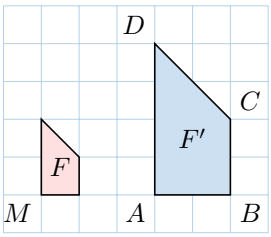
SIMILARITY

A DEFINITIONS

A.1 FINDING ELEMENTS

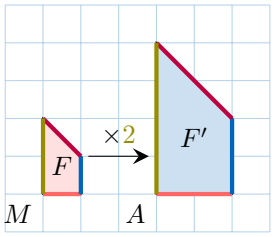
MCQ 1: The figure F' is an enlargement of the figure F.



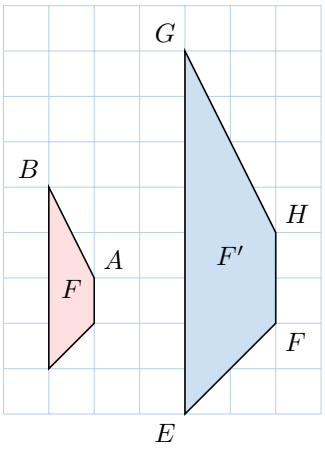
Find the vertex that is the image of vertex M.

- ☒ A
- ☐ B
- ☐ C
- ☐ D

Answer: The vertex $M(1,1)$ in figure F corresponds to vertex $A(4,1)$ in figure F', as the enlargement with scale factor 2 maps M to A. The correct answer is A.



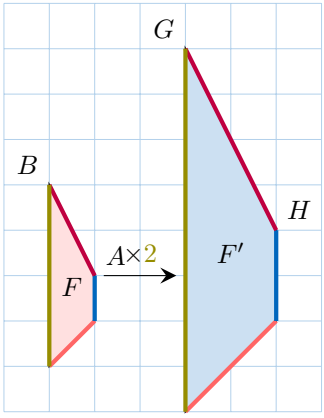
MCQ 2: The figure F' is an enlargement of the figure F.



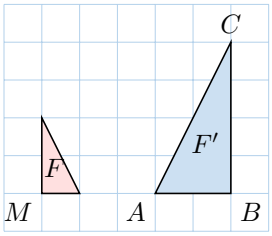
Find the segment that is the image of segment $\overline{AB}$.

- ☐ $\overline{EF}$
- ☐ $\overline{FG}$
- ☒ $\overline{GH}$
- ☐ $\overline{HE}$

Answer: The segment $\overline{AB}$ in figure F, connecting $A(2,2)$ to $B(1,4)$, corresponds to segment $\overline{GH}$ in figure F', connecting $G(4,7)$ to $H(6,3)$, as the enlargement with scale factor 2 maps $A \to H$ and $B \to G$. The correct answer is $\overline{GH}$.



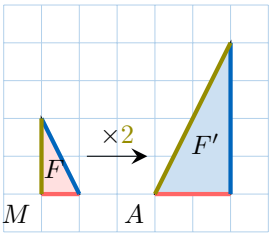
MCQ 3: The figure F' is an enlargement of the figure F.



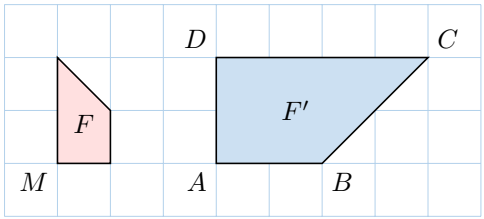
Find the vertex that is the image of vertex M.

- ☒ A
- ☐ B
- ☐ C

Answer: The vertex $M(1,1)$ in figure F corresponds to vertex $A(4,1)$ in figure F', as the enlargement with scale factor 2 maps M to A. The correct answer is A.



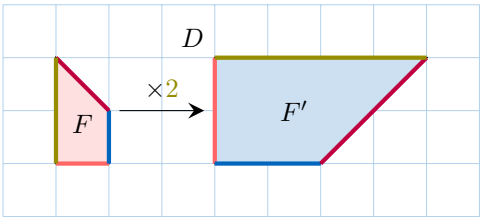
MCQ 4: The figure F' is an enlargement of the figure F.



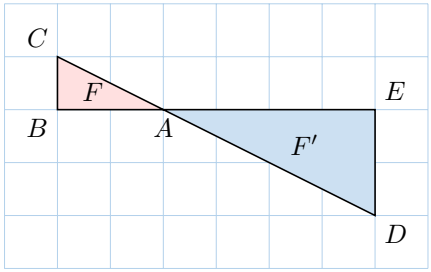
Find the vertex that is the image of vertex M.

- ☐ A
- ☐ B
- ☐ C
- ☒ D

Answer: The vertex $M(1,1)$ in figure F corresponds to vertex $D(4,3)$ in figure F', as the enlargement with scale factor 2 maps M to D. The correct answer is D.



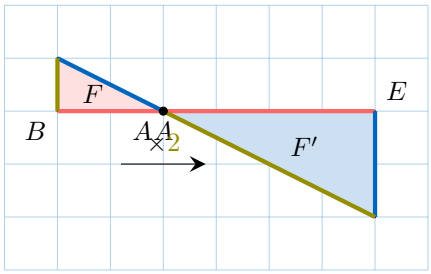
MCQ 5: The figure F' is an enlargement of the figure F.



Find the segment that is the image of segment $\overline{AB}$.

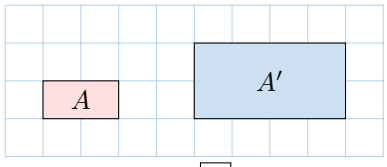
- ☒ $\overline{AE}$
- ☐ $\overline{AD}$
- ☐ $\overline{DE}$

Answer: The segment $\overline{AB}$ in figure F, connecting $A(3,1)$ to $B(1,1)$, corresponds to segment $\overline{AE}$ in figure F', connecting $A(3,1)$ to $E(7,1)$, as the enlargement with scale factor 2 maps $A \to E$ and $B \to A$. The correct answer is $\overline{AE}$.



A.2 FINDING THE SCALE FACTOR

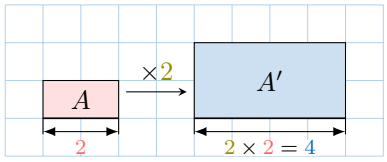
Ex 6: Find the scale factor for this enlargement.



$k =$ 2

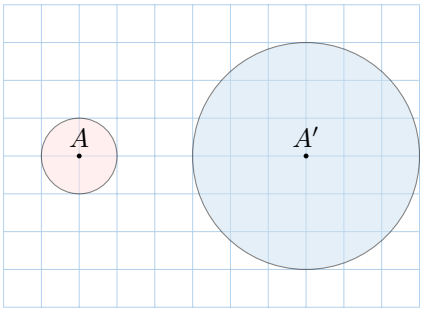
Answer: The scale factor is determined by comparing the side lengths of rectangles A and A'. Rectangle A has a width of 2 units, and A' has a width of 4 units. The ratio is:

$$k = \frac{\text{width of } A'}{\text{width of } A} = \frac{4}{2} = 2$$



$k = 2$

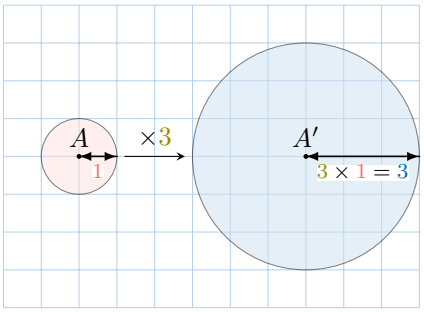
Ex 7: Find the scale factor for this enlargement.



$k =$ 3

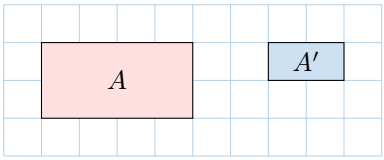
Answer: The scale factor is determined by comparing the radii of circles A and A'. Circle A has a radius of 1 unit, and A' has a radius of 3 units. The ratio is:

$$k = \frac{\text{radius of } A'}{\text{radius of } A} = \frac{3}{1} = 3$$



$k = 3$

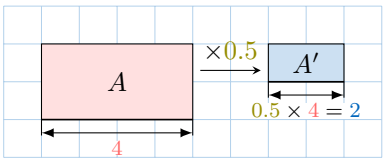
Ex 8: Find the scale factor for this reduction.



$k =$ 0.5

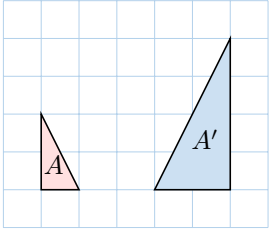
Answer: The scale factor is determined by comparing the side lengths of rectangles A and A'. Rectangle A has a width of 4 units, and A' has a width of 2 units. The ratio is:

$$k = \frac{\text{width of } A'}{\text{width of } A} = \frac{2}{4} = 0.5$$



$k = 0.5$

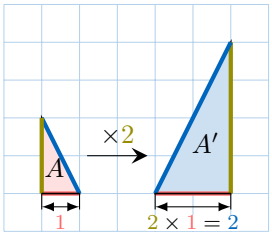
Ex 9: Find the scale factor for this enlargement.



$k =$ 2

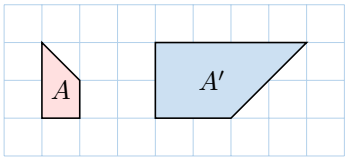
Answer: The scale factor is determined by comparing the side lengths of triangles A and A'. The base of triangle A (from $(1,1)$ to $(2,1)$) is 1 unit, and the base of A' (from $(4,1)$ to $(6,1)$) is 2 units. The ratio is:

$$k = \frac{\text{base of } A'}{\text{base of } A} = \frac{2}{1} = 2$$



$k = 2$

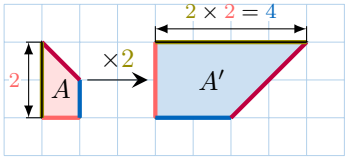
Ex 10: Find the scale factor for this enlargement.



$k = \boxed{2}$

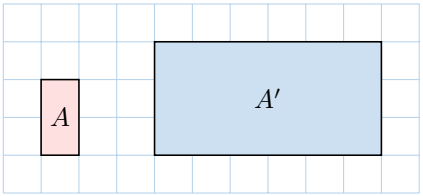
Answer: The scale factor is determined by comparing the side lengths of quadrilaterals A and A'. The side from $(1,1)$ to $(1,3)$ in A is 2 units, and the corresponding side from $(4,3)$ to $(8,3)$ in A' is 4 units. The ratio is:

$$k = \frac{\text{length in } A'}{\text{length in } A} = \frac{4}{2} = 2$$



$k = 2$

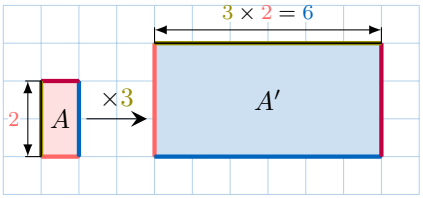
Ex 11: Find the scale factor for this enlargement.



$k = \boxed{3}$

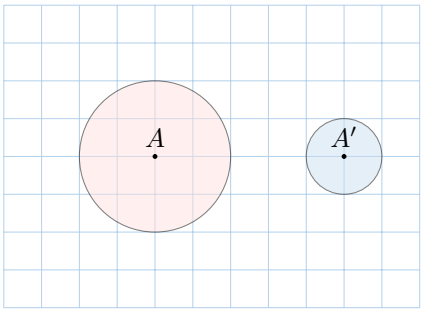
Answer: The scale factor is determined by comparing the side lengths of quadrilaterals A and A'. The side from $(1,1)$ to $(1,3)$ in A is 2 units, and the corresponding side from $(4,4)$ to $(10,4)$ in A' is 6 units. The ratio is:

$$k = \frac{\text{length in } A'}{\text{length in } A} = \frac{6}{2} = 3$$



$k = 3$

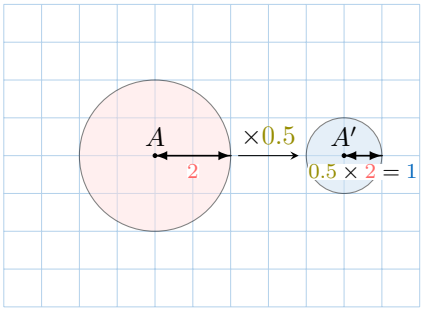
Ex 12: Find the scale factor for this reduction.



$k = \boxed{0.5}$

Answer: The scale factor is determined by comparing the radii of circles A and A'. Circle A has a radius of 2 units, and A' has a radius of 1 unit. The ratio is:

$$k = \frac{\text{radius of } A'}{\text{radius of } A} = \frac{1}{2} = 0.5$$

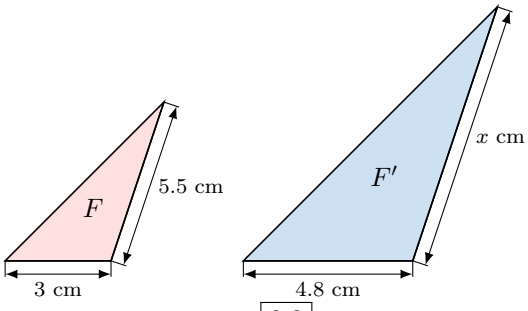


$k = 0.5$

B SIMILAR FIGURES

B.1 FINDING UNKNOWN LENGTH

Ex 13: The figures F and F' are similar. Find x.

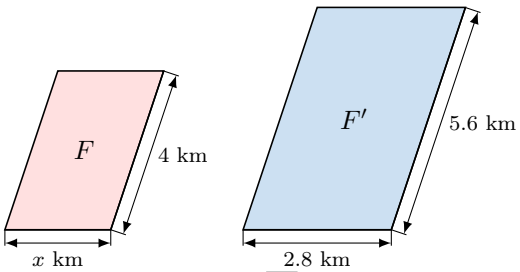


$x = \boxed{8.8}$

Answer: The ratios of the corresponding sides are equal:

$$\frac{x}{5.5} = \frac{4.8}{3}$$
$$x \times 3 = 5.5 \times 4.8 \quad \text{(cross multiplication)}$$
$$x = \frac{5.5 \times 4.8}{3}$$
$$x = \frac{26.4}{3}$$
$$x = 8.8$$

Ex 14: The figures F and F' are similar.Find x.

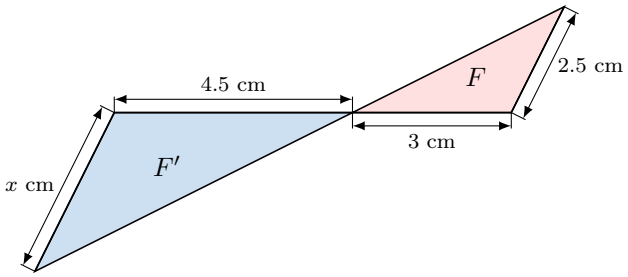


$x = \boxed{2}$

Answer: The ratios of the corresponding sides are equal:

$$\frac{2.8}{x} = \frac{5.6}{4}$$
$$x \times 5.6 = 2.8 \times 4 \quad \text{(cross multiplication)}$$
$$x = \frac{2.8 \times 4}{5.6} \quad \text{(dividing by 5.6)}$$
$$x = \frac{11.2}{5.6}$$
$$x = 2$$

Ex 15: The figures F and F' are similar.Find x.

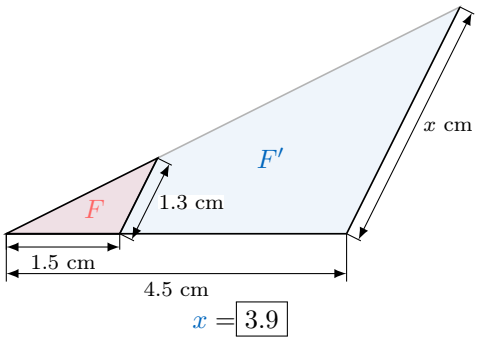


$x = \boxed{3.75}$

Answer: The ratios of the corresponding sides are equal:

$$\frac{x}{2.5} = \frac{4.5}{3}$$
$$x \times 3 = 2.5 \times 4.5 \quad \text{(cross multiplication)}$$
$$x = \frac{2.5 \times 4.5}{3}$$
$$x = \frac{11.25}{3}$$
$$x = 3.75$$

Ex 16: The figures F and F' are similar.Find x.

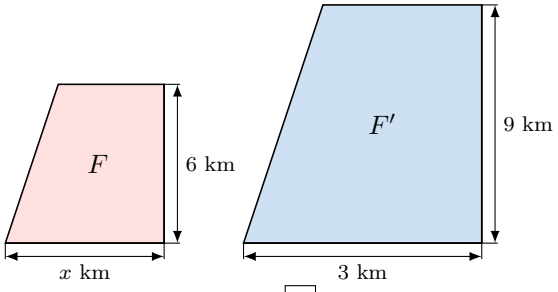


$x = \boxed{3.9}$

Answer: The ratios of the corresponding sides are equal:

$$\frac{x}{1.3} = \frac{4.5}{1.5}$$
$$x \times 1.5 = 1.3 \times 4.5 \quad \text{(cross multiplication)}$$
$$x = \frac{1.3 \times 4.5}{1.5}$$
$$x = \frac{5.85}{1.5}$$
$$x = 3.9$$

Ex 17: The figures F and F' are similar.Find x.



$x = \boxed{2}$

Answer: The ratios of the corresponding sides are equal:

$$\frac{3}{x} = \frac{9}{6}$$
$$x \times 9 = 3 \times 6 \quad \text{(cross multiplication)}$$
$$x = \frac{3 \times 6}{9} \quad \text{(dividing by 9)}$$
$$x = \frac{18}{9}$$
$$x = 2$$

B.2 DETERMINING SHAPE SIMILARITY

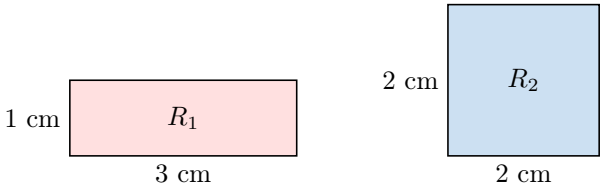
MCQ 18: Are all rectangles similar?

☐ True

☒ False

Answer: Not all rectangles are similar. For rectangles to be similar, the ratios of their corresponding side lengths must be equal. Consider the following rectangles:

- Rectangle R_1 with side lengths 3 cm and 1 cm.
- Rectangle R_2 with side lengths 2 cm and 2 cm.



The ratios of the corresponding sides are not equal:

$$\frac{\text{long side of } R_2}{\text{long side of } R_1} = \frac{2}{3}, \quad \frac{\text{short side of } R_2}{\text{short side of } R_1} = \frac{2}{1}$$

Since $\frac{2}{3} \neq \frac{2}{1}$, the rectangles are not similar. Therefore, the correct answer is False.

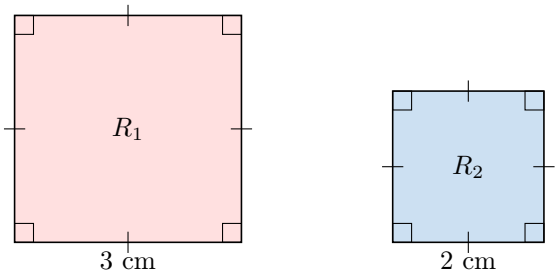
MCQ 19: Are all squares similar?

☒ True

☐ False

Answer: All squares are similar because they have four right angles and four equal sides, with the ratio of corresponding side lengths being constant between any two squares. For example:

- Square R_1 with side length 3 cm.
- Square R_2 with side length 2 cm.



The ratio of the side lengths is:

$$\frac{\text{side of } R_2}{\text{side of } R_1} = \frac{2}{3}$$

Since all sides of a square are equal, the ratios of corresponding sides are always equal, and the angles are all 90°, making all squares similar. Therefore, the correct answer is True.

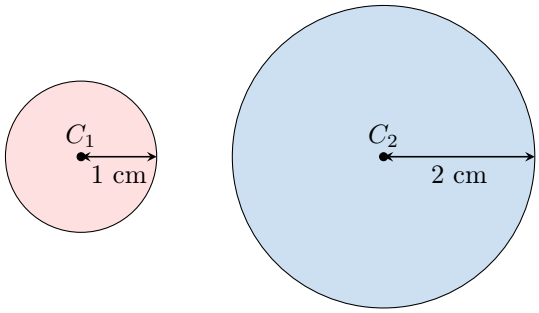
MCQ 20: Are all circles similar?

☒ True

☐ False

Answer: All circles are similar because they have the same shape, defined by a constant radius, and can be scaled by a factor to match any other circle. For example:

- Circle C_1 with radius 1 cm.
- Circle C_2 with radius 2 cm.



The ratio of the radii is:

$$\frac{\text{radius of } C_2}{\text{radius of } C_1} = \frac{2}{1} = 2$$

Therefore, the correct answer is True.

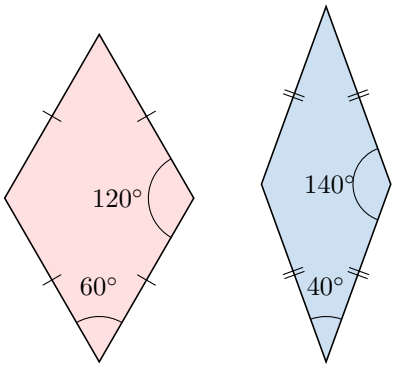
MCQ 21: Are all rhombuses similar?

☐ True

☒ False

Answer: Not all rhombuses are similar. For rhombuses to be similar, their corresponding angles must be equal, in addition to having equal side lengths within each rhombus. Consider the following rhombuses:

- Rhombus R_1 with angles 60° and 120°.
- Rhombus R_2 with angles 40° and 140°.



These rhombuses are not similar because their corresponding angles are not equal ($60° \neq 40°$, $120° \neq 140°$). Therefore, the correct answer is False.