GRADE 7 ACCELERATED · UNIT 6 · LESSONS 7–8

Similar Triangles; Indirect Measurement

MA.8.GR.2.4

I can find a missing side of similar triangles with the scale factor, and use similar triangles to measure what I cannot reach.

Warm-Up

1. The triangle $(0, 0)$, $(3, 0)$, $(3, 2)$: its perimeter, to the tenth?
2. A 17-ft ladder's foot is 8 ft from a wall. How high does it reach?
3. A 10 cm side is 4 cm in a copy. What is the scale factor?
4. At 1 in : 6 ft, a 3.5-in wall on a drawing is how long?

Warm-Up

1. The triangle $(0, 0)$, $(3, 0)$, $(3, 2)$: its perimeter, to the tenth?

   8.6 units

2. A 17-ft ladder's foot is 8 ft from a wall. How high does it reach?

   15 ft

3. A 10 cm side is 4 cm in a copy. What is the scale factor?

   k = 0.4

4. At 1 in : 6 ft, a 3.5-in wall on a drawing is how long? **21 ft**

Vocabulary

similar triangles

the same shape, any size: matching angles equal, and every side multiplied by the same number

corresponding sides

sides that match — across from equal angles: shortest with shortest, longest with longest

scale factor k

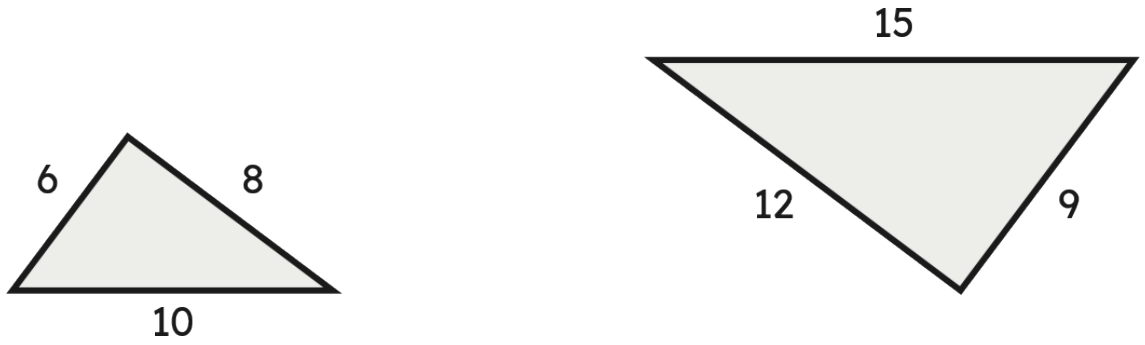
copy ÷ original, for one matching pair of sides

indirect measurement

finding a length you cannot reach from similar triangles you can measure

Notes

I. Similar: every side times the same k

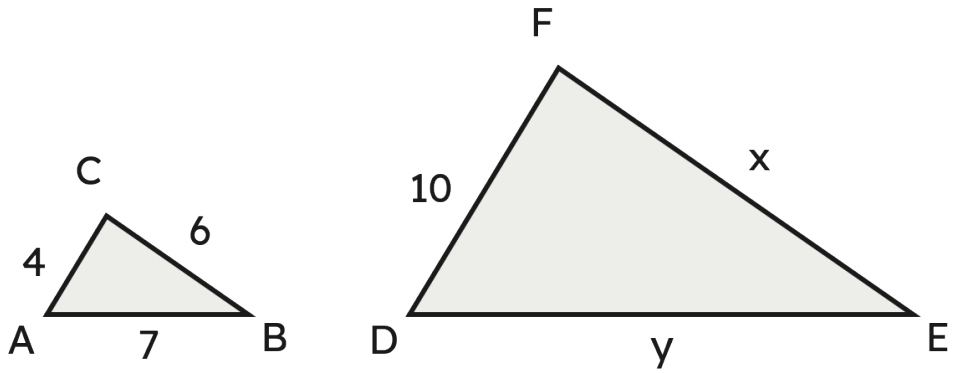


$$\frac{9}{6} = 1.5, \quad \frac{12}{8} = 1.5, \quad \frac{15}{10} = 1.5$$

Three ratios, all equal: similar. Match shortest to shortest, longest to longest.

Notes

II. A missing side: find k, then multiply



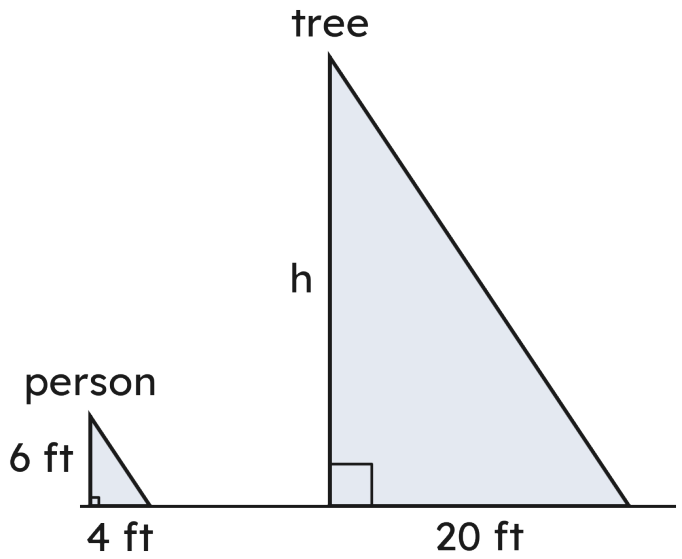
$$\triangle ABC \sim \triangle DEF, \quad k = \frac{10}{4} = 2.5$$

$$x = 6 \times 2.5 = 15, \quad y = 7 \times 2.5 = 17.5$$

The order of the letters is the matching: A with D, B with E, C with F.

Notes

III. Same sun, same angle: shadows

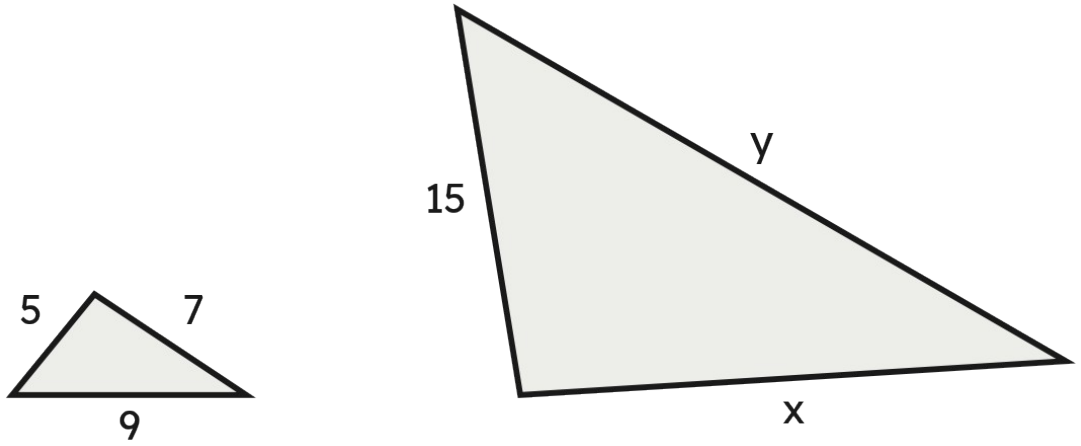


$$k = \frac{20}{4} = 5$$

$$h = 6 \times 5 = 30 \text{ ft}$$

Example 1

The two triangles are similar.



Find x and y.

Example 1

the shortest sides match: $k = \frac{15}{5} = 3$

the middle sides: $x = 7 \times 3 = 21$

the longest sides: $y = 9 \times 3 = 27$

Answer: x = 21, y = 27

Your Turn

A triangle has sides 3, 5 and 7.

A similar triangle has sides 28, x and 12. Find x.

Your Turn

A triangle has sides 3, 5 and 7.

A similar triangle has sides 28, x and 12. Find x.

$\frac{12}{3} = 4$ and $\frac{28}{7} = 4$: one k

so x matches the 5: $x = 5 \times 4 = 20$

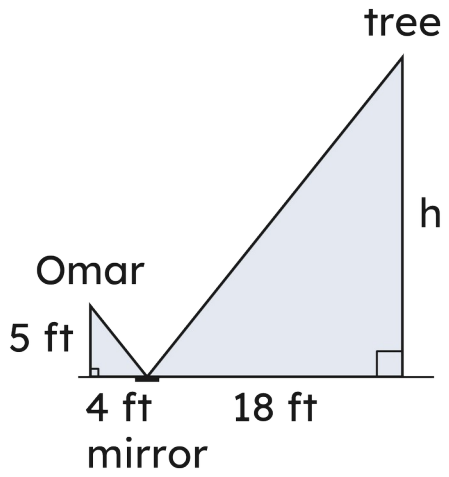
Answer: x = 20

Example 2

Omar's eyes are 5 ft up, 4 ft from a mirror on the ground.

In it he sees the top of a tree 18 ft beyond the mirror.

The two right triangles are similar.



How tall is the tree?

Example 2

$$k = \frac{18}{4} = 4.5$$

$$h = 5 \times 4.5 = 22.5$$

Answer: The tree is 22.5 ft tall.

Your Turn

Ana's eyes are 4 ft up, 1.5 ft from a mirror on the ground.

In it she sees the top of a flagpole 12 ft beyond the mirror.

The two right triangles are similar. How tall is the flagpole?

Your Turn

Ana's eyes are 4 ft up, 1.5 ft from a mirror on the ground.

In it she sees the top of a flagpole 12 ft beyond the mirror.

The two right triangles are similar. How tall is the flagpole?

$$k = \frac{12}{1.5} = 8$$

$$h = 4 \times 8 = 32$$

Answer: 32 ft

Whiteboards · Question 1 of 9

Are triangles with sides 8, 12, 14 and 12, 18, 21 similar?

Answer it.

Whiteboards · Question 1 of 9

Are triangles with sides 8, 12, 14 and 12, 18, 21 similar?

$$\frac{12}{8} = 1.5, \quad \frac{18}{12} = 1.5, \quad \frac{21}{14} = 1.5$$

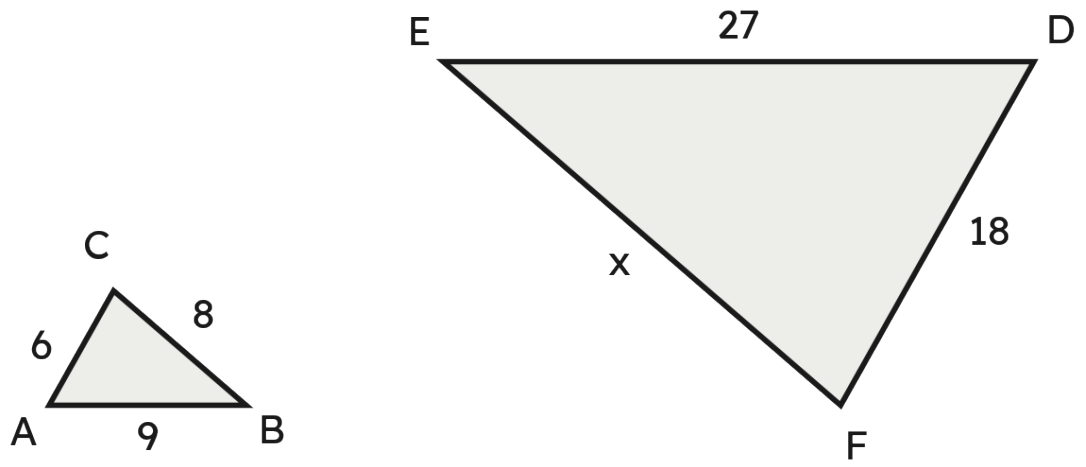
all three equal

Answer: Yes — every ratio is 1.5

Whiteboards · Question 2 of 9

Triangle ABC is similar to triangle DEF.

Find x.

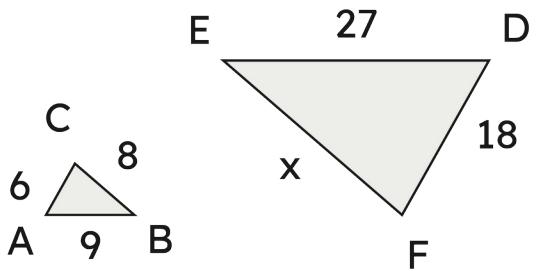


Answer it.

Whiteboards · Question 2 of 9

Triangle ABC is similar to triangle DEF.

Find x.



the names: AC with DF, BC with EF, AB with DE

$k = \frac{18}{6} = 3$

$x = 8 \times 3 = 24$

Answer: x = 24

Whiteboards · Question 3 of 9

A triangle has sides of 12, 16 and 20 inches.

A similar triangle's longest side is 5 inches.

Find its other two sides.

Answer it.

Whiteboards · Question 3 of 9

A triangle has sides of 12, 16 and 20 inches.

A similar triangle's longest side is 5 inches.

Find its other two sides.

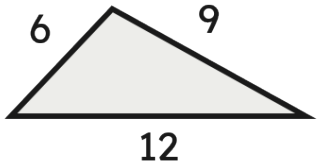
$$k = \frac{5}{20} = 0.25$$

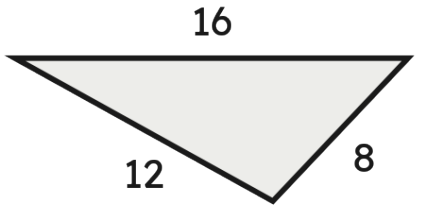
$$12 \times 0.25 = 3, \quad 16 \times 0.25 = 4$$

Answer: 3 inches and 4 inches

Whiteboards · Question 4 of 9

Similar triangles: which side of the second matches the 9?





A. 8

B. 16

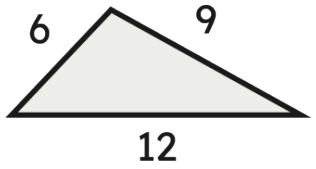
C. 12

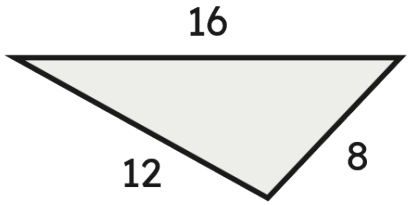
D. none of them

Answer it.

Whiteboards · Question 4 of 9

Similar triangles: which side of the second matches the 9?





sorted: 6, 9, 12 and 8, 12, 16

the middle sides match: 9 and 12

Answer: C — the 12

Whiteboards · Question 5 of 9

Which triangle is similar to one with sides 5, 6 and 8?

A. 7, 8, 10

B. 10, 12, 16

C. 10, 12, 15

D. 5, 6, 9

Answer it.

Whiteboards · Question 5 of 9

Which triangle is similar to one with sides 5, 6 and 8?

$$\frac{10}{5} = 2, \quad \frac{12}{6} = 2, \quad \frac{16}{8} = 2$$

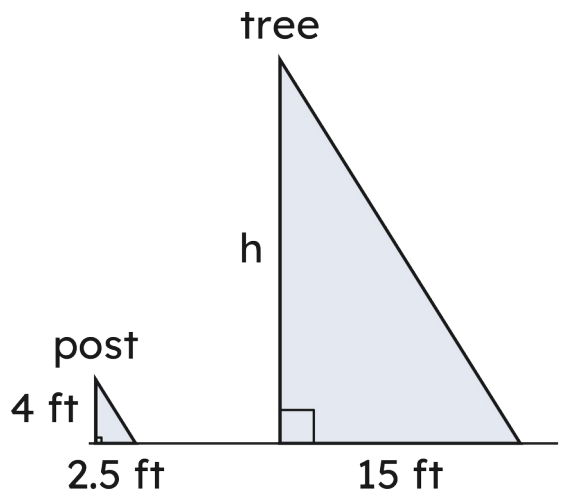
one k for every side

Answer: B — 10, 12, 16

Whiteboards · Question 6 of 9

A 4-ft post casts a 2.5-ft shadow as a tree casts a 15-ft shadow.

How tall is the tree?

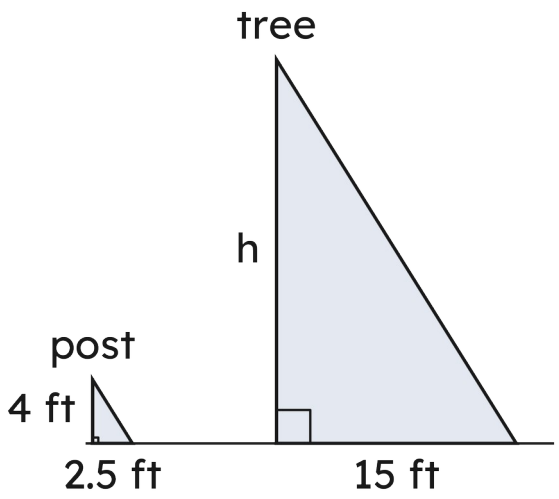


Answer it.

Whiteboards · Question 6 of 9

A 4-ft post casts a 2.5-ft shadow as a tree casts a 15-ft shadow.

How tall is the tree?



$$k = \frac{15}{2.5} = 6$$

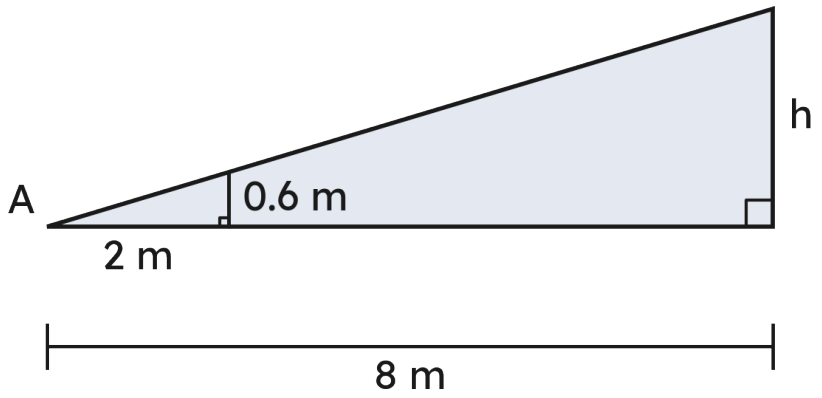
$$h = 4 \times 6 = 24$$

Answer: 24 ft

Whiteboards · Question 7 of 9

A ramp rises 0.6 m over its first 2 m from A. The right triangles are similar.

How high is the ramp 8 m from A?

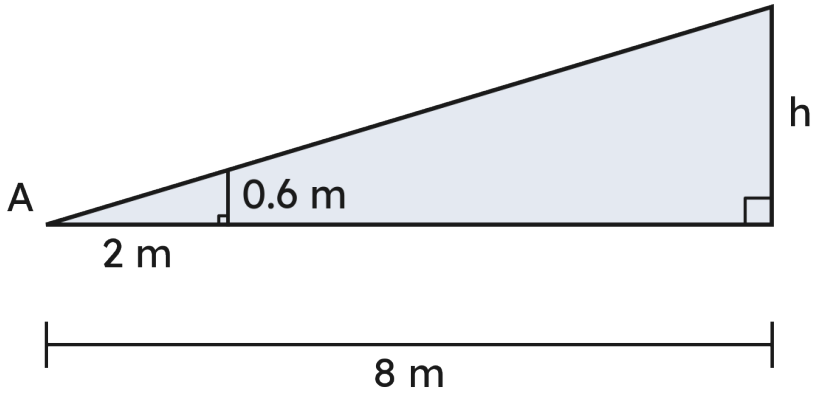


Answer it.

Whiteboards · Question 7 of 9

A ramp rises 0.6 m over its first 2 m from A. The right triangles are similar.

How high is the ramp 8 m from A?



$$k = \frac{8}{2} = 4$$

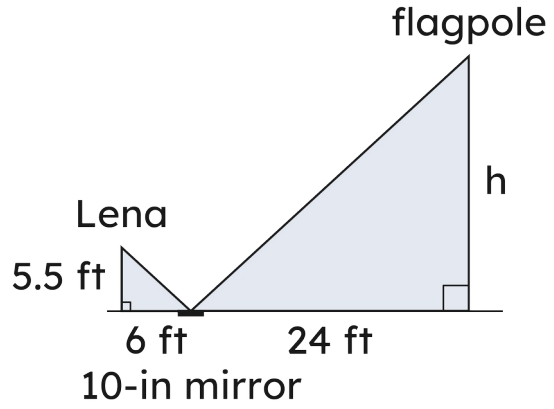
$$h = 0.6 \times 4 = 2.4$$

Answer: 2.4 m

Whiteboards · Question 8 of 9

Lena's eyes are 5.5 ft up. In a 10-inch mirror on the ground 6 ft away, she sees the top of a flagpole 24 ft past the mirror.

The two right triangles are similar. How tall is the flagpole?

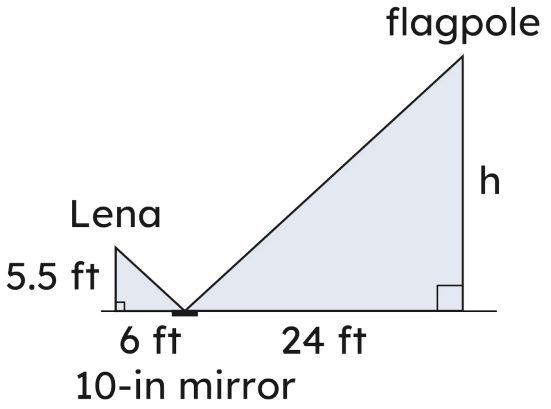


Answer it.

Whiteboards · Question 8 of 9

Lena's eyes are 5.5 ft up. In a 10-inch mirror on the ground 6 ft away, she sees the top of a flagpole 24 ft past the mirror.

The two right triangles are similar. How tall is the flagpole?



$$k = \frac{24}{6} = 4$$

$$h = 5.5 \times 4 = 22$$

Answer: 22 ft

Whiteboards · Question 9 of 9

Kim says triangles with sides 3, 4, 5 and 5, 6, 7 are similar, because each side grew by 2.

Is she right? Explain.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Kim says triangles with sides 3, 4, 5 and 5, 6, 7 are similar, because each side grew by 2.

Is she right? Explain.

$\frac{5}{3} \approx 1.67$, $\frac{6}{4} = 1.5$, $\frac{7}{5} = 1.4$: three ratios

Answer: No — similar means × one k, not + 2.

Independent Set

1. Are triangles with sides 4, 10, 12 and 6, 15, 20 similar? Show the three ratios.

2. Triangle PQR is similar to triangle XYZ. PQ is 8, QR is 10 and PR is 13, and XY is 20. Find YZ and XZ.

3. A triangle has sides 15, 25 and 30. A similar triangle's longest side is 6. Find its other two sides.

4. A 1.5-m child casts a 2-m shadow. At the same moment a tree casts a 14-m shadow. How tall is the tree?

5. The two right triangles are similar and share corner A. The small one runs 3 m along the ground from A and stands 1.2 m high. The big one runs 12 m along the ground from A. How high is it?

6. Which is similar to a triangle with sides 8, 10 and 14: one with sides 10, 12, 16, or one with sides 12, 15, 21? Show why.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 6 test.

Today's skills — all required

Side lengths of similar triangles — QSK
Similar triangles and indirect measurement — 88W
Identify similar triangles — 6PD