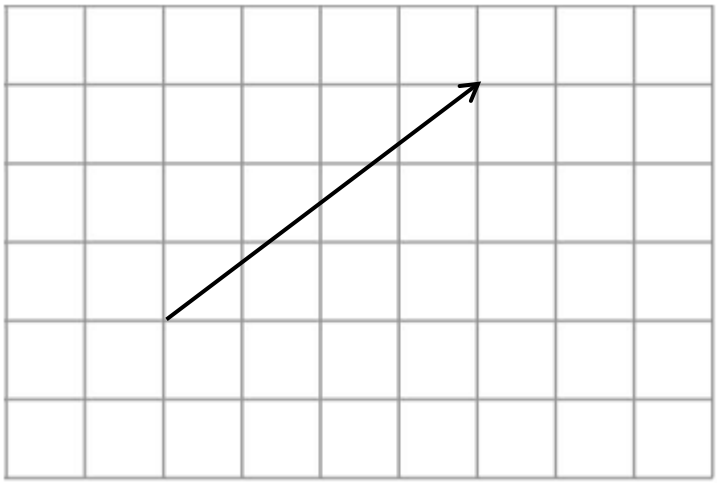
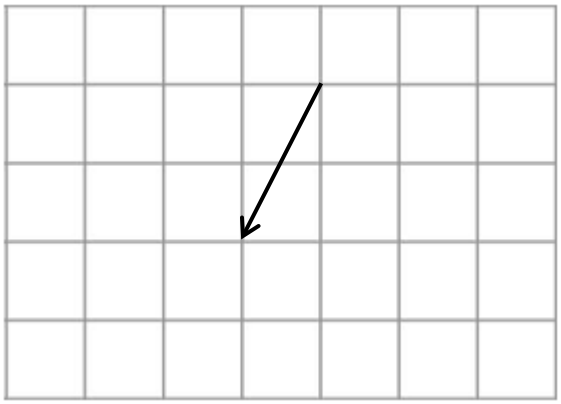
OCR 09 Congruence and Similarity (Foundation)

1. Write down the vector shown on the grid below as a column vector.



2. Write down the vector shown on the grid below as a column vector.

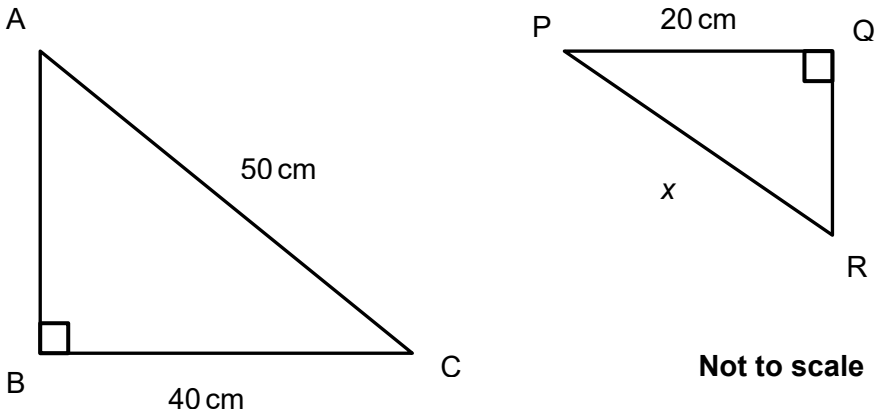


3. Calculate $\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} -3 \\ 4 \end{pmatrix}$.

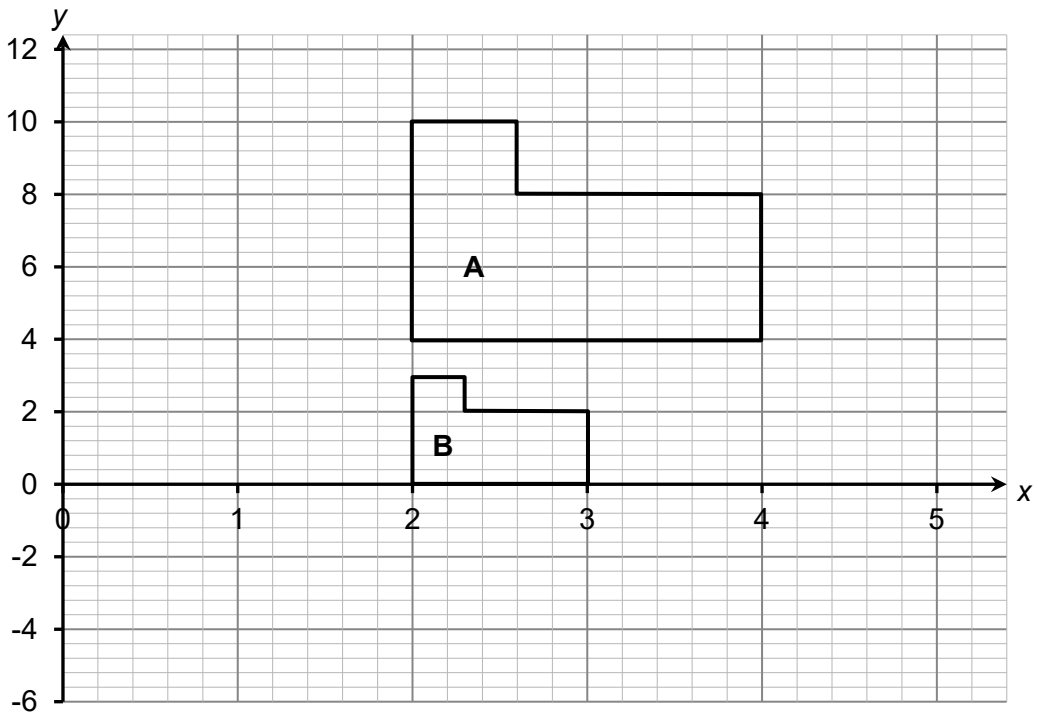
4. Calculate $\begin{pmatrix} -3 \\ 4 \end{pmatrix} - \begin{pmatrix} -5 \\ -3 \end{pmatrix}$.

5. Give two vectors parallel to $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

6. In the diagram below, triangle ABC is similar to triangle PQR. Find the length *x*.

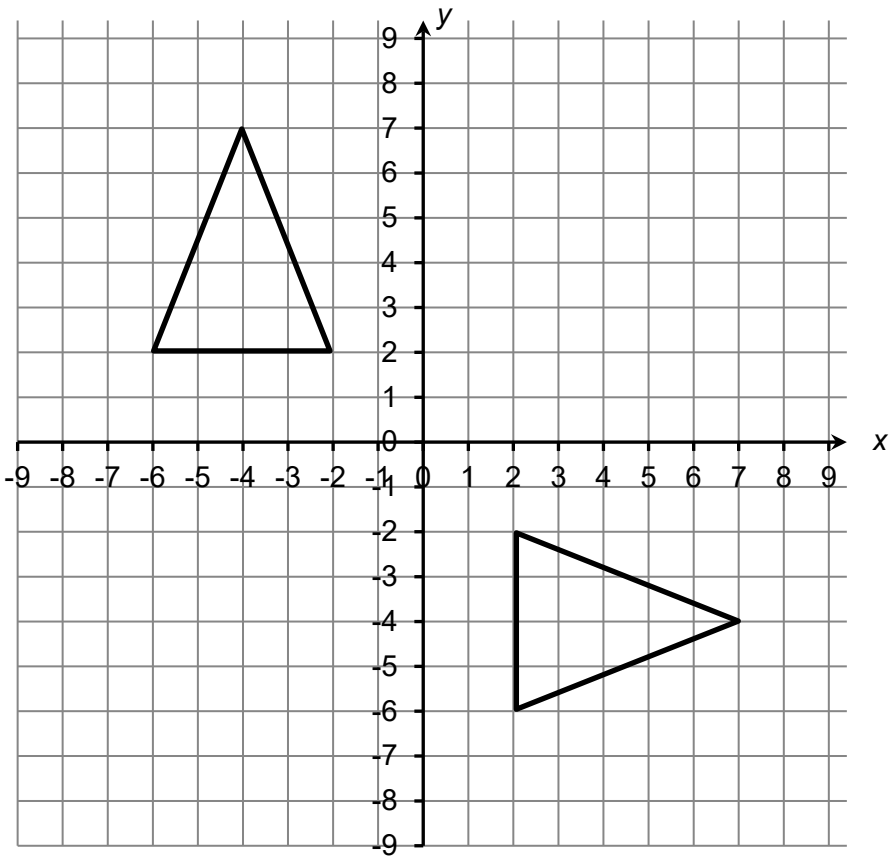


7. On the grid below, shape **A** has been enlarged to give shape **B**.
Identify the centre of enlargement from shape **A** to shape **B**.

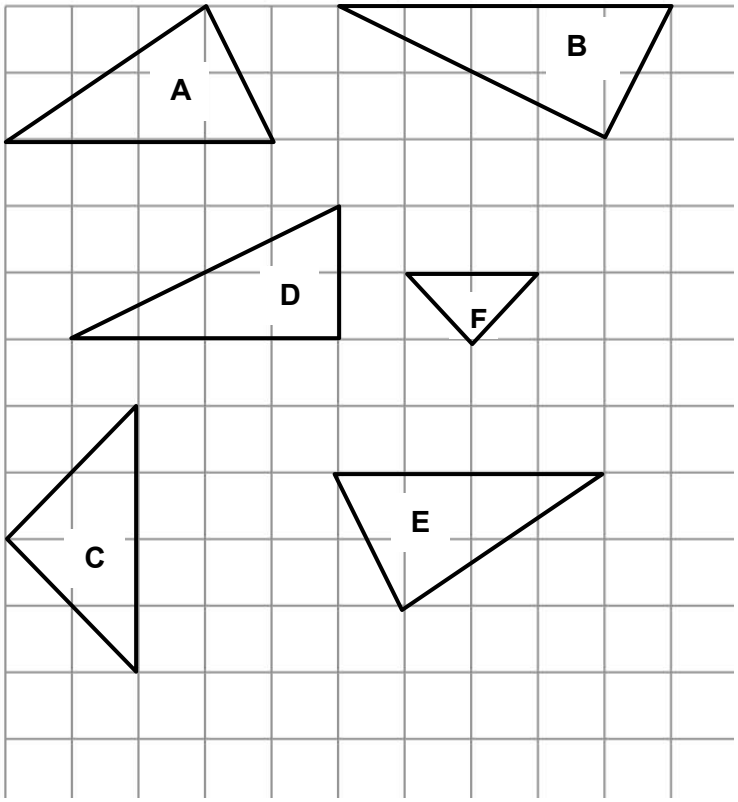


8. On the grid in question 7, what scale factor is used to enlarge shape **A** to give shape **B**?

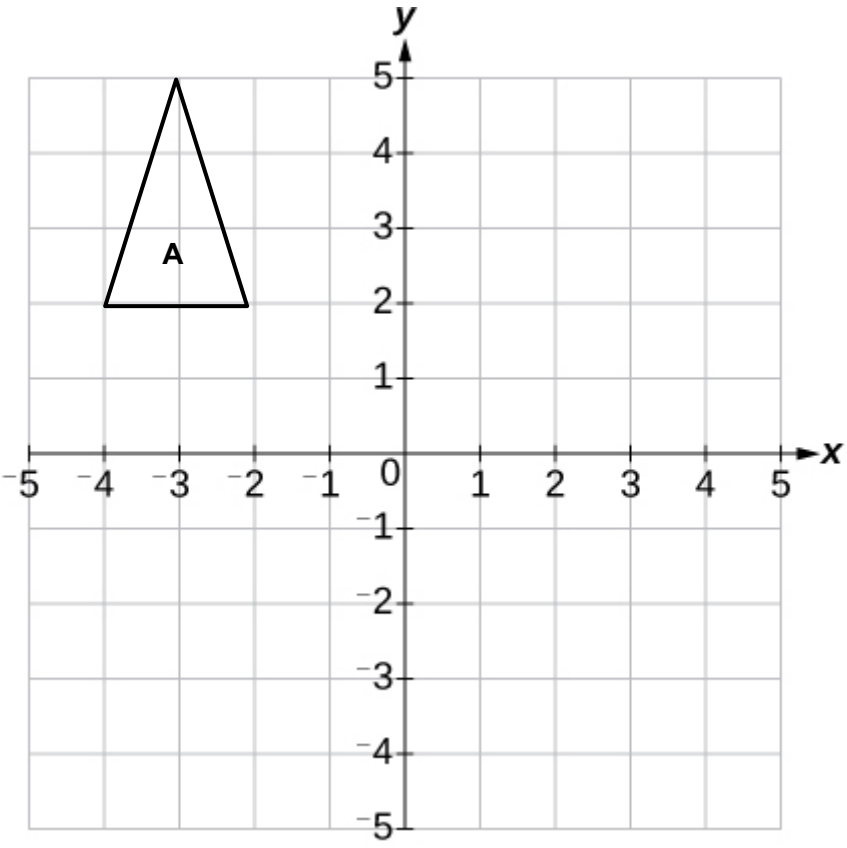
9. Identify the line of reflection between the two triangles in the diagram below.



10. Identify a pair of congruent triangles on the grid below.

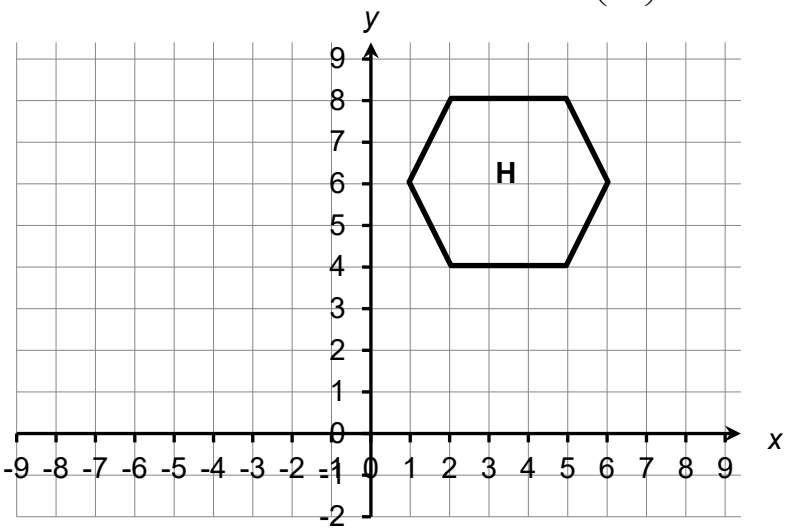


11. On the grid below, reflect shape **A** in the line $x = -1$ and label this shape **B**. Then reflect shape **B** in the line $y = 1$ and label this shape **C**.

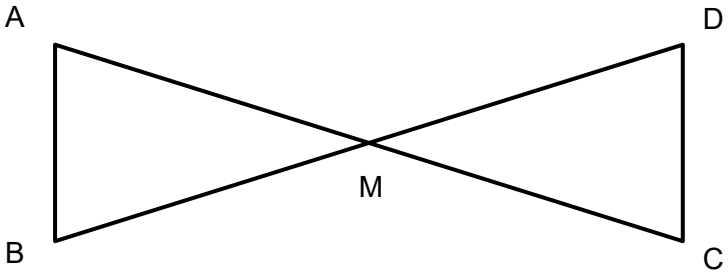


12. Using your answer from question 11, describe a single transformation that maps shape **A** to shape **C**.

13. Draw the image of hexagon **H** after a translation of $\begin{pmatrix} 1\frac{1}{2} \\ -5 \end{pmatrix}$.

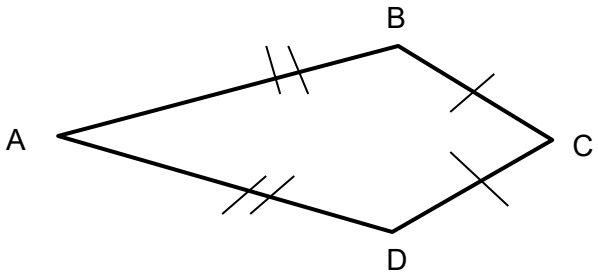


14. In the diagram below, M is the midpoint of straight lines AC and BD.
Prove that triangles AMB and CMD are congruent giving full reasoning.



Not to scale

15. In the diagram below, quadrilateral ABCD is a kite.
Prove that triangles ABC and ADC are congruent giving full reasoning.

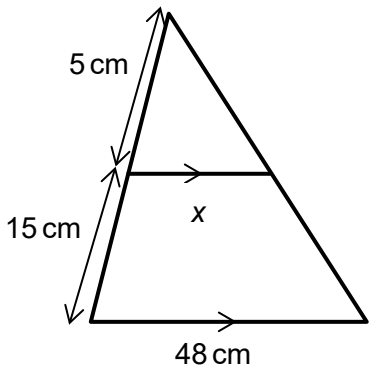


Not to scale

16. A model is made of a sculpture. The model has height 30 cm and is an enlargement with scale factor 0.25 of the sculpture. The sculpture is on a podium with height 1 m. Calculate the height of the sculpture and the podium together.

17. Three points, A, B and C, are on a grid. The vector $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$ represents travel from A to B. The vector $\begin{pmatrix} -4 \\ 8 \end{pmatrix}$ represents travel from B to C. Calculate the vector representing travel from A to C.

18. Find the missing length *x* in the diagram below.

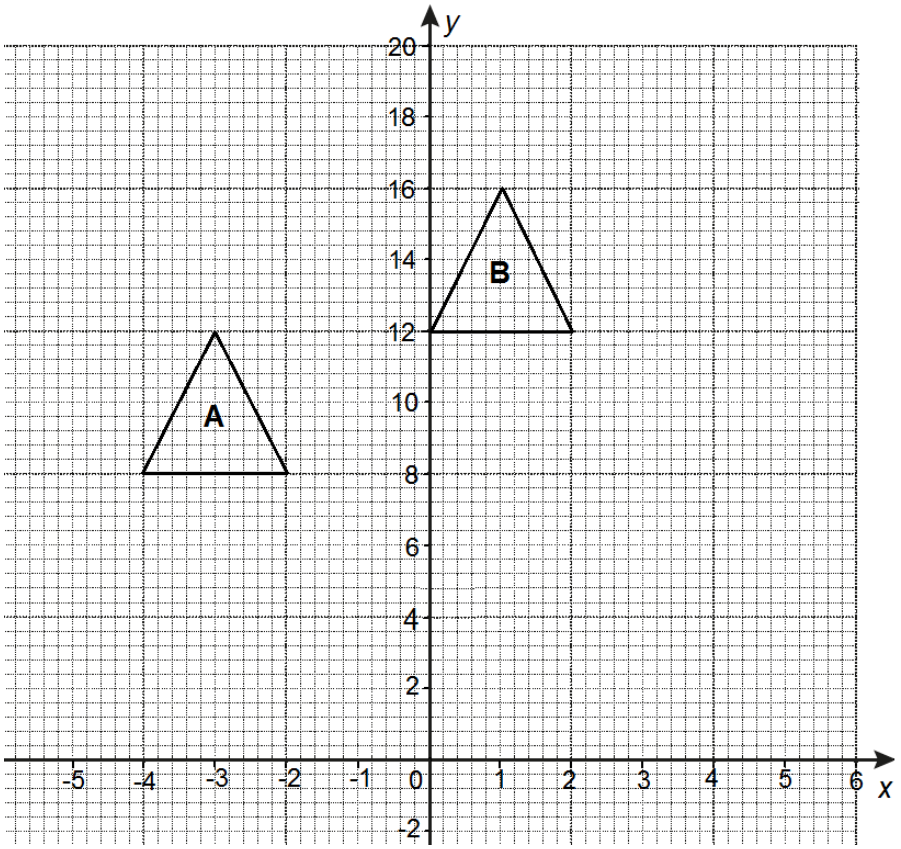


Not to scale

19. A rectangle, **A**, has length 10 cm and width 6 cm. A similar rectangle, **B**, has length 2.5 cm. What is the area of rectangle **B**?

20. Triangle **A** can be mapped onto triangle **B** by translation $\begin{pmatrix} 2c \\ \frac{1}{2}d \end{pmatrix}$.

Find c and d.



Answers

1. $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$

2. $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$

3. $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$

4. $\begin{pmatrix} 2 \\ -7 \end{pmatrix}$

5. Any multiple of the vector i.e. $\begin{pmatrix} 4 \\ -6 \end{pmatrix}$

6. 25 cm

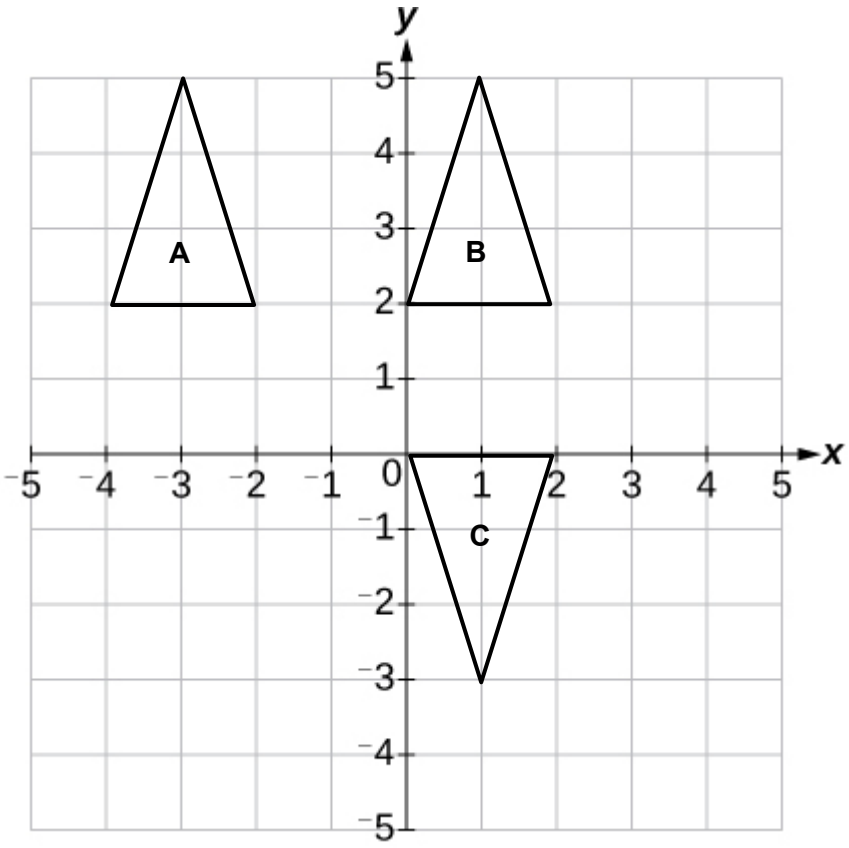
7. Centre of enlargement (2, -4)

8. Scale factor $\frac{1}{2}$

9. $y = x$

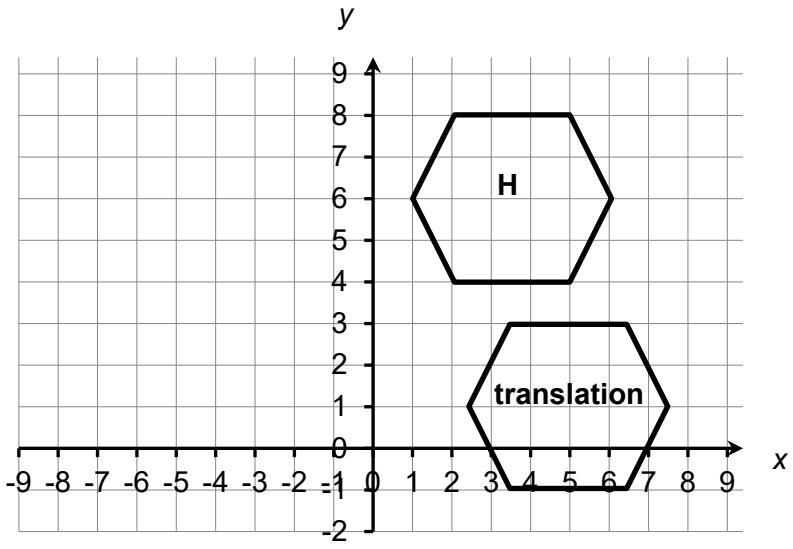
10. A and E

11.



12. 180° rotation about (-1, 1)

13.



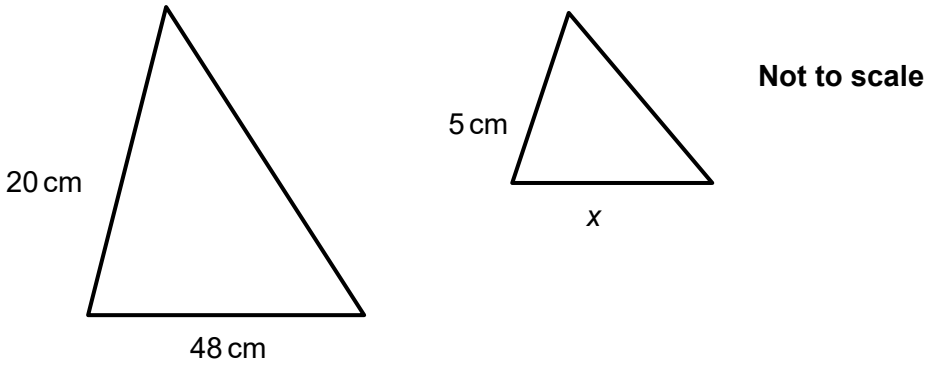
14. AM = CM and BM = DM as M is the midpoint of lines AC and BD.
Angle AMB = angle CMD using opposite angles.
Triangles ABM and CMD are congruent (SAS).

15. AC is common to both triangle ABC and triangle ADC.
AB = AD and BC = DC.
Triangle ABC and triangle ADC are congruent (SSS).

16. 30 cm ÷ 0.25 = 120 cm
1 m = 100 cm
120 cm + 100 cm = 220 cm

17. $\begin{pmatrix}2\\6\end{pmatrix}+\begin{pmatrix}-4\\8\end{pmatrix}=\begin{pmatrix}-2\\14\end{pmatrix}$

18. Separate the triangles to see them more clearly.



Not to scale

It is then easy to see that x must be $\frac{1}{4}$ of 48 so $x = 12$ cm.

19. Width or rectangle **B** $= 6 \div \frac{10}{2.5} = 1.5$ cm
Area of rectangle **B** $= 1.5 \times 2.5 = 3.75$ cm^2

20. Translation of 4 horizontally $= 2c$, so $c = 2$.
Translation of 4 vertically $= \frac{1}{2}d$, so $d = 8$.

GCSE (9–1)

MATHEMATICS

Section Check In

Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Represent a 2D vector as a column vector			
AO1	2	Represent a 2D vector as a column vector			
AO1	3	Calculate with vectors			
AO1	4	Calculate with vectors			
AO1	5	Find parallel vectors			
AO1	6	Find a length in similar shapes			
AO1	7	Find centre of enlargement			
AO1	8	Identify a scale factor			
AO1	9	Identify a line of reflection			
AO1	10	Identify congruent triangles			
AO2	11	Reflect a shape			
AO2	12	Describe a single transformation			
AO2	13	Translate a shape using a column vector			
AO2	14	Prove that two triangles are congruent using SAS			
AO2	15	Prove that two triangles are congruent using SSS			
AO3	16	Solve a real-life problem with scale factors			
AO3	17	Calculate with vectors			
AO3	18	Find a missing side length using similar triangles			
AO3	19	Calculate an area using similar shapes			
AO3	20	Translate with column vectors			

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