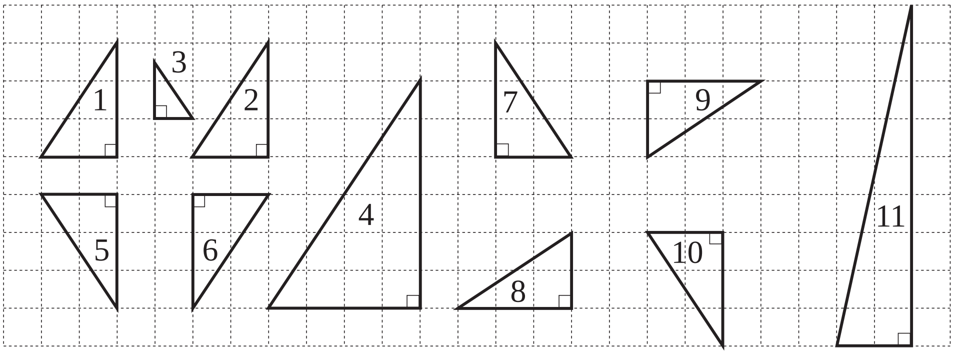
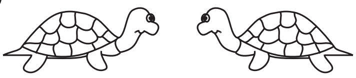
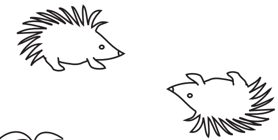
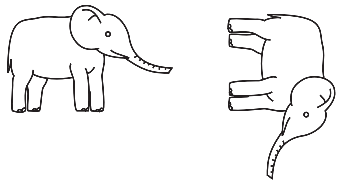
1 What has been done to *Triangle 1* to form the other shapes? Describe each **transformation** in your exercise book.

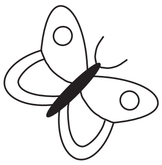


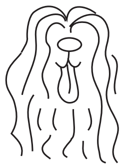
2 Draw the lines of symmetry and mark the centres of rotation.

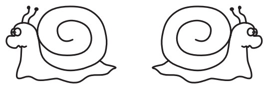
a) 

b) 

c) 

d) 

e) 

f) 

3

a) On a coordinate grid, draw a **pentagon** with vertices at these points.

A (– 3, 2) B (0, 2) C (1, 3) D (1, 4) E (– 3, 4)

b) Change the coordinates of the points according to the instructions and draw the new shapes. Describe how the original pentagon's shape and size changes.

i) Keep the *x* coordinate the same and multiply the *y* coordinate by (– 1).

ii) Subtract 4 from both coordinates.

iii) Multiply both coordinates by (– 1).

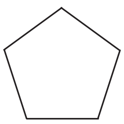
iv) Multiply both coordinates by 2.

v) Divide both coordinates by (– 2).

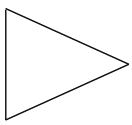
c) List the **similar** shapes.

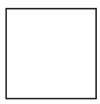
d) List the **congruent** shapes.

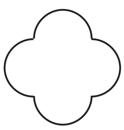
4 Draw the lines of symmetry and mark the centres of rotation.

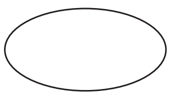
a) 

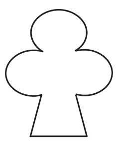
b) 

c) 

d) 

e) 

f) 

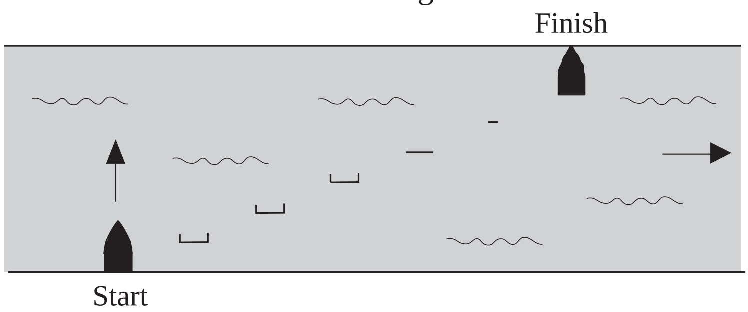
g) 

h) 

1 A boat sailed from one bank of the river to the opposite **parallel** bank, staying **perpendicular** to both banks during the crossing.

This drawing shows the positions of the boat seen from above at equal intervals of time. The arrow shows the direction in which the river was flowing.

Complete the drawing.



2

a) **Rotate** trapezium ABCD by 60° around the point O in a **clockwise** direction and show its route on the triangular grid.

b) Complete the statements.

A'B' = AB a' =

B'C' = b' =

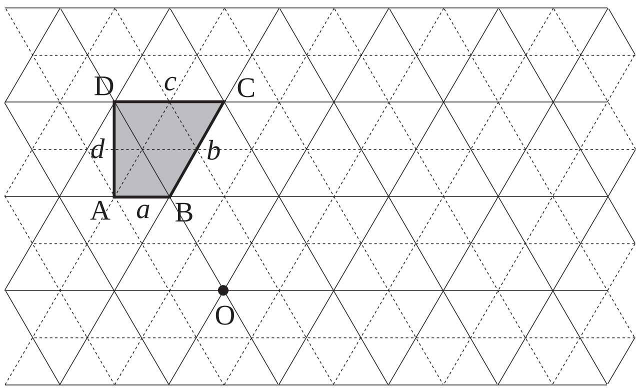
C'D' = c' =

D'A' = d' =

∠ B' =   ∠ C' =

B'D' =   A'C' =

A'B'C'D' ☐ ABCD



3

a) Draw these rectangles in your exercise book.

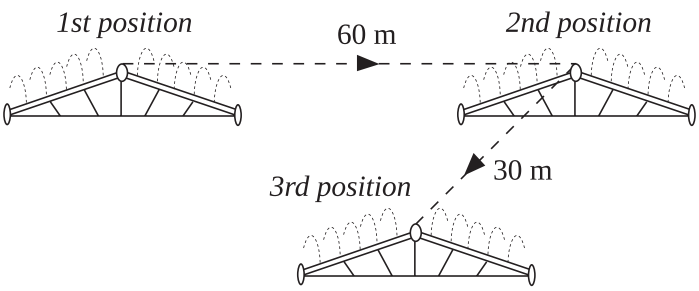
i) $a = 2$ cm, $b = 1.5$ cm   ii) $a = 6$ cm, $b = 4.5$ cm

iii) $a = 4$ cm, $b = 3.5$ cm   iv) $a = 3$ cm, $b = 4$ cm

v) $a = 1.5$ cm, $b = 2$ cm   vi) $a = 5$ cm, $b = 2$ cm

b) List the **similar** rectangles.   c) List the **congruent** rectangles.

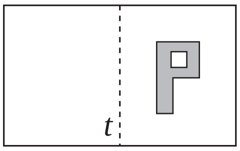
4 A sprinkler was moved 60 m E from its 1st position to its 2nd position, then 30 m SW from its 2nd position to its 3rd position.



a) On the sketch, draw the **direct** route between its 1st and 3rd positions.

b) Measure this distance on the sketch and calculate its real length in metres.

1



a) Draw the letter P on a sheet of paper. Colour it *green*.

b) Fold the sheet of paper along line *t*. Pierce the vertices of the shape, unfold the sheet then draw the *mirror image* of the shape on the other part of the sheet. Colour it *red*.

c) Complete the sentences.

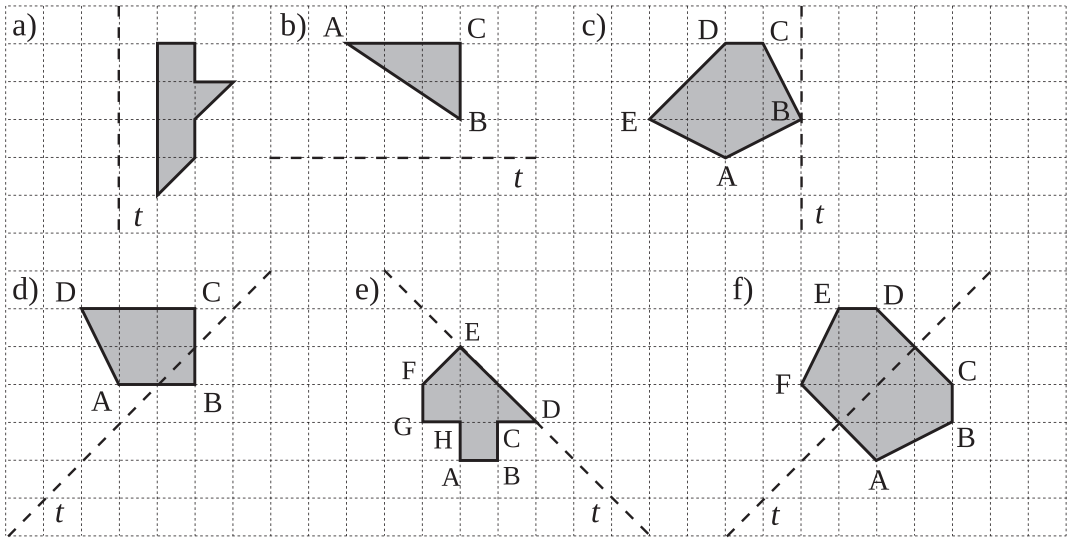
i) The *red* shape is the ______ ______ of the *green* shape.

ii) The *red* shape and the *green* shape are ______ .

iii) The *red* and *green* shapes are in **symmetrical** positions to ______ *t*.

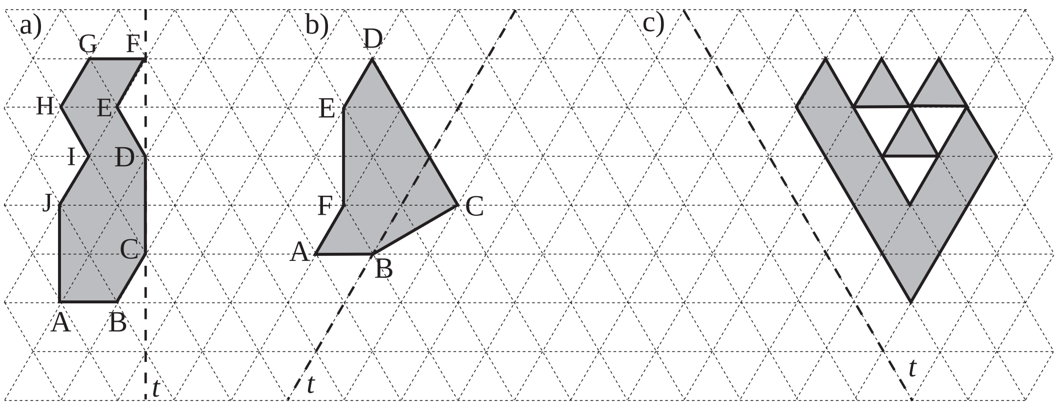
2

Reflect each shape in the given *mirror line* or **axis**. Use different colours.



3

Reflect each shape in the given axis. Use a different colour for each reflection.



4

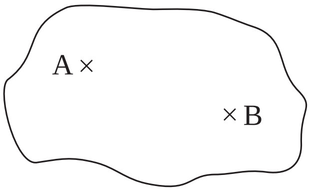
a) Draw an axis (*mirror line*) in your exercise book and label it *t*.

b) Place pairs of dried peas on the page so that they are *mirror images* of each other. Draw points to mark their positions and label the points. (e.g. A and A')

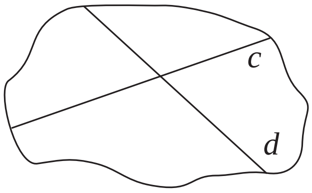
c) Do the same with pairs of matchsticks. Draw line segments to mark their positions.

1 Find points in the clearings which are an equal distance from:

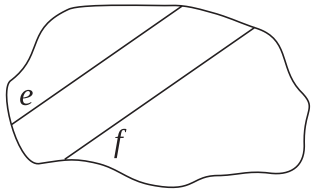
a) trees A and B



b) paths *c* and *d*

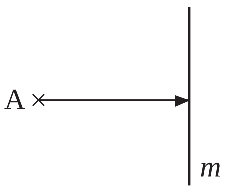


c) paths *e* and *f*.

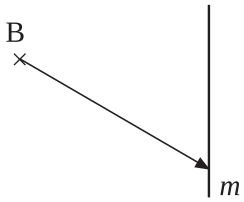


2 Draw the *mirror image* of each child's route.

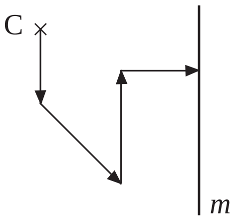
a)



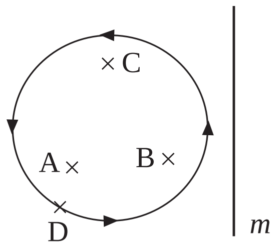
b)



c)

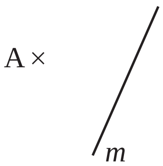


d)

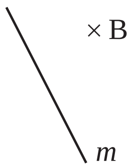


3 **Reflect** the point in the given axis. Construct and label its *mirror image*.

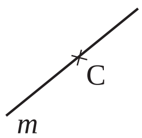
a)



b)

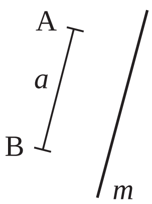


c)

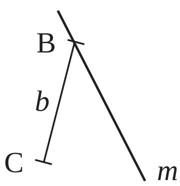


4 **Reflect** the line segment in the given axis. Construct and label its *mirror image*.

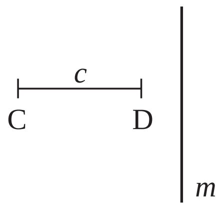
a)



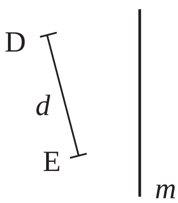
b)



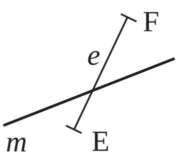
c)



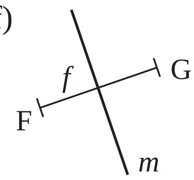
d)



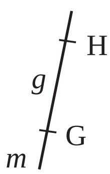
e)



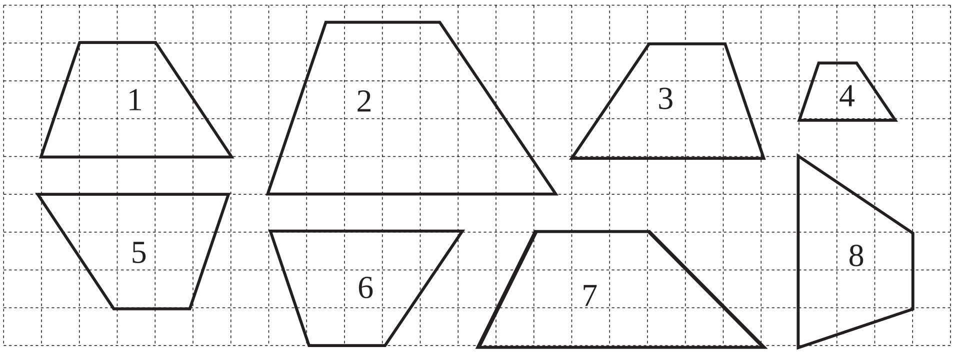
f)



g)



1 What has been done to Shape 1 to form the other shapes? Describe each **transformation** in your exercise book. Colour the shape which is **not** similar.



2 a) Draw a sketch for each of these triangles, then construct them accurately in your exercise book. Use a ruler, a pair of compasses and a protractor.

i) $\angle A = 30°$, $b = 3$ cm, $c = 4$ cm

ii) $\angle A = 50°$, $b = c = 20$ mm

iii) $\angle C = 65°$, $a = c = 4$ cm

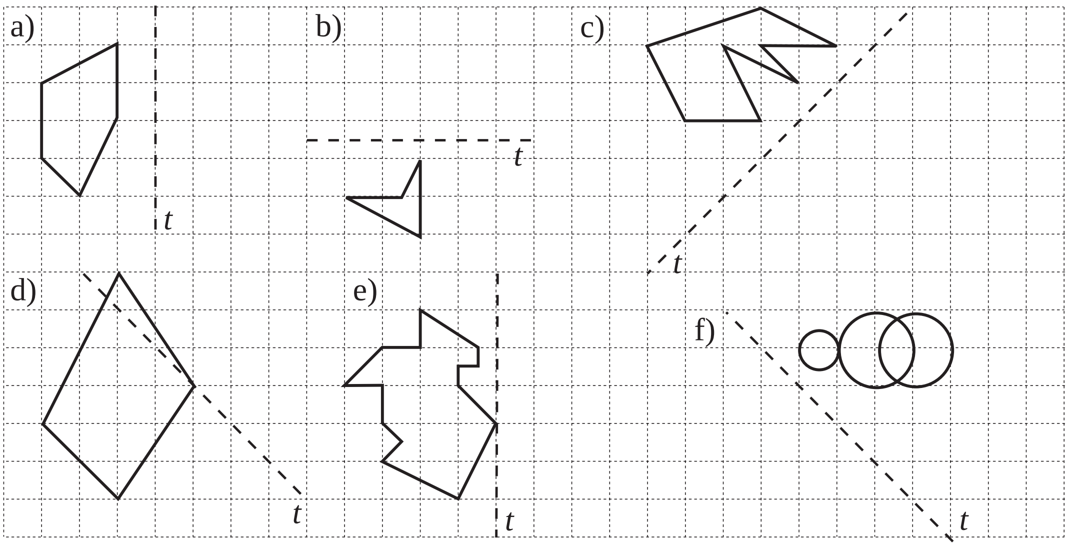
iv) $\angle A$ is a right angle, $b = 15$ mm, $c = 20$ mm

v) $a = 2.5$ cm, $b = 1.5$ cm, $\angle A = 90°$

vi) $\angle A = 100°$, $b = 30$ mm, $c = 40$ mm

b) List the **similar** triangles. c) List the **congruent** triangles.

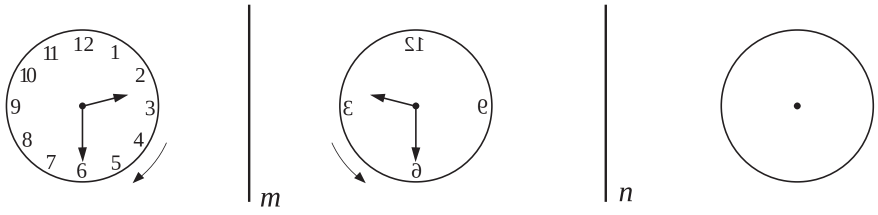
3 **Reflect** each shape in the given *mirror line, t.* Colour the *mirror image*.



4 Draw an axis (*mirror line*) in your exercise book and label it *t*.

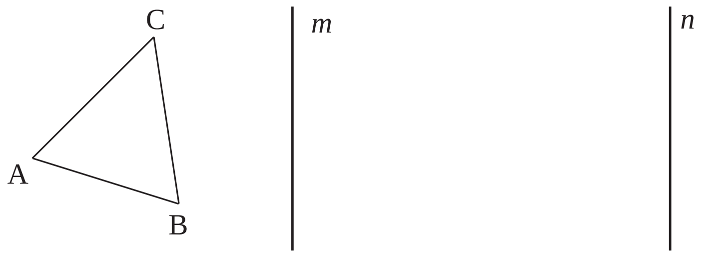
Draw a shape on one side of the axis and label its vertices. Draw its *mirror image* and label it appropriately. **Reflect** this *mirror image* in another axis which is **not** parallel to *t*.

1 Complete the reflection of the clock in axis *m*, then **reflect** its *mirror image* in axis *n*.



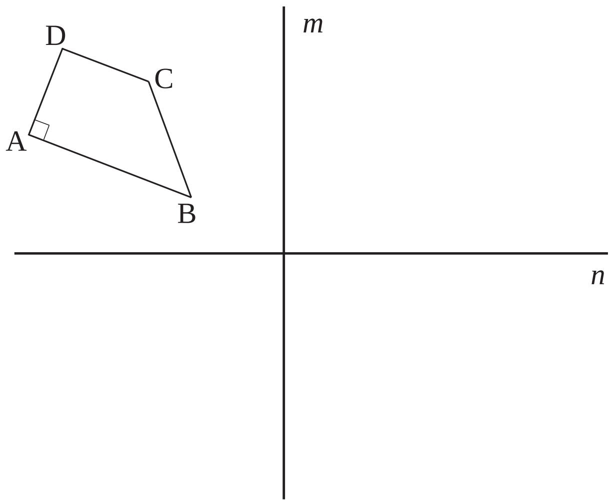
2 **Reflect** triangle ABC in axis *m*, then **reflect** A'B'C' in axis *n*.

Label the vertices of the 2nd *mirror image* appropriately.



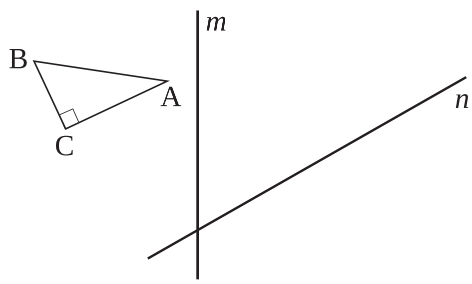
3 **Reflect** quadrilateral ABCD in axis *m*, then **reflect** A'B'C'D' in axis *n*.

Label the vertices of the 2nd *mirror image* appropriately. (The 2 axes are perpendicular.)

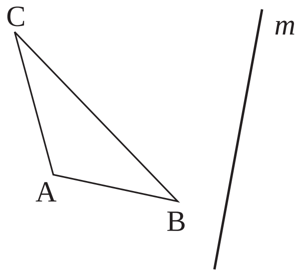


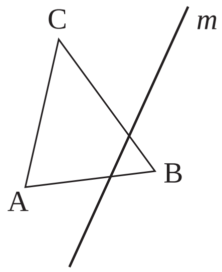
4 **Reflect** triangle ABC in axis *m*, then **reflect** A'B'C' in axis *n*.

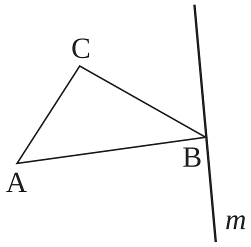
Label the vertices of the 2nd *mirror image* appropriately.

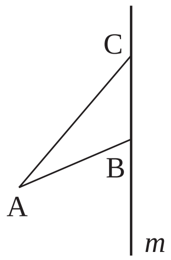


1 Construct the *mirror image* of each triangle. Colour the *mirror image red* and label its vertices appropriately.

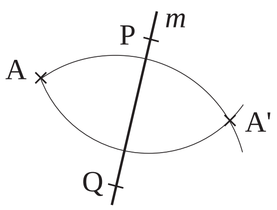
a) 

b) 

c) 

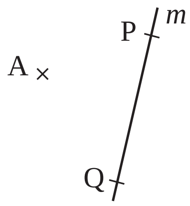
d) 

2

a) 

Write the steps needed to **reflect** point A in axis *m*.

b) Carry out the construction on this diagram.



3

a) Write the steps needed to reflect any straight line in any axis.
Draw an axis *m* and a straight line *e*. **Reflect** line *e* in *m*.

b) Write down the steps needed to reflect any angle in any axis.
Draw an axis *m* and an angle α. **Reflect** angle α in *m*.

c) Write down the steps needed to reflect any circle in any axis.
Draw an axis *m* and a circle *k*. **Reflect** circle *k* in *m*.

4 Solve each problem by folding a thin sheet of paper.

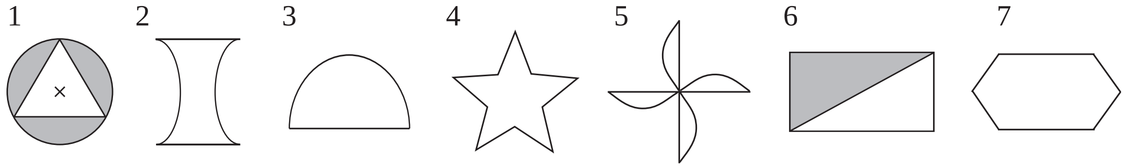
a) Draw any line *e* on a sheet of paper. Draw two different points at different distances from the line *e*.

By folding the paper, find a point on *e* which is an equal distance from A and B.

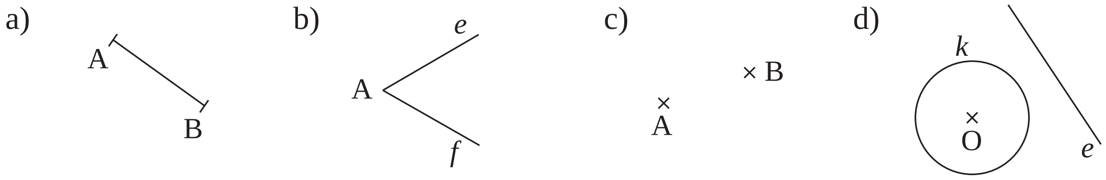
b) Draw three different points: A, B and C, on a sheet of paper.

By folding the paper, find a point which is an equal distance from A, B and C.

1 Draw lines of symmetry on the shapes.



2 Construct the lines of symmetry.



3

a) Fold a rectangular sheet of paper along one of its diagonals and cut along the fold.

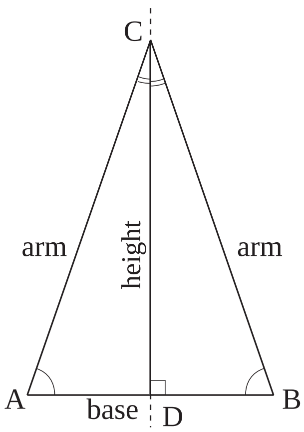
b) Use the two pieces formed to make different polygons by placing equal sides together. Measure the sides and angles of these polygons and note the values.

c) In your exercise book, draw a sketch of each of the polygons you form and mark on the sketch the size of the angles and the lengths of the sides.

4 Fill in the missing items.

a) This **symmetrical** triangle has ☐ equal sides and is called an **isosceles** triangle.

b) If a triangle has **2** equal sides, it is ☐.



c) AC = ☐; ∠ A ☐ ∠ B; ∠ ACD = ∠ ☐

d) The equal sides are called the ☐ of the triangle.

e) AB is the ☐ of the triangle.

f) The line of symmetry **bisects** the ☐ and is perpendicular to it.

g) AB ⊥ ☐; AD ☐ DB

h) CD is the ☐ of triangle ABC from its base.

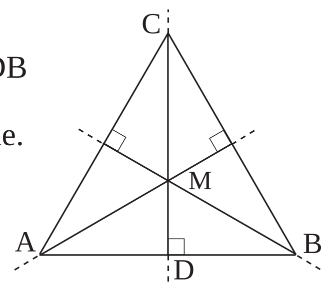
5 If a triangle has **3** equal sides, it is called a **regular** or an **equilateral** triangle. Complete the statements.

a) ∠ A = ☐ = ☐; AB ⊥ ☐; AD ☐ DB

b) Any equilateral triangle is an ☐ triangle.

c) An equilateral triangle has ☐ lines of symmetry.

d) DC is the ☐ of the equilateral triangle.

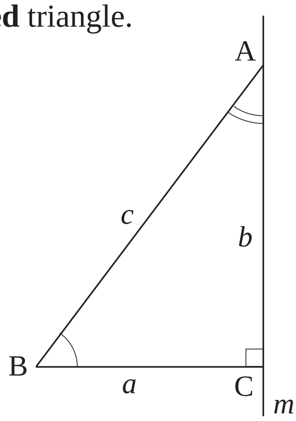


1

a) Measure the sides of this **right-angled** triangle.

$a \approx \boxed{\quad}$ cm, $b \approx \boxed{\quad}$ cm

$c \approx \boxed{\quad}$ cm



b) Measure its angles.

$\angle A \approx \boxed{\quad}\,°$, $\angle B \approx \boxed{\quad}\,°$

$\angle C \approx \boxed{\quad}\,°$

c) What is the sum of its three angles? $\angle A + \angle B + \angle C \approx \boxed{\quad}\,°$

d) **Prove** that $\angle A + \angle B = 90°$ in your exercise book.

e) **Reflect** triangle ABC in the line AC.

i) What shape is formed from the triangle and its *mirror image*? . . . .

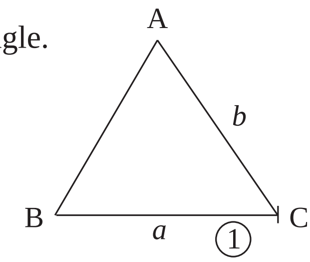
ii) What is the sum of the angles of the new shape? $\boxed{\quad}\,°$

2

a) Complete this sketch to show the construction of a triangle. (*Step 1* is already given.)

b) In your exercise book, construct this **isosceles** triangle.

Base: $a = 3.5$ cm Arms: $b = c = 5$ cm



3

In your exercise book, draw a sketch to show your construction plan, then construct these **isosceles** triangles accurately. Label them appropriately.

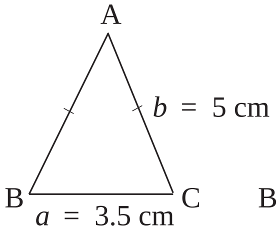
a) $a = 6$ cm
$h = 3$ cm

b) $a = 4$ cm
$\angle B = \angle C = 60°$

c) $a = 4.5$ cm
$b = 3$ cm

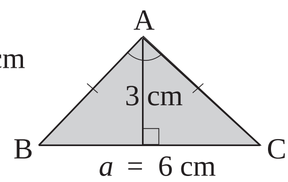
4

a) Measure the angles of the **isosceles** triangles you drew in *Questions 2* and *3*. Write your results below these sketches.



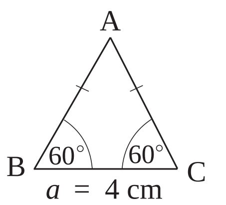
$\angle A \approx$

$\angle B = \angle C \approx$



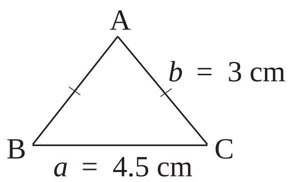
$\angle A \approx$

$\angle B = \angle C =$



$\angle A =$

$\angle B = \angle C = 60°$

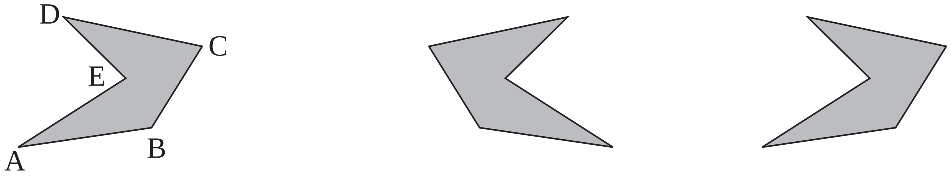


$\angle A \approx$

$\angle B = \angle C \approx$

b) Calculate the area of the shaded triangle.

1 The **pentagon** ABCDE was reflected in axis *m* then its *mirror image* was reflected in axis *n*. Draw the two axes and label them. Label the two *mirror images* appropriately.



What single transformation could have been done instead of the two reflections?

. . . .

2 Work in your exercise book.

a) Draw a point, A. Draw any axis, *m*. **Reflect** point A in *m*. Label the *mirror image* appropriately.

b) Draw a line segment, BC. Draw any axis, *n*. **Reflect** BC in *n*. Label the *mirror image* appropriately.

c) Draw any polygon and label its vertices. Draw any axis, *t*. **Reflect** the polygon in *t*. Label the *mirror image* appropriately.

d) Draw any circle, *k*. Mark a point P on its circumference. Label its centre O. Draw any axis, *s*. **Reflect** circle *k* in *s*. Label the *mirror image* of point P.

e) Write down the steps needed to **reflect** any polygon in any axis.

3 Draw a sketch of each triangle first, then construct it accurately. Mark on your diagram all the important information. Write below it the type of triangle it is.

a) Triangle ABC: $a = 7$ cm, $b = c = 10$ cm

b) Triangle DEF: $\angle D = \angle E = \angle F$, DE $= 7$ cm

c) Triangle GHI: $\angle G = 35°$, GH $= 55$ mm, HI $= 33$ mm.

4 Fill in the missing words.

a) An **equilateral** triangle has angles of ____ ° and has three ____ sides.

b) An **isosceles** triangle has at least ____ equal ____.

c) An **equilateral** triangle is also an ____ triangle.

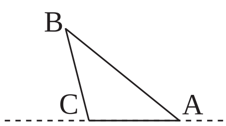
d) A triangle which has sides in the ratio of 3 : 4 : 5 is a ____ triangle.

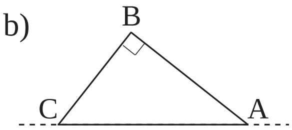
e) A triangle with 3 different sides is called a ____ triangle.

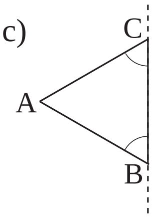
f) There is no triangle which has a ____ angle.

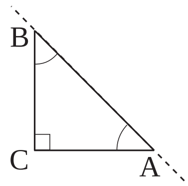
g) The sum of the angles of any triangle is ____ °.

1 **Reflect** the triangles in the side indicated. Write the name of the polygon formed by the original shape and its *mirror image*.

a) 

b) 

c) 

d) 

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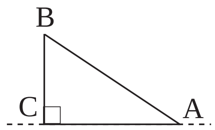
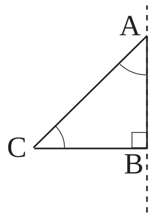
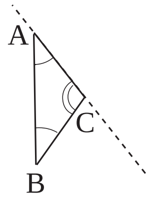
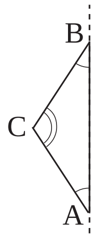
e) 

f) 

g) 

h) 

....

2 

To the left of AC construct an **isosceles** triangle which has **2 cm** arms.

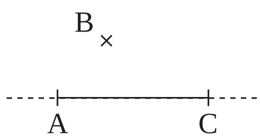
To the right of AC construct another **isosceles** triangle which has **3 cm** arms.

We say that AC is the **common base** of the two triangles.

What kind of polygon have you formed? ....

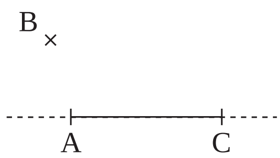
3 **Reflect**:

a) point B in line AC



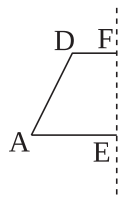
Join B and B' to A and C.
What is ABCB'?

b) point B in line AC



Join B and B' to A and C.
What is ABCB'?

c) the linear shape in line EF.



What is A A' D' D?

4 Complete the sentences. Draw an example of each quadrilateral in your exercise book.

a) A quadrilateral is called a [   ] if its diagonals **bisect** each other.

b) A quadrilateral with equal angles is called a [   ].

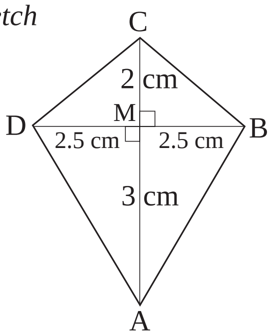
c) A quadrilateral with equal sides is called a [   ].

d) A **regular** quadrilateral is called a [   ].

1

a) Construct this **deltoid** accurately using the data given in the sketch.

Sketch



b) Calculate the area of the deltoid. (Find right-angled triangles.)

c) Measure the angles of the deltoid and add them together.

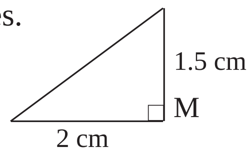
Σ angles = ☐

d) Measure the sides of the deltoid and add their lengths together.

P = ☐

2

a) Complete the drawing of a **rhombus**. Label its vertices.



b) Calculate the area of the rhombus.

c) Measure its angles and add them together.

d) Measure its sides and calculate its perimeter.

3

a) Construct a **square** which has sides 3.5 cm long.

b) Calculate its area.

c) Calculate its perimeter.

d) Calculate the sum of its angles.

e) Draw and measure its diagonals.

f) Measure the the angles formed by the diagonals.

4

a) Construct a **rectangle** which has sides 4 cm and 3 cm long.

b) Calculate its area.

c) Calculate its perimeter.

d) Calculate the sum of its angles.

e) Draw and measure its diagonals.

f) Measure the angles formed by its diagonals.

5

a) What is the name of this shape?

. . . .

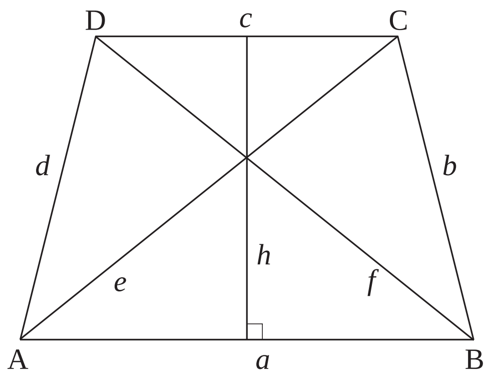
b) Measure its diagonals.

c) Measure its sides.

d) Calculate its perimeter.

e) Measure its angles and add them together.

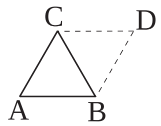
f) Calculate its area.



1

a) Construct an **equilateral** triangle with 4 cm sides. Label its vertices.

Sketch



b) **Reflect** it in the line BC. Label the *mirror image* of A with D.

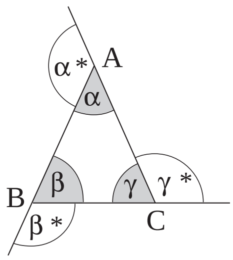
What kind of shape is ABDC? . . . .

c) **Reflect** the second triangle in line BD. Label the *mirror image* of C with E.

d) What shape do the three triangles form altogether? . . . .
Measure or calculate its angles and add them together.

2

Calculate the missing angles in the table if AB = AC and the given angle is:



	α	β	γ	α^*	β^*	γ^*	$\alpha + \beta + \gamma$	$\alpha^* + \beta^* + \gamma^*$
a)	40°							
b)			65°					
c)						120°		

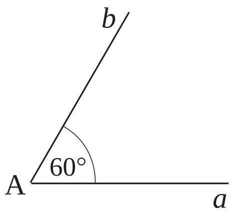
3

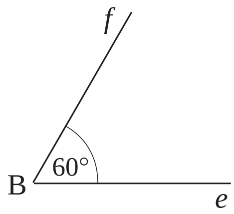
Each of the angles below is 60°. Construct:

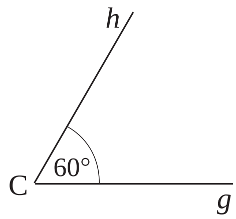
a) a 45° angle on this diagram

b) a 120° angle on this diagram

c) a 90° angle on this diagram.



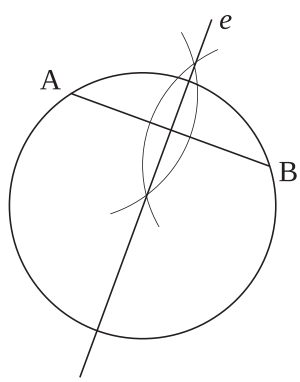




4

Describe the steps needed to find the centre of the circle.

A **chord**, AB, and its **perpendicular bisector**, line *e*, have been drawn.



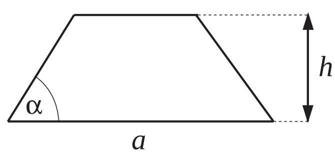
5

Construct a **trapezium** which has these dimensions.

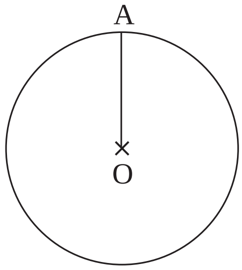
Base: $a = 5.2$ cm, Height: $h = 3.4$ cm

$\angle\alpha = 60°$

Sketch



1 Divide the whole (360°) central angle of the circle into **3** equal parts.

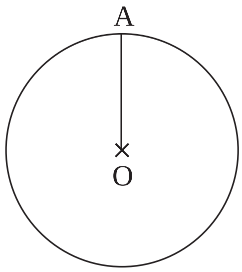


Draw the radii and join up the **3** points where the radii meet the circumference.

What shape have you drawn?

. . . .

2 Divide the whole (360°) central angle of the circle into **4** equal parts.

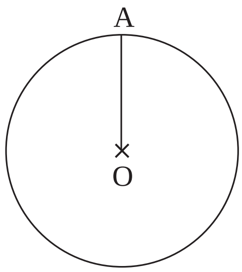


Draw the radii and join up the **4** points where the radii meet the circumference in order.

What shape have you drawn?

. . . .

3 Divide the whole (360°) central angle of the circle into **5** equal parts.

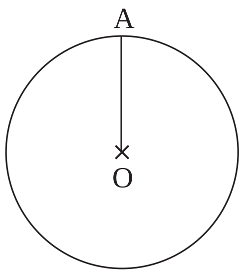


Draw the radii and join up the **5** points where the radii meet the circumference in order.

What shape have you drawn?

. . . .

4 Divide the whole (360°) central angle of the circle into **6** equal parts.

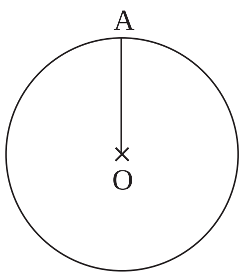


Draw the radii and join up the **6** points where the radii meet the circumference in order.

What shape have you drawn?

. . . .

5 Divide the whole (360°) central angle of the circle into **8** equal parts.

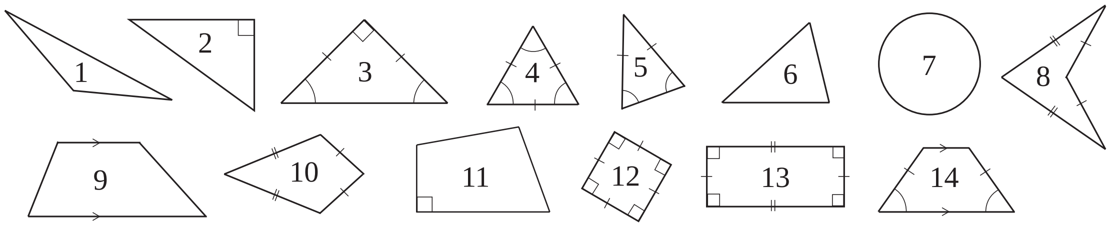


Draw the radii and join up the **8** points where the radii meet the circumference in order.

What shape have you drawn?

. . . .

1 List the numbers of the shapes which match the descriptions.



a) It has line symmetry. ....

b) It has rotational symmetry. ....

c) It is a regular shape. ....

d) It has an obtuse angle. ....

e) It has **only** acute angles. ....

f) It is a trapezium. ....

g) It is a deltoid. ....

h) It is a rhombus. ....

i) It is **not** a polygon. ....

2 a) Construct these polygons accurately in your exercise book. Label the vertices.

i) An **equilateral** triangle which has sides of length 4.5 cm.

ii) An **isosceles** triangle which has a base side 3 cm and base angles $35°$.

iii) A **right-angled** triangle which has base length 7.5 cm and height 10 cm.

iv) A **scalene** triangle which has 43 mm, 37 mm and 25 mm sides.

v) A **deltoid** which has diagonals of length 6 cm and 9.5 cm.

vi) A **right-angled trapezium** which has a base of 4.5 cm, a height of 38 mm and one of its base angles is $30°$.

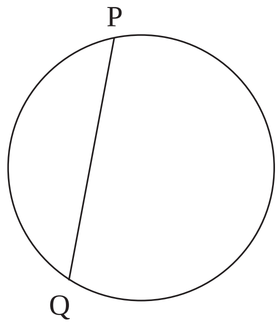
b) Write true statements about each polygon using words or mathematical notation.

3 a) Find the centre of this circle.

b) Write down the steps you used to find it.

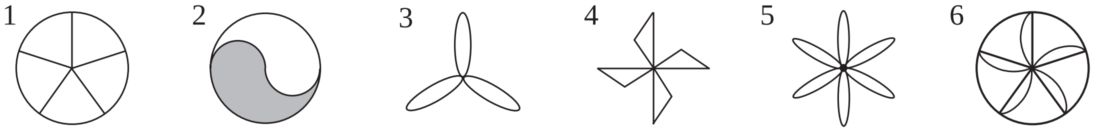
c) What length is the **radius** of the circle?

d) What length is the **diameter** of the circle?



4 Construct a regular **decagon** by drawing a circle and dividing up the central angle.

1 List the numbers of the shapes which match the descriptions.



a) It has line symmetry. ....

b) It has rotational symmetry. ....

c) It has rotational symmetry of 60°. ....

d) It has rotational symmetry of 120°. ....

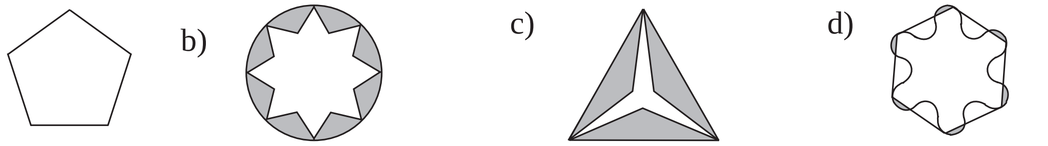
e) It has rotational symmetry of 72°. ....

f) It has rotational symmetry of 90°. ....

g) It has rotational symmetry of 180°. ....

2 Mark the centre of rotation. Write the smallest angle of rotation.

a) b) c) d)



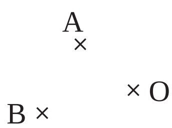
________ ________ ________ ________

3
a) **Reflect** points A and B in point O.

b) Join up the points A, B', A', B and A in order.
What shape have you formed?

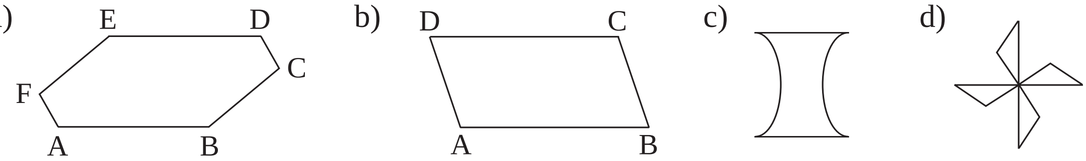
....

c) Join A to A' and B to B'. What do you notice?



4 Draw any lines of symmetry and mark the centres of rotation.

a) b) c) d)



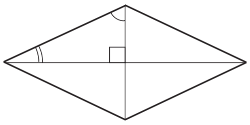
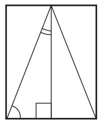
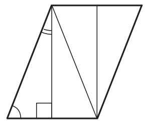
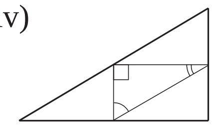
5 Form a **regular polygon** with congruent triangles so that the line segments from the centre of the polygon to its vertices divide the whole central angle into angles of 30°.

a) How many vertices does the polygon have? b) What size are its angles ?

c) What is the sum of its angles?

1 These polygons have been formed from 4 **congruent** right-angled triangles.

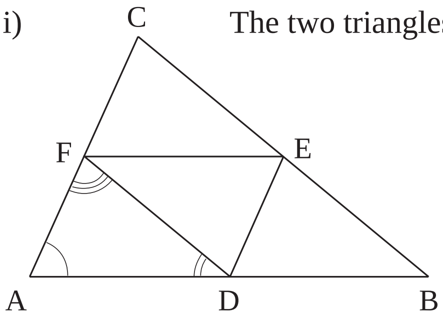
a) Write the names of the shapes.

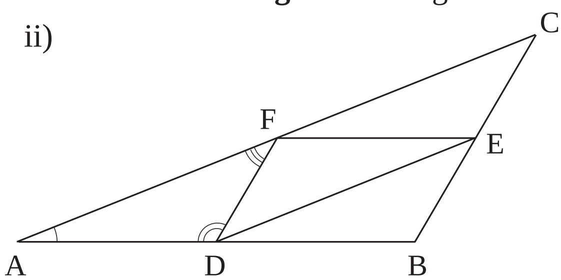
i)  ii)  iii)  iv) 

i) .... ii) .... iii) .... iv) ....

b) Calculate the sum of the angles in each polygon in your exercise book.

2 The two triangles have been formed from **congruent** triangles.

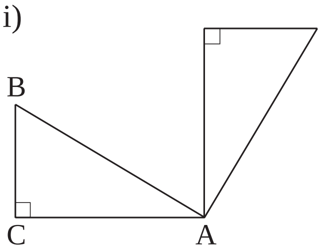
i) 

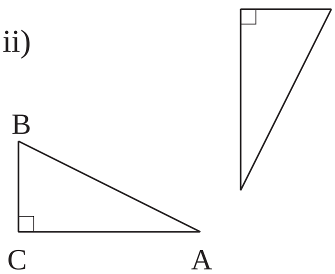
ii) 

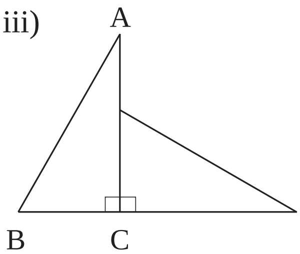
a) Measure the angles of the small internal triangles and of the large triangles.

b) **Prove** that the sum of the angles in each triangle is 180°.

3 a) Mark the centres of rotation.

i) 

ii) 

iii) 

b) By how many degrees has each shape been rotated?

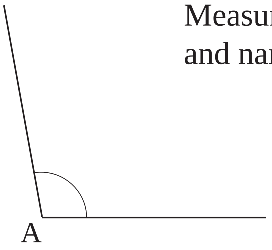
i) . . . . ii) . . . . iii) . . . .

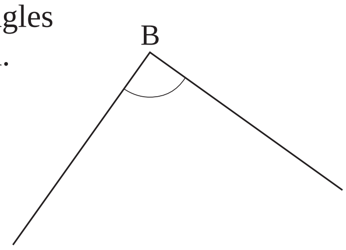
c) Draw on the diagrams the paths taken by the vertices when they were rotated.

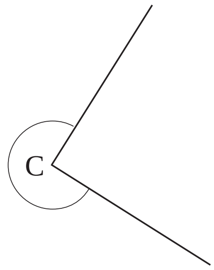
4 Draw the paths of the vertices when the triangle is turned over along the straight line. (Use compasses.)

5 Construct: a) a 90° angle b) a 45° angle. c) a 240° angle.

1 Measure the angles and name them.







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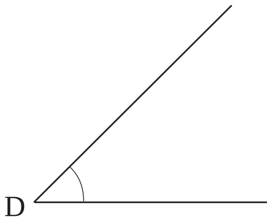
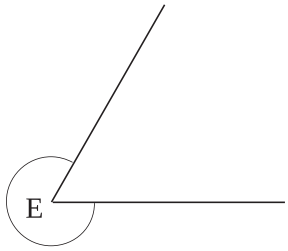




....

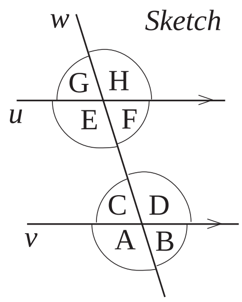
2 Work in your exercise book.

Draw two parallel lines, then draw a line which crosses both of them. Label the angles as shown in the sketch.

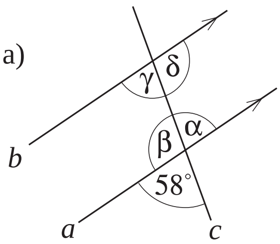
a) Measure the angles formed and write down the values.

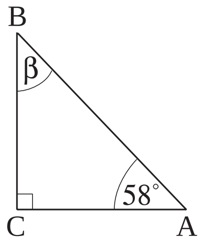
b) List the angles which are equal.

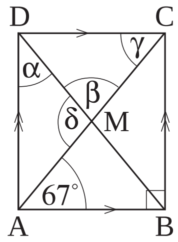
c) Find other relationships among the angles.

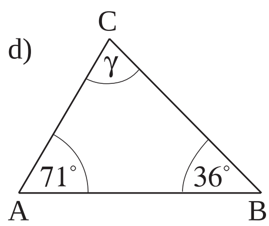


3 Calculate the sizes of the unknown angles.

a)


b)


c)


d)


4 a) Construct these angles in your exercise book and write their names below them.

i) 75° ii) 210° iii) 135° b) Draw an angle of 40°.

5 Calculate with angles. (1° = 60')

a) 22° 20' + 38° 30' + 75° 75' = ______

b) 180° − 68° 32' = ______

c) 72° 43' − 28° 51' = ______

d) 16° 42' × 5 =

e) 13° 24' ÷ 6 =

f) 173° 15' ÷ 10 =

Solve these problems in your exercise book.

1

The temperature was 16°C at 07:00.

a) By 12:00 the temperature had risen by 60%. What was the temperature at 12:00?

b) By 18:00, the mid-day temperature had fallen by 60%. What was the temperature at 18:00?

2

On 20 November 2003, 1 EUR (Euro) was worth 0.7021 GBP (£).

a) Calculate the value of 1 GBP in Euros on that day.

b) i) If 1 GBP = 1.42 EUR, what is the Euro equivalent of 532 GBP?
ii) What percentage of 1 Euro is 1 GBP?

c) i) If 1 EUR = 0.7 GBP, what is the GBP equivalent of 532 Euros?
ii) What percentage of 1 GBP is 1 Euro?

3

On 20 November 2003, 1 GBP was worth 1.6998 USD ($).

a) If 1 GBP = 1.7 USD, how many £s can you get for 1 USD?

b) i) If 1 GBP = 1.7 USD, what is the USD equivalent of 532 GBP?
ii) What percentage of 1 USD is 1 GBP?

c) i) If 1 USD = 0.59 GBP, what is the GBP equivalent of 532 USD?
ii) What percentage of 1 GBP is 1 USD?

4

On 20 November 2003, 1 GBP was worth 185.11 JPY (Japanese Yen).

a) If 1 GBP = 185 JPY, how many £s can you get for 1 Japanese Yen?

b) i) If 1 GBP = 185 JPY, what is the JPY equivalent of 532 GBP?
ii) What percentage of 1 Japanese Yen is 1 GBP?

c) i) If 1 JPY = 0.0054 GBP, what is the GBP equivalent of 532 JPY?
ii) How much more or less than 1% of £1 is 1 Japanese Yen?

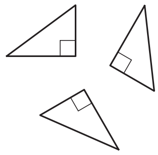
5

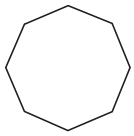
a) The price of a bicycle is £60 + VAT. Calculate its **gross** price if the *Value Added Tax* (VAT) is 15% of the **net** price.

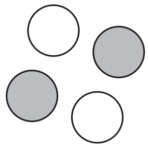
b) The **gross** price of a computer is £450, including VAT. Calculate the **net** price if the VAT is 12.5% of the net price.

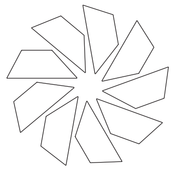
c) How much is the VAT on a product which can be bought for £37.50 but its **net** price is £30?

1 Mark the centre of rotation. Write the smallest angle of rotation.

a)  __________

b)  __________

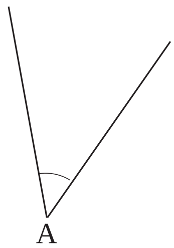
c)  __________

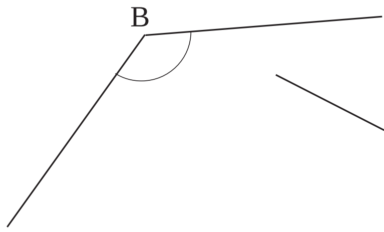
d)  __________

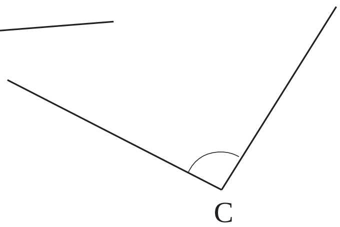
2 Draw these angles.

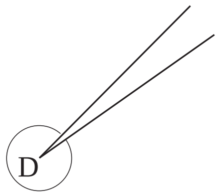
a) 25° b) 85° c) 118° d) 190° e) 345°.

3 Measure the marked angles.



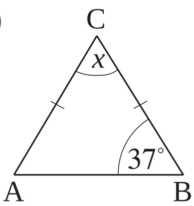


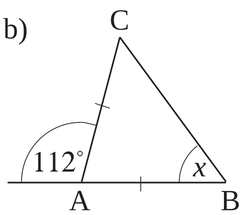


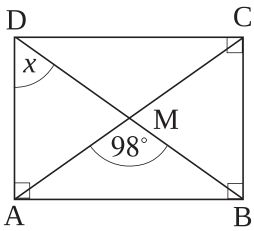


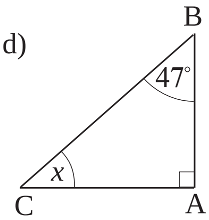
....

4 Calculate the size of angle *x*. *The diagrams are not drawn to scale.*

a) 

b) 

c) 

d) 

5

a) The temperature rose from $-6°C$ to $12°C$.
By how many degrees did the temperature rise?

b) The price of a wrought iron garden gate is £240, excluding VAT at 17.5%.
What price will we actually have to pay for the gate?

c) Three angles in a quadrilateral are measured accurately by computer as $41°56'$, $63°45'$ and $122°8'$. What is the size of the 4th angle?

d) How many spokes are on a wheel if the angle between the spokes is $18°$?

e) Molly went on holiday to the USA and changed her money to US dollars.
The exchange rate was 1 GBP = 1.6 USD.

Molly came back from her holiday with 60\$, which was 15% of the money she had taken. How many £s did Molly change to USD?

1 Colour the equal values in the same colour.

$(400 \div 100) \times 120$ | 70% of 80 | 120% of 400 | 400 + (20% of 400)

$80 - 80 \times 0.3$ | 80% of 70 | 400×1.2 | $70 \times \frac{4}{5}$ | 8×0.7

2 Convert the quantities.

a) 45.8 kg = ☐ g; 718 g = ☐ kg; 5.1 t = ☐ kg

b) 3.4 litres = ☐ cl = ☐ ml; 216 cl = ☐ litres;

470 ml = ☐ litres

c) 2.9 km = ☐ m; 53 cm = ☐ m; 4280 mm = ☐ m

d) 233 min = ☐ hr; 10.4 hr = ☐ min; 45 sec = ☐ min

3

a) If 1 EUR (Euro) = 7.4 DK (Danish Kroner) and £1 = 1.4 EUR:

i) how many Danish Kroner is £1 worth ii) how many £s is 1 DK worth?

b) Calculate 18% of 360 DK and give your answer in £s.

4 On 1 January, Martin put £3600 into an account which had an interest rate of 4% per year.

a) Calculate the yearly interest for Martin's account.

b) If Martin did not touch his account, how much money would be in his account:

i) 1 year later ii) 2 years later?

c) What **percentage** of his starting amount would be in his account:

i) 1 year later ii) 2 years later?

5 Mr. Yamamoto is a very clever businessman. His software company has made a profit of 262 million JPY this year. The company's value is now 140% of what it was last year.

a) By what **percentage** has his company's value increased?

b) What was the value of the company at the end of last year?

c) What is the value of the company now?

(JPY means Japanese Yen)

6 Calculate the **whole quantity** if:

a) $\frac{3}{8}$ of it is 210 kg b) 35% of it is £1812.30 c) $2\frac{1}{2}$ of it is $11\frac{2}{3}$ m^2

d) 130% of it is 32.5 miles.

1

$\boxed{1 \text{ foot} \approx 30 \text{ cm}}$

a) Calculate the height **in cm** of:

i) a child who is 5 feet tall ii) a boy who is 5.9 feet tall
iii) a basketball player who is 7.1 feet tall.

b) Calculate the height **in feet** of:

i) a man who is 186 cm tall ii) a man who is 162 cm tall.

2

$\boxed{1 \text{ inch} \approx 25.4 \text{ mm}, \ 1 \text{ zoll} \approx 26.3 \text{ mm}}$

a) Calculate what percentage:

i) 1 inch is of 1 zoll ii) 1 zoll is of 1 inch.

b) Convert 52.6 cm into: i) zolls ii) inches

3

$\boxed{1 \text{ mile} \approx 1.6 \text{ km}, \ 1 \text{ Nautical mile} \approx 1.85 \text{ km}}$

a) A French sailor reported that his ship had sailed 620 km. How would an English sailor have reported sailing the same distance?

b) Michael Schumacher, the German racing driver, did a road test on his car and said that he had covered a distance of 410 km.

If David Coulthard, the Scottish racing driver, had done the same road test, what distance would he say that he had covered?

4

$\boxed{1 \text{ acre} \approx 0.4 \text{ of a hectare}}$

László, a Hungarian farmer, has a farm covering 120 hectares. Ian, a British farmer, has a farm covering 375 acres.

a) What is the ratio of:

i) Ian's land to László's land ii) László's land to Ian's land?

b) By what percentage is Ian's land greater than László's land?

5

$\boxed{1 \text{ kg} \approx 2.2 \text{ pounds (lb)}}$

Sarah bought $1\frac{1}{2}$ lb of meat for £12 in a butcher's shop. Olga bought 500 g of the same kind of meat for £7 in the supermarket.

a) Who had the better bargain?

b) What would 1 kg of the meat cost in each shop?

1

1 foot $\approx$ 30.5 cm, 1 yard $\approx$ 91.5 cm

The members of a school's athletics team were training for a competition and their coach noted how far they could run in a set time.

a) Leslie ran 610 yards 2 feet. Cora ran 90% of Leslie's distance in the same time. How many metres did Cora run?

b) Jane ran 502 m 88 cm. Adam ran 120% of Jane's distance in the same time. How many yards did Adam run?

2

$$°\text{C} \rightarrow °\text{F}: \ \frac{9}{5} \times x + 32, \quad °\text{F} \rightarrow °\text{C}: \ \frac{5}{9} \times (x - 32)$$

a) "It's 32° here and I'm cold!" said Kate on the phone in London.
"It's 32° here and I'm hot!" Lucia answered from Sao Paolo in Brazil.

Who is correct? *Give a reason for your answer.*

b) Convert to degrees Celsius: i) 0°F ii) 50°F iii) 104°F

c) Convert to degrees Fahrenheit: i) 100°C ii) 30°C iii) –10°C

3

a)
$$\begin{array}{rrrr} & 4\text{ h} & 16\text{ min} & 37\text{ sec} \\ + & 5\text{ h} & 57\text{ min} & 43\text{ sec} \\ \hline \\ \hline \end{array}$$

b)
$$\begin{array}{rrrr} & 17\text{ h} & 31' & 18'' \\ - & 6\text{ h} & 50' & 32'' \\ \hline \\ \hline \end{array}$$

c)
$$\begin{array}{rrrr} & 168\text{ h} & & \\ - & 19\text{ h} & 26' & 41'' \\ \hline \\ \hline \end{array}$$

4

Calculate the arrival time if a plane took off at:

a) 3.24 pm and the flight lasted 9 hours 44 minutes

b) 11.45 am and the flight lasted 3 hours 16 minutes

c) 21:18 and the flight lasted 5 hours 33 minutes.

5

Calculate our journey time if we left at:

a) 9:35 am and arrived at 11.56 am

b) 9.35 am and arrived at 13:25

c) 09:35 and arrived at 4.10 pm

d) 09:35 and arrived at 07:25 the next day.

6

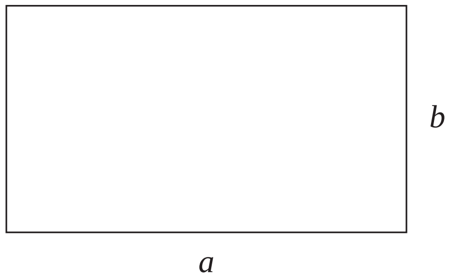
When the time is 09:00 in Exeter in the UK, it is 10:00 in Kassel in Germany.

a) David left Exeter at 7.30 am and arrived in Kassel at 15:15.
How long did his journey take?

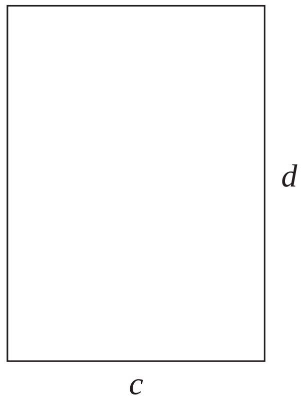
b) A month later, Werner left Kassel at 08:30 and arrived in Exeter at 14:15.
How long did his journey take?

1 Measure the data needed to calculate the perimeter and area of the rectangles.

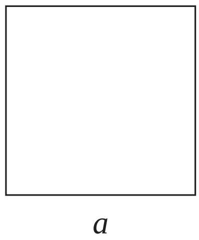
a)



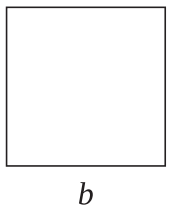
b)



c)



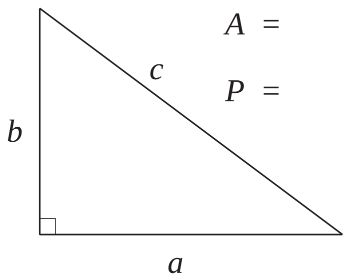
d)



Write the perimeter and area inside each rectangle.

2 Measure the necessary data, then calculate the area and perimeter as required.

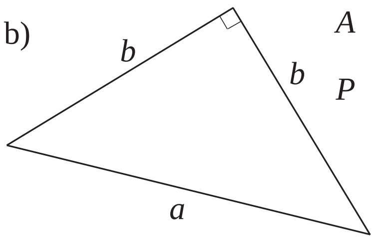
a)



A =

P =

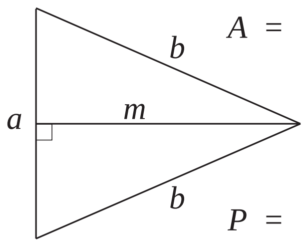
b)



A =

P =

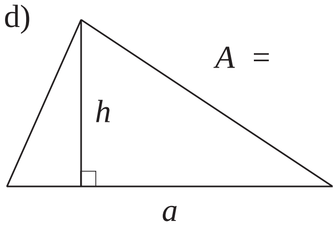
c)



A =

P =

d)



A =

3

a) The landing strip at an airport is 4 km long and 200 m wide.

What is the area of the landing strip?

b) A park is square-shaped and its sides are 3.1 km long.

i) How much fencing is needed to enclose it?

ii) What is the area of the park?

4 The length of one side of a triangular park is 2.6 km and the opposite corner is 2.1 km from this side.

Calculate the area of the park.

1 Use a calculator to work out the missing values.

a) If £1 ≈ 1.43 Euros,
1 Euro ≈ £ ____

b) If 1 Euro ≈ 7.47 Danish Kroner,
1 DK ≈ ____ EUR

c) If 1 USD ≈ 0.62 GBP,
1 GBP ≈ ____ USD

d) If £1 ≈ 183.2 JPY,
1 JPY ≈ £ ____

2

a) Jenny put £375 into a bank account and did not touch the account for a year. By the end of the year the balance in her account was £397.50.

What was the interest rate on her account?

b) If Jenny did not touch her account for another year, how much would she have in her account at the end of that year?

3 Convert:

a)	i) 312 ft to metres		ii) 11 m to feet		[1 ft ≈ 30 cm]
b)	i) 36.4 cm to inches		ii) 13 inches to mm		[1 inch ≈ 25.4 mm]
c)	i) 580 lb to kilograms		ii) 37 kg to pounds		[1 kg ≈ 2.2 lb]
d)	i) 22°C to °F		ii) 28°F to °C		[see page 103, Q.2]

4 How long did these journeys take?

a)	Departure time: 0835 hours	Arrival time: 1410 hours
b)	Departure time: 17:55	Arrival time: 03:22
c)	Departure time: 10.15 am	Arrival time: 12.24 am
d)	Departure time: 6.35 pm	Arrival time: 18.52

5 Draw these rectangles *to scale* in your exercise book.

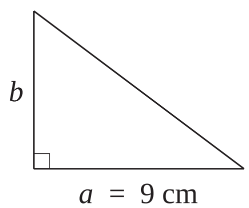
a) Its area is 16 cm^2 and its perimeter is 16 cm.

b) $A = 24$ cm^2, $P = 28$ cm

c) $A = 72$ cm^2, $P = 34$ cm

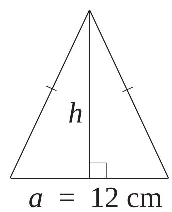
6

a) $A = 54$ cm^2



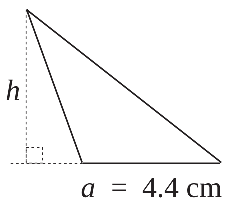
$b =$ ....

b) $A = 42$ cm^2



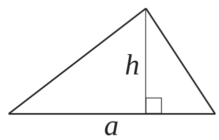
$h =$ ....

c) $h = 3.8$ cm



$A =$ ....

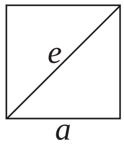
d) $h = 5.3$ cm
$A = 37.1$ cm^2



$a =$ ....

1

Calculate the area of these squares.



a) $a = 27$ cm b) $a = 365$ mm c) $a = 2.3$ m

d) $e = 15$ cm e) $e = 72$ mm

2

Fill in the missing numbers if $A = a^2$.

a	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A																

3

The area of a square is 1156 cm^2. Follow these methods to find the length of its sides.

a) Between which two whole tens is the length of each side?

$$\boxed{}^2 < a^2 < \boxed{}^2$$

Now find a by trial and error.

b) First factorise 1156, then work out the value of a.

4

Fill in the missing numbers if $a = \sqrt{A}$ (or $a^2 = A$)

A	1	4	9	16	25	36	49	64	81	100	121	144	169	196	225
a															

5

Work out (or approximate) the side of each square if its area is:

a) i) 25 cm^2 ii) 250 cm^2 iii) 2500 cm^2

b) i) 64 cm^2 ii) 6.4 cm^2 iii) 0.64 cm^2.

6

Work out the **square roots**. Use a calculator where necessary.

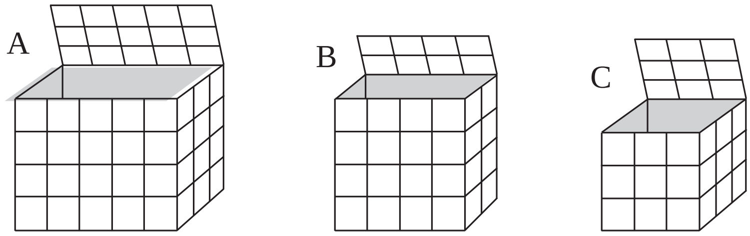
a) i) $\sqrt{100} =$ ii) $\sqrt{10\,000} =$ iii) $\sqrt{1\,000\,000} =$

b) i) $\sqrt{256} =$ ii) $\sqrt{2.56} =$ iii) $\sqrt{25\,600} =$

c) i) $\sqrt{0.25} =$ ii) $\sqrt{25} =$ iii) $\sqrt{2500} =$

d) i) $\sqrt{1.96} =$ ii) $\sqrt{196} =$ iii) $\sqrt{19.6} \approx$

1 These are 3 different boxes for storing unit cubes.



a) How many cubes will fit along the front edge of the bottom layer in each box?

b) How many: i) rows ii) cubes can be put in each bottom layer?

c) Fill in the table.

	Along an edge	In a layer	Total number of cubes
A			
B			
C			

2

a) How many **faces**, **edges** and **vertices** has each of these shapes:

i) cuboid ii) square-based prism iii) cube?

b) How many faces are **perpendicular** to each face of a cuboid?

c) How many edges are **parallel** with each edge of a cuboid?

d) How many edges meet at each **vertex** of a cuboid?

3

a) Calculate the volume of a cube which has 5 cm long edges.

b) What is the volume of a cube which has edge length e?

4

a) Calculate the volume of a cuboid which has a base edge 3 cm long and a height of 8 cm. (It is a square-based **prism**.)

b) What is the volume of a square-based cuboid which has base edge a and height h?

5

a) Calculate the volume of a cuboid which has edges 3 cm, 4 cm and 5 cm long.

b) What is the volume of a cuboid with edges a, b and c?

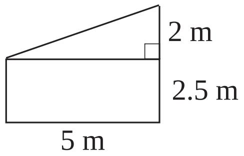
6

a) The surface area of each face of an ice cube is 49 cm^2. Calculate:

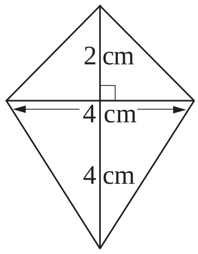
i) the volume of the ice cube ii) its mass, if 1 cm^3 of ice weighs 0.91 g.

b) The surface area of a square-based prism is 64 cm^2 and its base edge is 2 cm. What is the volume of the prism?

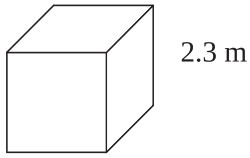
1 Write the areas and volumes below the diagrams, as required.

a) 

A =

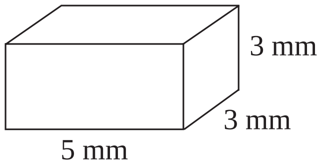
b) 

A =

c) 

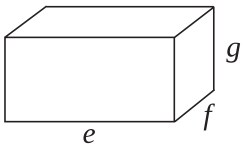
A =

V =

d) 

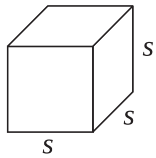
A =

V =

e) 

A =

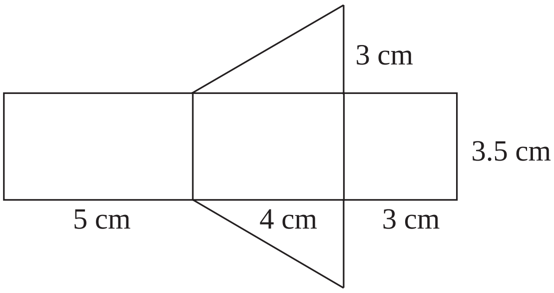
V =

f) 

A =

V =

2



A cuboid was cut into two equal pieces.

This is the net of one of the halves.

Calculate the surface area and the volume of this prism.

3 What is the volume of a cube if its edge is 1, 2, 3, 4, 5, 6 or 7 units?
Fill in the table to show the volumes for different edge lengths.

a (units)	1	2	3	4	5	6	7	8	9	10
V (unit cubes)										

4

a) An empty cubic box contains 8000 cm^3 of air. How long is its edge?

b) i) How many metres long is the edge of a 1 km^3 cube?

ii) What is the surface area of the cube?

c) i) How many centimetres long is the edge of a 1 m^3 cube?

ii) What is the surface area of the cube?

d) How many mm long is the edge of a 729 000 cm^3 cube?
Use the table in *Question 3* to help you.

1

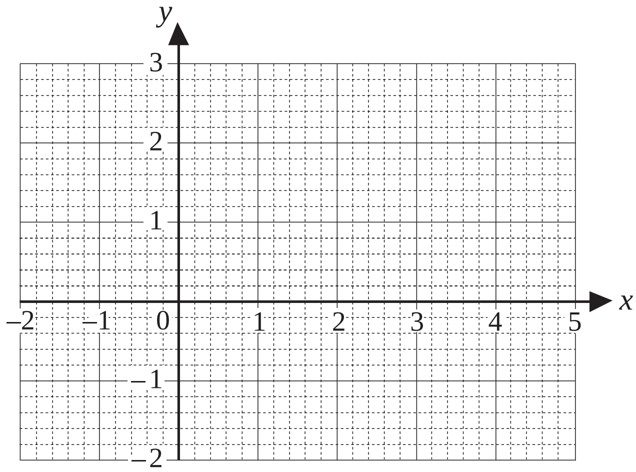
Let y be 60% of x.

a) Complete the table.

x	1	– 1	4	0	2.5	– 2	5
y	0.6						

b) Represent the pairs of values as dots in the coordinate grid.

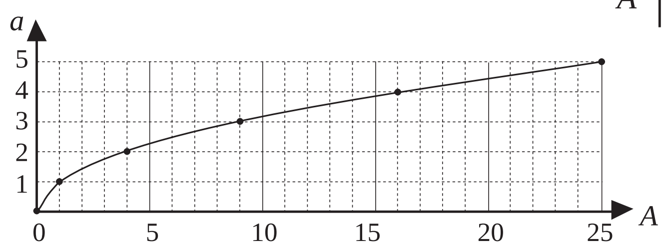
Join up the points with a line.



2

a) Read the corresponding values from the graph and complete the table.

a	0	1	2	3		5
A	0					



b) What is the rule?

c) What could a and A represent?

3

Complete the table so that a is the edge of a cube and A is its surface area.

a	0.1	0.9		$\frac{3}{4}$			5		1
A			24		$\frac{1}{6}$	37.5		600	

Write the rule in different ways. A = a =

4

The area of a rectangle is 5 cm^2.

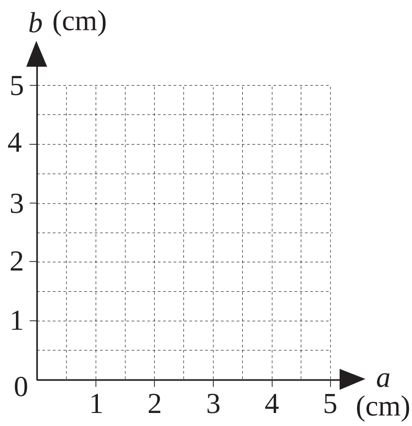
a) How long is side b if side a is:

i) 1 cm ii) 0.5 cm iii) $2\frac{1}{2}$ cm

iv) 5 cm v) 3 cm?

b) Show the data in a table in your exercise book.

c) Represent the pairs of values on the coordinate grid. Join up the dots.



5

Fill in the missing values if a is the edge of a cube and V is the volume of the cube.

a	0.1	0.9	1.1			$\frac{2}{3}$		10		
V				64	1		$\frac{27}{8}$		125	1000

V = a =

1

a) What is the area of a square if the length of a side is:

i) 5 cm ii) 1.9 cm iii) 23 mm iv) 4.7 km v) 0.1 m?

b) What is the length of a side of a square if its area is:

i) 16 cm^2 ii) 100 m^2 iii) 169 m^2 iv) 256 m^2 v) 1225 m^2?

2

a) A cube has edge length 13 cm.

i) What is its volume? ii) What is its surface area?

b) The surface area of a cube is 486 cm^2.

i) What is the length of an edge? ii) What is its volume?

c) The volume of a square-based cuboid is 100 cm^3 and its height is 4 cm.

i) What is the length of one of its base edges?

ii) What is its surface area?

3

Complete the table for different sizes of cubes.
(a = edge length, V = volume, A = surface area)

a (cm)		0.2		6			3.7			11
V (cm^3)			125			0.001			1000	
A (cm^2)	6				864			96		

4

Work out the **square roots**. Use a calculator where necessary.

a) i) $\sqrt{81}$ = ii) $\sqrt{8100}$ = iii) $\sqrt{0.81}$ =

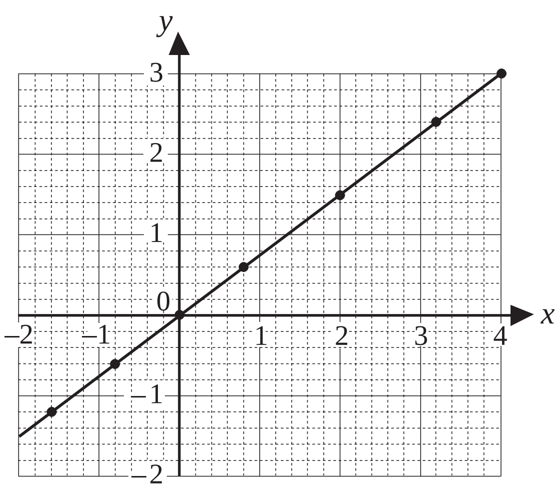
b) i) $\sqrt{169}$ = ii) $\sqrt{1.69}$ = iii) $\sqrt{16\,900}$ =

c) i) $\sqrt{1.44}$ = ii) $\sqrt{144}$ = iii) $\sqrt{1440\,000}$ =

5

a) Read the data from the graph.
Write corresponding values for
x and y in the table.

x	0						
y	0						



b) What is the rule (formula)?

. . . .

c) What could x and y represent?