Similar Triangles Worksheet

Proving similarity and finding the scale factor

Name _____ **Date** _____ **Score** _____ / 30

WHEN ARE TWO TRIANGLES SIMILAR?

Similar means *same shape, any size*: corresponding angles are equal and corresponding sides are in the same ratio.

AA two pairs of angles equal • **SSS** all three side ratios equal • **SAS** two side ratios equal with equal angles between them

The **scale factor** k is the ratio of corresponding sides. Perimeters scale by k, and **areas scale by** k^2.

Write the similarity statement with the vertices in corresponding order — $\triangle ABC \sim \triangle DEF$ means A matches D, B matches E, C matches F.

SECTION A Are they similar, and why?

Write AA, SSS or SAS — or *not similar*, with a reason.

1. In $\triangle ABC$ and $\triangle DEF$, $\angle A = 55°$, $\angle B = 70°$, $\angle D = 55°$ and $\angle E = 70°$.

Answer _____

2. $\triangle ABC$ has sides 6, 9, 12 and $\triangle DEF$ has sides 4, 6, 8.

Answer _____

3. $\triangle ABC$ has $AB = 8$, $AC = 10$ and $\angle A = 42°$. $\triangle DEF$ has $DE = 12$, $DF = 15$ and $\angle D = 42°$.

Answer _____

4. Both triangles are right-angled, and each has an acute angle of 37°.

Answer _____

5. $\triangle ABC$ has sides 5, 7, 9 and $\triangle DEF$ has sides 10, 14, 20.

Answer _____

6. $\triangle ABC$ has $AB = 6$, $BC = 8$ and $\angle A = 50°$. $\triangle DEF$ has $DE = 9$, $EF = 12$ and $\angle D = 50°$.

Answer _____

SECTION B Scale factor

Divide a side of the second triangle by the corresponding side of the first. Give the answer as a fraction in lowest terms.

7 A side of 6 in the first triangle corresponds to 9 in the second. Find the scale factor from first to second.

Answer _____

8 A side of 4 in the first triangle corresponds to 10 in the second. Find the scale factor from first to second.

Answer _____

9 A side of 15 in the first triangle corresponds to 12 in the second. Find the scale factor from first to second.

Answer _____

10 A side of 7 in the first triangle corresponds to 21 in the second. Find the scale factor from first to second.

Answer _____

11 A side of 8 in the first triangle corresponds to 20 in the second. Find the scale factor from first to second.

Answer _____

12 A side of 18 in the first triangle corresponds to 12 in the second. Find the scale factor from first to second.

Answer _____

Similar Triangles Worksheet

Missing sides by proportion · keep answers exact

SECTION C Find the missing side

Set up a proportion between corresponding sides and solve. Keep answers exact.

13 $\triangle ABC \sim \triangle DEF$ with $AB = 4$, $BC = 6$ and $DE = 10$. Find EF.

Answer _____

14 $\triangle ABC \sim \triangle DEF$ with $AB = 5$, $BC = 8$ and $DE = 15$. Find EF.

Answer _____

15 $\triangle ABC \sim \triangle DEF$ with $AB = 9$, $BC = 12$ and $DE = 6$. Find EF.

Answer _____

16 $\triangle ABC \sim \triangle DEF$ with $AB = 7$, $BC = 10$ and $DE = 21$. Find EF.

Answer _____

17 $\triangle ABC \sim \triangle DEF$ with $AB = 12$, $BC = 18$ and $DE = 8$. Find EF.

Answer _____

18 $\triangle ABC \sim \triangle DEF$ with $AB = 6$, $BC = 15$ and $DE = 14$. Find EF.

Answer _____

19 $\triangle ABC \sim \triangle DEF$ with $AB = 3$, $BC = 7$ and $DE = 12$. Find EF.

Answer _____

20 $\triangle ABC \sim \triangle DEF$ with $AB = 10$, $BC = 25$ and $DE = 4$. Find EF.

Answer _____

Similar Triangles Worksheet

Perimeter and area ratios, and applied problems

SECTION D Perimeter and area ratios

Lengths scale by k; areas scale by k^2. State both ratios.

21 Two similar triangles have a scale factor of 2 : 3. Find the ratio of their perimeters and the ratio of their areas.

Answer _____

22 Two similar triangles have a scale factor of 3 : 5. Find the ratio of their perimeters and the ratio of their areas.

Answer _____

23 Two similar triangles have a scale factor of 1 : 4. Find the ratio of their perimeters and the ratio of their areas.

Answer _____

24 Two similar triangles have a scale factor of 5 : 2. Find the ratio of their perimeters and the ratio of their areas.

Answer _____

SECTION E Apply it

Sketch the two triangles, label the corresponding sides, then write the proportion.

25 A 1.8 m tall person casts a shadow 2.4 m long. At the same moment a tree casts a shadow 14 m long. How tall is the tree?

Answer _____

26 A 6 ft pole casts a 4 ft shadow while a building casts a 38 ft shadow. How tall is the building?

Answer _____

27 A model of a bridge is built to scale. A support that is 3 cm on the model is 7.5 m on the bridge. If another part is 8 cm on the model, how long is it on the bridge?

Answer

28 Standing 12 m from a flagpole, a person whose eye is 1.5 m above the ground sights the top. A 1 m stick held 2 m from the eye just lines up with the top. Using similar triangles, how far above eye level is the top of the pole?

Answer

Similar Triangles Worksheet

Reasoning · answer in your own words

SECTION F Explain your reasoning

A short paragraph each.

29 Two triangles are congruent. Are they also similar? Is the reverse true? Explain.

Answer _____

30 Why does doubling every side of a triangle multiply its area by four, not two?

Answer _____

THE MISTAKE TO AVOID

Applying the scale factor to area. If lengths are in the ratio 2 : 3, areas are in the ratio 4 : 9, not 2 : 3. The other common slip is pairing the wrong sides — always read the similarity statement and match vertex to vertex before writing the proportion.

Answer Key

Every ratio and missing length recomputed at build time.

SECTION A

1. Two pairs of angles match, so the third pair must too (180° sum). **AA similarity**.
2. $\frac{6}{4} = \frac{9}{6} = \frac{12}{8} = \frac{3}{2}$ — all three ratios equal. **SSS similarity**.
3. $\frac{8}{12} = \frac{10}{15} = \frac{2}{3}$ and the equal angles sit between those sides. **SAS similarity**.
4. The right angles match and the 37° angles match. **AA similarity**.
5. $\frac{10}{5} = 2$ and $\frac{14}{7} = 2$, but $\frac{20}{9} \neq 2$. **Not similar** — all three ratios must match.
6. $\frac{6}{9} = \frac{8}{12} = \frac{2}{3}$, and $\angle A$ and $\angle D$ correspond. **SAS similarity**.

SECTION B

7. $\frac{9}{6} = \frac{3}{2}$
8. $\frac{10}{4} = \frac{5}{2}$
9. $\frac{12}{15} = \frac{4}{5}$
10. $\frac{21}{7} = 3$
11. $\frac{20}{8} = \frac{5}{2}$
12. $\frac{12}{18} = \frac{2}{3}$

Answer Key

Every ratio and missing length recomputed at build time.

SECTION C

13. $\frac{4}{6} = \frac{10}{EF}$, so $EF = 15$

14. $\frac{5}{8} = \frac{15}{EF}$, so $EF = 24$

15. $\frac{9}{12} = \frac{6}{EF}$, so $EF = 8$

16. $\frac{7}{10} = \frac{21}{EF}$, so $EF = 30$

17. $\frac{12}{18} = \frac{8}{EF}$, so $EF = 12$

18. $\frac{6}{15} = \frac{14}{EF}$, so $EF = 35$

19. $\frac{3}{7} = \frac{12}{EF}$, so $EF = 28$

20. $\frac{10}{25} = \frac{4}{EF}$, so $EF = 10$

SECTION D

21. Perimeters 2 : 3 (the same as the scale factor). Areas 4 : 9 (the scale factor squared).

22. Perimeters 3 : 5 (the same as the scale factor). Areas 9 : 25 (the scale factor squared).

23. Perimeters 1 : 4 (the same as the scale factor). Areas 1 : 16 (the scale factor squared).

24. Perimeters 5 : 2 (the same as the scale factor). Areas 25 : 4 (the scale factor squared).

Answer Key

Every ratio and missing length recomputed at build time.

SECTION E

25. $\frac{1.8}{2.4} = \frac{h}{14}$, so $h = 10.5$ m.

26. $\frac{6}{4} = \frac{h}{38}$, so $h = 57$ ft.

27. $\frac{3}{7.5} = \frac{8}{\ell}$, so $\ell = 20$ m.

28. $\frac{1}{2} = \frac{h}{12}$, so $h = 6$ m above eye level (about 7.5 m above the ground).

SECTION F

29. Congruent triangles are always similar, with scale factor 1 — congruence is the special case where the sizes match too. The reverse fails: similar triangles share a shape but may differ in size, like a photograph and its enlargement.

30. Area depends on two dimensions. Doubling the base doubles the area; doubling the height doubles it again, so the total factor is $2 \times 2 = 4$. In general a scale factor of k multiplies area by k^2 — and volume by k^3.