Similar shapes – Solutions

Identify similar and congruent shapes, and use scale factors to find missing dimensions.

Name _____ **Date** _____

How to solve these problems

Decide whether shapes are similar by checking if corresponding angles are equal and sides are in proportion. When shapes are similar, use the scale factor (ratio of corresponding sides) to find missing dimensions. Show your reasoning clearly.

Worked example Triangle A has sides 3, 4, 5. Triangle B has sides 6, 8, 10. Are they similar?

Check each ratio: $\frac{6}{3} = 2$, $\frac{8}{4} = 2$, $\frac{10}{5} = 2$.
All ratios equal 2, so the shapes are similar with scale factor 2.

1. Rectangle A is 2 cm $\times$ 5 cm. Rectangle B is 4 cm $\times$ 10 cm. Are they similar?

Solution: Yes. Ratios: $\frac{4}{2} = 2$ and $\frac{10}{5} = 2$.

2. A side grows from 4 cm to 8 cm. Find the scale factor.

Solution: Scale factor: $\frac{8}{4} = 2$

3. A side shrinks from 12 cm to 6 cm. Find the scale factor.

Solution: Scale factor: $\frac{6}{12} = \frac{1}{2}$

4. A triangle is enlarged by scale factor 2. A side was 5 cm. Find the new side length.

Solution: New side: $5 \times 2 = 10$ cm

5. A shape is enlarged by scale factor $\frac{1}{2}$. A side was 10 cm. Find the new side length.

Solution: New side: $10 \times \frac{1}{2} = 5$ cm

6. A small square has side 3 cm. A similar larger square has side 9 cm. Find the scale factor.

Solution: Scale factor: $\frac{9}{3} = 3$

7. Triangle A has sides 2, 3, 4. Triangle B has sides 4, 6, 8. Are they similar?

Solution: Yes. Ratios: $\frac{4}{2} = \frac{6}{3} = \frac{8}{4} = 2$.

8. Triangle A has sides 4, 5, 6. Triangle B has sides 8, 10, 14. Are they similar?

Solution: No. $\frac{8}{4} = 2$, $\frac{10}{5} = 2$, but $\frac{14}{6} \neq 2$.

9. A similar shape has scale factor 4. The original side is 2.5 cm. Find the new side.

Solution: New side: $2.5 \times 4 = 10$ cm

10. A similar shape has scale factor $\frac{1}{3}$. The original side is 18 cm. Find the new side.

Solution: New side: $18 \times \frac{1}{3} = 6$ cm

11. A rectangle 3 by 7 is enlarged by factor 2. Write the new dimensions.

Solution: New dimensions: 6 by 14

12. A triangle side goes from 9 cm to 27 cm. Find the scale factor.

Solution: Scale factor: $\frac{27}{9} = 3$

Similar shapes – Solutions (continued)

Identify similar and congruent shapes, and use scale factors to find missing dimensions.

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13. A side goes from 20 cm to 4 cm. Find the scale factor.

Solution: Scale factor: $\frac{4}{20} = \frac{1}{5} = 0.2$

14. Two polygons have matching side lengths 5 and 15. What is the enlargement factor?

Solution: Enlargement factor: $\frac{15}{5} = 3$

15. A larger similar triangle has side 24 cm. The scale factor from small to large is 3. Find the small side.

Solution: Small side: $\frac{24}{3} = 8$ cm

16. A larger similar rectangle has side 14 cm. The scale factor from small to large is 2. Find the small side.

Solution: Small side: $\frac{14}{2} = 7$ cm

17. A smaller similar shape has side 6 cm. The scale factor from large to small is $\frac{1}{2}$. Find the large side.

Solution: Large side: $\frac{6}{\frac{1}{2}} = 12$ cm

18. Triangles with sides 3, 5, 7 and 6, 10, 14: similar or not?

Solution: Yes. All ratios: $\frac{6}{3} = \frac{10}{5} = \frac{14}{7} = 2$.

19. Rectangles 4×9 and 8×18: similar or not?

Solution: Yes. $\frac{8}{4} = 2$ and $\frac{18}{9} = 2$.

20. Do similar shapes always have equal angles? Explain briefly.

Solution: Yes. Similar shapes have equal corresponding angles by definition.

21. Rectangle A is 3 cm $\times$ 5 cm. Rectangle B is 6 cm $\times$ 8 cm. Are they similar?

Solution: No. $\frac{6}{3} = 2$ but $\frac{8}{5} \neq 2$.

22. A side grows from 7 cm to 21 cm. Find the scale factor.

Solution: Scale factor: $\frac{21}{7} = 3$

23. A rectangle is enlarged by scale factor 3. A side was 4 cm. Find the new side length.

Solution: New side: $4 \times 3 = 12$ cm

24. A small triangle has side 8 cm. A similar larger triangle has side 12 cm. Find the scale factor.

Solution: Scale factor: $\frac{12}{8} = \frac{3}{2} = 1.5$

25. Scale factor 2 is applied to a shape. Is the area also scaled by 2? Explain.

Solution: No. Area scales by $2^2 = 4$. (Linear scale factor squared)

26. If two shapes are congruent, what is the scale factor between them?

Solution: Scale factor is 1. (Congruent means identical in size and shape)

27. A shape is reduced by scale factor $\frac{1}{4}$. A side was 20 cm. Find the new side.

Solution: New side: $20 \times \frac{1}{4} = 5$ cm