# Weekly check: Year 9 part 3

Worked solutions

**KS3 Maths weekly check**

This check online

**1** ABC is a triangle. The side BC is extended to the point D.

Angle BAC = $a$ and angle ABC = $b$.

Prove that angle ACD = $a + b$.

Give a reason for each stage of your working.

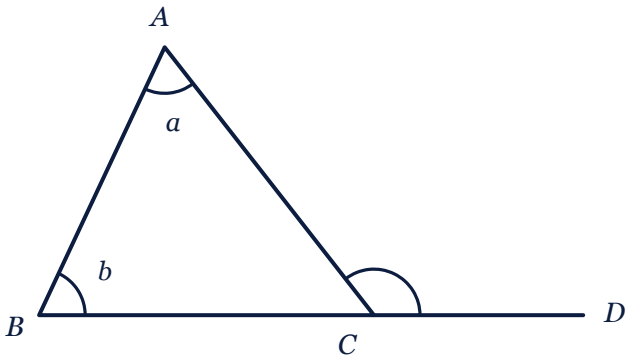



Diagram NOT accurately drawn

(3 marks)

Angles in a triangle add up to 180°

ACB = 180 - a - b

Angles on a straight line add up to 180°

ACD = 180 - ACB

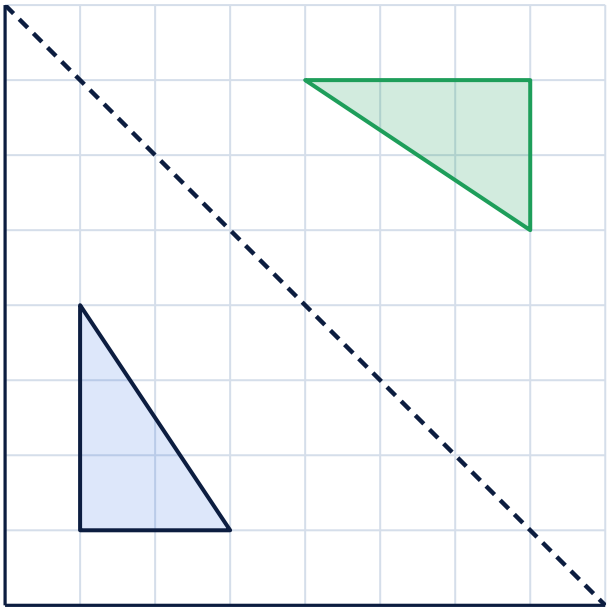
ACD = 180 - (180 - a - b)

ACD = a + b

**Angle ACD = a + b**


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**2** Reflect the shape in the mirror line.



(2 marks)

each corner: go at right angles to the mirror

same distance on the other side

diagonal squares on a 45° line

join the new corners

image drawn, same size, flipped over the line

**3** Rectangle $A$ has vertices at (1, 1), (3, 1), (3, 2) and (1, 2).

Rectangle $B$ has vertices at (2, 2), (6, 2), (6, 4) and (2, 4).

Describe fully the single transformation that maps rectangle $A$ onto rectangle $B$.

(2 marks)

Compare side lengths

A: width 2, height 1

B: width 4, height 2

Scale factor = 4 ÷ 2

Scale factor = 2

Each vertex doubles, so centre (0, 0)

(1, 1) → (2, 2)

(3, 1) → (6, 2)

(3, 2) → (6, 4)

Enlargement, scale factor 2, centre (0, 0)

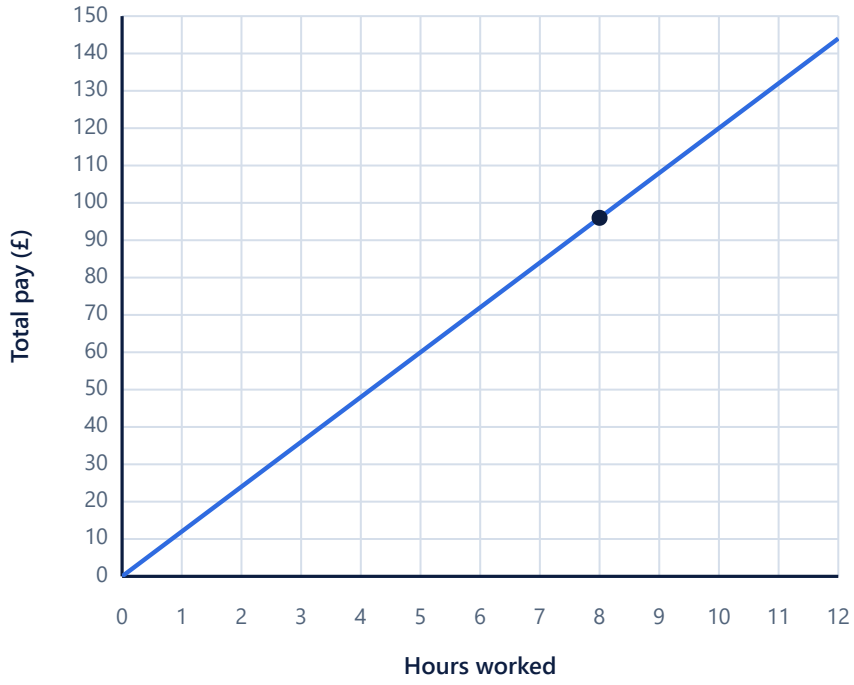

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**4** A graph shows Kelly's total pay plotted against the number of hours she works.

The graph is a straight line through (0, 0) and through the point (8, 96), where pay is in pounds.

a. Work out Kelly's hourly rate of pay.

b. Work out Kelly's total pay for working 11 hours.




(3 marks)

a)

8 hours → £96

$\text{Rate} = \frac{96}{8}$

Rate = 12

£12 per hour

b)

Pay = 11 × 12

Pay = 132

£132


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**5** Triangle $P$ has vertices at (2, 1), (5, 1) and (5, 3).

Triangle $Q$ has vertices at (2, −1), (5, −1) and (5, −3).

Describe fully the single transformation that maps triangle $P$ onto triangle $Q$. (2 marks)

Compare matching vertices

$(2, 1) \rightarrow (2, -1)$

$(5, 1) \rightarrow (5, -1)$

$(5, 3) \rightarrow (5, -3)$

x stays the same, y changes sign

$(x, y) \rightarrow (x, -y)$

**Reflection in the x-axis**

**6** a. A prism has a cross-section with an area of 24 $cm^2$. The prism is 15 cm long. Work out the volume of the prism.

b. Another prism has a volume of 540 $cm^3$. Its cross-section has an area of 72 $cm^2$. Work out the length of this prism. (3 marks)

a)

V = area of cross-section x length

$V = 24 \times 15$

$V = 360$

**360 $cm^3$**

b)

$72 \times L = 540$

÷72 $L = 7.5$ ÷72

**7.5 cm**


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**7** A cube has a volume of 64 $cm^3$.

Work out the total surface area of the cube. (3 marks)

Side length = cube root of 64

$s = \sqrt[3]{64}$

$s = 4$

Area of one face $= 4 \times 4$

Area of one face $= 16$

A cube has 6 faces

$SA = 6 \times 16$

$SA = 96$

$96\ cm^2$

**8** Find the equation of the straight line that is perpendicular to $y = 2x - 3$ and passes through the point (4, 1). (3 marks)

Perpendicular: negative reciprocal

Gradient of $y = 2x - 3$ is 2

$m = -\frac{1}{2}$

$y = -\frac{1}{2}x + c$

Substitute (4, 1)

$1 = -\frac{1}{2} \times 4 + c$

$1 = -2 + c$

+2 $c = 3$ +2

$y = -\frac{1}{2}x + 3$


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**9** The diagram shows five sketch graphs, labelled **A**, **B**, **C**, **D** and **E**.

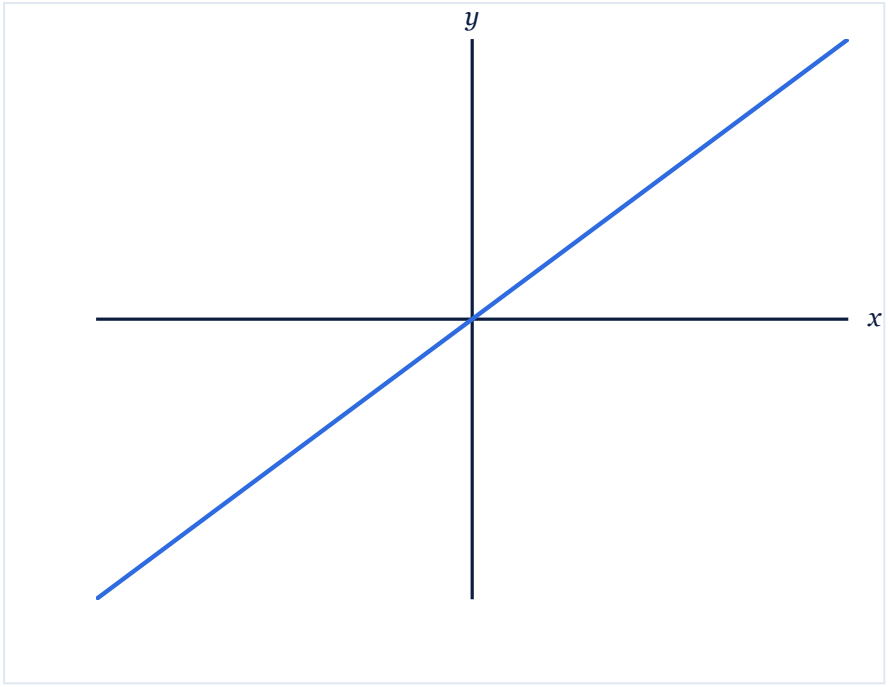
Match each equation below to the letter of its graph.

a. $y = -x^2$

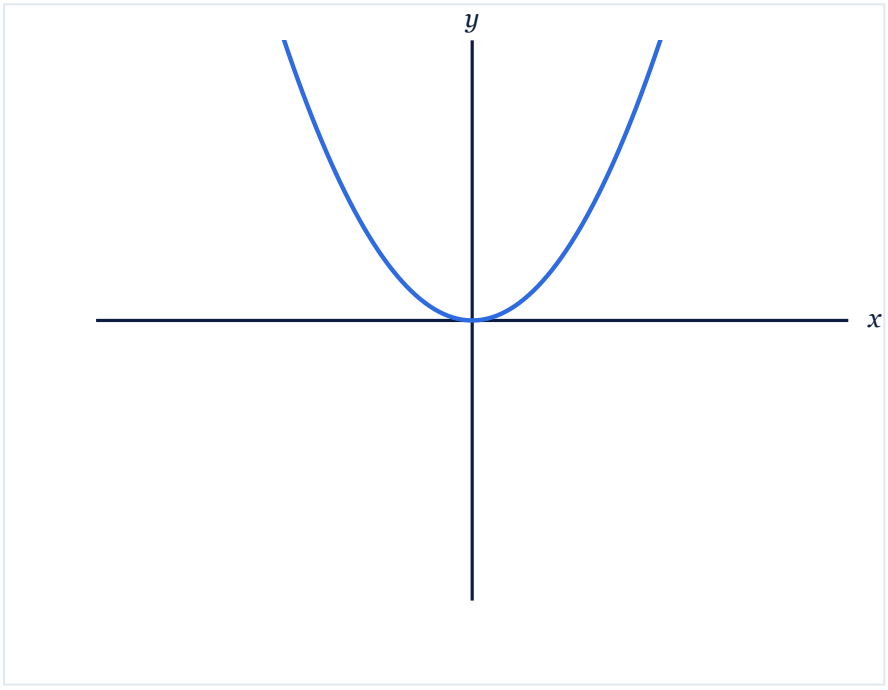
b. $y = x^3$

c. $y = \frac{5}{x}$

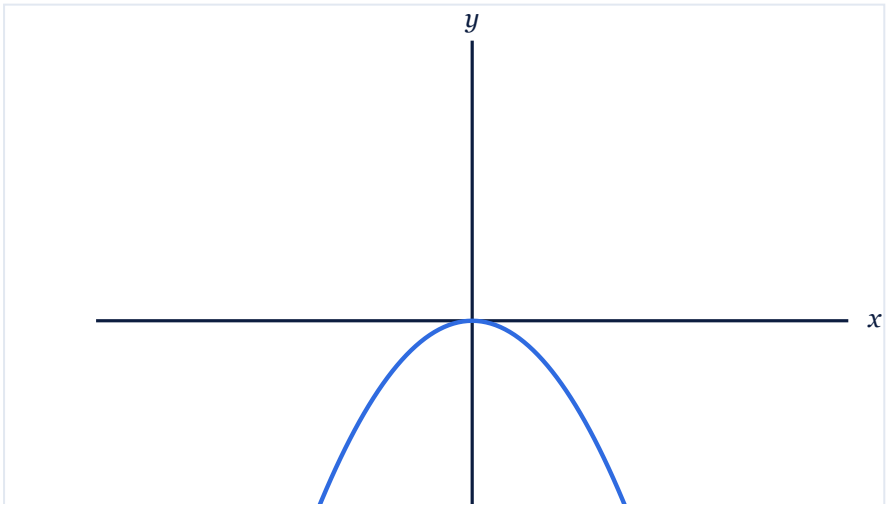

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**A**




**B**

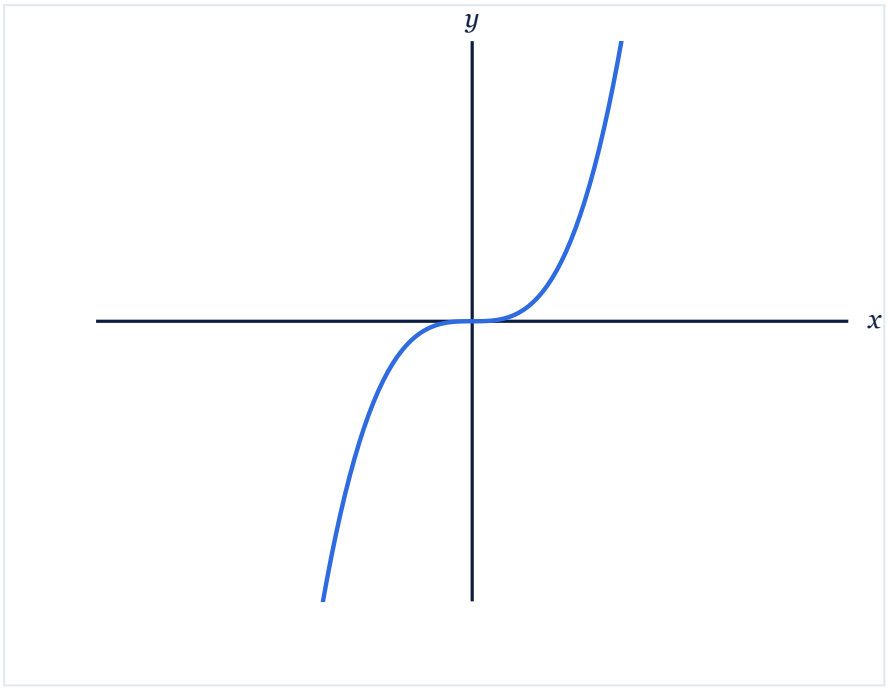




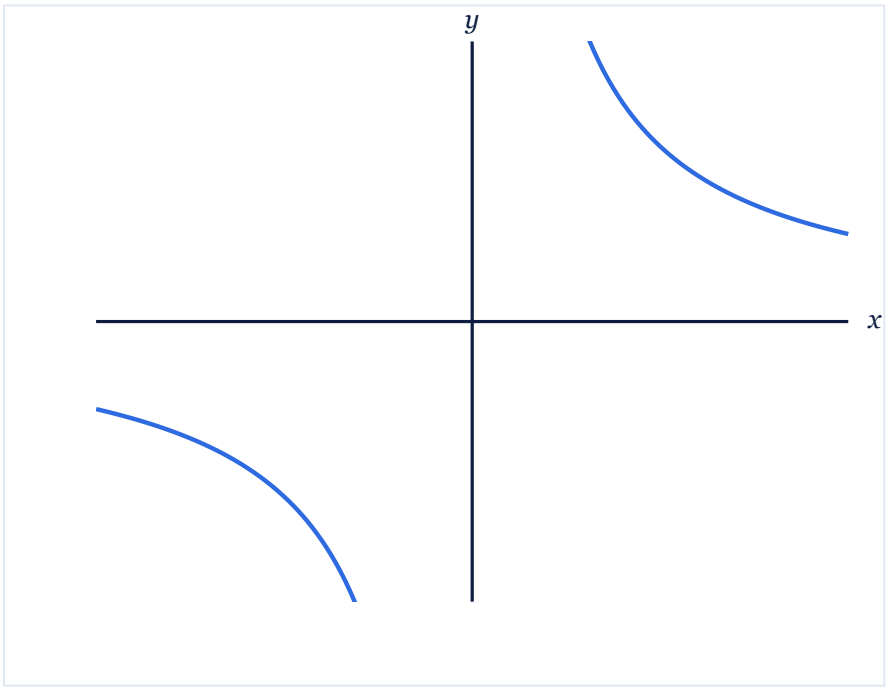
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**C**




**D**




**E**

(3 marks)

a)

Upside-down parabola

C


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b)

S-shaped cubic through the origin

**D**

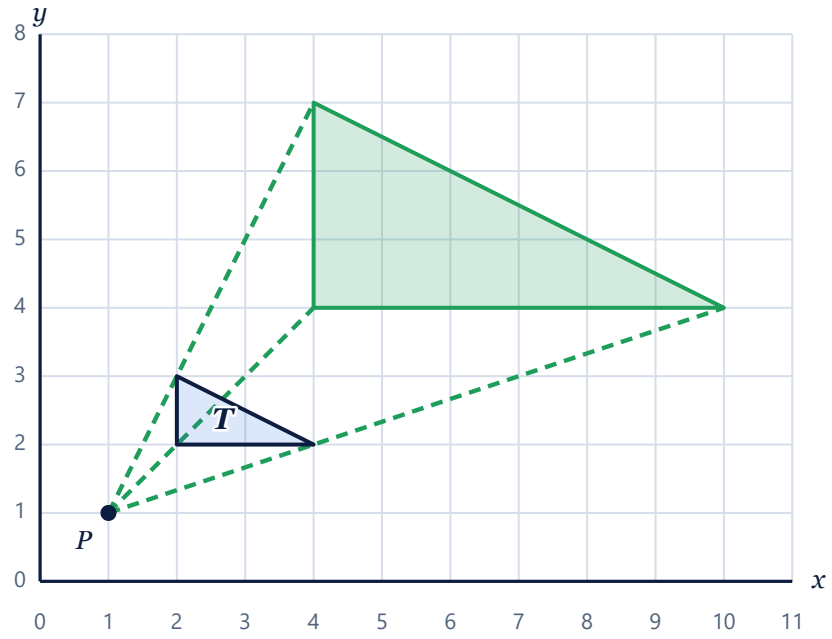
c)

Reciprocal curve, two branches

**E**

**10** Triangle T and the point P (1, 1) are drawn on the grid.

Enlarge triangle T by scale factor 3, centre P.




(3 marks)

from P (1, 1) to each corner, then × 3

(2, 2): 1 right, 1 up → 3 right, 3 up → (4, 4)

(4, 2): 3 right, 1 up → 9 right, 3 up → (10, 4)

(2, 3): 1 right, 2 up → 3 right, 6 up → (4, 7)

check: rays from P go through each pair

**image at (4, 4), (10, 4), (4, 7)**


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**11** Triangle PQR is a right-angled triangle with the right angle at Q.

PQ = 7 cm and QR = 9 cm.

Work out the length of PR.

Give your answer correct to 1 decimal place.

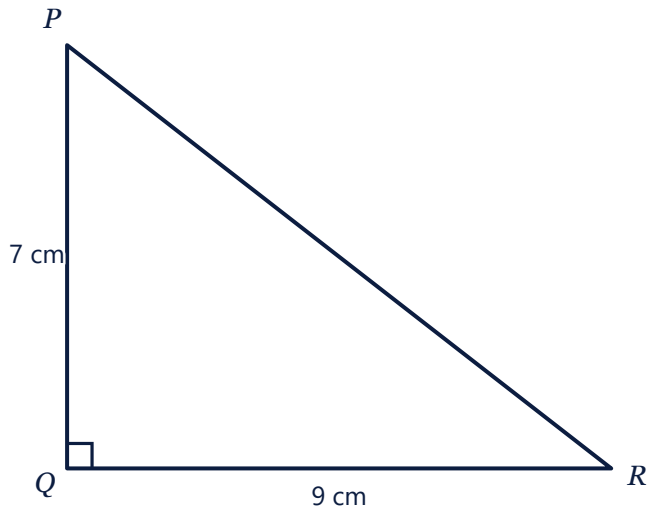



Diagram NOT accurately drawn

(2 marks)

PR is the hypotenuse

$PR^2 = PQ^2 + QR^2$

$PR^2 = 7^2 + 9^2$

$PR^2 = 49 + 81$

$PR^2 = 130$

$PR = \sqrt{130}$

$PR = 11.4017...$

Round to 1 dp

**11.4 cm**


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**12** AB and CD are parallel lines. The line PQ crosses them at P and Q.

One of the angles at P is 62°, as shown.

a. Write down the value of $x$. Give a reason for your answer.

b. Write down the value of $z$. Give a reason for your answer.

c. Work out the value of $y$. Give a reason for your answer.

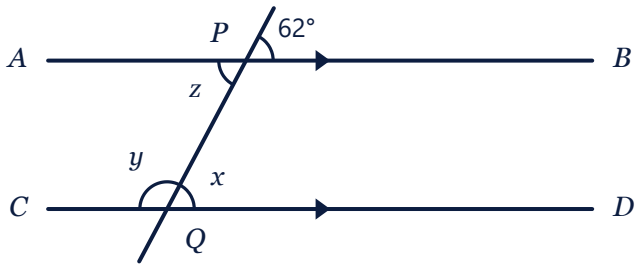



Diagram NOT accurately drawn

(3 marks)

a)

$x = 62$

Corresponding angles are equal

b)

$z = x = 62$

Alternate angles are equal

c)

$y = 180 - 62$

$y = 118$

Angles on a straight line add up to 180°

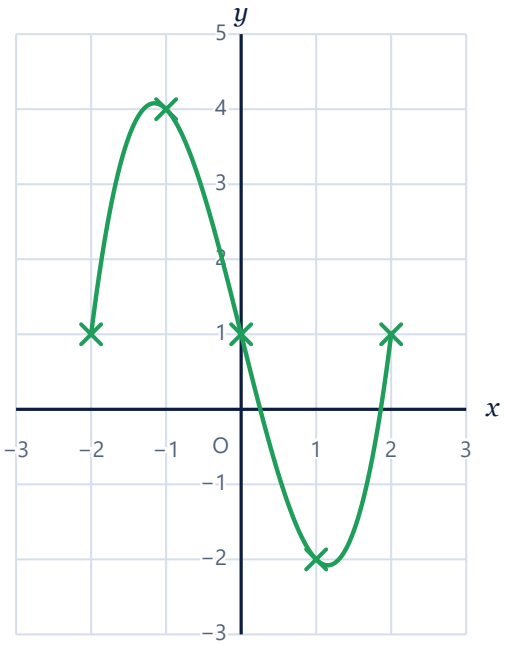

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**13** Here is a table of values for $y = x^3 - 4x + 1$

| $x$ | −2 | −1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| $y$ | 1 | | 1 | | |

a. Complete the table.

b. On the grid, draw the graph of $y = x^3 - 4x + 1$ for values of $x$ from −2 to 2




(4 marks)

a)

$x = -1$: $(-1)^3 - 4 \times (-1) + 1 = -1 + 4 + 1 = 4$

$x = 1$: $1 - 4 + 1 = -2$

$x = 2$: $8 - 8 + 1 = 1$

**4, -2, 1**

b) plot the five points

smooth curve: up, over the top, down, then up

**S-shaped curve drawn**


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**14** Triangle ABC is a right-angled triangle with the right angle at B.

AB = 6 cm and BC = 8 cm.

Work out the length of AC.

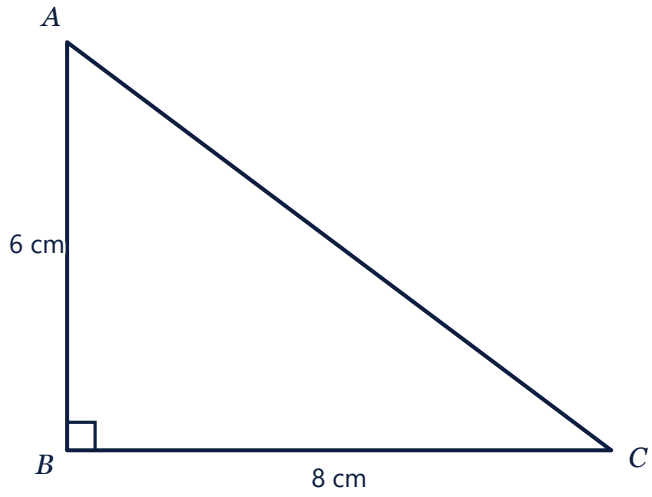



Diagram NOT accurately drawn

(2 marks)

AC is the hypotenuse

$AC^2 = AB^2 + BC^2$

$AC^2 = 6^2 + 8^2$

$AC^2 = 36 + 64$

$AC^2 = 100$

$AC = \sqrt{100}$

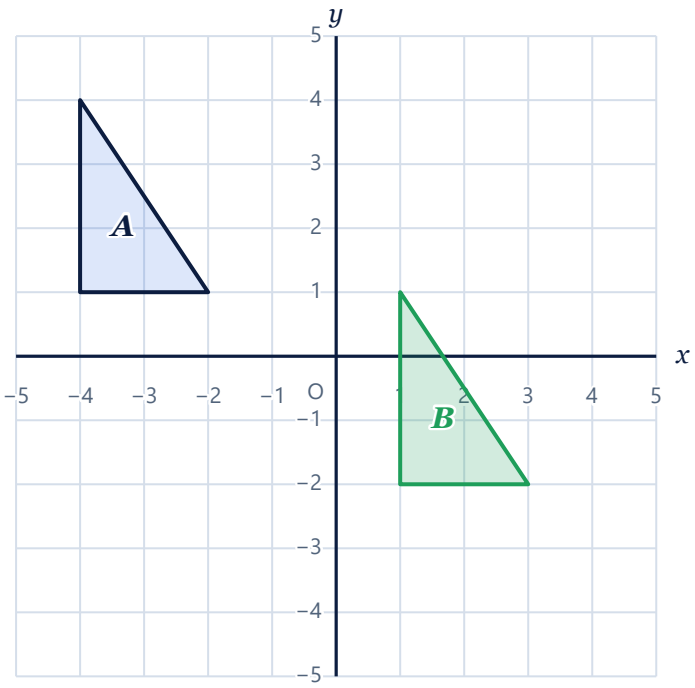
$AC = 10$

**10 cm**


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**15** Triangle A is drawn on the grid.

Translate triangle A by the vector $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$. Label the image B.




(2 marks)

top number 5: 5 right

bottom number -3: 3 down

(-4, 1), (-2, 1), (-4, 4)

move each corner 5 right, 3 down

(1, -2), (3, -2), (1, 1)

B has corners (1, -2), (3, -2), (1, 1)

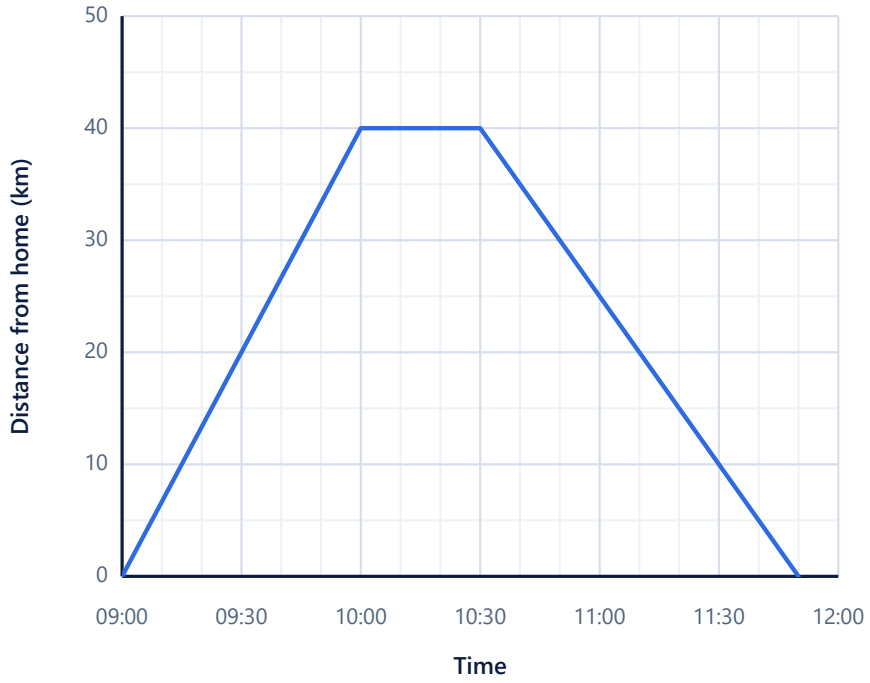

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**16** The distance-time graph shows Marek's car journey from home to a garden centre and back.

a. For how many minutes does Marek stay at the garden centre?

b. Work out his speed, in km/h, on the way to the garden centre.

c. Work out his speed, in km/h, on the way home.




(3 marks)

a)

Horizontal line = stopped

10:30 - 10:00 = 30 minutes

**30 minutes**

b)

40 km from 09:00 to 10:00

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = \frac{40}{1}$$

$$\text{Speed} = 40$$

**40 km/h**

c)

40 km from 10:30 to 11:50

Time = 80 minutes

$$\text{Time} = \frac{80}{60} \text{ hours}$$


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$$\text{Time} = \frac{4}{3} \text{ hours}$$

$$\text{Speed} = 40 \div \frac{4}{3}$$

$$\text{Speed} = 40 \times \frac{3}{4}$$

$$\text{Speed} = 30$$

**30 km/h**

**17** In triangle ABC, AB = AC.
The point D lies on BC so that AD bisects angle BAC.
Prove that triangle ABD is congruent to triangle ACD.

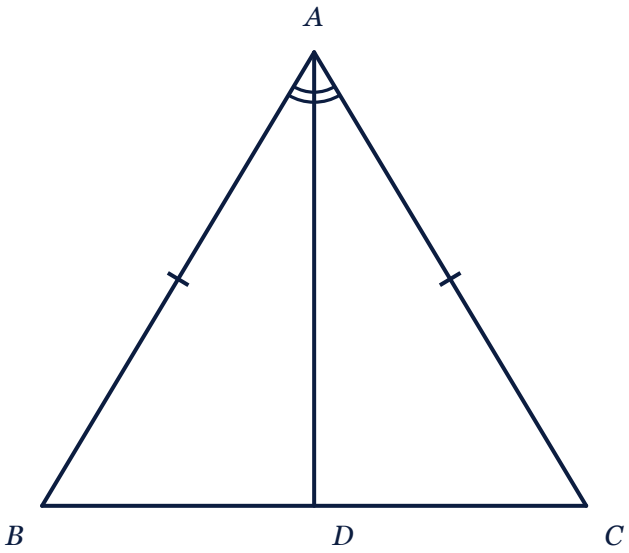



Diagram NOT accurately drawn

(3 marks)

Triangles ABD and ACD

AB = AC (given)

∠BAD = ∠CAD (AD bisects ∠BAC)

AD = AD (common side)

The angle is between the two sides

**ABD ≡ ACD (SAS)**


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**18** The diagram shows a right-angled triangle PQR.

a. Write down the name of the side that is the hypotenuse.

b. Show that the three lengths fit Pythagoras' theorem.

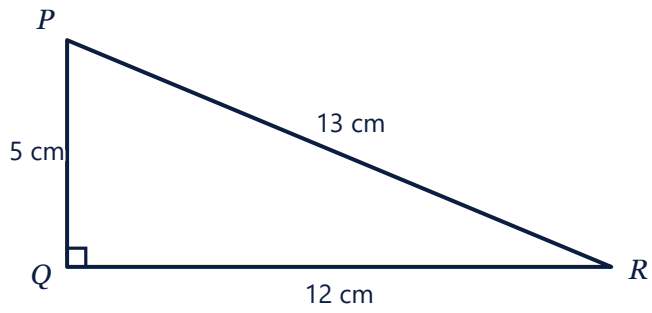



Diagram NOT accurately drawn

(2 marks)

a)

Opposite the right angle

PR

b)

$5^2 + 12^2 = 25 + 144$

$= 169$

$13^2 = 169$

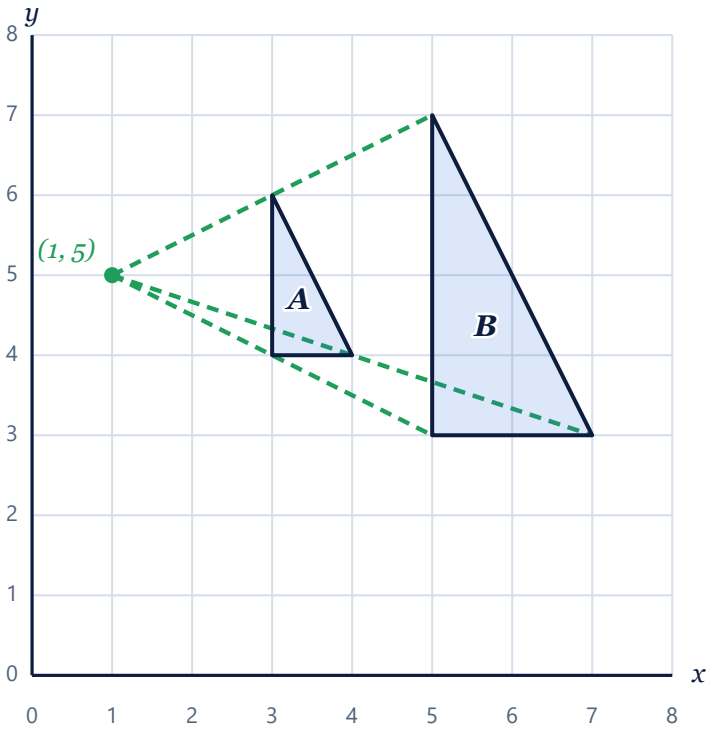
$5^2 + 12^2 = 13^2$


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**19** Triangle B is an enlargement of triangle A.

a. Write down the scale factor of the enlargement.

b. Find the coordinates of the centre of the enlargement.




(3 marks)

a) compare matching sides

A: 1 square, B: 2 squares

scale factor = 2 ÷ 1

= 2

**2**

b) join each corner of B to the matching corner of A

extend the lines until they meet

they meet at (1, 5)

check (3, 4): 2 right, 1 down from (1, 5)

x 2: 4 right, 2 down → (5, 3), a corner of B

**(1, 5)**


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**20** A rectangle is 9 cm long and 6 cm wide.

Work out the length of a diagonal of the rectangle.

Give your answer correct to 1 decimal place.

(2 marks)

Diagonal is the hypotenuse

$d^2 = 9^2 + 6^2$

$d^2 = 81 + 36$

$d^2 = 117$

$d = \sqrt{117}$

$d = 10.8166...$

Round to 1 dp

**10.8 cm**


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