

MathsWatch

eBook

Answers

FOUNDATION TIER

Grades G, F, E, D and C
Clips 1 to 134, Pages 1 to 134

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- To produce the best and most comprehensive Maths GCSE revision videos possible.
- To produce the best and most comprehensive Maths GCSE worksheets possible.
- To improve our discs, year on year.

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Maths Watch

eBook

The Foundation Syllabus

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Place Value

1 000 000	100 000	10 000	1 000	100	10	1
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- 1)
 - a) Write the number forty five thousand, two hundred and seventy three in figures. **45 273**
 - b) Write the number five thousand, one hundred and three in figures. **5 103**
 - c) Write the number three hundred thousand, seven hundred and ninety one in figures. **300 791**
 - d) Write the number two and a half million in figures. **2 500 000**
 - e) Write the number one and three quarter million in figures. **1 750 000**



- 2) Write the following numbers in words
 - a) 1 250 **One thousand, two hundred and fifty**
 - b) 3 502 **Three thousand five hundred and two**
 - c) 72 067 **Seventy two thousand and sixty seven**
 - d) 192 040 **One hundred and ninety two thousand, and forty**
 - e) 30 000 000 **Thirty million**



- 3)
 - a) Write down the value of the 7 in the number 3 752. **Seven hundred**
 - b) Write down the value of the 6 in the number 56 025. **Six thousand**
 - c) Write down the value of the 2 in the number 99 723. **Twenty**
 - d) Write down the value of the 5 in the number 258 610. **Fifty thousand**
 - e) Write down the value of the 2 in the number 1 253 549. **Two hundred thousand**

Ordering Numbers

Put these numbers in order, starting with the smallest:



- 1) 74, 57, 38, 8, 61
8, 38, 57, 61, 74



- 2) 39, 84, 11, 128, 24
11, 24, 39, 84, 128



- 3) 76, 102, 12, 140, 73
12, 73, 76, 102, 140



- 4) 3.1, 31, 1.3, 13, 1.03
1.03, 1.3, 3.1, 13, 31



- 5) 0.321, 0.312, 1.04, 1.23
0.312, 0.321, 1.04, 1.23



- 6) 0.34, 0.047, 0.4, 0.43, 0.403
0.047, 0.34, 0.4, 0.403, 0.43



- 7) 0.79, 0.709, 0.97, 0.792
0.709, 0.79, 0.792, 0.97



- 8) 2.71, 2.074, 2.071, 2.701
2.071, 2.074, 2.701, 2.71



- 9) 0.875, 0.88, 0.0885, 0.008, 0.11
0.008, 0.0885, 0.11, 0.875, 0.88



- 10) 3, -2, -7, 10, -1
-7, -2, -1, 3, 10



- 11) -3, -11, 1, -5, 7
-11, -5, -3, 1, 7



- 12) -4, 6, 0, -6, -1
-6, -4, -1, 0, 6



1) Round these numbers to the nearest 10:

- a) 26 **30**
- b) 62 **60**
- c) 75 **80**
- d) 231 **230**
- e) 797 **800**
- f) 5 842 **5 840**
- g) 9 875 **9 880**
- h) 13 758 **13 760**



2) Round these numbers to the nearest 100:

- a) 78 **100**
- b) 223 **200**
- c) 549 **500**
- d) 1 450 **1 500**
- e) 1 382 **1 400**
- f) 4 537 **4 500**
- g) 9 193 **9 200**
- h) 17 625 **17 600**



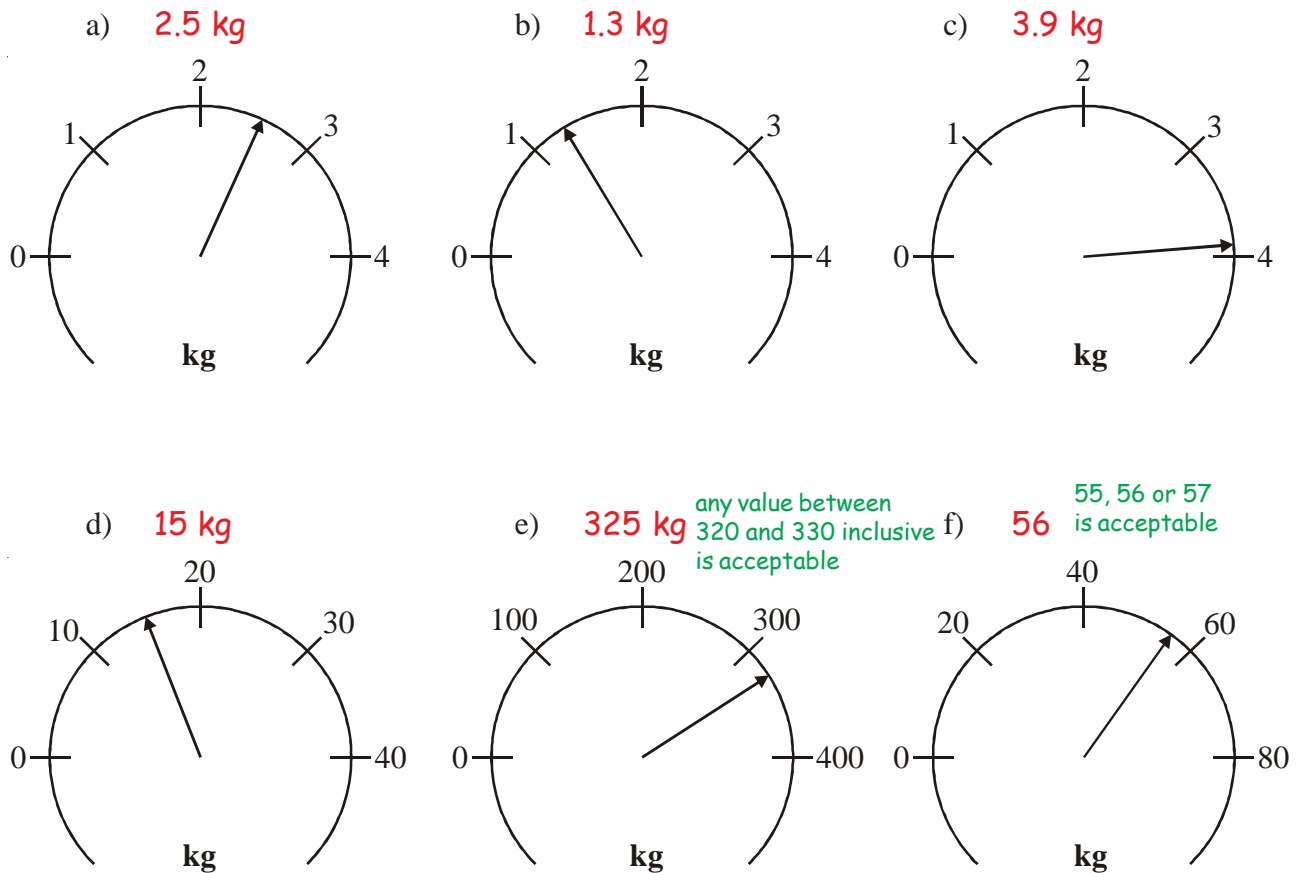
3) Round these numbers to the nearest 1000:

- a) 850 **1 000**
- b) 1 455 **1 000**
- c) 3 230 **3 000**
- d) 7 500 **8 000**
- e) 8 455 **8 000**
- f) 9 690 **10 000**
- g) 12 390 **12 000**
- h) 28 910 **29 000**

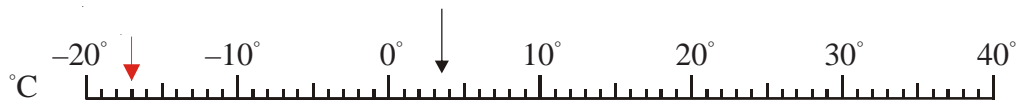
Reading Scales



1) What is the reading on each of these scales?



2) This scale shows degrees Centigrade.

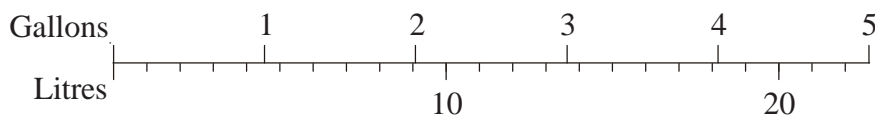


a) What temperature is the arrow pointing to? **3.5°C**

b) Draw an arrow which points to -17°C



3) This is a diagram for converting gallons to litres.



Use the diagram to convert

a) 3 gallons to litres. **13.7 litres**

b) 4.5 gallons to litres. **20.5 litres**

c) 6 litres to gallons. **1.3 gallons**

Multiply and Divide by Powers of 10



1) Multiply the following numbers by 10, 100 and 1000:

		$\times 10$	$\times 100$	$\times 1000$
e.g.	21	210	2100	21000
	9	90	900	9 000
	63	630	6 300	63 000
	845	8 450	84 500	845 000
	3.65	36.5	365	3 650
	0.4	4	40	400
	1.324	13.24	132.4	1 324



2) Divide the following numbers by 10, 100 and 1000:

		$\div 10$	$\div 100$	$\div 1000$
e.g.	21	2.1	0.21	0.021
	9	0.9	0.09	0.009
	63	6.3	0.63	0.063
	845	84.5	8.45	0.845
	3.65	0.365	0.0365	0.00365
	0.4	0.04	0.004	0.0004
	1.324	0.1324	0.01324	0.001324



3) Work out the following:

$$\begin{aligned}
 3 \times 100 &= 300 \\
 65 \times 10 &= 650 \\
 17 \div 10 &= 1.7 \\
 359 \times 10 &= 3\,590 \\
 0.5 \div 100 &= 0.005 \\
 2.3 \times 1000 &= 2\,300 \\
 42 \div 100 &= 0.42 \\
 3582 \div 100 &= 35.82 \\
 0.9 \times 10 &= 9 \\
 3.645 \times 100 &= 364.5 \\
 88 \div 1000 &= 0.088 \\
 39.62 \times 1000 &= 39\,620
 \end{aligned}$$

Negatives in Real Life



- 1) At midnight, the temperature was -7°C .

By 7am the next morning, the temperature had increased by 6°C .

- a) Work out the temperature at 7am the next morning.

-1°C

At midday, the temperature was 3°C .

- b) Work out the difference between the temperature at midday and the temperature at midnight.

10°C

- c) Work out the temperature which is halfway between -7°C and 3°C .

-2°C



- 2) The table below gives the temperature recorded on 25th December in 7 cities across the world.

City	Edinburgh	London	New York	Moscow	Paris	Rome	Cairo
Temperature	-6°C	0°C	-15°C	-23°C	3°C	5°C	18°C

- a) Which city recorded the lowest temperature?

Moscow

- b) What is the difference in temperature between New York and Paris?

18°C

- c) What is the difference in temperature between Cairo and Edinburgh?

24°C

- d) The temperature in Madrid was 9°C lower than in Rome.

What was the temperature in Madrid?

-4°C

- e) The temperature in Mexico City was 6°C higher than in New York.

What was the temperature in Mexico City?

-9°C



- 3) The table shows the temperature on the surface of each of five planets.

Planet	Temperature
Venus	210°C
Jupiter	-150°C
Saturn	-180°C
Neptune	-210°C
Pluto	-230°C

- a) Work out the difference in temperature between Jupiter and Pluto.

80°C

- b) Work out the difference in temperature between Venus and Saturn.

390°C

- c) Which planet has a temperature 30°C lower than Saturn?

Neptune

The temperature on Mars is 90°C higher than the temperature on Jupiter.

- d) Work out the temperature on Mars.

-60°C

Multiplication & Division with Negatives

Work out the following:



all questions

- 1) $-3 \times 6 = -18$
- 2) $4 \times 2 = 8$
- 3) $10 \div -2 = -5$
- 4) $-6 \div -3 = 2$
- 5) $-5 \times -7 = 35$
- 6) $7 \times -3 = -21$
- 7) $12 \div 4 = 3$
- 8) $-24 \div 6 = -4$
- 9) $-8 \times 2 = -16$
- 10) $-9 \div 3 = -3$
- 11) $4 \div -1 = -4$
- 12) $-3 \times -9 = 27$
- 13) $-70 \div -7 = 10$
- 14) $11 \times -6 = -66$
- 15) $4 \times -3 \times 2 = -24$
- 16) $-5 \times 2 \times -4 = 40$
- 17) $4 \times 5 \div -2 = -10$
- 18) $-8 \div -2 \times -6 = -24$
- 19) $-2 \times -3 \times -4 = -24$
- 20) $8 \div -2 \times -6 = 24$

Fraction of an Amount



1) Work out the following:

- a) $\frac{1}{2}$ of £10
£5
- b) $\frac{1}{3}$ of £9
£3
- c) $\frac{1}{5}$ of £25
£5
- d) $\frac{1}{2}$ of 24kg
12kg
- e) $\frac{1}{4}$ of 36cm
9cm
- f) $\frac{1}{6}$ of 42kg
7kg
- g) $\frac{1}{8}$ of 48kg
6kg
- h) $\frac{1}{11}$ of £66
£6
- i) $\frac{1}{9}$ of 90km
10km
- j) $\frac{1}{7}$ of £28
£4
- k) $\frac{1}{5}$ of 125kg
25kg
- l) $\frac{1}{6}$ of 240km
40km



2) Work out the following:

- a) $\frac{1}{4}$ of 20
5
- b) $\frac{3}{4}$ of 20
15
- c) $\frac{1}{3}$ of 21
7
- d) $\frac{2}{3}$ of 21
14
- e) $\frac{3}{4}$ of 44
33
- f) $\frac{2}{3}$ of 24
16
- g) $\frac{3}{5}$ of 15
9
- h) $\frac{3}{4}$ of 36
27
- i) $\frac{7}{9}$ of 81
63
- j) $\frac{5}{7}$ of 56
40
- k) $\frac{3}{10}$ of 50
15
- l) $\frac{6}{11}$ of 33
18
- m) $\frac{1}{4}$ of 14
3.5
- n) $\frac{3}{4}$ of 14
10.5
- o) $\frac{3}{8}$ of 20
7.5



3) The highest possible mark for a Maths test was 64.

Dora got $\frac{7}{8}$ of the full marks.

How many marks did she get? **56 marks**

$$64 \div 8 = 8$$

$$8 \times 7 = 56$$



4) At MathsWatch School there are 1500 students.

$\frac{7}{15}$ of these students are male.

a) What fraction of students are female? **$\frac{8}{15}$**

b) How many are male? **700**

$$1500 \div 15 = 100$$

$$100 \times 7 = 700$$

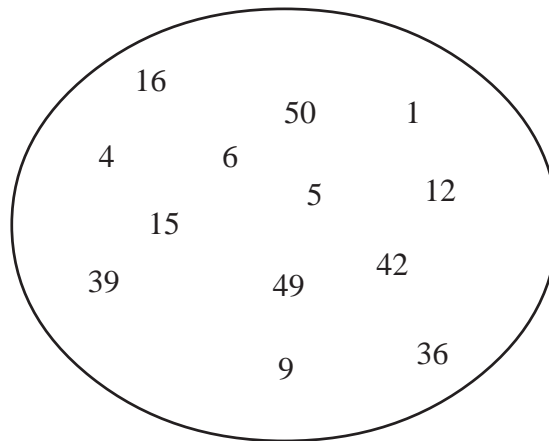
c) How many are female? **800**

$$1500 - 700 = 800$$

Square and Cube Numbers



1)



- a) In the numbers, above, find six of the first seven square numbers.
1, 4, 9, 16, 36, 49
- b) Which of the first seven square numbers is missing?
25



2) Work out the following:

- a) 10^2 b) 9^2 c) $7^2 + 3^2$ d) $8^2 - 2^2$
100 81 $49 + 9 = 58$ $64 - 4 = 60$



3) For each pair of numbers, below, there is just one square number that lies between them. In each case, write the square number:

- a) 7 15 b) 21 29 c) 72 96 d) 130 156
9 25 81 144



4) Work out the following:

- a) $\sqrt{25}$ b) $\sqrt{81}$ c) $\sqrt{16} + 6^2$
5 9 $4 + 36 = 40$



5) The first cube number is $1^3 = 1$

Write out the 2nd, 3rd, 4th and 10th cube numbers.

8, 27, 64, ..., 1000



6) Work out the following:

- a) $1^3 + 3^3$ b) $10^3 + 5^3$
 $1 + 27 = 28$ $1000 + 125 = 1125$



7) Work out the following:

- a) $3^3 + 6^2$ b) $10^3 + \sqrt{100}$
 $27 + 36 = 63$ $1000 + 10 = 1010$



8) Work out what should go in the boxes:

- a) $\sqrt{\boxed{36}} = 6$ b) $\sqrt{\boxed{64}} = 8$



1) Write the following fractions as decimals and percentages:

eg. $\frac{1}{10} \xrightarrow{1 \div 10} 0.1 \xrightarrow{0.1 \times 100} 10\%$

a) $\frac{3}{10} = 0.3 = 30\%$

b) $\frac{1}{5} = 0.2 = 20\%$

c) $\frac{2}{5} = 0.4 = 40\%$

d) $\frac{1}{4} = 0.25 = 25\%$

e) $\frac{3}{4} = 0.75 = 75\%$

f) $\frac{1}{2} = 0.5 = 50\%$

g) $\frac{1}{3} = 0.\dot{3} = 33\frac{1}{3}\%$



2) Fill in the blanks in the table below:

Fraction	Decimal	Percentage
$\frac{6}{10}$	0.6	60%
$\frac{1}{5}$	0.2	20%
$\frac{9}{10}$	0.9	90%
$\frac{2}{5}$	0.4	40%
$\frac{1}{4}$	0.25	25%
$\frac{4}{5}$	0.8	80%
$\frac{12}{100}$	0.12	12%
$\frac{1}{3}$	$0.\dot{3}$	$33\frac{1}{3}\%$
$\frac{7}{10}$	0.7	70%

Money Questions



1) Bill buys 3 melons at £1.09 each.

a) How much does he spend? **£3.27**

b) How much change does he get from £5? **£1.73**



2) Jenny is taking her family to the cinema.
Jenny pays for 1 adult and 3 children.

a) How much does she spend? **£18.50**

b) How much change does she get from £20? **£1.50**

Cinema

Adult: £6.50

Child: £4.00



3) Bob is paid £7 per hour.

a) Last monday Bob worked for 8 hours
Work out his pay for that day. **£56**

b) Yesterday Bob was paid £42.
Work out how many hours Bob worked. **6 hours**



4) Complete this bill.

1½ kg of carrots at 40p per kg = **£0.60**

3 kg of potatoes at 52p per kg = **£1.56**

...2... boxes of tea bags at 90p each = £1.80

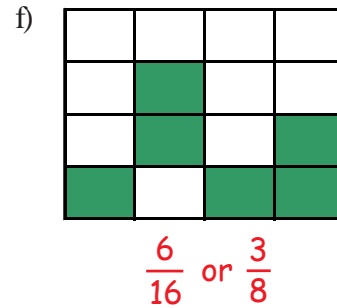
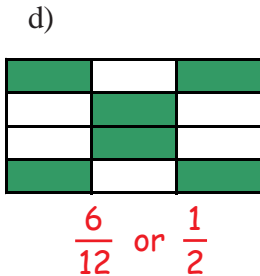
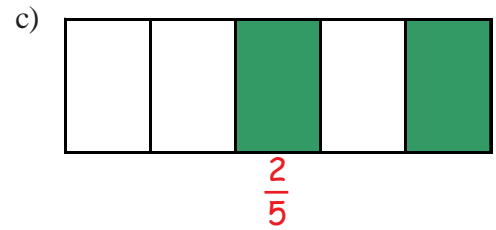
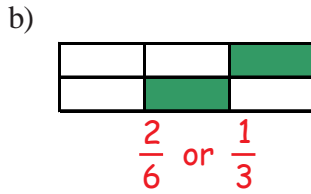
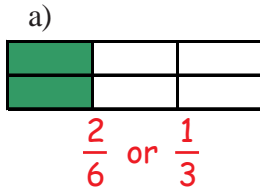
4 packs of yogurts at **£1.20** each = £4.80

Total = **£8.76**

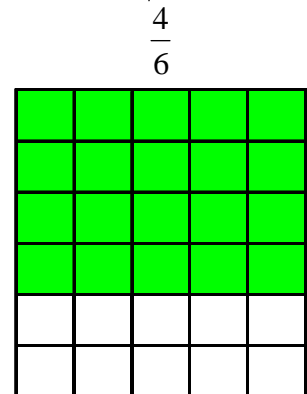
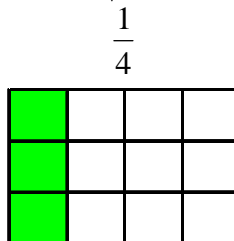
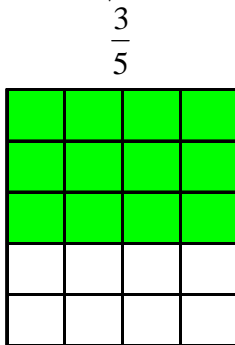
Shading Fractions



1) What fraction of each of the following shapes is shaded?

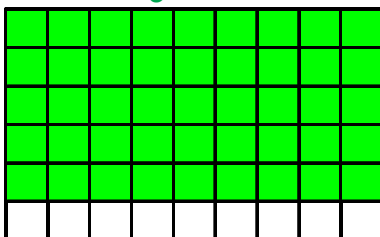


2) Shade the given fraction in the following grids.



3) Which of these fractions is the smallest?

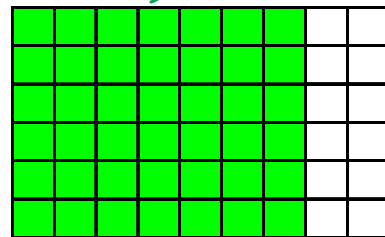
$\frac{5}{6} = 45 \text{ sq.}$



$\frac{5}{6}$ or $\frac{7}{9}$

(use the grids to help)

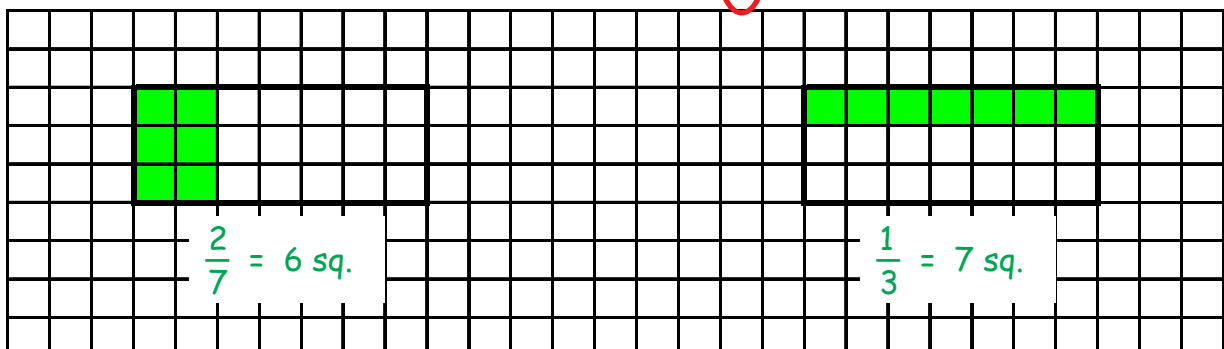
$\frac{7}{9} = 42 \text{ sq.}$



4) Which of these fractions is the largest?

$\frac{2}{7}$ or $\frac{1}{3}$

(you must show your working)



Ordering Fractions, Decimals & Percentages



1) Change these fractions to decimals

eg. $\frac{1}{5} \xrightarrow{1 \div 5} 0.2$

a) $\frac{3}{5}$ **0.6** b) $\frac{4}{5}$ **0.8** c) $\frac{1}{4}$ **0.25** d) $\frac{3}{4}$ **0.75** e) $\frac{1}{3}$ **$0.\dot{3}$** f) $\frac{2}{3}$ **$0.\dot{6}$**



2) Change these percentages to decimals

eg. $52\% \xrightarrow{52 \div 100} 0.52$

a) 63% **0.63** b) 8% **0.08** c) 59% **0.59** d) 81% **0.81** e) 28.5% **0.285** f) 6.5% **0.065**



3) Write the following numbers in order of size (smallest to largest)

a)	0.61 0.61 0.55	$\frac{2}{3}$ $0.\dot{6}$ 59%	59% 0.59 $\frac{3}{5}$	0.55 0.55 0.61	$\frac{3}{5}$ 0.6 $\frac{2}{3}$
b)	81% 0.81 $\frac{3}{4}$	0.78 0.78 0.78	$\frac{4}{5}$ 0.8 $\frac{4}{5}$	$\frac{3}{4}$ 0.75 0.805	0.805 0.805 81%
c)	$\frac{1}{3}$ $0.\dot{3}$ $\frac{1}{4}$	0.3 0.3 28.5%	$\frac{1}{4}$ 0.25 0.3	28.5% 0.285 0.32	0.32 0.32 $\frac{1}{3}$
d)	0.23 0.23 19.2%	21% 0.21 $\frac{1}{5}$	$\frac{1}{5}$ 0.2 21%	$\frac{22}{100}$ 0.22 $\frac{22}{100}$	19.2% 0.192 0.23
e)	1% 0.01 1%	0.012 0.012 0.012	$\frac{3}{100}$ 0.03 0.021	0.021 0.021 $\frac{1}{40}$	$\frac{1}{40}$ 0.025 $\frac{3}{100}$

Estimation



1) Work out an estimate

eg. $17 \times 193 \longrightarrow 20 \times 200 = 4000$

a) 12×304 **3000**

10×300

b) 38×72 **2800**

40×70

c) 231×56 **12000**

200×60

d) 773×13 **8000**

800×10



2) Work out an estimate

eg. $4.7 \times 54 \longrightarrow 5 \times 50 = 250$

a) 3.8×52 **200**

4×50

b) 7.9×103 **800**

8×100

c) 9.6×265 **3000**

10×300

d) 512×2.4 **1000**

500×2



3) Work out an estimate

eg. $37 \div 12 \longrightarrow 40 \div 10 = 4$

a) $122 \div 53$ **2**

$100 \div 50$

b) $372 \div 44$ **10**

$400 \div 40$

c) $\frac{341}{28}$ $\frac{300}{30}$ **10**

d) $\frac{109}{96}$ $\frac{100}{100}$ **1**



4) Work out an estimate

eg. $37 \div 1.2 \longrightarrow 40 \div 1 = 40$

a) $68 \div 1.7$ **35**

$70 \div 2$

b) $37 \div 7.9$ **5**

$40 \div 8$

c) $\frac{253}{4.6}$ $\frac{300}{5}$ **60**

d) $\frac{96}{10.4}$ $\frac{100}{10}$ **10**



5) Work out an estimate

eg. $\frac{62 \times 28}{89} \longrightarrow \frac{60 \times 30}{90} = \frac{1800}{90} = 20$

a) $\frac{45 \times 21}{14}$ $\frac{50 \times 20}{10}$ **100**

b) $\frac{76 \times 17}{42}$ $\frac{80 \times 20}{40}$ **40**

c) $\frac{42 \times 53}{2.2}$ $\frac{40 \times 50}{2}$ **1000**

d) $\frac{33 \times 61}{8.7}$ $\frac{30 \times 60}{9}$ **200**



- 1) Using the information that $23 \times 68 = 1564$ work out the value of:

- a) 2.3×68 **156.4**
- b) 2.3×6.8 **15.64**
- c) 0.23×68 **15.64**
- d) 2.3×0.68 **1.564**
- e) 230×68 **15 640**
- f) 230×6.8 **1 564**
- g) 2300×680 **1 564 000**
- h) $1564 \div 23$ **68**
- i) $1564 \div 2.3$ **680**
- j) $15640 \div 23$ **680**



- 2) Using the information that $416 \times 35 = 14560$ work out the value of:

- a) 4.16×35 **145.6**
- b) 41.6×0.35 **14.56**
- c) 41600×350 **14 560 000**
- d) 0.416×350 **145.6**
- e) 4160×0.035 **145.6**
- f) 41.6×350000 **14 560 000**
- g) 0.00416×0.0035 **0.00001456**
- h) $14560 \div 3.5$ **4160**
- i) $145.6 \div 4.16$ **35**
- j) $1.456 \div 0.35$ **4.16**



- 3) If $78 \div 2.5 = 31.2$, what do you have to divide 78 by to get an answer of 0.312? **250**



- 4) If $812 \times 2.9 = 2354.8$, what do you have to multiply 8.12 by to get an answer of 23548? **2900**



1) a)
$$\begin{array}{r} 42 \\ + 26 \\ \hline 68 \end{array}$$

b)
$$\begin{array}{r} 57 \\ + 38 \\ \hline 95 \end{array}$$

c)
$$\begin{array}{r} 96 \\ + 75 \\ \hline 171 \end{array}$$



2) a)
$$\begin{array}{r} 637 \\ + 961 \\ \hline 1598 \end{array}$$

b)
$$\begin{array}{r} 983 \\ + 442 \\ \hline 1425 \end{array}$$

c)
$$\begin{array}{r} 969 \\ + 758 \\ \hline 1727 \end{array}$$



3) a)
$$\begin{array}{r} 452 \\ + 38 \\ \hline 490 \end{array}$$

b)
$$\begin{array}{r} 147 \\ + 763 \\ \hline 910 \end{array}$$

c)
$$\begin{array}{r} 813 \\ + 431 \\ + 38 \\ \hline 1282 \end{array}$$



4) There were two exhibitions at the NEC one Sunday.
3816 people went to one of the exhibitions and 13427 people went to the other exhibition.

How many people went to the NEC, in total, on the Sunday? **17243**

$$\begin{array}{r} 13427 \\ + 3816 \\ \hline 17243 \end{array}$$



5) a)
$$\begin{array}{r} 2.6 \\ + 1.2 \\ \hline 3.8 \end{array}$$

b)
$$\begin{array}{r} 2.74 \\ + 6.81 \\ \hline 9.55 \end{array}$$

c)
$$\begin{array}{r} 45.36 \\ + 6.81 \\ \hline 52.17 \end{array}$$



6) a)
$$\begin{array}{r} 23 \\ + 1.5 \\ \hline 24.5 \end{array}$$

b)
$$\begin{array}{r} 13.6 \\ + 38 \\ \hline 51.6 \end{array}$$

c)
$$\begin{array}{r} 13.2 \\ + 17.82 \\ \hline 31.02 \end{array}$$



7) a)
$$\begin{array}{r} 78 \\ - 42 \\ \hline 36 \end{array}$$

b)
$$\begin{array}{r} 74 \\ - 26 \\ \hline 48 \end{array}$$

c)
$$\begin{array}{r} 62 \\ - 39 \\ \hline 23 \end{array}$$



8) a)
$$\begin{array}{r} 485 \\ - 291 \\ \hline 194 \end{array}$$

b)
$$\begin{array}{r} 773 \\ - 486 \\ \hline 287 \end{array}$$

c)
$$\begin{array}{r} 100 \\ - 34 \\ \hline 66 \end{array}$$



9) a)
$$\begin{array}{r} 653 \\ - 48 \\ \hline 605 \end{array}$$

b)
$$\begin{array}{r} 362 \\ - 183 \\ \hline 179 \end{array}$$

c)
$$\begin{array}{r} 2000 \\ - 461 \\ \hline 1539 \end{array}$$



10) There were two films showing at a cinema one Saturday.

One of the films was shown in a large room and the other was in a smaller room.

The film in the larger room was watched by a total of 3562 people.

The film in the smaller room was watched by 1671 people.

How many more people saw the film in the larger room? **1891**

$$\begin{array}{r} 3562 \\ - 1671 \\ \hline 1891 \end{array}$$



11) a)
$$\begin{array}{r} 782 \\ + 426 \\ - 278 \\ \hline 930 \end{array}$$

b)
$$\begin{array}{r} 8162 \\ + 1149 \\ - 799 \\ \hline 8512 \end{array}$$

Long Multiplication



1) Work out

a) 13×18 **234**

b) 135×27 **3645**

c) 116×41 **4756**

d) 264×43 **11352**

e) 326×24 **7824**

f) 281×59 **16579**

g) 286×48 **13728**

h) 428×34 **14552**

i) 461×45 **20745**



2) “MathsWatch Travel” has 36 coaches.

Each of these coaches can carry 53 passengers.

36×53

How many passengers in total can all the coaches carry? **1 908**



3) “MathsWatch Tours” has a plane that will carry 47 passengers.

To fly from Manchester to Lyon, each passenger pays £65

47×65

Work out the total amount that the passengers pay.

£3 055



4) A Science textbook costs £13.

Mr Jones buys a class set of 34 books.

34×13

How much do they cost him?

£442



5) A graphical calculator costs £18.

43×18

How much would 43 calculators cost?

£774

Long Division



1) Work out

a) $325 \div 5$ **65**

d) $377 \div 29$ **13**

g) $75 \div 4$ **18.75**

b) $448 \div 8$ **56**

e) $27 \div 6$ **4.5**

h) $135 \div 20$ **6.75**

c) $221 \div 13$ **17**

f) $123 \div 15$ **8.2**

i) $381 \div 12$ **31.75**



2) A box can hold 19 books.

$646 \div 19$

Work out how many boxes will be needed to hold 646 books. **34 boxes**



3) The distance from Glasgow to Paris is 1290 km.

A flight from Glasgow to Paris lasts 3 hours.

Given that

$$\text{Average speed} = \frac{\text{Distance}}{\text{Time}}$$

$1290 \div 3$

Work out the average speed of the aeroplane in km/h. **430 km/h**



4) Pencils cost 25p each.

Mr Smith spends £15 on pencils.

$1500 \div 25$

Work out the number of pencils he gets. **60 pencils**



5) Yesterday, Gino was paid £19.61 for delivering pizzas.

He is paid 53p for each pizza he delivers.

$1961 \div 53$

Work out how many pizzas Gino delivered yesterday. **37 pizzas**



6) Emma sold 38 teddy bears for a total of £513

She sold each teddy bear for the same price.

$513 \div 38$

Work out the price at which Emma sold each teddy bear. **£13.50**



7)

Canal boat for hire
£1855.00
for 14 days

$1855 \div 14$

Work out the cost per day of hiring the canal boat. **£132.50**



8) A teacher has £539 to spend on books.

Each book costs £26

$539 \div 26$

How many books can the teacher buy? **20 books**



9) John delivers large wooden crates with his van.

The weight of each crate is 68 kg.

The greatest weight the van can hold is 980 kg.

$980 \div 68$

Work out the greatest number of crates that the van can hold. **14 crates**



10) Rulers costs 17p each.

MathsWatch High School has £120 to spend on rulers.

$12000 \div 17$

Work out the number of rulers bought. **705 rulers**

Multiplication and Division with Decimals



1) Work out

a) 6×0.2 **1.2**

d) 0.2×0.8 **0.16**

b) 0.2×0.3 **0.06**

e) 0.03×0.9 **0.027**

c) 0.4×7 **2.8**

f) 1.5×0.2 **0.3**



2) A box contains 7 books, each weighing 2.5 kg. **7×2.5**
Work out the total weight of the box. **17.5 kg**



3) John takes 13 boxes out of his van.
The weight of each box is 25.5 kg **13×25.5**
Work out the total weight of the 13 boxes. **331.5 kg**



4) Work out

a) $9 \div 0.3$ **30**

d) $25 \div 0.5$ **50**

b) $6 \div 0.1$ **60**

e) $21 \div 0.3$ **70**

c) $12 \div 0.4$ **30**

f) $15 \div 0.2$ **75**



5) Work out

a) $3.6 \div 0.4$ **9**

d) $0.56 \div 0.08$ **7**

b) $0.8 \div 0.2$ **4**

e) $5.5 \div 0.05$ **110**

c) $2.4 \div 0.4$ **6**

f) $8.1 \div 0.09$ **90**



6) John takes boxes out of his van.
The total weight of the boxes is 4.9 kg
The weight of each box is 0.7 kg **$4.9 \div 0.7$**
Work out the number of boxes in John's van. **7 boxes**



7) Mr Rogers bought a bag of elastic bands for £6
Each elastic band costs 12p. **$600 \div 12$**
Work out the number of elastic bands in the bag. **50 elastic bands**

Rounding to Decimal Places



1) Round the following numbers to 1 decimal place

a) 13.681
13.7

b) 344.7234
344.7

c) 0.76133
0.8



2) Round the following numbers to 2 decimal places

a) 58.8136
58.81

b) 14.22731
14.23

c) 203.86884
203.87



3) Round the following numbers to 1 decimal place

a) 48.9732
49.0

b) 163.9299
163.9

c) 19.952
20.0



4) Round the following numbers to 2 decimal places

a) 10.697
10.70

b) 8.993
8.99

c) 14.9964
15.00



5) Work out the answer to 2.6882×14.71728 and give your answer correct to 2 decimal places. **39.56**



6) Work out the answer to $64.2 \div 5.7$ and give your answer correct to 1 decimal place. **11.3**



7) Work out the answer to 4.74^2 giving your answer correct to 2 decimal places. **22.47**



8) Find the answer to $\sqrt{17.3}$ giving your answer correct to 1 decimal place. **4.2**



1) Write down the number which is in the middle of:

- a) 3 and 9 **6**
- b) 12 and 28 **20**
- c) 11 and 22 **16.5**
- d) 17 and 32 **24.5**
- e) 72 and 108 **90**
- f) 1 and 100 **50.5**
- g) -6 and 2 **-2**



2) Write down the number which is in the middle of:

- a) 2.4 and 6.8 **4.6**
- b) 5.9 and 12.5 **9.2**
- c) -5 and 7.8 **1.4**



- 3) a) 7 is in the middle of 3 and which other number? **11**
- b) 16 is in the middle of 9 and which other number? **23**
- c) 2.4 is in the middle of 1.1 and which other number? **3.7**

Reciprocals



1) Write down the reciprocal of

a) 8 $\frac{1}{8}$

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

c) 1 1

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



2) Write down the reciprocal of

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

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

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

d) $\frac{1}{8}$ 8



3) Write down the reciprocal of

a) 0.1 $\frac{1}{0.1}$ 10

b) 0.5 $\frac{1}{0.5}$ 2

c) 0.2 $\frac{1}{0.2}$ 5



4) Why can't we have a reciprocal of 0? **Because division by "0" does not exist.**

Proportion



- 1) 8 bananas cost £4

Work out the cost of 5 bananas. **£2.50**

$$\begin{array}{r} 0.50 \\ 8 \overline{) 4.00} \\ 5 \times 0.50 = 2.50 \end{array}$$



- 2) Emily bought 4 identical pairs of sock for £3.60

Work out the cost of 9 pairs of these socks. **£8.10**

$$\begin{array}{r} 0.90 \\ 4 \overline{) 3.60} \\ 9 \times 0.90 = 8.10 \end{array}$$



- 3) The price of 36 chocolates is £7.20

Work out the cost of 8 chocolates. **£1.60**

$$\begin{array}{r} 0.20 \\ 36 \overline{) 7.20} \\ 8 \times 0.20 = 1.60 \end{array}$$



- 4) Theresa bought 5 theatre tickets for £60

Work out the cost of 9 theatre tickets. **£108**

$$\begin{array}{r} 12 \\ 5 \overline{) 60} \\ 9 \times 12 = 108 \end{array}$$



- 5) Jenny buys 4 folders.

The total cost of these 4 folders is £6.40

Work out the total cost of 7 of these folders. **£11.20**

$$\begin{array}{r} 1.60 \\ 4 \overline{) 6.40} \\ 7 \times 1.60 = 11.20 \end{array}$$



- 6) The cost of 15 litres of petrol is £12

Work out the cost of 20 litres of petrol. **£16**

$$\begin{array}{l} 12 \div 15 = \text{£}0.80 \\ 20 \times 0.8 = 16 \end{array}$$



- 7) 3 maths books cost £7.47

Work out the cost of 5 of these. **£12.45**

$$\begin{array}{l} 7.47 \div 3 = \text{£}2.49 \\ 5 \times 2.49 = 12.45 \end{array}$$



- 8) Five 1 litre tins of paint cost a total of £48.75

Work out the cost of seven of these 1 litre tins of paint. **£68.25**

$$\begin{array}{l} 48.75 \div 5 = 9.75 \\ \text{£}68.25 \quad 7 \times 9.75 = 68.25 \end{array}$$



- 9) William earns £9.30 for $1\frac{1}{2}$ hours of work.

Work out how much he would earn for:

a) 30 minutes **£3.10**

b) 5 hours **£31**

$$\begin{array}{l} 9.30 \div 1.5 = \text{£}6.20/\text{hr} \\ 0.5 \times 6.2 = 3.10 \\ 5 \times 6.2 = 31 \end{array}$$



- 10) It took 3 hours for Emyr to lay 450 bricks.

He always works at the same speed.

How long will it take Emyr to lay 750 bricks? **5 hrs**

Distance Tables



- 1) The table shows the distances in kilometres between some cities in the USA.

San Francisco		New York		Miami		Los Angeles		Chicago	
4827									
4990		2132							
668		4541		4375					
3493		1352		2183		3366			

- a) Write down the distance between San Francisco and Miami. **4990 km**

One of the cities in the table is 4541 km from Los Angeles.

- b) Write down the name of this city. **New York**

- c) Write down the name of the city which is furthest from Chicago. **San Francisco**



- 2) The table shows the distances in miles between four cities.

London		Cardiff		York		Edinburgh	
155							
212		245					
413		400		193			

- a) Write down the distance between London and York. **212 miles**

- b) Write down the distance between Edinburgh and Cardiff. **400 miles**

- c) Which two cities are the furthest apart? **London and Edinburgh**

Tom travels from London to York. **212**

He then travels from York to Edinburgh. **+ 193**

He finally travels back to London from Edinburgh. **+ 413**

- d) Work out the total distance travelled by Tom. **818 miles**

Peter and Jessica both drive to York.

Peter travels from London whilst Jessica travels from Cardiff.

$$245 - 212 = 33$$

- e) Who travels the furthest out of Peter and Jessica and by how much?

Jessica by 33 miles

Timetables



- 1) Change the following to the 24 hour clock
- | | | | |
|-------------|--------------|--------------------------|--------------|
| a) 4.30 pm | 16 30 | d) 7.15 pm | 19 15 |
| b) 5 am | 05 00 | e) Quarter past midnight | 00 15 |
| c) 10.26 am | 10 26 | f) Half past noon | 12 30 |



- 2) Change the following to the 12 hour clock
- | | | | |
|----------|-----------------|-----------------------|----------------|
| a) 06 35 | 6.35 am | d) 19 15 | 7.15 pm |
| b) 14 30 | 2.30 pm | e) 00 50 | 0.50 am |
| c) 12 45 | 12.45 pm | f) Half past midnight | 0.30 am |



- 3) What is the difference in hours and minutes between the following
- | | |
|---------------------------|----------------------|
| a) 10.15 pm and 11.30 pm? | 1 hr 15 mins |
| b) 14 20 and 17 10? | 2 hrs 50 mins |
| c) 11.50 pm and 3.20 am? | 3 hrs 30 mins |
| d) 22 45 and 01 00? | 2 hrs 15 mins |



- 4) Here is part of a train timetable

Manchester	05 15	06 06	06 45	07 05	07 15	07 46
Stockport	05 26	06 16	06 55	07 15	07 25	07 55
Macclesfield	05 39	06 29	07 08		07 38	08 08
Stoke	05 54	06 45	07 24		07 54	08 24
Stafford	06 12		07 41		08 11	
Euston	08 09	08 26	09 06	09 11	09 50	10 08

- a) Tim catches the 06 06 train from Manchester.
At what time should he expect to arrive at Euston? **08 26**
- b) Jenny arrives at the Stockport train station at 07 00
- | | |
|--|----------------|
| (i) How long should she expect to wait for a train to Stoke? | 25 mins |
| (ii) How long should her train journey take? | 29 mins |
- c) Sarah needs to travel to Euston from Macclesfield.
She has to arrive at Euston before 09 30.
What is the departure time of the latest train she can catch to get there on time? **07 08**



- 1) Write the following using indices:
eg. $3 \times 3 \times 3 \times 3 = 3^4$

a) $2 \times 2 \times 2 \times 2$ 2^4

d) $12 \times 12 \times 12 \times 12 \times 12$ 12^5

b) $4 \times 4 \times 4$ 4^3

e) 3.6×3.6 3.6^2

c) $5 \times 5 \times 5 \times 5 \times 5 \times 5$ 5^6

f) $5.2 \times 5.2 \times 5.2$ 5.2^3



- 2) Write each of the following as a single power:
eg. $5^2 \times 5^4 = 5^6$

a) $6^2 \times 6^3$ 6^5

d) $5^3 \times 5$ 5^4

b) $7^4 \times 7^2$ 7^6

e) $2^9 \times 2^3$ 2^{12}

c) $9^3 \times 9^6$ 9^9

f) $7.2^3 \times 7.2^2$ 7.2^5



- 3) Write each of the following as a single power:
eg. $7^5 \div 7^2 = 7^3$

a) $9^5 \div 9^3$ 9^2

d) $\frac{7^8}{7^3}$ 7^5

b) $6^9 \div 6^5$ 6^4

e) $\frac{3^6}{3}$ 3^5

c) $11^7 \div 11^2$ 11^5

f) $\frac{8^{15}}{8^4}$ 8^{11}



- 4) Write each of the following as a single power:

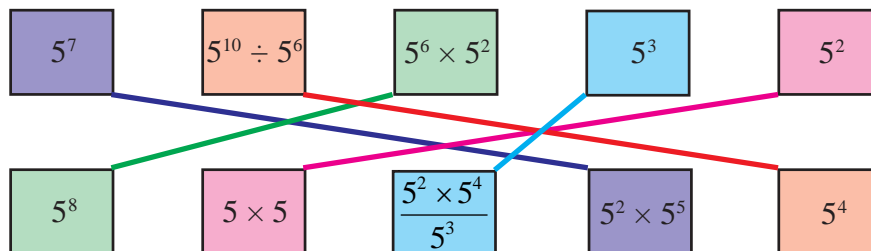
eg. $\frac{7^3 \times 7^8}{7^6} = \frac{7^{11}}{7^6} = 7^5$

a) $\frac{4^7 \times 4^3}{4^6}$ $\frac{4^{10}}{4^6}$ 4^4

b) $\frac{9^2 \times 9^6}{9^4}$ $\frac{9^8}{9^4}$ 9^4



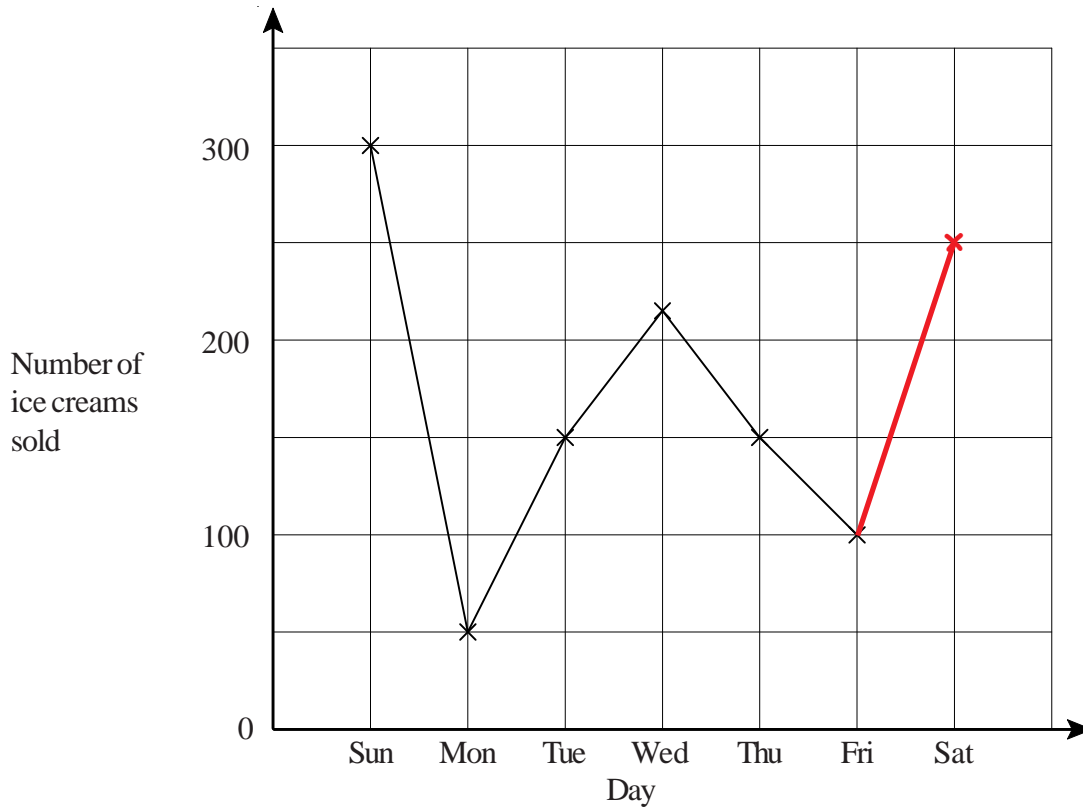
- 5) Match together cards with the same answer



Line Graphs



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



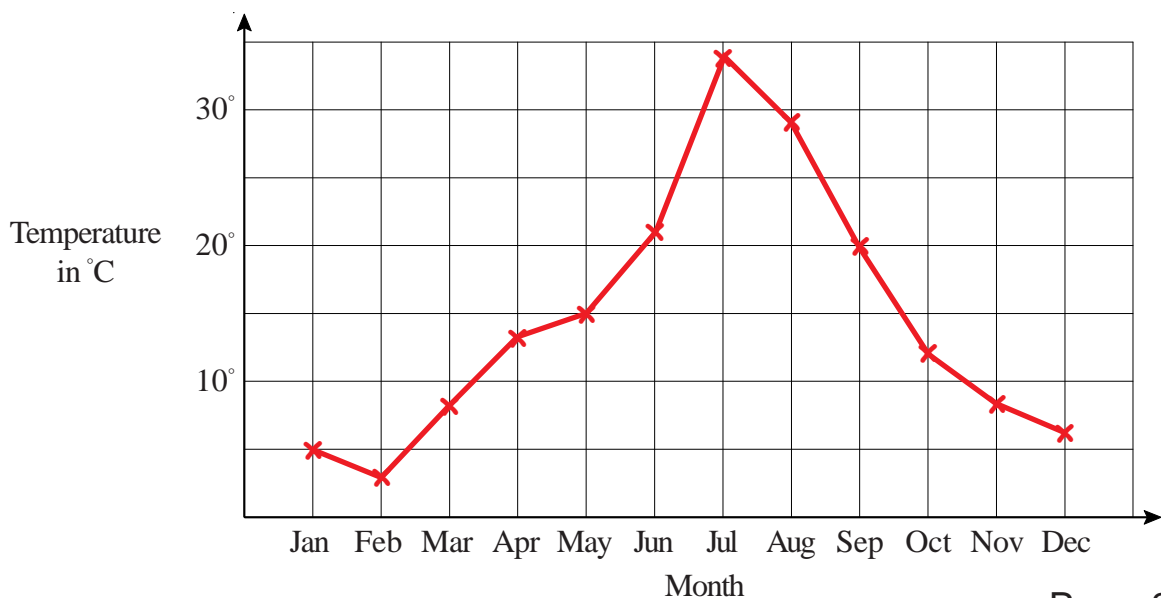
- a) How many more ice creams were sold on Sunday than on Friday? **200**
- b) Explain what might have happened on Monday. **It might have been raining.**
- c) On Saturday, 250 ice creams were sold.
Update the graph with this information.
- d) About how many ice creams were sold on Wednesday? **213 (you can have between 206 and 220)**



- 2) The average temperature, in degrees Centigrade, was recorded for each month.
The results are as follows:

January 5°C February 3°C March 8°C April 13°C May 15°C June 21°C
July 34°C August 29°C September 20°C October 12°C November 8°C December 6°C

Draw a line graph to show these results.

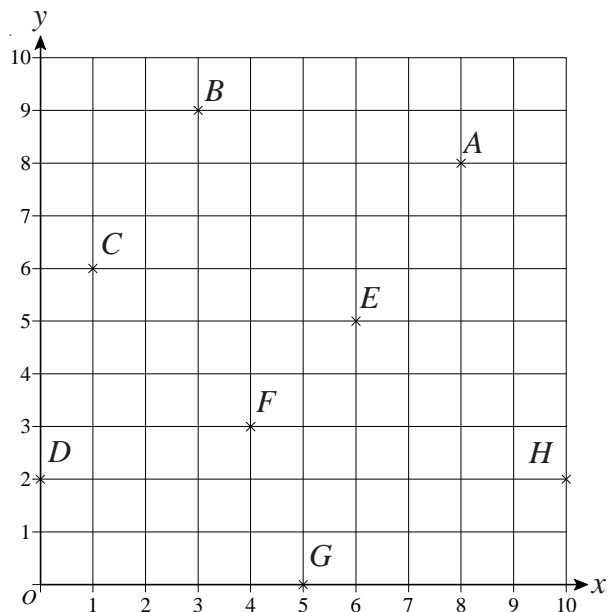


Coordinates

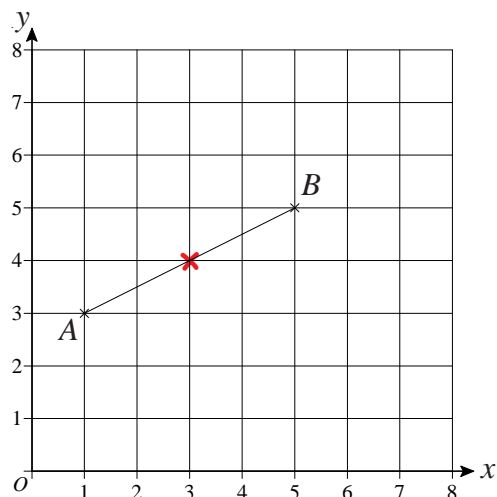


1) Write down the coordinates of the points A to H.

A (8, 8)
B (3, 9)
C (1, 6)
D (0, 2)
E (6, 5)
F (4, 3)
G (5, 0)
H (10, 2)



2) a) Write down the coordinates of: (i) A (1, 3) (ii) B (5, 5)
b) Write down the coordinates of the midpoint of the line AB. (3, 4)



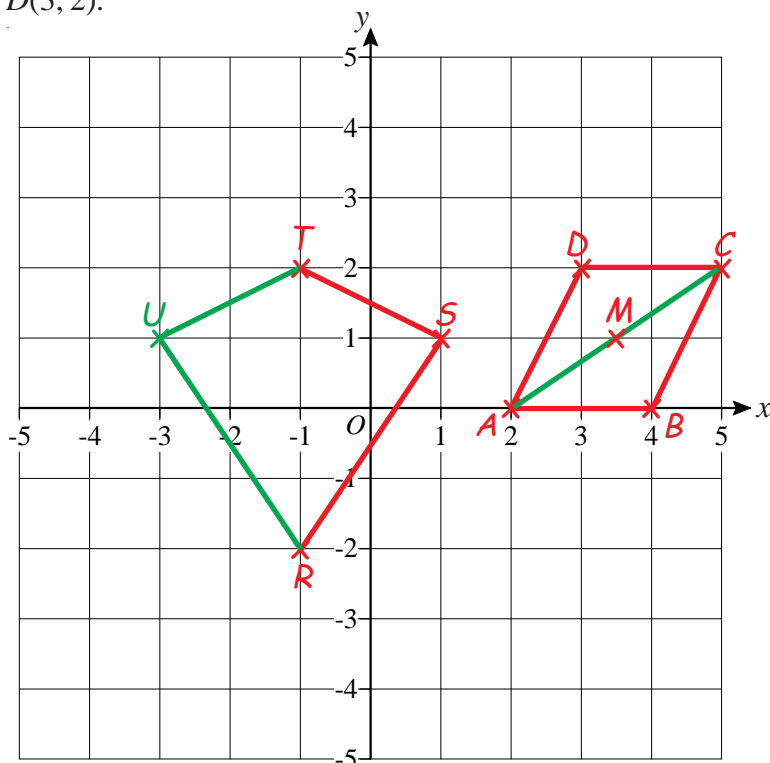
3) Using the pair of axes,
a) Plot the points A(2, 0), B(4, 0), C(5, 2) and D(3, 2).

b) Join the points in order, to form a shape and name the shape.

Parallelogram

M is the midpoint of the line segment AC.

c) Find the coordinates of M. (3.5, 1)



4) Using the same pair of axes,
a) Plot the points R(-1, -2), S(1, 1) and T(-1, 2).

b) Join R to S and S to T.

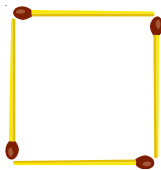
RSTU is a kite.

c) Write the coordinates of point U. (-3, 1)

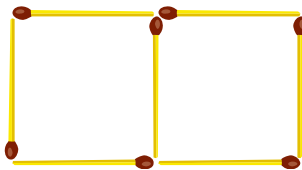
Number Sequences



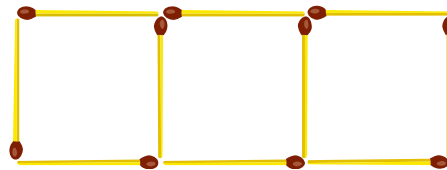
1) Here are some patterns made from matchsticks



Pattern 1



Pattern 2



Pattern 3

a) Draw pattern 4.



Pattern 4

b) How many matchsticks are used in

(i) Pattern 5? **16 matchsticks**

(ii) Pattern 10? **31 matchsticks**

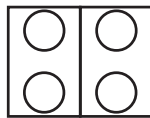
c) Which pattern will have 46 matchsticks? **pattern 15**



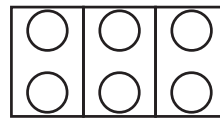
2) A pattern is made of rectangles and circles



Pattern 1

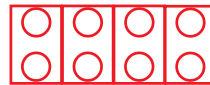


Pattern 2



Pattern 3

a) Draw pattern 4.



Pattern 4

b) Complete the table below.

Pattern number	1	2	3	4	5	10
Number of rectangles	1	2	3	4	5	10
Number of circles	2	4	6	8	10	20
Total rectangles + circles	3	6	9	12	15	30

c) Which pattern will have 64 circles? **32**

d) Which pattern will have a total (rectangles + circles) of 90? **30**



3) For each of the following sequences write down the next two terms.

a) 5, 10, 15, 20... **25, 30**

c) 27, 23, 19, 15... **11, 7**

b) 9, 16, 23, 30... **37, 44**

d) 12, 7, 2, -3... **-8, -13**



4) Look at this number sequence: 4, 10, 16, 22...

The 50th term of the sequence is 298.

a) Write down the 51st term. **304**

b) Will 643 be a term in this sequence? **No.**

Explain your answer. **All the numbers in this sequence are "even".**

Number Machines



- 1) Here is a table for the rule $\times 3$ then -1

$\times 3$ then -1	
Input	Output
1	2
2	5
3	8
5	14
7	20
12	35

Complete the table.



- 2) Here is the table for the rule $+5$ then $\div 2$

$+5$ then $\div 2$	
Input	Output
1	3
2	3.5
3	4
4	4.5
9	7
15	10

Complete the table.



- 3) Here is the table for the rule $\times 4$ then -3 then $\times 2$

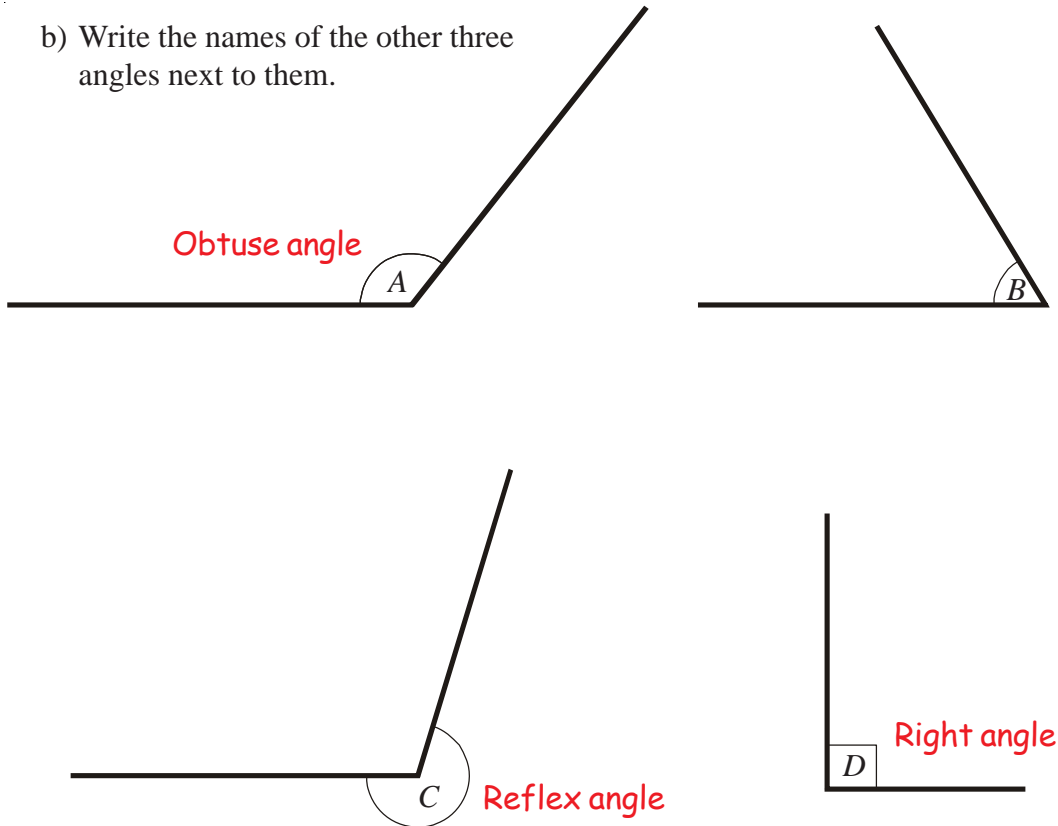
$\times 4$ then -3 then $\times 2$	
Input	Output
1	2
2	10
3	18
5	34
7	50
10	74
11	82

Complete the table.

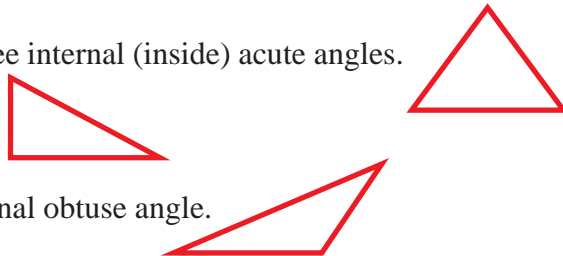


- 1) a) One of these angles is an acute angle.
Which one? **Angle B**

- b) Write the names of the other three angles next to them.



- 2) a) Sketch a triangle which has three internal (inside) acute angles.
b) Sketch a right-angled triangle.
c) Sketch a triangle with one internal obtuse angle.



- 3) Debbie says she is going to draw a triangle with two internal obtuse angles.

Harry says that this is impossible.

Is Harry correct? Explain why.

Harry is correct.

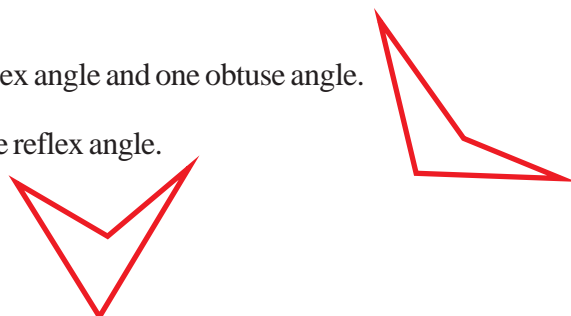
An obtuse angle is bigger than 90° .

Two of them would mean the angles added up to more than 180° .

But we know the angles of a triangle add up to 180° .



- 4) Draw a quadrilateral with
a) Two internal acute angles, one reflex angle and one obtuse angle.
b) Three internal acute angles and one reflex angle.

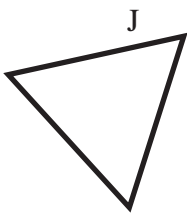
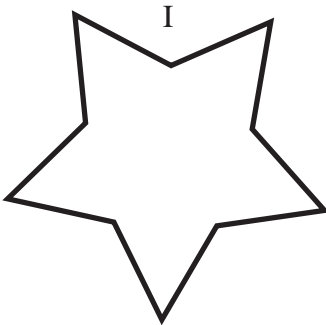
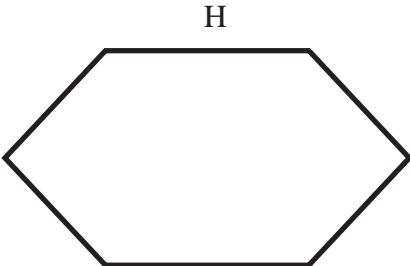
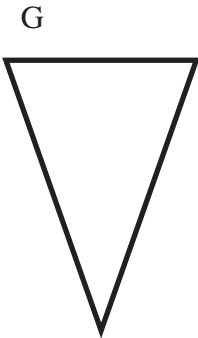
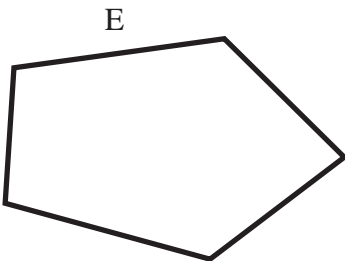
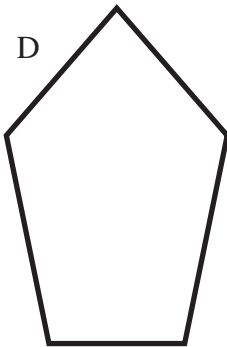
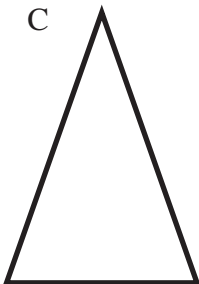
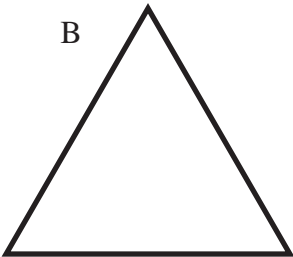
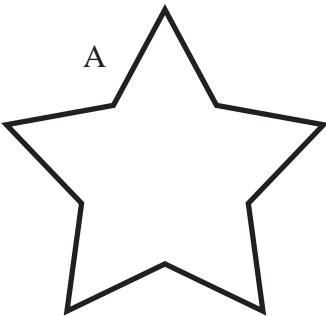


Congruent and Similar Shapes



Shape	Congruent to	Similar to
A	I	F
B		J
C	G	
D	E	
E	D	
F		A and I
G	C	
H		
I	A	F
J		B

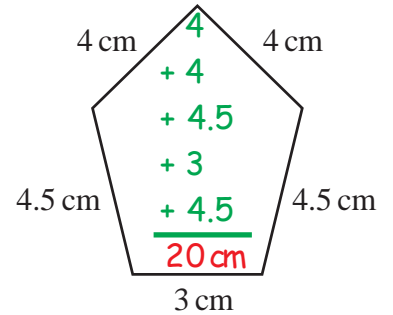
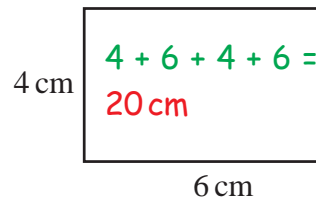
Fill in the table on the left where possible.
 You are allowed to use tracing paper to help get the correct answers.



Perimeter and Areas



- 1) Find the perimeter of the following rectangle and pentagon:



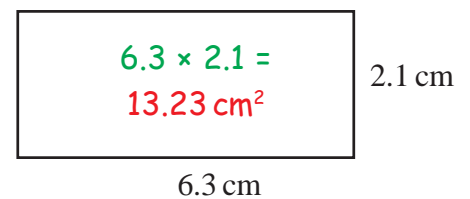
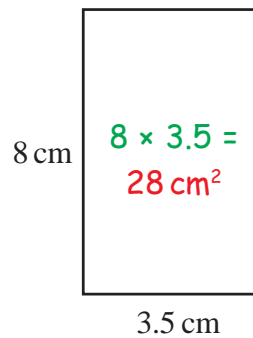
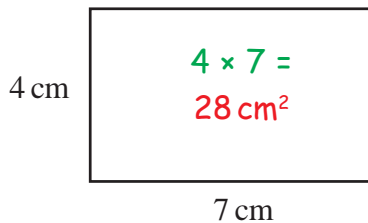
- 2) A rectangle has a perimeter of 40 cm. The length of the longest side is 12 cm. Sketch the rectangle, and find the length of the shorter side.

$$40 - 12 - 12 = 16$$

$$16 \div 2 = 8 \text{ cm}$$



- 3) Find the area of the following rectangles:



- 4) A rectangle has an area of 40cm² and a length of 8 cm. Sketch the rectangle and find the width.

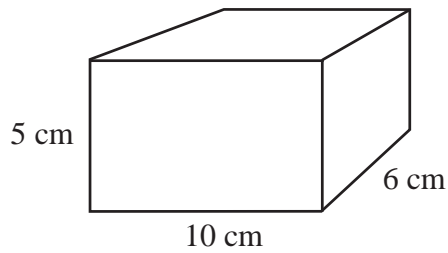
$$40 \div 8 = 5 \text{ cm}$$



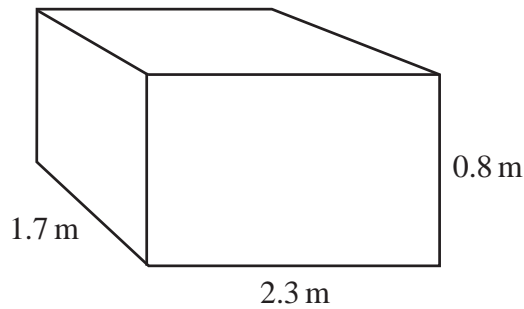
Volume of Cuboids



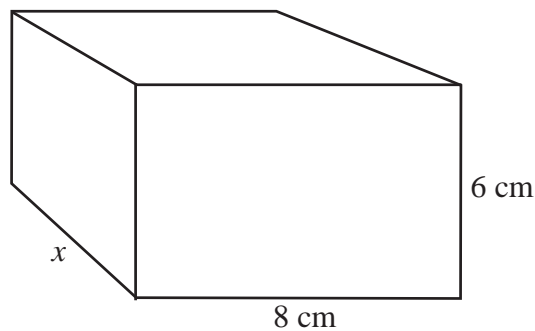
- 1) Find the volume of this cuboid. **Volume = 300 cm³**



- 2) Find the volume of this cuboid. **Volume = 3.128 m³**



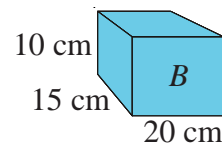
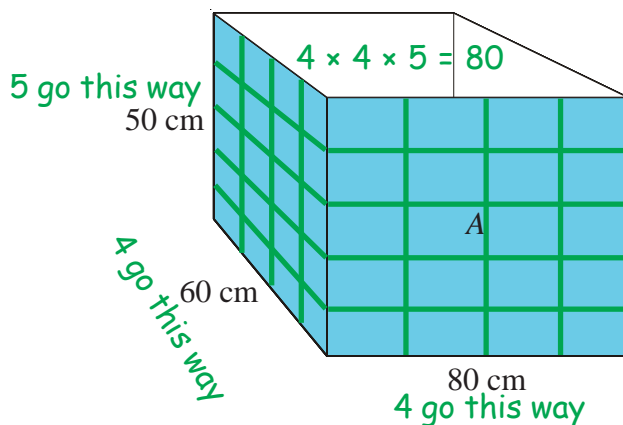
- 3) The volume of this cuboid is 480 cm³.
Find the length of the side marked x . **$x = 10$ cm**



$$\begin{aligned} V &= W \times L \times H \\ 480 &= 8 \times x \times 6 \\ 480 &= 48 \times x \\ x &= 10 \text{ cm} \end{aligned}$$



- 4) Boxes A and B are both cuboids.
How many of box B could be packed into box A? **80 of box B go into box A**



Converting Metric Measures



- 1) Complete this table by writing down a sensible unit for each measurement.
Four have been done for you.

	Metric	Imperial
The distance between London and Manchester	km	miles
The length of a pen	cm	inches
The weight of your Maths Teacher	kg	pounds
The amount of petrol in a car	litres	gallons
The length of an ant	mm	inches



- 2) Change the following measurements:

- a) 4 cm to mm **40mm** d) 10 cm to mm **100 mm** g) 1 km to m **1 000 m**
b) 7 m to cm **700 cm** e) 25 m to mm **25 000 mm** h) 1 km to cm **100 000 cm**
c) 5 m to mm **5 000 mm** f) 34 m to cm **3 400 cm** i) 23 km to m **23 000 m**



- 3) Change the following measurements:

- a) 300 cm to m **3 m** d) 6 cm to m **0.06 m** g) 4386 cm to m **43.86 m**
b) 4 mm to cm **0.4 cm** e) 412 cm to m **4.12 m** h) 549 mm to cm **54.9 cm**
c) 7425 mm to m **7.425 m** f) 1500 m to km **1.5 km** i) 0.3 km to m **300 m**



- 4) Change the following measurements:

- a) 5 m² to cm² **50 000 cm²** d) 8.2 m² to cm² **82 000 cm²** g) 5.1 m³ to cm³ **5 100 000 cm³**
b) 8 cm² to mm² **800 mm²** e) 7320 mm² to cm² **73.2 cm²** h) 53478 mm³ to cm³ **53.478 cm³**
c) 250 cm² to m² **0.025 m²** f) 8 m³ to cm³ **8 000 000 cm³** i) 183000 cm³ to m³ **0.183 m³**

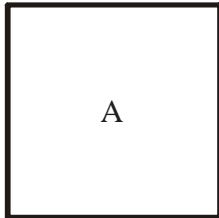
Triangles, Quadrilaterals and Other Polygons



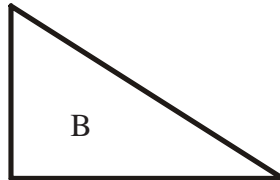
For each of the shapes A to N, below:

- Name the shape.
 - Mark on the shape, or write in words, the features that make it special.
- eg) Shape A is a **square** because it has four equal sides and four right angles.

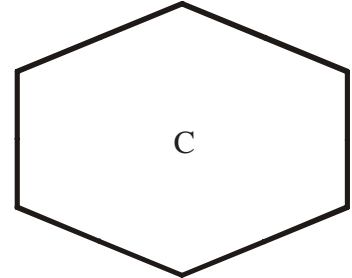
Square
4 equal sides
4 right angles



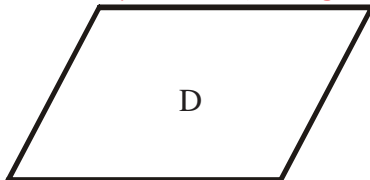
Right-angled triangle
1 right angle



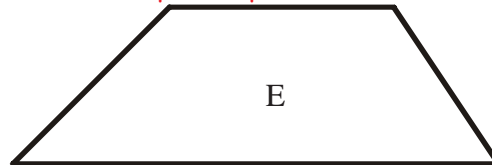
Hexagon
6 sides



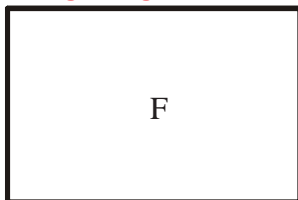
Parallelogram
2 pair of parallel sides
2 pairs of equal angles



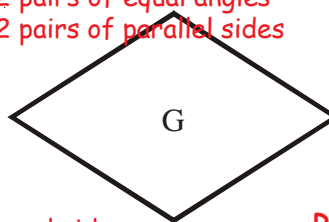
Trapezium
1 pair of parallel sides



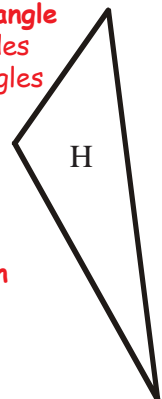
Rectangle
2 pairs of equal sides
4 right angles



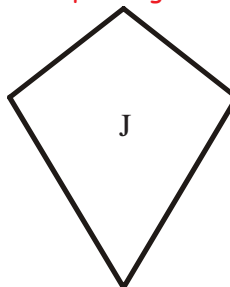
Rhombus
4 equal sides
2 pairs of equal angles
2 pairs of parallel sides



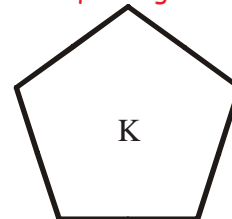
Scalene triangle
No equal sides
No equal angles



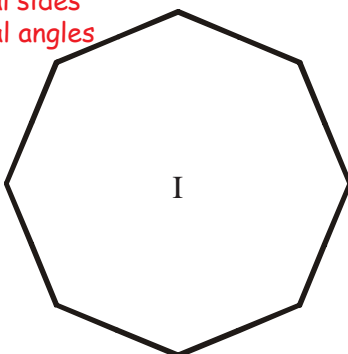
Kite
2 pairs of equal sides
1 pair of equal angles



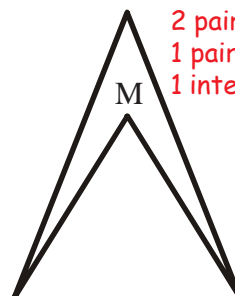
Regular pentagon
5 equal sides
5 equal angles



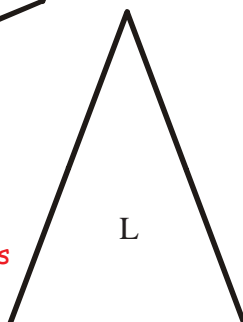
Regular Octagon
8 equal sides
8 equal angles



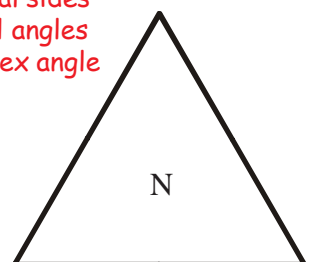
Arrowhead
2 pairs of equal sides
1 pair of equal angles
1 internal reflex angle



Isosceles triangle
1 pair of equal sides
1 pair of equal angles



Equilateral triangle
All sides equal
All angles 60°



Names of Solids



1) Draw a sketch of each of the following solids:

a) A cube.

b) A cylinder.



Cube

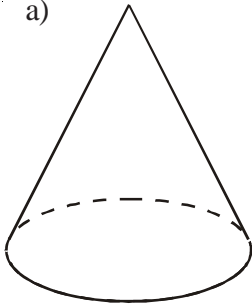


Cylinder



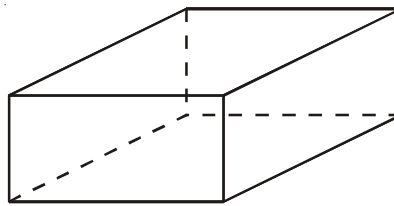
2) Write down the mathematical name of each of these 3-D shapes.

a)



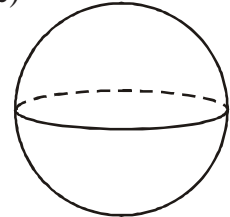
Cone

b)



Cuboid

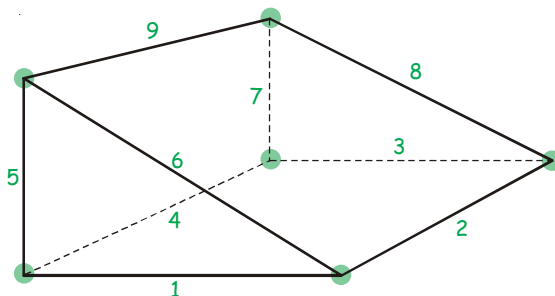
c)



Sphere



3) Look at this solid.



a) What is its name? **Triangular prism**

b) How many vertices does it have? **6**

c) How many edges are there? **9**

d) How many faces does it have? **5**

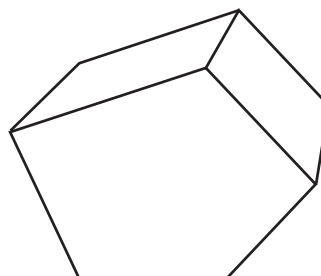


4) This is a picture of a pentagonal prism.

a) How many faces does it have? **7**

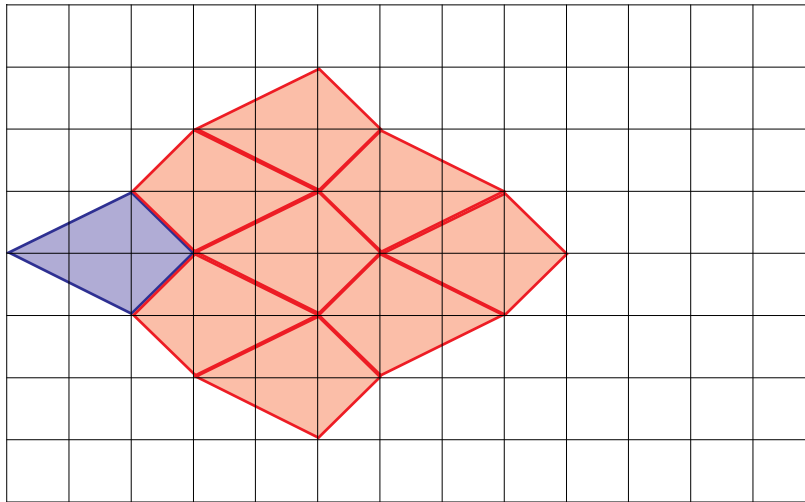
b) How many edges does it have? **15**

c) How many vertices does it have? **10**

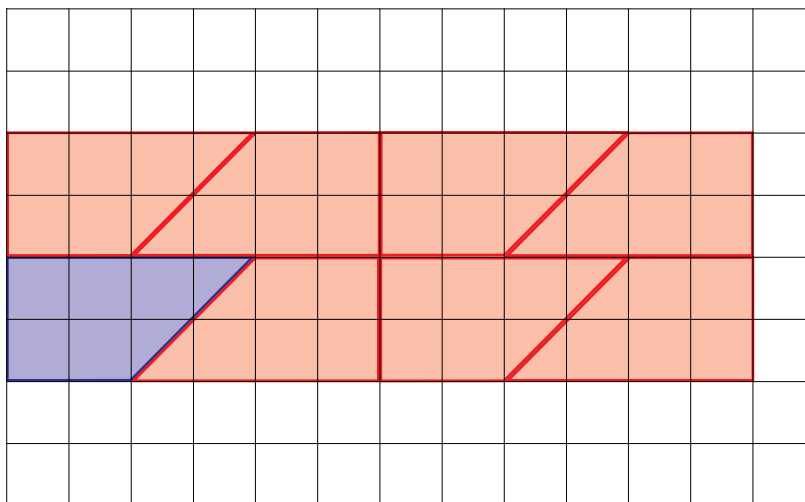




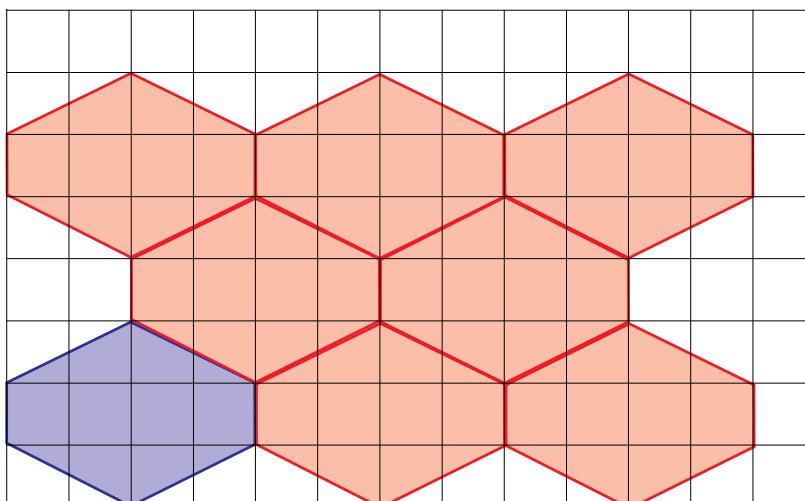
- 1) On the grid below, show how the shaded shape will tessellate.
You should draw at least six shapes.



- 2) On the grid below, show how the shaded shape will tessellate.
You should draw at least six shapes.

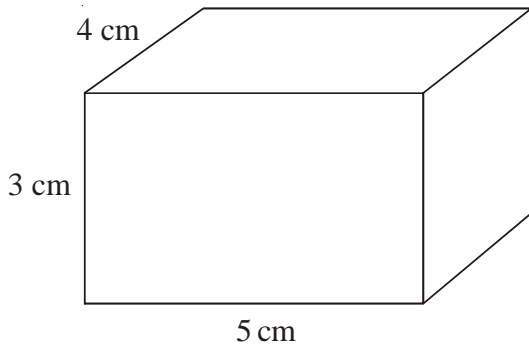


- 3) On the grid below, show how the shaded shape will tessellate.
You should draw at least six shapes.



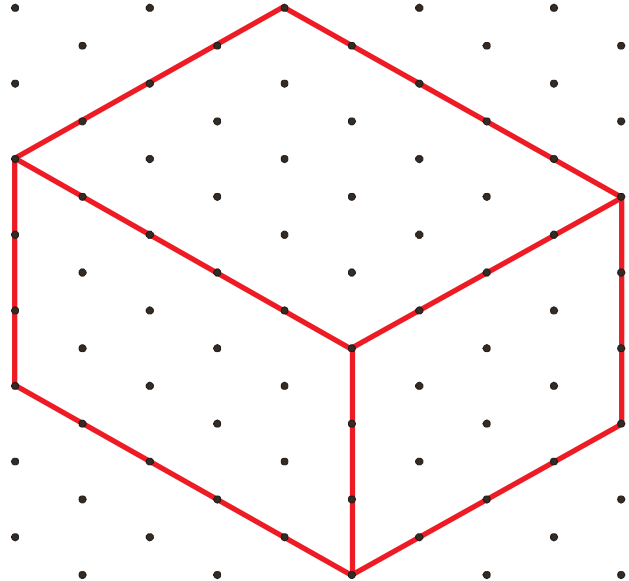


- 1) Copy the shape below onto the isometric grid.

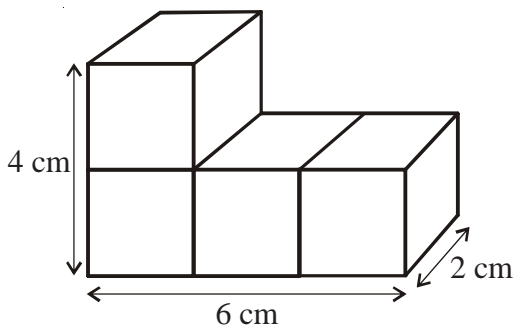


Isometric Drawing

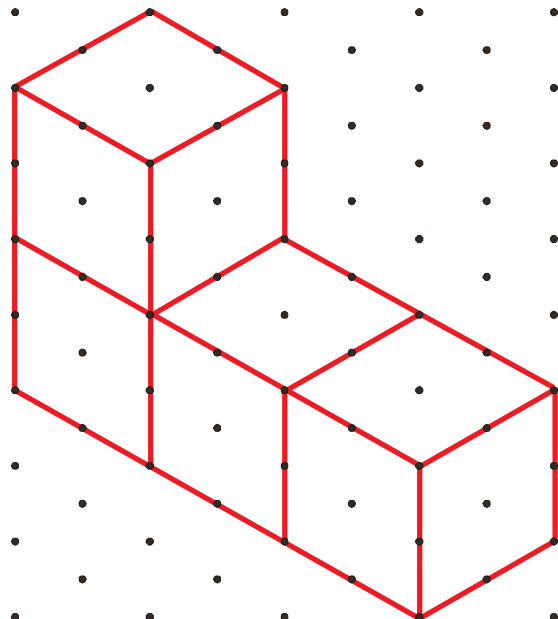
Other correct diagrams are possible.



- 2) The shape below is made out of 2 cm by 2 cm by 2 cm cubes. Copy the shape onto the isometric grid.



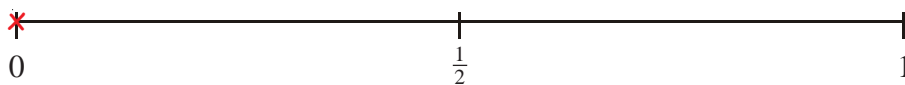
Other correct diagrams are possible.



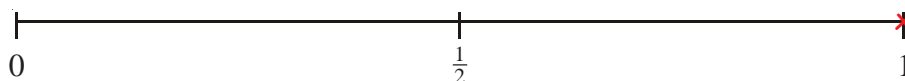
The Probability Scale



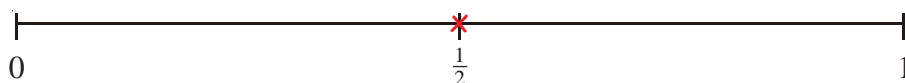
- 1) a) On the probability scale below, mark with a cross (×) the probability that it will snow in Birmingham in July.



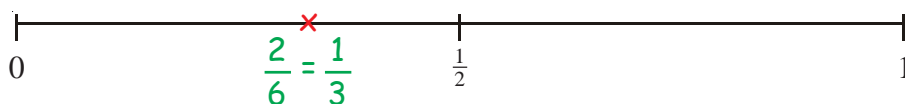
- b) On the probability scale below, mark with a cross (×) the probability that it will rain in Wales next year.



- c) On the probability scale below, mark with a cross (×) the probability that you will get a tail when you flip a fair coin.



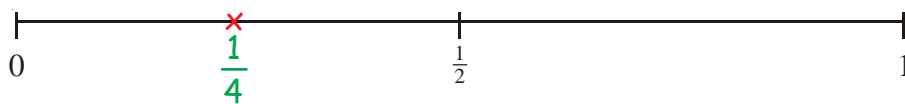
- d) On the probability scale below, mark with a cross (×) the probability that you will get a number bigger than 4 when you roll an ordinary dice.



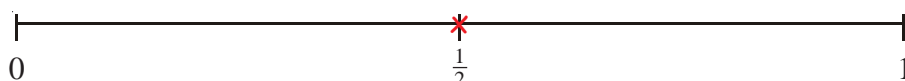
- 2) 4 jelly babies are in a bag.
2 are red, 1 is green and 1 is black.

Without looking in the bag, a jelly baby is taken out.

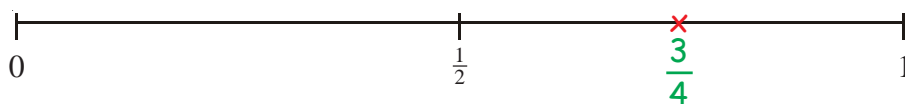
- a) On the probability scale below, mark with a cross (×) the probability that the jelly baby taken from the bag is green.



- b) On the probability scale below, mark with a cross (×) the probability that the jelly baby taken from the bag is green or black.



- c) On the probability scale below, mark with a cross (×) the probability that the jelly baby taken from the bag is red or black.



The Averages



- 1) Kaya made a list of his homework marks.

3 2 3 4 1 4 5 4

- a) Write down the mode of Kaya's marks. **4**

- b) Work out his mean homework mark. **3.25**

$$3 + 2 + 3 + 4 + 1 + 4 + 5 + 4 = 26 \quad 26 \div 8 = 3.25$$



- 2) Lydia rolled an 8-sided dice ten times.
Here are her scores.

5 1 2 5 3 8 6 6 3 2

- a) Work out Lydia's median score. **4**

~~1, 2, 2, 3, 3, 5, 5, 6, 6, 8~~ **3**

- b) Work out the mean of her scores. **4.1**

$$5 + 1 + 2 + 5 + 3 + 8 + 6 + 6 + 3 + 2 = 41 \quad 41 \div 10 = 4.1$$



- 3) In a two-week period, a train was this many minutes late each day:

3 0 0 0 7 4 5 2 0 1 14 0 5 1

- a) What was the mean average number of minutes late? **3 minutes late**

$$42 \div 14 = 3$$

- b) What was the median average number of minutes late? **2.5 minutes late**



- 4) Two small Year 10 classes, Set A and Set B, sat the same Science test.

Set A had these scores for the test:

63%, 71%, 48%, 95%, 46%, 82%, 77%, 36%, 73% **65.7%**

Set B had these scores:

58%, 63%, 85%, 61%, 59%, 38%, 90%, 84%, 75%, 48% **66.1%**

How much bigger was Set B's mean average score than Set A's mean average score?

Give your answer correct to 1 decimal place. **66.1% - 65.7% = 0.4%**



- 5) A rugby team played six games.

The mean score for the six games is 15

The rugby team played one more game.

The mean score for all seven games is 16

Work out the number of points the team scored in the seventh game. **22**


















$$6 \times 15 = 90$$

$$7 \times 16 = 112$$

Pictograms



- 1) The pictogram shows the number of watches sold by a shop in January, February and March.

January	   
February	 
March	 
April	    
May	   

Key  represents 4 watches.















- a) How many watches were sold in January? **16 watches**
- b) How many **more** watches were sold in March than in February? **3 watches more**

19 watches were sold in April.
14 watches were sold in May.

- c) Use this information to complete the pictogram.



- 2) The pictogram shows the number of DVDs borrowed from a shop on Monday and Tuesday.

Monday	   
Tuesday	  
Wednesday	    
Thursday	 

Key  represents 10 DVDs.

- a) How many DVDs were borrowed on
- (i) Monday? **40 DVDs**
- (ii) Tuesday? **25 DVDs**

On Wednesday, 50 DVDs were borrowed.
On Thursday, 15 DVDs were borrowed.

- b) Show this information in the pictogram.

Conversion Graphs



1) Use the graph to convert:

a) 11 gallons to litres

50 litres

b) 40 litres to gallons

8.8 gallons

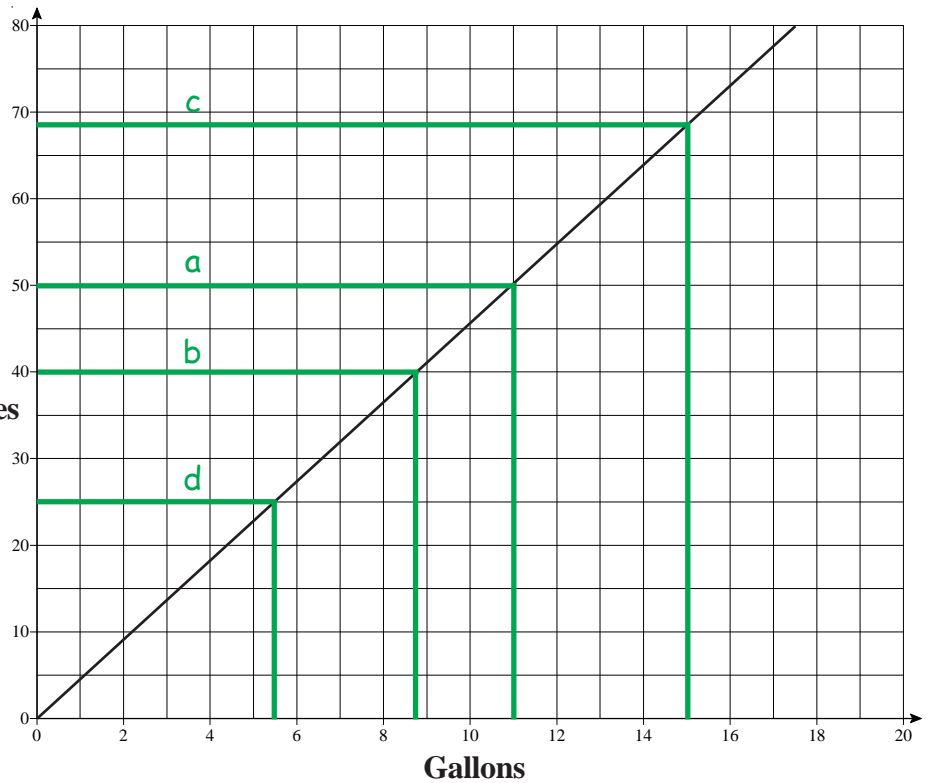
c) 15 gallons to litres

68 litres

d) 25 litres to gallons

5.5 gallons

Litres



2) The conversion graph below converts between kilometres and miles.

a) Bob travels 50 miles.

What is this distance in kilometres?

80 km

b) Terry travels 100 kilometres.

What is this distance in miles?

62 miles

c) The distance between the surgery and the hospital is 25 kilometres.

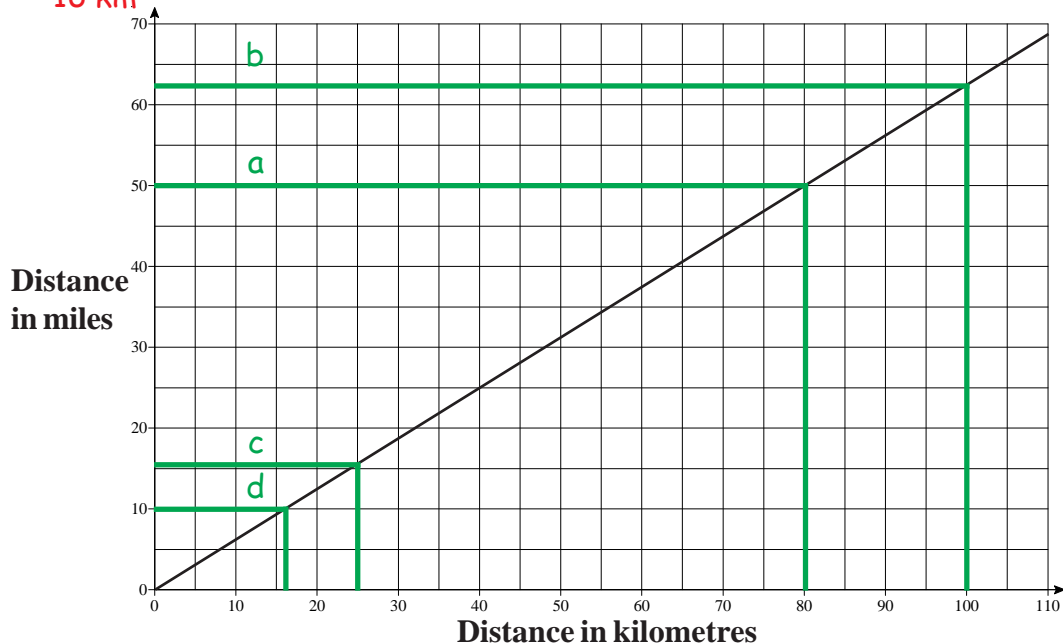
What is this distance in miles?

16 miles

d) Bill completes a 10 mile run.

How far is this in kilometres?

16 km





1) Write the factors of

a) 6

1, 2, 3, 6

b) 16

1, 2, 4, 8, 16

c) 18

1, 2, 3, 6, 9, 18

d) 30

1, 2, 3, 5, 6, 10, 15, 30



2) In a pupil's book the factors of 12 are listed as

1 2 3 4 ~~8~~ 12
6

The above list contains a mistake.

Cross it out from the list and replace it with the correct number.



3) The factors of 30 and 40 are listed

30: 1, 2, 3, 5, 6, 10, 15, 30

40: 1, 2, 4, 5, 8, 10, 20, 40

Write the common factors of 30 and 40 (the numbers that are factors of 30 and 40).

1, 2, 5, 10



4) Write the first four multiples of

a) 3

3, 6, 9, 12

b) 5

5, 10, 15, 20

c) 10

10, 20, 30, 40

d) 15

15, 30, 45, 60



5) In a pupil's book the first 7 multiples of 8 are listed as

8 16 ~~22~~ 32 40 48 ~~54~~
24 56

The above list contains 2 mistakes.

Cross them out and replace them with the correct numbers.



6) The first five multiples of 4 and 10 are listed

4: 4, 8, 12, 16, 20

10: 10, 20, 30, 40, 50

From the two lists above, write the common multiple of 4 and 10.

20



7) List the first five prime numbers

2, 3, 5, 7, 11



8) Using just this list of numbers:

11 18 1 4 21 24 9 3 12 2 19

find the following:

a) The prime numbers **2, 3, 11, 19**

b) The factors of 18 **1, 2, 3, 9, 18**

c) The multiples of 3 **3, 9, 12, 18, 21, 24**



1) Evaluate the following:

a) 2^3 **8**

b) 3^2 **9**

c) 10^4 **10000**



2) Evaluate the following:

a) 2^8 **256**

b) 6^4 **1296**

c) 5^6 **15625**



3) Find the value of

a) $2^4 + 3^2$ **25**

b) $5^2 - 2^3$ **17**

c) $1^2 + 2^2 + 3^2$ **14**



4) Find the value of

a) $5^4 + 6^3$ **841**

b) $3^4 \times 2^5$ **2592**

c) $9^3 - 6^3$ **513**



5) Find the value of

$2^2 + 3^2 + 5^2 + 7^2 + 11^2 + 13^2 + 17^2$ **666**



1) What is the value of 5^2 ? **25**



2) What is the value of 8^2 ? **64**



3) These are the first five square numbers: 1, 4, 9, 16, 25

a) What is the sixth square number? **36**

b) What is the 10th square number? **100**



4) Which square number lies between 60 and 70? **64**



5) What is the value of 2^3 ? **8**



6) What is the value of 4^3 ? **64**



7) Work out $1^3 + 2^3 + 3^3$ **36**



8) Work out $\sqrt{25}$ **5**



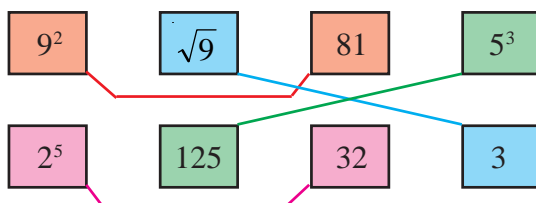
9) Work out $\sqrt{49}$ **7**



10) Work out the value of $\sqrt{121} \times \sqrt{121}$ **121**



11) Match together cards with the same answer

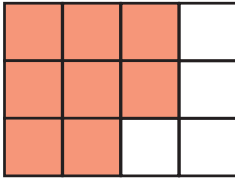


Equivalent Fractions

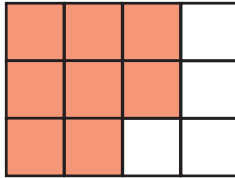


- 1) Each of the grids below has a fraction written at the side of it.
a) Shade the grids to show these fractions.

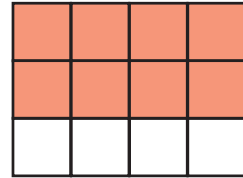
$$\frac{8}{12}$$



$$\frac{4}{6}$$



$$\frac{2}{3}$$

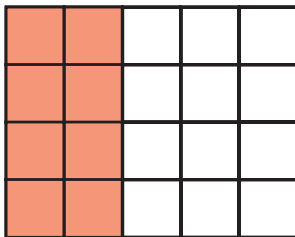


- b) What do you notice about how many little squares are shaded in each grid?
8 squares in each

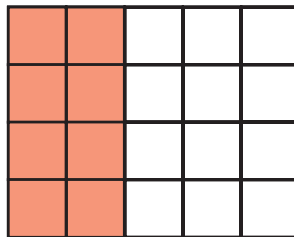


- 2) Each of the grids below has a fraction written at the side of it.
a) Shade the grids to show these fractions.

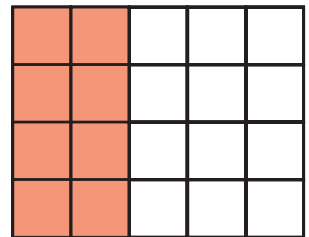
$$\frac{2}{5}$$



$$\frac{4}{10}$$



$$\frac{8}{20}$$



- b) What do you notice about how many little squares are shaded in each grid?
8 squares in each



- 3) Find the missing values in these equivalent fractions.

$$\frac{1}{2} = \frac{2}{\boxed{4}} = \frac{3}{\boxed{6}} = \frac{4}{\boxed{8}}$$



- 4) Find the missing values in these equivalent fractions.

$$\frac{2}{5} = \frac{6}{\boxed{15}} = \frac{\boxed{12}}{30} = \frac{14}{\boxed{35}}$$



- 5) How do you know that $\frac{3}{7}$ is not equivalent to $\frac{25}{56}$?

You have to multiply 7 by 8 to get 56 but when you multiply 3 by 8 you get 24 not 25



1) Write the following fractions in their simplest forms

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

b) $\frac{5}{10}$ $\frac{1}{2}$

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

d) $\frac{6}{9}$ $\frac{2}{3}$

e) $\frac{12}{15}$ $\frac{4}{5}$

f) $\frac{8}{12}$ $\frac{2}{3}$

g) $\frac{15}{20}$ $\frac{3}{4}$



2) Write the following fractions in their simplest forms

a) $\frac{9}{30}$ $\frac{3}{10}$

b) $\frac{14}{18}$ $\frac{7}{9}$

c) $\frac{7}{49}$ $\frac{1}{7}$

d) $\frac{48}{72}$ $\frac{2}{3}$

e) $\frac{60}{75}$ $\frac{4}{5}$

f) $\frac{15}{27}$ $\frac{5}{9}$

g) $\frac{72}{96}$ $\frac{3}{4}$

Ordering Fractions



- 1) Put these fractions in order of size, smallest to largest.
Show your working for each question.

a) $\frac{1}{2}$ $\frac{3}{6}$ $\frac{1}{3}$ $\frac{2}{6}$ $\frac{1}{3}$ $\frac{1}{2}$

b) $\frac{3}{5}$ $\frac{9}{15}$ $\frac{2}{3}$ $\frac{10}{15}$ $\frac{3}{5}$ $\frac{2}{3}$

c) $\frac{1}{2}$ $\frac{4}{8}$ $\frac{3}{8}$ $\frac{3}{8}$ $\frac{3}{8}$ $\frac{4}{8}$



- 2) Put these fractions in order of size, smallest to largest.
Show your working for each question.

a) $\frac{1}{2}$ $\frac{4}{8}$ $\frac{1}{4}$ $\frac{2}{8}$ $\frac{3}{8}$ $\frac{3}{8}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{1}{2}$

b) $\frac{3}{5}$ $\frac{12}{20}$ $\frac{1}{2}$ $\frac{10}{20}$ $\frac{3}{4}$ $\frac{15}{20}$ $\frac{1}{2}$ $\frac{3}{5}$ $\frac{3}{4}$

c) $\frac{5}{6}$ $\frac{10}{12}$ $\frac{2}{3}$ $\frac{8}{12}$ $\frac{3}{4}$ $\frac{9}{12}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{6}$



- 3) Put these fractions in order of size, smallest to largest.
Show your working for each question.

a) $\frac{2}{3}$ $\frac{8}{12}$ $\frac{7}{12}$ $\frac{7}{12}$ $\frac{3}{4}$ $\frac{9}{12}$ $\frac{5}{6}$ $\frac{10}{12}$ $\frac{7}{12}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{6}$

b) $\frac{5}{8}$ $\frac{15}{24}$ $\frac{2}{3}$ $\frac{16}{24}$ $\frac{3}{24}$ $\frac{3}{24}$ $\frac{7}{12}$ $\frac{14}{24}$ $\frac{3}{24}$ $\frac{7}{12}$ $\frac{5}{8}$ $\frac{2}{3}$

c) $\frac{6}{10}$ $\frac{36}{60}$ $\frac{4}{5}$ $\frac{48}{60}$ $\frac{5}{12}$ $\frac{25}{60}$ $\frac{8}{15}$ $\frac{32}{60}$ $\frac{5}{12}$ $\frac{8}{15}$ $\frac{6}{10}$ $\frac{4}{5}$



- 4) Ben spent his pocket money this way:

$\frac{7}{20}$ on magazines $\frac{7}{20}$

$\frac{4}{10}$ on chocolates $\frac{8}{20}$

$\frac{1}{4}$ on games $\frac{5}{20}$

Order the items Ben bought by value, largest first. **Chocolates, magazines, games**
Show all your working.



- 1) Which of the following offer better value for money?

Working must be shown

- a) 200ml of toothpaste for 50p or 400ml of toothpaste for 90p

$\times 2$
400ml of toothpaste for £1.00

- b) 600g of bananas for 70p or 200g of bananas for 22p

$\times 3$
600g of bananas for 66p

- c) 2 litres of paint for £1.60 or 5 litres of paint for £3.50

$\div 2$ $\div 5$
1 litre of paint for 80p or 1 litre of paint for 70p

- d) 60 teabags for £1.62 or 40 teabags for £0.96

$\times 2$ $\times 3$
120 teabags for £3.24 or 120 teabags for £2.88



- 2) Which of these is the best buy?

20 exercise books
for £4.00

$400 \div 20 = 20$
20p per book

35 exercise books
for £7.80

$780 \div 35 = 22.3$
22p per book



- 3) Hamza needs to buy 2 litres of paint.

At the shop he gets two choices:

500ml for £2.55 or 1 litre for £4.79.

$\times 2$
1 litre of paint for £5.10

- a) Work out which of these would be the best buy for Hamza.

1 litre of paint for £4.79

- b) How much does he save if he buys the 'best buy' rather than the 'worst buy'?

£0.62 or 62p

You must show all your working.

$$\begin{array}{r} \pounds 10.20 \\ - \pounds 9.58 \\ \hline \pounds 0.62 \end{array}$$



- 4) Honey pots are sold in two sizes.

A small pot costs 45p and weighs 450g.

$$45 \div 450 = 0.1\text{p per g}$$

A large pot costs 80p and weighs 850g.

$$80 \div 850 = 0.09\text{p per g}$$

Which pot of honey is better value for money?

Large pot at 80p for 850g

You must show all your working.

Find a Percentage with a Calculator



1) Work out:

- a) 21% of £340 **£71.40**
- b) 64% of £1080 **£691.20**
- c) 36% of £800 **£288**
- d) 98% of £13 **£12.74**



2) Work out:

- a) 17.5% of £58 **£10.15**
- b) 20% of £5.40 **£1.08**
- c) 61.7% of £2000 **£1234**
- d) 17.5% of £68.40 **£11.97**



3) A computer costs £406 plus VAT at 20%.

Work out the total cost of the computer. **£487.20**



4) A car is usually priced at £9800 but now has a discount of 8%.

What is the new price of the car? **£9016**



5) 9500 people attend a festival and 22% of them are children.

How many children are at the festival? **2090**



6) 65% of a car, by weight, is steel and iron.

If a car weighs 1100 kg, what is the weight of steel and iron in the car? **715 kg**



7) Tony earns £17800 per year and receives a 3.8% pay rise.

How much does he now earn? **£18476.40**

Find a Percentage without a Calculator



1) Work out:

- a) 10% of £170 **£17**
- b) 10% of £6800 **£680**
- c) 10% of £923 **£92.30**
- d) 10% of £16 **£1.60**



2) Work out:

- a) 20% of £60 **£12**
- b) 30% of £90 **£27**
- c) 15% of £800 **£120**
- d) 15% of £68 **£10.20**



3) Work out:

- a) 35% of £80 **£28**
- b) 90% of £160 **£144**
- c) 17.5% of £600 **£105**
- d) 17.5% of £850 **£148.75**



4) Work out:

- a) 15% of £4.60 **£0.69**
- b) 40% of £2.80 **£1.12**
- c) 17.5% of £3.20 **£0.56**
- d) 97.5% of £24 **£23.40**



5) The normal price of a jacket is £54.
In a sale, the price is reduced by 30%
What is the sale price? **£37.80**



6) A football costs £14 plus 20% VAT.
How much is the football? **£16.80**

Change to a Percentage with a Calculator



1) Write the following as percentages, giving all your answers to 1 decimal place.

- a) 12 out of 34 **35.3%**
- b) 62 out of 85 **72.9%**
- c) 113 out of 153 **73.9%**
- d) 2150 out of 3452 **62.3%**



2) Sarah sat a Science test and got a score of 64 marks out of 112 possible marks.

What was her mark as a percentage? **57.1%**
Give your answer to 1 decimal place.



3) In a class of 32 students, 18 of them are boys.

What percentage of the class are boys? **56.3%**
Give your answer to 1 decimal place.



4) In a French class there are 13 girls and 6 boys.

What percentage of the class are girls? **68.4%**
Give your answer to 1 decimal place.



5) A new car usually costs £8500.

Henry gets a discount of £1000.

What is the discount as a percentage of the usual cost? **11.8%**
Give your answer to 1 decimal place.



6) Write out £148 as a percentage of £600. **24.7%**

Give your answer to 1 decimal place.



7) In a wood there are 200 oak trees, 650 silver birch trees and 400 wild cherry trees.

What percentage of the trees are oak trees? **16%**



8) In England in 2010 there were 68820 deaths caused by cancer.

Of these deaths, 37500 were caused by smoking.

What percentage of deaths due to cancer were caused by smoking? **54.5%**
Give your answer to 1 decimal place.



1) Write the following as percentages.

- a) 12 out of 50 **24%**
- b) 15 out of 25 **60%**
- c) 8 out of 10 **80%**
- d) 11 out of 20 **55%**
- e) 4 out of 5 **80%**
- f) 32 out of 40 **80%**
- g) 12 out of 80 **15%**
- h) 640 out of 800 **80%**
- i) 36 out of 60 **60%**



2) Tim got 17 out of 20 in a French test.

Write 17 out of 20 as a percentage. **85%**



3) Write £19 as a percentage of £25 **76%**



4) Work out £14 as a percentage of £40 **35%**



5) A baker burnt 12 loaves out of the 200 loaves he baked.

What percentage of the 200 loaves did he burn? **6%**



6) What is £380 as a percentage of £400? **95%**



7) What is £22 as a percentage of £40? **55%**



8) If there are 9 girls and 11 boys in a class, what percentage of the class are girls? **45%**

Finding a Fraction of an Amount



1) Work out these amounts.

a) $\frac{3}{4}$ of £20 **£15**

b) $\frac{2}{3}$ of 60 kg **40 kg**

c) $\frac{3}{8} \times 24$ **9**

d) $150 \times \frac{2}{3}$ **100**

e) $\frac{2}{9}$ of 180 cm **40 cm**

f) $49 \times \frac{4}{7}$ **28**

g) $60 \times \frac{1}{4}$ **15**

h) $\frac{5}{8}$ of £48 **£30**

i) $4000 \times \frac{7}{8}$ **3 500**



2) There are 600 apples on a tree and there are maggots in $\frac{3}{5}$ of them.

How many apples have maggots in them? **360 apples**



3) Liz and Lee are travelling in a car from Glasgow to Poole (770 km).

At midday they had already travelled $\frac{5}{7}$ of the total distance.

What distance, in km, had they travelled by midday? **550 km**



4) A digital camera that cost £49 was sold on eBay for $\frac{3}{7}$ of the original price.

What was the selling price? **£21**



5) Yesterday Thomas travelled a total of 175 miles.

He travelled $\frac{2}{5}$ of this distance in the morning.

How many miles did he travel during the rest of the day? **105 miles**

$\frac{2}{5}$ of 175 miles is 70 miles
 $175 - 70 = 105$



6) Debra received her £15 pocket money on Saturday.

She spent $\frac{1}{3}$ of her pocket money on magazines.

She spent $\frac{2}{5}$ of her pocket money on a necklace.

How much of the £15 did she have left? **£4**

$\frac{1}{3}$ of £15 is £5
 $\frac{2}{5}$ of £15 is £6
 $15 - 5 - 6 = 4$

Addition and Subtraction of Fractions

In all the questions on this page, please
give your answers in their simplest form.



1) Work out the following:

a) $\frac{1}{7} + \frac{3}{7} = \frac{4}{7}$

b) $\frac{4}{9} + \frac{1}{9} = \frac{5}{9}$



2) Work out the following:

a) $\frac{1}{5} + \frac{3}{4} = \frac{19}{20}$

b) $\frac{3}{8} + \frac{1}{4} = \frac{5}{8}$

c) $\frac{2}{3} + \frac{3}{10} = \frac{29}{30}$

d) $\frac{1}{2} + \frac{2}{5} = \frac{9}{10}$



3) Work out the following:

a) $\frac{2}{3} + \frac{1}{2} = 1\frac{1}{6}$

b) $\frac{3}{5} + \frac{2}{3} = 1\frac{4}{15}$

c) $\frac{5}{8} + \frac{3}{4} = 1\frac{3}{8}$

d) $\frac{5}{7} + \frac{2}{5} = 1\frac{4}{35}$



4) Work out the following:

a) $2\frac{1}{2} + 1\frac{3}{4} = 4\frac{1}{4}$

b) $1\frac{2}{5} + \frac{2}{3} = 2\frac{1}{15}$

c) $2\frac{1}{6} + 1\frac{1}{2} = 3\frac{2}{3}$

d) $1\frac{3}{7} + \frac{2}{5} = 1\frac{29}{35}$



5) Work out the following:

a) $\frac{3}{4} - \frac{1}{2} = \frac{1}{4}$

b) $\frac{5}{7} - \frac{2}{3} = \frac{1}{21}$

c) $\frac{5}{8} - \frac{1}{3} = \frac{7}{24}$

d) $\frac{8}{9} - \frac{2}{3} = \frac{2}{9}$



6) Work out the following:

a) $2\frac{1}{2} - 1\frac{3}{4} = \frac{3}{4}$

b) $1\frac{2}{3} - \frac{3}{4} = \frac{11}{12}$

c) $3\frac{2}{5} - 1\frac{1}{2} = 1\frac{9}{10}$

d) $2\frac{3}{8} - \frac{3}{5} = 1\frac{31}{40}$



7) Ted received his pocket money on Friday.

He spent $\frac{3}{5}$ of his pocket money on games.

He spent $\frac{1}{10}$ of his pocket money on magazines.

What fraction of his pocket money did he have left? $\frac{3}{10}$



8) Maisie buys a bag of flour.

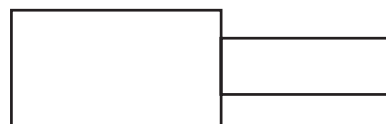
She uses $\frac{1}{4}$ to bake a cake and $\frac{2}{5}$ to make a loaf.

a) What fraction of the bag of flour was used? $\frac{13}{20}$

b) What fraction of the bag of flour is left? $\frac{7}{20}$



9) Work out the total length of this shape. Give your answer as a mixed number. $5\frac{11}{12}$



$\leftarrow 3\frac{1}{4} \text{ inches} \rightarrow$ $\nwarrow 2\frac{2}{3} \text{ inches} \nearrow$

Multiplication and Division of Fractions

In all the questions on this page, please give your answers in their simplest form.



1) Work out the following:

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

b) $\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$

c) $\frac{3}{5} \times \frac{2}{7} = \frac{6}{35}$

d) $\frac{4}{7} \times \frac{5}{9} = \frac{20}{63}$



2) Work out the following:

a) $\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$

b) $\frac{3}{4} \times \frac{8}{11} = \frac{6}{11}$

c) $\frac{2}{9} \times \frac{3}{4} = \frac{1}{6}$

d) $\frac{4}{5} \times \frac{1}{12} = \frac{1}{15}$



3) Work out the following:

a) $1\frac{1}{2} \times \frac{1}{3} = \frac{1}{2}$

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

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

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



4) Work out the following:

a) $\frac{2}{5} \div \frac{3}{4} = \frac{8}{15}$

b) $\frac{1}{7} \div \frac{3}{5} = \frac{5}{21}$

c) $\frac{4}{9} \div \frac{1}{2} = \frac{8}{9}$

d) $\frac{3}{10} \div \frac{5}{9} = \frac{27}{50}$



5) Work out the following:

a) $\frac{1}{2} \div \frac{1}{3} = 1\frac{1}{2}$

b) $\frac{3}{7} \div \frac{4}{7} = \frac{3}{4}$

c) $\frac{1}{9} \div \frac{2}{3} = \frac{1}{6}$

d) $\frac{2}{5} \div \frac{3}{10} = 1\frac{1}{3}$



6) Work out the following:

a) $1\frac{1}{3} \div \frac{1}{4} = 5\frac{1}{3}$

b) $\frac{3}{5} \div 2\frac{2}{3} = \frac{9}{40}$

c) $3\frac{2}{3} \div 1\frac{1}{5} = 3\frac{1}{18}$

d) $4\frac{1}{2} \div 1\frac{1}{2} = 3$

Change Fractions to Decimals

Write the following fractions as decimals



1)

$$\frac{3}{10}$$

0.3



2)

$$\frac{7}{10}$$

0.7



3)

$$\frac{9}{100}$$

0.09



4)

$$\frac{1}{2}$$

0.5



5)

$$\frac{3}{4}$$

0.75



6)

$$\frac{2}{5}$$

0.4



7)

$$\frac{7}{20}$$

0.35



8)

$$\frac{1}{3}$$

0.3



9)

$$\frac{1}{8}$$

0.125



10)

$$\frac{5}{8}$$

0.625

Work out the following.



for all questions.

- 1) $6 \times 5 + 2 = 32$ $30 + 2 = 32$
- 2) $2 + 6 \times 5 = 32$ $2 + 30 = 32$
- 3) $35 - 4 \times 3 = 23$ $35 - 12 = 23$
- 4) $48 \div (14 - 2) = 4$ $48 \div 12 = 4$
- 5) $27 \div (3 + 6) = 3$ $27 \div 9 = 3$
- 6) $27 \div 3 + 6 = 15$ $9 + 6 = 15$
- 7) $(9 + 2) \times 2 + 5 = 27$ $11 \times 2 + 5$, $22 + 5 = 27$
- 8) $4 \times (1 + 4) - 6 = 14$ $4 \times 5 - 6$, $20 - 6 = 14$
- 9) $6 \times 4 - 3 \times 5 = 9$ $24 - 15 = 9$
- 10) $\frac{9+3}{4+2} = 2$ $\frac{12}{6} = 2$
- 11) $\frac{23+9}{7-3} = 8$ $\frac{32}{4} = 8$
- 12) $\frac{7-2^2}{4^2-15} = 3$ $\frac{7-4}{16-15}$, $\frac{3}{1} = 3$
- 13) $\frac{5^2+3}{2 \times 7} = 2$ $\frac{25+3}{14}$, $\frac{28}{14} = 2$
- 14) $\frac{5 \times 6 - 4}{13} = 2$ $\frac{30-4}{13}$, $\frac{26}{13} = 2$
- 15) $\frac{8 \times 2 - 4}{3+1^2} = 3$ $\frac{16-4}{3+1}$, $\frac{12}{4} = 3$
- 16) $\frac{12-3 \times 2}{14 \div 7} = 3$ $\frac{12-6}{2}$, $\frac{6}{2} = 3$
- 17) $\frac{20-3^2}{10-(5+4)} = 11$ $\frac{20-9}{10-9}$, $\frac{11}{1} = 11$
- 18) $\frac{3+9 \times 8}{1+6 \times 4} = 3$ $\frac{3+72}{1+24}$, $\frac{75}{25} = 3$



1) Work out

- a) $£1.42 \times 3$ **£4.26**
- b) $£2.64 \times 7$ **£18.48**
- c) $£213 \times 16$ **£3408**
- d) $£32.40 \times 23$ **£745.20**



2) David buys 5 books for £8.75 each.
How much does he pay? **£43.75**



3) A DVD costs £12.25.
Work out the cost of 9 of these DVDs. **£110.25**



4) John takes 27 boxes out of his van.
The weight of each box is 41.7 kg.
Work out the total weight of the 27 boxes. **1 125.9 kg**



5) Nina bought 43 teddy bears at £9.35 each.
Work out the total amount she paid. **£402.05**



6) Elliott goes shopping.
He buys

0.5 kg of pears at £0.84 per kg.	£0.42
2.5 kg of grapes at £1.89 per kg.	£4.73
6 kg of potatoes at £0.25 per kg.	+ £1.50

How much does he pay? **£6.65**



7) Brian hires a car for 3 days.
Tariffs are:

£44.80 for the first day and	£44.80
£37.50 for each extra day.	£37.50
	+ £37.50

How much does he pay? **£119.80**



1) Write the following ratios in their simplest form:

- a) $6 : 9$ $2 : 3$
- b) $10 : 5$ $2 : 1$
- c) $7 : 21$ $1 : 3$
- d) $4 : 24$ $1 : 6$
- e) $12 : 40$ $3 : 10$
- f) $4 : 2 : 8$ $2 : 1 : 4$
- g) $18 : 63 : 9$ $2 : 7 : 1$



2) Write the missing value in these equivalent ratios:

- a) $3 : 5 = 12 : \boxed{20}$
- b) $4 : 9 = \boxed{12} : 27$
- c) $\boxed{8} : 7 = 16 : 14$



3) The ratio of girls to boys in a class is $4 : 5$.

What fraction of the class are girls? $\frac{4}{9}$



4) A model of a plane is made using a scale of $1 : 5$.

- a) If the real length of the plane is 20 m, what is the length of the model? 4 m
- b) If the wings of the model are 1.2 m long, what is the actual length of the wings on the plane? 6 m



- 1) Here are the ingredients needed to make 8 pancakes.
James makes 24 pancakes.

Pancakes
Ingredients to make 8 pancakes
250 ml milk
1 egg
140 g flour
5 g butter

- a) Work out how much milk he needs. **750 ml**

Kate makes 12 pancakes.

- b) Work out how much flour she needs. **210 g**



- 2) Here are the ingredients for making fish pie for 6 people.

Fish pie for 6 people
180 g flour
240 g fish
80 g butter
4 eggs
180 ml milk

Jill makes a fish pie for 3 people.

- a) Work out how much flour she needs. **90 g**

Tim makes a fish pie for 15 people.

- b) Work out how much milk he needs. **450 ml**



- 3) Here are the ingredients for making pineapple sorbet for 6 people.

Pineapple sorbet for 6 people
800 g of pineapple
4 egg whites
$\frac{1}{2}$ lemon
100 g caster sugar

Trevor makes pineapple sorbet for 18 people.

- a) Work out how much caster sugar he uses. **300 g**

Sid makes a pineapple sorbet.
He uses 2 lemons.

- b) Work out how many people he makes pineapple sorbet for. **24 people**



- 1) Use your calculator to work out

$$\frac{23.7 \times 14.2}{8.4 \times 3.2} \quad \frac{336.54}{26.88} \quad 12.52008929$$

Write down all the figures on your calculator display.



- 2) Use your calculator to work out

$$\frac{\sqrt{21.4}}{5.7 - 2.35} \quad \frac{4.626013402}{3.35} \quad 1.380899523$$

Write down all the figures on your calculator display.



- 3) Work out $\frac{5.8 + 4.65}{3.1^2 + 1.62} \quad \frac{10.45}{11.23} \quad 0.9305431879$

Write down all the figures on your calculator display.



- 4) Use your calculator to work out the value of

$$\frac{9.2 \times 16.3}{9.4 - 5.71} \quad \frac{149.96}{3.69} \quad 40.6395664$$

Write down all the digits from your calculator.
Give your answer as a decimal.



- 5) Use your calculator to work out

$$\frac{3}{2.1 + 3.45} \quad \frac{3}{5.55} \quad 0.5405405405$$

Write down all the figures on your calculator display.
You must give your answer as a decimal.



- 6) Use your calculator to work out

$$\frac{15^2 - 12^2}{\sqrt{9.6 - 3.87}} \quad \frac{15^2 - 12^2}{\sqrt{9.6 - 3.87}} \quad \frac{81}{2.393741841} \quad 33.83823544$$

Write down all the figures on your calculator display.
You must give your answer as a decimal.



- 7) Use a calculator to work out

$$\sqrt{\frac{22.4 \times 13.9}{3.6}} \quad \sqrt{\frac{311.36}{3.6}} \quad 9.299940263$$

Write down all the figures on your calculator display.

Money Exchange Questions



- 1) The cost of 4 kg of bananas is £5.80.
The total cost of 3 kg of bananas and 1.5 kg of pears is £5.61.
Work out the cost of 1 kg of pears. **£0.84**

$$\begin{aligned} 5.80 \div 4 &= 1.45 \\ 3 \times 1.45 &= 4.35 \\ 5.61 - 4.35 &= 1.26 \\ 1.26 \div 1.5 &= 0.84 \end{aligned}$$



- 2) In July 2007, Peter hired a car in Italy.
The cost of hiring the car was £620
The exchange rate was £1 = €1.25

- a) Work out the cost of hiring the car in euros (€). **€775**

Peter bought some perfume in Italy.
The cost of the perfume in Italy was €50
The cost of the same perfume in London was £42

The exchange rate was still £1 = €1.25

- b) Work out the difference between the cost of the perfume in Italy and the cost of the perfume in London.

Give your answer in pounds (£). **£2 more in London**

$$\begin{aligned} \text{Cost in Italy} &= £40 \\ \text{Cost in London} &= £42 \end{aligned}$$



- 3) Jill wants to work out how much tax she needs to pay.

Last year she earned £19000

She does not pay Income tax on the first £6475 she earned.

She pays tax of 20 pence for each pound she earned above £6475.

She pays the tax in two equal half-yearly instalments.

- a) How much Income tax does Jill pay in her first half-yearly instalment? **£1252.50**

Jill wants to know what percentage of her earnings she pays in tax.

- b) Calculate the Income tax Jill has to pay as a percentage of her earnings last year. **13.2%**
Give your answer correct to 1 decimal place.

Generate a Sequence from the N th Term



- 1) The n th term of a number sequence is $2n + 5$

Write down the first three terms of the sequence. **7, 9, 11**



- 2) The n th term of a number sequence is $3n - 1$

Write down the first four terms of the sequence. **2, 5, 8, 11**



- 3) The n th term of a number sequence is $3n + 2$

Write down the first four terms of the sequence. **5, 8, 11, 14**



- 4) The n th term of a number sequence is $5n - 7$

Write down the first four terms of the sequence. **-2, 3, 8, 13**



- 5) The n th term of a number sequence is n^2

Write down the first three terms of the sequence. **1, 4, 9**



- 6) The n th term of a number sequence is $n^2 + 3$

Write down the first three terms of the sequence. **4, 7, 12**



- 7) The n th term of a number sequence is $11 - n^2$

a) Find the third term of this sequence. **2**

b) Find the fifth term of this sequence. **-14**



- 8) The n th term of a number sequence is $n^2 + n$

a) Find the third term of this sequence. **12**

b) Find the fifth term of this sequence. **30**

Substitution



- 1) $y = 5x$
- a) Work out the value of y when $x = 3$ **15**
- b) Work out the value of y when $x = -2$ **-10**



- 2) $y = 2x + 7$
- a) Work out the value of y when $x = 4$ **15**
- b) Work out the value of y when $x = -3$ **1**



- 3) $y = 2x + 4t$
- $x = 6$
- $t = 1$
- Work out the value of y . **16**



- 4) $y = 2a - 3b$
- $a = 4$
- $b = -2$
- Work out the value of y . **14**



- 5) $v = 3a + 5b$
- $a = 6$
- $b = -3$
- Work out the value of v . **3**



- 6) $y = x^2$
- a) Work out the value of y when $x = 6$ **36**
- b) Work out the value of y when $x = -4$ **16**



- 7) $y = 2x^2$
- a) Work out the value of y when $x = 5$ **50**
- b) Work out the value of y when $x = -3$ **18**



- 8) $y = 3x^2 + 2x$
- a) Work out the value of y when $x = 2$ **16**
- b) Work out the value of y when $x = -4$ **40**



- 9) $v = u^2 + 5as$
- $u = 6$
- $a = 2.5$
- $s = 9$

Work out the value of v .
148.5



- 10) $y = p - 2qx^2$
- $p = -10$
- $q = 2$
- $x = -5$

Work out the value of y .
-110



- 11) $v^2 = u^2 + 2as$
- $u = 6$
- $a = 2.5$
- $s = 9$

Work out the value of v . **9**



- 12) $v^2 = u^2 + 2as$
- $u = 3$
- $a = 9.8$
- $s = 12$

Work out the value of v . **15.6**
Give your answer correct to 1 decimal place



- 13) $s = ut + 0.5at^2$
- $a = 9.8$
- $t = 5$
- $u = 7$

Work out the value of s .
157.5

Parallel Lines and Angles

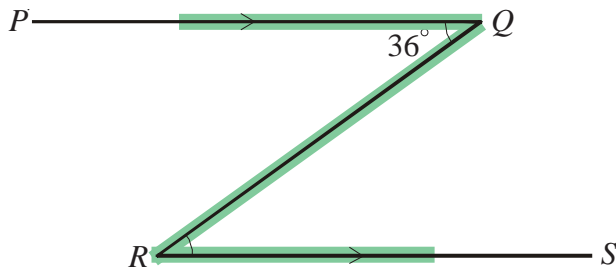


- 1) Line PQ is parallel to line RS .

If angle PQR is equal to 36°

a) What is the size of angle QRS ? 36°

b) Give a reason for your answer. *Alternate angles are equal*



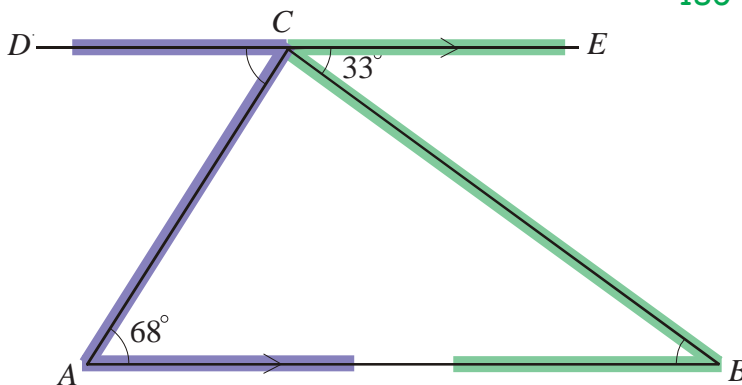
- 2) Line DCE is parallel to line AB

a) Find the size of angle ABC 33°

b) Find the size of angle DCA 68°

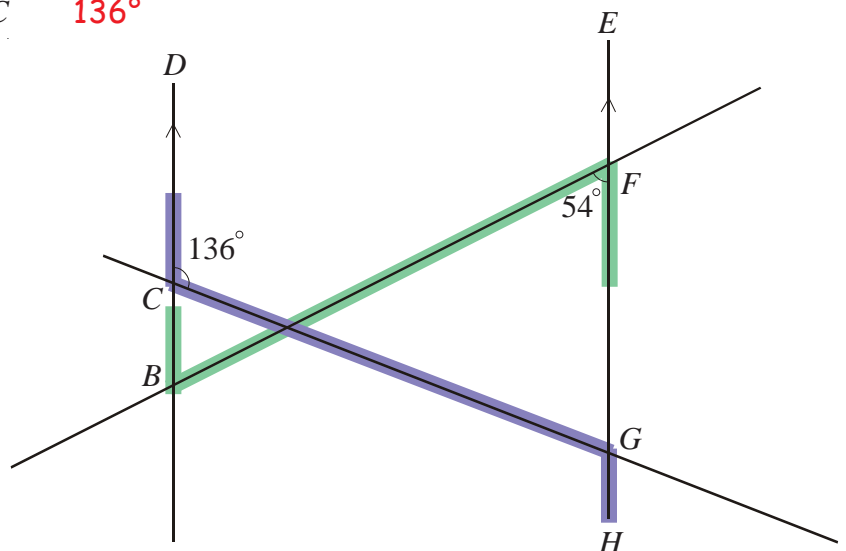
c) Calculate the size of angle ACB 79°

DCE is straight line
 $180^\circ - 68^\circ - 33^\circ = 79^\circ$



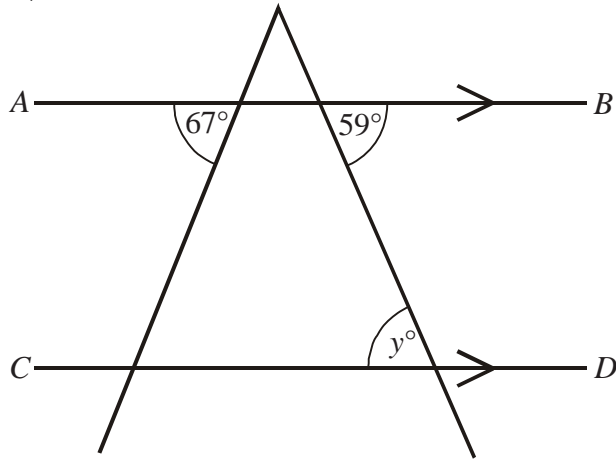
- 3) a) Find the size of angle DBF 54°

b) Find the size of angle HGC 136°





1)

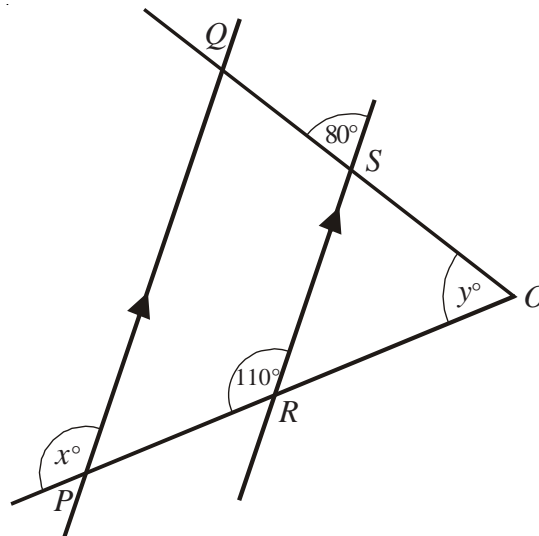


AB is parallel to CD .

- Write down the value of y . 59°
- Give a reason for your answer. *Alternate angles are equal*



2)



PQ is parallel to RS .

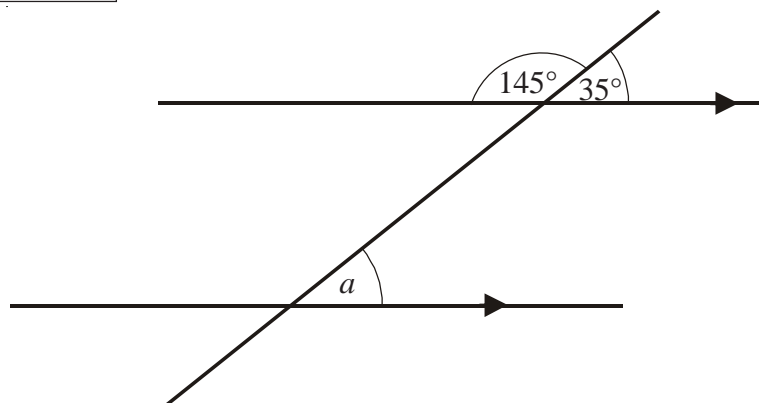
OSQ and ORP are straight lines.

- Write down the value of x . 110°
 - Give a reason for your answer. *Corresponding angles are equal*
- Work out the value of y . 30°

Parallel Lines and Angles



1)

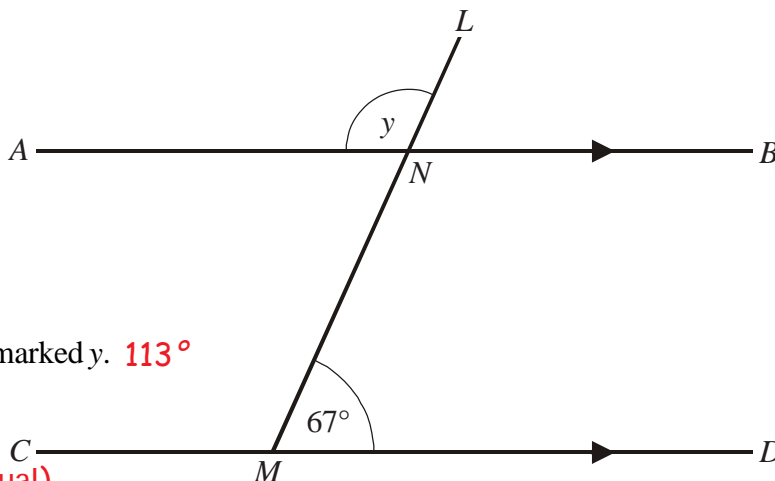


(i) Write down the size of the angle marked a . 35°

(ii) Give a reason for your answer. *Corresponding angles are equal*



2)



ANB is parallel to CMD .

LNM is a straight line.

Angle $LMD = 67^\circ$

(i) Work out the size of the angle marked y . 113°

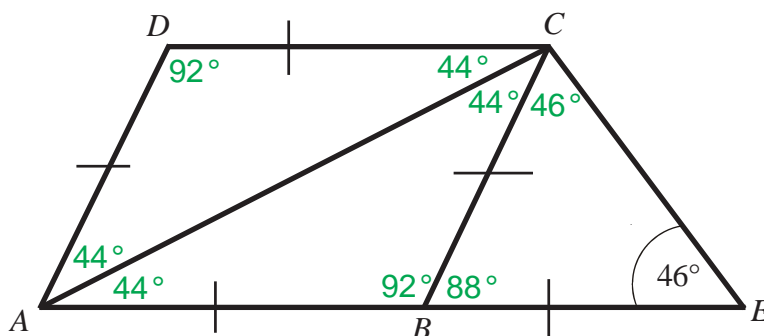
(ii) Give reasons for your answer.

*Angle $LNB = 67^\circ$
(corresponding angles are equal)*

$y = 113^\circ$ (angles on a straight line add up to 180°)



3)



$ABCD$ is a rhombus.

BCE is an isosceles triangle.

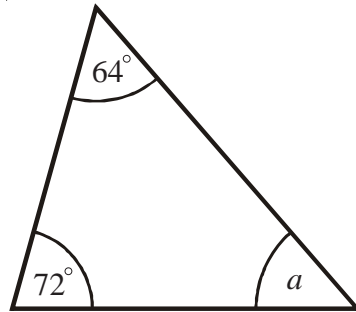
ABE is a straight line.

Work out the size of angle DCA . 44°

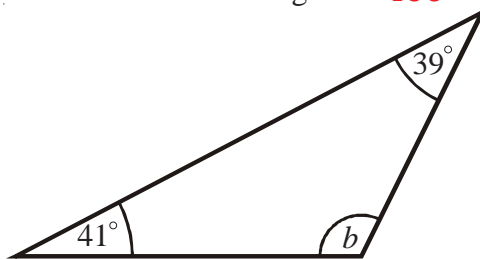
Angle Sum of a Triangle



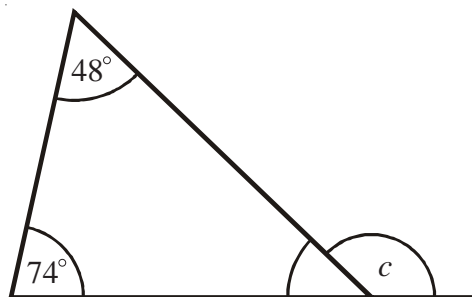
- 1) Work out the size of angle a . 44°



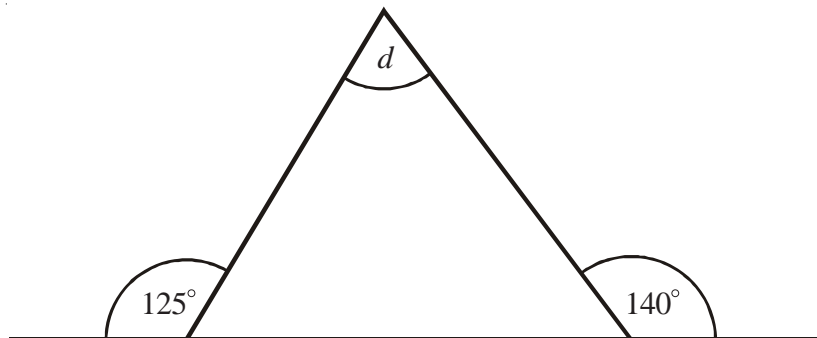
- 2) Work out the size of angle b . 100°



- 3) Work out the size of angle c . 122°



- 4) Work out the size of angle d . 85°



Properties of Special Triangles



- 1) ABC is a triangle.
- a) Find the size of angle A . $180 - 60 - 60$
Angle A is 60°
- b) Triangle ABC is equilateral.
 Explain why.
Triangle ABC is equilateral because all three angles are 60° .

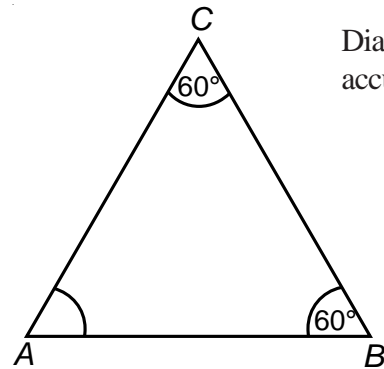


Diagram **NOT** accurately drawn



- 2) BCD is a triangle.
 ABC is a straight line.
 Angle $CBD = 70^\circ$.
 $BD = CD$.
- a) (i) Work out the value of x .
 $x = 110^\circ$ $180 - 70$
- (ii) Give a reason for your answer.
Angles on a straight line add up to 180° .
- b) (i) Work out the value of y .
 $y = 40^\circ$ $180 - 70 - 70$
- (ii) Give reasons for your answer.
**Base angles of an isosceles triangle are equal.
 180° in a triangle.**

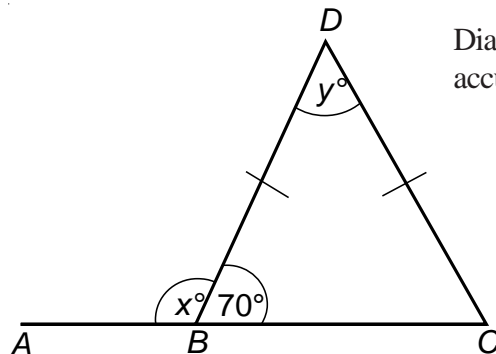
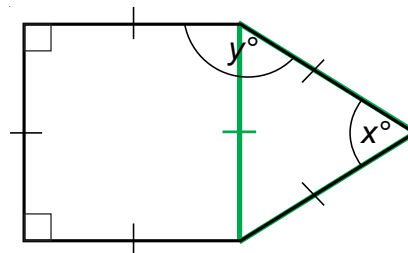


Diagram **NOT** accurately drawn



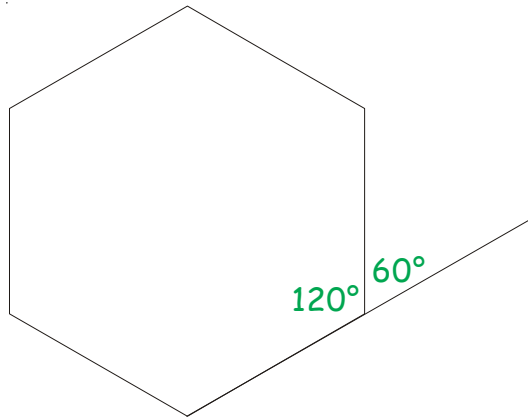
- 3) The diagram shows a 5-sided shape.
 All the sides of the shape are equal in length.
- a) (i) Find the value of x .
 $x = 60^\circ$
- (ii) Give a reason for your answer.
The triangle in the diagram is equilateral.
- b) (i) Work out the value of y .
 $y = 150^\circ$
- (ii) Explain your answer.
Angle y is made up of the angle in the square and the angle in the equilateral triangle. This is $90^\circ + 60^\circ = 150^\circ$.



Angles of Regular Polygons



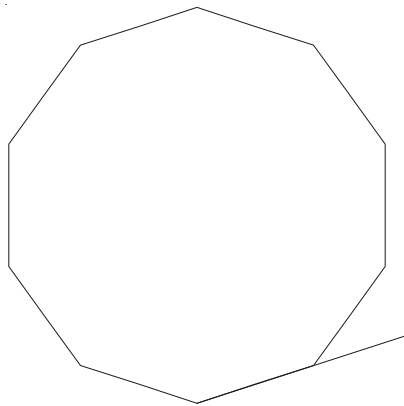
1)



- a) Work out the size of an **exterior** angle of a regular hexagon. 60° $360 \div 6$
b) Work out the size of an **interior** angle of a regular hexagon. 120° $180 - 60$



2)



- a) Name the regular polygon, above. **Decagon**
b) Work out the size of an **exterior** angle and of an **interior** angle for this polygon.
Exterior angle = 36° **Interior angle = 144°**
 $360 \div 10$ $180 - 36$



- 3) The size of each **exterior** angle of a regular polygon is 90° .
Work out the number of sides of the regular polygon. **4 sides** $360 \div ? = 90$



- 4) The size of each **exterior** angle of a regular polygon is 40° .
Work out the number of sides of the regular polygon. **9 sides** $360 \div ? = 40$



- 5) The size of each **interior** angle of a regular polygon is 120° .
Work out the number of sides of the regular polygon. **6 sides**
Interior angle = 120, exterior angle = 60, $360 \div ? = 60$



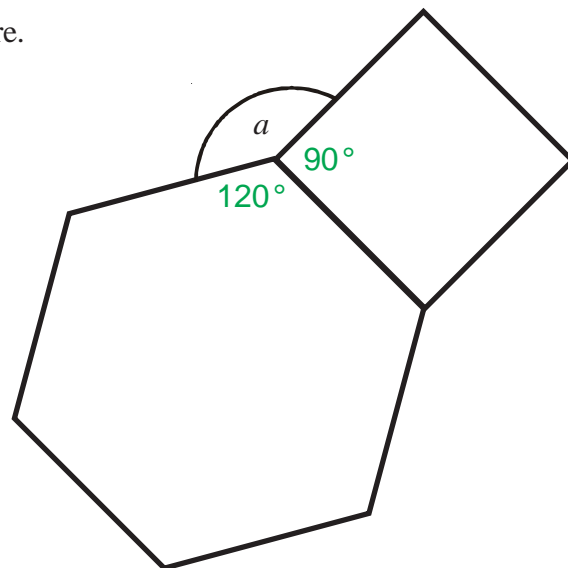
- 6) The size of each **interior** angle of a regular polygon is 150° .
Work out the number of sides of the regular polygon. **12 sides**
Interior angle = 150, exterior angle = 30, $360 \div ? = 30$

Angles of Regular Polygons

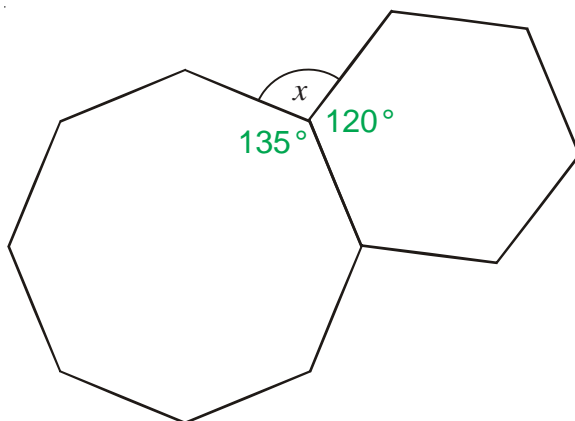


- 1) The diagram shows a regular hexagon and a square.

Calculate the size of the angle a . 150°



- 2)



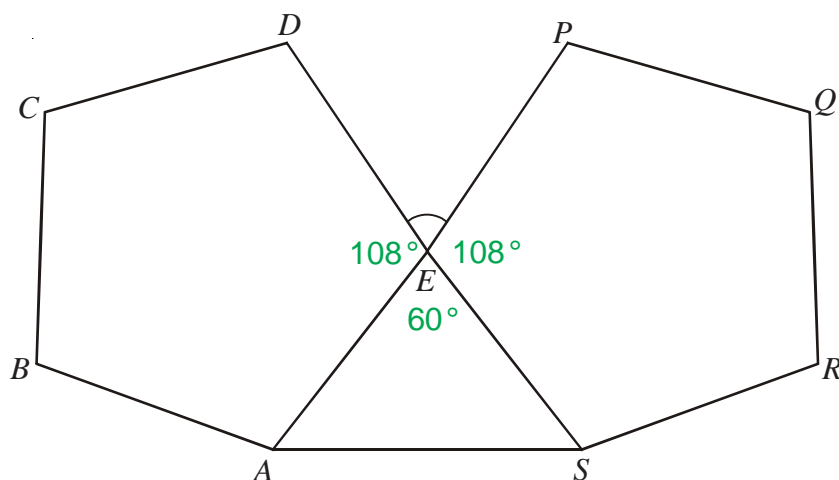
The diagram shows a regular octagon and a regular hexagon.

Work out the size of angle x . 105°



- 3) $ABCDE$ and $PQRSE$ are regular pentagons.
 AES is an equilateral triangle.

Work out the size of angle DEP . 84°

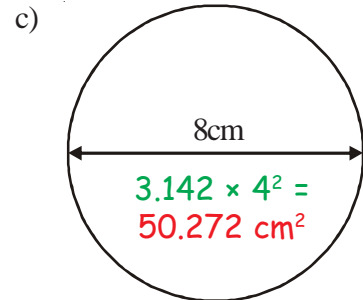
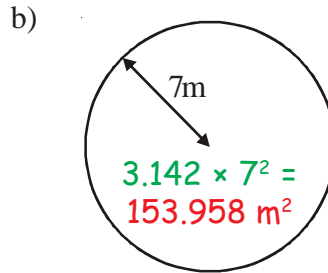
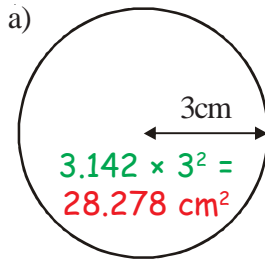


Area of a Circle

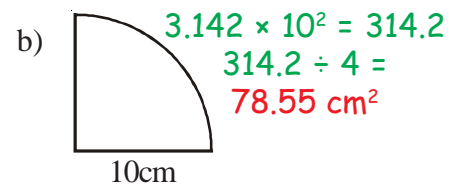
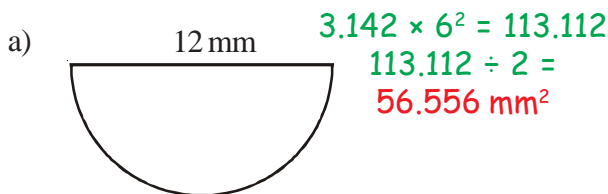
Take π to be 3.142 for all questions.



- 1) Find the areas of the following shapes.



- 2) Work out the areas of the following shapes.



- 3) The diagram shows a circular garden comprising a rectangular pond enclosed by grass. The circular garden has a diameter of 10m. The rectangular pond measures 8m by 6m.

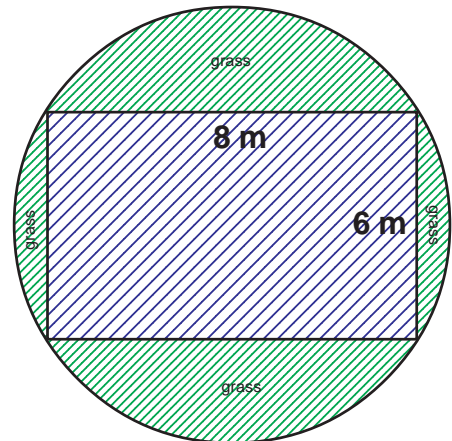
Work out the area of the garden covered in grass.
Give your answer to the nearest m^2 .

31 m^2 to the nearest metre

Circular garden area: $3.142 \times 5^2 = 78.55$

Rectangular pond area: $8 \times 6 = 48$

$78.55 - 48 = 30.55$



- 4) The **radius** of the top of a circular table is 60cm. The table also has a circular base with **diameter** 30cm.

- a) Work out the area of the top of the table.

11 311.2 cm^2

- b) Work out the area of the base of the table.

706.95 cm^2

3.142×60^2

3.142×15^2



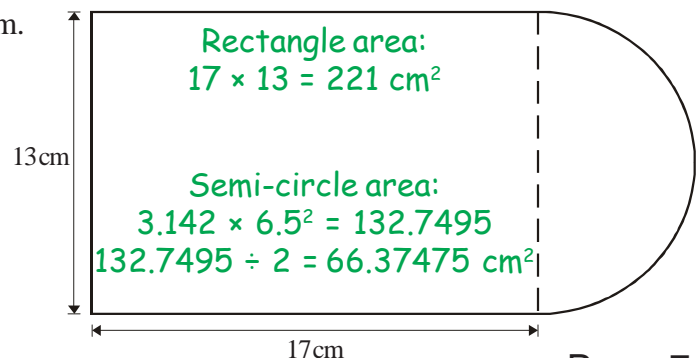
- 5) The diagram shows a shape, made from a semi-circle and a rectangle. The diameter of the semi-circle is 13cm. The length of the rectangle is 17cm.

Calculate the area of the shape.

Give your answer correct to

3 significant figures. **287 cm^2**

$221 + 66.37475 = 287.37475$



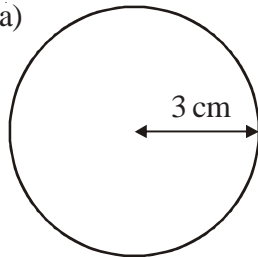
Circumference of a Circle

Take π to be 3.142 for all questions.



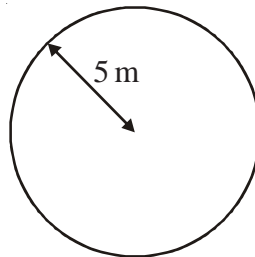
- 1) Find the circumference of the following shapes.

a) $C = 18.852 \text{ cm}$



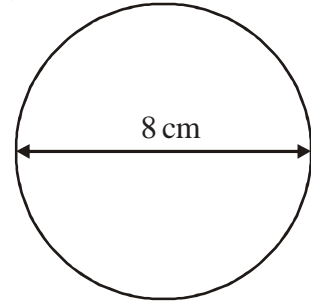
$C = 2 \times 3.142 \times 3$

b) $C = 31.42 \text{ m}$



$C = 2 \times 3.142 \times 5$

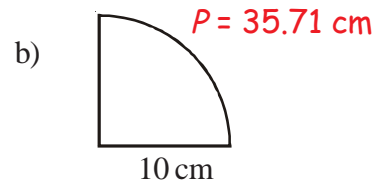
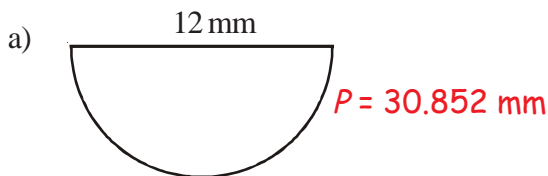
c) $C = 25.136 \text{ cm}$



$C = 2 \times 3.142 \times 4$



- 2) Work out the perimeter of the following shapes.



- 3) The **radius** of the top of a circular table is 60 cm.
The table also has a circular base with **diameter** 30 cm.

- a) Work out the circumference of the top of the table.

$C = 377.04 \text{ cm}$

- b) Work out the circumference of the base of the table.

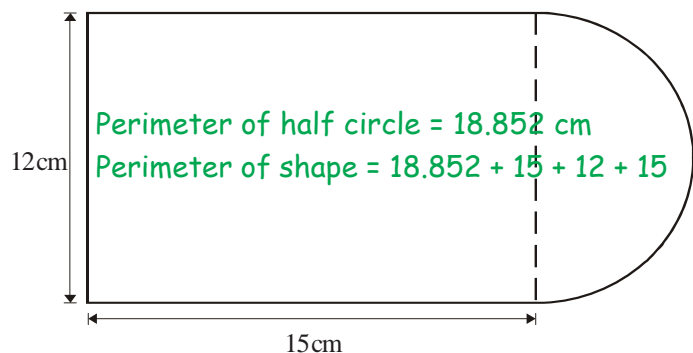
$C = 94.26 \text{ cm}$



- 4) The diagram shows a shape, made from a semi-circle and a rectangle.
The diameter of the semi-circle is 12 cm.
The length of the rectangle is 15 cm.

Calculate the perimeter of the shape.
Give your answer correct to
3 significant figures.

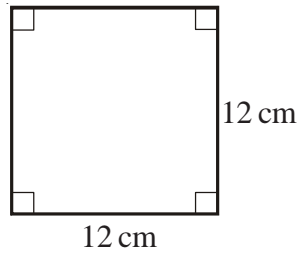
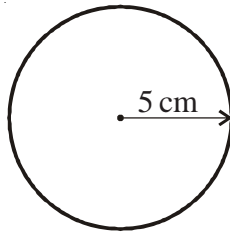
$P = 60.9 \text{ cm}$



Area and Circumference of Circles



- 1) A circle has a radius of 5 cm.
A square has sides of length 12 cm.

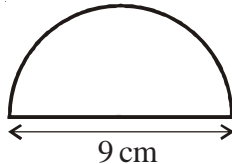


Work out the difference between the area of the circle and the area of the square if you take π to be 3. **69 cm² difference**

Area of circle = 75
Area of square = 144



- 2) Here is a tile in the shape of a semi-circle.



The diameter of the semi-circle is 9 cm.

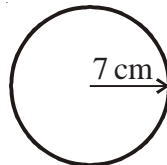
Work out the perimeter of the tile.

Give your answer correct to two decimal places. **23.14 cm**

14.139 + 9



- 3) A circle has a radius of 7 cm.

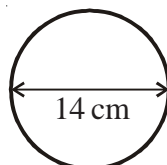


Work out the area of the circle. **154 cm²**

Give your answer correct to three significant figures.



- 4) A circle has a diameter of 14 cm.



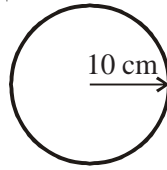
Work out the circumference of the circle. **44.0 cm**

Give your answer correct to three significant figures.

Area and Circumference of Circles



- 1) The radius of a circle is 10 cm.

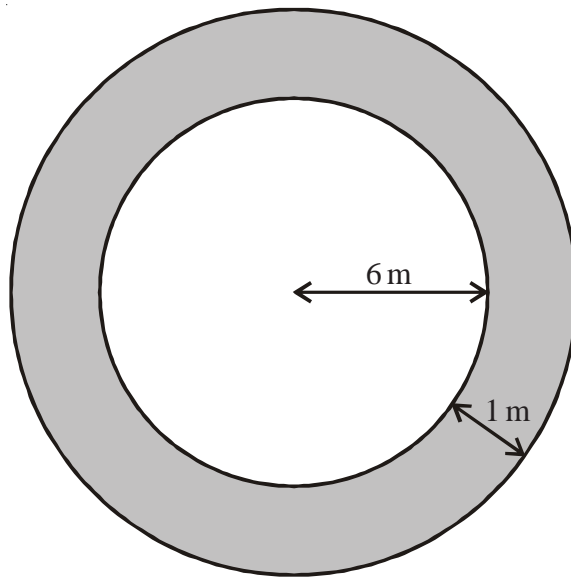


Work out the area of this circle. **314 cm²**

Take π to be 3.14



- 2) The diagram shows a circular pond with a path around it.



The pond has a radius of 6 m.

The path has a width of 1 m.

Work out the area of the path. **40.8 m²**

Give your answer correct to 3 significant figures.

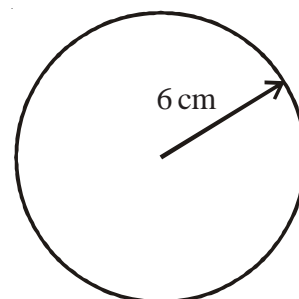
153.958 – 113.112



- 3) The diagram shows a CD which has a radius of 6 cm.

- a) Work out the circumference of the CD. **37.7 cm**

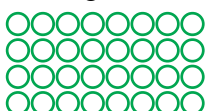
Give your answer correct to 3 significant figures.



CDs of this size are cut from rectangular sheets of plastic.

Each sheet is 1 metre long and 50 cm wide.

- b) Work out the greatest number of CDs which can be cut from one rectangular sheet. **32**

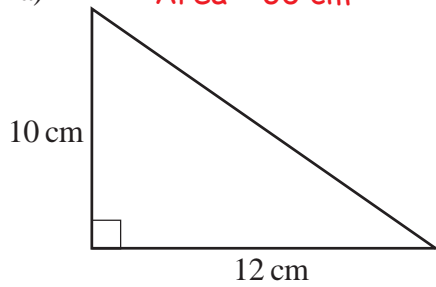




1) Find the areas of these two triangles.

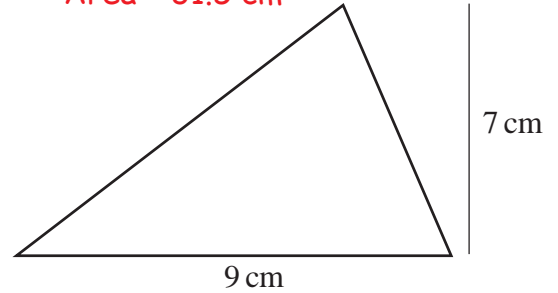
a)

Area = 60 cm²



b)

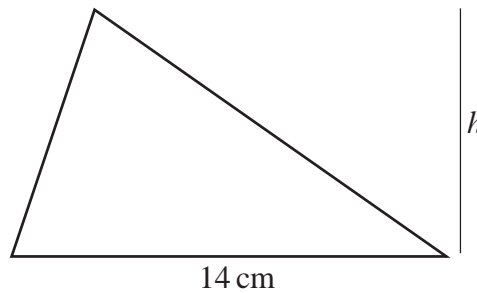
Area = 31.5 cm²



2) The area of this triangle is 70 cm².

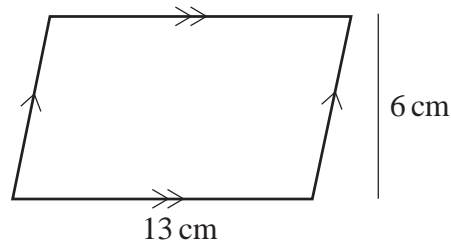
Find its height, h .

$h = 10$ cm



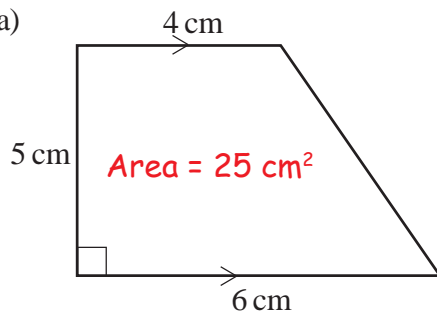
3) Find the area of the parallelogram.

Area = 78 cm²



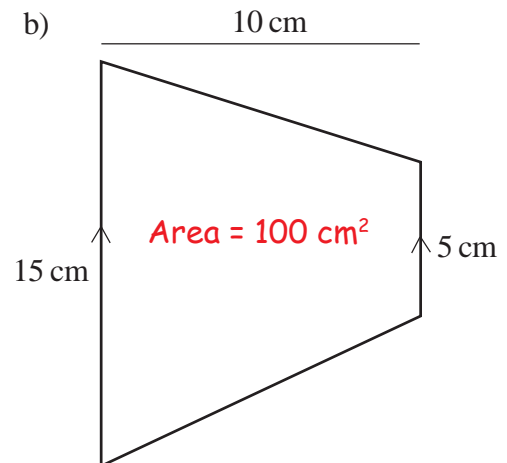
4) Find the area of these two trapeziums.

a)



Area = 25 cm²

b)



Area = 100 cm²

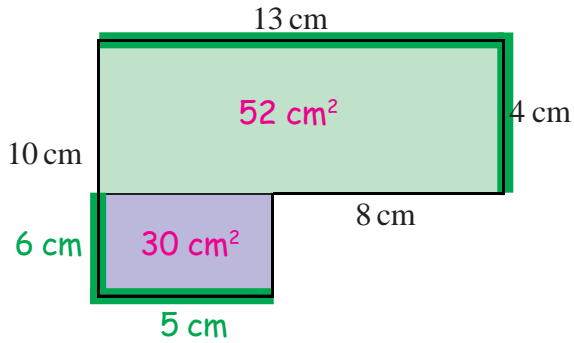
$\text{Area of trapezium} = \frac{1}{2} (a + b)h$

Area

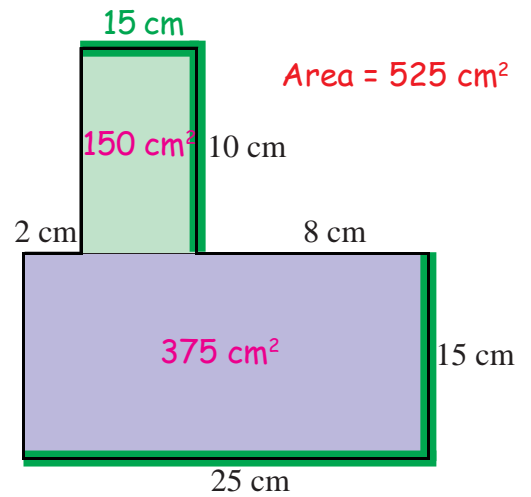


1) Find the area of each shape.

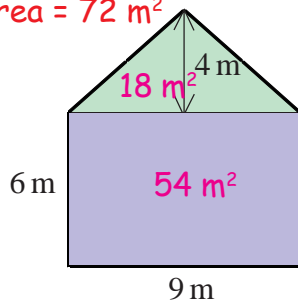
a) **Area = 82 cm^2**



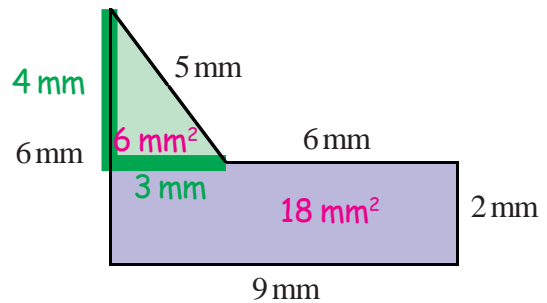
b)



c) **Area = 72 m^2**

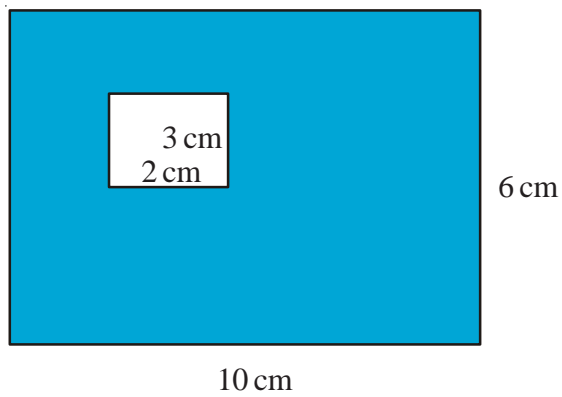


d) **Area = 24 mm^2**

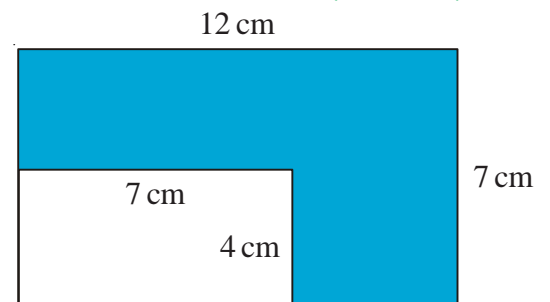


2) Find the shaded area of each shape.

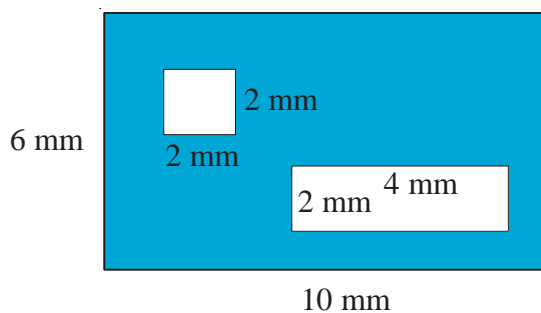
a) **Area = 54 cm^2** $(60 - 6)$



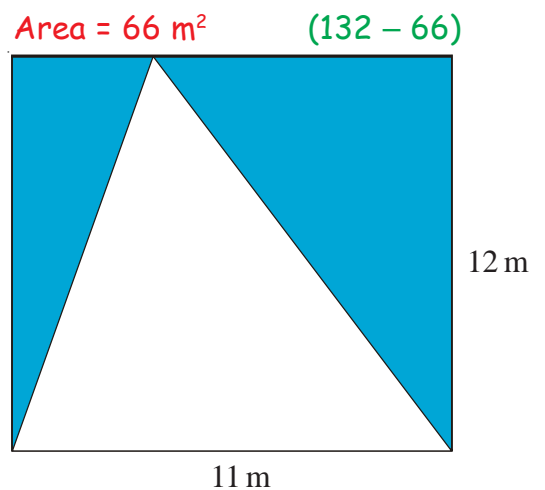
b) **Area = 56 cm^2** $(84 - 28)$



c) **Area = 48 mm^2** $(60 - 4 - 8)$



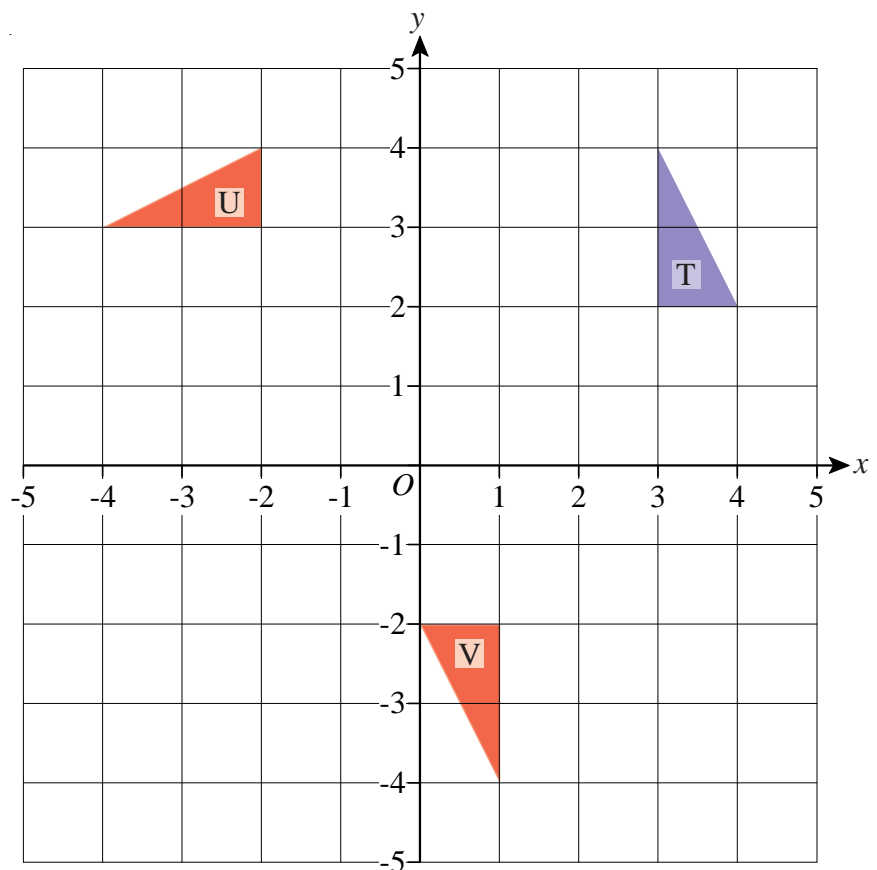
d)



Rotations

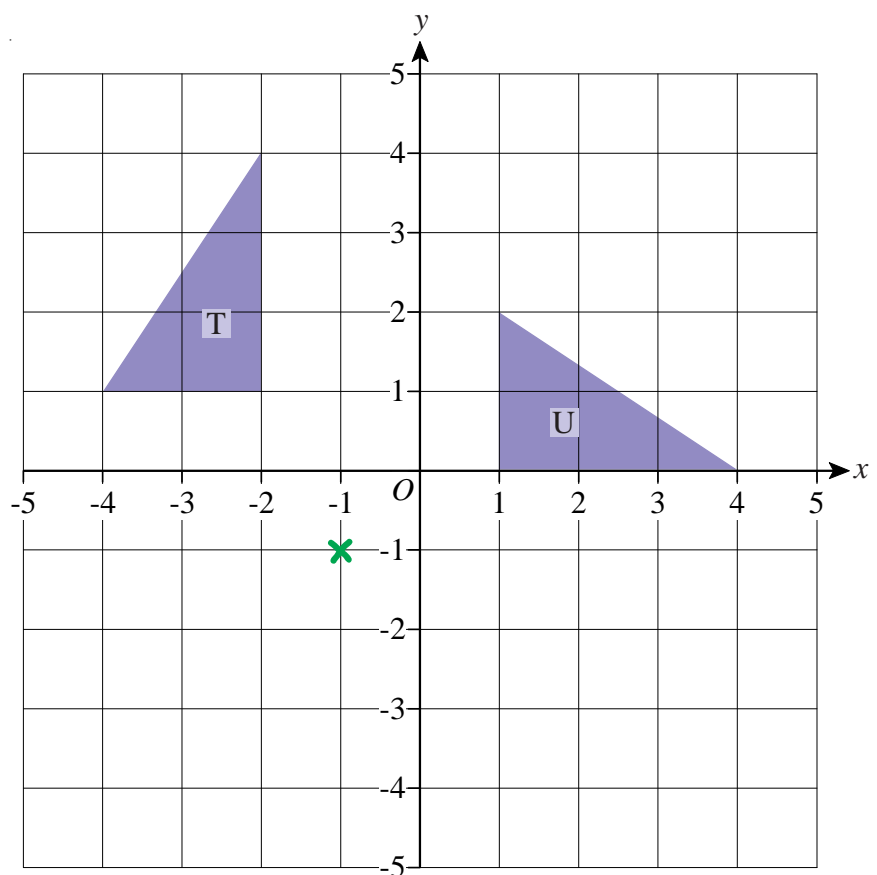


- 1) a) Rotate triangle T 90° anti-clockwise about the point $(0, 0)$.
Label your new triangle U.
- b) Rotate triangle T 180° about the point $(2, 0)$.
Label your new triangle V.



- 2) Describe fully the single transformation which maps triangle T to triangle U.

Rotation,
 90° clockwise,
centre of rotation $(-1, -1)$

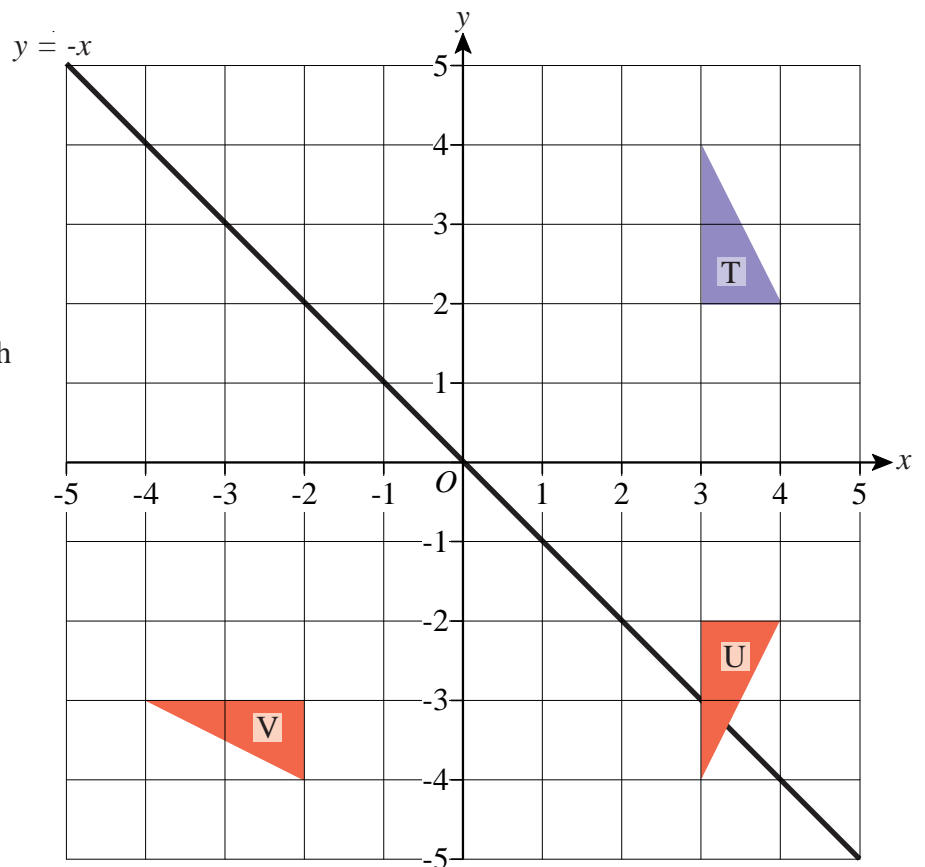


Reflections



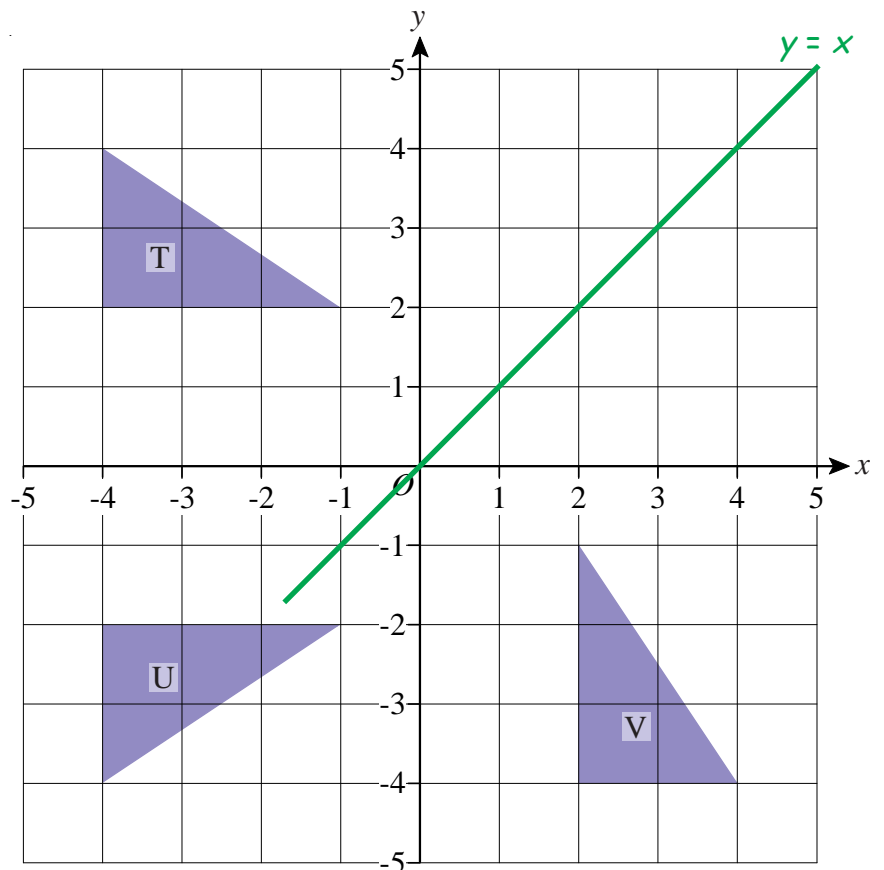
- 1) a) Reflect triangle T in the x axis.
Label your new triangle U.

- b) Reflect triangle T in the line with equation $y = -x$.
Label your new triangle V.



- 2) a) Describe fully the single transformation which maps triangle T to triangle U.
Reflection in the x axis.

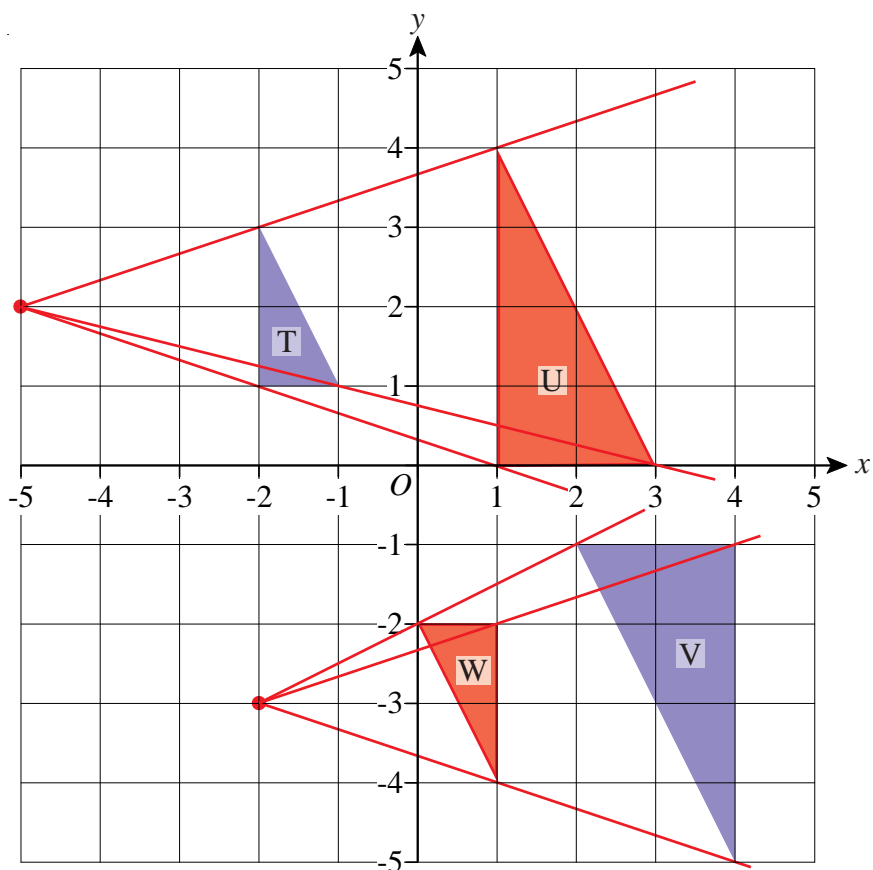
- b) Describe fully the single transformation which maps triangle T to triangle V.
Reflection in the $y = x$ line.



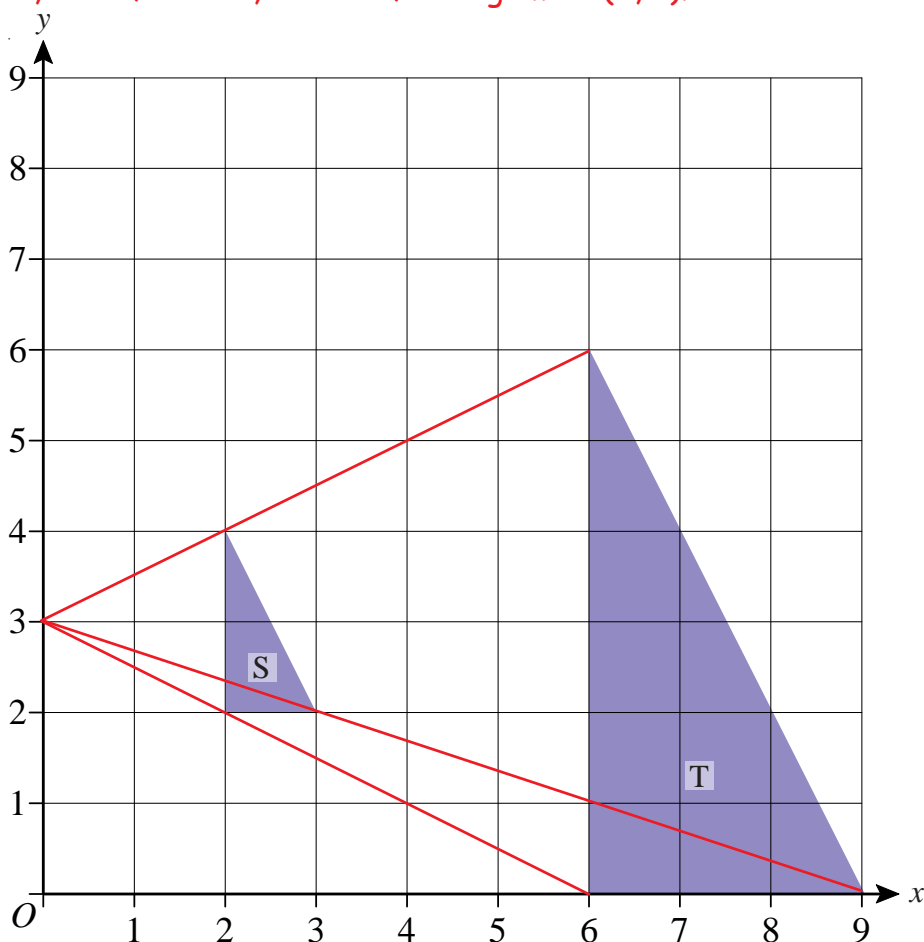
Enlargements



- 1) a) Enlarge triangle T by scale factor 2 using point $(-5, 2)$ as the centre of enlargement. Label your new triangle U.
- b) Enlarge triangle V by scale factor a half using the point $(-2, -3)$ as the centre of enlargement. Label your new triangle W.



- 2) Describe fully the single transformation which maps triangle S to triangle T.
Enlargement, scale factor 3, centre of enlargement $(0, 3)$.

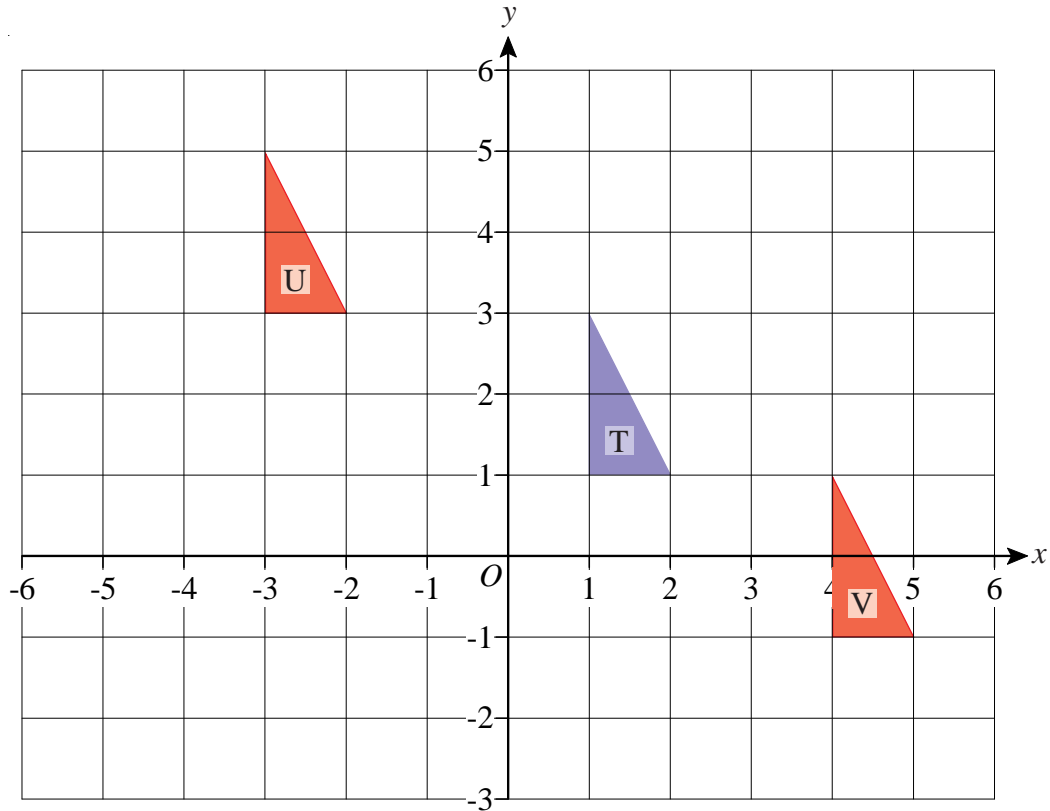


Translations



1) a) Translate triangle T by vector $\begin{bmatrix} -4 \\ 2 \end{bmatrix}$ and label it U.

b) Translate triangle T by vector $\begin{bmatrix} 3 \\ -2 \end{bmatrix}$ and label it V.

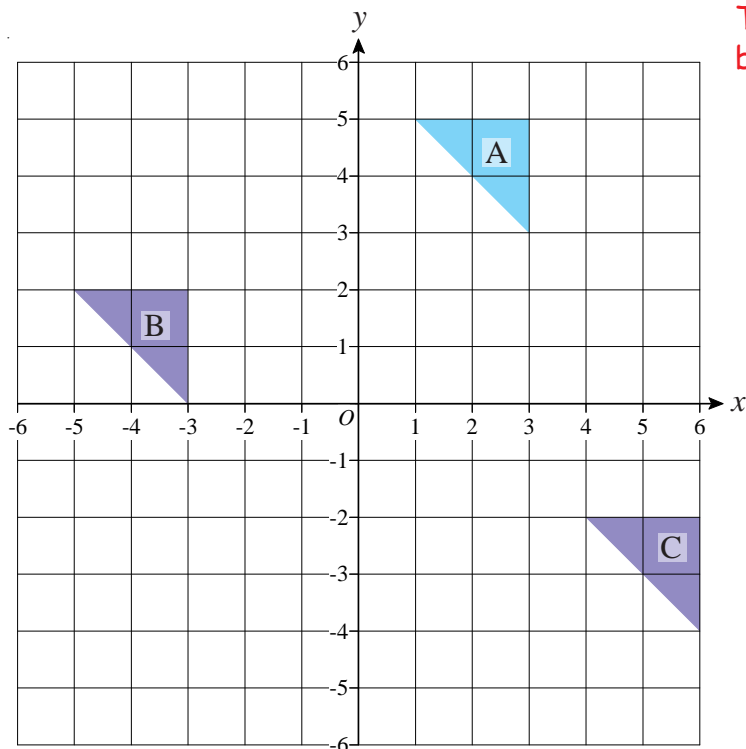


Translation by vector $\begin{bmatrix} -6 \\ -3 \end{bmatrix}$



2) a) Describe fully the single transformation which maps triangle A to triangle B.

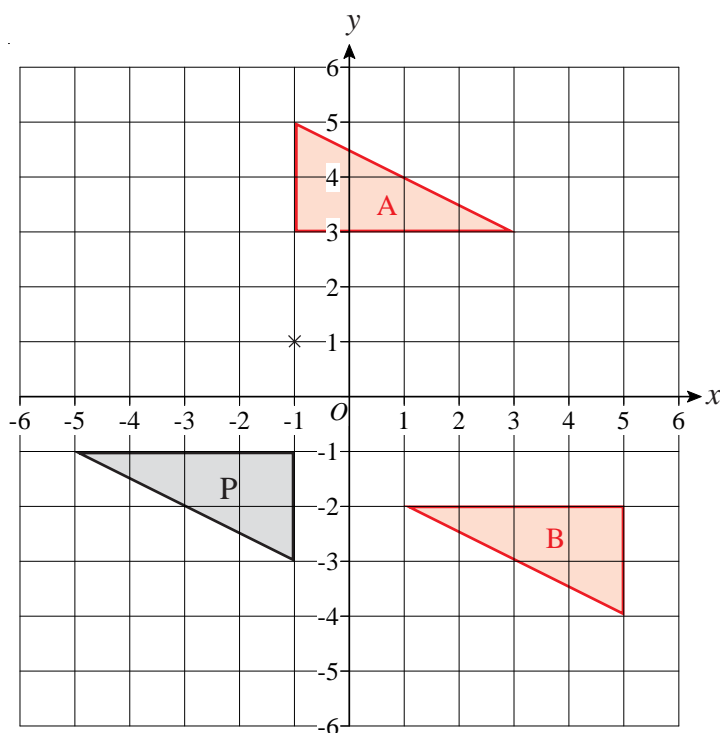
b) Describe fully the single transformation which maps triangle A to triangle C.



Translation by vector $\begin{bmatrix} 3 \\ -7 \end{bmatrix}$

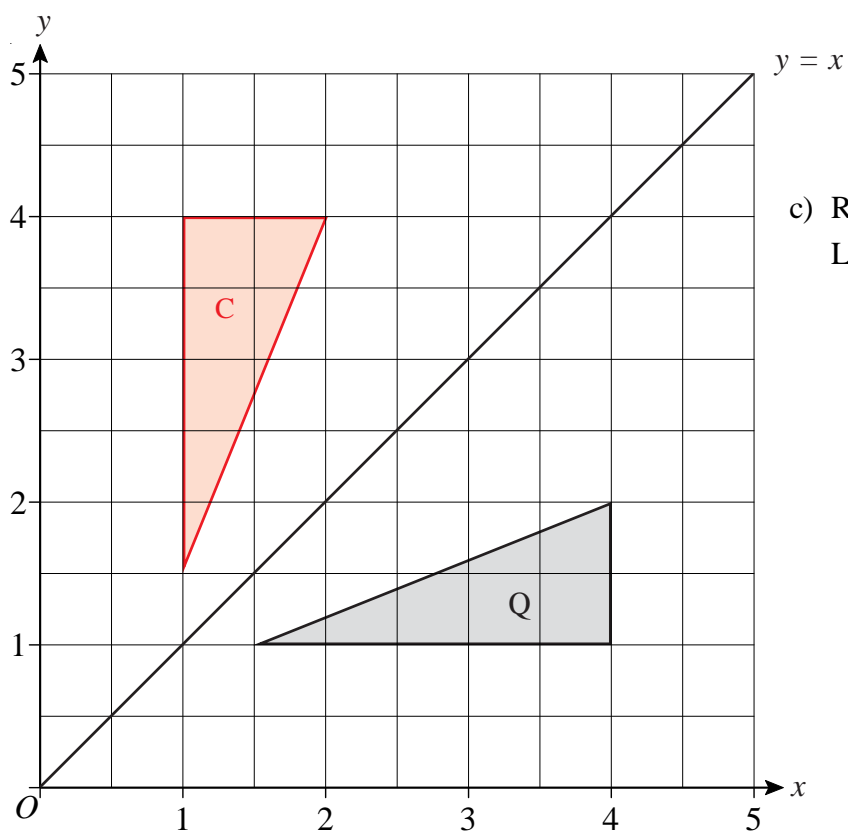


1)



a) Rotate triangle P 180° about the point $(-1, 1)$.
Label the new triangle A.

b) Translate triangle P by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.
Label the new triangle B.

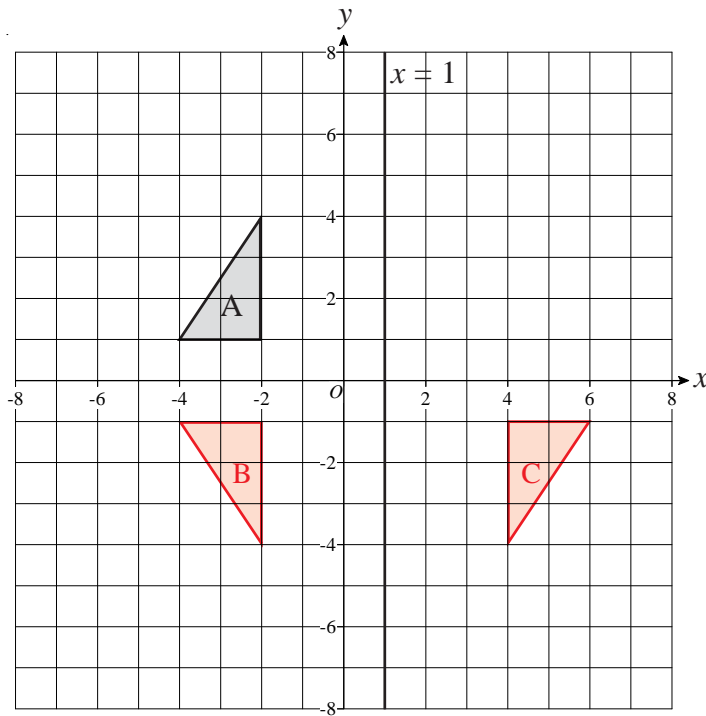


c) Reflect triangle Q in the line $y = x$.
Label the new triangle C.

Transformations



1)



Triangle A is reflected in the x -axis to give triangle B.

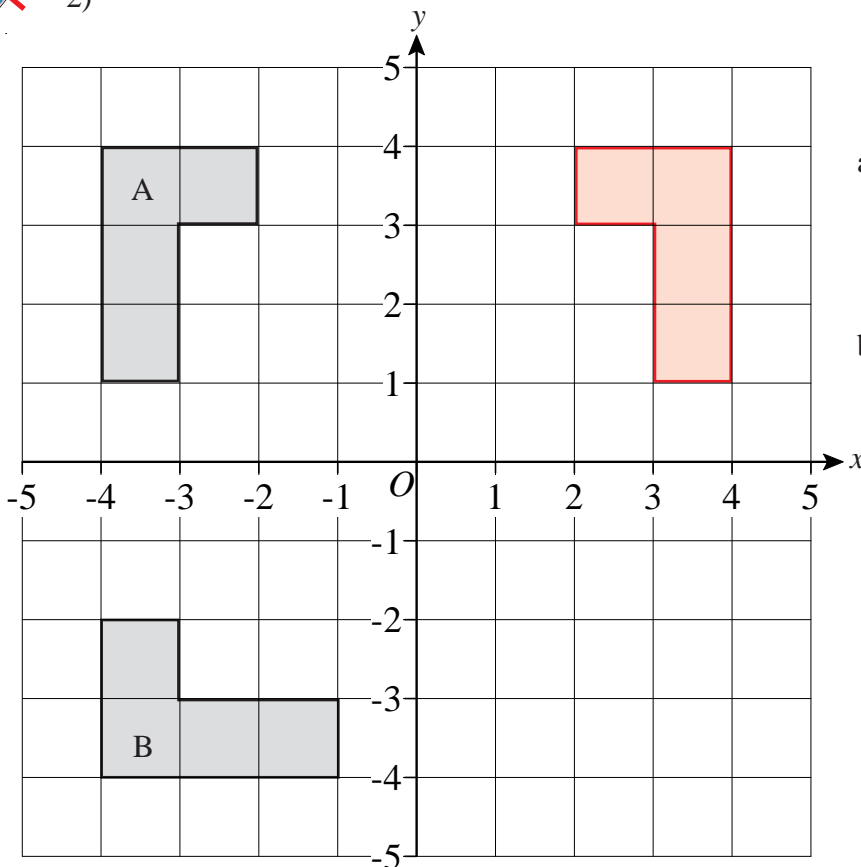
Triangle B is reflected in the line $x = 1$ to give triangle C.

Describe fully the **single** transformation that takes triangle A to triangle C.

Rotation of 180° about the point $(1, 0)$



2)



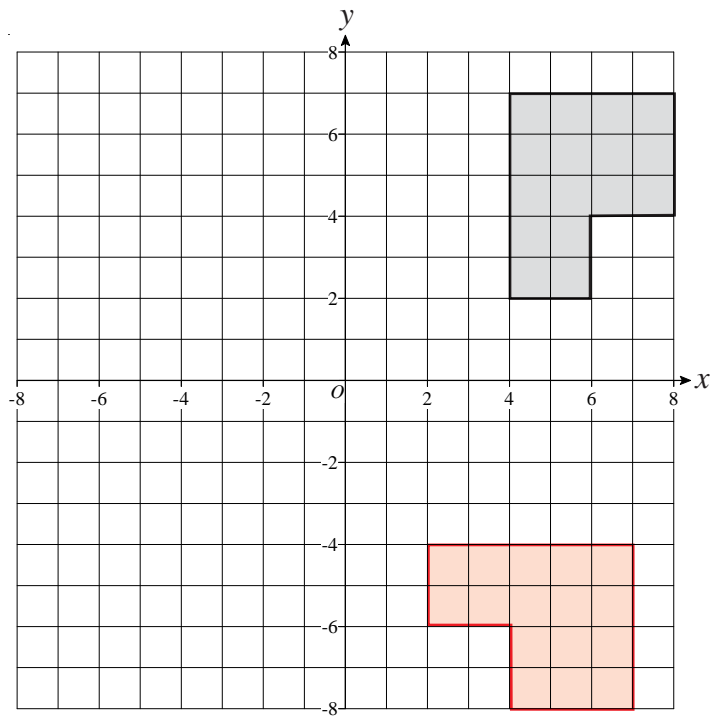
a) Reflect shape A in the y -axis.

b) Describe fully the **single** transformation which takes shape A to shape B.

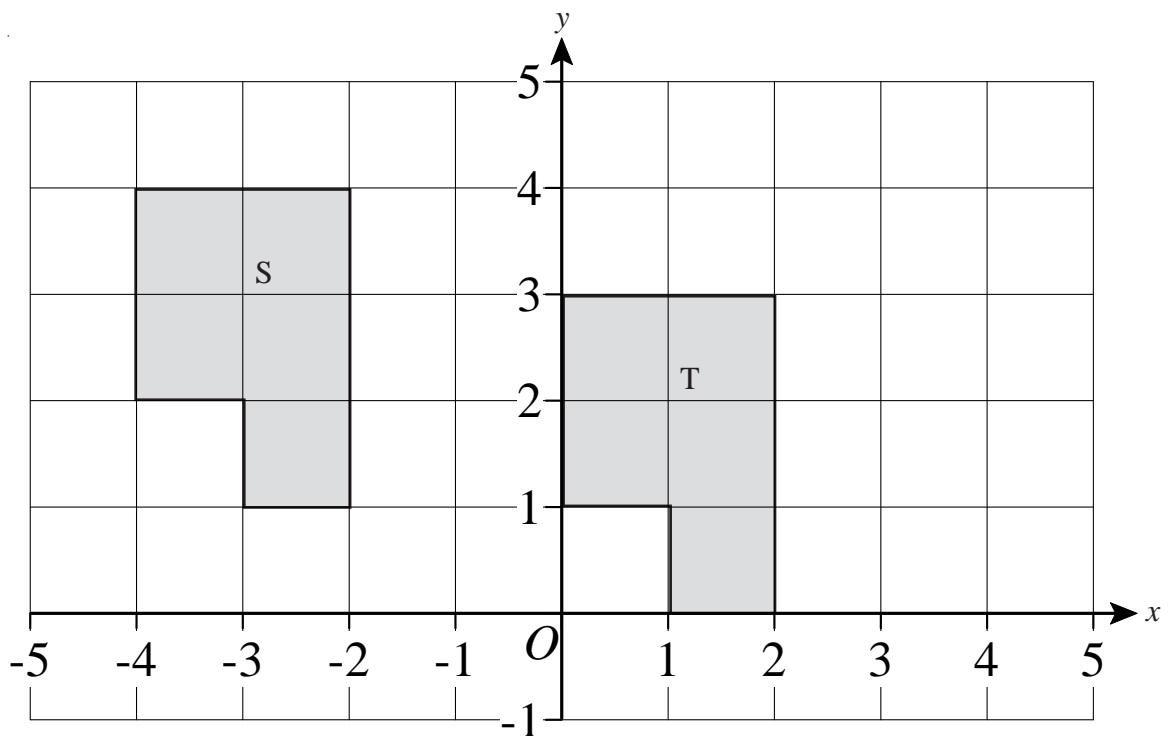
Rotation of 90° anticlockwise about the point $(0, 0)$



1)



- a) Rotate the shaded shape 90° clockwise about the point O .

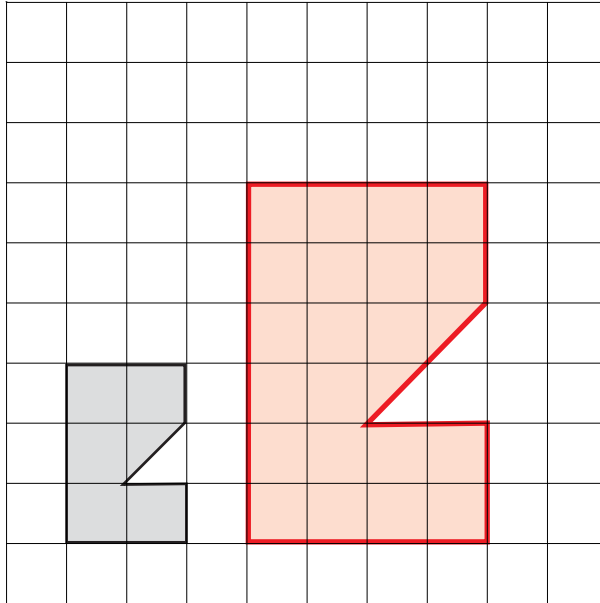


- b) Describe fully the single transformation that will map shape S onto shape T.

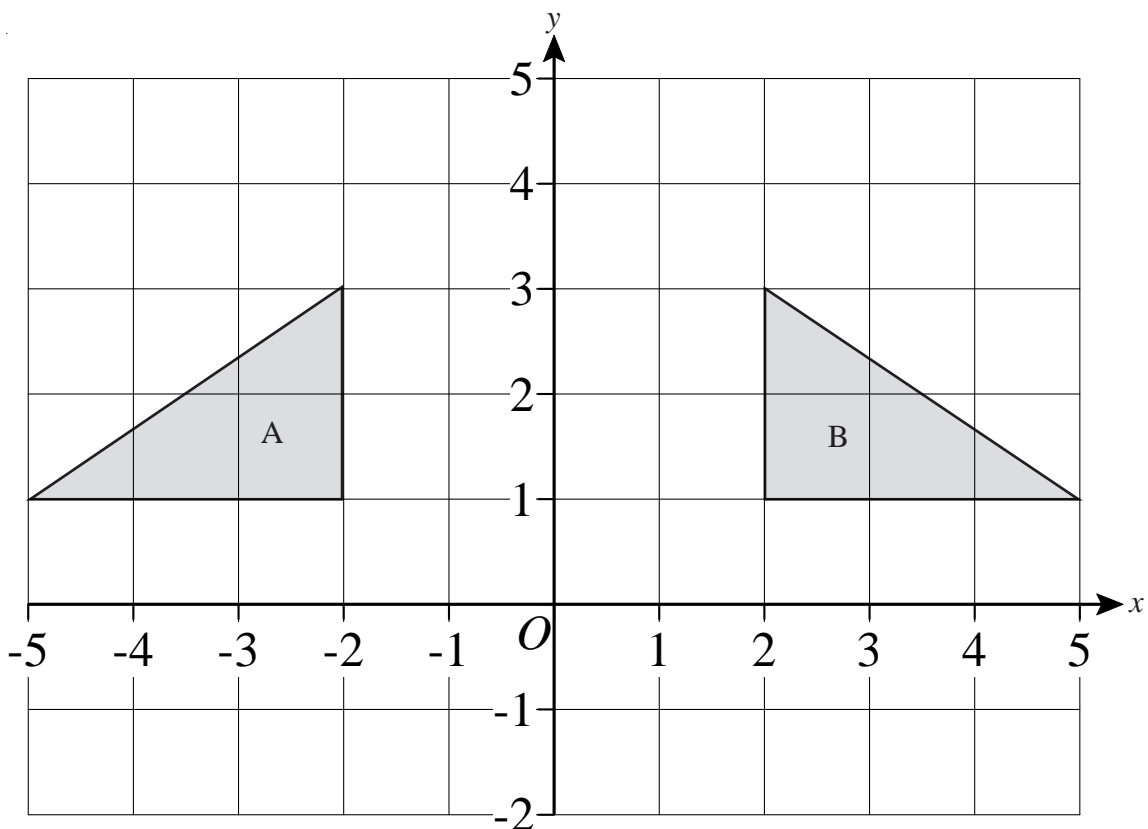
Translate shape S by the vector $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$



1)



a) On the grid, draw an enlargement, scale factor 2, of the shaded shape.

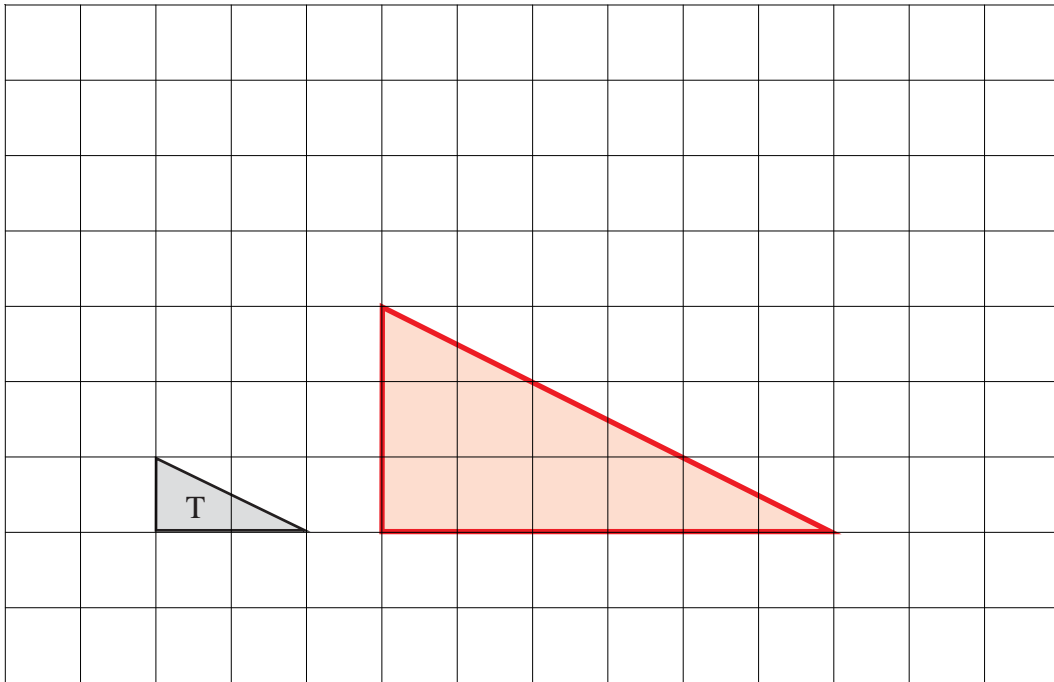


b) Describe fully the single transformation that maps triangle A onto triangle B.

Reflection in the y -axis

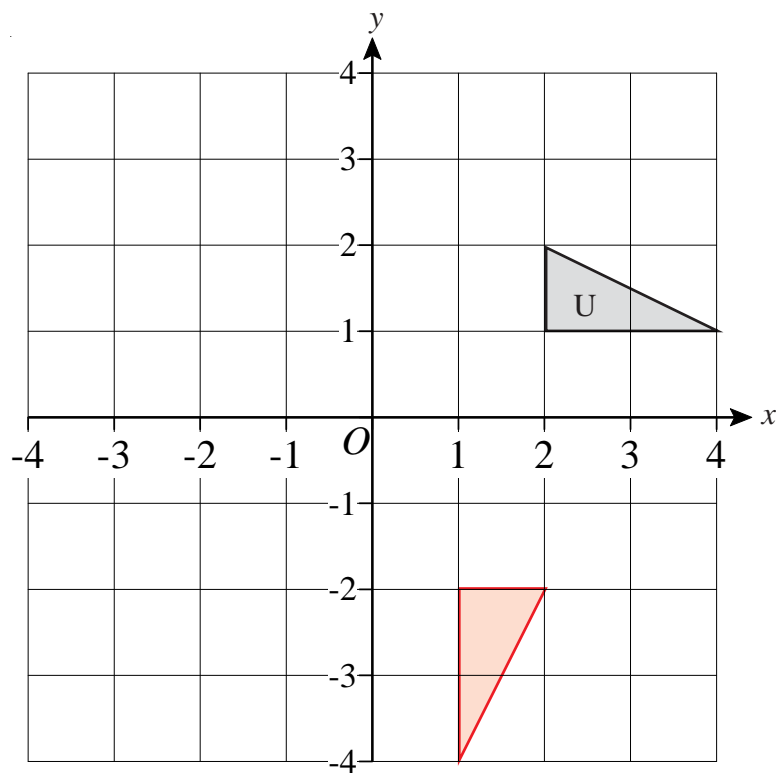


1)



Triangle T has been drawn on a grid.

- a) On the grid, draw an enlargement of the triangle T with scale factor 3.

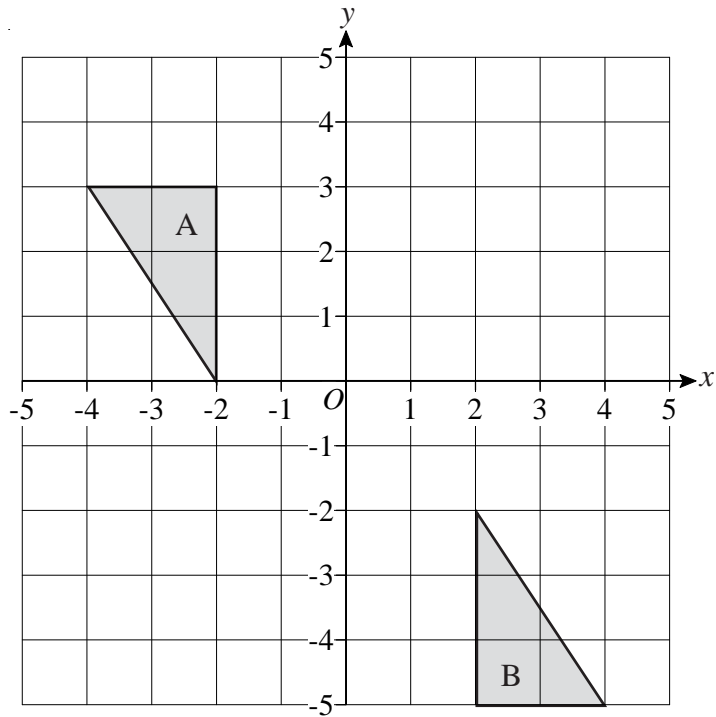


Triangle U has been drawn on a grid.

- b) On the grid, rotate triangle U 90° clockwise about the centre O.



1)

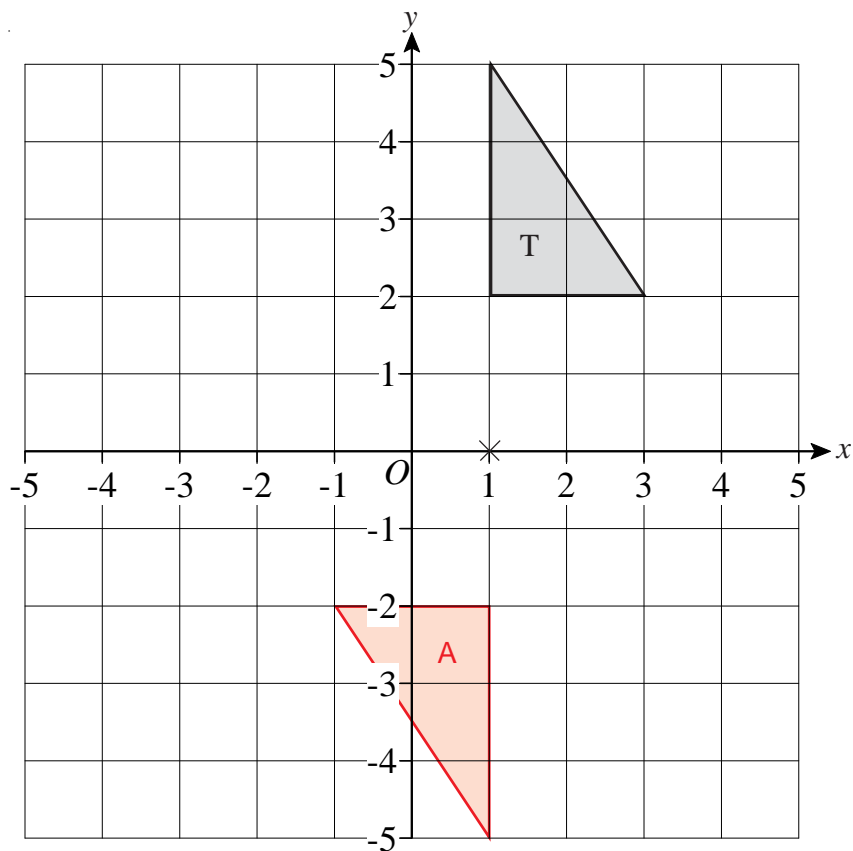


Describe fully the single transformation that maps triangle A onto triangle B.

Rotation of 180° about the point $(0, -1)$



2)



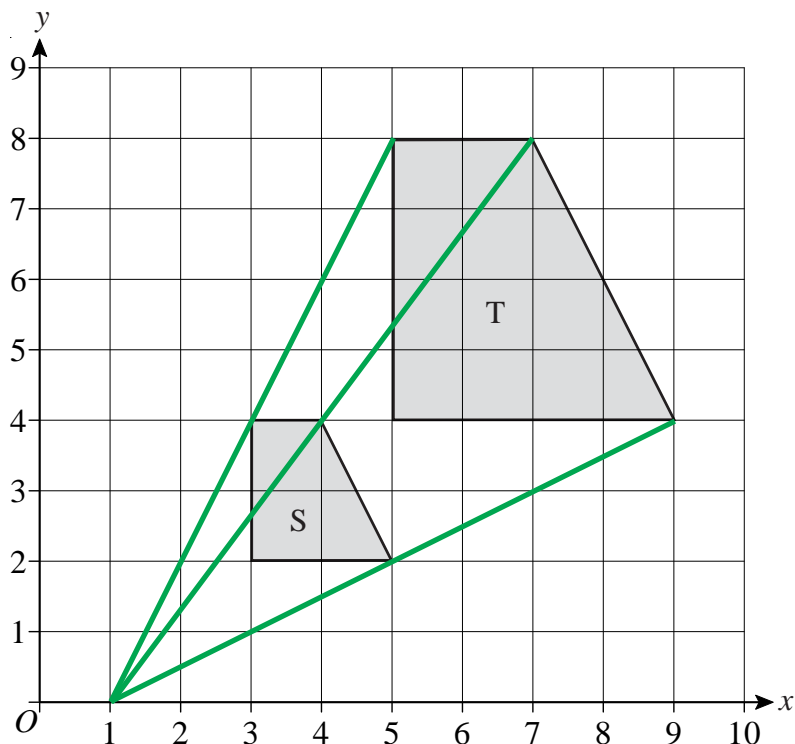
Triangle T has been drawn on the grid.

Rotate triangle T 180° about the point $(1, 0)$

Label the new triangle A.



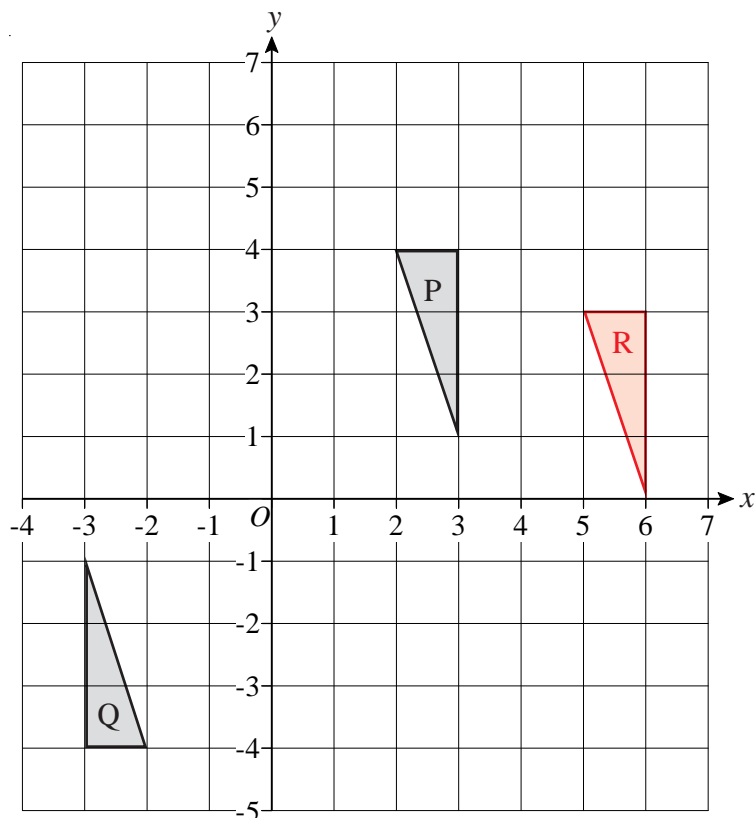
1)



Describe fully the single transformation which maps shape S onto shape T.
Enlargement scale factor 2 with (1, 0) as the centre of enlargement.



2)

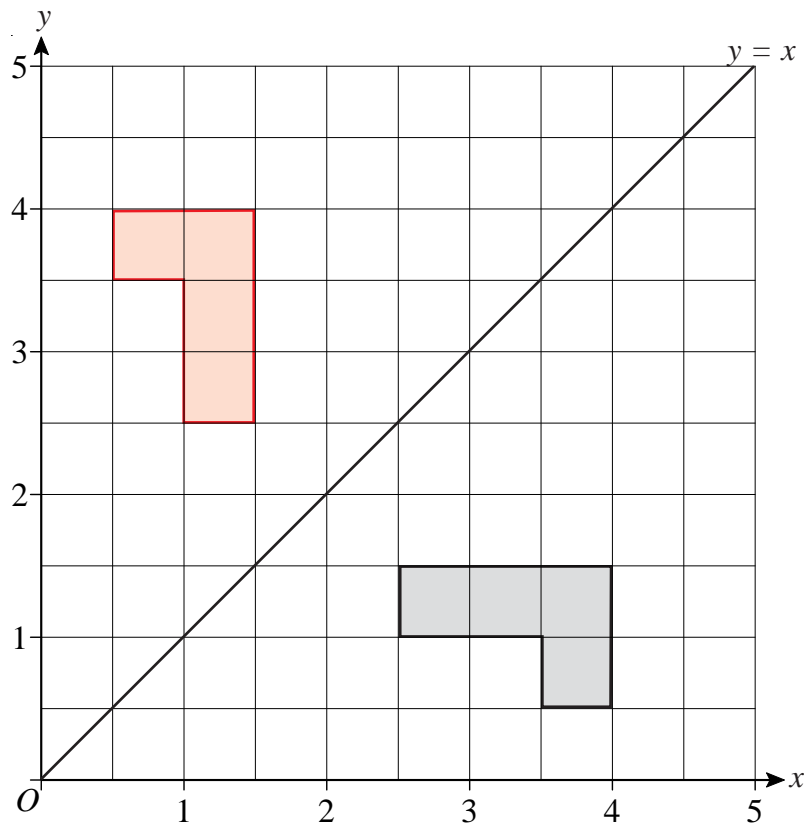


Triangle P and triangle Q are drawn on the grid.

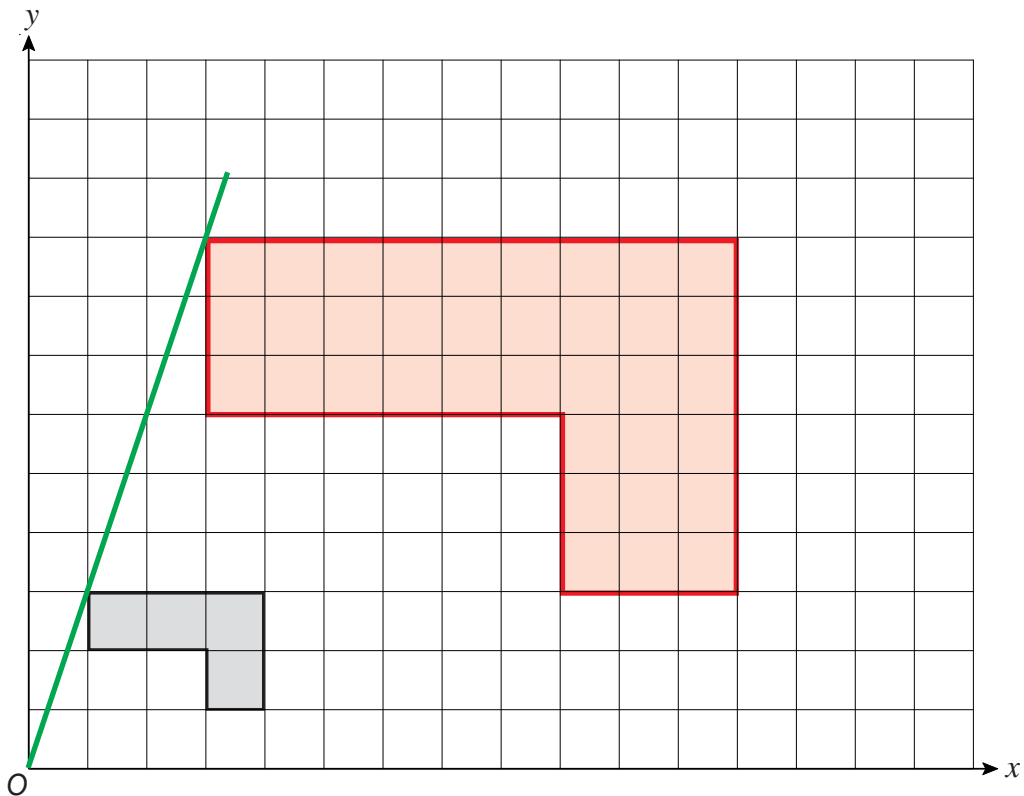
- Describe fully the single transformation which maps triangle P onto triangle Q.
Rotation of 180° about the point (0, 0)
- Translate triangle P by the vector $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$
Label the new triangle R.



1)



a) Reflect the shaded shape in the line $y = x$.

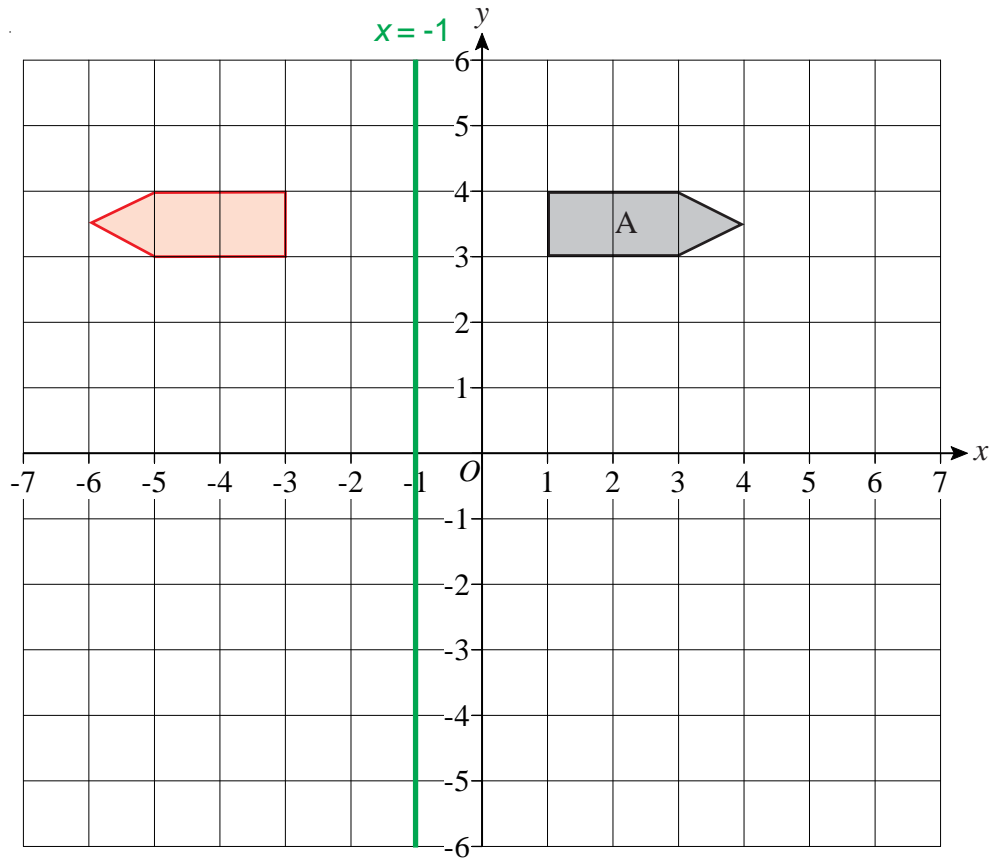


b) On the grid, enlarge the shaded shape by a scale factor of 3, centre O .

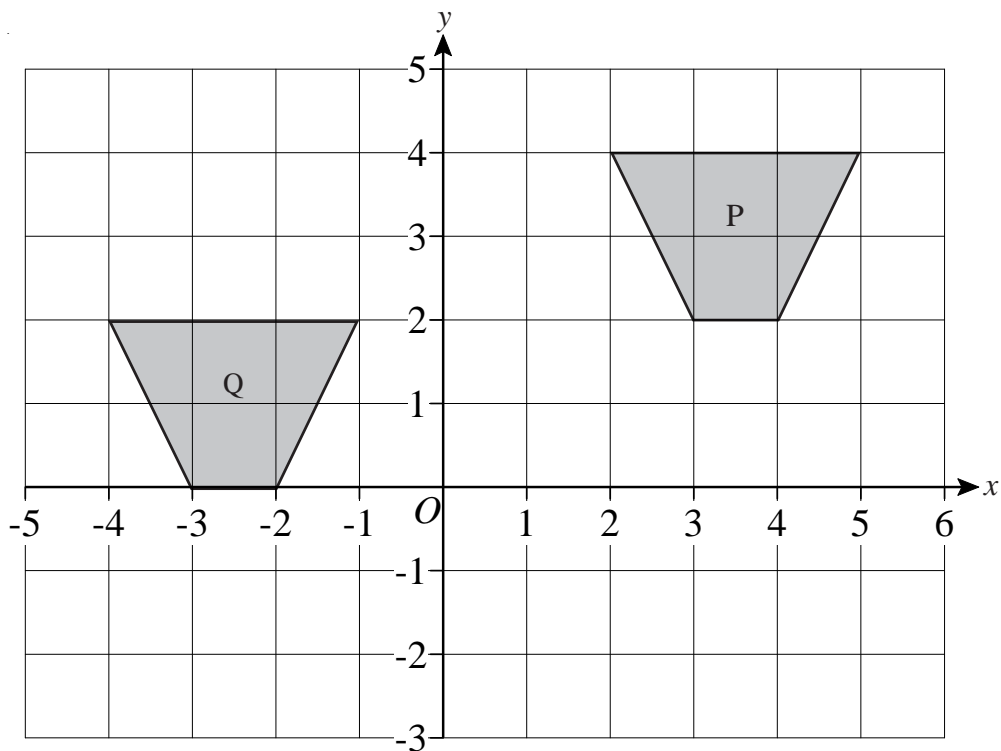
Transformations



1)



- a) On the grid above, reflect shape A in the line $x = -1$

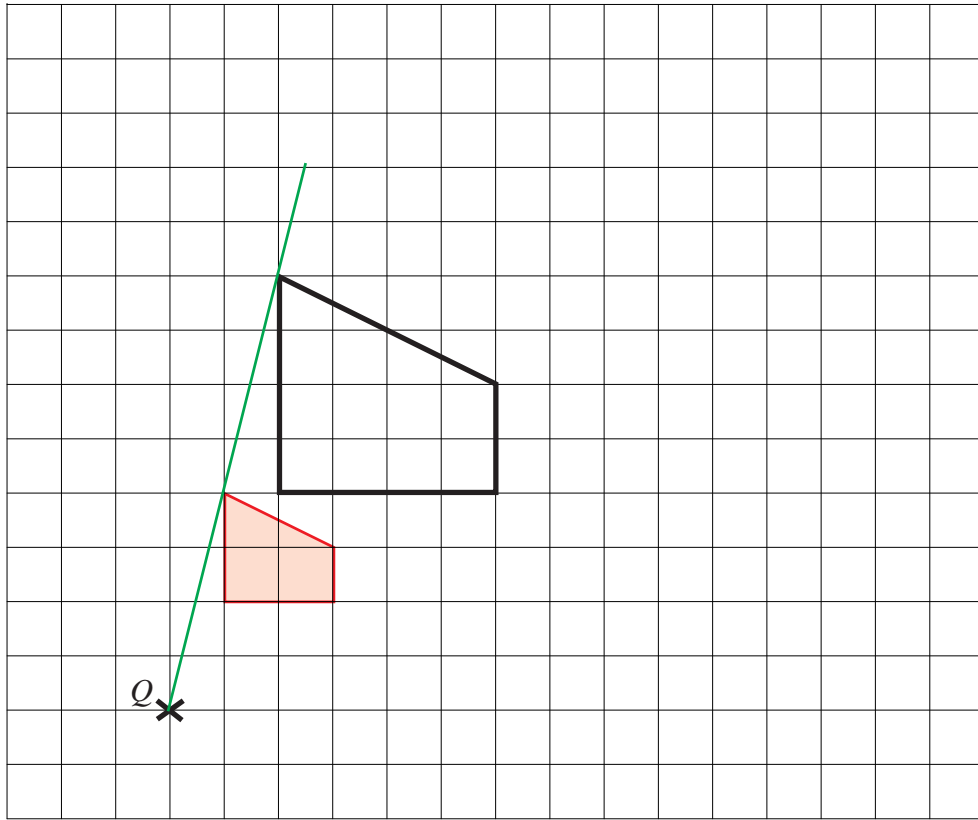


- b) Describe fully the single transformation that will map shape P onto shape Q.

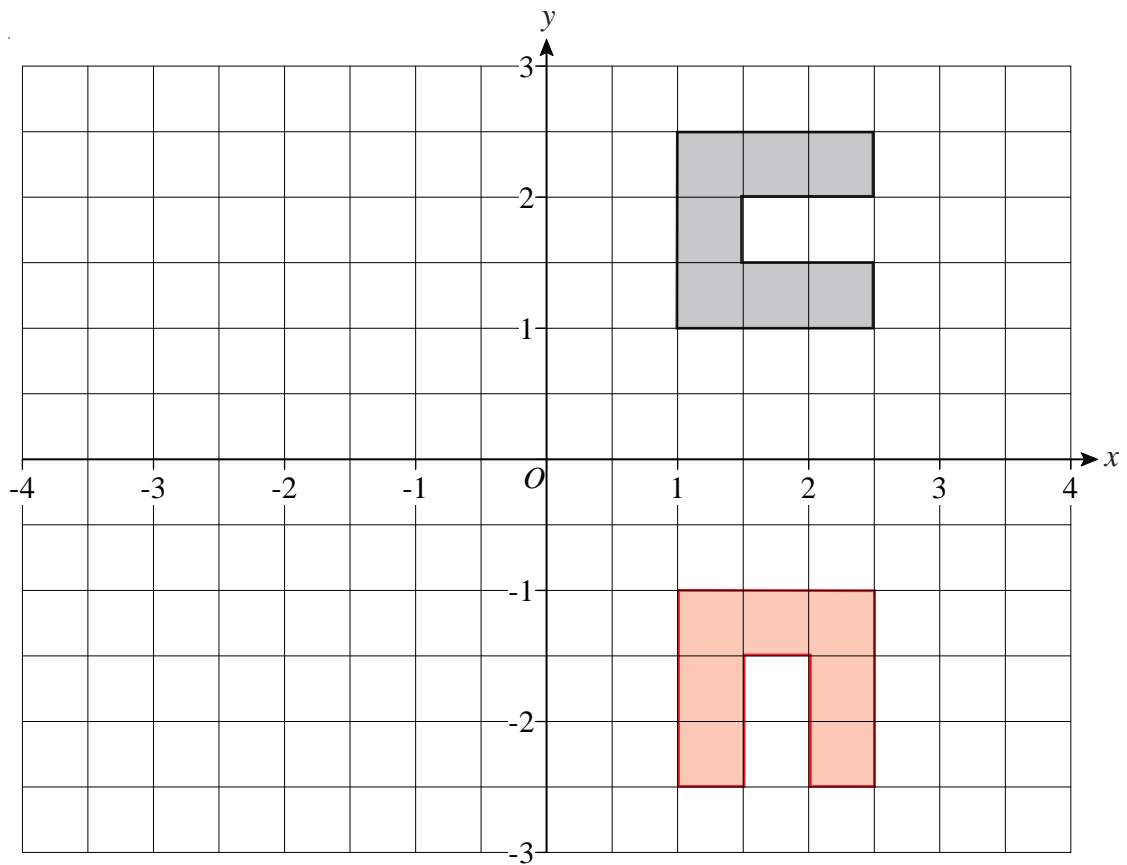
Translation by vector $\begin{pmatrix} -6 \\ -2 \end{pmatrix}$



1)



- a) On the grid, enlarge the shape with scale factor $\frac{1}{2}$, centre Q .

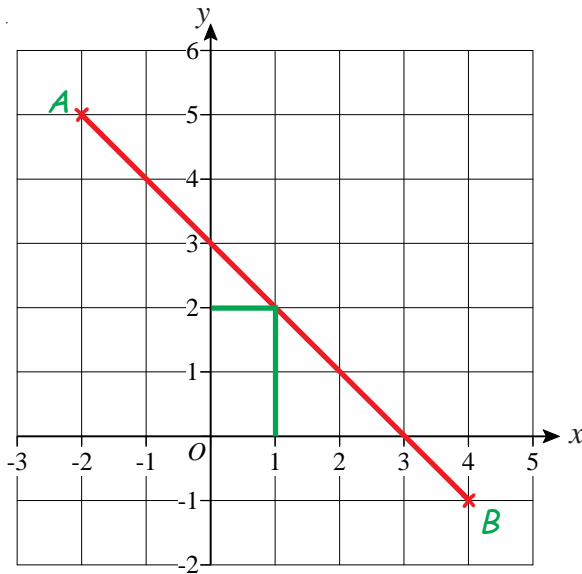


- b) Rotate the shape 90° clockwise, centre O .

Finding the Midpoint of a Line



- 1) Find the midpoint of A and B where A has coordinates $(-2, 5)$ and B has coordinates $(4, -1)$. **Midpoint at $(1, 2)$**



- 2) Find the midpoint of A and B where A has coordinates $(2, 0)$ and B has coordinates $(8, 6)$. **Midpoint at $(5, 3)$**

$$\begin{aligned} x & (2 + 8) \div 2 = 5 \\ y & (0 + 6) \div 2 = 3 \end{aligned}$$



- 3) Find the midpoint of A and B where A has coordinates $(-4, -2)$ and B has coordinates $(2, 4)$. **Midpoint at $(-1, 1)$**

$$\begin{aligned} x & (-4 + 2) \div 2 = -1 \\ y & (-2 + 4) \div 2 = 1 \end{aligned}$$



- 4) Find the midpoint of A and B where A has coordinates $(-3, -2)$ and B has coordinates $(7, 5)$. **Midpoint at $(2, 1.5)$**

$$\begin{aligned} x & (-3 + 7) \div 2 = 2 \\ y & (-2 + 5) \div 2 = 1.5 \end{aligned}$$



- 5) Find the midpoint of A and B where A has coordinates $(2, -5)$ and B has coordinates $(7, 4)$. **Midpoint at $(4.5, -0.5)$**

$$\begin{aligned} x & (2 + 7) \div 2 = 4.5 \\ y & (-5 + 4) \div 2 = -0.5 \end{aligned}$$



- 6) Find the midpoint of A and B where A has coordinates $(-7, -4)$ and B has coordinates $(-2, -1)$. **Midpoint at $(-4.5, -2.5)$**

$$\begin{aligned} x & (-7 + -2) \div 2 = -4.5 \\ y & (-4 + -1) \div 2 = -2.5 \end{aligned}$$



- 7) The midpoint of A and B is at $(1, 3)$.
The coordinates of A are $(-2, 4)$.

Work out the coordinates of B . **$(4, 2)$**

$$\begin{aligned} x & (-2 + ?) \div 2 = 1 \\ y & (4 + ?) \div 2 = 3 \end{aligned}$$



- 8) The midpoint of A and B is at $(3.5, 2.5)$.
The coordinates of A are $(2, 5)$.

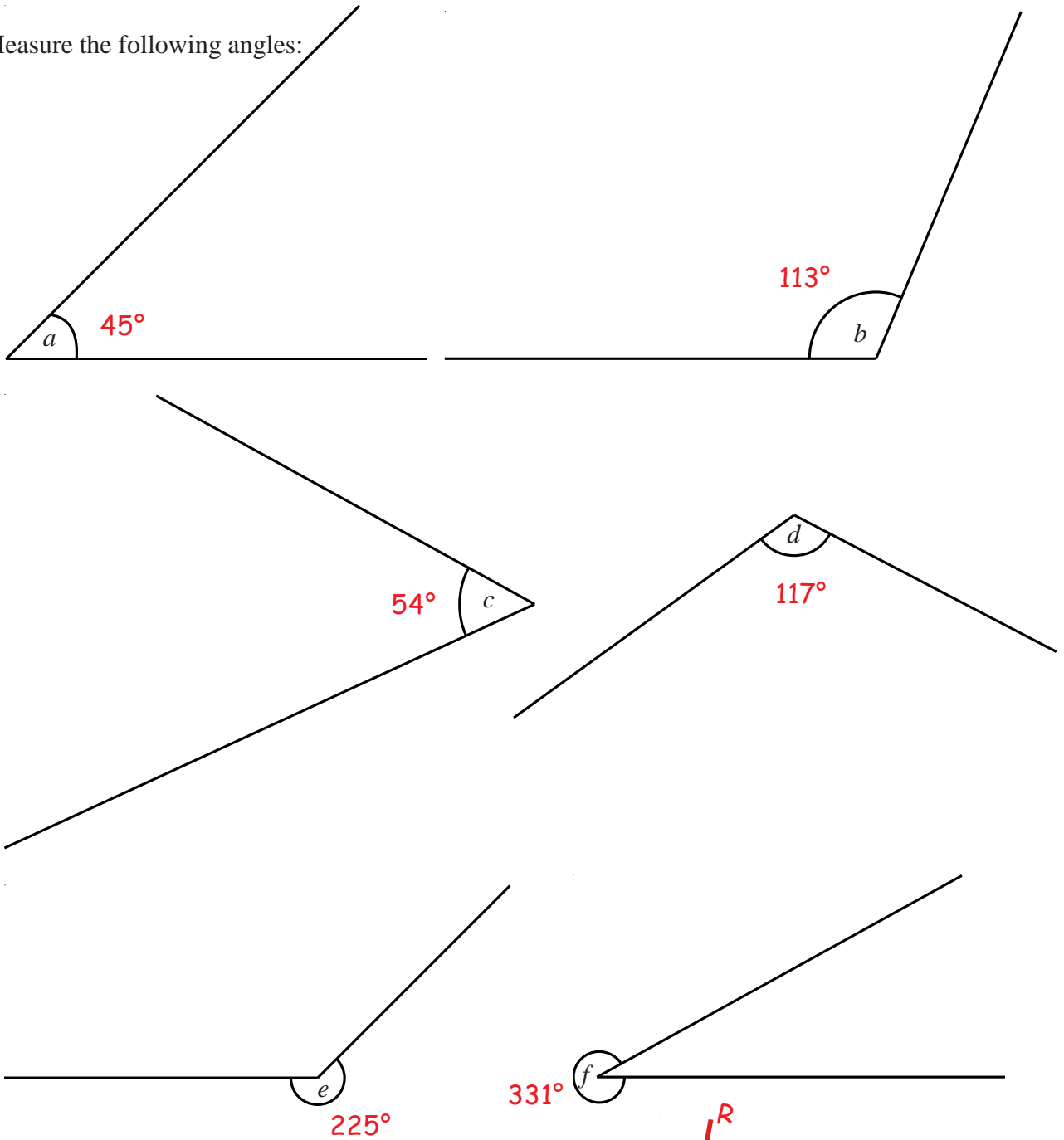
Work out the coordinates of B . **$(5, 0)$**

$$\begin{aligned} x & (2 + ?) \div 2 = 3.5 \\ y & (5 + ?) \div 2 = 2.5 \end{aligned}$$

Measuring and Drawing Angles

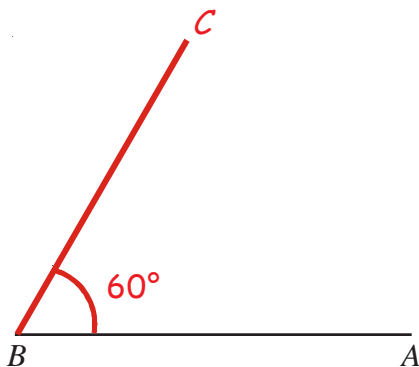


1) Measure the following angles:

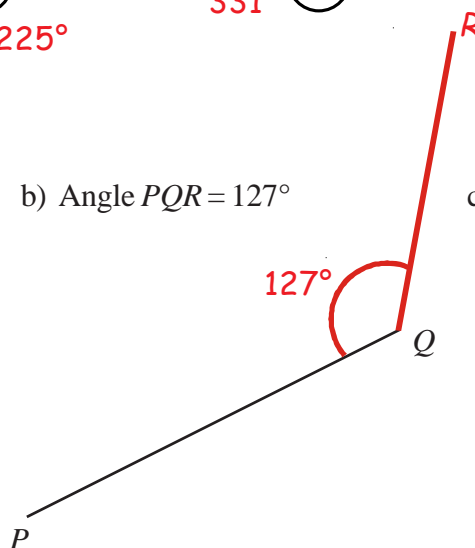


2) Draw the following angles:

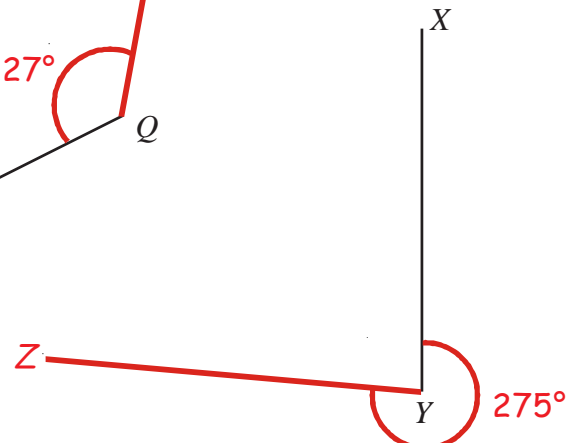
a) Angle $ABC = 60^\circ$



b) Angle $PQR = 127^\circ$

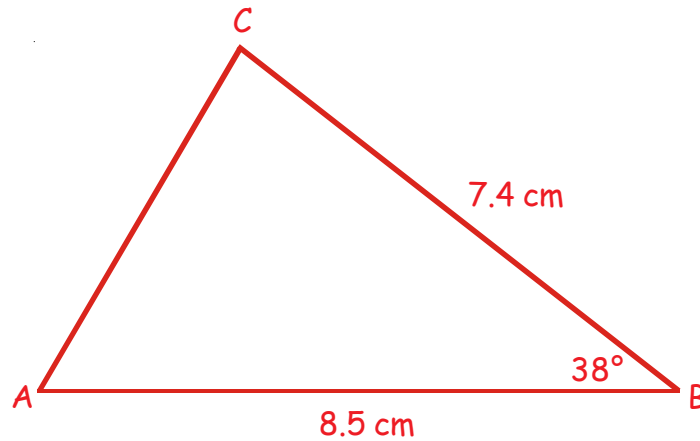


c) Angle $XYZ = 275^\circ$

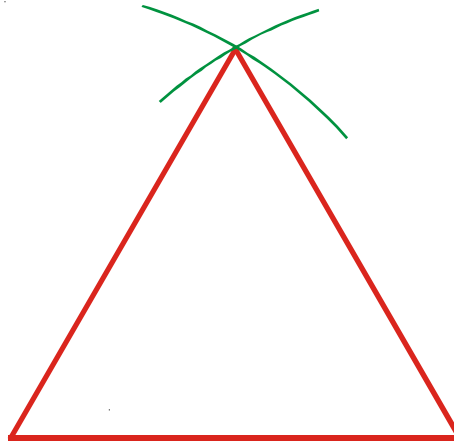


Drawing Triangles

- 1) The diagram shows a sketch of triangle ABC.

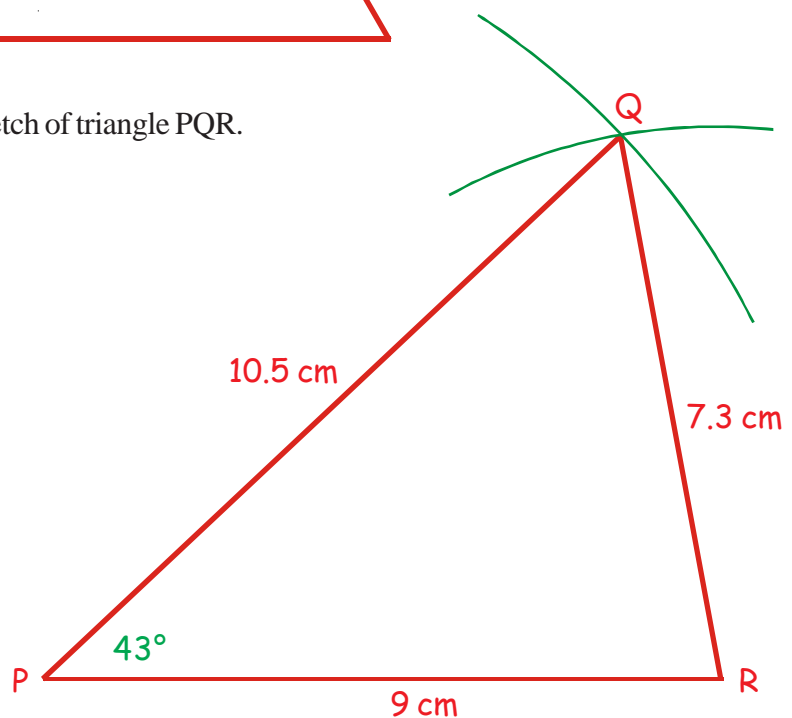


- a) Make an accurate drawing of triangle ABC.
b) Measure the size of angle A on your diagram. **Angle A = 59°**
- 2) Use ruler and compasses to **construct** an equilateral triangle with sides of length 6 centimetres.



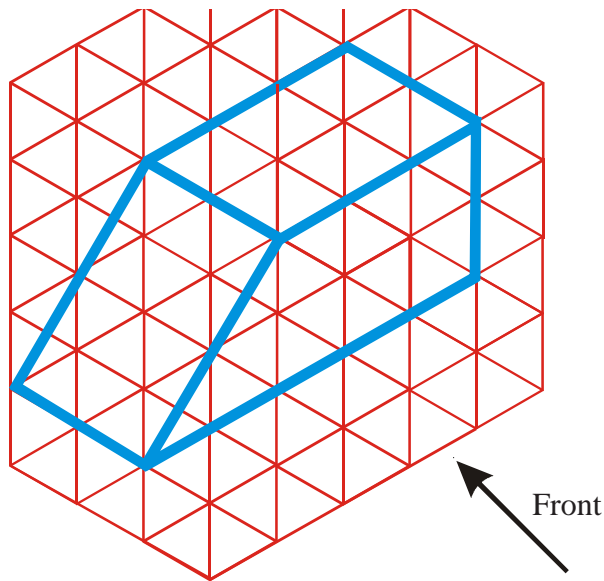
- 3) The diagram shows a sketch of triangle PQR.

Angle P = 43°

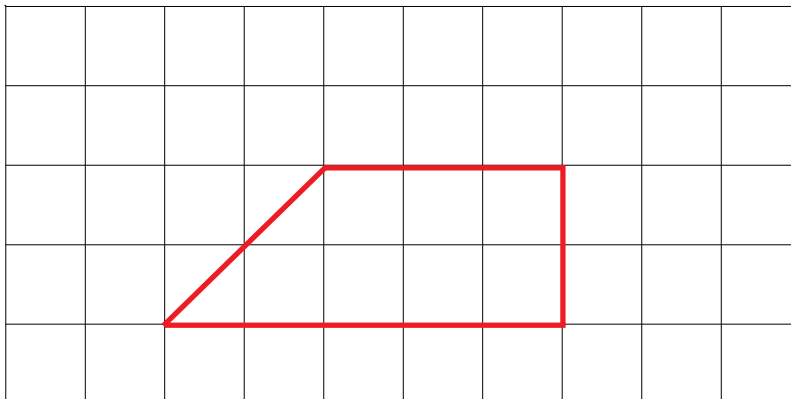




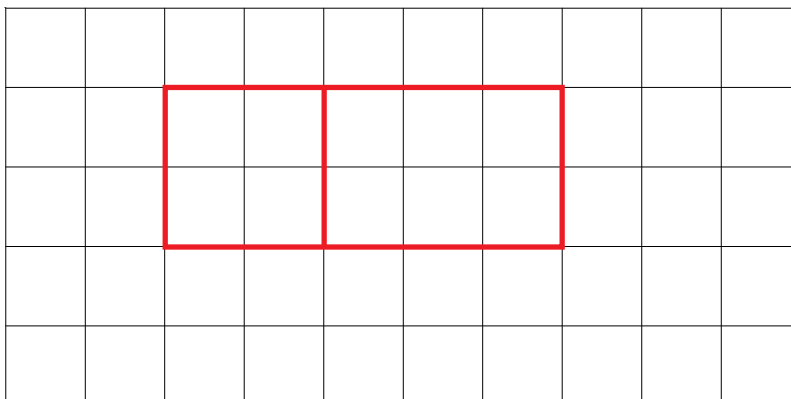
- 1) The diagram shows a prism drawn on an isometric grid.



- a) On the grid below, draw the front elevation of the prism from the direction marked by the arrow.

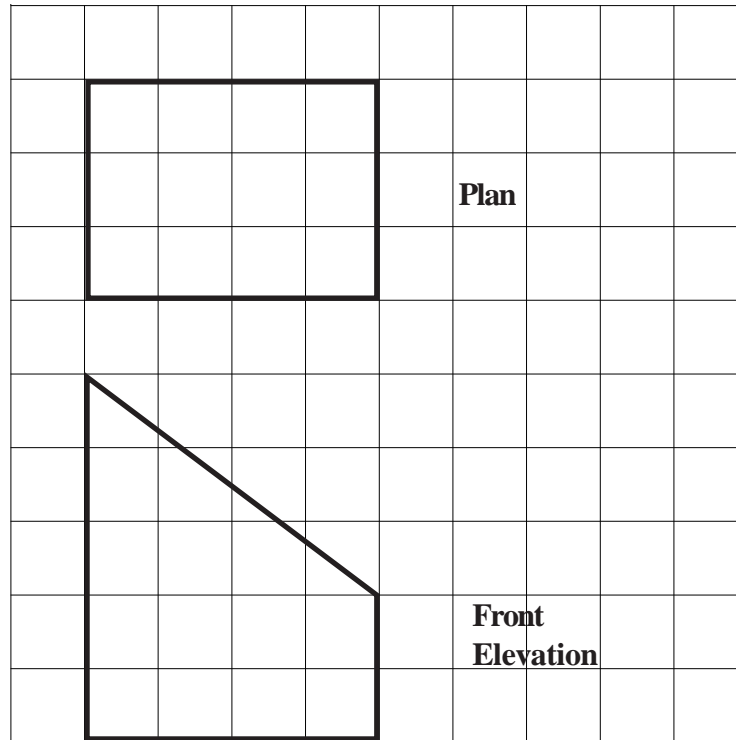


- b) On the grid below draw a plan of the prism.

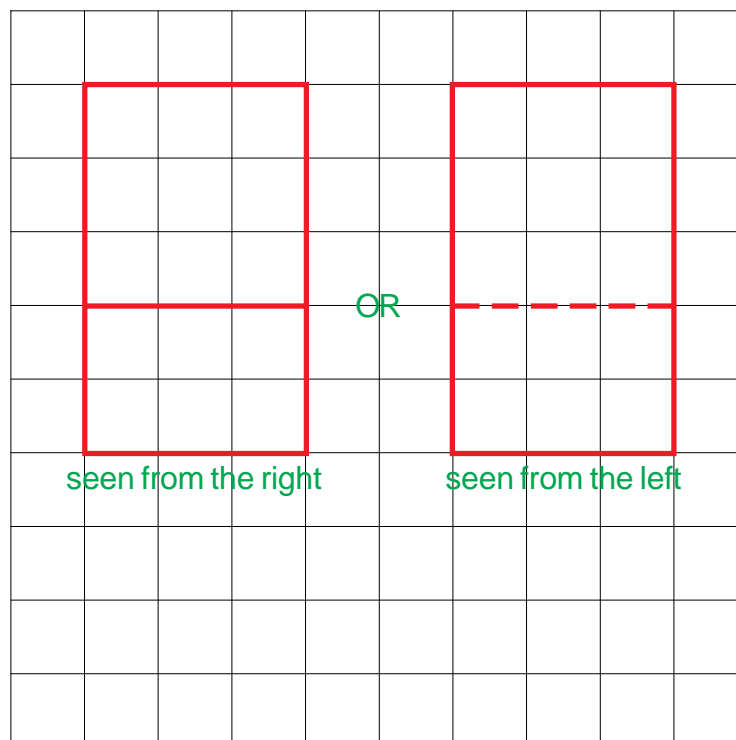




- 1) Here is the plan and front elevation of a prism.
The front elevation shows the cross section of the prism.

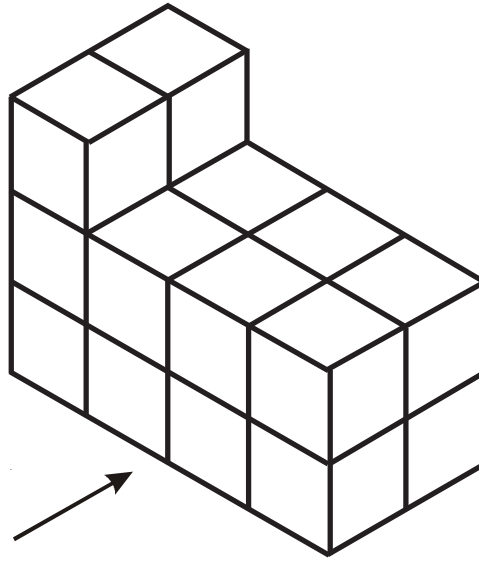


On the grid below, draw the side elevation of the prism.

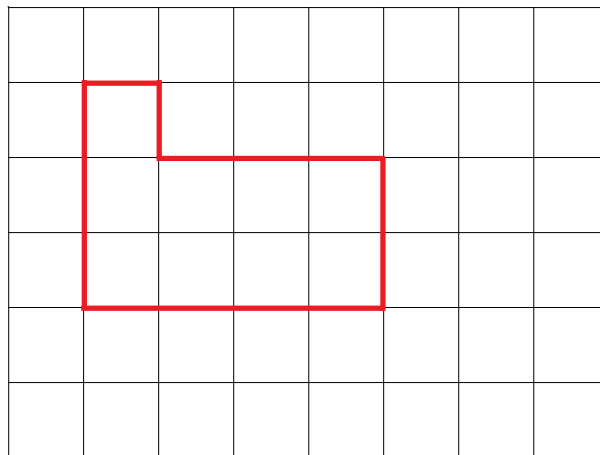




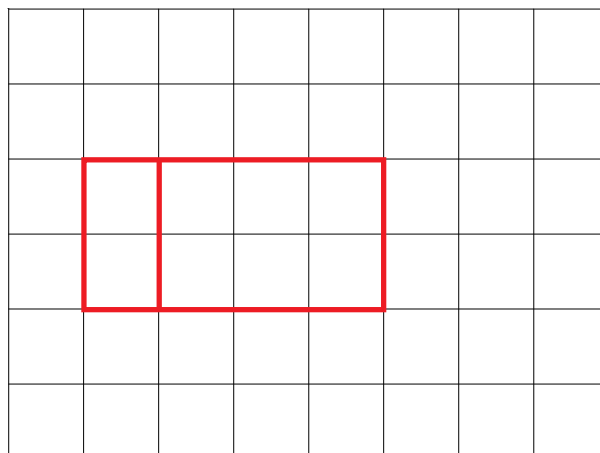
- 1) The diagram shows a solid prism made from centimetre cubes.



- a) On the centimetre square grid, draw the front elevation of the solid prism from the direction shown by the arrow.

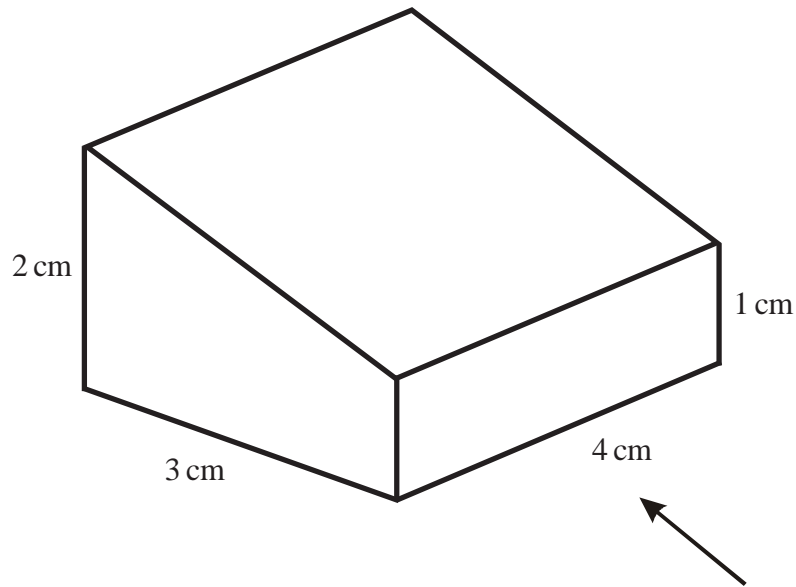


- b) On the centimetre square grid below, draw the plan of the solid prism.

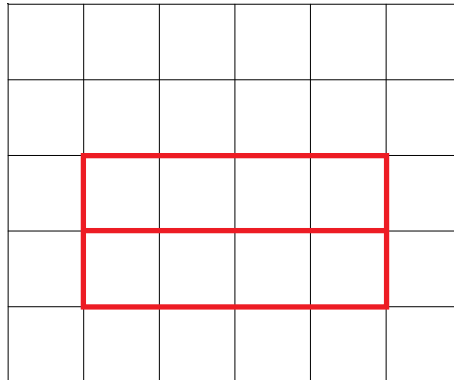




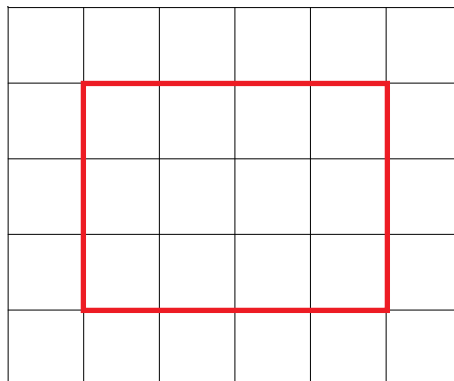
- 1) The diagram shows a solid prism.



- a) On the grid below, draw the front elevation of the prism from the direction of the arrow.



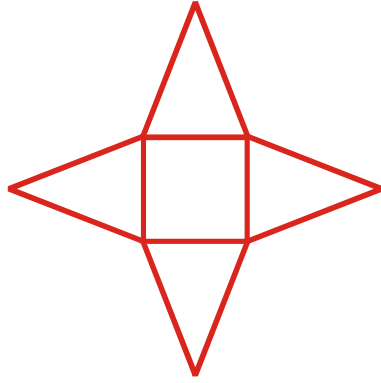
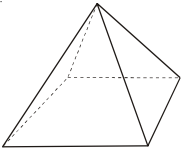
- b) On the grid below, draw the plan of the prism.



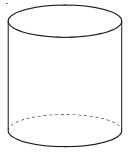
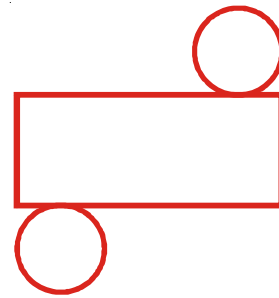
Nets

1) Sketch nets of these solids.

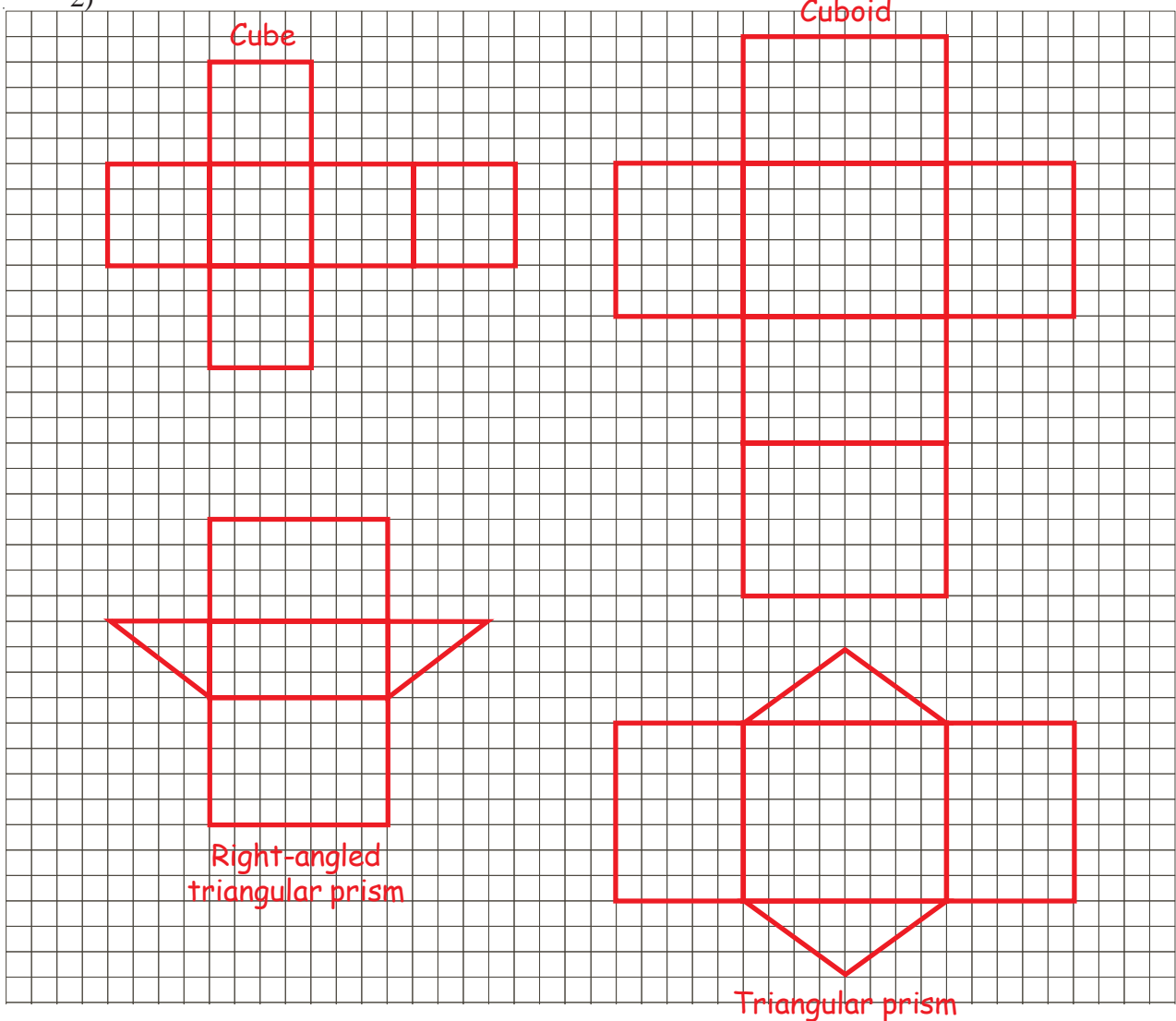
a)



b)



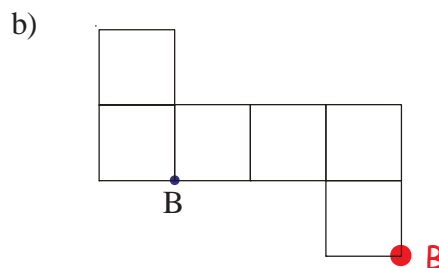
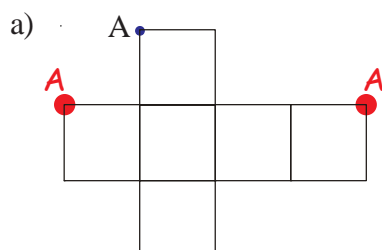
2)



3) The two nets, below, are folded to make cubes.

Two other vertices will meet at the the dot, A. Mark them with As.

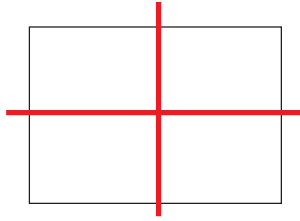
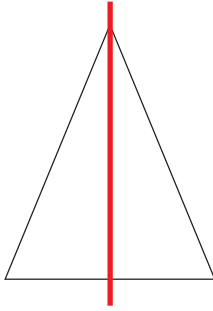
One other vertex will meet at the dot B. Mark it with B.



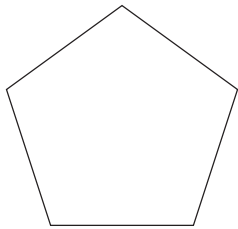
Symmetries



- 1) Draw all the lines of symmetry on the triangle and the rectangle.



- 2) What is the order of rotational symmetry of the two shapes below?

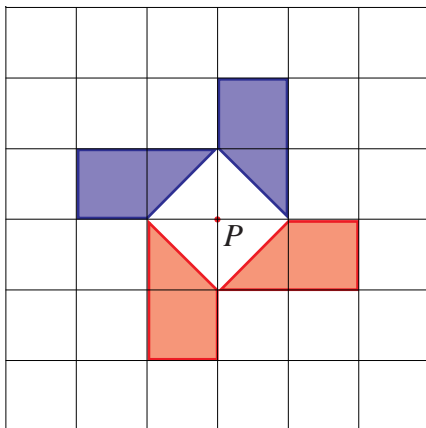


Rotational symmetry order 5

Rotational symmetry order 2



- 3) The diagram below, shows part of a shape.



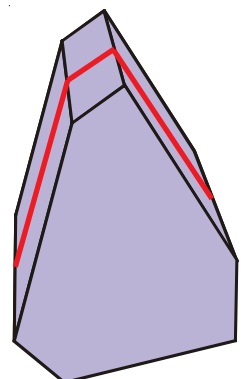
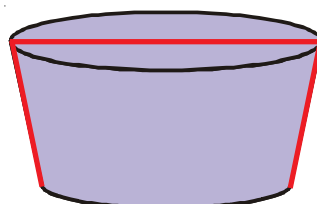
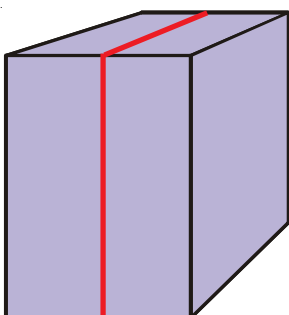
The shape has rotational symmetry of order 4 about point P .

Complete the shape.



- 4) On each of the shapes below, draw one plane of symmetry.

There are other answers for these two questions.





- 1) Tony wants to know which type of programme pupils in his class like watching on TV.
Design a suitable data collection sheet he could use to gather the information.

Type of programme	Tally	Frequency
Soap opera		
Reality TV		
Films		
Situation comedy		
Documentary		



- 2) Emma asked 20 people what was their favourite pet.
Here are their answers.

cat	cat	hamster	cat
mouse	hamster	cat	dog
dog	dog	snake	hamster
cat	cat	hamster	dog
cat	hamster	snake	cat

Design and complete a suitable data collection sheet that Emma could have used to collect and show this information.

Favourite pet	Tally	Frequency
Cat		8
Hamster		5
Mouse		1
Dog		4
Snake		2

Two-Way Tables



- 1) Billy has been carrying out a survey.
He asked 100 people the type of water they like to drink (still, sparkling or both).
Here are part of his results:

	Still	Sparkling	Both	Total
Male	26	21	6	53
Female	17	20	10	47
Total	43	41	16	100

- a) Complete the two-way table.
- b) How many males were in the survey? **53**
- c) How many females drink only still water? **17**
- d) How many people drink only sparkling water? **41**



- 2) 90 students each study one of three languages.
The two-way table shows some information about these students.

	French	German	Spanish	Total
Female	6	11	23	40
Male	14	7	29	50
Total	20	18	52	90

50 of the 90 students are male.
29 of the 50 male students study Spanish.

- a) Complete the two-way table.
- b) How many females study French? **6**
- c) How many people study Spanish? **52**



- 3) Karen asks 100 students if they like milk, plain or white chocolates best.
36 of the students are girls.
19 of these girls like milk chocolates best.
16 boys like white chocolates best.
8 out of the 24 students who like plain chocolates best are girls.
Work out the number of students who like milk chocolates the best. **51**

Pie Charts



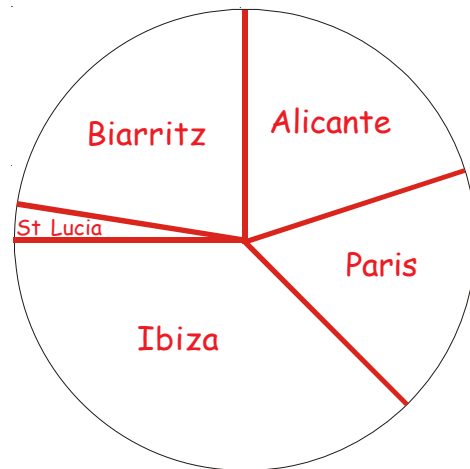
- 1) Patrick asked some of his colleagues which was their favourite holiday destination.
The table shows the results.

City	Frequency	Angle
Alicante	8 × 9	72°
Paris	7 × 9	63°
Ibiza	15 × 9	135°
St Lucia	1 × 9	9°
Biarritz	9 × 9	81°
	40	360°

$$360 \div ?$$

$$360 \div 40 = 9$$

Draw a pie chart to illustrate the information.



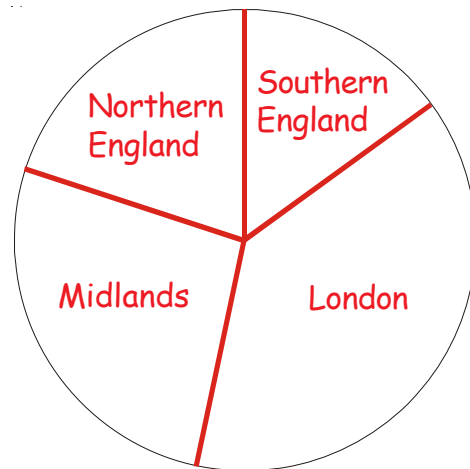
- 2) Brian asked 60 people which region their favourite rugby team came from.
The table shows the results.

Region	Frequency	Angle
Southern England	9 × 6	54°
London	23 × 6	138°
Midlands	16 × 6	96°
Northern England	12 × 6	72°
Total	60	360°

$$360 \div ?$$

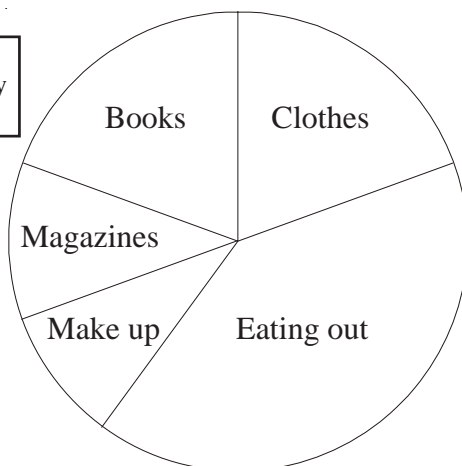
$$360 \div 60 = 6$$

Draw a pie chart to illustrate the information.



- 3) Sophie represents her monthly expenses using a pie chart.

Diagram accurately drawn



Numbers from her table have been rubbed out by mistake.

Use the pie chart to complete the table.

		Angle
Clothes	£35	70°
Eating out	£73	146°
Make up	£17	34°
Magazines	£20	40°
Books	£35	70°
Total	£180	360°

Scatter Graphs



- 1) The scatter graph shows some information about the marks of six students.

It shows each student's marks in Maths and Science.

The table below shows the marks for four more students.

Maths	22	8	17	26
Science	30	12	24	24

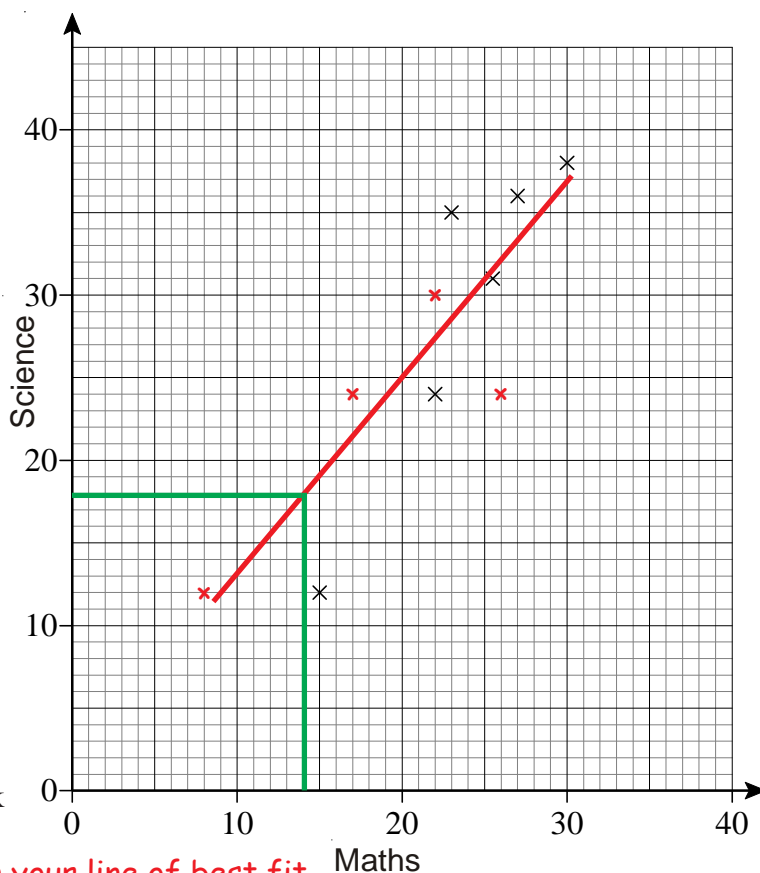
- On the scatter graph, plot the information from the table.
- Draw a line of best fit.
- Describe the correlation between the marks in Maths and the marks in Science.

There is a positive correlation

Another student has a mark of 18 in Science.

- Use the line of best fit to estimate the mark in Maths of this student.

My answer is 14. Yours will depend on your line of best fit.



- 2) The table below shows the average daily number of hours sleep of 10 children.

Age (years)	4	2	5	1	9	6	8	7	10	1.5
Number of hours sleep	14	13	12.5	15	10	12.5	10.8	12	11	14

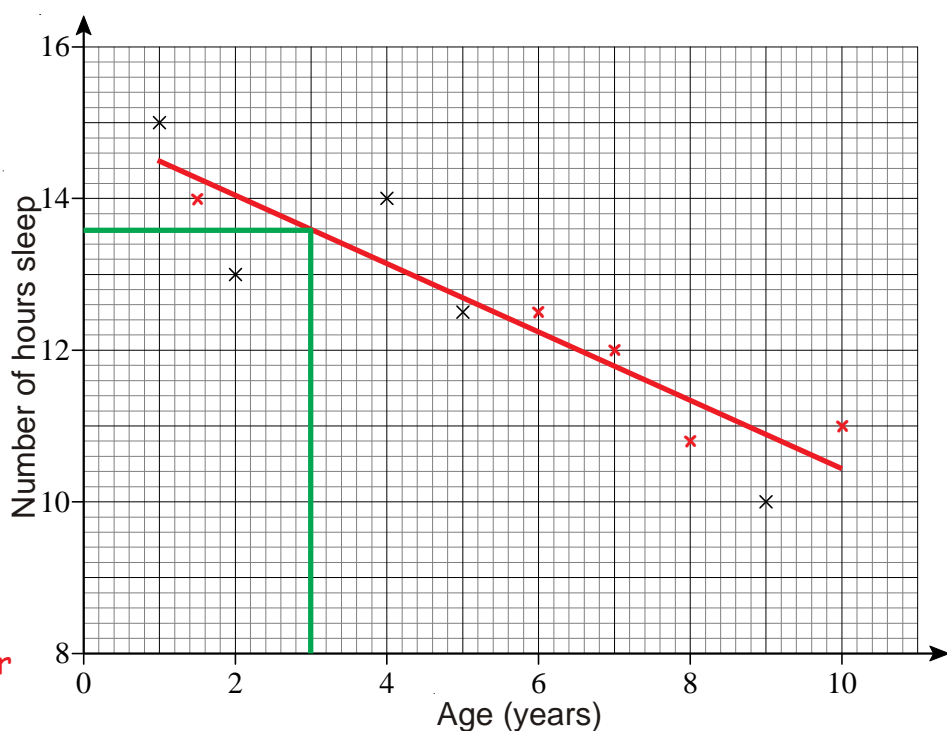
The first five results have been plotted on the scatter diagram.

- Plot the next five points.
- Draw a line of best fit.

- Describe the relationship between the age of the children and their number of hours sleep per day.
- Use your scatter graph to estimate the number of hours sleep for a 3 year old child.

A negative correlation.

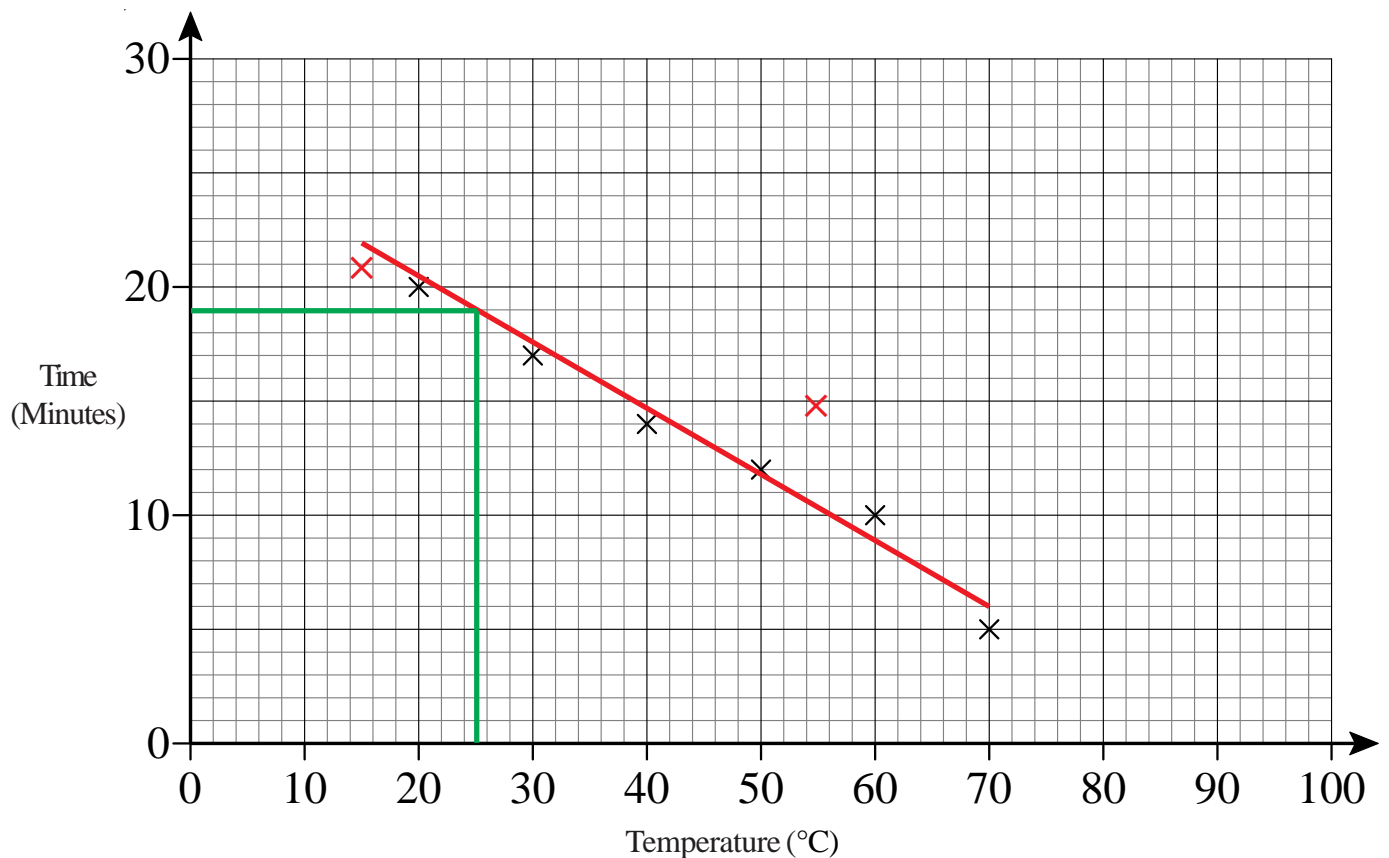
**My answer is 13.6
Yours will depend on your line of best fit.**



Scatter Graphs



- 1) Sue did an experiment to study the times, in minutes, it took 1 cm ice cubes to melt at different temperatures.
Some information about her results is given in the scatter graph.



The table shows the results from two more experiments.

Temperature (°C)	15	55
Time (Minutes)	21	15

- On the scatter graph, plot the results from the table.
- Describe the relationship between the temperature and the time it takes a 1 cm ice cube to melt. **Negative correlation**
- Find an estimate for the time it takes a 1 cm ice cube to melt when the temperature is 25 °C. **19 minutes (your answer will depend on your line of best fit)**

Sue's data cannot be used to predict how long it will take a 1 cm ice cube to melt when the temperature is 100 °C.

- Explain why. **Line of best fit would give a negative time or
You cannot draw and use a line of best fit which goes beyond the values.**

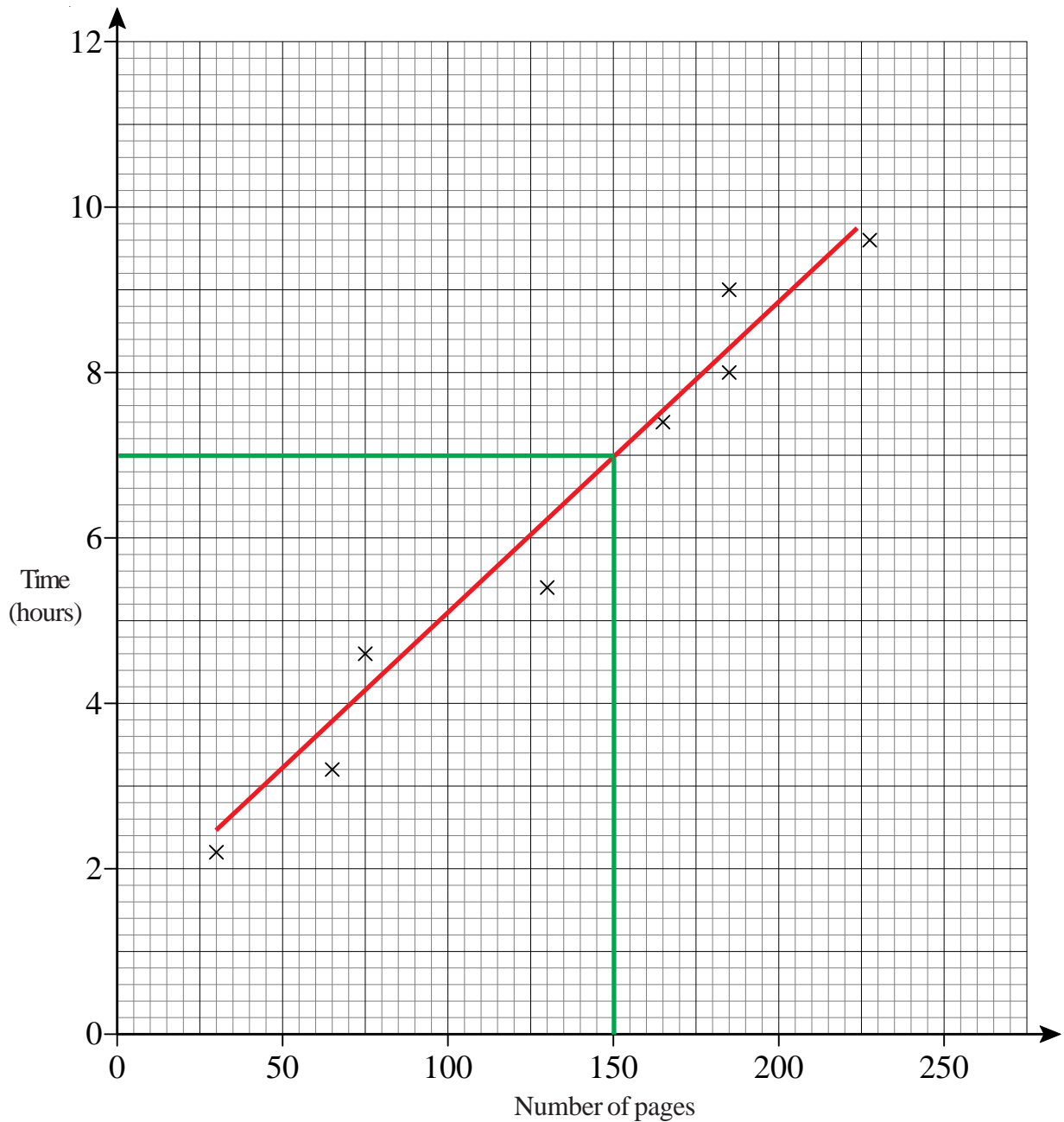
Scatter Graphs



- 1) Henry reads eight books.

For each book he recorded the number of pages and the time he took to read it.

The scatter graph shows information about his results.



- a) Describe the relationship between the number of pages in a book and the time Henry takes to read it. **Positive correlation**

Henry reads another book.

The book has 150 pages.

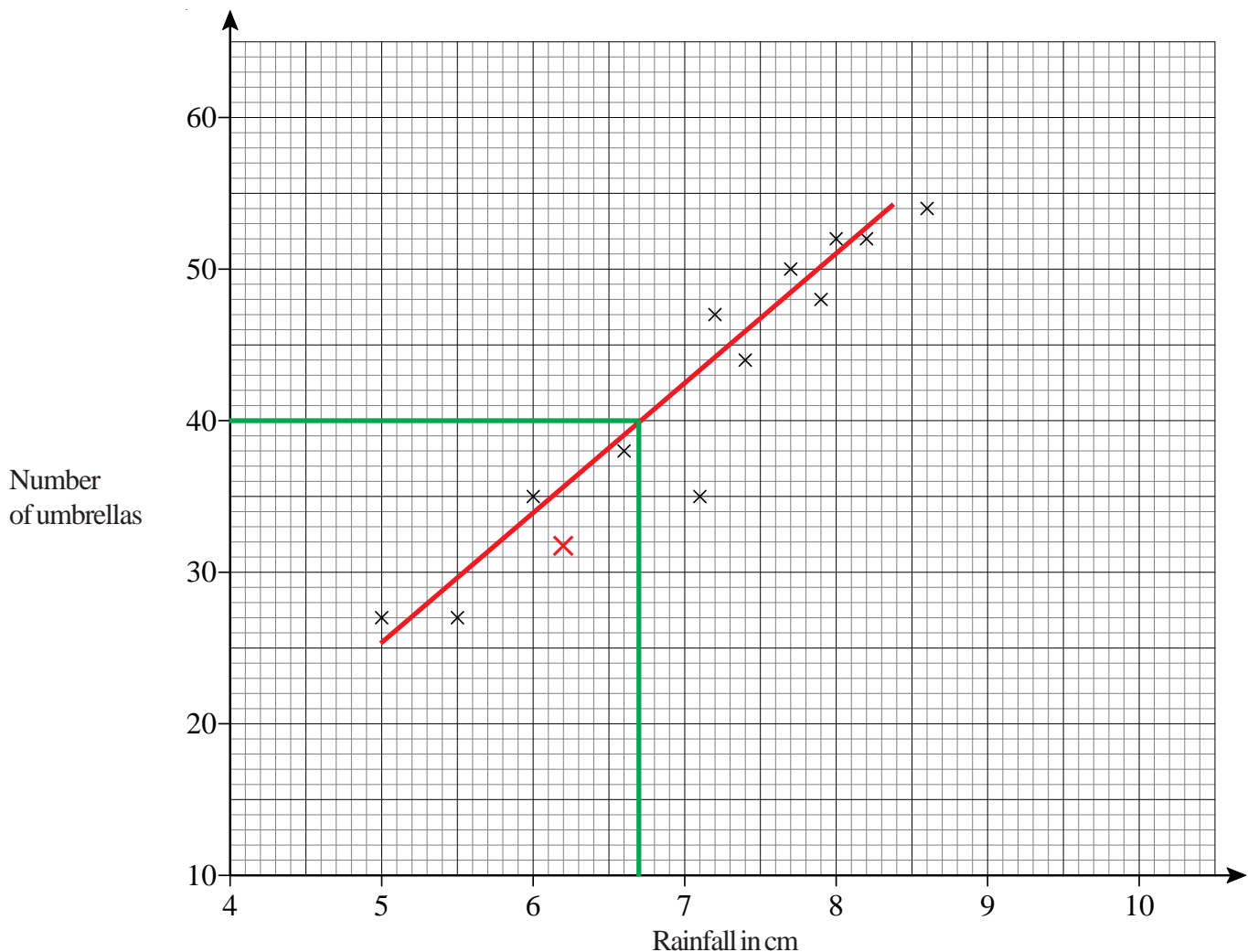
- b) Estimate the time it takes Henry to read it. **7 hours** (your answer will depend on your line of best fit)

Scatter Graphs



- 1) Mr Jones sells umbrellas.

The scatter graph shows some information about the number of umbrellas he sold and the rainfall, in cm, each month last year.



In January of this year, the rainfall was 6.2 cm.

During January, Mr Jones sold 32 umbrellas.

- a) Show this information on the scatter graph.

- b) What type of correlation does this scatter graph show? **Positive correlation**

In February of this year, Mr Jones sold 40 umbrellas.

- c) Estimate the rainfall for February. **6.7 cm** (your answer will depend on your line of best fit)

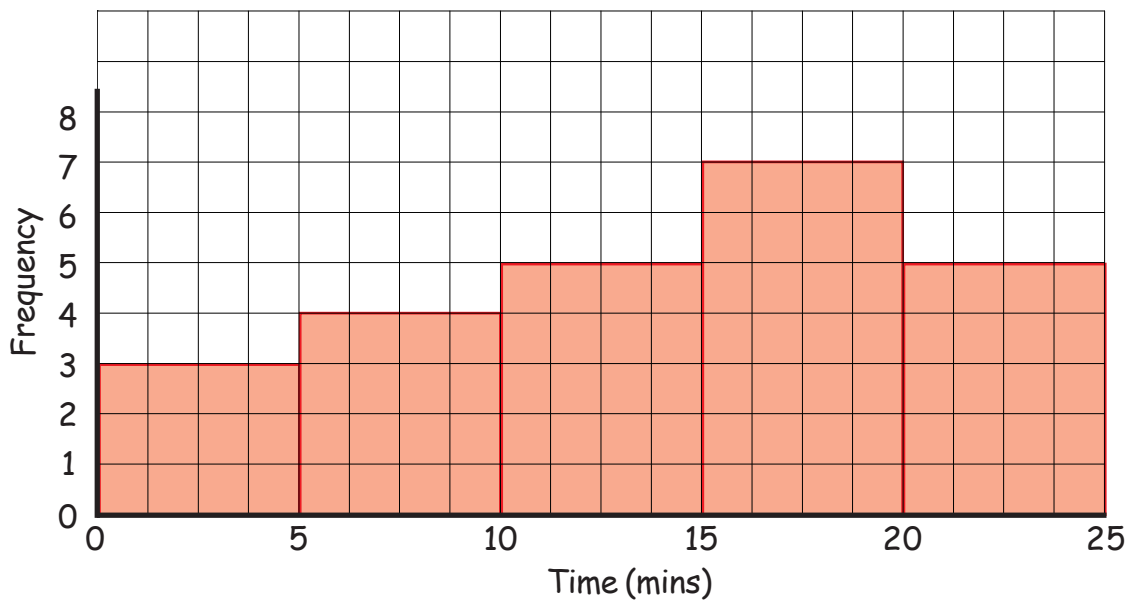
Frequency Diagrams



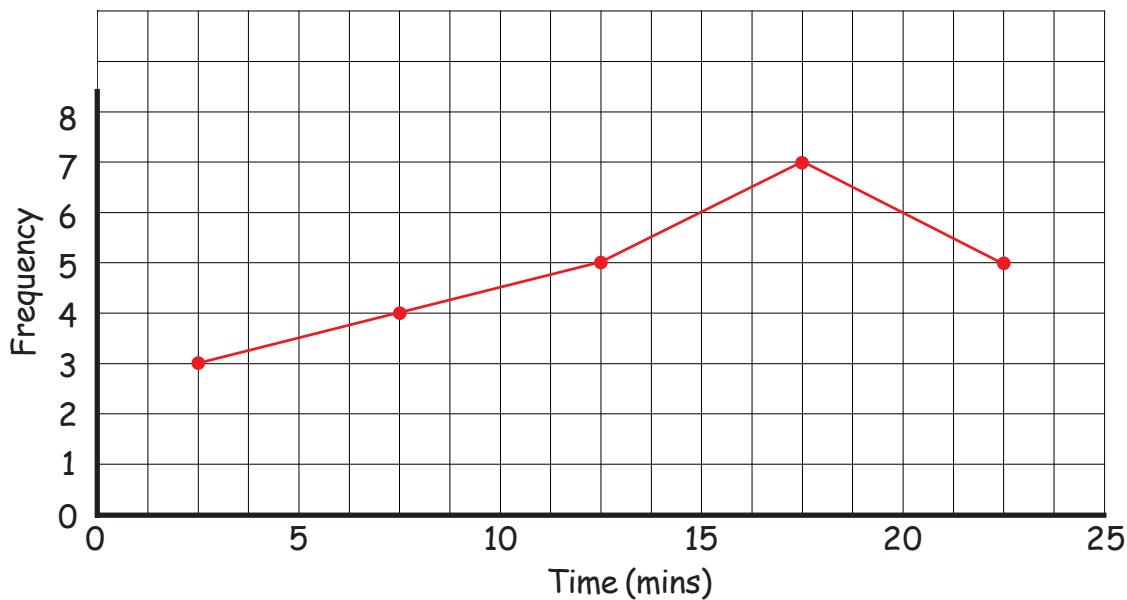
- 1) A class of pupils is asked to solve a puzzle.
The frequency table below shows the times taken by the pupils to solve the puzzle.

Time (t) in min	Frequency
$0 < t \leq 5$	3
$5 < t \leq 10$	4
$10 < t \leq 15$	5
$15 < t \leq 20$	7
$20 < t \leq 25$	5

- a) Draw a frequency diagram to show this information.



- b) Draw a frequency polygon to show this information.



Frequency Diagrams

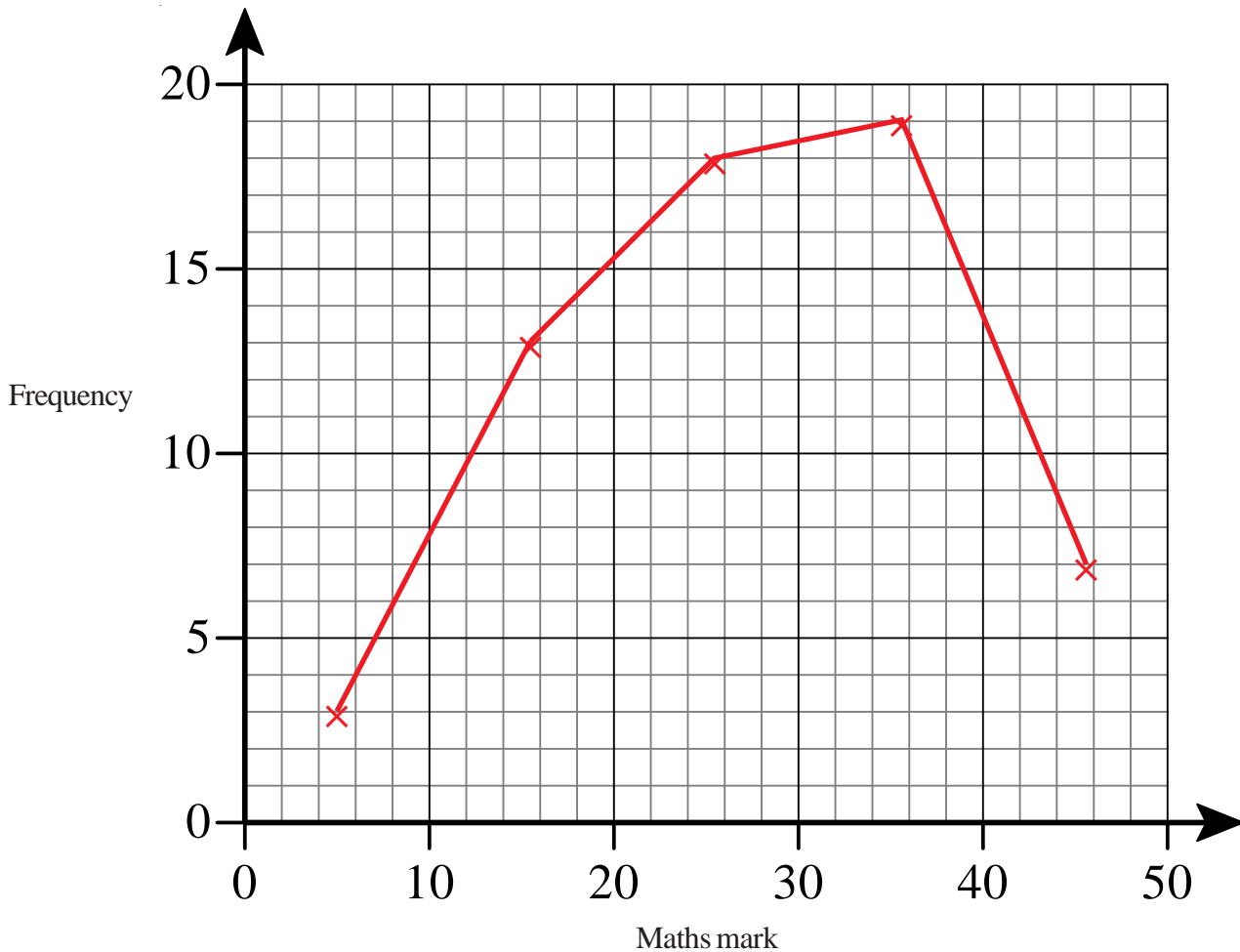


- 1) 60 students take a Maths test.
The test is marked out of 50.

This table shows information about students' marks.

	5	15.5	25.5	35.5	45.5
Maths mark	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50
Frequency	3	13	18	19	7

On the grid, draw a frequency polygon to show this information.



Frequency Diagrams

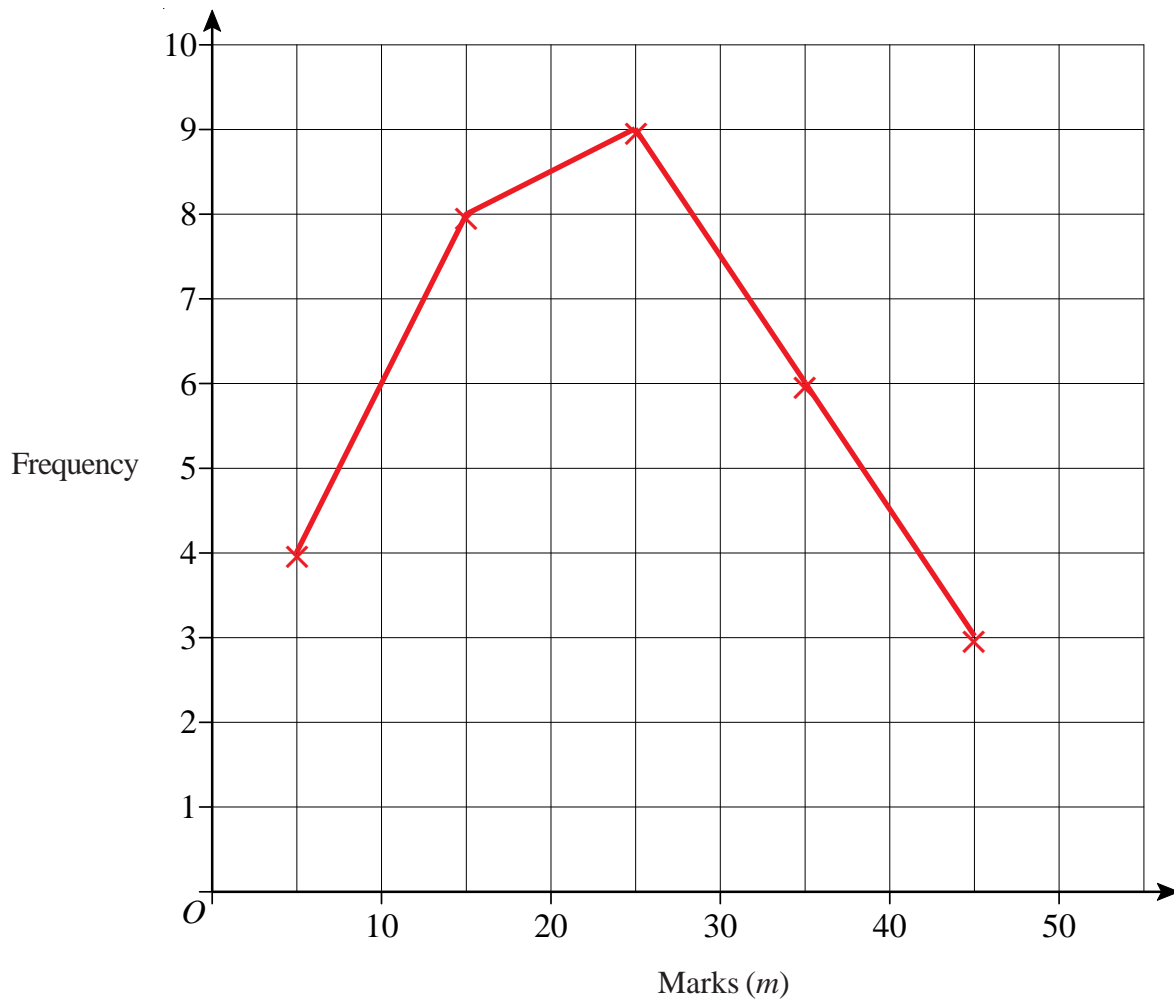


- 1) 30 students took a test.

The table shows information about how many marks they gained in the test.

Marks (m)	Frequency
$0 < m < 10$ 5	4
$10 < m < 20$ 15	8
$20 < m < 30$ 25	9
$30 < m < 40$ 35	6
$40 < m < 50$ 45	3

On the grid, draw a frequency polygon for this information.



Frequency Diagrams



- 1) The table shows some information about the ages, in years, of 60 people.

Age (in years)	Frequency
0 to 9 4.5	5
10 to 19 14.5	14
20 to 29 24.5	12
30 to 39 34.5	9
40 to 49 44.5	7
50 to 59 54.5	3
60 to 69 64.5	10

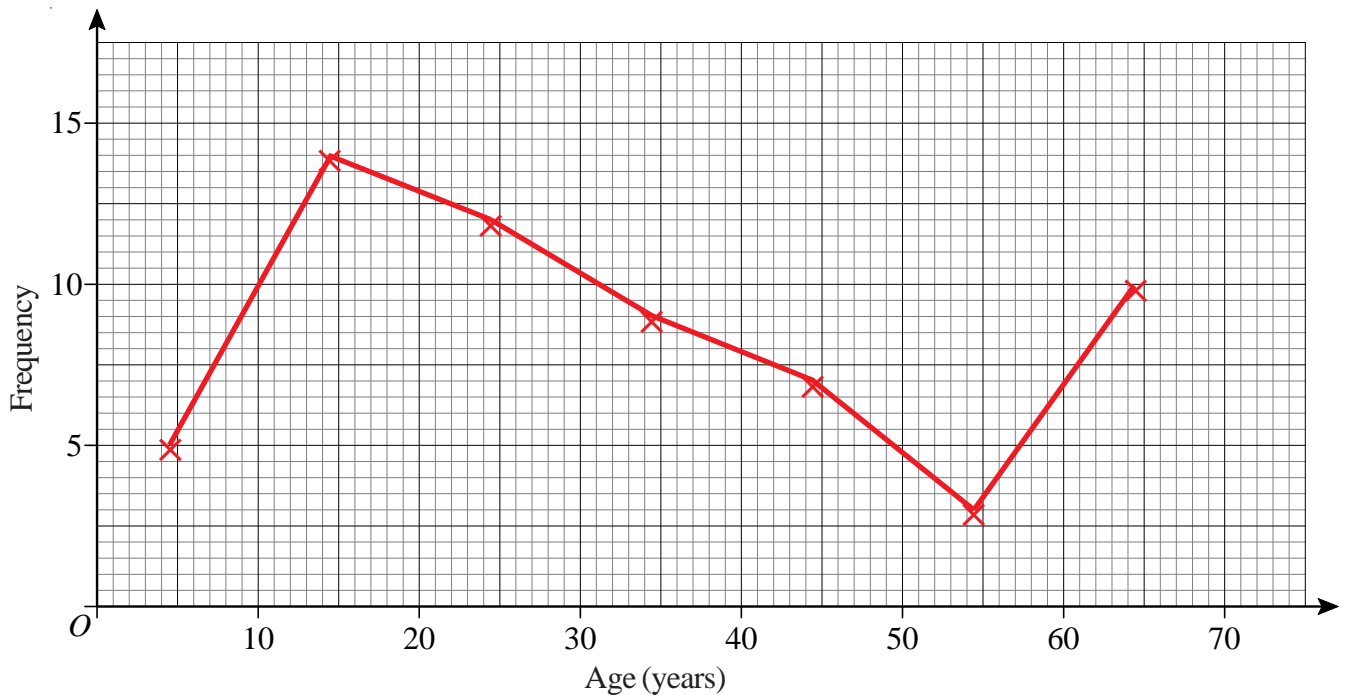
- a) Write down the modal class. 10 to 19

Colin says

‘The median lies in the class 30 to 39’

Colin is wrong.

- b) Explain why. The median lies in the 20 to 29 class.



- c) On the grid, draw a frequency polygon for the information in the table.

Stem and Leaf Diagrams



- 1) 16 students sat a Maths test.
Here are their marks:

64 72 39 45 49 67 73 50
73 44 55 77 51 62 64 79

39, 44, 45, 49, 50, 51, 55, 62, 64, 64, 67, 72, 73, 73, 77, 79

Draw a stem and leaf diagram to show this information.

```

3 | 9
4 | 4 5 9
5 | 0 1 5
6 | 2 4 4 7
7 | 2 3 3 7 9
  
```

Key: 3|9 means 39 marks



- 2) Pat is carrying out a survey on how tall pupils in her class are.
Here are their heights in cm:

173 162 170 169 163 173 156
159 161 168 177 182 170 169

156, 159, 161, 162, 163, 168, 169, 169, 170, 170, 173, 173, 177, 182

Draw a stem and leaf diagram to show this information.

```

15 | 6 9
16 | 1 2 3 8 9 9
17 | 0 0 3 3 7
18 | 2
  
```

Key: 15|6 means 156 cm



- 3) The stem and leaf diagram, below, shows information about the times, in minutes, it takes a group of people to eat their breakfast.

```

0 | 5 7 9
1 | 0 0 5 8 8
2 | 0 2 3 5 7
3 | 2 5
  
```

Key: 1|0 represents 10 minutes.

- a) How many people are in the group? **15 people**
b) How many people spend 15 minutes or more eating their breakfast? **10 people**
c) Find the median time that it took to eat breakfast. **18 minutes**

Stem and Leaf Diagrams



- 1) Here are the ages, in years, of 15 office workers.

34	54	42	27	36
23	31	41	50	35
44	29	45	45	53

Draw an ordered stem and leaf diagram to show this information.
You must include a key.

2	3	7	9		
3	1	4	5	6	
4	1	2	4	5	5
5	0	3	4		

Key: 2|3 means 23 years old



- 2) Tony collected some information about the heights of 21 plants.
This information is shown in the stem and leaf diagram.

1	1	1	3	5			
2	3	4	5	9	9		
3	0	2	3	3	5	7	8
4	1	2	4	8	9		

Key 3|6 means 36 mm

Find the median. 32 mm



- 3) Here are the ages, in years, of 16 people.

36	47	18	22	36	28	45	30
38	27	41	16	36	48	28	21

- a) Draw an ordered stem and leaf diagram to show this information.
You must include a key.

1	6	8			
2	1	2	7	8	8
3	0	6	6	6	8
4	1	5	7	8	

Key: 1|6 means 16 yrs old

- b) Find the median age. 33 years old

Stem and Leaf Diagrams



- 1) Here are the weights in grams, to the nearest gram, of 15 eggs.

34	45	42	54	50
37	61	44	56	52
63	57	51	37	64

Draw an ordered stem and leaf diagram to show this information.
You must include a key.

3	4	7	7				
4	2	4	5				
5	0	1	2	4	6	7	
6	1	3	4				

Key: 3|4 means 34 g



- 2) Here are the weights, in grams, of 16 eggs.

46	44	50	52	45	60	54	61
59	55	56	47	53	61	57	58

Draw an ordered stem and leaf diagram to show this information.
You must include a key.

4	4 5 6 7
5	0 2 3 4 5 6 7 8 9
6	0 1 1

Key: 4|4 means 44 g



- 3) Sue plays golf.
Here are 15 of her scores.

68	75	81	85	79
81	90	76	92	83
72	82	81	77	72

6	8					
7	2	2	5	6	7	9
8	1	1	1	2	3	5
9	0	2				

Draw an ordered stem and leaf diagram to show this information.
You must include a key.

Key: 6|8 means a score of 68

Simple Probability



- 1) A blue dice and a red dice are rolled.

a) How many different outcomes are possible? **36**

b) List the possible outcomes.

1,1 1,2 1,3 1,4 1,5 1,6
2,1 2,2 2,3 2,4 2,5 2,6
3,1 3,2 3,3 3,4 3,5 3,6
4,1 4,2 4,3 4,4 4,5 4,6
5,1 5,2 5,3 5,4 5,5 5,6
6,1 6,2 6,3 6,4 6,5 6,6



- 2) Three coins are flipped.

One possible outcome is H, H, H

List all the outcomes.

**HHH, HHT, HTH, THH
TTH, THT, HTT, TTT**



- 3) If five coins are flipped, how many possible outcomes are there? **32**



- 4) A dice is rolled and a coin is flipped. **1H, 2H, 3H, 4H, 5H, 6H**

List all the possible outcomes. **1T, 2T, 3T, 4T, 5T, 6T**



- 5) A box contains 3 grey counters and 2 white counters.

A counter is taken from the box at random.

What is the probability of choosing a white counter? **$\frac{2}{5}$**



- 6) There are 3 blue counters, 5 red counters and 7 green counters in a bag.

A counter is taken from the bag at random.

a) What is the probability that a green counter will be chosen? **$\frac{7}{15}$**

b) What is the probability that a blue or red counter will be chosen? **$\frac{8}{15}$**



- 7) In a class there are 10 boys and 15 girls.

A teacher chooses a student at random from the class.

Eric says that the probability a boy will be chosen is 0.5 because a student can be either a boy or a girl.

Jenny says that Eric is wrong.

Decide who is correct - Eric or Jenny - giving reasons for your answer.

Jenny is correct.

The probability of choosing a boy is $\frac{10}{25}$



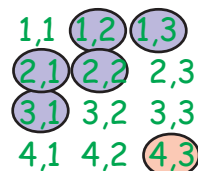
- 8) Spinner A has numbers 1 to 4 on it.

Spinner B has numbers 1 to 3 on it.

Both spinners are spun and the numbers on each are added together to give a score.

What is the probability that the score will be

- a) 7? **$\frac{1}{12}$**
b) 3 or 4? **$\frac{5}{12}$**



Mutually Exclusive Events



- 1) If the probability of passing a driving test is 0.54,
what is the probability of failing it? **0.46**



- 2) The probability that a football team will win their next game is $\frac{2}{11}$.
The probability they will lose is $\frac{3}{11}$.
What is the probability the game will be a draw? **$\frac{6}{11}$**



- 3) On the school dinner menu there is only ever one of four options.
Some of the options are more likely to be on the menu than others.
The table shows the options available on any day, together with three of the probabilities.

Food	Curry	Sausages	Fish	Casserole
Probability	0.36	0.41	0.14	0.09

- a) Work out the probability of the dinner option being Fish. **0.14**
b) Which option is most likely? **Sausages**
c) Work out the probability that it is a Curry or Sausages on any particular day. **0.77**
d) Work out the probability that it is **not** Casserole. **0.91**



- 4) Julie buys a book every week.
Her favourite types are Novel, Drama, Biography and Romance.
The table shows the probability that Julie chooses a particular type of book.

Type of book	Novel	Drama	Biography	Romance
Probability	0.24	0.16	x	x

- a) Work out the probability that she will choose a Novel or a Drama. **0.4**
b) Work out the probability that she will choose a Biography or a Romance. **0.6**

The probability that she will choose a Biography is the same as the probability she will choose a Romance.

- c) Work out the probability that she will choose a Biography. **0.3**

Overview of Percentages



- 1) Find the following to the nearest penny:
- a) 23% of £670 **£154.10**
 - b) 12% of £580 **£69.60**
 - c) 48% of £64 **£30.72**
 - d) 13% of £7.50 **£0.98**
 - e) 87% of £44 **£38.28**
 - f) 15.7% of £7000 **£1099**
 - g) 23.8% of £980 **£233.24**
 - h) 34% of £16.34 **£5.56**
 - i) 48.6% of £971.26 **£472.03**
 - j) 78.24% of £12.82 **£10.03**
 - k) 42.15% of £7876.42 **£3319.91**
 - l) 0.57% of £60000 **£342**



- 2) Find the following:
- a) 10% of £700 **£70**
 - b) 10% of £400 **£40**
 - c) 10% of £350 **£35**
 - d) 10% of £530 **£53**
 - e) 10% of £68 **£6.80**
 - f) 10% of £46 **£4.60**
 - g) 10% of £6.50 **£0.65**
 - h) 10% of £12.20 **£1.22**
 - i) 20% of £600 **£120**
 - j) 30% of £900 **£270**
 - k) 60% of £800 **£480**
 - l) 20% of £650 **£130**
 - m) 40% of £320 **£128**
 - n) 15% of £300 **£45**
 - o) 15% of £360 **£54**
 - p) 65% of £12000 **£7800**
 - q) 45% of £64 **£28.80**
 - r) 85% of £96 **£81.60**
 - s) 17.5% of £800 **£140**
 - t) 17.5% of £40 **£7**
 - u) 17.5% of £8.80 **£1.54**



- 3) Change the following to percentages, giving all answers to 1 decimal place:
- a) 6 out of 28 **21.4%**
 - b) 18 out of 37 **48.6%**
 - c) 42 out of 83 **50.6%**
 - d) 24 out of 96 **25%**
 - e) 73 out of 403 **18.1%**
 - f) 234 out of 659 **35.5%**
 - g) 871 out of 903 **96.5%**
 - h) 4.7 out of 23 **20.4%**
 - i) 6.9 out of 79 **8.7%**
 - j) 14.8 out of 23.6 **62.7%**
 - k) 65.8 out of 203.7 **32.3%**



- 4) Change the following to percentages:
- a) 46 out of 100 **46%**
 - b) 18 out of 50 **36%**
 - c) 7 out of 25 **28%**
 - d) 23 out of 25 **92%**
 - e) 9 out of 20 **45%**
 - f) 16 out of 20 **80%**
 - g) 7 out of 10 **70%**
 - h) 9.5 out of 10 **95%**
 - i) 10 out of 40 **25%**
 - j) 16 out of 40 **40%**
 - k) 30 out of 40 **75%**
 - l) 12 out of 40 **30%**
 - m) 28 out of 80 **35%**
 - n) 32 out of 80 **40%**
 - o) 60 out of 80 **75%**
 - p) 3 out of 5 **60%**
 - q) 4 out of 5 **80%**
 - r) 15 out of 75 **20%**
 - s) 24 out of 75 **32%**
 - t) 30 out of 75 **40%**



- 5) A shop gives a discount of 20% on a magazine that usually sells for £2.80. Work out the discount in pence. **56p**



- 6) A television costs £596 plus VAT at 17.5%.
Work out the cost of the television including VAT. **£700.30**



- 7) Peter has 128 trees in his garden.
16 of the trees are pear trees.
What percentage of the trees in his garden are pear trees? **12.5%**



- 8) Jane scored 27 out of 42 in a Maths test and 39 out of 61 in a Science test.
What were her percentages in both subjects to 1 decimal place? **Maths 64.3%**
Sci 63.9%



- 9) In class 9A there are 7 girls and 18 boys.
What percentage of the class are girls? **28%**



- 10) A shop decides to reduce all the prices by 15%.
The original price of a pair of trainers was £70. How much are they after the reduction? **£59.50**
- 11) VAT at 17.5% is added to the price of a car. Before the VAT is added it cost £18000.
How much does it cost with the VAT? **£21150**





- 1) The normal price of a dog basket is £20.
In a sale the price of the dog basket is reduced by 15%.
Work out the sale price of the dog basket. **£17**



- 2) Tony bought a car.
The total cost of the car was £6000 plus VAT at 17½%.
Tony paid £3000 when he got the car.
He paid the rest of the total cost of the car in 10 equal monthly payments.
Work out the cost of each monthly payment. **£405**



- 3) Jill bought a car.
The total cost of the car was £8000 plus VAT at 17½%.
Jill paid £3400 when she got the car.
She paid the rest of the total cost of the car in 12 equal monthly payments.
Work out the cost of each monthly payment. **£500**



- 4) The cost of a radio is the list price plus VAT at 17.5%.
The list price of the radio is £320.
Work out the cost of the radio. **£376**



- 5) A computer costs £460 plus 17.5% VAT.
Calculate the total cost of the computer. **£540.50**



- 6) Work out £168 as a percentage of £700. **24%**



- 7) A car tyre costs £90 plus VAT at 17.5%.
Work out the total cost of the tyre. **£105.75**



- 8) Kate got 9 out of 40 in a test.
Write 9 out of 40 as a percentage. **22.5%**

Increase/Decrease by a Percentage



1) Increase:

a) 500 by 10%
550

$$10\% = 50$$

$$500 + 50$$

c) 80 by 15%
92

$$10\% = 8, 5\% = 4$$

$$80 + 8 + 4$$

b) 320 by 10%
352

$$10\% = 32$$

$$320 + 32$$

d) 75 by 20%
90

$$10\% = 7.5, 20\% = 15$$

$$75 + 15$$



2) Decrease:

a) 400 by 10%
360

$$10\% = 40$$

$$400 - 40$$

c) 140 by 15%
119

$$10\% = 14, 5\% = 7$$

$$140 - 14 - 7$$

b) 380 by 10%
342

$$10\% = 38$$

$$380 - 38$$

d) 35 by 20%
28

$$10\% = 3.5, 20\% = 7$$

$$35 - 7$$



3) The price of a laptop is increased by 15%.
The old price of the laptop was £300.
Work out the new price. **£345**

$$10\% = 30, 5\% = 15$$

$$300 + 30 + 15 = 345$$



4) The price of a £6800 car is reduced by 10%.
What is the new price? **£6 120**

$$10\% = 680$$

$$6800 - 680 = 6120$$



5) Increase:

a) 65 by 12% **72.8**

$$\frac{112}{100} \times 65$$

c) 600 by 17.5% **705**

$$\frac{117.5}{100} \times 600$$

b) 120 by 23% **147.6**

$$\frac{123}{100} \times 120$$

d) 370 by 17.5% **434.75**

$$\frac{117.5}{100} \times 370$$



6) Decrease:

a) 42 by 15% **35.7**

$$\frac{85}{100} \times 42$$

c) 52 by 8.5% **47.58**

$$\frac{91.5}{100} \times 52$$

b) 79 by 12% **69.52**

$$\frac{88}{100} \times 79$$

d) 8900 by 18% **7 298**

$$\frac{82}{100} \times 8900$$



7) The price of a mobile phone is £78.40 plus VAT.
VAT is charged at a rate of 17.5%.
What is the total price of the mobile phone? **£92.12**

$$\frac{117.5}{100} \times 78.40$$



8) In a sale, normal prices are reduced by 7%.
The normal price of a camera is £89.
Work out the sale price of the camera. **£82.77**

$$\frac{93}{100} \times 89$$



9) A car dealer offers a discount of 20% off the normal price of a car, for cash.
Peter intends to buy a car which usually costs £6800.
He intends to pay by cash.
Work out how much he will pay. **£5 440**

$$\frac{80}{100} \times 6800$$



10) A month ago, John weighed 97.5 kg.
He now weighs 4.5% more.
Work out how much John now weighs. **101.9 kg**
Give your answer to 1 decimal place.

$$\frac{104.5}{100} \times 97.5$$



- 1) Tom and Julie share £48 in the ratio 5 : 3

Work out how much more money Tom gets than Julie gets. **£12**



- 2) Ben and Sue share £60 in the ratio 2 : 3

Work out how much each person gets. **Ben gets £24 and Sue gets £36**



- 3) A box contains milk chocolates and plain chocolates only.
The number of milk chocolates to the number of plain chocolates is in the ratio 2 : 1

There are 24 milk chocolates.

Work out the total number of chocolates. **36 chocolates altogether**



- 4) Andy, Ben and Claire share £54

Ben gets three times as much money as Andy.

Claire gets twice as much money as Ben.

How much money does Claire get? **£32.40**



- 5) There are some marbles in a bag.

18 of the marbles are blue.

12 of the marbles are red.

- a) Write down the ratio of the number of blue marbles to the number of red marbles.

Give your ratio in its simplest form. **3 : 2**

There are some apples and pears in a box.

The total number of apples and pears is 54.

The ratio of the number of apples to the number of pears is 1 : 5

- b) Work out the number of pears in the box. **45 pears**



- 6) A piece of string is 180 cm long.

Jim cuts it into three pieces in the ratio 2 : 3 : 4

Work out the length of the longest piece. **80 cm**



- 7) Sally is 13 years old.

Tammy is 12 years old.

Danny is 10 years old.

Sally, Tammy and Danny share £28 in the ratio of their ages.

Tammy gives a third of her share to her mother.

How much should Tammy now have? **£6.40**

35 shares

Sa	Ta	Da
13	12	10

£28 ÷ 35 = £0.80

Tammy: 12 × £0.80 = £9.60



- 1) List the first seven prime numbers. **2, 3, 5, 7, 11, 13, 17**



- 2) Express the following numbers as the product of their prime factors:

a) 12 **$2 \times 2 \times 3$**

b) 20 **$2 \times 2 \times 5$**

c) 30 **$2 \times 3 \times 5$**

d) 24 **$2 \times 2 \times 2 \times 3$**



- 3) Express the following numbers as the product of their prime factors:

a) 64 **$2 \times 2 \times 2 \times 2 \times 2 \times 2$**

b) 100 **$2 \times 2 \times 5 \times 5$**

c) 150 **$2 \times 3 \times 5 \times 5$**



- 4) Express the following numbers as the product of their prime factors:

a) 175 **$5 \times 5 \times 7$**

b) 192 **$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$**

c) 315 **$3 \times 3 \times 5 \times 7$**



- 5) The number 96 can be written as $2^m \times n$, where m and n are prime numbers.

Find the value of m and the value of n . **$m = 5$ and $n = 3$**

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$96 = 2^5 \times 3$



- 6) The number 75 can be written as $5^x \times y$, where x and y are prime numbers.

Find the value of x and the value of y . **$x = 2$ and $y = 3$**

$75 = 3 \times 5 \times 5$

$75 = 3 \times 5^2$



- 1) Find the Highest Common Factor of 16 and 24. **8**



- 2) Find the Highest Common Factor of 21 and 28. **7**



- 3) Find the Highest Common Factor of 60 and 150. **30**



- 4) Find the Highest Common Factor of 96 and 108. **12**



- 5) Find the Lowest Common Multiple of 20 and 60. **60**



- 6) Find the Lowest Common Multiple of 28 and 72. **504**



- 7) Find the Lowest Common Multiple of 70 and 240. **1680**



- 8) Find the Lowest Common Multiple of 35 and 55. **385**



- 9) (i) Write 42 and 63 as products of their prime factors. **$42 = 2 \times 3 \times 7$ $63 = 3 \times 3 \times 7$**
(ii) Work out the Highest Common Factor of 42 and 63. **21**
(iii) Work out the Lowest Common Multiple of 42 and 63. **126**

Product of Prime Factors, HCF & LCM



- 1) a) Express 84 as a product of its prime factors. $2 \times 2 \times 3 \times 7$
 b) Find the Highest Common Factor (HCF) of 84 and 35. 7



- 2) Express 72 as the product of its prime factors. $2 \times 2 \times 2 \times 3 \times 3$



- 3) Express 180 as the product of its prime factors. $2 \times 2 \times 3 \times 3 \times 5$



- 4) a) Express 66 as a product of its prime factors. $2 \times 3 \times 11$
 b) Express 132^2 as a product of its prime factors.
 $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 11 \times 11$



- 5) Express 252 as a product of its prime factors. $2 \times 2 \times 3 \times 3 \times 7$



- 6) Find the Lowest Common Multiple (LCM) of 24 and 36. 72



- 7) a) Write 56 as a product of its prime factors. $2 \times 2 \times 2 \times 7$
 b) Find the Highest Common Factor (HCF) of 56 and 42. 14



- 8) a) Express 45 as a product of its prime factors. $3 \times 3 \times 5$
 b) Find the Highest Common Factor (HCF) of 45 and 30. 15



- 9) a) Find the Highest Common Factor (HCF) of 24 and 30. 6
 b) Find the Lowest Common Multiple (LCM) of 4, 5 and 6. 60

Using Place Value



1) Using the information that

$$4.7 \times 34 = 159.8$$

write down the value of

a) 47×34 **1598**

b) 4.7×3.4 **15.98**

c) $159.8 \div 47$ **3.4**



2) Using the information that

$$324 \times 48 = 15552$$

write down the value of

a) 3.24×4.8 **15.552**

b) 0.324×0.48 **0.15552**

c) $15552 \div 4.8$ **3240**



3) Using the information that

$$73 \times 234 = 17082$$

write down the value of

a) 730×234 **170820**

b) 73×2.34 **170.82**



4) Using the information that

$$27 \times 5.6 = 151.2$$

write down the value of

a) 27×56 **1512**

b) 2.7×0.56 **1.512**

c) $151.2 \div 56$ **2.7**



5) Using the information that

$$719 \times 35 = 25165$$

write down the value of

a) 71.9×3.5 **251.65**

b) 0.719×0.35 **0.25165**

c) $25165 \div 7.19$ **3500**

Using Place Value



- 1) Use the information that

$$13 \times 17 = 221$$

to write down the value of

- (i) 1.3×1.7 **2.21**
(ii) $221 \div 1.7$ **130**



- 2) Use the information that

$$253 \times 48 = 12144$$

to write down the value of

- (i) 2.53×4.8 **12.144**
(ii) 2530×480 **1214400**
(iii) 0.253×4800 **1214.4**
(iv) $12144 \div 25.3$ **480**
(v) $12144 \div 0.48$ **25300**



- 3) Use the information that

$$27.3 \times 2.8 = 76.44$$

to write down the value of

- (i) 273×28 **7644**
(ii) 2.73×280 **764.4**
(iii) 0.273×28 **7.644**
(iv) $76.44 \div 28$ **2.73**
(v) $7.644 \div 2.73$ **2.8**



- 4) Use the information that

$$97.6 \times 370 = 36112$$

to write down the value of

- (i) 9.76×37 **361.12**
(ii) 9760×3700 **36112000**
(iii) 0.0976×3.7 **0.36112**
(iv) $36.112 \div 3.7$ **9.76**
(v) $361120 \div 9.76$ **37000**



- 1) Write each recurring decimal as an exact fraction, in its lowest terms.

a) $0.\dot{5}$ $\frac{5}{9}$

b) $0.\dot{7}$ $\frac{7}{9}$

c) $0.\dot{4}$ $\frac{4}{9}$

d) $0.\dot{2}\dot{4}$ $\frac{24}{99}$ $\frac{8}{33}$

e) $0.\dot{7}\dot{5}$ $\frac{75}{99}$ $\frac{25}{33}$

f) $0.\dot{8}\dot{2}$ $\frac{82}{99}$

g) $0.\dot{6}1\dot{7}$ $\frac{617}{999}$

h) $0.\dot{2}1\dot{6}$ $\frac{216}{999}$ $\frac{8}{37}$

i) $0.\dot{7}1\dot{4}$ $\frac{714}{999}$ $\frac{238}{333}$

j) $0.\dot{3}2\dot{4}$ $\frac{324}{999}$ $\frac{12}{37}$

k) $0.\dot{7}235\dot{7}$ $\frac{72357}{99999}$ $\frac{89}{123}$

l) $0.\dot{6}521\dot{4}$ $\frac{65214}{99999}$ $\frac{7246}{11111}$

Four Rules of Negatives



1) Work out the following:

a) $2 - 7$ **-5**

b) $4 - 6$ **-2**

c) $1 - 8$ **-7**

d) $0 - 4$ **-4**



2) Work out the following:

a) $-3 + 2$ **-1**

b) $-7 + 5$ **-2**

c) $-3 + 8$ **5**

d) $-9 + 11$ **2**



3) Work out the following:

a) $-1 - 3$ **-4**

b) $-4 - 5$ **-9**

c) $-7 - 8$ **-15**

d) $-2 - 12$ **-14**



4) Work out the following:

a) $6 - -3$ **9**

b) $-3 - -5$ **2**

c) $-9 - -2$ **-7**

d) $1 - -13$ **14**



5) Work out the following:

a) -3×4 **-12**

b) 5×-2 **-10**

c) -4×-5 **20**

d) -6×-3 **18**



6) Work out the following:

a) $12 \div -4$ **-3**

b) $-20 \div -2$ **10**

c) $-15 \div 3$ **-5**

d) $-100 \div -5$ **20**



1) Work out the following:

a) $1 \div 0.1$ **10**

b) $1 \div 0.2$ **5**

c) $1 \div 0.5$ **2**



2) Work out the following:

a) $2 \div 0.2$ **10**

b) $5 \div 0.1$ **50**

c) $8 \div 0.5$ **16**



3) Work out the following:

a) $6 \div 0.3$ **20**

b) $24 \div 0.8$ **30**

c) $7.2 \div 0.9$ **8**



4) Work out the following:

a) $5 \div 0.25$ **20**

b) $8 \div 0.25$ **32**

c) $20 \div 0.25$ **80**



5) Work out the following:

a) $4.08 \div 0.12$ **34**

b) $7.13 \div 0.23$ **31**

c) $44.94 \div 0.14$ **321**



6) Work out the following:

a) $61.6 \div 0.55$ **112**

b) $5.166 \div 0.42$ **12.3**

c) $2.6202 \div 0.11$ **23.82**

Significant Figures



1) Round the following numbers to 1 significant figure:

- a) 428 **400**
- b) 783 **800**
- c) 5608 **6 000**
- d) 3 521 **4 000**
- e) 21 999 **20 000**
- f) 793 041 **800 000**



2) Round the following numbers to 2 significant figures:

- a) 846 **850**
- b) 2 647 **2600**
- c) 3 552 **3600**
- d) 46 817 **47000**
- e) 89 711 **90 000**
- f) 195 084 **200 000**



3) Round the following numbers to 3 significant figures:

- a) 91 249 **91 200**
- b) 64 182 **64 200**
- c) 223 058 **223 000**
- d) 389 512 **390 000**
- e) 7761 223 **7 760 000**
- f) 4997 124 **5 000 000**



4) Work out the following and give your answer to 3 significant figures:

- a) 216×348 **75 200**
- b) 7721×609 **4 700 000**
- c) 8714×2198 **192 000 000**



5) Round the following numbers to 1 significant figure:

- a) 0.00618 **0.006**
- b) 0.00482 **0.005**
- c) 0.00006492 **0.00006**
- d) 0.004981 **0.005**



6) Round the following numbers to 2 significant figures:

- a) 0.035812 **0.036**
- b) 0.00082477 **0.00082**
- c) 0.0038611 **0.0039**
- d) 0.000037211 **0.000037**



7) Round the following numbers to 3 significant figures:

- a) 0.00143229 **0.00143**
- b) 0.000721981 **0.000722**
- c) 0.0000044251 **0.00000443**
- d) 0.000668821 **0.000669**



8) Round the following numbers to 3 significant figures:

- a) 47.84122 **47.8**
- b) 9.778112 **9.78**
- c) 12.35913 **12.4**



9) Work out the following and give your answer to 3 significant figures:

- a) $15 \div 0.38$ **39.5**
- b) $0.31 \div 0.16$ **1.94**
- c) 208×366 **76100**

Estimating Answers



1) Work out an estimate for

$$\frac{304 \times 9.96}{0.51}$$

6000

$$\frac{300 \times 10}{0.5}$$



2) Work out an estimate for

$$\frac{6.7 \times 192}{0.051}$$

28000

$$\frac{7 \times 200}{0.05}$$



3) Work out an estimate for

$$\frac{32 \times 4.92}{0.21}$$

750

$$\frac{30 \times 5}{0.2}$$



4) Work out an estimate for

$$\frac{3880}{236 \times 4.85}$$

4

$$\frac{4000}{200 \times 5}$$



5) Work out an estimate for

$$\frac{7.18 \times 19.7}{0.47}$$

280

$$\frac{7 \times 20}{0.5}$$



1) Work out an estimate for the value of

a) $\frac{547}{4.8 \times 9.7}$ **10**

$\frac{500}{5 \times 10}$ $\frac{500}{50}$

b) $\frac{69 \times 398}{207}$ **140**

$\frac{70 \times 400}{200}$ $\frac{28\,000}{200}$

c) $\frac{7.5 \times 2.79}{2.71 + 3.19}$ **4**

$\frac{8 \times 3}{3 + 3}$ $\frac{24}{6}$

d) $\frac{409 \times 5.814}{0.19}$ **12\,000**

$\frac{400 \times 6}{0.2}$ $\frac{2\,400}{0.2}$



2) a) Work out an estimate for

$\frac{19.6 \times 31.7}{7.9 \times 5.2}$ **15**

$\frac{20 \times 30}{8 \times 5}$ $\frac{600}{40}$

b) Use your answer to part (a) to find an estimate for

$\frac{196 \times 317}{79 \times 52}$ **15**

3) a) Work out an estimate for

$\frac{6.13 \times 9.68}{3.79 \times 2.56}$ **5**

$\frac{6 \times 10}{4 \times 3}$ $\frac{60}{12}$

b) Use your answer to part (a) to find an estimate for

$\frac{613 \times 968}{379 \times 256}$ **5**

Simplification of Algebraic Expressions



1) Simplify the following

- a) $x + x$ $2x$
- b) $2x + 3x$ $5x$
- c) $5t - 3t$ $2t$
- d) $7y - 6y$ y
- e) $x + 2x + 3x$ $6x$
- f) $3g - g + 6g$ $8g$
- g) $2x - 7x + 8x$ $3x$
- h) $y - 2y - 3y + 6y$ $2y$



2) Simplify the following

- a) $xy + 3xy$ $4xy$
- b) $5xy - 2xy$ $3xy$
- c) $4x^2y + x^2y$ $5x^2y$
- d) $3xy^2 - 2xy^2$ xy^2
- e) $2x^2y^3 + 4x^2y^3 - 3x^2y^3$ $3x^2y^3$
- f) $6a^2bc^4 + 5a^2bc^4 - 2a^2bc^4$ $9a^2bc^4$



3) Simplify the following

- a) $x + y + x + y$ $2x + 2y$
- b) $2x + 3y + x + 4y$ $3x + 7y$
- c) $2a + 4b - a + 2b$ $a + 6b$
- d) $3x + 4y - x - 2y$ $2x + 2y$
- e) $6x - 2y + 2x + 5y$ $8x + 3y$
- f) $4x - 3y - 2x - 5y$ $2x - 8y$
- g) $3t + 4u + 2t - 7u$ $5t - 3u$
- h) $2xy + 3t - xy - 4t$ $xy - t$



4) Simplify the following

- a) $x \times x$ x^2
- b) $x \times x \times x \times x \times x$ x^5
- c) $y \times y \times y$ y^3



5) Simplify the following

- a) $x^2 \times x^4$ x^6
- b) $x^3 \times x^5$ x^8
- c) $y \times y^3$ y^4
- d) $x^2 \times x \times x^4$ x^7



6) Simplify the following

- a) $2x \times x$ $2x^2$
- b) $4x \times 3x$ $12x^2$
- c) $3t^2 \times 2t$ $6t^3$
- d) $4y^2 \times 3y^3$ $12y^5$
- e) $x \times 2x^2 \times 3x^3$ $6x^6$



7) Simplify the following

- a) $3x \times y$ $3xy$
- b) $4x^2y \times 2x$ $8x^3y$
- c) $3xy^2 \times 2xy^3$ $6x^2y^5$
- d) $2x^2y^3 \times 5x^4y^2$ $10x^6y^5$
- e) $tu^2 \times t^2u \times 4tu$ $4t^4u^4$



8) Simplify the following

- a) $x^5 \div x$ x^4
- b) $y^4 \div y^3$ y
- c) $g^8 \div g^5$ g^3



9) Simplify the following

- a) $\frac{x^6 \times x^3}{x^4}$ x^5
- b) $\frac{x^3 \times x^4}{x^2 \times x}$ x^4
- c) $\frac{(x+5)^5}{(x+5)^2}$ $(x+5)^3$



10) Simplify the following

- a) $20x^6 \div 5x^2$ $4x^4$
- b) $\frac{14x^7}{2x^2}$ $7x^5$
- c) $\frac{8x \times 2x^3}{4x^2}$ $4x^2$

Simplification of Algebraic Expressions



1) a) Simplify $4p \times 6q$ **$24pq$**

b) Simplify $d \times d \times d \times d$ **d^4**

c) Simplify $t^9 \div t^4$ **t^5**



2) a) Simplify $4a + 3c - 2a + c$ **$2a + 4c$**

b) Simplify $2x - 6c - x + 2c$ **$x - 4c$**



3) a) Simplify $5xt + 2xt - 4xt$ **$3xt$**

b) Simplify $4x + 3y - 2x + 4y$ **$2x + 7y$**

c) Simplify $m \times m \times m$ **m^3**

d) Simplify $3n \times 2t$ **$6nt$**



4) Simplify $3x^2 \times 4x^5y^4$ **$12x^7y^4$**



5) Simplify $4x + 3y - 2x + 6y$ **$2x + 9y$**



6) a) Simplify $t^4 \times t^5$ **t^9**

b) Simplify $a \times a \times a$ **a^3**



7) a) Simplify $x^6 \times x^2$ **x^8**

b) Simplify $10x^2y^4 \div 2xy^2$ **$5xy^2$**



8) a) Simplify $3a + 5c - a + 3c$ **$2a + 8c$**

b) Simplify $x^3 \times x^4$ **x^7**

c) Simplify $4x^2y^4 \times 5xy^2$ **$20x^3y^6$**



9) Simplify $6x + 8y + 2x - 10y$ **$8x - 2y$**



10) a) Simplify $x \times x \times x \times x$ **x^4**

b) Simplify $2x \times 3y$ **$6xy$**



11) a) Simplify $pq + 2pq$ **$3pq$**

b) Simplify $5x + 3y - x - 4y$ **$4x - y$**



12) a) Simplify $6a + 5b - 3b + a$ **$7a + 2b$**

b) Simplify $x^4 + x^4$ **$2x^4$**



13) a) Simplify $x + y + x + y + x$ **$3x + 2y$**

b) Simplify $t^2 + t^2 + t^2$ **$3t^2$**



14) a) Simplify $a^3 \times a^3$ **a^6**

b) Simplify $\frac{3x^2y \times 4xy^3}{2xy^2}$ **$6x^2y^2$**



15) a) Simplify $3d + e - d + 4e$ **$2d + 5e$**

b) Simplify $3x^2 - x^2$ **$2x^2$**

c) Simplify $5t + 8d - 2t - 3d$ **$3t + 5d$**

d) Simplify $\frac{(3x + 1)^3}{(3x + 1)}$ **$(3x + 1)^2$**

Expanding and Simplifying Brackets



1) Expand these brackets

a) $2(x + 3)$ $2x + 6$

b) $3(2x + 4)$ $6x + 12$

c) $5(3p - 2q)$ $15p - 10q$

d) $4(x^2 + 2y^2)$ $4x^2 + 8y^2$

e) $6(r - r^2)$ $6r - 6r^2$



2) Expand these brackets

a) $x(x - 2)$ $x^2 - 2x$

b) $x(3x + 5)$ $3x^2 + 5x$

c) $p(3p - 7q)$ $3p^2 - 7pq$

d) $y(y + 6y^2)$ $y^2 + 6y^3$

e) $x(r + r^2)$ $xr + xr^2$



3) Expand these brackets

a) $2x(x - 5)$ $2x^2 - 10x$

b) $4x(2x + 3)$ $8x^2 + 12x$

c) $5p(4p - 2q)$ $20p^2 - 10pq$

d) $2y(3y + 4x^2)$ $6y^2 + 8x^2y$

e) $x(x + r^2)$ $x^2 + r^2x$



4) Expand these brackets

a) $x(x^2 - 2)$ $x^3 - 2x$

b) $3x(2x^3 + 1)$ $6x^4 + 3x$

c) $5p^2(4p - 2)$ $20p^3 - 10p^2$

d) $2y^2(3y^3 + 4y)$ $6y^5 + 8y^3$

e) $2xy(x + y^2)$ $2x^2y + 2xy^3$



5) Expand and simplify

a) $2(x + y) + 3(x + y)$ $5x + 5y$

b) $3(2x + y) + 2(5x + 3y)$ $16x + 9y$

c) $5(x + y) + 3(2x + y)$ $11x + 8y$

d) $3(2c + d) + 2(c + d)$ $8c + 5d$

e) $4(2p + q) + 3(2p + q)$ $14p + 7q$



6) Expand and simplify

a) $2(x + y) + 3(x - y)$ $5x - y$

b) $5(2x + y) + 2(3x - 2y)$ $16x + y$

c) $4(x - y) + 3(2x + y)$ $10x - y$

d) $6(2c - d) + 2(c - d)$ $14c - 8d$

e) $2(5p - q) + 3(p - 2q)$ $13p - 8q$



7) Expand and simplify

a) $3(x + 2y) - 3(x - y)$ $9y$

b) $5(2x - y) - 2(3x - 2y)$ $4x - y$

c) $7(x - 2y) - 3(2x + y)$ $x - 17y$

d) $6(2x - y) - 2(x + 2y)$ $10x - 10y$

e) $2(5p - q) - (p - 3q)$ $9p + q$

Expanding and Simplifying Brackets



1) Expand and simplify

- a) $(x + 3)(x + 2)$ $x^2 + 5x + 6$
- b) $(x + 5)(x + 3)$ $x^2 + 8x + 15$
- c) $(x + 1)(x + 4)$ $x^2 + 5x + 4$
- d) $(x + 6)(x + 4)$ $x^2 + 10x + 24$
- e) $(x + 5)(x + 7)$ $x^2 + 12x + 35$



2) Expand and simplify

- a) $(x + 5)(x - 2)$ $x^2 + 3x - 10$
- b) $(x - 7)(x + 2)$ $x^2 - 5x - 14$
- c) $(x - 1)(x + 3)$ $x^2 + 2x - 3$
- d) $(x + 4)(x - 3)$ $x^2 + x - 12$
- e) $(x - 5)(x + 5)$ $x^2 - 25$



3) Expand and simplify

- a) $(x - 3)(x - 4)$ $x^2 - 7x + 12$
- b) $(x - 2)(x - 6)$ $x^2 - 8x + 12$
- c) $(x - 1)(x - 1)$ $x^2 - 2x + 1$
- d) $(x - 7)(x - 2)$ $x^2 - 9x + 14$
- e) $(x - 4)(x - 5)$ $x^2 - 9x + 20$



4) Expand and simplify

- a) $(x - 7)(x + 1)$ $x^2 - 6x - 7$
- b) $(p - 6)(p + 4)$ $p^2 - 2p - 24$
- c) $(e - 3)(e - 7)$ $e^2 - 10e + 21$
- d) $(x + 8)(x + 1)$ $x^2 + 9x + 8$
- e) $(x - 5)(x - 5)$ $x^2 - 10x + 25$



5) Expand and simplify

- a) $(2x + 3)(2x + 1)$ $4x^2 + 8x + 3$
- b) $(3p - 4)(2p + 5)$ $6p^2 + 7p - 20$
- c) $(e - 3)(3e - 4)$ $3e^2 - 13e + 12$
- d) $(4x - 6)(2x + 1)$ $8x^2 - 8x - 6$
- e) $(2x - 3)(2x + 3)$ $4x^2 - 9$



6) Expand and simplify

- a) $(2x + y)(3x + 2y)$ $6x^2 + 7xy + 2y^2$
- b) $(3p - 2q)(4p + 5q)$ $12p^2 + 7pq - 10q^2$
- c) $(4e - 3f)(2e - 2f)$ $8e^2 - 14ef + 6f^2$
- d) $(6x - y)(6x + y)$ $36x^2 - y^2$
- e) $(3x - 2y)(x - 5y)$ $3x^2 - 17xy + 10y^2$



1) Factorise

- a) $2x + 4$ $2(x + 2)$
- b) $2y + 10$ $2(y + 5)$
- c) $3x + 12$ $3(x + 4)$
- d) $3x - 6$ $3(x - 2)$
- e) $5x - 15$ $5(x - 3)$



2) Factorise

- a) $p^2 + 7p$ $p(p + 7)$
- b) $x^2 + 4x$ $x(x + 4)$
- c) $y^2 - 2y$ $y(y - 2)$
- d) $p^2 - 5p$ $p(p - 5)$
- e) $x^2 + x$ $x(x + 1)$



3) Factorise

- a) $2x^2 + 6x$ $2x(x + 3)$
- b) $2y^2 - 8y$ $2y(y - 4)$
- c) $5p^2 + 10p$ $5p(p + 2)$
- d) $7c^2 - 21c$ $7c(c - 3)$
- e) $6x^2 + 9x$ $3x(2x + 3)$



4) Factorise

- a) $2x^2 - 4xy$ $2x(x - 2y)$
- b) $2t^2 + 10tu$ $2t(t + 5u)$
- c) $6x^2 - 8xy$ $2x(3x - 4y)$
- d) $3x^2y^2 + 9xy$ $3xy(xy + 3)$

Solving Equations



1) Solve $2x - 3 = 17$
 $x = 10$



2) Solve $3x + 2 = 14$
 $x = 4$



3) Solve $5x - 7 = 33$
 $x = 8$



4) Solve $4x + 7 = 19$
 $x = 3$



5) Solve $x + x + x + x = 20$
 $x = 5$



6) Solve $x + 3x = 24$
 $x = 6$



7) Solve $2(x + 3) = 8$
 $x = 1$



8) Solve $2(3x - 4) = 22$
 $x = 5$



9) Solve $5(t - 1) = 20$
 $t = 5$



10) Solve $3(2x + 5) = 36$
 $x = 3.5$



11) Solve $2x + 7 = x + 11$
 $x = 4$



12) Solve $5y - 2 = 3y + 10$
 $y = 6$



13) Solve $2x + 1 = 5x - 20$
 $x = 7$



14) Solve $p - 3 = 3p - 11$
 $p = 4$



15) Solve $2d + 5 = 20 - 3d$
 $d = 3$



16) Solve $4 - e = 2e - 8$
 $e = 4$



17) Solve $2(x + 3) = x + 9$
 $x = 3$



18) Solve $x - 7 = 3(2x - 4)$
 $x = 1$



19) Solve $5(x + 3) = 2(x + 6)$
 $x = -1$



20) Solve $4(2y + 1) = 2(12 - y)$
 $y = 2$



21) Solve $7 - 3x = 2(x + 1)$
 $x = 1$



22) Solve $\frac{x}{2} = 5$
 $x = 10$



23) Solve $\frac{x}{5} = 6$
 $x = 30$



24) Solve $\frac{2x}{3} = 4$
 $x = 6$



25) Solve $\frac{5x}{2} = 15$
 $x = 6$



26) Solve $\frac{x - 2}{3} = 1$
 $x = 5$



27) Solve $\frac{x + 5}{2} = 7$
 $x = 9$



28) Solve $\frac{2x + 1}{4} = 2$
 $x = 3.5$



29) Solve $\frac{5x - 3}{3} = 4$
 $x = 3$



30) Solve $\frac{x + 2}{3} = x + 4$
 $x = -5$



31) Solve $\frac{3x - 1}{4} = 2x - 3$
 $x = 2.2$

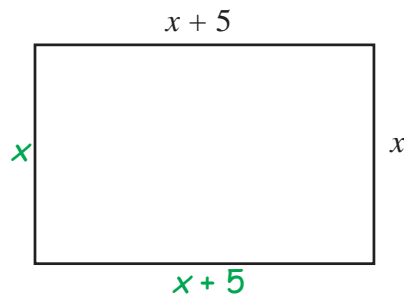


32) Solve $\frac{4x + 3}{5} = \frac{2x - 1}{2}$
 $x = 5.5$

Forming Equations



- 1) The width of a rectangle is x centimetres.
The length of the rectangle is $(x + 5)$ centimetres.



$$P = x + 5 + x + x + 5 + x$$

$$P = 4x + 10$$

- a) Find an expression, in terms of x , for the perimeter of the rectangle.
Give your answer in its simplest form. $4x + 10$

The perimeter of the rectangle is 38 centimetres.

- b) Work out the length of the rectangle. **Length is 12 cm**



2)

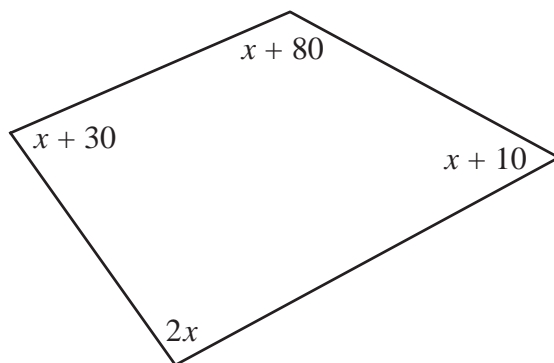


Diagram NOT accurately drawn

The sizes of the angles, in degrees, of the quadrilateral are

$$x + 10$$

$$2x$$

$$x + 80$$

$$x + 30$$

Angles of a quadrilateral add up to 360°

$$x + 80 + x + 10 + 2x + x + 30 = 360$$

$$5x + 120 = 360$$

- a) Use this information to write down an equation in terms of x . **$5x + 120 = 360$**

- b) Use your answer to part (a) to work out the size of the smallest angle of the quadrilateral. **Smallest angle is 58°**
- $$\begin{array}{rcl} 5x + 120 & = & 360 \\ 5x & = & 240 \\ x & = & 48 \end{array}$$



- 3) Sarah buys 6 cups and 6 mugs

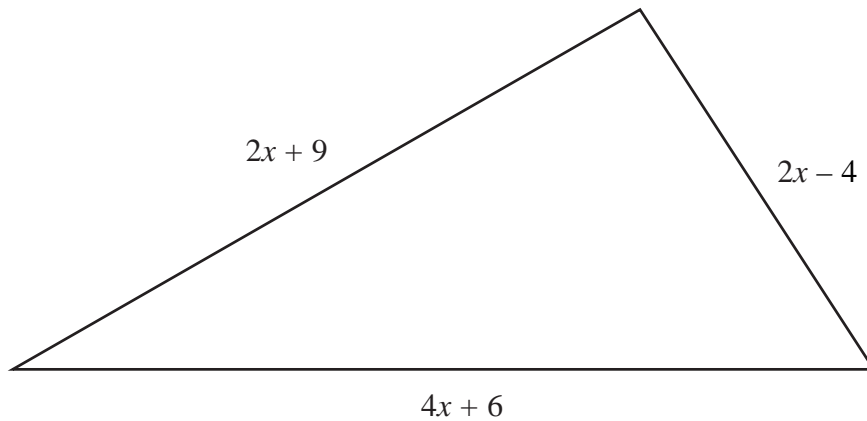
A cup costs $\pounds x$

A mug costs $\pounds (x + 3)$

- a) Write down an expression, in terms of x , for the total cost, in pounds, of 6 cups and 6 mugs. **$12x + 18$**
- b) If the total cost of 6 cups and 6 mugs is $\pounds 48$, write an equation in terms of x . **$12x + 18 = 48$**
- c) Solve your equation to find the cost of a cup and the cost of a mug.
A cup costs $\pounds 2.50$ and a mug costs $\pounds 5.50$



1)



In the diagram, all measurements are in centimetres.

The lengths of the sides are

$$2x + 9$$

$$2x - 4$$

$$4x + 6$$

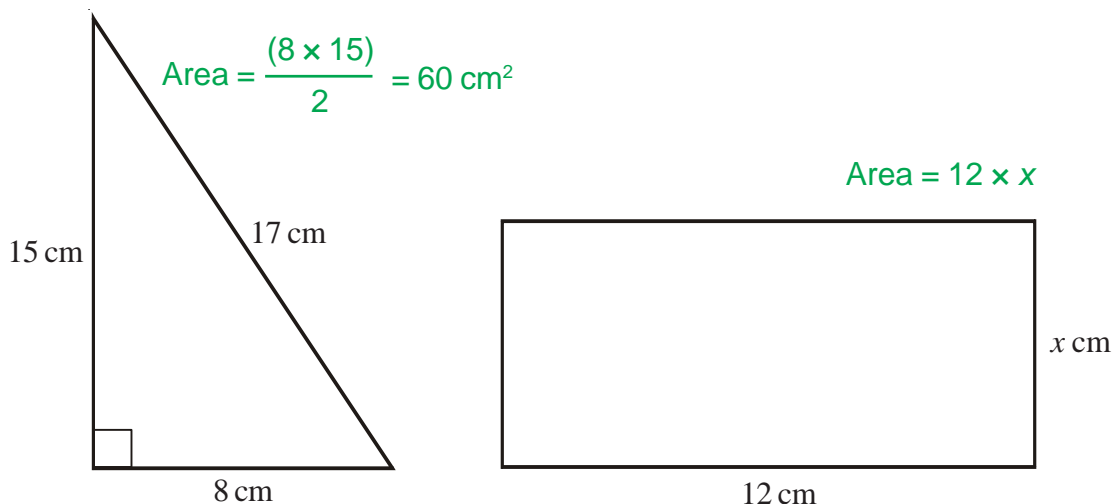
- a) Find an expression, in terms of x , for the perimeter of the triangle. $8x + 11$
Give your expression in its simplest form.

The perimeter of the triangle is 39 cm.

- b) Find the value of x . $x = 3.5 \text{ cm}$



- 2) The diagram shows a right-angled triangle and a rectangle.



The area of the right-angled triangle is equal to the area of the rectangle.

Find the value of x . $x = 5 \text{ cm}$

Forming Equations



- 1) A shop sells small boxes and large boxes for storing CDs.

A small box stores x CDs.

A large box stores y CDs.

Emma buys 8 small boxes and 5 large boxes.

Emma can store a total of T CDs in these boxes.

Write down a formula for T in terms of x and y . $T = 8x + 5y$



- 2) Batteries are sold in packets and boxes.

Each packet contains 4 batteries.

Each box contains 20 batteries.

Tony buys p packets of batteries and b boxes of batteries.

Tony buys a total of N batteries.

Write down a formula for N in terms of p and b . $N = 4p + 20b$



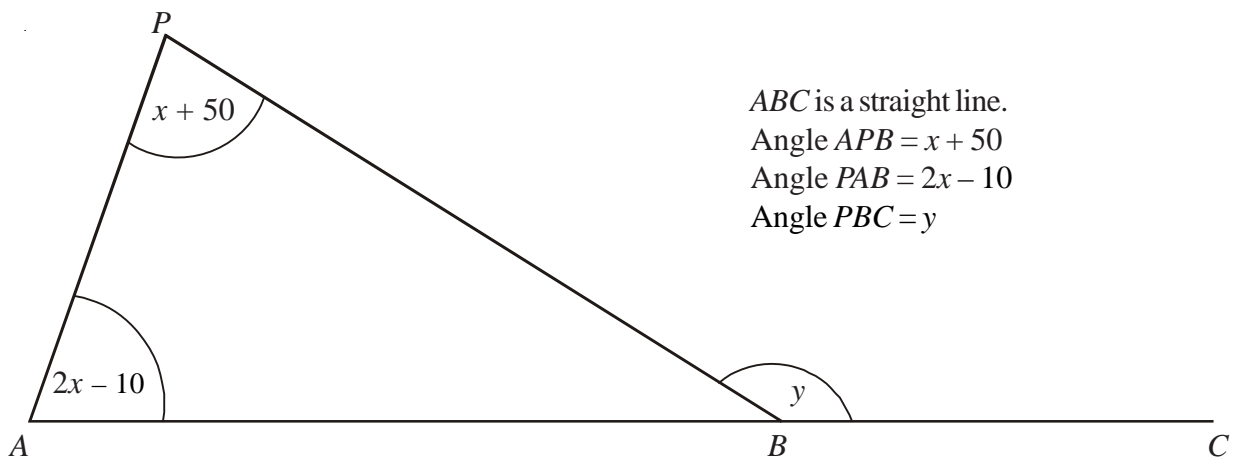
- 3) Compasses cost c pence each.

Rulers cost r pence each.

Write down an expression for the total cost, in pence, of 2 compasses and 4 rulers. $2c + 4r$



- 4)



ABC is a straight line.
 Angle $APB = x + 50$
 Angle $PAB = 2x - 10$
 Angle $PBC = y$

- a) Show that $y = 3x + 40$
 Give reasons for each stage of your working.

$$\begin{aligned}
 \text{Angle } PAB + \text{Angle } APB &= 3x + 40 \\
 \text{Angle } PBA &= 180 - (3x + 40) \\
 &= 140 - 3x \\
 \text{Angle } y &= 180 - \text{angle } PBA \\
 &= 180 - (140 - 3x) \\
 &= 40 + 3x \\
 &= 3x + 40
 \end{aligned}$$

- b) Given that y equals 145 degrees

(i) Work out the value of x . 35°

(ii) Work out the size of the largest angle in triangle APB . 85°

Changing the Subject of a Formula



- 1) Make c the subject of the formula.

$$a = b + cd \quad c = \frac{a - b}{d}$$



- 2) Make t the subject of the formula.

$$u = v + 2t \quad t = \frac{u - v}{2}$$



- 3) Make n the subject of the formula.

$$M = 3n + 5 \quad n = \frac{M - 5}{3}$$



- 4) Make z the subject of the formula.

$$x = 3y + z \quad z = x - 3y$$



- 5) $r = 5s + 3t$

a) Make t the subject of the formula. $t = \frac{r - 5s}{3}$

b) Make s the subject of the formula. $s = \frac{r - 3t}{5}$



- 6) Rearrange $y = 3x + 1$ to make x the subject.

$$x = \frac{y - 1}{3}$$



- 7) Rearrange $y = \frac{1}{2}x + 2$ to make x the subject.

$$x = 2(y - 2) \quad \text{or} \quad x = 2y - 4$$



- 8) Rearrange $y = \frac{1}{3}x + 1$ to make x the subject.

$$x = 3(y - 1) \quad \text{or} \quad x = 3y - 3$$



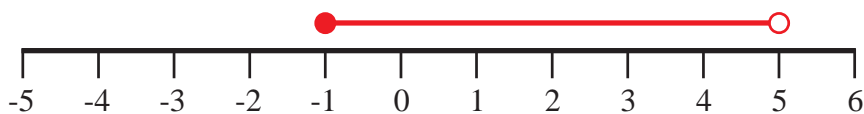
- 1) Represent this inequality on the number line

$$-3 < x \leq 2$$

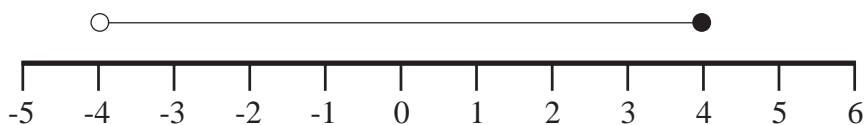


- 2) Represent this inequality on the number line

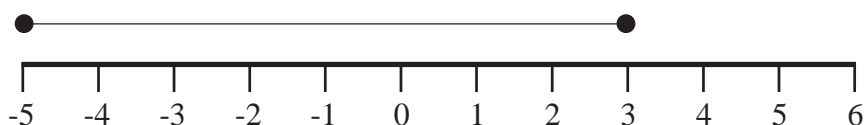
$$-1 < x < 5$$



- 3) Write down the inequality shown $-4 < x \leq 4$



- 4) Write down the inequality shown $-5 \leq x \leq 3$



- 5) If y is an integer, write down all the possible values of

$$-2 < y < 5$$

$-1, 0, 1, 2, 3, 4, 5$



- 6) If x is an integer, write down all the possible values of

$$-9 < x < -5$$

$-8, -7, -6$

Solving Inequalities



1) Solve

a) $3x - 1 > 5$

$x > 2$

b) $7y + 2 \leq 30$

$y \leq 4$

c) $\frac{x}{2} - 3 \geq 2$

$x \geq 10$

d) $5 + 2x > 7$

$x > 1$

e) $8 < 5p - 2$

$2 < p$

f) $\frac{y}{3} + 5 \geq 3$

$y \geq -6$

g) $\frac{2x}{3} - 5 \geq -3$

$x \geq 3$

h) $6x - 5 > 2x + 3$

$x > 2$

i) $3p - 9 < 6 - 2p$

$p < 3$

j) $5 - 3y < 2y - 10$

$3 < y$



2) a) Solve the inequality

$2z + 2 \geq 7$

$z \geq 2.5$

b) Write down the smallest **integer** value of z which satisfies the inequality

$2z + 2 \geq 7$

$z = 3$



3) $5x + 2y < 10$

x and y are both integers.

Write down two possible pairs of values that satisfy this inequality.

$x = \dots 1 \dots, y = \dots 1 \dots$

and

$x = \dots 1 \dots, y = \dots 2 \dots$

other pairs of values are possible.

Solving Equations & Inequalities



1) Solve the inequality $6x - 3 < 9$
 $x < 2$



2) Solve $4x + 1 = 2x + 12$
 $x = 5.5$



3) a) Solve the inequality $3t + 1 < t + 13$
 $t < 6$
b) If $2t^2 = 72$ find a value of t
 $t = 6$ (or -6)



4) Solve $3(x + 2) = 8$ $x = \frac{2}{3}$



5) Solve the inequality $6y \geq y + 10$
 $y \geq 2$



6) Solve $4(2x - 3) = 5x + 7$ $x = 6\frac{1}{3}$



7) $h = 5t^2 + 3$
Work out the value of t when $h = 48$ $t = 3$ or -3



8) Solve $3(2p - 4) = 2p + 12$
 $p = 6$



9) Solve the equation $4x + 1 = 19$
 $x = 4.5$



10) Solve $\frac{29 - x}{3} = x + 5$ $x = 3.5$



11) Solve $3x - 10 = x + 30$ $x = 20$



12) Solve the inequality $3x - 2 > x + 7$ $x > 4.5$



13) Solve the inequality $\frac{2x}{3} < 10$ $x < 15$

Trial and Improvement



1) The equation

$$x^3 - x = 29$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

$x = 3$

$x = 4$

$x = 3.1$

$x = 3.2$

$x = 3.15$

$$x^3 - x = 29$$

$3^3 - 3 = 24$

too low

$4^3 - 4 = 60$

too high

$3.1^3 - 3.1 = 26.691$

too low

$3.2^3 - 3.2 = 29.568$

too high

$3.15^3 - 3.15 = 28.105875$

too low

Therefore, $x = 3.2$ to 1 decimal place.



2) The equation

$$x^3 - 4x = 25$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

$x = 3$

$x = 4$

$x = 3.4$

$x = 3.3$

$x = 3.35$

$$x^3 - 4x = 25$$

$3^3 - 4 \times 3 = 15$

too low

$4^3 - 4 \times 4 = 48$

too high

$3.4^3 - 4 \times 3.4 = 25.704$

too high

$3.3^3 - 4 \times 3.3 = 22.737$

too low

$3.35^3 - 4 \times 3.35 = 24.195375$

too low

Therefore, $x = 3.4$ to 1 decimal place.



3) The equation

$$x^3 - 2x = 68$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

$x = 4$

$x = 5$

$x = 4.2$

$x = 4.3$

$x = 4.25$

$$x^3 - 2x = 68$$

$4^3 - 2 \times 4 = 56$

too low

$5^3 - 2 \times 5 = 115$

too high

$4.2^3 - 2 \times 4.2 = 65.688$

too low

$4.3^3 - 2 \times 4.3 = 70.907$

too high

$4.25^3 - 2 \times 4.25 = 68.265625$

too high

Therefore, $x = 4.2$ to 1 decimal place.



4) The equation

$$x^3 + 4x = 101$$

has one solution which is a positive number.

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

$x = 3$

$x = 4$

$x = 5$

$x = 4.2$

$x = 4.3$

$x = 4.4$

$x = 4.35$

$$x^3 + 4x = 101$$

$3^3 + 4 \times 3 = 39$

too low

$4^3 + 4 \times 4 = 80$

too low

$5^3 + 4 \times 5 = 145$

too high

$4.2^3 + 4 \times 4.2 = 90.888$

too low

$4.3^3 + 4 \times 4.3 = 96.707$

too low

$4.4^3 + 4 \times 4.4 = 102.784$

too high

$4.35^3 + 4 \times 4.35 = 99.712875$

too low

Therefore, $x = 4.4$ to 1 decimal place.





1) Write as a power of 8

a) $8^4 \times 8^3$ **8^7**

b) $8^{12} \div 8^7$ **8^5**



2) Write as a power of 3

a) $3^2 \times 3^9$ **3^{11}**

b) $3^{10} \div 3^3$ **3^7**



3) Simplify

a) $k^5 \times k^2$ **k^7**

b) $x^4 \div x^2$ **x^2**

c) $\frac{k^{11}}{k^6}$ **k^5**

d) $(k^8)^2$ **k^{16}**



4) Simplify

eg. $(2xy^3)^4 = 2xy^3 \times 2xy^3 \times 2xy^3 \times 2xy^3 = 16x^4y^{12}$

a) $(2xy^5)^3$ **$8x^3y^{15}$**

b) $(2x^2y^2)^3$ **$8x^6y^6$**

c) $(4xy^4)^2$ **$16x^2y^8$**

d) $(3xy^2)^4$ **$81x^4y^8$**



5) $2^x \times 2^y = 2^{10}$

and

$2^x \div 2^y = 2^2$

Work out the value of x and the value of y .

$x = 6$ and $y = 4$



6) $5^x \times 5^y = 5^{12}$

and

$5^x \div 5^y = 5^6$

Work out the value of x and the value of y .

$x = 9$ and $y = 3$



7) $a = 2^x$, $b = 2^y$

Express in terms of a and b

a) 2^{x+y} **ab**

b) 2^{2x} **a^2**

c) 2^{3y} **b^3**

d) 2^{x+2y} **ab^2**



- 1) a) Simplify $d \times d \times d \times d$ d^4
 b) Simplify $t \times t^2$ t^3
 c) Simplify $m^5 \div m^3$ m^2



- 2) a) Simplify $(2x^2)^3$ $8x^6$
 b) Simplify $3x^2 \times 4x^5y^4$ $12x^7y^4$



- 3) a) Simplify $t^4 \times t^5$ t^9
 b) Simplify $x^8 \div x^5$ x^3
 c) Simplify $(c^4)^3$ c^{12}



- 4) a) Simplify $x^6 \times x^2$ x^8
 b) Simplify $\frac{x^8}{x^3}$ x^5
 c) Simplify $(2t)^3$ $8t^3$
 d) Simplify $3x^2y \times 4x^5y^4$ $12x^7y^5$



- 5) a) Simplify $x^3 \times x^4$ x^7
 b) Simplify $t^7 \div t^3$ t^4
 c) Simplify $4x^2y^4 \times 3xy^2$ $12x^3y^6$



- 6) a) Simplify $x \times x \times x \times x$ x^4
 b) Simplify $2x \times 3y$ $6xy$

Finding the N th Term



- 1) Here are the first five terms of an arithmetic sequence.

1 3 5 7 9

Find, in terms of n , an expression for the n th term of this sequence.

$$2n - 1$$



- 2) Here are the first five terms of an arithmetic sequence.

6 10 14 18 22

Find, in terms of n , an expression for the n th term of this sequence.

$$4n + 2$$



- 3) Here are the first five terms of an arithmetic sequence.

1 4 7 10 13

Find, in terms of n , an expression for the n th term of this sequence.

$$3n - 2$$



- 4) Here are the first five terms of an arithmetic sequence.

7 12 17 22 27

Find, in terms of n , an expression for the n th term of this sequence.

$$5n + 2$$



- 5) Here are the first five terms of an arithmetic sequence.

8 6 4 2 0

Find, in terms of n , an expression for the n th term of this sequence.

$$-2n + 10$$



- 1) Here are the first four terms of an arithmetic sequence.

4 7 10 13

Find an expression, in terms of n , for the n th term of the sequence. $3n + 1$



- 2) The n th term of a number sequence is $n^2 + 3$

Write down the first three terms of the sequence. $4, 7, 12$



- 3) Here are the first five terms of an arithmetic sequence.

2 7 12 17 22

- a) Find, in terms of n , an expression for the n th term of this sequence. $5n - 3$

- b) An expression for the n th term of another sequence is $11 - n^2$

(i) Find the third term of this sequence. 2

(ii) Find the fifth term of this sequence. -14



- 4) The n th term of a sequence is $2n^2$

- (i) Find the 4th term of the sequence. 32

- (ii) Is the number 400 a term of the sequence?

No

$$2n^2 = 400$$

$$n^2 = \frac{400}{2} = 200$$

200 isn't a square number

Give reasons for your answer.



- 1) The n th term of a number sequence is given by $4n + 1$
a) Work out the first **two** terms of the number sequence. **5, 9**

Here are the first four terms of another number sequence.

1 4 7 10

- b) Find, in terms of n , an expression for the n th term of this number sequence. **$3n - 2$**



- 2) Here is a number pattern.

Line Number			
1	$1^2 + 3^2$	$2 \times 2^2 + 2$	10
2	$2^2 + 4^2$	$2 \times 3^2 + 2$	20
3	$3^2 + 5^2$	$2 \times 4^2 + 2$	34
4	$4^2 + 6^2$	$2 \times 5^2 + 2$	52
.			
.			
10	$10^2 + 12^2$	$2 \times 11^2 + 2$	244

- a) Complete Line Number 4 of the pattern.
b) Complete Line Number 10 of the pattern.
c) Use the number pattern to find the answer to $999^2 + 1001^2$ **2000002**

$$\begin{aligned}
 &2 \times 1000^2 + 2 \\
 &2 \times 1000000 + 2 \\
 &2000000 + 2 \\
 &2000002
 \end{aligned}$$

Drawing Straight Line Graphs



- 1) a) Complete the table of values for $y = 4x - 2$

x	-2	-1	0	1	2	3
y	-10	-6	-2	2	6	10

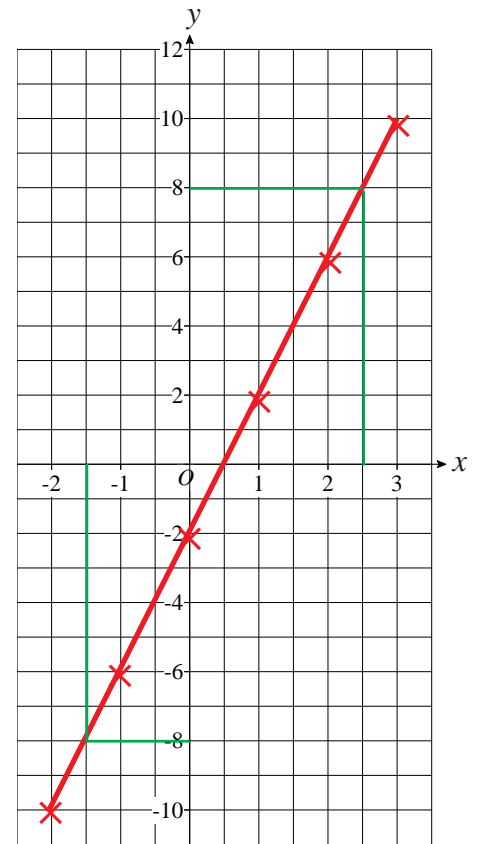
- b) On the grid, draw the graph of $y = 4x - 2$, for values of x from -2 to 3.

- c) Use the graph to find the value of y when $x = 2.5$

$y = 8$

- d) Use the graph to find the value of x when $y = -8$

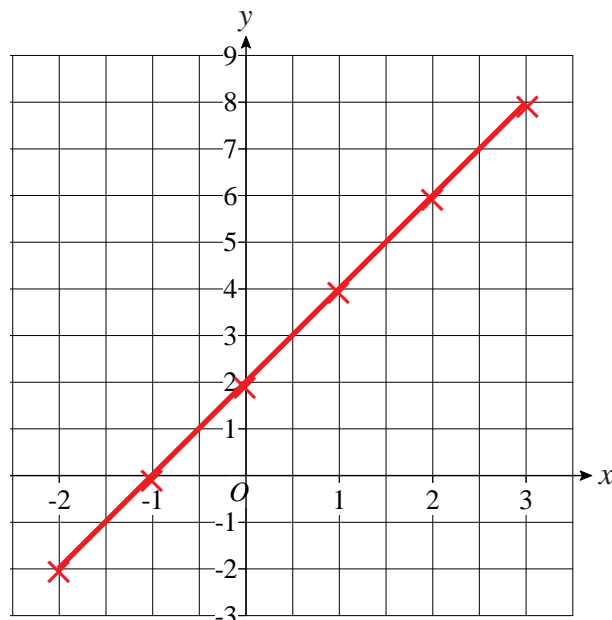
$x = -1.5$



- 2) a) Complete the table of values for $y = 2x + 2$

x	-2	-1	0	1	2	3
y	-2	0	2	4	6	8

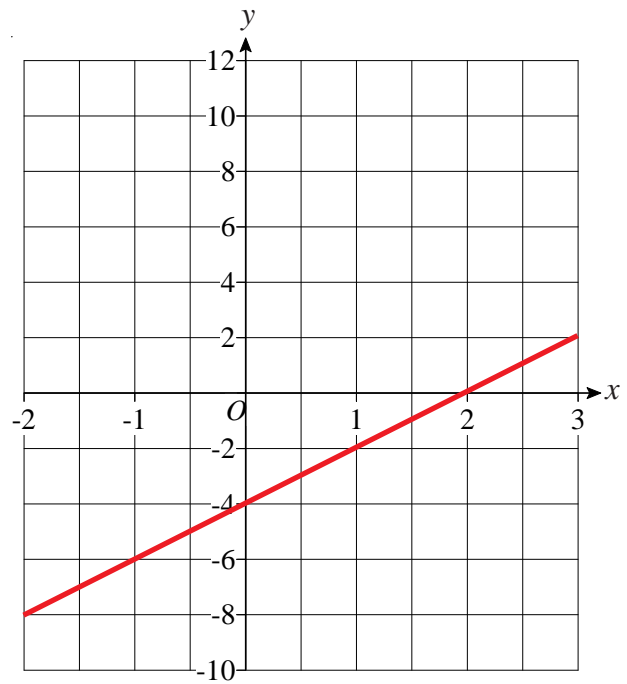
- b) On the grid, draw the graph of $y = 2x + 2$.



Drawing Straight Line Graphs



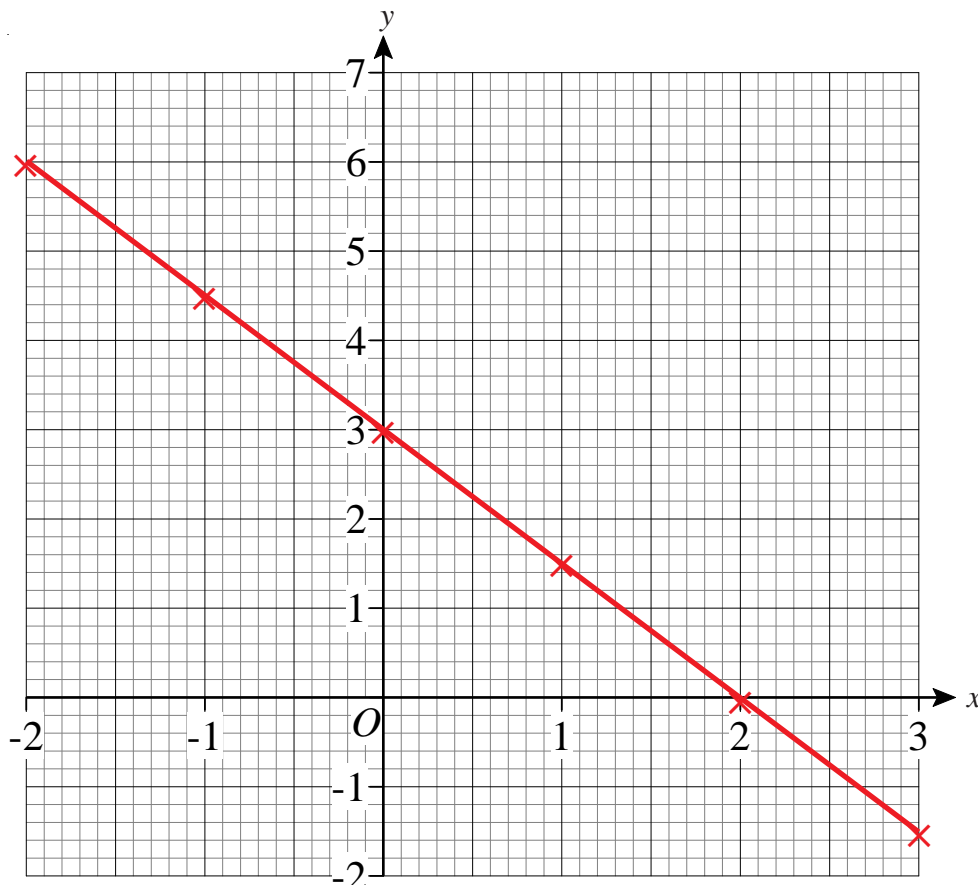
- 1) On the grid, draw the graph of $y = 2x - 4$



- 2) a) Complete the table of values for $3x + 2y = 6$

x	-2	-1	0	1	2	3
y	6	4.5	3	1.5	0	-1.5

- b) On the grid, draw the graph of $3x + 2y = 6$



- c) Find the gradient of the graph of $3x + 2y = 6$. Gradient is -1.5

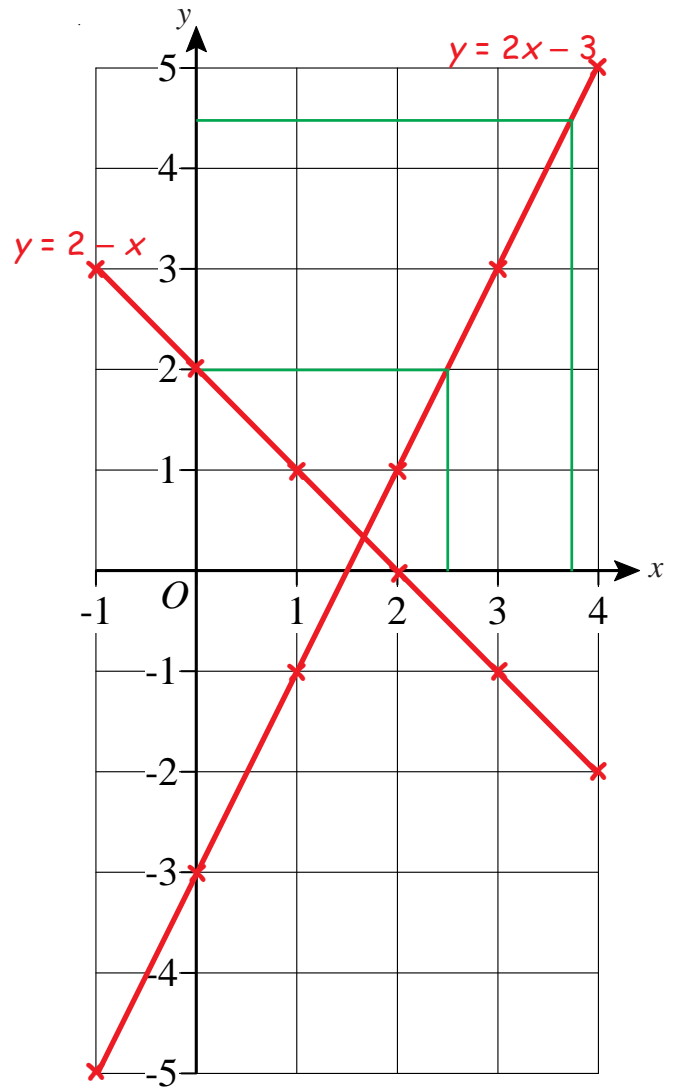
Drawing Straight Line Graphs



- 1) a) Complete the table of values for $y = 2x - 3$

x	-1	0	1	2	3	4
y	-5	-3	-1	1	3	5

- b) Using the axes on the right draw the graph of $y = 2x - 3$
- c) Use your graph to work out the value of y when $x = 2.5$ $y = 2$
- d) Use your graph to work out the value of x when $y = 4.5$ $x = 3.75$



- 2) a) Complete the table of values for $y = 2 - x$

x	-1	0	1	2	3	4
y	3	2	1	0	-1	-2

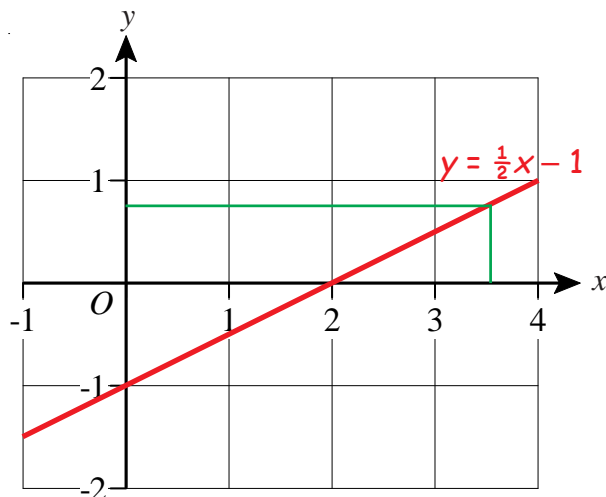
- b) Using the axes on the right, again, draw the graph of $y = 2 - x$



- 3) a) Complete the table of values for $y = \frac{1}{2}x - 1$

- b) Draw the graph of $y = \frac{1}{2}x - 1$

x	-1	0	1	2	3	4
y	$-1\frac{1}{2}$	-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1

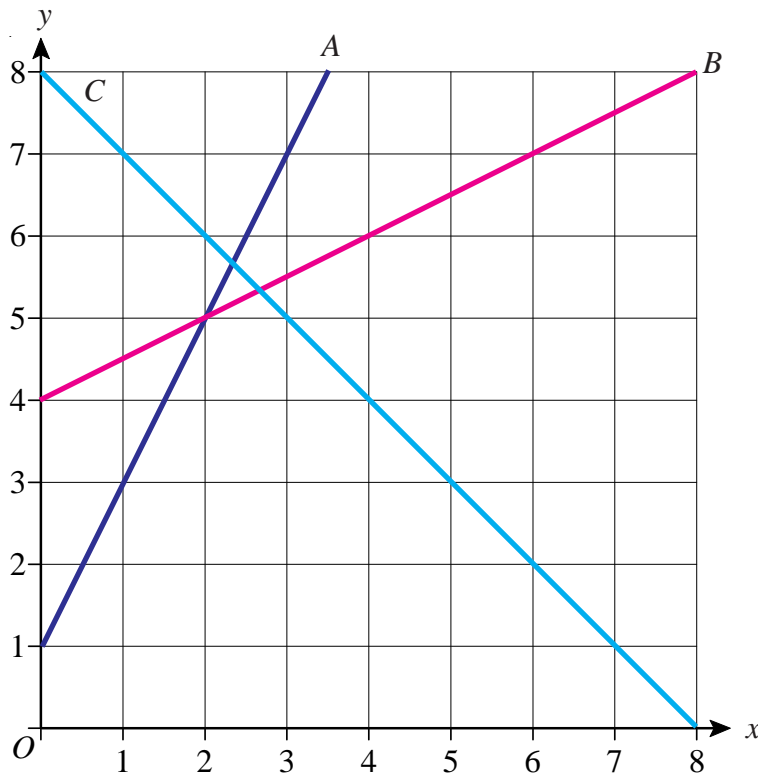


- c) Use your graph to find the value of y when $x = 3.5$ $x = 0.75$

Finding the Equation of a Straight Line



- 1) Find the equations of lines A, B and C on the axes below



Line A: $y = 2x + 1$

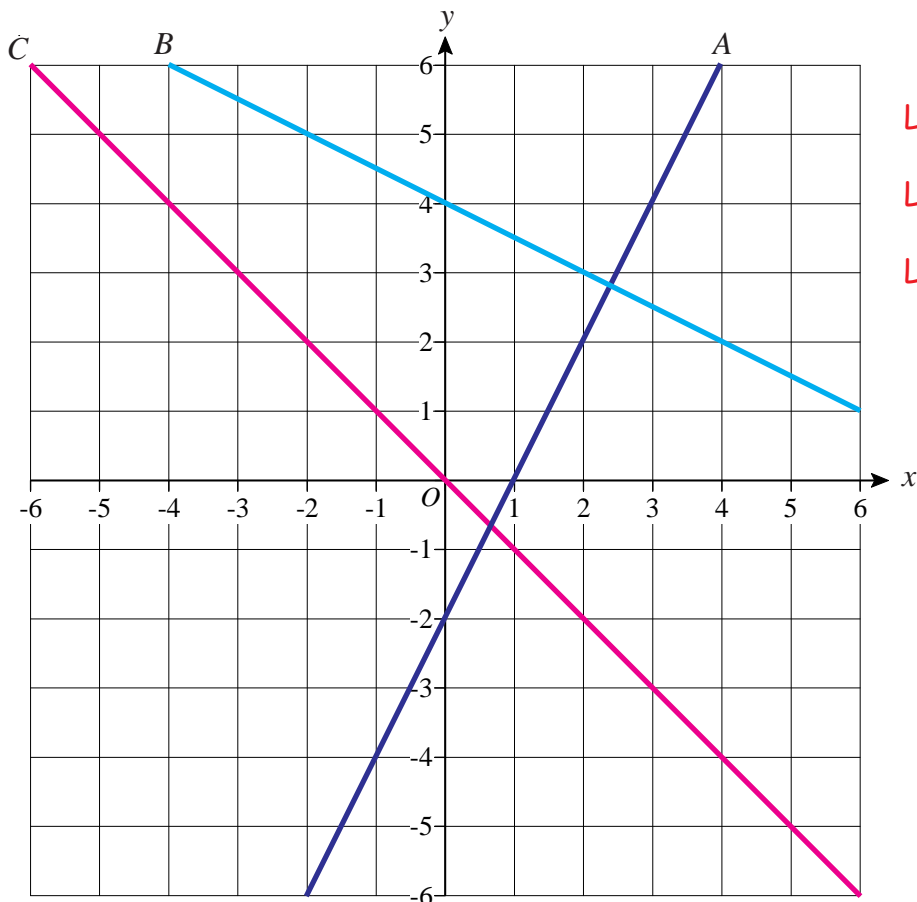
Line B: $y = \frac{1}{2}x + 4$

Line C: $y = -x + 8$

or Line C: $y = 8 - x$



- 2) Find the equations of lines A, B and C on the axes below



Line A: $y = 2x - 2$

Line B: $y = -\frac{1}{2}x + 4$

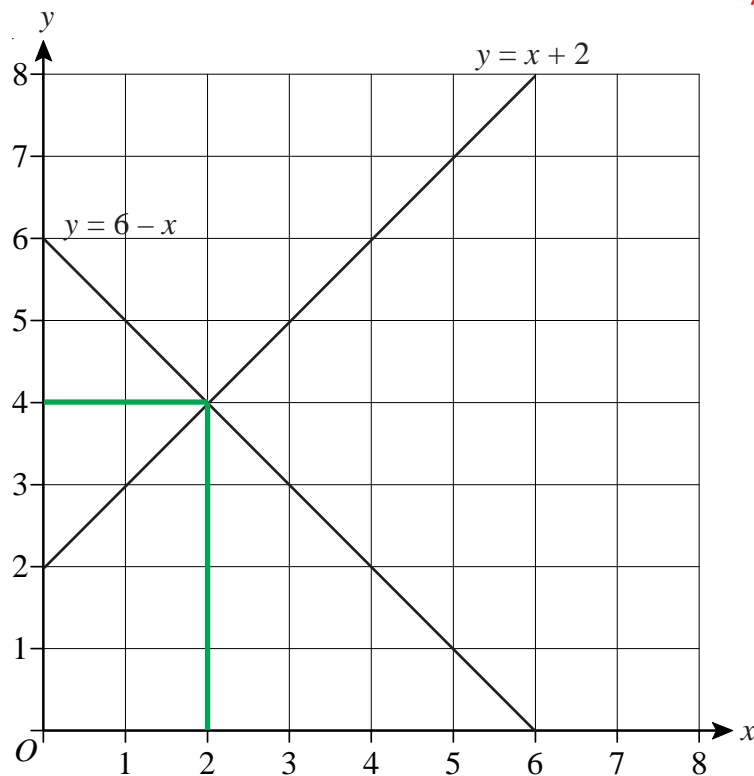
Line C: $y = -x$

Solving Simultaneous Equations Graphically



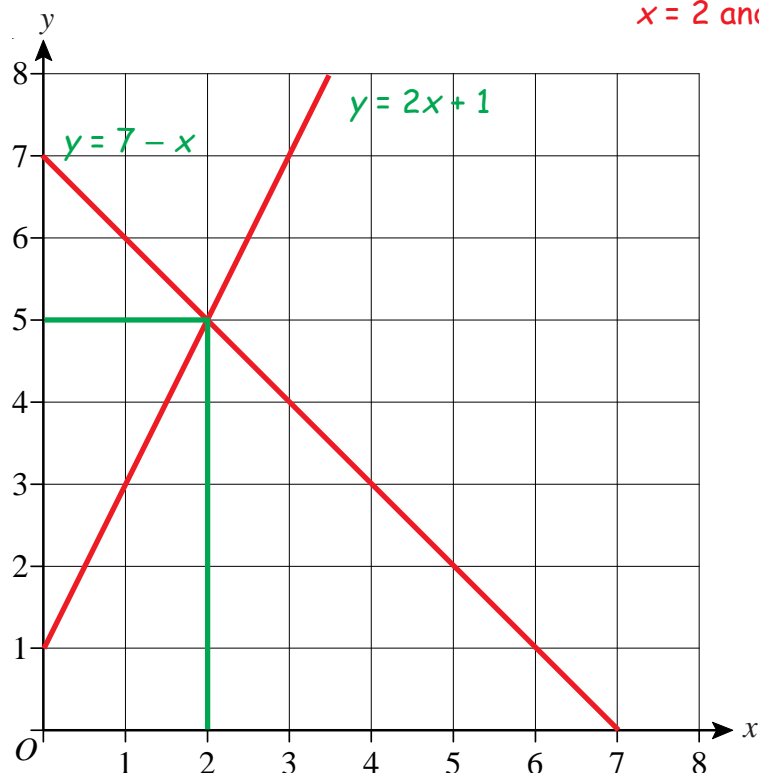
- 1) On the axes below, the graphs of $y = x + 2$ and $y = 6 - x$ have been drawn.
Use the graphs to solve the simultaneous equations $y = x + 2$ and $y = 6 - x$

$x = 2$ and $y = 4$



- 2) On the axes below draw the graphs of $y = 2x + 1$ and $y = 7 - x$
Use your graphs to solve the simultaneous equations $y = 2x + 1$ and $y = 7 - x$

$x = 2$ and $y = 5$



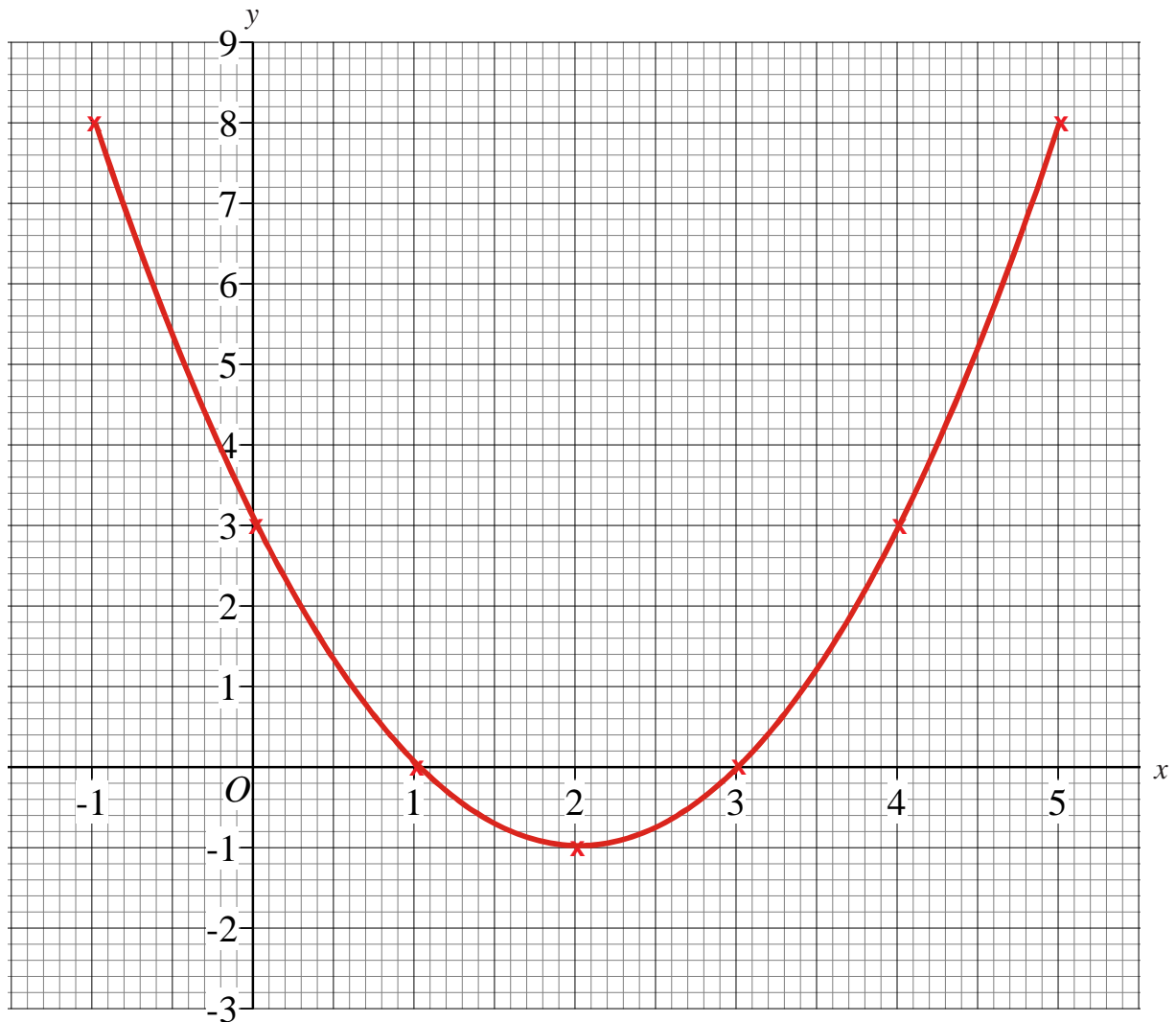
Drawing Quadratic Graphs



1) Complete the table of values for $y = x^2 - 4x + 3$

x	-1	0	1	2	3	4	5
y	8	3	0	-1	0	3	8

On the grid, draw the graph of $y = x^2 - 4x + 3$



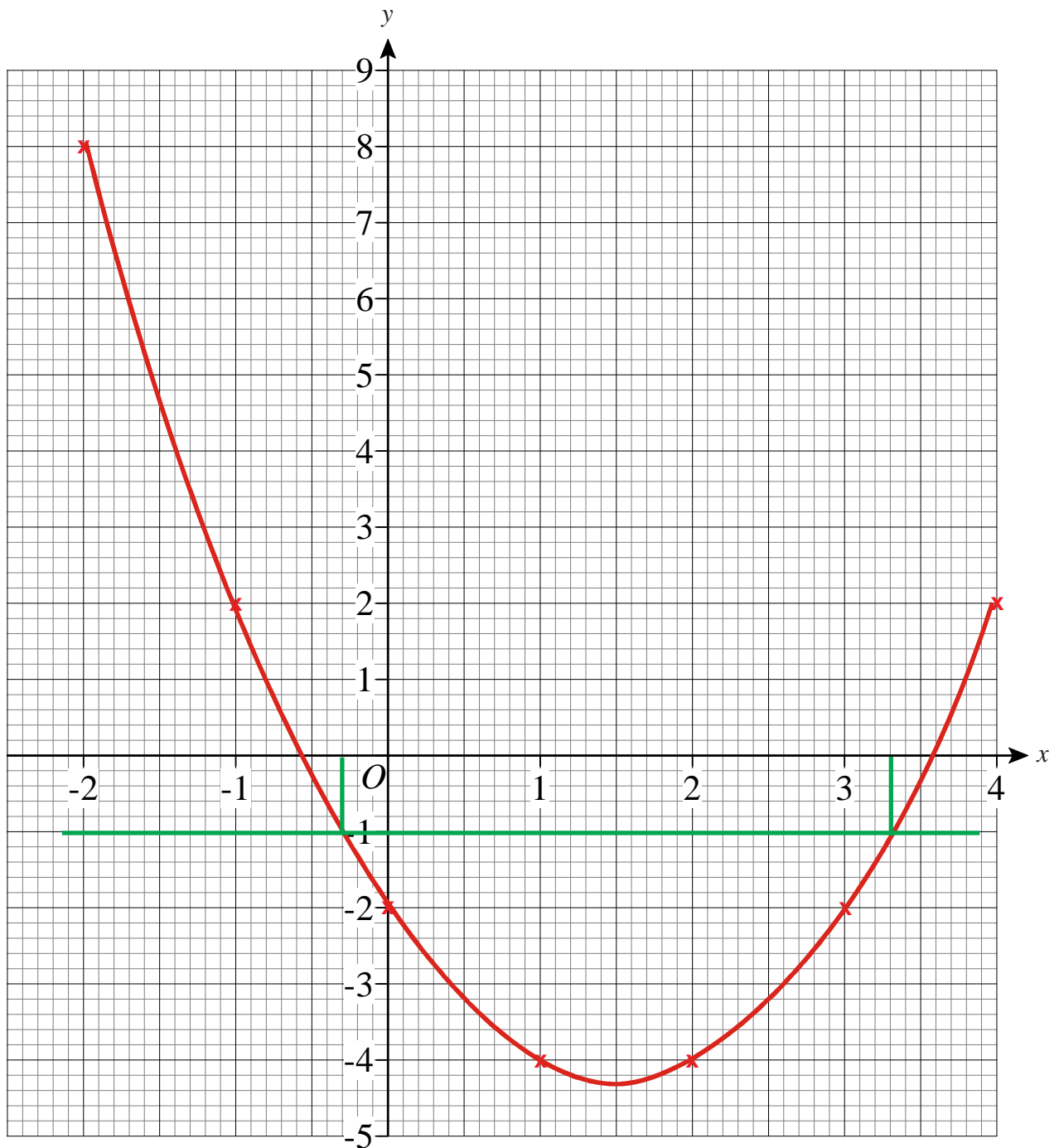
Drawing Quadratic Graphs



1) a) Complete the table of values for $y = x^2 - 3x - 2$

x	-2	-1	0	1	2	3	4
y	8	2	-2	-4	-4	-2	2

b) On the grid, draw the graph of $y = x^2 - 3x - 2$



c) Use your graph to estimate the values of x when $y = -1$ $x = -0.3$ and $x = 3.3$

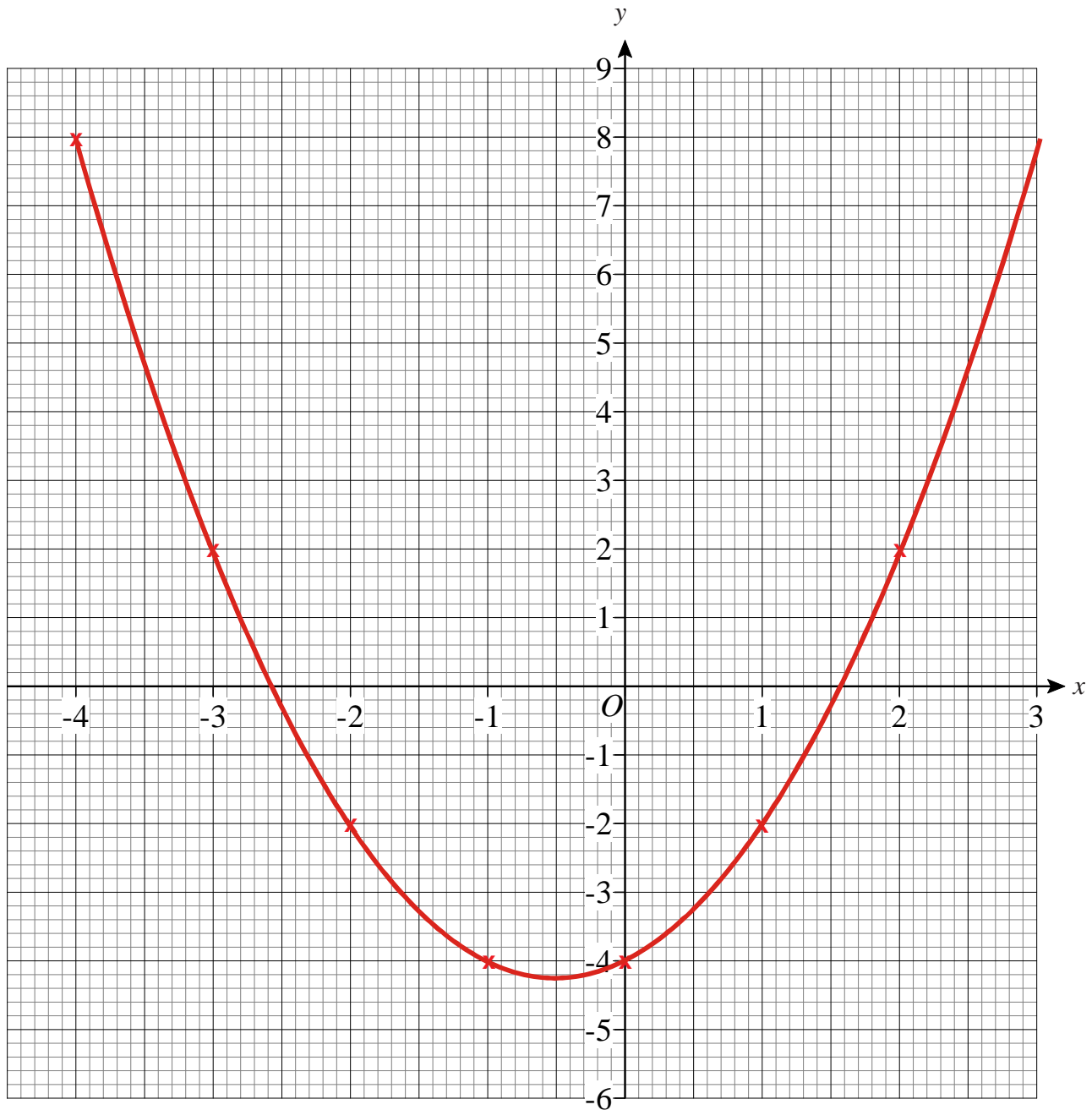
Drawing Quadratic Graphs



1) a) Complete the table of values for $y = x^2 + x - 4$

x	-4	-3	-2	-1	0	1	2	3
y	8	2	-2	-4	-4	-2	2	8

b) On the grid, draw the graph of $y = x^2 + x - 4$



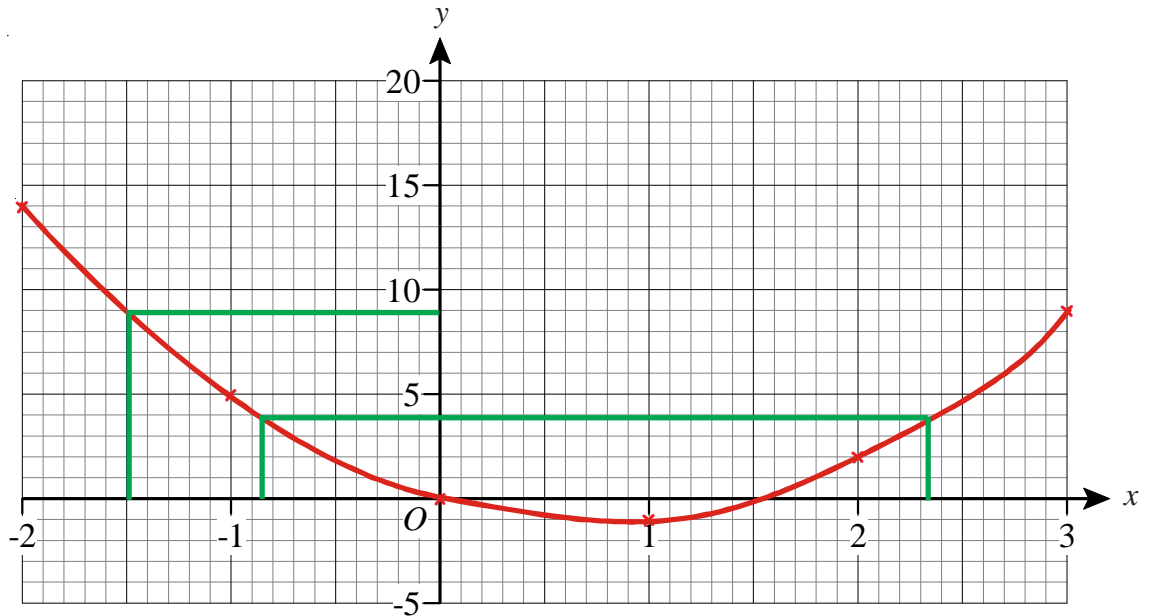
Drawing Quadratic Graphs



- 1) a) Complete the table of values for $y = 2x^2 - 3x$

x	-2	-1	0	1	2	3
y	14	5	0	-1	2	9

- b) On the grid, draw the graph of $y = 2x^2 - 3x$ for values of x from -2 to 3



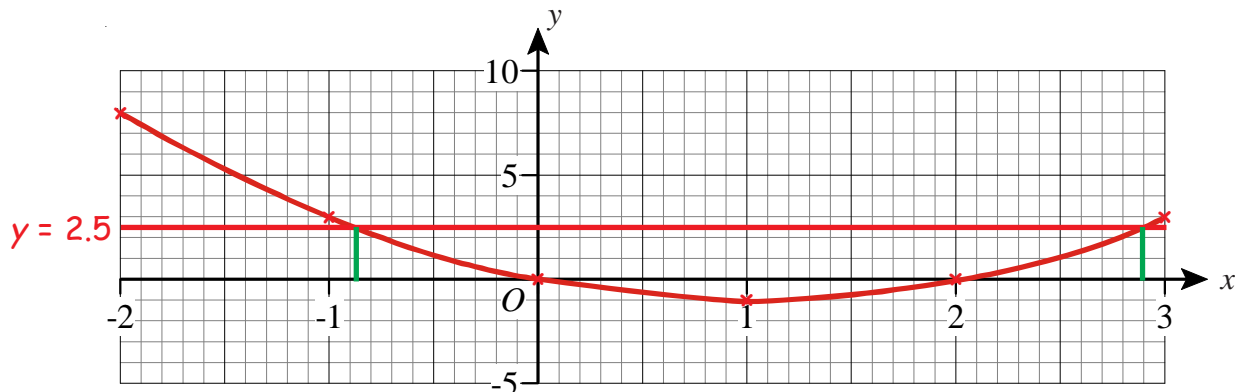
- c) Use the graph to find the value of y when $x = -1.5$ $y = 9$
d) Use the graph to find the values of x when $y = 4$ $x = -0.85$ and $x = 2.33$



- 2) a) Complete the table of values for $y = x^2 - 2x$

x	-2	-1	0	1	2	3
y	8	3	0	-1	0	3

- b) On the grid, draw the graph of $y = x^2 - 2x$ for values of x from -2 to 3

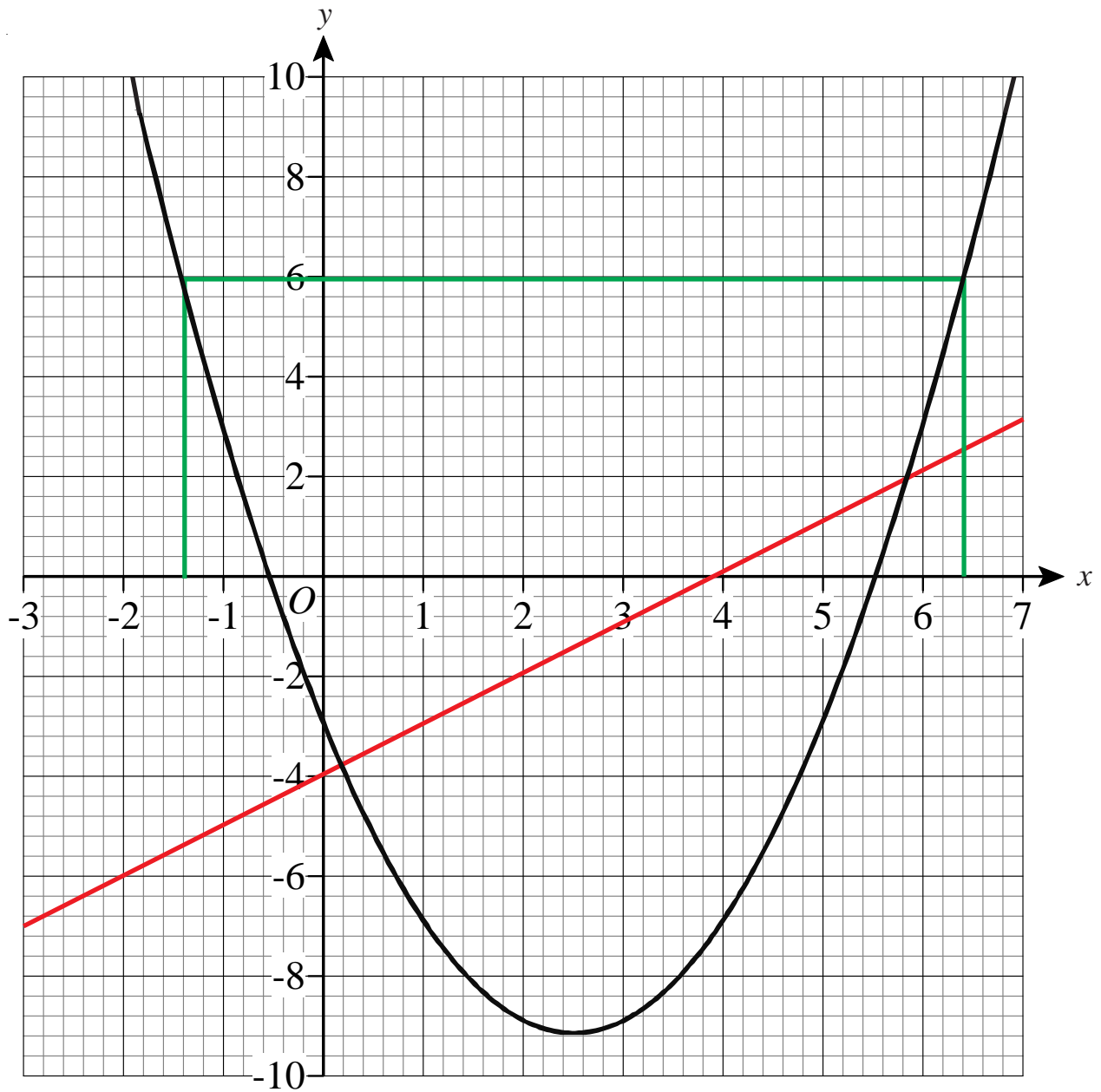


- c) (i) On the same axes draw the straight line $y = 2.5$
(ii) Write down the values of x for which $x^2 - 2x = 2.5$ $x = -0.89$ or $x = 2.9$

Drawing Quadratic Graphs



- 1) The diagram shows the graph of $y = x^2 - 5x - 3$



- a) Use the graph to find estimates for the solutions of

(i) $x^2 - 5x - 3 = 0$ $x = -0.5$ and 5.5

(ii) $x^2 - 5x - 3 = 6$ $x = -1.4$ and 6.4

- b) Use the graph to find estimates for the solutions of the simultaneous equations

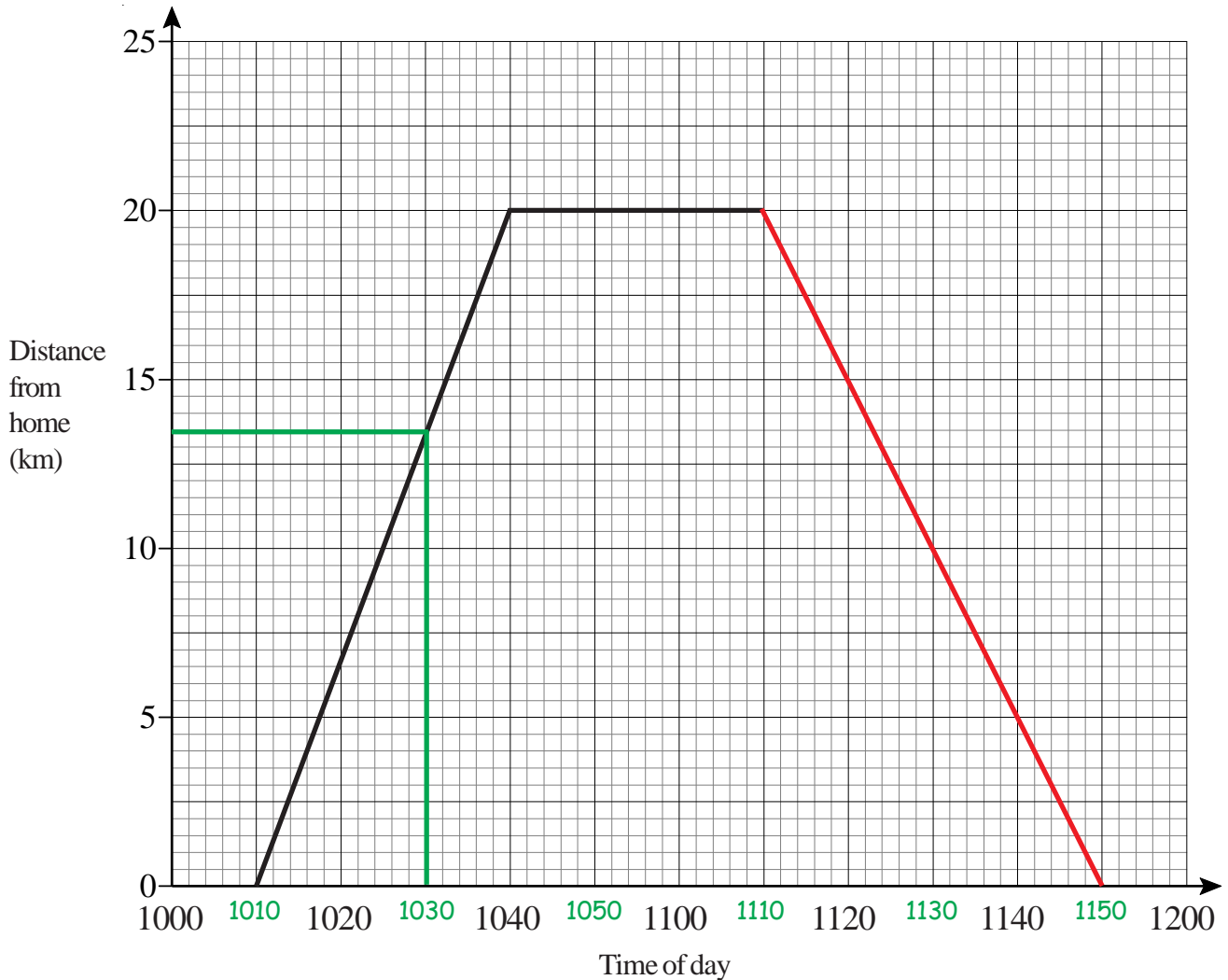
$$\begin{array}{lll} y = x^2 - 5x - 3 & x = 0.2 & x = 5.8 \\ y = x - 4 & y = -3.8 & y = 1.8 \end{array}$$

$y = x - 4$	
x	y
0	-4
1	-3
2	-2

Distance-Time Graphs



- 1) Sarah travelled 20 km from home to her friend's house. She stayed at her friend's house for some time before returning home. Here is the travel graph for part of Sarah's journey.



a) At what time did Sarah leave home? **10 10**

b) How far was Sarah from home at 1030? **13.5 km**

Sarah left her friend's house at 11 10 to return home.

c) Work out the time in minutes Sarah spent at her friend's house. **30 minutes**

Sarah returned home at a steady speed.

She arrived home at 11 50

d) Complete the travel graph.

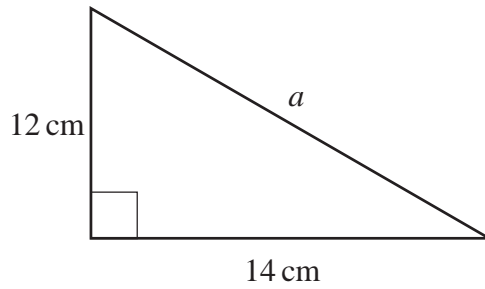
e) Work out Sarah's average speed on her journey from her home to her friend's house. Give your answer in kilometres per hour. **40km/h**

f) Work out Sarah's average speed on her journey home from her friend's house. Give your answer in kilometres per hour. **30km/h**

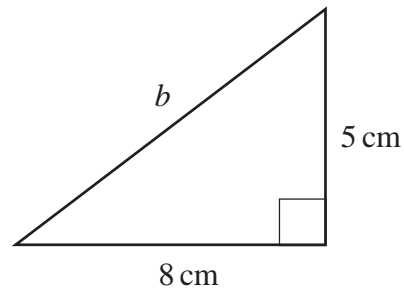
Pythagoras' Theorem



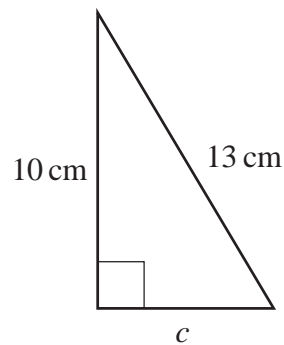
- 1) Find the length of side a . **18.4 cm**
Give your answer to 1 decimal place.



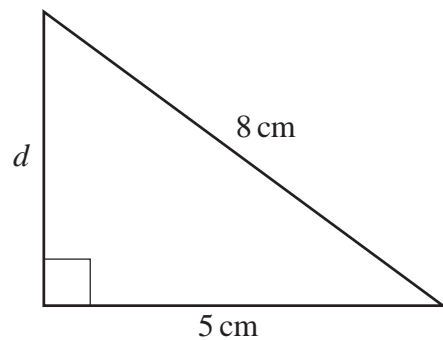
- 2) Find the length of side b . **9.4 cm**
Give your answer to 1 decimal place.



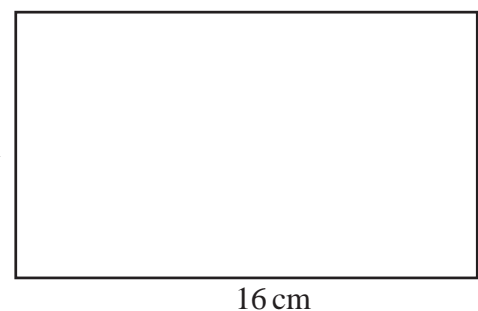
- 3) Find the length of side c . **8.3 cm**
Give your answer to 1 decimal place.



- 4) Find the length of side d . **6.2 cm**
Give your answer to 1 decimal place.



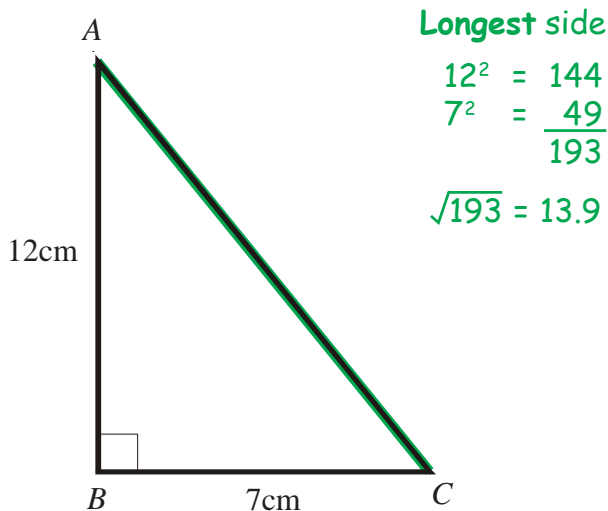
- 5) Find the length of the diagonal of this rectangle.
Give your answer to 1 decimal place. **18.4 cm**



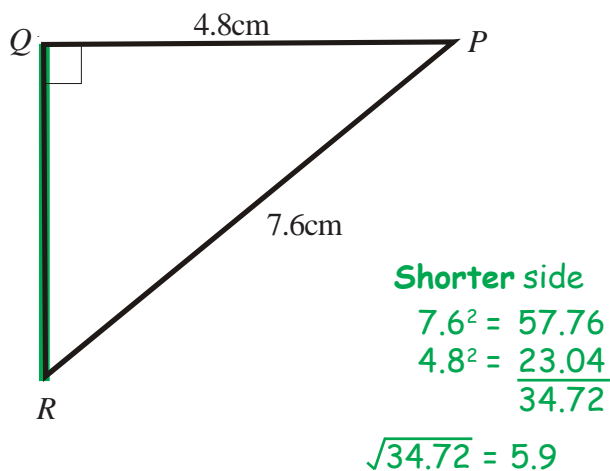
Pythagoras' Theorem



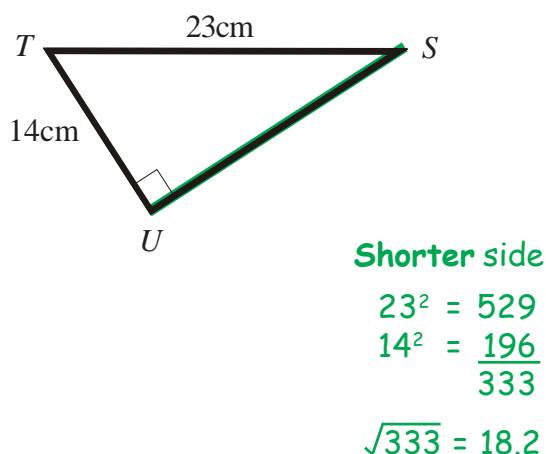
- 1) Find the length of side AC. **13.9cm**
Give your answer to 1 decimal place.



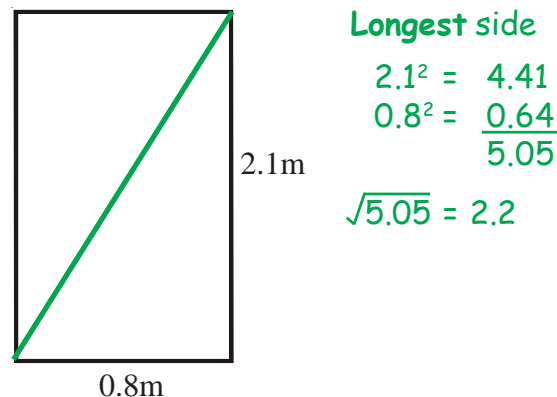
- 2) Find the length of side QR. **5.9cm**
Give your answer to 1 decimal place.



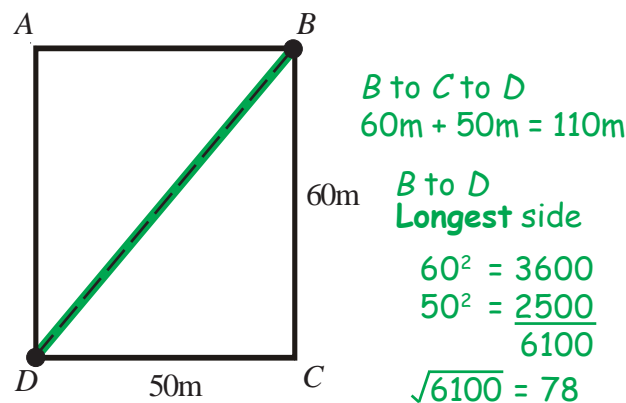
- 3) Find the length of side SU. **18.2cm**
Give your answer to 1 decimal place.



- 4) Below is a picture of a doorway. **2.2m**
Find the size of the diagonal of the doorway.
Give your answer to 1 decimal place.



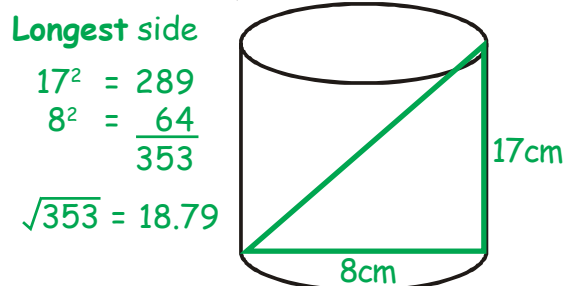
- 5) In the sketch of the rectangular field, below, James wants to walk from B to D.



Which of the following routes is shorter and by how much? **B to D by 32m**
From B to C to D or straight across the field from B to D. $110\text{m} - 78\text{m} = 32\text{m}$
Give your answer to the nearest metre.



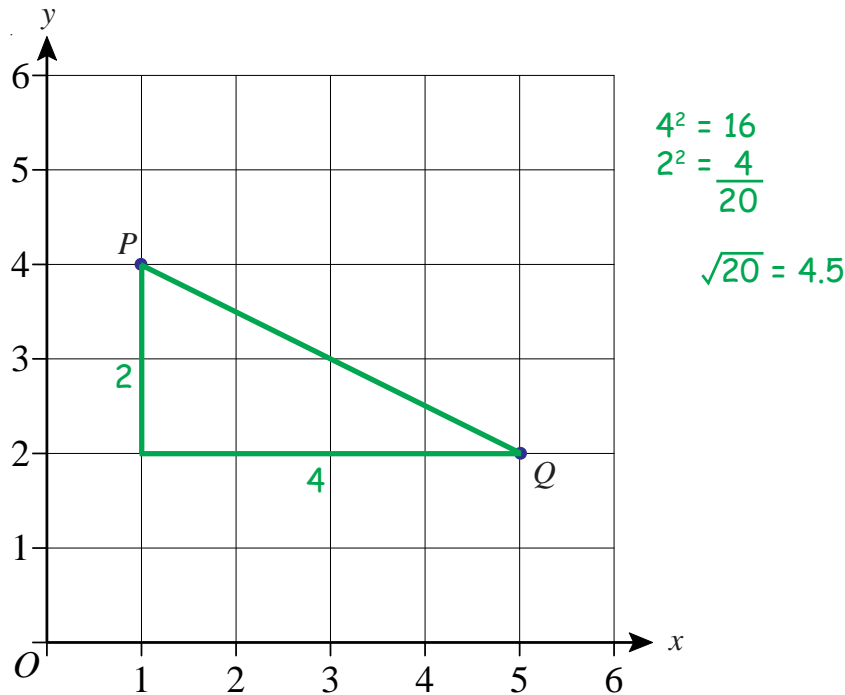
- 6) Fiona keeps her pencils in a cylindrical beaker as shown below.
The beaker has a diameter of 8cm and a height of 17cm.
Will a pencil of length 19cm fit in the beaker without poking out of the top? **No. The diagonal is only 18.8cm.**
All workings must be shown.



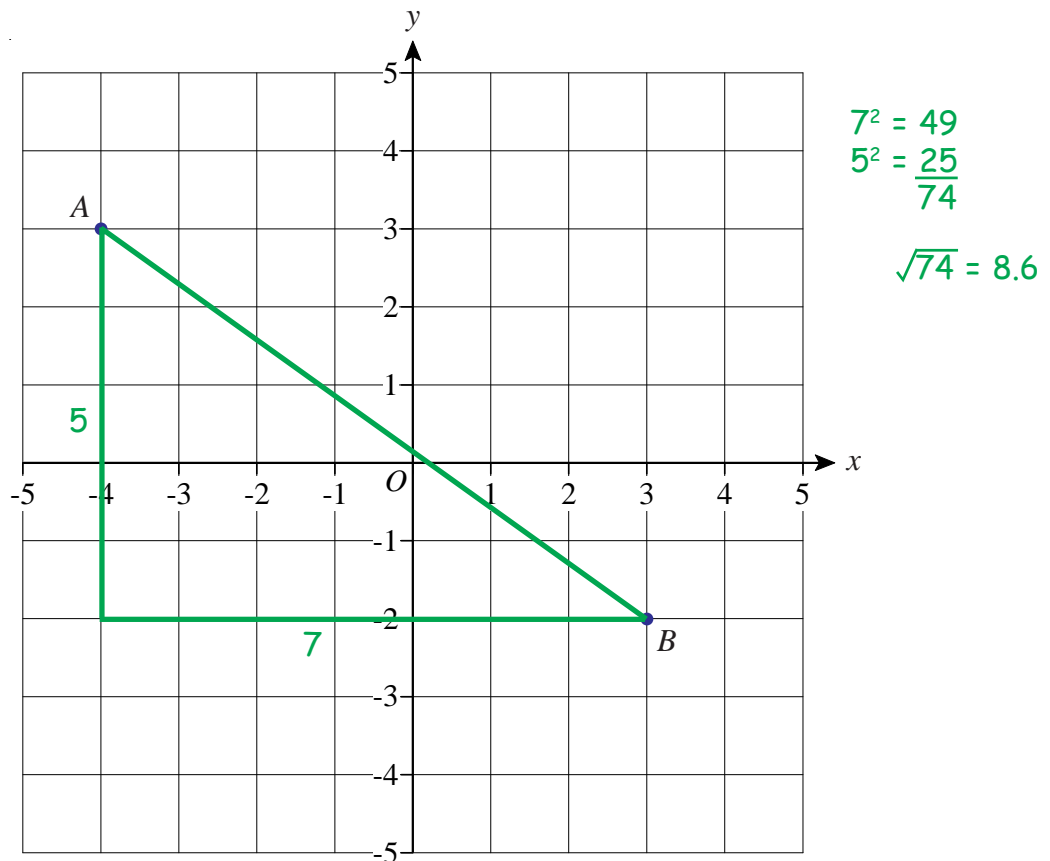
Pythagoras - Line on a Graph



- 1) Points P and Q have coordinates $(1, 4)$ and $(5, 2)$.
Calculate the shortest distance between P and Q .
Give your answer correct to 1 decimal place. **4.5**



- 2) Points A and B have coordinates $(-4, 3)$ and $(3, -2)$.
Calculate the shortest distance between A and B .
Give your answer correct to 1 decimal place. **8.6**

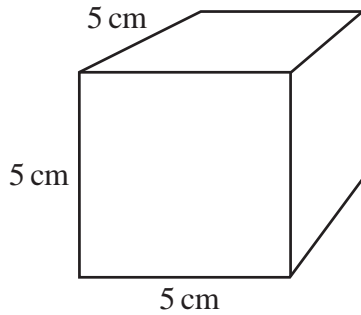


Surface Area of Cuboids



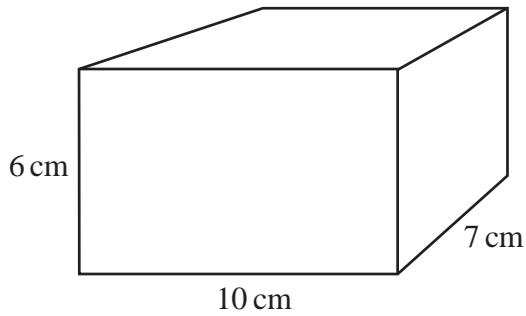
- 1) A cube has sides of length 5 cm.

Find the total surface area of the cube. **150 cm²**



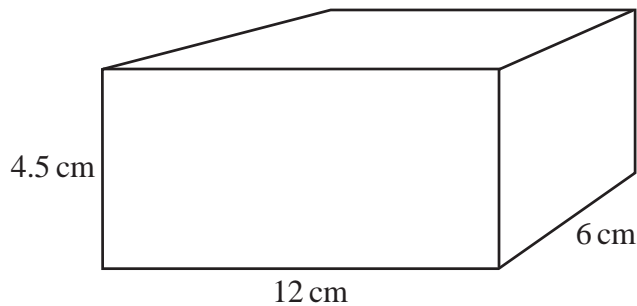
- 2) A cuboid has sides of length 10 cm, 6cm and 7 cm.

Find the total surface area of the cuboid. **344 cm²**



- 3) A cuboid has sides of length 12 cm, 4.5cm and 6 cm.

Find the total surface area of the cuboid. **306 cm²**



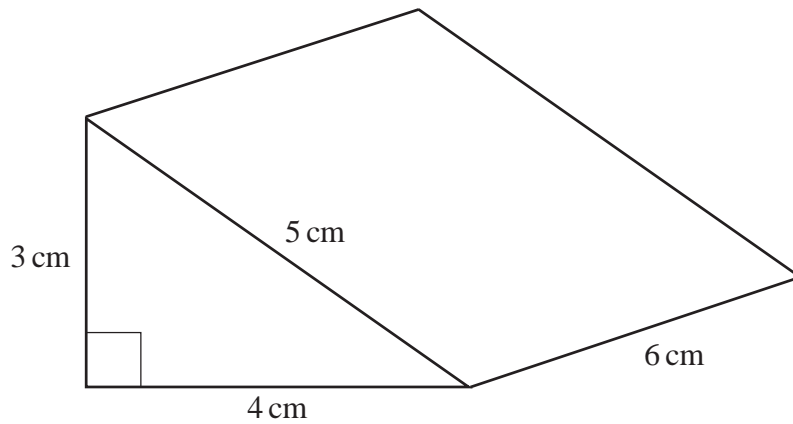
Surface Area of Triangular Prisms



- 1) Find the surface area of this triangular prism.

84 cm²

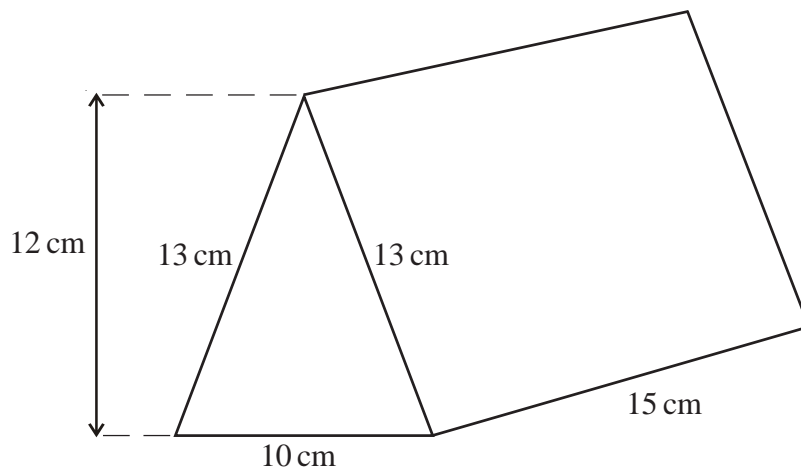
$$6 + 6 + 30 + 24 + 18$$



- 2) Find the surface area of this triangular prism.

660 cm²

$$60 + 60 + 195 + 195 + 150$$

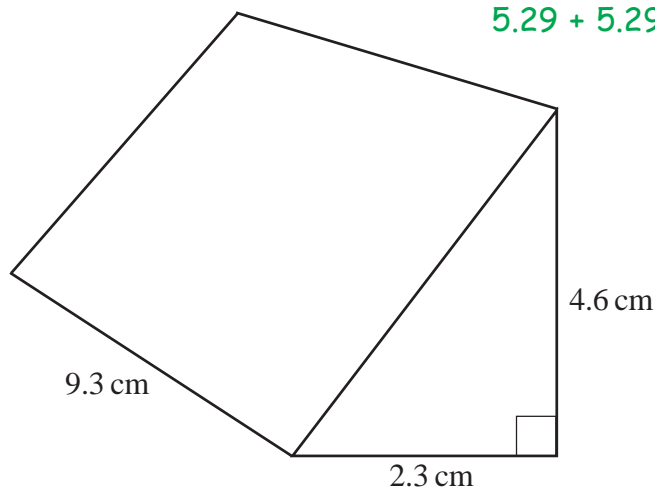


- 3) With the aid of Pythagoras' Theorem, find the surface area of this triangular prism.

Give your answer correct to 2 significant figures.

120 cm²

$$5.29 + 5.29 + 42.78 + 21.39 + 47.43$$



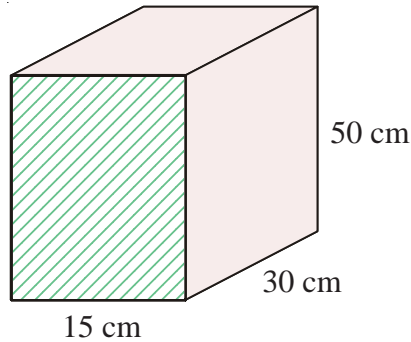
Volume of a Prism



- 1) The diagram shows a cuboid.

Work out the volume of the cuboid.

$$V = 22500 \text{ cm}^3$$

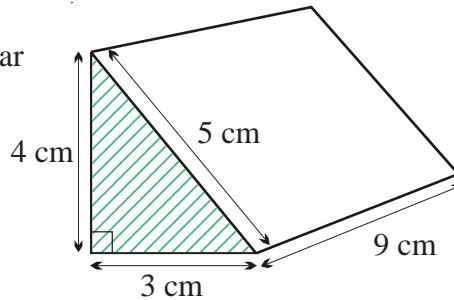


$$\begin{aligned} A &= L \times H \\ A &= 15 \times 50 \\ A &= 750 \text{ cm}^2 \\ V &= A \times L \\ V &= 750 \times 30 \end{aligned}$$



- 2) Calculate the volume of this triangular prism.

$$V = 54 \text{ cm}^3$$



$$\begin{aligned} A &= \frac{b \times h}{2} \\ A &= \frac{3 \times 4}{2} \\ A &= 6 \text{ cm}^2 \\ V &= A \times L \\ V &= 6 \times 9 \end{aligned}$$

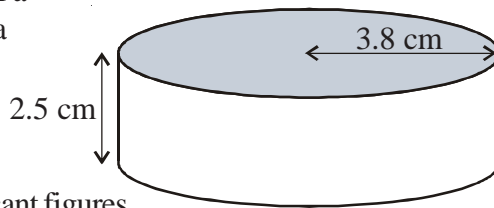


- 3) An ice hockey puck is in the shape of a cylinder with a radius of 3.8 cm and a thickness of 2.5 cm.

Take π to be 3.142

Work out the volume of the puck.
Give your answer correct to 3 significant figures.

$$V = 113 \text{ cm}^3$$



$$\begin{aligned} A &= \pi r^2 \\ A &= 3.142 \times 3.8^2 \\ A &= 45.37048 \text{ cm}^2 \\ V &= A \times L \\ V &= 45.37048 \times 2.5 \end{aligned}$$



- 4) A cuboid has: a volume of 80 cm^3
a length of 5 cm
a width of 2 cm

$$80 \div 5 \div 2$$

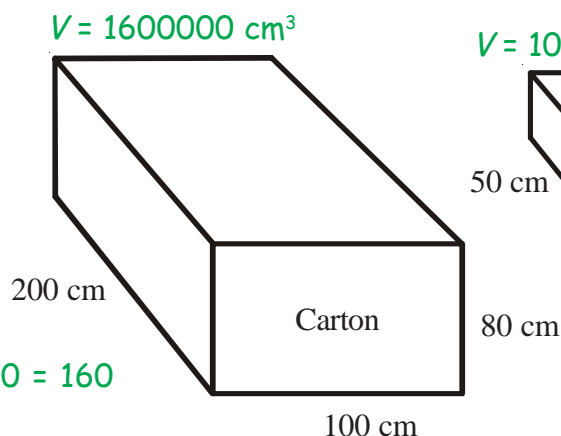
Work out the height of the cuboid.

$$H = 8 \text{ cm}$$



- 5) Work out the maximum number of boxes which can fit in the carton.

160 boxes will fit.



$$V = 1600000 \text{ cm}^3$$

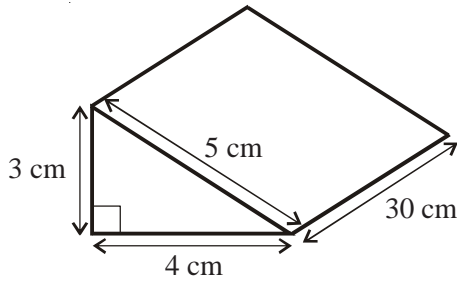
$$V = 10000 \text{ cm}^3$$

$$1600000 \div 10000 = 160$$

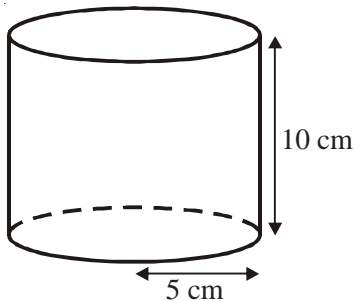
Volume of a Prism



- 1) Work out the volume of the prism. **180 cm³**



2)



A solid cylinder has a radius of 5 cm and a height of 10 cm.

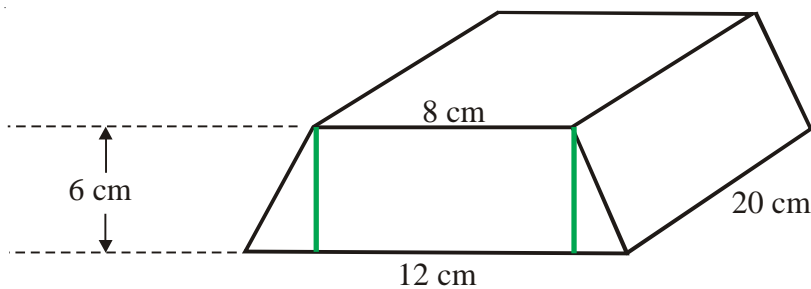
Work out the volume of the cylinder. **786 cm³**

Take π to be 3.142

Give your answer correct to 3 significant figures.



3)



The diagram shows a solid prism made from metal.
The cross-section of the prism is a trapezium.

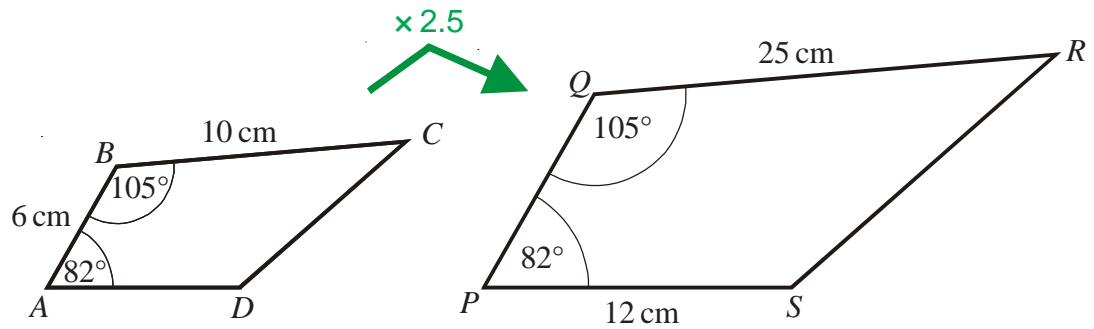
Find the volume of the prism. **1200 cm³**

You must state your units.

Similar Shapes



1)

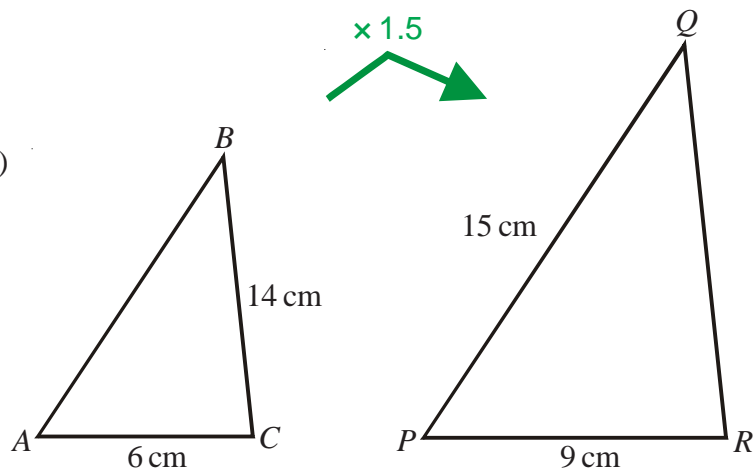


$ABCD$ and $PQRS$ are mathematically similar.

- Find the length of PQ . **15 cm**
- Find the length of AD . **4.8 cm**



2)



Triangles ABC and PQR are mathematically similar.

Angle A = angle P .

Angle B = angle Q .

Angle C = angle R .

$AC = 6$ cm.

$BC = 14$ cm.

$PR = 9$ cm.

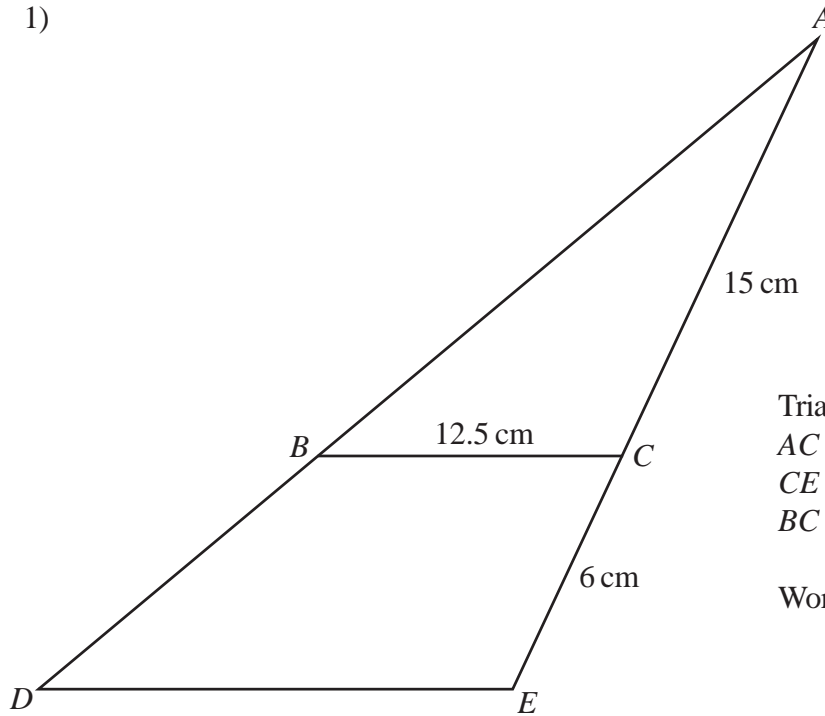
$PQ = 15$ cm

- Work out the length of QR . **21 cm**
- Work out the length of AB . **10 cm**

Similar Shapes



1)



Triangle ABC is similar to triangle ADE .
 $AC = 15$ cm.
 $CE = 6$ cm.
 $BC = 12.5$ cm.

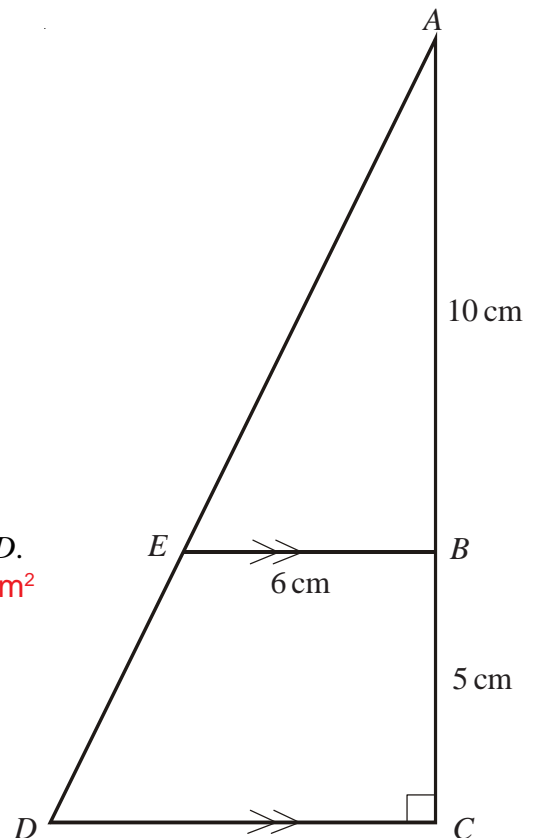
Work out the length of DE . **17.5 cm**



- 2) ABC and AED are straight lines.
 EB is parallel to DC .
Angle $ACD = 90^\circ$

$AB = 10$ cm
 $BC = 5$ cm
 $EB = 6$ cm

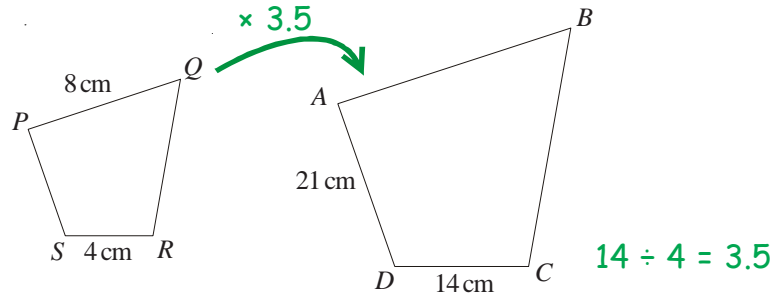
- a) Work out the length of DC . **9 cm**
- b) Work out the area of the trapezium $EBCD$. **37.5 cm^2**



Similar Shapes



- 1) The diagram shows two quadrilaterals that are mathematically **similar**.



- a) Calculate the length of AB **28 cm** $AB = PQ \times 3.5$
b) Calculate the length of PS **6 cm** $PS = AD \div 3.5$

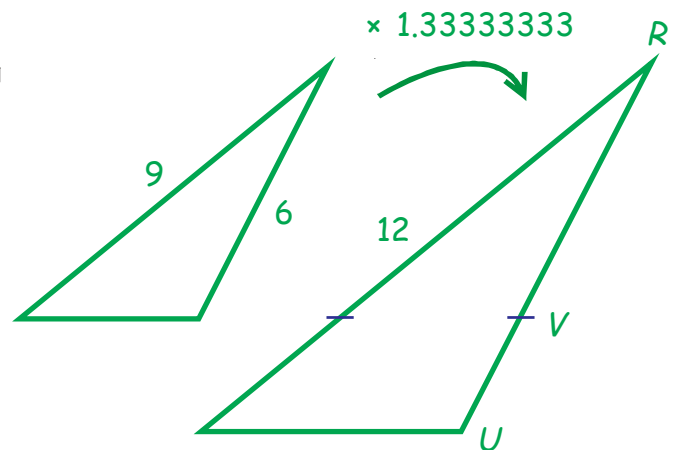
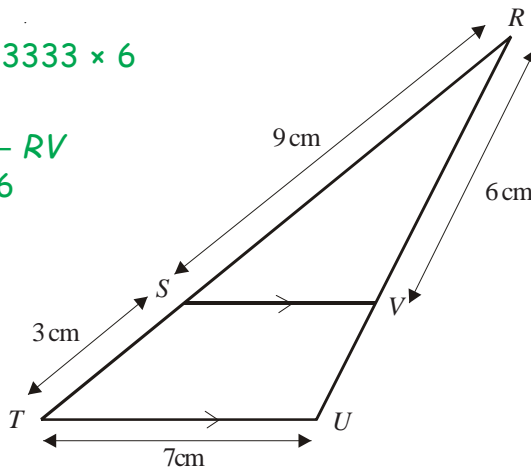


- 2) SV is parallel to TU .
 RST and RVU are straight lines.
 $RS = 9$ cm, $ST = 3$ cm, $TU = 7$ cm, $RV = 6$ cm

$$12 \div 9 = 1.33333333$$

Calculate the length of VU . **2 cm**

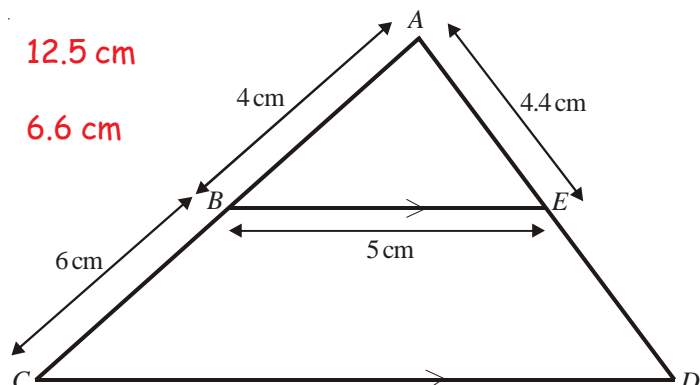
$$\begin{aligned} RU &= 1.333333 \times 6 \\ RU &= 8 \\ VU &= RU - RV \\ VU &= 8 - 6 \end{aligned}$$



- 3) BE is parallel to CD .
 ABC and AED are straight lines.
 $AB = 4$ cm, $BC = 6$ cm, $BE = 5$ cm, $AE = 4.4$ cm

$$\text{Scale factor} = 2.5 \quad (10 \div 4)$$

- a) Calculate the length of CD . **12.5 cm**
b) Calculate the length of ED . **6.6 cm**



Converting Metric Units



- 1) Change 9 m^2 into cm^2 **90000 cm^2**



- 2) How many square metres are there in 5 square kilometres? **5000000 m^2**



- 3) Change 4 cm^2 into mm^2 **400 mm^2**



- 4) Convert 6.5 m^2 into mm^2 **6500000 mm^2**



- 5) Change 2 m^3 into cm^3 **2000000 cm^3**



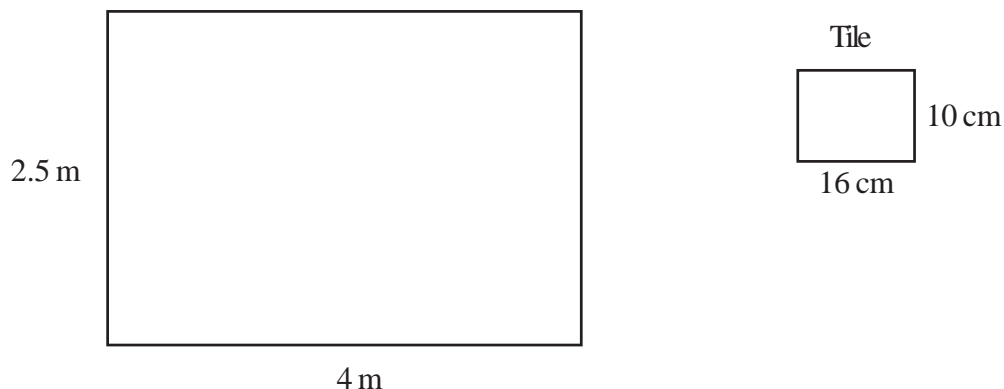
- 6) How many cubic millimetres are there in 3 cubic centimetres? **3000 mm^3**



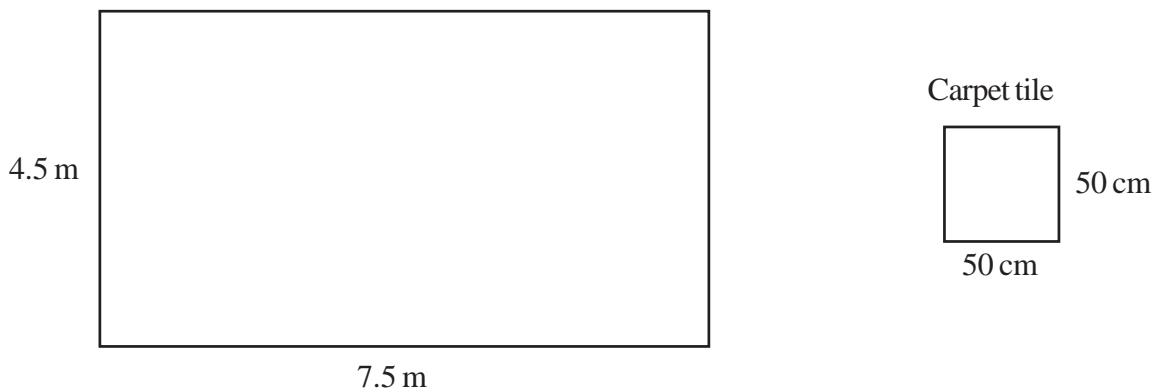
- 7) Change 7 m^3 into mm^3 **7000000000 mm^3**



- 8) A tiler wants to tile a rectangular wall which measures 4 m by 2.5 m.
Each tile measures 16 cm by 10 cm.
How many tiles will he need for the wall? **625**



- 9) A carpet-fitter is laying carpet tiles on a rectangular floor which measures 7.5 m by 4.5 m.
Each carpet tile measures 50 cm by 50 cm.
How many carpet tiles will he need for the floor? **135**





- 1) A silver necklace has a mass of 123 grams, correct to the nearest gram.

- a) Write down the least possible mass of the necklace. **122.5 g**
- b) Write down the greatest possible mass of the necklace. **123.5 g**



- 2) Each of these measurements was made correct to one decimal place.
Write the maximum and minimum possible measurement in each case.

- | | | | |
|--------------|--------------|-----------------|-----------------|
| a) 4.6 cm | b) 0.8 kg | c) 12.5 litres | d) 25.0 km/h |
| max: 4.65 cm | max: 0.85 kg | max: 12.55 L | max: 25.05 km/h |
| min: 4.55 cm | min: 0.75 kg | min: 12.45 L | min: 24.95 km/h |
| e) 10.3 s | f) 36.1 m | g) 136.7 m/s | h) 0.1 g |
| max: 10.35 s | max: 36.15 m | max: 136.75 m/s | max: 0.15 g |
| min: 10.25 s | min: 36.05 m | min: 136.65 m/s | min: 0.05 g |



- 3) Each side of a regular octagon has a length of 20.6 cm, correct to the nearest millimetre.

- a) Write down the least possible length of each side. **20.55 cm**
- b) Write down the greatest possible length of each side. **20.65 cm**
- c) Write down the greatest possible perimeter of the octagon. **165.2 cm**



- 4) A girl has a pen that is of length 12 cm, measured to the nearest centimetre.
Her pencil case has a diagonal of length 12.5 cm, measured to the nearest millimetre.

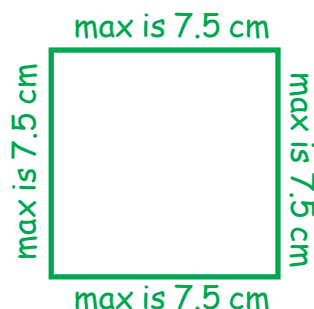
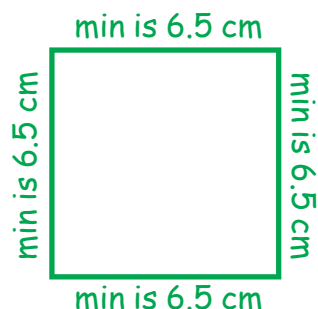
Explain why it might not be possible for her to fit the pen in the pencil case.

12 cm to the nearest cm has a maximum possible length of 12.5 cm.
12.5 cm to the nearest mm has a minimum possible length of 12.45 cm.
A 12.5 cm pencil won't fit into a pencil case with a diagonal length of 12.45 cm.



- 5) A square has sides of length 7 cm, correct to the nearest centimetre.

- a) Calculate the lower bound for the perimeter of the square. **26 cm** **$6.5 + 6.5 + 6.5 + 6.5$**
- b) Calculate the upper bound for the area of the square. **56.25 cm^2** **7.5×7.5**





- 1) Jane runs 200 metres in 21.4 seconds.

Work out Jane's average speed in metres per second.
Give your answer correct to 1 decimal place.

$$S = 9.3 \text{ m/s}$$

$$S = \frac{D}{T}$$

$$S = \frac{200}{21.4}$$



- 2) A car travels at a steady speed and takes five hours to travel 310 miles.

Work out the average speed of the car in miles per hour.

$$S = 62 \text{ mph}$$

$$S = \frac{D}{T}$$

$$S = \frac{310}{5}$$



- 3) A plane flies 1440 miles at a speed of 240 mph.

How long does it take?

$$T = 6 \text{ hours}$$

$$T = \frac{D}{S}$$

$$T = \frac{1440}{240}$$



- 4) A marathon runner runs at 7.6 mph for three and a half hours.

How many miles has he run?

$$D = 26.6 \text{ miles}$$

$$D = S \times T$$

$$D = 7.6 \times 3.5$$



- 5) A car takes 15 minutes to travel 24 miles.

Find its speed in **mph**.

$$S = 96 \text{ mph}$$

$$S = \frac{D}{T} \quad \text{15 mins is 0.25 of an hour}$$

$$S = \frac{24}{0.25}$$



- 6) A cyclist takes 10 minutes to travel 2.4 miles.

Calculate the average speed in mph.

$$S = 14.4 \text{ mph}$$

$$S = \frac{D}{T} \quad \text{10 mins is 0.16 of an hour}$$

$$S = \frac{2.4}{0.16}$$



- 7) An ice hockey puck has a volume of 113 cm³.

It is made out of rubber with a density of 1.5 grams per cm³.

Work out the mass of the ice hockey puck.

$$M = 169.5 \text{ g}$$

$$M = D \times V$$

$$M = 1.5 \times 113$$



- 8) An apple has a mass of 160 g and a volume of 100 cm³.

Find its density in g/cm³.

$$D = 1.6 \text{ g/cm}^3$$

$$D = \frac{M}{V}$$

$$D = \frac{160}{100}$$



- 9) A steel ball has a volume of 1500 cm³.

The density of the ball is 95 g/cm³.

Find the mass of the ball in **kg**.

$$M = 142.5 \text{ kg}$$

$$M = D \times V$$

$$M = 95 \times 1500$$

$$M = 142\,500$$



- 10) The mass of a bar of chocolate is 1800 g.

The density of the chocolate is 9 g/cm³.

What is the volume of the bar of chocolate?

$$V = 200 \text{ cm}^3$$

$$V = \frac{M}{D}$$

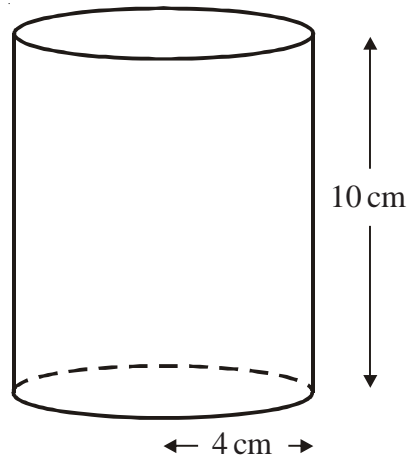
$$V = \frac{1800}{9}$$



- 1) Tony went on holiday to Miami.
He travelled from London by plane.
The distance from London to Miami is 7120 km.
The plane journey took 8 hours.
Calculate the average speed of the plane. **890 km/h**



- 2) A solid cylinder has a radius of 4 cm and a height of 10 cm.



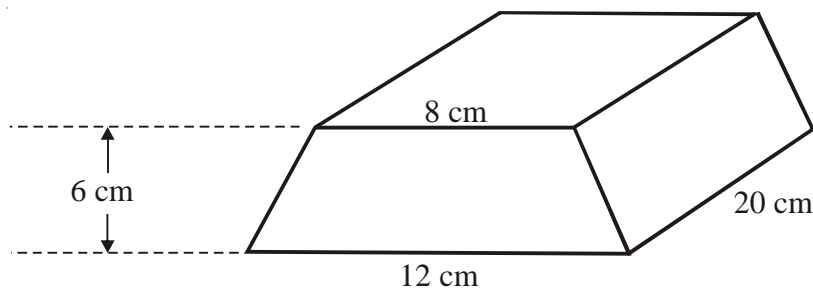
- a) Work out the volume of the cylinder.
Give your answer correct to 3 significant figures. **503 cm³**

The cylinder is made of wood.
The density of the wood is 0.7 grams per cm³

- b) Work out the mass of the cylinder.
Give your answer correct to 3 significant figures. **352 g**



- 3)



The diagram shows a solid prism made from metal.
The cross-section of the prism is a trapezium.

The parallel sides of the trapezium are 8 cm and 12 cm.

The height of the trapezium is 6 cm.

The length of the prism is 20 cm.

The density of the metal is 4 g/cm³.

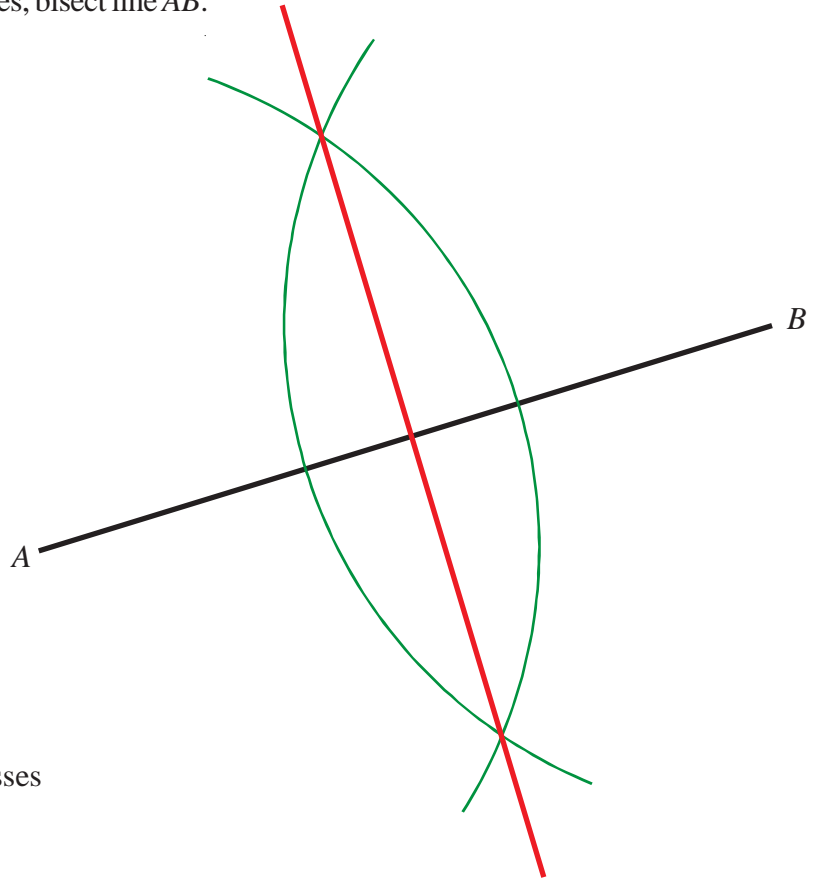
$$\begin{aligned} \text{mass} &= \text{density} \times \text{volume} \\ \text{mass} &= 4 \times 1200 \\ \text{mass} &= 4800 \text{ g} \end{aligned}$$

Calculate the mass of the prism. **4.8 kg**
Give your answer in kilograms.

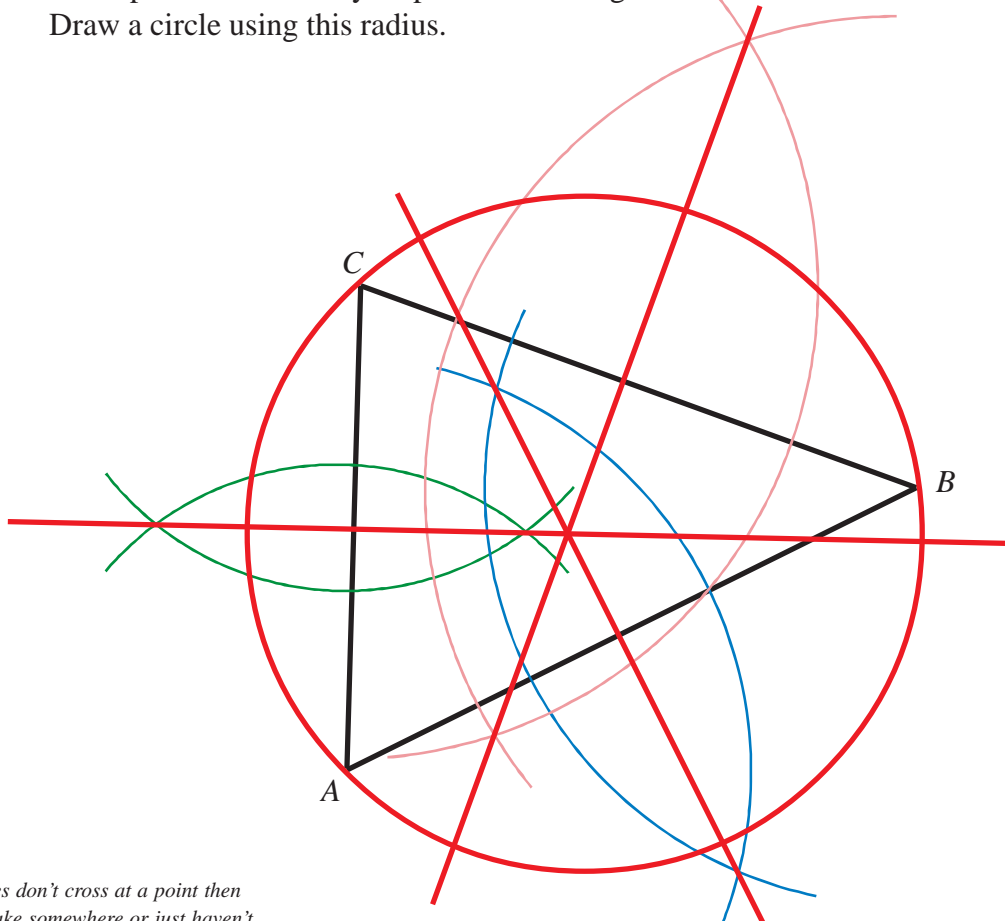
Bisecting a Line



- 1) Using ruler and compasses, bisect line AB .



- 2) Using ruler and compasses
- Bisect line AB
 - Bisect line BC
 - Bisect line AC
 - Place your compass point where your three lines cross*
Now open them out until your pencil is touching vertex A .
Draw a circle using this radius.

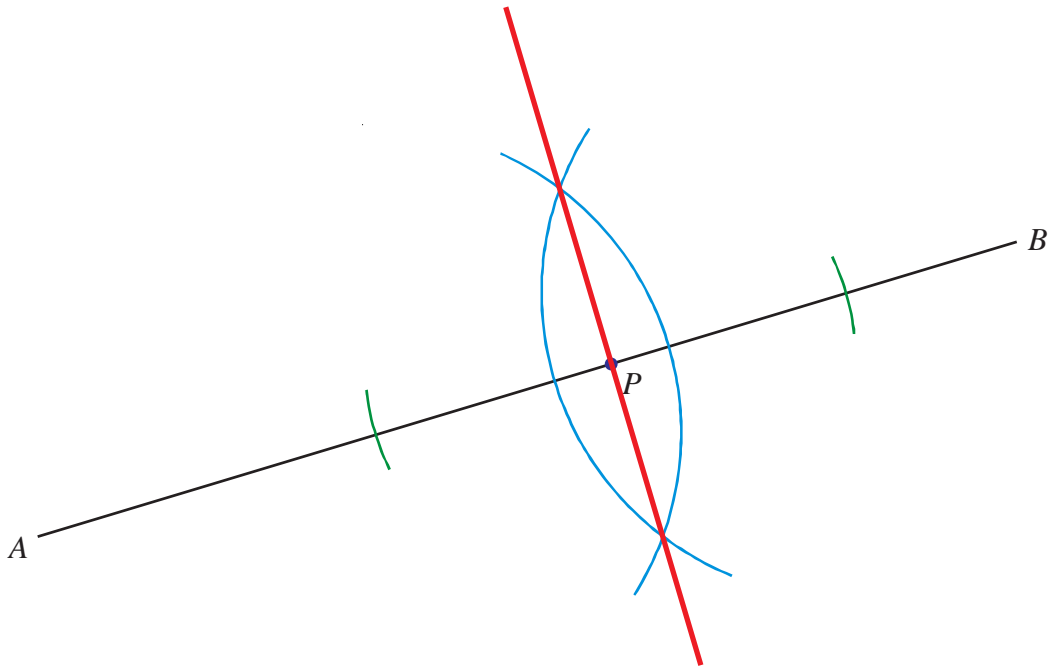


* If your three lines don't cross at a point then you have a mistake somewhere or just haven't been accurate enough.

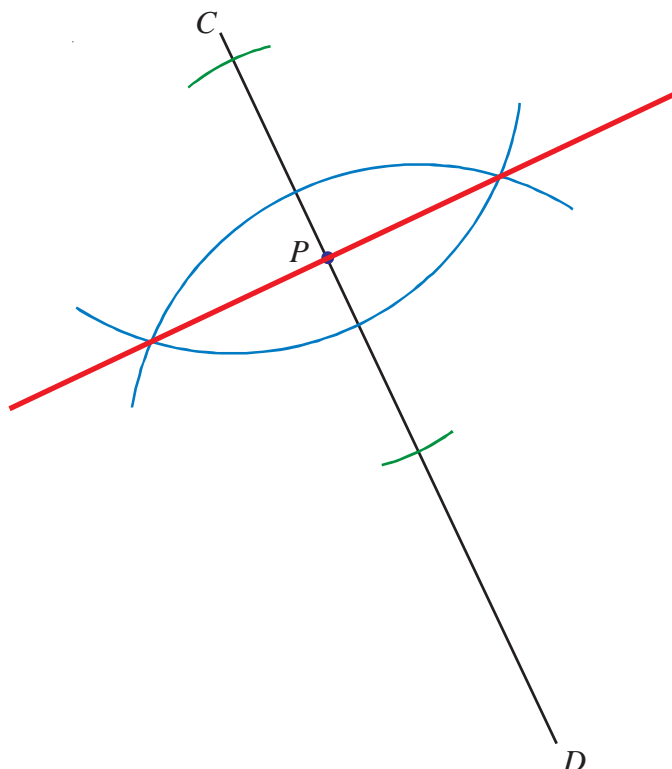
Drawing a Perpendicular to a Line



- 1) Use ruler and compasses to **construct** the perpendicular to the line segment AB that passes through the point P .
You must show all construction lines.



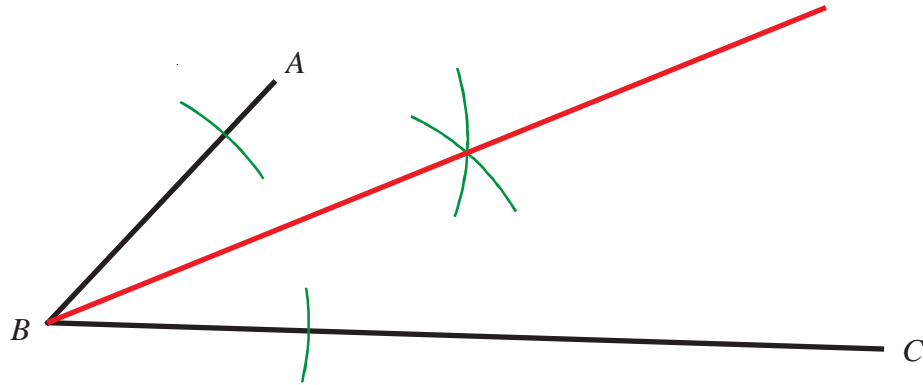
- 2) Use ruler and compasses to **construct** the perpendicular to the line segment CD that passes through the point P .
You must show all construction lines.



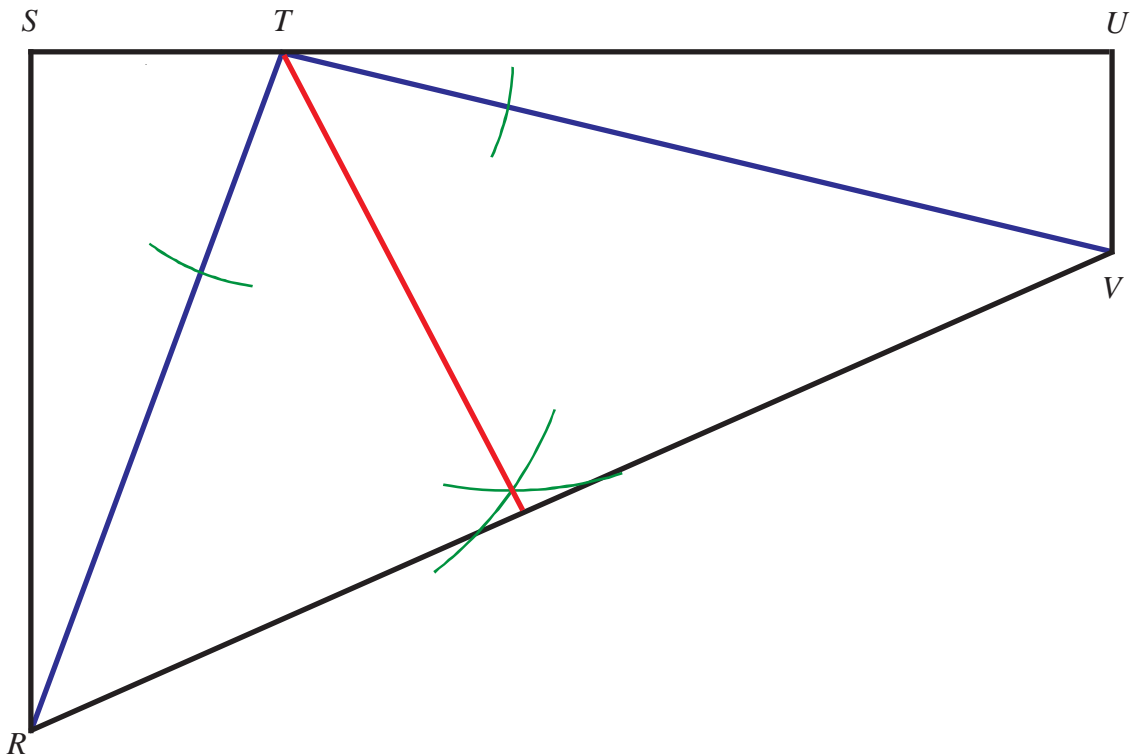
Bisecting an Angle



- 1) Using ruler and compasses, bisect angle ABC .



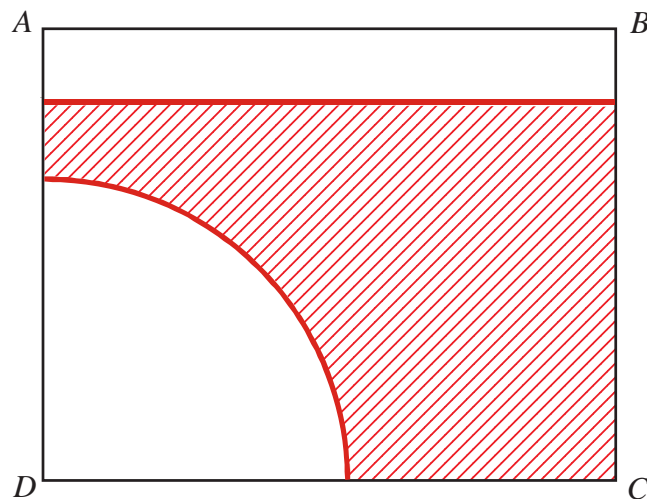
- 2) The diagram below shows the plan of a park.
The border of the park is shown by the quadrilateral $RSTUV$



There are two paths in the park. One is labelled TR and the other TV
A man walks in the park so that he is always the same distance from both paths.
Using ruler and compasses show exactly where the man can walk.



1)

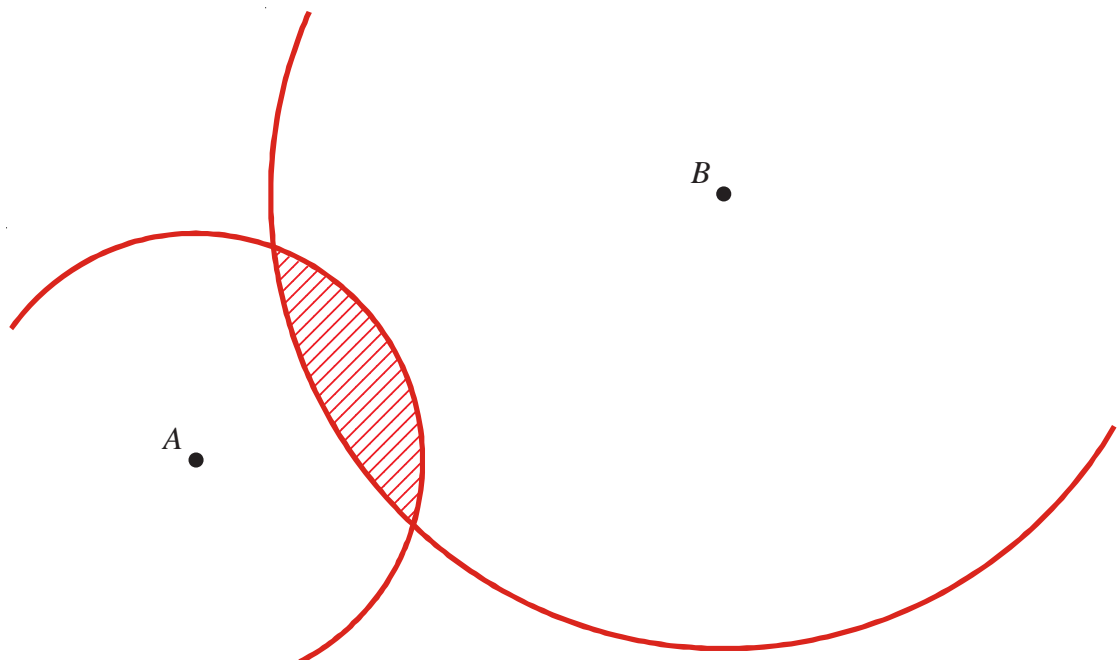


$ABCD$ is a rectangle.

Shade the set of points inside the rectangle which are **both**
more than 4 centimetres from the point D
and more than 1 centimetre from the line AB .



2) Two radio transmitters, A and B , are situated as below.



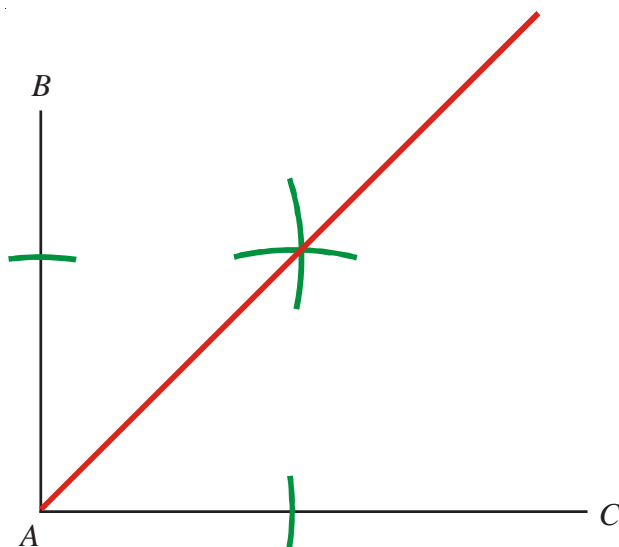
Transmitter A broadcasts signals which can be heard up to 3 km from A .

Transmitter B broadcasts signals which can be heard up to 6 km from B .

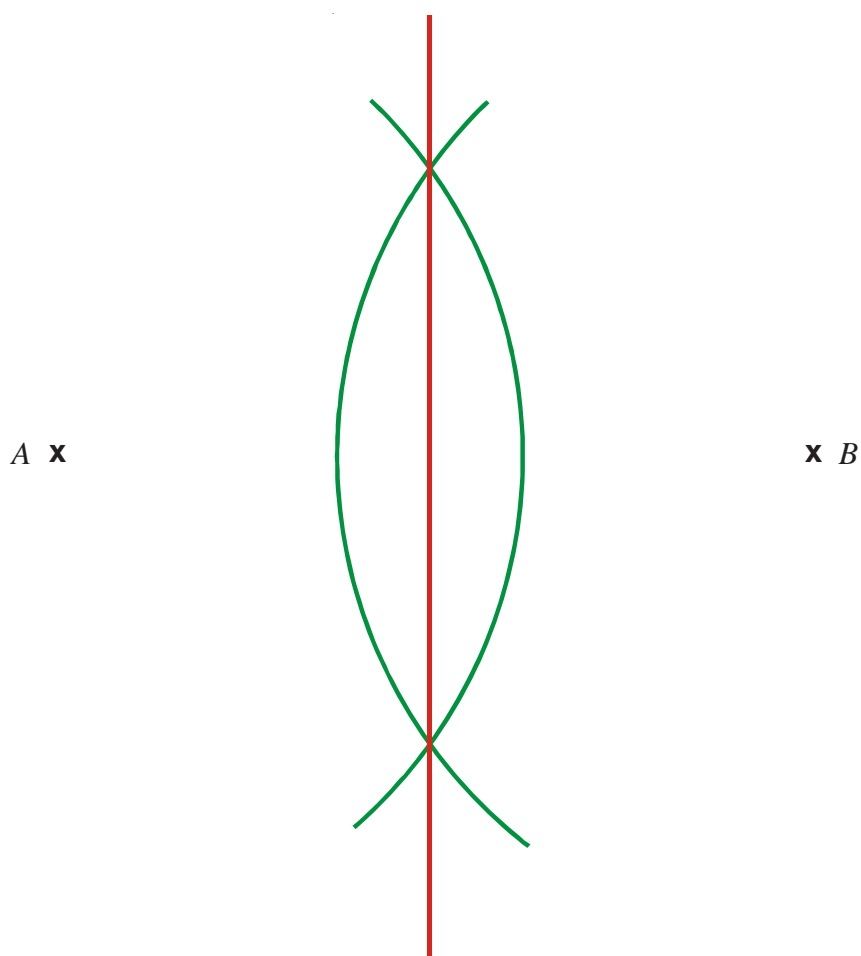
Shade in the area in which radio signals can be heard from both transmitters.
Use a scale of 1 cm = 1 km.



- 1) Draw the locus of all points which are equidistant from the lines AB and AC .

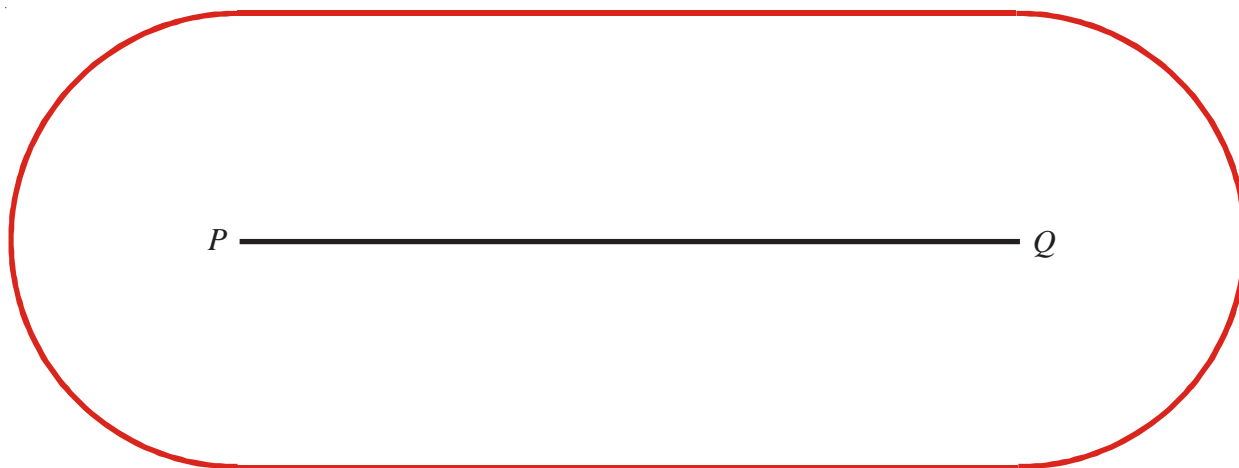


- 2) Draw the locus of all points which are equidistant from the points A and B .

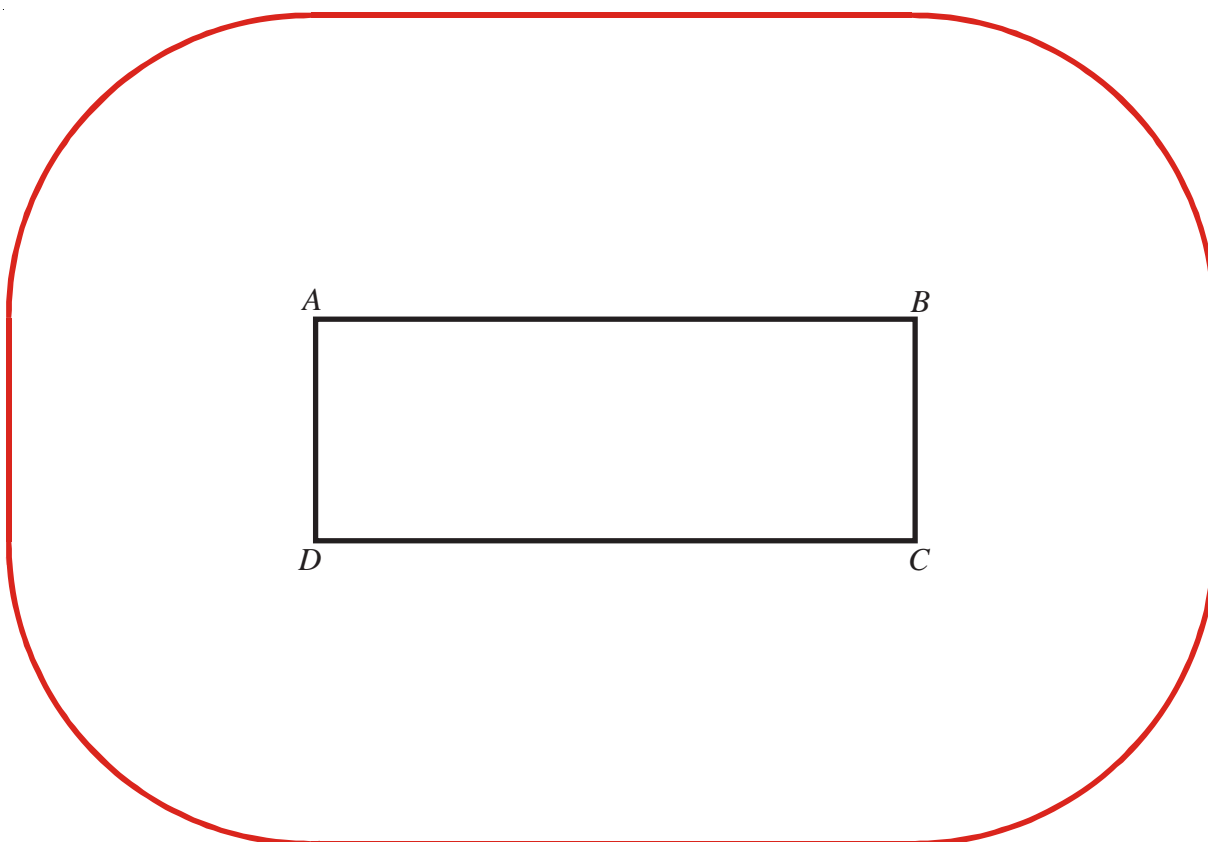




- 1) Draw the locus of all points that are exactly 3 cm from the line PQ .



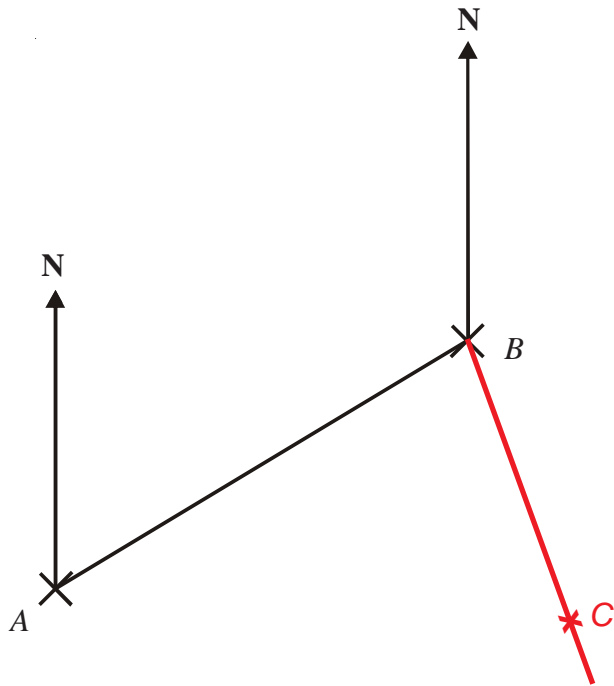
- 2) Draw the locus of all points that are exactly 4 cm from the rectangle $ABCD$



Bearings



- 1) The diagram shows the position of two telephone masts, A and B , on a map.



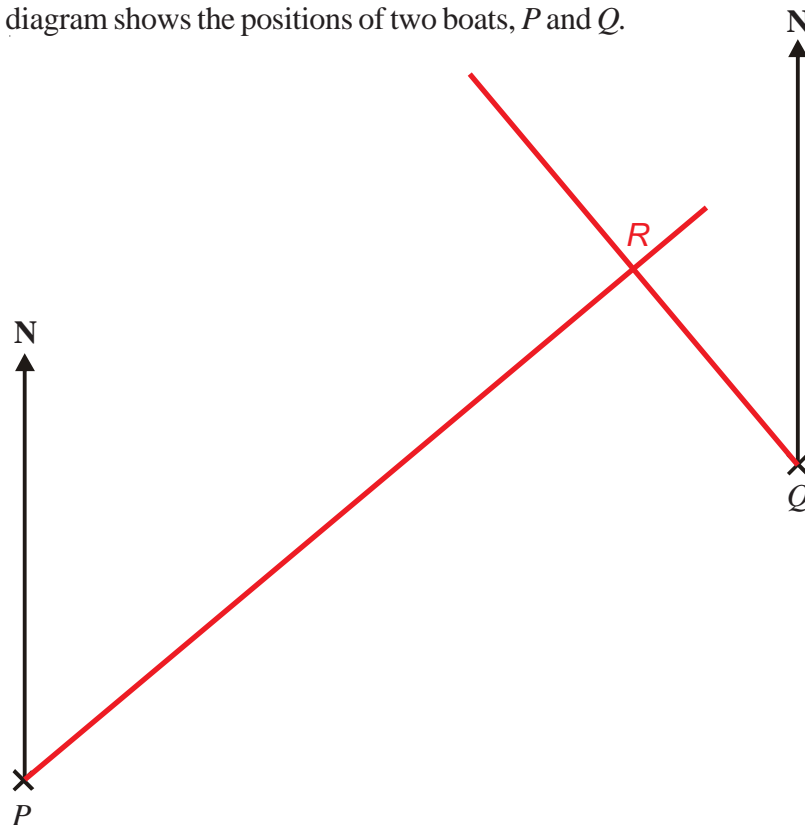
- a) Measure the bearing of B from A . **059°**

Another mast C is on a bearing of 160° from B .
On the map, C is 4 cm from B .

- b) Mark the position of C with a cross and label it C .



- 2) The diagram shows the positions of two boats, P and Q .



The bearing of a boat R from boat P is 050°

The bearing of boat R from boat Q is 320°

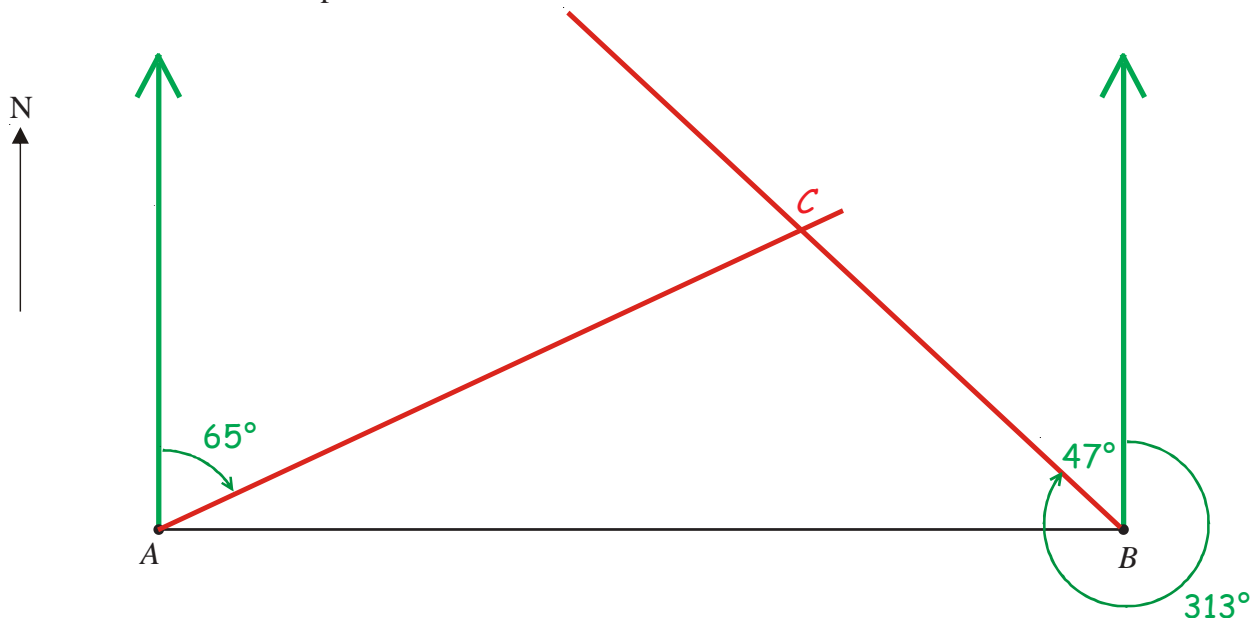
In the space above, draw an accurate diagram to show the position of boat R .
Mark the position of boat R with a cross (\times). Label it R .

Bearings



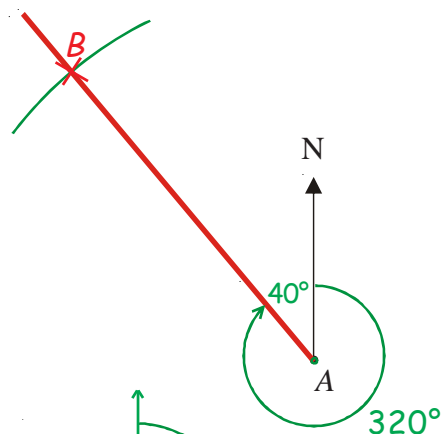
- 1) School B is due east of school A .
 C is another school.
 The bearing of C from A is 065° .
 The bearing of C from B is 313° .

Complete the scale drawing below.
 Mark with a cross the position of C .

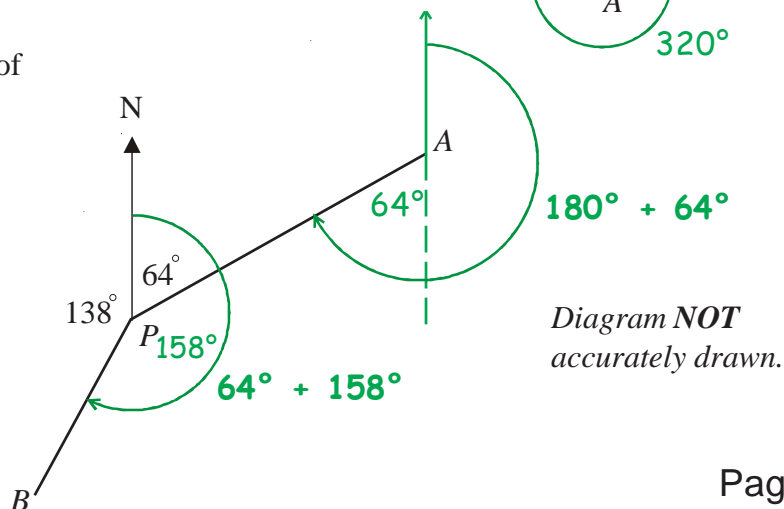


- 2) In the diagram, point A marks the position of Middlewich.
 The position of Middlemarch is to be marked on the diagram as point B .
 On the diagram, mark with a cross the position of B given that:

B is on a bearing of 320° from A and
 B is 5 cm from A



- 3) **Work out** the bearing of
 a) B from P 222°
 b) P from A 244°



Experimental Probabilities



- 1) Ahmad does a statistical experiment.

He throws a dice 600 times.

He scores one, 200 times.

Is the dice fair? Explain your answer **Two possible answers:**

No, you would expect to score 1 about 100 times.

Yes, although you would expect 1 about 100 times, you could still get it 200 times.



- 2) Chris has a biased coin.

The probability that the biased coin will land on a tail is 0.3

Chris is going to flip the coin 150 times.

Work out an estimate for the number of times the coin will land on a tail. **45 times**

$$0.3 \times 150 = 45$$



- 3) On a biased dice, the probability of getting a six is $\frac{2}{3}$.

The dice is rolled 300 times.

Work out an estimate for the number of times the dice will land on a six. **200 times**

$$\frac{2}{3} \times 300 = 200$$



- 4) On a biased dice, the probability of getting a three is 0.5

The dice is rolled 350 times.

Work out an estimate for the number of times the dice will land on a three. **175 times**

$$0.5 \times 350 = 175$$



- 5) Jenny throws a biased dice 100 times.

The table shows her results.

Score	Frequency
1	15
2	17
3	10
4	24
5	18
6	16

- a) She throws the dice once more.

Find an estimate for the probability that she will get a four. **$\frac{24}{100}$ or 0.24**

- b) If the dice is rolled 250 times, how many times would you expect to get a five? **45 times**

$$\frac{18}{100} \times 250 = 45$$

Averages from a Table



- 1) Tom carried out a survey of the number of school dinners 34 students had in one week.

The table shows this information.

Number of school dinners	Frequency	
0	0	
1	7	
2	14	
3	7	
4	4	
5	2	

Calculate the mean number of school dinners. **2.4**

Give your answer to 1 decimal place.



- 2) Sindy recorded the time, in minutes, that her train was late over 100 days.

Information about these times is shown in the table.

Time (t minutes)	Frequency	Midpoint	MP \times Frequency
$0 < t < 6$	15	3	45
$6 < t < 12$	23	9	207
$12 < t < 18$	28	15	420
$18 < t < 24$	19	21	399
$24 < t < 30$	15	27	405
	100		1476

Calculate an estimate for the mean time that her train was late.

Give your answer to 1 decimal place. **14.8 minutes**



- 3) Tony asked 32 men about the number of children they had.

The table shows information about his results.

Number of children	Frequency	
0	10	
1	5	
2	7	
3	8	
4	2	
more than 4	0	

- a) Find the mode. **0 children**

- b) Calculate the mean to 1 decimal place. **1.6 children**

Averages from a Table



- 1) The table shows some information about the heights (h cm) of 100 plants.

Height (h cm)	Frequency	Midpoint	MP \times Frequency
$120 < h < 130$	9	125	1125
$130 < h < 140$	18	135	2430
$140 < h < 150$	27	145	3915
$150 < h < 160$	31	155	4805
$160 < h < 170$	15	165	2475
100			14750

- a) Find the class interval in which the median lies. $140 < h < 150$
- b) Work out an estimate for the mean height of the plants. **147.5 cm**



- 2) The table gives information about the number of books sold in a shop during each of the last 30 weeks.

Number of books (n)	Frequency	Midpoint	MP \times Frequency
$0 < n < 40$	2	20	40
$40 < n < 80$	6	60	360
$80 < n < 120$	13	100	1300
$120 < n < 160$	6	140	840
$160 < n < 200$	3	180	540
30			3080

- Calculate an estimate for the mean number of books sold each week. **102.7 books**
- Give your answer correct to 1 decimal place.

Averages from a Table



- 1) The number of pens in each pupil's pencil case in a classroom has been counted. The results are displayed in a table.

Number of pens	Number of pupils	
0	4	0×4
1	6	1×6
2	7	2×7
3	5	3×5
4	3	4×3
5	1	5×1
	26	52
		Total

- a) Work out the total number of pens in the classroom. **52 pens**
- b) Write down the modal number of pens in a pencil case. **2 pens**
- c) Work out the mean number of pens in a pencil case. **2 pens** $52 \div 26$
- d) Work out the range of the number of pens in a pencil case. **5 pens** $5 - 0$



- 2) Thomas is analysing the local football team. He records the number of goals scored in each football match in the past twelve months.

Thomas said that the mode is 7

Thomas is wrong.

- a) Explain why. **Thomas gave the highest frequency instead of giving the number of "goals scored" associated with it.**

- b) Calculate the mean number of goals scored.

1.92 goals $48 \div 25$

Goals scored	Frequency	
0	7	0×7
1	5	1×5
2	3	2×3
3	6	3×6
4	2	4×2
5	1	5×1
6	1	6×1
Total	25	48



- 3) Tina recorded how long, in minutes, she watched TV for each day during a month.

- a) Find the class interval in which the median lies.

$30 < t \leq 45$

- b) Work out an estimate for the mean amount of time Tina watched TV each day of this month. Give your answer to the nearest minute.

37 minutes $1140 \div 31$

Time (t in minutes)	Frequency
$10 < t < 20$	5
$20 < t < 30$	9
$30 < t < 45$	8
$45 < t < 60$	6
$60 < t < 90$	3

Questionnaires



- 1) A survey into how people communicate with each other is carried out. A questionnaire is designed and two of the questions used are shown below. The questions are **not** suitable. For each question, write down a reason why.

- a) Do you prefer to communicate with your friend by phone (voice call) or by text message?

Yes ☐ No ☐

Reason This is not a question you can answer 'yes' or 'no' to.

- b) How many text messages do you send?

1 ☐ 2 ☐ 3 ☐ 4 ☐

Reason Response boxes need to include '0' and 'more than 4'.
Question needs a time frame eg per day, per week.



- 2) A restaurant owner has made some changes. He wants to find out what customers think of these changes. He uses this question on a questionnaire.

“What do you think of the changes in the restaurant?”

☐ ☐ ☐
Excellent Very good Good

- a) Write down what is wrong with this question.

There is no negative or neutral response box.

This is another question on the questionnaire.

“How often do you come to the restaurant?”

☐ ☐
Very often Not often

- b) i) Write down one thing that is wrong with this question.

Question needs a time frame eg per week, per month.

Response boxes need to be more specific eg once a week, twice a week.

- ii) Design a better question to use.

You should include some response boxes.

How many times do you visit this restaurant per month?

☐ ☐ ☐ ☐
None Once Twice More
than
twice