{16}$ TTTT

k) $\dfrac{10}{16}$ TTTH   l) $\dfrac{11}{16}$ HTHH m) $\dfrac{12}{16}$ TTHH   n) $\dfrac{13}{16}$ THTH   o) $\dfrac{14}{16}$ THTH

p) $\dfrac{15}{16}$ Not HHHH   q) $\dfrac{16}{16}$ HTTH   r)   50% HTTT

1 Calculate the sums.

a)
```
        8 7 0 4
    1 6 0 7 1
    8 0 3 2 6
  +     9 5 6 5
    1 1 4 6 6 6
```

b)
```
      4 3 0.2
    7 2 1 4.5
        9 0 8.3
  + 1 1 1 6
    9 6 6 9.0
```

c) $\dfrac{4}{9} + 1\dfrac{3}{5} = \dfrac{92}{45} = 2\dfrac{2}{45}$

d) $43.2 + 10\dfrac{4}{5} = 54$

2 Calculate the differences.

a)
```
    7 2 0 4 9
  − 5 2 1 3 8
    1 9 9 1 1
```

b)
```
    6 3 1 0.0 8
  − 1 6 3 4.1
    4 6 7 5.9 8
```

c) $2\dfrac{1}{4} - \dfrac{5}{6} = \dfrac{34}{24} = 1\dfrac{10}{24} = 1\dfrac{5}{12}$

d) $23\dfrac{3}{4} - 15.05 = 8.7$

3 Calculate the products.

a)
```
        6 8 2
      ×   3 6
      4 0 9 2
    2 0 4 6 0
    2 4 5 5 2
```

b)
```
        4.1 5
      × 0.7 1
        4 1 5
    2 9 0 5 0
    2.9 4 6 5
```

c) $4\dfrac{2}{5} \times \dfrac{3}{7} = \dfrac{66}{35} = 1\dfrac{31}{35}$

4 Calculate the quotients.

a)
```
        0 5 7 5.8
    9 5 1 8 3
      4 5
        6 8
        6 3
          5 3
          4 5
            8
```

b)
```
        0 0 6 3.3 3
    2 6 1 6 4 6.8
          1 5 6
            8 6
            7 8
              8 8
              7 8
              1 0 0
                7 8
                2 2   etc.
```

c) $5\dfrac{1}{3} \div \dfrac{2}{5} = \dfrac{80}{6} = \dfrac{40}{3} = 13\dfrac{1}{3}$

5

a) Six friends went on a day trip in a minibus. They spent £186.50 on petrol and £133.50 on food.
If they shared the costs equally, how much did they each have to pay? **£53.33**

b) Bob wanted to fill a 260 litre barrel from a 545 litre tank full of water.

He transferred the water from the tank to the barrel using two 5 litre buckets at a time. How many times did he need to fill the two 5 litre buckets? **26 times**

c) A beetle was 108 times as fast as a snail. If the beetle covered 54 cm in a certain time, how far could the snail move in the same time? **$\dfrac{1}{2}$ cm**

d) The edges of a cuboid are 8 cm, 5.3 cm and 36 mm. What is its volume?
8 cm x 5.3 cm x 3.6 cm = 152.64 cm³

1

The Ladder Game

Rule: **A** says a natural number from 1 to 5. **B** adds on a natural number 1 to 5.
A adds a natural number, 1 to 5, to **B**'s sum, and so on.

The winner is the player who reaches 40. If 40 is the number to reach, aim for the following numbers: $4 \rightarrow 10 \rightarrow 16 \rightarrow 22 \rightarrow 28 \rightarrow 34 \rightarrow 40$

a)   Play the game with a partner.   b)   Work out a strategy for each player.

c)   Which player can be sure of winning each time if he makes no mistakes?
If A starts, then A should win. B can win only if A does not know the strategy or makes a mistake.

2

The *Ladder Game* can be changed so that the player who says '40' is **not** the winner.

a)   Play this version of the game with a partner.

b)   Work out a strategy. If 40 is not the number to reach, then aim for 39:
$3 \rightarrow 9 \rightarrow 15 \rightarrow 21 \rightarrow 27 \rightarrow 33 \rightarrow 39$

c)   Which player can be sure of winning this game if he makes no mistakes?
Player A should win if they use the strategy correctly.

3

a)   Continue the pattern in your exercise book.
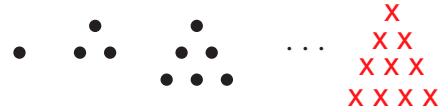
Write the first 10 terms in this sequence of **triangular** numbers.
1, 3, 6, 10, 15, 21, 28, 36, 45, 55

b)   Continue the pattern in your exercise book.

Write the first 10 terms in this sequence of **square** numbers.
1, 4, 9, 16, 25, 36, 49, 64, 81, 100

4

A family gathered 4 kg of cherries from the 1st tree in their orchard, 8 kg from the second tree and so on. They always gathered 4 kg more cherries from the next tree than from the one before it.

a)   If there were 10 trees in the orchard, what mass of cherries was gathered altogether?
4 + 8 + 12 + 16 + 20 + 24 + 28 + 32 + 36 + 40 = 220

b)   What mass of cherries would the family have collected if they had gathered 6 kg from the first tree and 4 kg more from one tree to the next?
6 + 10 + 14 + 18 + 22 + 26 + 30 + 34 + 38 + 42 = 240

5

$x + (x+1) + (x+2) = 3x + 3$
$= 3(x+1)$

a) $1 + 2 + 3$ and $2 + 3 + 4$ and $3 + 4 + 5$ are exactly divisible by 3.
What can you say about the **sum** of three adjacent positive whole numbers?
The sum of any 3 adjacent numbers is always divisible by 3.

b) $1 \times 2 \times 3$ and $2 \times 3 \times 4$ and $3 \times 4 \times 5$ are exactly divisible by 6.
What can you say about the **product** of 3 adjacent positive whole numbers?
The product of any 3 adjacent positive whole numbers is a multiple of 6.

6

a)   The difference between two numbers is 2.1. What is the larger number if the smaller number is x?   2.1 + x

b)   Laura has n stamps. Laura and George have 125 stamps altogether.
How many stamps does George have?   125 - n

1

In a box of mixed fruit jellies, there are 60 sweets altogether.

BL : L : O : S

There are blackcurrant, lemon, orange and strawberry flavours in the ratio of 6 : 3 : 4 : 2.

a) If you took out a sweet with your eyes closed, what is the probability that the sweet will be:

   i) lemon $\frac{3}{15}$ ii) strawberry $\frac{2}{15}$ iii) neither lemon **nor** strawberry $\frac{10}{15}$

   iv) **not** blackcurrant $\frac{9}{15}$ v) orange **or** lemon $\frac{7}{15}$ vi) banana? 0

b) What is the **least** number of sweets you must take out of the bag with your eyes closed to be **certain** of getting a lemon jelly?

   Number of lemon sweets = $\frac{3}{15}$ =12. Hence least number is 49.

2

Practice calculation.

a) $\frac{3}{7} + \frac{3}{4} = \frac{33}{28}$ b) $\frac{5}{8} + \frac{7}{8} = 1\frac{1}{2}$ c) $\frac{7}{11} + \frac{1}{2} = 1\frac{3}{22}$ d) $\frac{4}{9} + \frac{9}{13} = 1\frac{16}{117}$

e) $\frac{5}{6} \times \frac{1}{6} = \frac{5}{36}$ f) $\frac{11}{12} \times \frac{7}{11} = \frac{7}{12}$ g) $\frac{15}{24} \times \frac{6}{55} = \frac{3}{44}$ h) $\frac{11}{52} \times \frac{4}{13} = \frac{11}{169}$

3

Do the calculations in your exercise book.

a) i) $9815 + 27\,082 + 90\,437 + 8455$ ii) $541.3 + 8325.6 + 1057.01 + 954$
      135 789   10 877.91

b) i) $83\,506 - 63\,049$ ii) $5421.19 - 2745.2$ iii) $5\frac{2}{5} - 3.8$ 1.6
      20 457   2675.99

c) i) 3065×27 ii) 431^2 iii) 2073.4×2.07 iv) $7\frac{7}{8} \times 0.25$
      82 755   185 761   4 291.938   1.96875

d) i) $6259 \div 23$ ii) $3759.29 \div 5.3$ 709.3 iii) $10\frac{1}{5} \div \frac{17}{25}$ 15
      272 remainder 3

4

These are the probabilities for certain outcomes when drawing a card from a normal pack of 52 cards. Write a question to match each probability.

e.g.
a) $\frac{1}{13}$ p(Ace) b) $\frac{1}{4}$ p(Heart) c) $\frac{1}{2}$ p(red) d) $\frac{13}{26}$ p(black) e) $\frac{3}{13}$ p(face card)

f) $\frac{3}{52}$ g) $\frac{1}{26}$ p(Joker) h) $\frac{5}{13}$ i) $\frac{8}{13}$ j) 0 p(5 Aces)
   p(a Club face card   p(2, 3, 4, 5 or 6) p(not Heart)

5

Solve the problems.

a) The sum of two numbers is 8.3 and their difference is 1.1. What are the 2 numbers?
   3.6 and 4.7

b) I thought of a 3-digit number. Both the number and the **square root** of the number are 1 more than a whole 10. What could my number be? 121, 441, 961

c) Adam has 20 more CDs than Caroline. David has 15 fewer CDs than Belinda. Caroline and David together have the same number of CDs as Belinda.

   If David has 8 CDs, how many CDs does each person have? Adam 35, Caroline 15
   David 8, Belinda 23

1 The **base set** is the set of positive, whole numbers.

a) Write 4 numbers which have exactly 2 factors.   2, 3, 5, 7

b) Write a number which has exactly one factor.   1

c) Write 3 numbers which have exactly 3 factors.   4, 9, 25

d) Write 3 numbers which have exactly 4 factors.   6, 8, 10

2 **Simplify** these fractions.

a) $\dfrac{42}{60} = \dfrac{7}{10}$ b) $\dfrac{36}{48} = \dfrac{3}{4}$ c) $\dfrac{56}{40} = \dfrac{7}{5}$ d) $\dfrac{140}{56} = \dfrac{5}{2}$

3 Decide whether the sum is exactly divisible by 3, then do the calculation.

a) $(36 + 18 + 27 + 45) \div 3 =$ 42 Divisible exactly by 3

b) $(36 + 14 + 66 + 19) \div 3 =$ 45 Divisible exactly by 3

c) $(45 + 73 + 46 + 90) \div 3 =$ 82,r 2 Not divisible exactly by 3

4 Decide whether the sum is exactly divisible by 4, then do the calculation.

a) $(33 + 41 + 62 + 240) \div 4 =$ 94 Divisible exactly by 4

b) $(44 + 60 + 20 + 12) \div 4 =$ 34 Divisible exactly by 4

c) $(26 + 27 + 28 + 29) \div 4 =$ 27, r 2 Not divisible exactly by 4

5 Decide whether the difference is exactly divisible by 5, then do the calculation.

a) $(75 - 40) \div 5 =$ 7   b) $(78 - 43) \div 5 =$ 7

c) $(82 - 35) \div 5 = \dfrac{47}{5} = 9\dfrac{2}{5}$ d) $(36 - 14) \div 5 = \dfrac{22}{5} = 4\dfrac{2}{5}$

e) $(54 - 26) \div 5 = \dfrac{28}{5} = 5\dfrac{3}{5}$ f) $(90 - 36) \div 5 = \dfrac{54}{5} = 10\dfrac{4}{5}$

6 $$(35 + 4\,\boxed{} + 28) \div 7$$

Which digit could be written in the box so that the sum inside the brackets:

a) is exactly divisible by 7 2 or 9 b) gives a remainder of 3 when divided by 7 5

c) gives a remainder of 6 when divided by 7? 1 or 8

7 **Simplify** the fractions in your exercise book. Check that you are correct.

a) $\dfrac{4 + 6 + 8}{2}$ b) $\dfrac{4 \times 6 \times 8}{2}$ c) $\dfrac{10 + 25 + 55}{5}$ d) $\dfrac{10 \times 25 \times 55}{5}$

9   96   Page 121   18   2750

1

Write **five** 3-digit numbers which are exactly divisible by:
a)   2   b)   5   c)   10.
e.g. a) 120, 688, 142, 806,100   b) 215, 340, 105, 410, 635
      c) 100, 110, 120, 130,140

2

Write **five** 4-digit numbers which are exactly divisible by:
a)   4   b)   25   c)   100.
e.g. a) 1004, 2096, 4108, 1000, 7596
      b) 1075, 6350, 2025, 5100, 7575   c) 1000, 1100, 1200, 1300, 1400

3

Write **four** 5-digit numbers which are exactly divisible:

a)   by 2 and by 5   b)   by 4 and by 25.

e.g. 13 430, 76 000, 21 560, 55 550   e.g. 26 400, 41 000, 70 900, 11 100

4

Decide on the remainder **before** doing the calculation by writing the remainder for each term below it.

a) $(45 + 63 + 18) \div 3 = $ 42
       $0 + 0 + 0 \longrightarrow$ 0

b) $(41 + 72 + 81) \div 3 = $ 64 r2
       $2 + 0 + 0 \longrightarrow$ 2

c) $(53 + 90 + 19) \div 3 = $ 54
       $2 + 0 + 1 \longrightarrow$ 0

d) $(1000 + 100 + 10 + 6) \div 3 = $ 372
       $1 + 1 + 1 + 0 \longrightarrow$ 0

e) $(300 + 20 + 4) \div 3 = $ 108
       $0 + 2 + 1 \longrightarrow$ 0

f) $(4000 + 100 + 70 + 1) \div 3 = $ 1390 r1
       $1 + 1 + 1 + 1 \longrightarrow$ 1

5

Write the remainder after dividing each number by 9.

a)   100 [1]   b)   200 [2]   c)   800 [8]   d)   900 [0]

e)   1000 [1]   f)   2000 [2]   g)   6000 [6]   h)   9000 [0]

i)   819 [0]   j)   7368 [6]   k) 12 534 [6]   l) 88 888 [4]

6

Decide on the remainder **before** doing the calculation by writing the remainder for each term below it.

a) $(45 + 63 + 18) \div 9 = $ 14
       $0 + 0 + 0 \longrightarrow$ 0

b) $(41 + 72 + 81) \div 9 = $ 21 r5
       $5 + 0 + 0 \longrightarrow$ 5

c) $(53 + 90 + 19) \div 9 = $ 18
       $8 + 0 + 1 \longrightarrow$ 0

d) $(1000 + 100 + 10 + 6) \div 9 = $ 124
       $1 + 1 + 1 + 6 \longrightarrow$ 0

e) $(300 + 20 + 4) \div 9 = $ 36
       $3 + 2 + 4 \longrightarrow$ 0

f) $(4000 + 100 + 70 + 1) \div 9 = $ 463 r4
       $4 + 1 + 7 + 1 \longrightarrow$ 4

7

Write the remainder after dividing each number by 3.

a)   100 [1]   b)   200 [2]   c)   800 [2]

d)   900 [0]   e)   1000 [1]   f)   2000 [2]

g)   6000 [0]   h)   9000 [0]   i)   819 [0]

j)   7368 [0]   k)   12 534 [0]   l)   88 888 [1]

1

a) Write **four** 5-digit numbers which are exactly divisible by 9. e.g. 12 510, 21 411, 90 000, 18 000

b) **Increase** the numbers so that when the new numbers are divided by 9:

i) there is a remainder of 1

12 511, 21 412, 90 001, 18 001

ii) there is a remainder of 4.

12 515, 21 415, 90 004, 18 004

c) **Decrease** the original numbers so that when the new numbers are divided by 9 there is a remainder of 8.
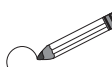
12 509, 21 410, 89 999, 17 999

2

a) Write **four** 4-digit numbers which are exactly divisible by 3. 3 000, 3 003, 3 006, 3 009

b) **Increase** the numbers so that the new numbers are exactly divisible by 9.

3 006, 3 015, 3 024, 3 033

c) **Increase** the original numbers so that when the new numbers are divided by 3:

i) there is a remainder of 1

3 001, 3 004, 3 007, 3 010

ii) there is a remainder of 2.

3 002, 3 005, 3 008, 3 011

3

a) Circle the numbers which are divisible by 2 and also by 3.

23 461   (72 534)   183   5606   (444)

b) Calculate the remainder when each number is divided by 6.

1   0   3   2   0

4

a) Write the **natural** numbers from 150 to 170 in the Venn diagram.

$150 \le n \le 170$: 151, 154, 155, 157, 158

Divisible by 4: 160, 152, 164

Intersection: 156, 168

Divisible by 3: 150, 153, 159, 162, 165

161, 163, 166, 167, 169, 170

b) Complete this sentence.

A natural number is divisible by 12 **only** if it is divisible by [3] and by [4].

5

a) Write the **natural** numbers from 150 to 170 in the correct place in the table.

$150 \le n \le 170$	Multiple of 6	Not a multiple of 6
Multiple of 4	156, 168	152, 160, 164
Not a multiple of 4	150, 162	151, 153, 154, 155, 157, 158, 159, 161, 163, 165, 166, 167, 169, 170

b) Complete this sentence.

If a natural number is divisible by 4 and by 6, then it is also divisible by [12].

6

a) Write a number which is exactly divisible by 7, 11 and 13. 1 001 . . . .

b) Multiply 215 by 7, then multiply the product by 11, then multiply this product by 13. Explain the result in your exercise book. 215 x 1 001 = 215 215

1 Calculate: a)   five times $3\frac{1}{4}$ **16.25**   b)   one fifth of $\frac{3}{7}$ c)   half of $2\frac{4}{5}$

$\frac{3}{35}$ **$1\frac{2}{5}$**

2 Write these fractions in decreasing order in your exercise book.

$$\frac{3}{4}, \quad \frac{8}{10}, \quad \frac{3}{6}, \quad \frac{75}{100}, \quad \frac{4}{5}, \quad \frac{11}{20}$$ **$\frac{8}{10}, \frac{4}{5}, \frac{75}{100}, \frac{3}{4}, \frac{11}{20}, \frac{3}{6}$**

3 Practise calculation.

a) $1\frac{2}{5} + 2\frac{2}{3} + 3\frac{4}{5} - 4\frac{1}{2} =$ **$3\frac{11}{30}$**

b) $234 \times 0.34 =$ **79.56**

c) $\left(34\frac{3}{5} - 12.4\right) \times 5 =$ **111**

d) $\left(3\frac{1}{4} + 2\frac{1}{2}\right) \times \frac{2}{5} =$ **2.3**

e) $\left(7\frac{3}{4} + 9\frac{4}{5}\right) \div \frac{3}{7} =$ **40.95**

f) $48.3 \div 1.5 =$ **32.2**

4 Write a plan, do the calculation, check it and write the answer in a sentence.

a)   If an adult eats on average $\frac{7}{10}$ kg of bread each day, how much bread might be

eaten by a family of 6 adults in a week?   **$(\frac{7}{10}$ kg x 7) x 6 = 29.4 kg**

b)   A group of students decided to walk a distance of 24 km over 4 days.

On the first day, they walked 6 and 2 fifths km, on the second day they walked
7 and 3 eighths km and on the third day they walked 5 and 3 quarter km.

What distance did they still have to walk on the 4th day?   **$24 - (6\frac{2}{5} + 7\frac{3}{8} + 5\frac{3}{4}) = 4\frac{19}{40}$(km)**

c)   The income of a group of 6 friends over a period of 3 weeks was £4500 in the first
week, £3725.40 in the second week and £4105.50 in the third week.

What was the average income per person per week?   **(£4500 + £3725.40 + £4105.50) ÷ 3 ÷ 6**

= £685.05

d)   The Council has laid $12\frac{1}{2}$ km of a cycle track, which is $\frac{7}{8}$ of the planned length.

i)   What length will the cycle track be when it is completed?   **$(12\frac{1}{2}$ km ÷ 7) x 8 = $\frac{100}{7}$ km**

= $14\frac{2}{7}$ km

ii)   Next year, the Council plans to extend the cycle track by $2\frac{1}{3}$ times the

original length. How long will the cycle track be then?

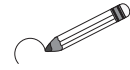**$14\frac{2}{7}$ km x $2\frac{1}{3}$ = $33\frac{1}{3}$ km**

1 Write a digit in each box so that the quotient is a whole number.

a) $(177 - 4\boxed{2}) \div 5$

b) $(84 + 5\boxed{6}) \div 7$

c) $(38\boxed{7} - \boxed{1}5) \div 4$

d) $(2\boxed{7}6 - 1\boxed{2}) \div 6$

e) $(78\boxed{7} - \boxed{1}7) \div 10$

f) $(1\boxed{4}5 + \boxed{9}) \div 11$

2

1723   (3978)   (1254)   8350   (1011)

a)   Circle the numbers which are exactly divisible by 3.

b)   Change 1 digit in each number so that the new numbers are exactly divisible by:

i)   4   ii)   5   iii)   6   iv)   7   v)   8   vi)   9

÷4	÷5
1724	1725
3988	3975
1264	1255
8360	8355
1012	1015

÷6	÷7
1722	1729
6978	3976
4254	2254
8352	8358
1014	1015

(÷8   1728, 3928, 1256, 8352, 1016)   (÷9 1728, 3078, 1251, 8352, 1017)

3 a)   Write the missing labels in the Venn diagram.

20 $\leq n \leq$ 60

23 22 25 26 29 31 34 35

Multiple of 4

Multiple of 3

20 28 32 40 44 52 56

24 36 48 60

21 27 33 39 45 57

30 51 54 42

37 38 41

53 55 58 59

Multiple of 6

43 46 47 49 50
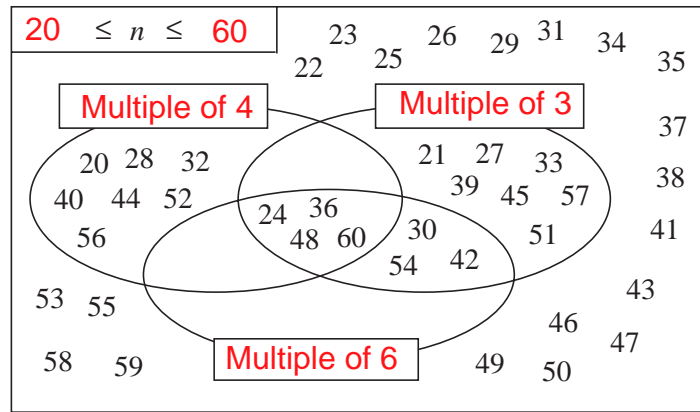
b)   Complete this sentence about what the digram shows.

A number which is divisible by $\boxed{3}$ and by $\boxed{4}$ and by $\boxed{6}$ is also divisible by $\boxed{12}$.

c)   Write true statements about the different sections, including the empty areas.

e.g. the subset of numbers which are divisible by 6 but not divisible by 4 and not divisible by 3, is empty.

4 Practise calculation.

a) $4\frac{1}{6} + \frac{1}{4} + 8\frac{2}{3} - 11\frac{1}{2}$ $\frac{19}{12} = 1\frac{7}{12}$

b) 364×4.36 1587.04

c) $\left(3\frac{5}{12} + 12.5\right) \times 6 =$ 95.5

d) $\left(4\frac{3}{4} + 6\frac{1}{3}\right) \div \frac{5}{6}$ 13.3

e) $(\sqrt{16} \times 12)^2$ 2304

f) $1864 \div \left(\sqrt{100}\right)^2$ 18.64

5 The 24 windows in the school library were being painted. A 2 litre tin of paint was needed for every $2\frac{1}{3}$ windows. $24 \div 2\frac{1}{3} = 10\frac{2}{7}$

a)   How many 2 litre tins of paint had to be bought?

11 tins = 22 litres

b)   How much paint was left?

$\frac{5}{7}$ of 2 litres $= \frac{10}{7}$ litres $= 1\frac{3}{7}$ litres

1

Write the quotient as a fraction and as a decimal in your exercise book.

a)   i) $1 \div 2 = \frac{1}{2} = 0.5$ ii) $3 \div 6 = \frac{1}{2} = 0.5$ iii) $479 \div 958 = \frac{1}{2} = 0.5$

b)   i) $23 \div 4 = 5\frac{3}{4} = 5.75$ ii) $34.5 \div 6 = 5\frac{3}{4} = 5.75$ iii) $1 \div 4 = \frac{1}{4} = 0.25$

c)   i) $2 \div 5 = \frac{2}{5} = 0.4$ ii) $18 \div 5 = \frac{18}{5} = 3.6$ iii) $2.1 \div 5 = \frac{21}{50} = 0.42$

d)   i) $3 \div 16 = \frac{3}{16} = 0.1875$ ii) $51 \div 20 = \frac{51}{20} = 2.55$ iii) $17 \div 80 = \frac{17}{80} = 0.2125$

e)   i) $2 \div 3 = \frac{2}{3} = 0.666\ldots$ ii) $5 \div 7.5 = \frac{2}{3} = 0.666$ iii) $4 \div 9 = \frac{4}{9} = 0.444\ldots$

2

Convert the fractions to decimals in your exercise book.

a) $\frac{43}{64} = 0.671875$ b) $\frac{89}{125} = 0.712$ c) $\frac{74}{20} = 3.7$

d) $\frac{5}{6} = 0.8\dot{3}$ e) $\frac{14}{30} = 0.4\dot{6}$ f) $\frac{55}{36} = 1.52\dot{7}$

g) $\frac{2}{7} = 0.\dot{2}8571\dot{4}$ h) $\frac{20}{35} = 0.\dot{5}7142\dot{8}$ i) $\frac{4}{11} = 0.\dot{3}\dot{6}$

3

At the end of the Second World War in 1945, about $\frac{11}{28}$ of the 3210 villages in Hungary had electricity. By 1960, about 92.5% of Hungarian villages had electricity and by 1963, $\frac{10}{10}$ had electricity.

a)   How many villages had electricity in:

i) 1945 **1261**   ii) 1960 **2969**   iii) 1963? **3210**

b)   Express the numbers in 1945 and in 1963 as percentages of the total number of Hungarian villages.
39%   **92.5%**   **100%**

4

In a factory on a certain day, 63 products were found to be faulty. This was 3.5% of the number of products made that day.

a)   How many products were made that day? **(63 ÷ 3.5) x 100 = 1 800**

b)   How many products were **not** faulty? **1737**

c)   If this was an average day, what percentage of faulty products would you expect there to be in a year?   **3.5%**

5

The length of an aluminium cuboid is 150 cm, which is 150% of its width.

The height of the cuboid is $\frac{3}{5}$ of its width.   **1.35 m x 2.25 m x 1.50 m = 4.55625 m³**

If the mass of 1 m³ of aluminium is 2700 kg, what is the mass of the cuboid?
12 301.875 kg

1

Write the numbers in increasing order.

a) $0.8, \quad \dfrac{2}{3}, \quad -0.9, \quad \dfrac{1}{2}, \quad \dfrac{4}{5}, \quad -\dfrac{3}{5}$

-0.9, $-\dfrac{3}{5}$, $\dfrac{1}{2}$, $\dfrac{2}{3}$, $\dfrac{4}{5}$, 0.8

b) $2\dfrac{4}{5}, \quad \dfrac{3}{4}, \quad -\dfrac{1}{2}, \quad \dfrac{4}{6}, \quad -\dfrac{3}{2}$

$-\dfrac{3}{2}$, $-\dfrac{1}{2}$, $\dfrac{4}{6}$, $\dfrac{3}{4}$, $2\dfrac{4}{5}$

2

a)   Round 7812 529 to the nearest:

    i)   10   ii)   100   iii)   1000   iv)   1 000 000.

        7 812 530   7 812 500   7 813 000   8 000 000

b)   Round 5.465 to the nearest:

    i)   unit   ii)   tenth   iii)   hundredth.

      5   5.5   5.47

3

Solve the equations.

a) $2.75 + a = 7.1$ **4.35**
    b) $b + \dfrac{2}{7} = 1\dfrac{4}{5}$ **$\dfrac{53}{35}$**
    c) $c - 8.02 = 3.8$ **11.82**

d) $5 - d = 3\dfrac{5}{8}$ **1.375**
    e) $7.2 \times e = 36$ **5**
    f) $f \div 4.2 = 10.5$ **44.1**

g) $\dfrac{4}{3} \div g = \dfrac{2}{5}$ **$3\dfrac{1}{3}$**
    h) $\dfrac{5}{6} \div h = 0$ **(not possible)**
    i) $\dfrac{72}{i} = 1.2$ **60**

4

a)   James had a 6.25 m length of wire. He used 125 cm one day, then he used 1.6 m on the next day, then $2\dfrac{1}{2}$ m on the day after that. How much wire was left?

    6.25 m - (1.25 m + 1.6 m + 2.5 m) = 0.9 m

b)   The sides of a rectangular park are 800 m and $1\dfrac{1}{4}$ km long.

    What is: i)   the perimeter of the park   ii)   the area of the park?

        4.1 km   1 km^2

c)   Calum has 45 stamps. Vanessa has $\dfrac{8}{9}$ of that number and George has 120% of that number. How many stamps do Vanessa and George each have?

        40   54

5

a)   A box of sugar lumps weighs 650 g and each lump of sugar weighs 2 g.
    If 6 sugar lumps were eaten:

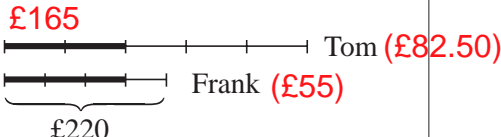   i)   what mass of sugar was left   ii)   how many lumps were left?

        638 g   319 lumps

b)   The sugar content in a jar of honey is 83%. How much sugar is there in 45 kg of honey?   **37.35 kg**

c)   The weight of 1cm^3 of steel is 300% of the weight of 1 cm^3 of aluminium.

    i)   What is the **ratio** of the weight of a 25 cm^3 aluminium cuboid and that of a 25 cm^3 steel cuboid?   **1:3**

    ii)   What is the **mass** of the aluminium cuboid if the steel cuboid's is 202.5 g? **67.5 g**

    iii)   How many grams is 1 cm^3 of steel? **8.1 g**

    iv)   How many grams is 1 cm^3 of aluminium? **2.7 g**

1 84% of an apple is water.

a)   How much water is in these quantities of apples?

   i)   1 kg   ii)   2 kg **1.68** iii)   5 kg   iv) $3\frac{1}{2}$ kg   v)   0.4 kg
   0.84 kg   **kg**   **4.2 kg**   **2.94 kg**   **0.336 kg**

b)   What amount of apples contains these quantities of water?

   i)   420 g   ii)   2.52 kg
   500 g   **3 kg**

2 Two fifths of a garden had already been landscaped. Five gardeners were employed to complete the job. If they shared the remaining work equally, what part of the whole garden were they each responsible for? $\frac{3}{5} \div 5 = \frac{3}{25}$

3 Charlie spent his time between 2 o'clock and 6 o'clock in the afternoon doing different things. He went shopping for $\frac{2}{5}$ of the time, played with a friend for $\frac{1}{4}$ of the time and read a book for $\frac{1}{6}$ of the time. $\frac{2}{5} + \frac{1}{4} + \frac{1}{6} = \frac{49}{60}$

a)   What part of the time did Charlie spend doing other activities? $\frac{11}{60}$

b)   How many minutes did Charlie spend on other activities? $240 \times \frac{11}{60} = 44$ **(mins)**

4 When experiments in television broadcasting first began in 1923, scientists could only transmit images across a distance of 2.5 metres.

Some years later, a Hungarian engineer, Denes Mihaly, who was working in Berlin in Germany, managed to transmit images across a distance of 1000 m.

a)   How many times more is 1000 m than 2.5 m? **400 times**

b)   What percentage is 1000 m of 2.5 m? **40 000%**

c)   Write their ratio with whole numbers. **1000 : 2.5**
                                             2000 : 5

5 Emma bought shares in the stock market for £100 000 but very soon their value began to fall. To avoid losing too much money, she sold half of her shares at a 15% loss.

Two weeks later, the value of her shares rose again and reached a level which was 20% more than the amount she had paid for them. She then sold the rest of her shares.

How much profit or loss did she make on the shares? **£2500 profit**

6 $\frac{2}{5}$ of Tom's money is the same as $\frac{3}{4}$ of Frank's money.

£165

Tom **(£82.50)**

Frank **(£55)**

£220

a)   If Frank has £220, how much does Tom have? **£412.50**

b)   What ratio is: i) Tom's to Frank's money   ii)   Frank's to Tom's money?
      412.50 : 220   **440 : 825**
      825 : 440   Page 128

1   Do the multiplications.

a) $\dfrac{1}{7} \times \dfrac{2}{7} \times \dfrac{3}{7} \times \dfrac{4}{7} \times \dfrac{5}{7} \times \dfrac{6}{7} = \dfrac{720}{117\ 649}$

b) $\dfrac{1}{2} \times \dfrac{2}{3} \times \dfrac{3}{4} \times \dfrac{4}{5} \times \dfrac{5}{6} \times \dfrac{6}{7} = \dfrac{720}{5040}\ \left(= \dfrac{1}{7}\right)$

c) $-\dfrac{4}{9} \times \dfrac{7}{8} \times \dfrac{3}{5} \times \left(-\dfrac{6}{7}\right) \times \left(-\dfrac{5}{6}\right) = -\dfrac{2520}{15\ 120}\ \left(= -\dfrac{1}{6}\right)$

---

2   Solve the equation then check your result.

a) $\left(x + 1\dfrac{4}{5}\right) + 6 = 10$ $x =$ **2.2**

b) $2\dfrac{3}{5} \times y = \dfrac{13}{7}$ $y = \dfrac{5}{7}$

c) $z \div 4 = 3\dfrac{1}{4}$ $z =$ **13**

---

3   Calculate in your exercise book:

a)   0.7 of 415 **290.5**   b)   1.43 of 19 **27.17**   c)   3% of 34.2 **1.026**

d)   69% of 5500 **3795**   e)   210% of 46.1 **96.81**

---

4   What is the number if:

a) $\dfrac{3}{10}$ of it is 28.5 **95**   b)   2.5 of it is 8260 **3304** c)   12% of it is 58.2 **485**

d)   99% of it is 346.5 **350** e)   250% of it is 8260? **3304**

---

5   The lengths of the sides of a rectangle are 40 cm and 60 cm.

One of the sides of a second rectangle is 110% of one of the sides of the first rectangle.
The adjacent side of the second rectangle is 1.1 times as long as the adjacent side of the
first rectangle.   **40 by 60   44 by 66**

What percentage of the area of the first rectangle is the area of the second rectangle?
121%

---

6   The perpendicular sides of a right-angled triangle are: $a = 10$ cm, $b = 6.2$ cm.

If we cut 20% off side a and shorten side b to $\dfrac{4}{5}$ of its length, a 2nd triangle is formed.

a)   Calculate the area of both triangles. **31 cm² , 19.84 cm²**

b)   What percentage of the area of the 1st triangle is the area of the 2nd triangle? **64%**

c)   What percentage smaller than the 1st triangle is the area of the 2nd triangle?
36% smaller

1 Write each decimal as a division of one-digit numbers.

a) 0.75 $\frac{3}{4}$ b) 1.6 $\frac{8}{5}$ c) 0.$\dot{1}$ $\frac{1}{9}$ d) 1.8 $\frac{9}{5}$ e) 0.$\dot{6}$ $\frac{2}{3}$

f) 0.625 $\frac{5}{8}$ g) 2.5 $\frac{5}{2}$ h) 1.125 $\frac{9}{8}$ i) 0.375 $\frac{3}{8}$ j) 0.1$\dot{6}$ $\frac{1}{6}$

2 Colour the equal values in the same colour.

$2\frac{3}{4}$ 0.333. . . $\frac{4}{5}$ 30%   0.25 $\frac{3}{10}$ $33\frac{1}{3}$ % $\frac{3}{100}$ 80%

$12\frac{1}{2}$ % $\frac{1}{3}$ 25%   3% $\frac{1}{8}$ 275 %   0.03 $\frac{1}{4}$ 0.125   2.75   0.8

3 a) Convert the decimals to fractions. Simplify where necessary.

i) 13.64 $\frac{341}{25}$ ii) 9.015 $\frac{1803}{200}$ iii) 0.875 $\frac{7}{8}$ iv) 0.$\dot{7}$ $\frac{7}{9}$ v) 5.55 $\frac{111}{20}$

b) Convert the numbers to decimals.

i) $\frac{11}{25}$ 0.44 ii) $1\frac{5}{8}$ 1.625 iii) $\frac{19}{20}$ 0.95 iv) $\frac{1}{6}$ 0.1666... v) $\frac{3}{11}$ 0.272727...

4 Solve the equations.

a) $a + 3.26 = 8.2$ 4.94 b) $b - \frac{3}{5} = 4\frac{6}{7}$ $\frac{191}{35}$ c) $0.91 - c = 1$ -0.09

d) $\frac{2}{9} \times d = \frac{1}{27}$ $\frac{1}{6}$ e) $\frac{3}{4}$ of $e = e - 25$ 100 f) $f \times 2.7 = \frac{27}{100}$ $\frac{1}{10}$

g) $g \div 9 + 2 = \sqrt{49}$ 45 h) $\frac{8}{15} \div h = 2 \div 5$ $\frac{4}{3}$ i) $6.3 \div i = \sqrt{81}$ 0.7
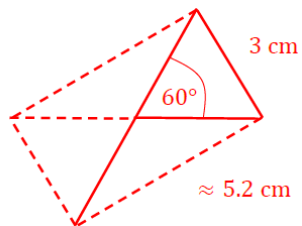
5 What is the whole amount if:

a) $\frac{5}{8}$ is 26 km 350 m 42.16 km b) $\frac{4}{15}$ is 6.78 litres 25.425 litres c) $\frac{11}{13}$ is £65 23 p £77.09

d) 0.75 is 4 kg 308 g 5.744 kg e) 1.06 is 7 h 4 min 400 min f) its **square root** is 110? 12 100

6 Solve the problems in your exercise book.

a) The area of one square is 25% of the area of a second square. If the first square has side 3 cm, what is the length of a side of the second square? 6cm

b) The area of one triangle is 2 fifths of the area of a second triangle.
The second triangle has base 4.5 cm and height 3.2 cm.

i) What is the area of the second triangle? 7.2cm^2

ii) What is the base of the first triangle if its height is 80 mm? 7.2 mm

1 Calculate:

a) half of $3\frac{4}{5}$ b) one fifth of $\frac{7}{8}$ c) seven times $2\frac{3}{5}$.

  1.9 $\frac{7}{40} = 0.175$ 18.2

2 A 1 metre metal tube weighs $\frac{9}{20}$ kg. What is the mass of **four** similar 7 metre tubes?

  12.6 kg

3 a) Convert these fractions to thirtieths: $\frac{5}{6}, \quad \frac{4}{5}, \quad \frac{7}{10}, \quad \frac{2}{3}$ $\frac{25}{30} \ \frac{24}{30} \ \frac{21}{30} \ \frac{20}{30}$

  b) Write the fractions in increasing order. $\frac{2}{3} \ \frac{7}{10} \ \frac{4}{5} \ \frac{5}{6}$

  c) What is the sum of the fractions? $\frac{90}{30} = 3$

4 a) Draw a rectangle which has sides 7 cm and 4 cm long.

7 cm

4 cm

  b) i) Draw its lines of symmetry.

   ii) Which plane shapes did you form by drawing these lines of symmetry?

  rectangles

  c) How many times larger than the perimeter of one of the smaller shapes is the perimeter of the original rectangle? 2 times

  $2(2 + 3.5) = 11$ $2(7 + 4) = 22$

  d) How many times larger than the area of one of the smaller shapes is the area of the original rectangle? 4 times

  7 cm^2 28 cm^2

5 Write:

a) two 4-digit natural numbers which are divisible by 2, 5 and 6. 1200, 1260

b) two 5-digit natural numbers which are divisible by 3, 4 and 25. 30 000, 30 300

6 List these fractions in increasing order: $\frac{3}{5}, \quad \frac{7}{10}, \quad \frac{1}{2}, \quad \frac{60}{100}, \quad \frac{13}{20}, \quad \frac{14}{20}$

  $\frac{10}{20} < \frac{12}{20} = \frac{12}{20} < \frac{13}{20} < \frac{14}{20} = \frac{14}{20}$ $\frac{1}{2}, \quad \frac{3}{5} = \frac{60}{100}, \quad \frac{13}{20}, \quad \frac{7}{10} = \frac{14}{20}$

7 72 radishes are tied in equal bundles, with no radishes left over. How many radishes could be in each bundle? $(1 \times 72), 2 \times 36, 3 \times 24, 4 \times 18, 6 \times 12, 8 \times 9, 9 \times 8, 12 \times 6,$
  $18 \times 4, 34 \times 3, 36 \times 2, (72 \times 1)$

8 a) Draw a point, then draw two 3 cm segments from the point so that the angle they form is $60°$.

  b) If each of the two segments is half of a diagonal of the same rectangle, construct the rectangle.

3 cm

60°

≈ 5.2 cm

  c) Measure the necessary dimensions, then calculate:

   i) the perimeter of the rectangle   ii) the area of the rectangle.

  2 x (5.2 + 3) cm = 16.4 cm   5.2 cm x 3 cm = 15.6 cm^2

1

$3\frac{2}{3} + 2\frac{4}{5} + 1\frac{1}{2} - 4\frac{3}{4} = $ $\frac{11}{3}$ $+\frac{14}{5}$ $+\frac{3}{2}$ $-\frac{19}{4} = \frac{193}{60} = 3\frac{13}{60}$

2

On the 1st day of a 4-day walking holiday, we walked $7\frac{1}{4}$ km. On the 2nd day we

walked $6\frac{3}{5}$ km and on the 3rd day we walked $5\frac{7}{8}$ km.

If we walked 25 km altogether, how far did we walk on the 4th day? **5.275 km**

3

a) Construct an **isosceles** triangle with base 3 cm long and arms 5 cm long.

b) i) Draw its lines of symmetry.

ii) Which plane shapes did you form by drawing these lines of symmetry?

2 congruent, right- angled, scalene triangles

c) Calculate the area of:

i) one of the smaller shapes   ii) the original triangle.

3.58 cm^2   **7.15 cm^2**

4

A group of 8 people in an office earned these amounts over a period of 4 weeks.

1st week: £3684,   2nd week: £3341,   3rd week: £3435.40,   4th week: £3256.80

How much did each person earn **on average** over the 4-week period?

£1714.65

5

In a recipe for making bread, 1 kg of flour produces 1.8 kg of dough. After the dough
has been kneaded and proved, it is put into the oven to bake.

During baking, the dough loses $\frac{1}{5}$ of its mass.   **1 kg - 1.8 kg x 0.8 = 1.44 kg**

How much bread can be made from 2 kg of flour using this recipe?   **2.88 kg**

6

Dad cut these lengths from a 2.5 m plank of wood: $\frac{4}{5}$ m, $\frac{3}{4}$ m and $\frac{5}{8}$ m.
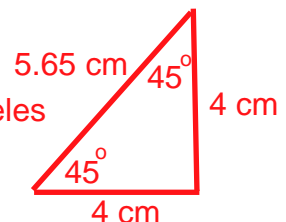
What length of plank was left? $\frac{13}{40}$ m

7

a) Construct an angle of 45°.

b) Mark a point 4 cm from the vertex on one of the arms of the angle.

c) Draw a line which is perpendicular to the arm at this point and extend it to cut
the other arm, forming a triangle.

d) Measure the sides and angles of this triangle.   **5.65 cm** **45°**

4 cm

e) What kind of triangle have you drawn? **right-angled isosceles**
triangle

45°

f) Calculate its area and perimeter.

perimeter = 4 cm + 4 cm + 5.65 cm = 13.65 cm   **4 cm**

area = 8 cm^2

1

a) $\dfrac{3}{4} \times \dfrac{5}{7}$ $\dfrac{15}{28}$ b) $\dfrac{12}{15} \times \dfrac{1}{6}$ $\dfrac{2}{15}$ c) $1\dfrac{3}{5} \times \dfrac{5}{8}$ 1   d) $2\dfrac{1}{3} \times 3\dfrac{1}{4}$ $7\dfrac{7}{12}$

2

Write each percentage as a fraction and as a decimal.   a) 43%   b) 206%

$\dfrac{43}{100} = 0.43$ $\dfrac{206}{100} = 2.06$

3

What are these parts of 838 km?   a)   0.67   b) $4\dfrac{1}{3}$ c)   86%

561.46 km $3631\dfrac{1}{3}$ km   720.68 km

4

A container was $\dfrac{4}{5}$ full of honey. Then 2 thirds of this honey was sold.

a)   What part of the container still contains honey? $\dfrac{4}{15}$

b)   If the container has a capacity of 50 litres:

   i)   how much honey was sold $26\dfrac{2}{3}$ litres

   ii) how much honey is left? $13\dfrac{1}{3}$ litres

5

A jewellery firm bought 3.6 m² of gold leaf. First 15% of the gold leaf was used, then $\dfrac{2}{9}$ of it, then 0.4 of it.

a)   How much gold leaf was used altogeth $(3.6 \times 0.15) + \left(3.6 \times \dfrac{2}{9}\right) + (3.6 \times 0.4)$ m²
$= 2.78$ m²

b)   If the firm employed 10 craftsmen, how much gold leaf did each craftsman use on average?   0.278 m²

6

a) $\left(3\dfrac{1}{2} + 2\dfrac{1}{4}\right) \times \dfrac{3}{5}$ $= \dfrac{69}{20} = 3\dfrac{9}{20}$ b) $\left(8\dfrac{1}{5} - 2\dfrac{3}{4}\right) \times \dfrac{2}{3}$ $= \dfrac{109}{30} = 3\dfrac{19}{30}$

7

What quantity is:

a) $\dfrac{2}{3}$ of 543 m   b) $1\dfrac{3}{4}$ of 615 kg   c) $2\dfrac{1}{2}$ of $15\dfrac{2}{5}$ km   d) 1.17 of 63.3 m²?

362 m   1076.25 kg   38.5 km   74.061 m²

8

In 2003, a firm planned for an income of £25.7 million. They exceeded this plan by 20%. How much income did the firm actually achieve?   £30.84 million

9

During a sale, the price of a £185 suit was reduced by 13%, then reduced again by 15%.

a)   By how many £s was the price reduced?   b)   What was the new price?

£49.19   £136.81

10

Construct a **rhombus** which has an angle of 60° and a longer diagonal of length 7 cm.
Measure the necessary data then calculate the perimeter and area of the rhombus.

$P \approx$ 4 cm + 4 cm + 4 cm + 4 cm = 16 cm

$A \approx (7 \times 4 \div 2)$ cm² = 14 cm²

1 An observatory on a mountain in Scotland measured the temperature at 6 am each day during the second half of February. This table shows the data collected.

Day	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th
Temperature (°C)	0	-1	-4	-5	-2	-3	-2	$+1$	$+2$	0	-1	$+1$	$+2$	$+2$

a) Draw a graph to show how the temperature changed.

b) Calculate the **mean** temperature. $-10 \div 14 = -\dfrac{10}{14} = -\dfrac{5}{7}$ (°C)

---

2 a) $5 \div \dfrac{2}{3}$ b) $16 \div 4\dfrac{1}{2}$ c) $54 \div 5\dfrac{1}{5}$ d) $100 \div \left(8\dfrac{1}{4} - 7\dfrac{1}{2}\right)$ $\dfrac{400}{3} = 133\dfrac{1}{3}$

7.5 $\dfrac{32}{9} = 3\dfrac{5}{9}$ $\dfrac{135}{13} = 10\dfrac{5}{13}$

---

3 What is the whole quantity if:

a) $\dfrac{1}{4}$ of it is 28 kg   b) $\dfrac{2}{3}$ of it is 28 litres   c) $2\dfrac{3}{4}$ of it is 121 m

    112 kg   42 litres   44 m

d) $1\dfrac{4}{5}$ of it is 189 cm   e) 0.17 of it is 61.2 g?

    105 cm   360 g

---

4 What is the whole quantity if:

a) 1% is £4.25 £425   b) 1% is 0.7 m 70 m   c) 25% is 32.6 kg

                                                        130.4 kg

d) 10% is 43.75 km   e) 50% is £159.80?

    437.5 km   £319.60

---

5 a) $(6.2 + 5.8) \div \dfrac{2}{3} = 18$ b) $\left(5\dfrac{1}{4} - 3\dfrac{1}{5}\right) \div 1\dfrac{1}{2} = \dfrac{41}{30} = 1\dfrac{11}{30}$

---

6 What is the whole quantity if:

a) $\dfrac{7}{8}$ of it is 315 cm   b) $4\dfrac{1}{3}$ of it is 611 m   c) 65% of it is 20.28 kg?

    360 cm   141 m   31.2 kg

---

7 A country bought 1 199 300 tonnes of oil, which was 33.5% of its imports that year.

What mass of goods did the country import that year?   3 580 000 tonnes

---

8 L x W x H = 140 cm x 98 cm x 63 cm

The length of a cuboid-shaped iron block is 140 cm. Its width is 0.7 of its length and $1\dfrac{5}{9}$ of its height.   57 428 cm^2

a) Calculate: i) its surface area   ii)   its volume. 864 360 cm^3

$S.A. = 2 \times (140 \times 98 + 140 \times 63 + 98 \times 63)\ \text{cm}^2 = 57\ 428\ \text{cm}^2$

b) How much does the block weigh if 1 cm^3 of iron weighs 7.6 g?   6.569 tonnes

1

Use the first difference to work out the value of the other differences.

a) $236.8 - 46.3 =$ **190.5**   b) $236.8 - (46.3 + 2) =$ **188.5**

c) $(236.8 - 5.6) - 46.3 =$ **184.9**   d) $236.8 - (46.3 - 3) =$ **193.5**

e) $(236.8 + 2) - (46.3 - 1) =$ **193.5**   f) $(236.8 - 1) - (46.3 + 1) =$ **188.5**

g) $(236.8 + 10) - (46.3 - 10) =$ **210.5** h) $(236.8 - 6) - (46.3 - 6) =$ **190.5**

i) $(236.8 + a) - (46.3 + b) =$ **190.5 + a - b** j) $(236.8 - 3c) - (46.3 - 5c) =$ **190.5 + 2c**

2

Use the first product to work out the value of the other products.

a) $325 \times 1.5 =$ **487.5**   b) $(325 \times 3) \times 1.5 =$ **1462.5**

c) $325 \times (1.5 \times 3) =$ **462.5**   d) $(325 \div 5) \times 1.5 =$ **97.5**

e) $325 \times (1.5 \div 3) =$ **162.5**   f) $(325 \times 0.2) \times (1.5 \times 4) =$ **390**

g) $(325 \div 4) \times (1.5 \div 3) =$ **40.625**   h) $(325 \times 11) \times (1.5 \div 11) =$ **487.5**

i) $(325 \div a) \times (1.5 \div b) =$ $\dfrac{\textbf{487.5}}{\textbf{ab}}$ j) $(325 \times a) \times (1.5 \div b) =$ $\dfrac{\textbf{487.5$a$}}{\textbf{$b$}}$

3

If $x + y = z$, what are the results of these operations?

a) $(x + 2.3) + y =$ **z + 2.3**   b) $x + \left[y + \left(-\dfrac{4}{5} \right) \right] =$ **z - $\dfrac{4}{5}$**

c) $\left[x - \left(-3\dfrac{1}{4} \right) \right] + y =$ **z + 3$\dfrac{1}{4}$**   d) $(x + 1.2) + (y + 1.6) =$ **z + 2.8**

e) $(x - 7) + (y + 7) =$ **z**   f) $(x \times 4) + y =$ **4x + y (= z + 3x)**

4

Construct a **trapezium** ABCD which has:

base AB = 5.5 cm, height = 3 cm, $\angle$A = 75°, $\angle$B = 50°.

a)   By measuring and calculating, work out: i)   its perimeter   ii)   s area.

b)   Draw any axis t. **Reflect** trapezium ABCD in t.
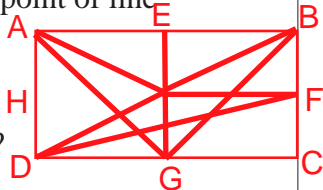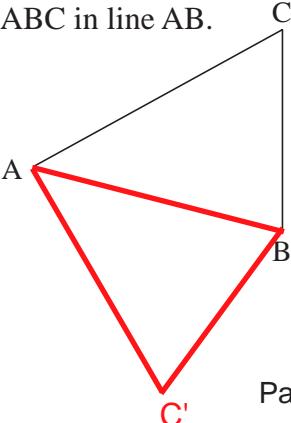

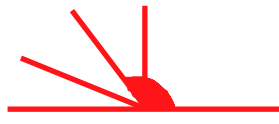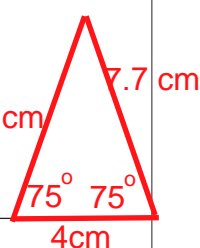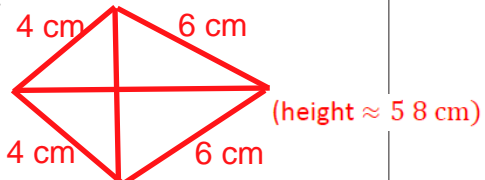**perimeter $\approx$ 14.6 cm   area $\approx$ 11.2 cm^2**
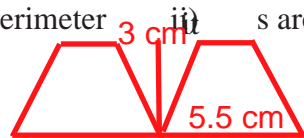
5
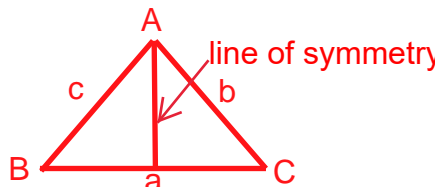
The sum of the digits of a 4-digit number is 15. The digits in the greatest and smallest place values are the same but are less than the two middle digits. The two middle digits have a difference of 1.

What could the 4-digit number be?   **1671, 1761, 2562, 2652, 3453 or 3543**

6

The combined ages of the 4 members of a family is 70 years. Mum is 6 times as old as her son and 10 times as old as her daughter. Dad is 2 years older than Mum.

How old is each member of the family?   **Mum Dad Son Daughter**

30 + 32 + 5 + 3   = 70 (years)

1 A man walks at an **average** speed of $4\frac{2}{5}$ km/hour. How far does he walk in $2\frac{2}{3}$ hours?

$\frac{176}{15}$ km $= 11\frac{11}{15}$ km

2 What is the whole quantity if:

a) $\frac{6}{7}$ of it is 60 kg   b)   55% of it is £273.02   c) $1\frac{3}{5}$ of it is $14\frac{2}{5}$ litres?

70 kg   £496.40   9 litres

3 = 3.6

If $a = 12 \div 3\frac{1}{3}$ and $b = 12 \div 2\frac{3}{4}$,   what is the value of:

a) a 3.6 b) b $\frac{48}{11}$ c) $a + b$ $\frac{438}{55}$ d) $a - b$ $-\frac{42}{55}$ e) $a \div b$ $\frac{33}{40}$ f) $b \div a$? $\frac{40}{33}$

4 If $1\frac{2}{5}$ of a number is $8\frac{2}{3}$, what is $3\frac{2}{5}$ of the same number? $\frac{422}{21} = 21\frac{1}{21}$

5 Here is some information about the dimensions of an aluminium cuboid:

30.8 cm   18.48 cm

$a = 38.5$ cm, $b = 80\%$ of a, $b = 1\frac{2}{3}$ of c

a)   Calculate the volume of the cuboid. 38.5 cm x 30.8 cm x 18.48 cm = 21 913.58 cm^3

b)   Calculate the mass of the solid if 1 cm^3 of aluminium weighs 2.7 g. 59.167 kg

6 a)   Draw a square and label its vertices, sides and diagonals.

b)   Write true statements about the square, using words or mathematical notation.
e.g. The two equal diagonals are perpendicular and bisect each other.

7 a)   Draw a rectangle and label its vertices A, B, C and D.

b)   Mark the mid-points of the sides and label them E, F, G and H.

c)   Draw the line of symmetry through E and G and mark the midpoint of line segment EG. Label the midpoint O.

d)   What are the *mirror images* of points F, D and O? H, C, O

e)   What are the *mirror images* of triangles AEG, GCB and AOB?
BEG | GDA | BOA

8 **Reflect** triangle ABC in line AB.

1

a)   Draw an **isosceles triangle** and label its vertices.

b)   Draw its lines of symmetry.

c)   Write 4 true statements about the triangle in words or using mathematical notation.
e.g. angle ABC = angle ACB; AB = AC; tthe two right-angled triangles are congruent; line of symmetry bisects BC

2

Construct and label:

a)   a 45° angle

b)   a 120° angle.

3

a)   Draw an **equilateral triangle** which has sides of length 2 cm.

b)   Draw a triangle which has sides 3 times longer than those in the 1st triangle. 6 cm sides

c)   How many times more than the area of the 1st triangle is the area of the 2nd triangle? $\approx$ 9.2 times

d)   How many times more than the perimeter of the 1st triangle is the perimeter of the 2nd triangle?   3 times   (6 cm and 18 cm)

4

a)   Construct an **isosceles triangle** which has a side of length 4 cm as its base and angles of 75° at its baseline.

b)   Measure the necessary data then calculate the perimeter of the triangle.
perimeter $\approx$ 19 cm   7.7 cm   7.7 cm

c)   Calculate the area of the triangle.   area $\approx$ 15 cm^2

75° 75°
4cm

5

a)   Construct a **deltoid** which has sides of length 4 cm and 6 cm and the length of the diagonal which lies on its line of symmetry is 8 cm.

b)   Calculate its perimeter.   20 cm

4 cm   6 cm

c)   Measure the necessary data, then calculate its area.
(height $\approx$ 5 8 cm)
area = 23.2 cm^2 4 cm   6 cm

6

Two opposite angles of a **deltoid** are 50° and 110°.

Calculate the size of the other two angles.   (360° - 50° - 110°) ÷ 2 = 100°

7

a)   Construct a **rhombus** which has diagonals 8 cm and 5 cm long.

b)   Measure the distance between two opposite sides. $\approx$ 4.2 cm

c)   Measure its angles and add them together.   116° + 64° + 116° + 64° = 360°

d)   Calculate the perimeter of the rhombus.   4 x 4.7 cm = 18.8 cm

e)   Calculate the area of the rhombus.   4 cm x 5 cm = 20 cm^2

1 The cross-section of a 3.5 m long pine beam is a 16 cm square. 3.5 m x 0.16 m x 0.16 m
= 0.0896 m³

If 1 m³ of pinewood weighs 500 kg, what is the mass of the beam?
0.0896 x 500 kg = 44.8 kg

2 A container shaped like a 35 cm cube was filled with water. 35 cm x 35 cm x 35 cm
= 42 875cm³

We ladled out half of the water, then ladled out $\frac{2}{5}$ of the remaining water.

21 437.5 cm³ $\times \frac{3}{5}$ = 12 862.5 cm³

How much water was left in the container? *Give your answer in litres.*
$\approx$ 12.9 litres

3 The spire of a church is shaped like a pyramid. The edges of its square base are 3.5 m long and each of its side faces is 5.2 m high.

How many m² of tin plate are needed to cover the spire?
4 x (3.5 m x 5.2 m ÷ 2) = 36.4 m²

4 The volume of a **square-based pyramid** can be calculated using this formula:

$$V = \frac{A \times h}{3}$$ (17 289 x 3) ÷ 36² = $\frac{1921}{48}$ = 40 $\frac{1}{48}$

where *A* is the area of the base and *h* is the height of the pyramid.

How high is the pyramid if its base edge is 36 cm and its volume is 17289 cm³? $\approx$ 40 cm

5 a) $\left[\frac{4}{5} \times 1\frac{3}{7} - \left(3\frac{1}{4} - 1\frac{5}{6}\right)\right] \times 4\frac{2}{3}$ = ? - $\frac{23}{18}$ b) What is $\frac{5}{6}$ of $3\frac{5}{7}$ kg?
$\frac{65}{21}$ kg = 3$\frac{2}{21}$ kg

c) If $3\frac{1}{2}$ times a length is $21\frac{7}{8}$ m, what is the whole length?
6.25 m

6 A tailor bought 35 rolls of a certain material. Each roll originally contained 26.5 m of material but the tailor has already used 19 and 3 quarter rolls.

How many men's suits can he make from the remaining material if each suit needs on average 3.1 m of material?
(15.25 x 26.5 m) ÷ 3.1 $\approx$ 130.36   Answer: 130 men's suits

7 I spent 9.5% of my money and had £304.08 left. How much money did I have at first?
£336

8 52% of the 350 pupils in a school are girls. How many girls and how many boys attend this school?
182 girls   168 boys

9 The edge of a container shaped like a cube is 24 cm. A second container shaped like a cuboid holds the same amount of liquid. 24 cm x 24 cm x 24 cm = 13 824 cm³

If the base edges of the second container are 36 cm and 24 cm, how high is it?
13 824 cm ÷ (36 x 24) = 16 (cm)

1

a) i) In how many ways can you put a *blue* and a *white* counter in order? 2 BW or WB

    ii) If it is done randomly, what is the probability that the order will be *blue*, *white*? $\frac{1}{2}$

b) i) How many ways are there of putting in order a *blue*, a *white* and a *red* counter? BWR, BRW, RWB, RBW, WRB, WBR   6 ways (3 x 2 x 1 = 6)

    ii) If the orders happen at random, what is the probability that the order will be *red*, *blue*, *white*? $\frac{1}{6}$

c) i) How many ways are there of putting in order a *blue*, a *white*, a *red* and a *green* counter? 24 ways (4 x 3 x 2 x 1 = 24)

    ii) If the orders happen at random, what is the probability that the order will be *white*, *red*, *green*, *blue*? $\frac{1}{24}$

2

a) i) Three horses, A, B and C, are running in a race. How many orders are possible for 1st, 2nd and 3rd places? 6 ways (3 x 2 x 1 = 6)

    ii) If each of the different orders has an equal chance of happening, what is the probability of the order C, A, B? $\frac{1}{6}$

b) i) Four horses, A, B, C and D, are running in another race. How many orders are possible for 1st, 2nd and 3rd places? 24 ways (4 x 3 x 2 x 1 = 24)

    ii) p (C, A, B) = ? $\frac{1}{24}$

c) i) Five horses, A, B, C, D and E are running in a 3rd race. How many orders are possible for 1st, 2nd and 3rd places? 60 ways (5 x 4 x 3 = 60)

    ii) p (C, A, B) = ? $\frac{1}{60}$

3

Two *white* marbles and one *red* marble are in a bag. If you take out a marble with your eyes shut, what is the probability of each of these outcomes?

a) You take out the *red* marble. $\frac{1}{3}$ b) You take out a *white* marble. $\frac{2}{3}$

c) You take out the *red* marble, replace it then take out the *red* marble again. $\frac{1}{9}$

d) You take out a *white* marble, then take out the other *white* marble. $\frac{2}{6} = \frac{1}{3}$

e) You take out a *white* marble, replace it then take out a *white* marble again. $\frac{4}{9}$

f) You take out a *white* marble, replace it then take out the *red* marble. $\frac{2}{9}$

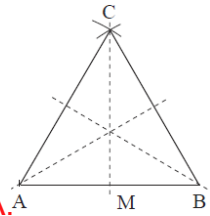g) You take out the *red* marble, replace it, then take out a *white* marble. $\frac{2}{9}$

4

If each member of a group shakes hands with each of the others, how many handshakes occur if there are:

A B C

a) 2 members in the group 1 b) 3 members in the group 3

c) 4 members in the group 6 d) 5 members in the group 10 A B C D

e) 11 members in the group f) *n* members in the group? ($n > 1$) A B C D E

$\frac{11 \times 10}{2} = 55$ $\frac{n(n-1)}{2}$

1

a) Draw an **equilateral triangle** and label its vertices.

b) Draw its lines of symmetry.

c) Write 4 true statements about the triangle, using words or

e.g. mathematical notation. rotational symmetry order 3. AB=BC=CA.

The point of intersection of the lines of symmetry is the centre of the triangle.

$\angle A = \angle B = \angle C$. The symmetry lines divide the triangle into 6 congruent, right-angled triangles.

d) Are all equilateral triangles **similar**? yes: all 3 angles are equal to 60°

2

This **prism** has 2 triangular faces, each with base 12 cm, height 8 cm and side edges 10 cm.   720 ÷ 48 = 15 cm

a) How long is the prism if its volume is 720 cm^3?

b) What is the surface area of the prism?

(48 + 48 + 150 + 150 + 180 cm^2 = 576 cm^2

10 cm   8 cm   15 cm   12 cm

3
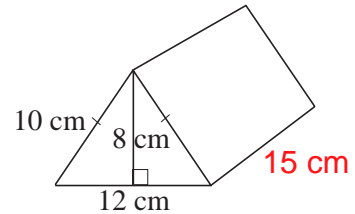
What is the whole quantity if:

a) $\frac{5}{7}$ of it is £60   b)   11% of it is £27.28   c) $2\frac{1}{3}$ of it is $12\frac{3}{5}$ litres?

£84   £248   5.4 litres

4

A glass container shaped like a cube has edges 8 cm long.   8 cm x 8 cm x 8 cm = 512 cm^3

A second tall glass container shaped like a cuboid has a 4 cm square base.

If the cube is filled with water and the water is then poured into the cuboid, what height will the water level reach?

512 cm^2 ÷ 16 cm^2 = 32 (cm)

5

After running a half marathon, I lost 7.5% of my body weight and weighed 94.35 kg.

What did I weigh before the race? 94.35 kg ÷ 92.5 x 100 = 102 kg

6

There are 2 *red* marbles, 3 *blue* marbles and a *white* marble in a bag. If you take out a marble with your eyes closed, what is the probability of each of these outcomes?

a) You take out a *red* marble. $\frac{2}{6} = \frac{1}{3}$ b)   You take out a *blue* marble. $\frac{3}{6} = \frac{1}{2}$

c) You take out the *white* marble, replace it then take out the *white* marble again. $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

d) You take out a *red* marble, then take out the other *red* marble. $\frac{2}{6} \times \frac{1}{5} = \frac{2}{30}$

e) You take out a *blue* marble, replace it then take out a *blue* marble again. $\frac{3}{6} \times \frac{3}{6} = \frac{9}{36}$

f) If you take out 3 marbles, replacing them each time, what is the probability that:

i)   the 3 marbles you take out will be *blue* $\frac{3}{6} \times \frac{3}{6} \times \frac{3}{6} = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

ii)   you will take out at least 2 different colours? $\frac{7}{8}$

7

Write problems which have these probabilities as their solutions.

p(score on die < 6)

a) $\frac{3}{10}$ b) $\frac{1}{4}$ c) $\frac{5}{6}$ d) $\frac{7}{13}$ e) $\frac{8}{15}$ pie-chart problems

e.g. draw spinner with different numbers of divisions

choosing cards from a pack