Similar Shapes and Congruence

GCSE Mathematics • **Higher Tier** • Grades 6–7 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 51 / 51

Show all your working. Marks are given for correct method as well as the final answer.

1. Two similar shapes have corresponding sides 4 cm and 12 cm. Write down the scale factor. **[1 mark]**

$12 \div 4 = 3$

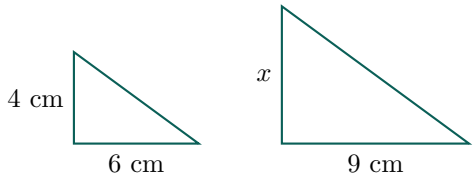
Answer: 3

2. Two similar rectangles have corresponding sides 5 cm and 8 cm. Write down the scale factor. **[2 marks]**

$8 \div 5 = 1.6$

Answer: 1.6

3. Work out x in the similar triangles. **[3 marks]**



scale factor $= 9 \div 6 = 1.5$
$x = 4 \times 1.5 = 6$

Answer: 6 **cm**

4. Shape B is similar to shape A with scale factor 4. A side of 7 cm on A becomes what on B? **[2 marks]**

$7 \times 4 = 28$

Answer: 28 **cm**

5. Shape B is similar to A with scale factor 2.5. A side of 20 cm on B came from what side on A? **[2 marks]**

$20 \div 2.5 = 8$
going backwards means dividing

Answer: 8 **cm**

6. Explain why all circles are similar. **[2 marks]**

every circle is an enlargement of any other

Answer: same shape, one scale factor

7. Two similar shapes have scale factor 3. Write down the area scale factor. **[2 marks]**

$3^2 = 9$
area uses k^2

Answer: 9

8. Shape A has area 12 cm^2. Shape B is similar with scale factor 2. Work out the area of B. **[3 marks]**

area SF = $2^2 = 4$
$12 \times 4 = 48$

Answer: 48 cm^2

9. Shape A has area 20 cm^2 and shape B, similar to A, has area 180 cm^2. Work out the length scale factor. **[3 marks]**

area SF = $180 \div 20 = 9$
length SF = $\sqrt{9} = 3$

Answer: 3

10. Two similar triangles have sides in the ratio 2 : 5. Write down the ratio of their areas. **[2 marks]**

square both parts

Answer: 4 : 25

11. Two similar solids have scale factor 2. Write down the volume scale factor. **[2 marks]**

$2^3 = 8$
volume uses k^3

Answer: 8

12. Solid A has volume 50 cm^3. Solid B is similar with scale factor 3. Work out the volume of B. **[3 marks]**

volume SF = 27
$50 \times 27 = 1350$

Answer: 1350 cm^3

13. Two similar solids have volumes 8 cm^3 and 125 cm^3. Work out the length scale factor. **[3 marks]**

volume SF = $125 \div 8 = 15.625$
length SF = $\sqrt[3]{15.625} = 2.5$

Answer: 2.5

14. Two similar cylinders have radii 3 cm and 6 cm. The smaller has volume 90 cm^3. Work out the volume of the larger. **[4 marks]**

length SF = 2
volume SF = 8
$90 \times 8 = 720$

Answer: 720 cm^3

15. Two similar cones have surface areas 16π and 144π cm^2. Work out the length scale factor. **[3 marks]**

area SF = $144 \div 16 = 9$
length SF = 3

Answer: 3

16. Write down the four conditions for two triangles to be congruent. **[4 marks]**

SSS: three sides
SAS: two sides and the angle between
ASA: two angles and a side
RHS: right angle, hypotenuse, side

Answer: SSS, SAS, ASA, RHS

17. Explain the difference between congruent and similar shapes. **[2 marks]**

congruent is scale factor 1

Answer: congruent = identical; similar = same shape, different size

18. Two triangles have sides $5, 6, 7$ and $5, 6, 7$. Which congruence condition applies? **[1 mark]**

all three sides match

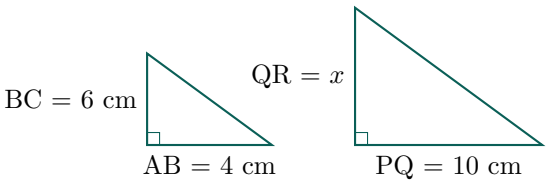
Answer: SSS

19. Two right-angled triangles have hypotenuse 13 cm and one side 5 cm each. Which condition applies? **[2 marks]**

right angle, hypotenuse, side

Answer: RHS

20. In triangles ABC and PQR, angle A = angle P and angle B = angle Q. $AB = 4$ cm and $PQ = 10$ cm.



(a) Explain why the triangles are similar. **[2 marks]**

two angles equal means the third is too

equal angles → similar

(b) $BC = 6$ cm. Work out QR. **[3 marks]**

scale factor = $10 \div 4 = 2.5$

$QR = 6 \times 2.5 = 15$ cm

Answer: equal angles ; QR = 15 cm

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