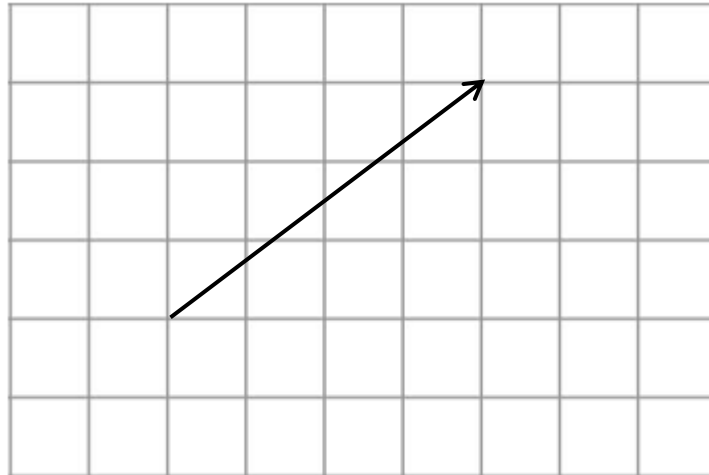


OCR 09 Congruence and Similarity (Foundation)

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

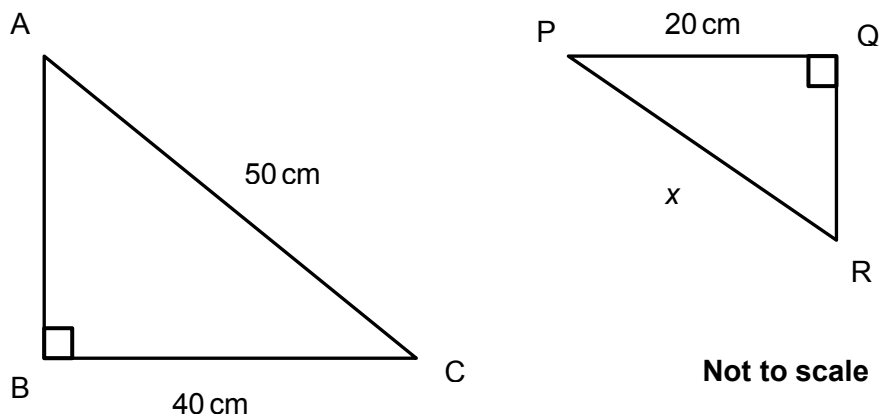


2. Write down the vector shown on the grid below as a column vector.

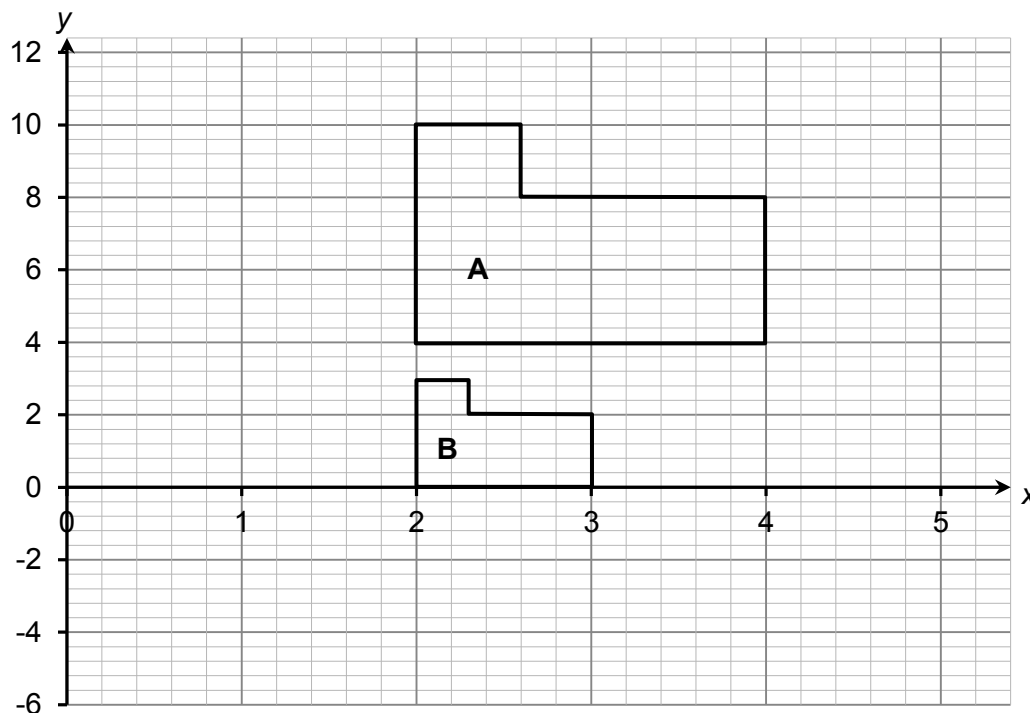


3. Calculate $\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} -3 \\ 4 \end{pmatrix}$.
4. Calculate $\begin{pmatrix} -3 \\ 4 \end{pmatrix} - \begin{pmatrix} -5 \\ -3 \end{pmatrix}$.
5. Give two vectors parallel to $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

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

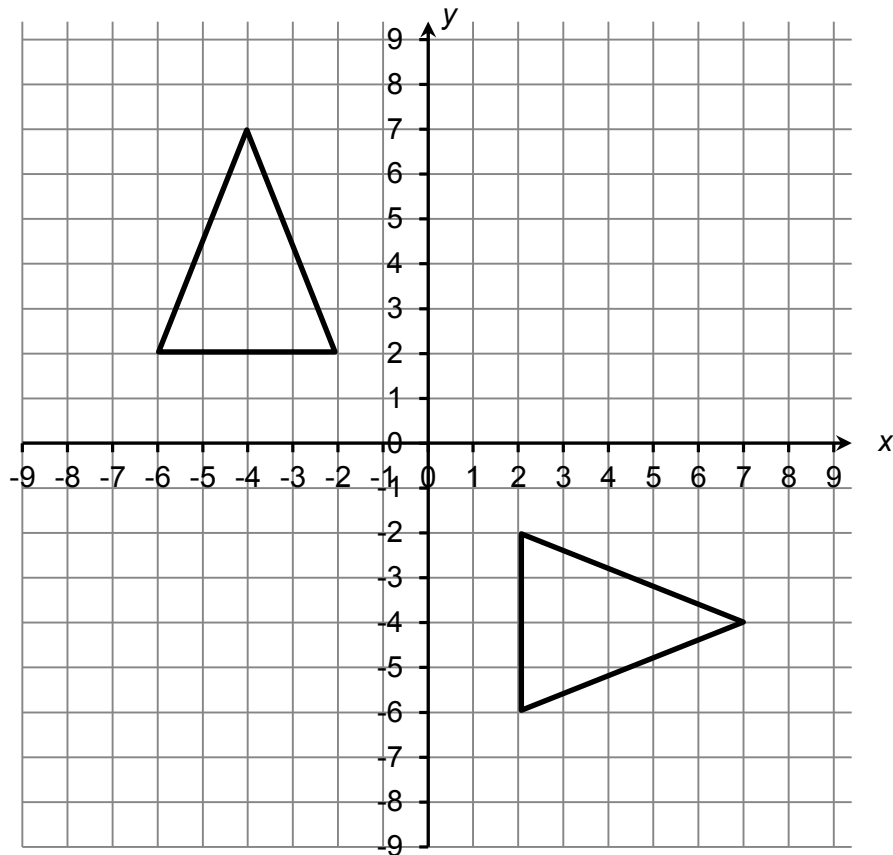


7. On the grid below, shape A has been enlarged to give shape B. Identify the centre of enlargement from shape A to shape B.

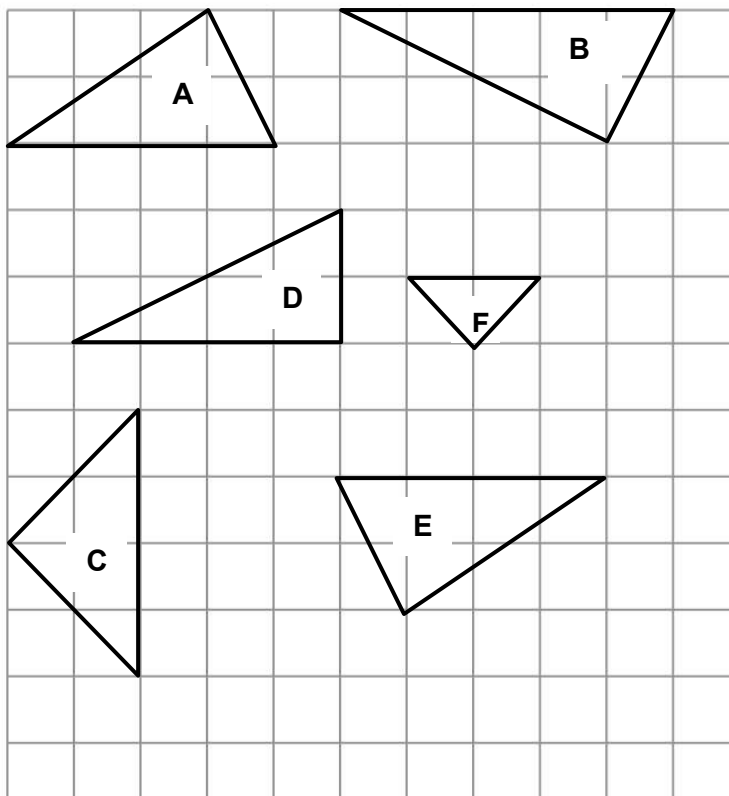


8. On the grid in question 7, what scale factor is used to enlarge shape A to give shape B?

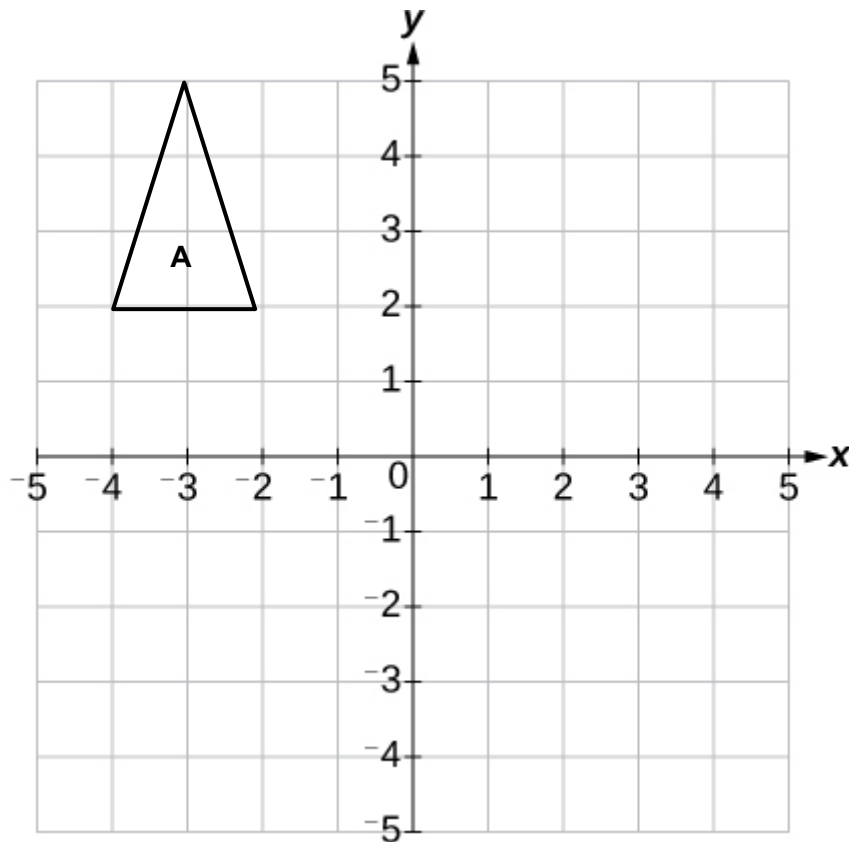
9. Identify the line of reflection between the two triangles in the diagram below.



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

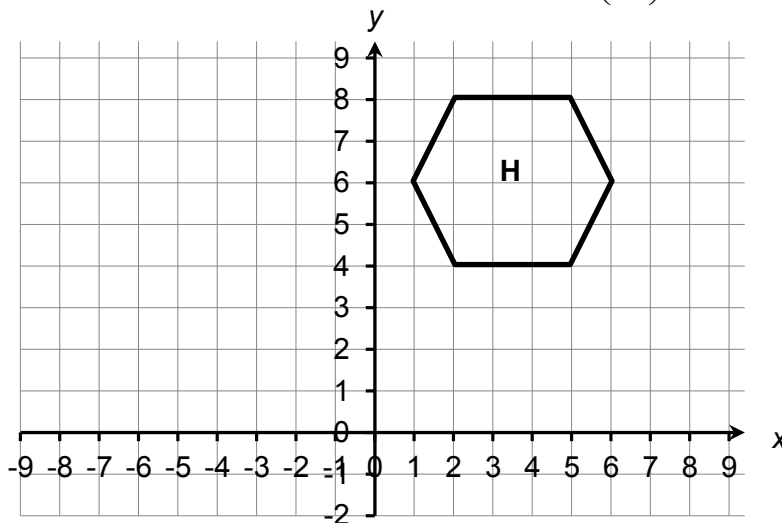


11. On the grid below, reflect shape **A** in the line $x = -1$ and label this shape **B**. Then reflect shape **B** in the line $y = 1$ and label this shape **C**.

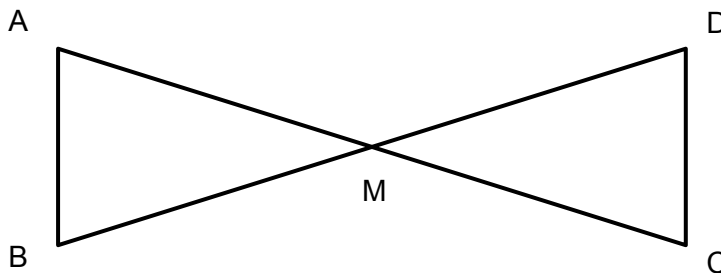


12. Using your answer from question 11, describe a single transformation that maps shape **A** to shape **C**.

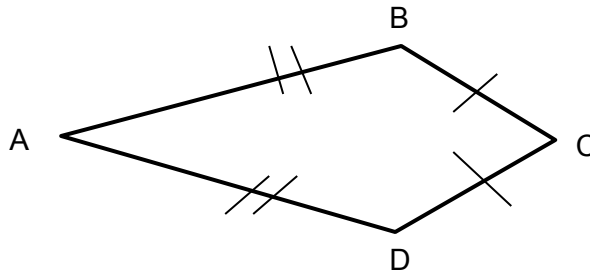
13. Draw the image of hexagon **H** after a translation of $\begin{pmatrix} 1 \\ \frac{1}{2} \\ -5 \end{pmatrix}$.



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**

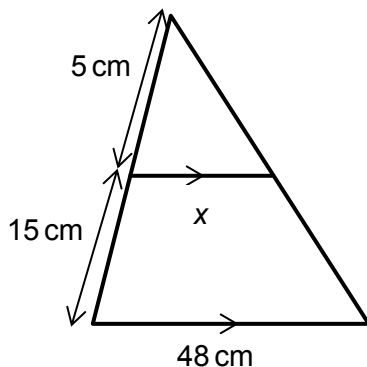
15. In the diagram below, quadrilateral ABCD is a kite.
Prove that triangles ABC and ADC are congruent giving full reasoning.

**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.

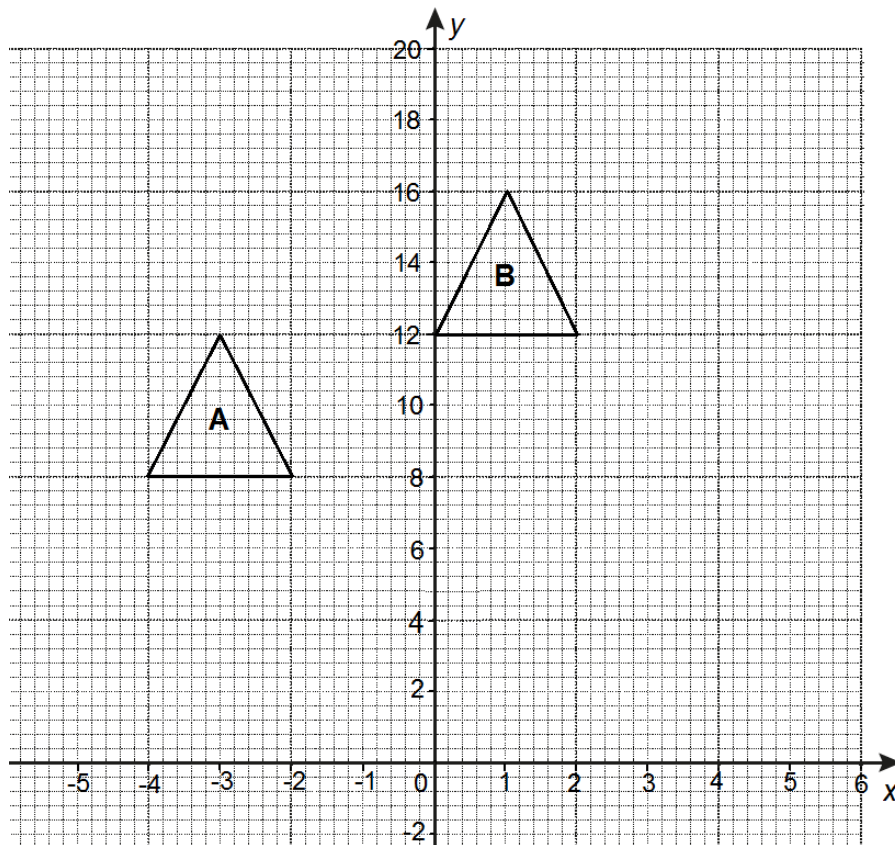
18. Find the missing length x in the diagram below.

**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. $\begin{pmatrix} 4 \\ -6 \end{pmatrix}$

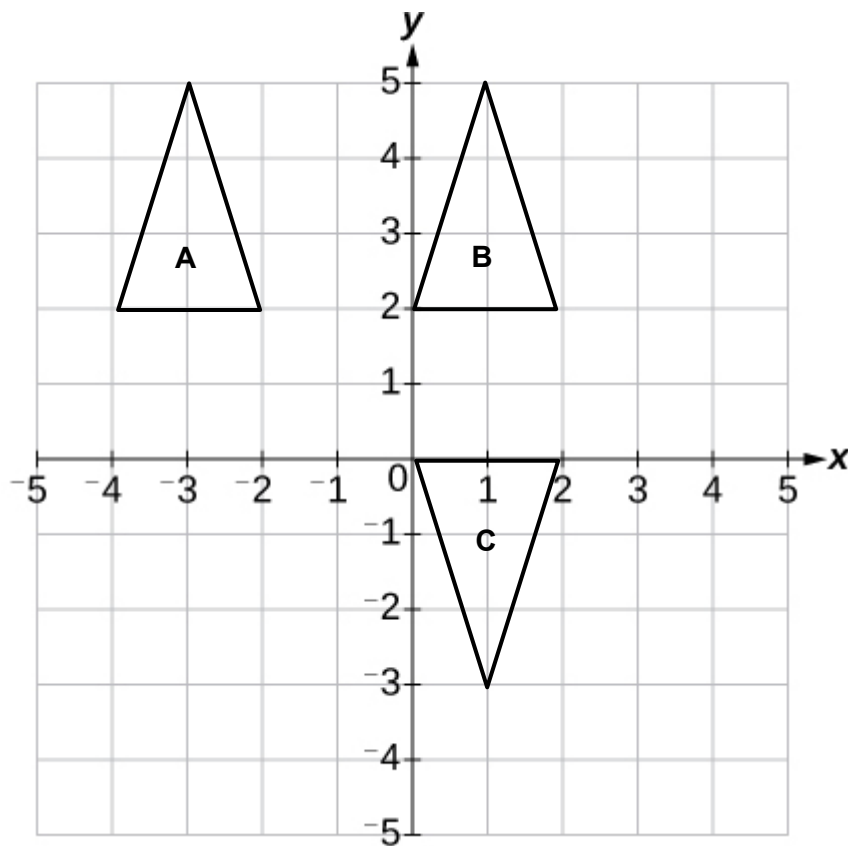
6. 25 cm

7. Centre of enlargement (2, -4)

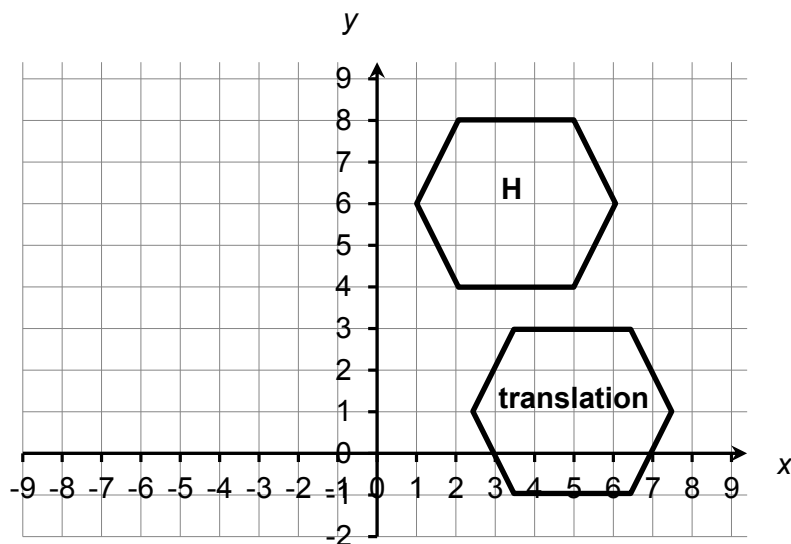
8. Scale factor $\frac{1}{2}$ 9. $y = x$

10. A and E

11.

12. 180° rotation about $(-1, 1)$

13.



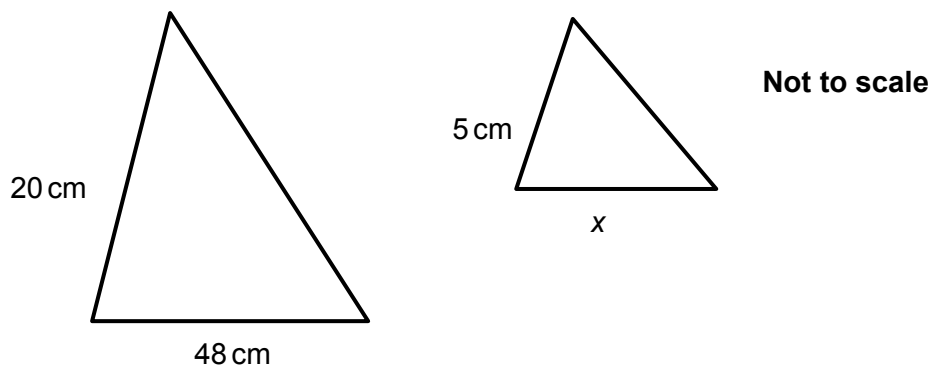
14. $AM = CM$ and $BM = DM$ as M is the midpoint of lines AC and BD .
 Angle $AMB =$ angle CMD using opposite angles.
 Triangles ABM and CMD are congruent (SAS).

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. $30 \text{ cm} \div 0.25 = 120 \text{ cm}$
 $1 \text{ m} = 100 \text{ cm}$
 $120 \text{ cm} + 100 \text{ cm} = 220 \text{ cm}$

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

18. Separate the triangles to see them more clearly.



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

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

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

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| 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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| AO3 | 18 | Find a missing side length using similar triangles | | | |
| AO3 | 19 | Calculate an area using similar shapes | | | |
| AO3 | 20 | Translate with column vectors | | | |