Year 10 · Geometry: Similar & Congruent Shapes

Name: _____ Date: _____

Hi! This sheet is all about similar and congruent shapes. You'll use matching angles and proportional sides to hunt down missing lengths and angles. Take your time and show your working.

Warm-up

1. Two shapes are congruent. What can you say about their corresponding sides and angles?

2. Two shapes are similar. What can you say about their corresponding angles?

3. A triangle is enlarged by a scale factor of 3. If one side was 4 cm, how long is the matching side on the enlarged triangle?

4. Two rectangles are similar. The small one is 2 cm by 5 cm. The large one has a shortest side of 6 cm. What is the scale factor?

Practice

5. Triangle ABC is similar to triangle DEF. AB = 6 cm corresponds to DE = 9 cm. If BC = 8 cm, find the length of EF.

6. In two similar triangles, one has angles 40° and 75°. What are all three angles in the other triangle?

7. A photo 10 cm wide and 15 cm tall is enlarged so its width becomes 25 cm. If it stays similar (same shape), how tall will the enlarged photo be?

8. Aroha stands next to a flagpole at Avondale College. She is 1.6 m tall and casts a shadow 2 m long. At the same time the flagpole casts a shadow 10 m long. Using similar triangles, how tall is the flagpole?

9. Two right-angled triangles are similar. The smaller has legs 3 cm and 4 cm with hypotenuse 5 cm. The larger triangle's hypotenuse is 15 cm. Find its two legs.

10. A model of the Sky Tower is built to a scale of 1 : 400. The real Sky Tower is 328 m tall. How tall is the model, in metres and then in centimetres?

Challenge

11. In the diagram, a small triangle sits inside a larger triangle sharing the same top vertex, with the bases parallel. The small triangle has height 4 cm and base 6 cm. The large triangle has total height 10 cm (measured from the same

vertex). The two triangles are similar. Find the base of the large triangle.

12. Two similar rectangles have a length scale factor of 4. The smaller rectangle has an area of 12 cm². (a) What is the area scale factor? (b) What is the area of the larger rectangle?

Answer key (for parents and tutors)

1. Two shapes are congruent. What can you say about their corresponding sides and angles?
   Congruent shapes are identical in shape and size, so all corresponding sides are equal in length AND all corresponding angles are equal.

2. Two shapes are similar. What can you say about their corresponding angles?
   In similar shapes, all corresponding angles are equal. (The corresponding sides are proportional, the same scale factor, but not necessarily equal.)

3. A triangle is enlarged by a scale factor of 3. If one side was 4 cm, how long is the matching side on the enlarged triangle?
   Multiply by the scale factor: 4 cm × 3 = 12 cm.

4. Two rectangles are similar. The small one is 2 cm by 5 cm. The large one has a shortest side of 6 cm. What is the scale factor?
   Scale factor = new length ÷ old length = 6 ÷ 2 = 3. So the scale factor is 3.

5. Triangle ABC is similar to triangle DEF. AB = 6 cm corresponds to DE = 9 cm. If BC = 8 cm, find the length of EF.
   Scale factor = DE ÷ AB = 9 ÷ 6 = 1.5. So EF = BC × 1.5 = 8 × 1.5 = 12 cm.

6. In two similar triangles, one has angles 40° and 75°. What are all three angles in the other triangle?
   The third angle in the first triangle is 180° − 40° − 75° = 65°. Since the triangles are similar, corresponding angles are equal, so the other triangle also has angles of 40°, 75° and 65°.

7. A photo 10 cm wide and 15 cm tall is enlarged so its width becomes 25 cm. If it stays similar (same shape), how tall will the enlarged photo be?
   Scale factor = 25 ÷ 10 = 2.5. New height = 15 × 2.5 = 37.5 cm.

8. Aroha stands next to a flagpole at Avondale College. She is 1.6 m tall and casts a shadow 2 m long. At the same time the flagpole casts a shadow 10 m long. Using similar triangles, how tall is the flagpole?
   The triangles (person + shadow, and pole + shadow) are similar because the sun's rays make equal angles. Scale factor = 10 ÷ 2 = 5. Flagpole height = 1.6 × 5 = 8 m.

9. Two right-angled triangles are similar. The smaller has legs 3 cm and 4 cm with hypotenuse 5 cm. The larger triangle's hypotenuse is 15 cm. Find its two legs.
   Scale factor = 15 ÷ 5 = 3. The legs are 3 × 3 = 9 cm and 4 × 3 = 12 cm.

10. A model of the Sky Tower is built to a scale of 1 : 400. The real Sky Tower is 328 m tall. How tall is the model, in metres and then in centimetres?
    Model height = 328 ÷ 400 = 0.82 m. In centimetres: 0.82 × 100 = 82 cm.

11. In the diagram, a small triangle sits inside a larger triangle sharing the same top vertex, with the bases parallel. The small triangle has height 4 cm and base 6 cm. The large triangle has total height 10 cm (measured from the same vertex). The two triangles are similar. Find the base of the large triangle.
    Because the bases are parallel, the two triangles are similar (equal corresponding angles). Scale factor = large height ÷ small height = 10 ÷ 4 = 2.5. Large base = 6 × 2.5 = 15 cm.

12. Two similar rectangles have a length scale factor of 4. The smaller rectangle has an area of 12 cm². (a) What is the area scale factor? (b) What is the area of the larger rectangle?
    (a) Area scale factor = (length scale factor)² = 4² = 16. (b) Larger area = 12 × 16 = 192 cm². Key idea: when lengths scale by k, areas scale by k², a stepping stone into Year 11 work on area and volume of similar shapes.