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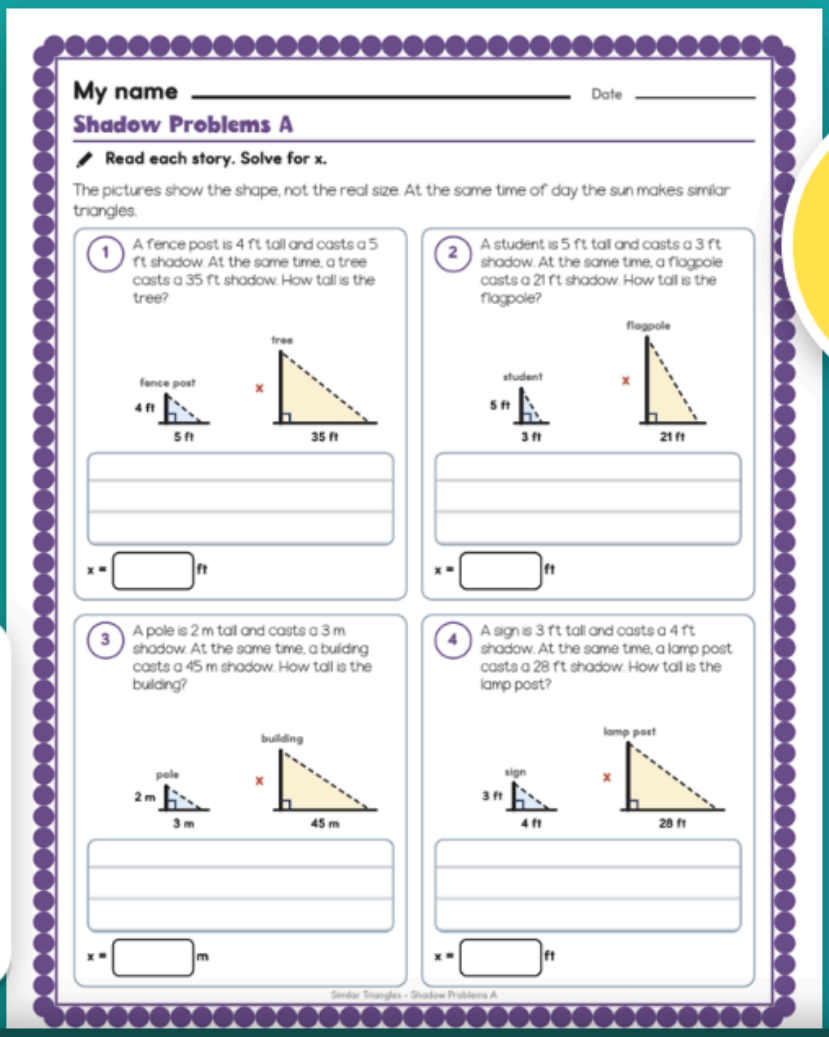

My name _____ Date _____

Shadow Problems A

Read each story. Solve for x.

The pictures show the shape, not the real size. At the same time of day the sun makes similar triangles.

1. A fence post is 4 ft tall and casts a 5 ft shadow. At the same time, a tree casts a 35 ft shadow. How tall is the tree?

fence post 4 ft 5 ft; tree x 35 ft

x = ____ ft

2. A student is 5 ft tall and casts a 3 ft shadow. At the same time, a flagpole casts a 21 ft shadow. How tall is the flagpole?

student 5 ft 3 ft; flagpole x 21 ft

x = ____ ft

3. A pole is 2 m tall and casts a 3 m shadow. At the same time, a building casts a 45 m shadow. How tall is the building?

pole 2 m 3 m; building x 45 m

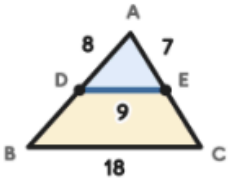
x = ____ m

4. A sign is 3 ft tall and casts a 4 ft shadow. At the same time, a lamp post casts a 28 ft shadow. How tall is the lamp post?

sign 3 ft 4 ft; lamp post x 28 ft

x = ____ ft

Similar Triangles - Shadow Problems A



28 PAGES

SIMILAR TRIANGLES

WORKSHEETS · GRADES 8-10

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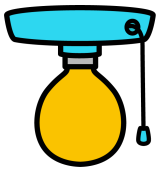
PREVIEW

Preview - Bright Path Sped

My name _____ Date _____



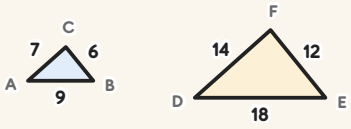
Similar Triangles: The Words

Read about each word. Fill in the blanks.

Triangle ABC and triangle DEF are similar. These six words come up on every page.

Similar

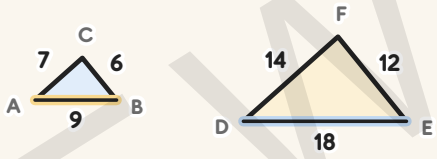
Same shape, not always the same size. One is a bigger copy of the other. The angles match.



Similar triangles have the same

Corresponding sides

Matching sides. They sit in the same place in each triangle, like the 9 and the 18.



The side that matches 7 is _____

Scale factor

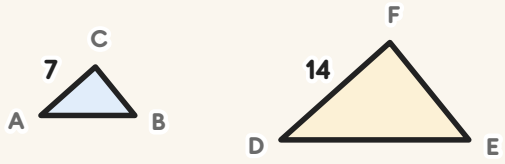
What you multiply a side by to get the matching side.



6 times ___ = 12. Scale factor = _____

Ratio

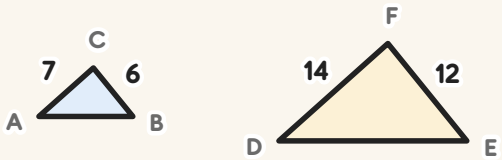
Two numbers compared by dividing.



14 / 7 = _____

Proportion

Two ratios that are equal: 6/12 = 7/14.



9/18 = 1/ _____

Indirect measurement

Find a length you cannot reach. A shadow gives you two triangles.



Shadows give triangles that are

_____

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

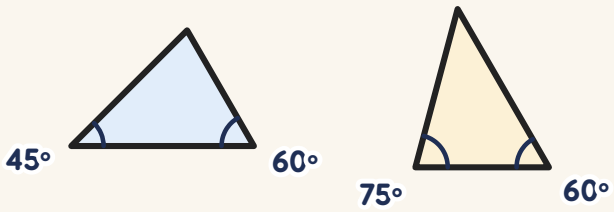
Three Tests and One Proportion

Read about each test. Fill in the blanks.

Three tests tell you triangles are similar. Then a proportion finds a missing side.

AA: two angles

Two angles of one triangle equal two angles of the other. The third angle must match too.



The first triangle's third angle is ____ °

SSS: three sides

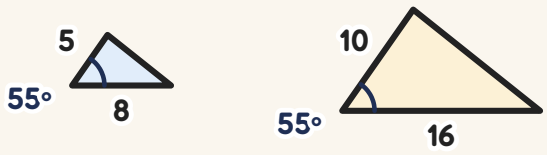
All three ratios of matching sides are equal.



22 / 11 = ____

SAS: two sides and the angle between

Two ratios of matching sides are equal, and the angle between those sides matches.



8/16 = 5/ ____

Set up a proportion

1. Match the sides.
2. Write the same kind of ratio for each triangle.
3. Cross multiply.
4. Divide to find x.

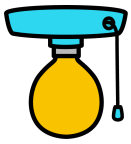
$\frac{x}{9} = \frac{4}{6}$

6x = 36, so x = ____

PREVIEW

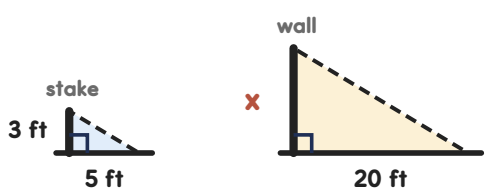
Preview - Bright Path Sped

My name _____ Date _____

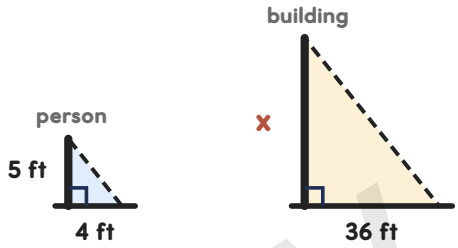


Worked Example 2

Read the example. Then fill in the blanks.



Example



Your turn

Example. A 3 ft stake casts a 5 ft shadow. At the same time a wall casts a 20 ft shadow. How tall is the wall?

Step 1	$\frac{3}{5}$ Stake: height over shadow.
Step 2	$\frac{x}{20}$ Wall: height over shadow.
Step 3	$\frac{3}{5} = \frac{x}{20}$ The sun makes similar triangles, so the ratios are equal.
Step 4	$5x = 60$, so $x = 12$ Cross multiply. Then divide by 5.
Check	$\frac{12}{20} = \frac{3}{5}$ Does 12 over 20 match 3 over 5?

Your turn. A 5 ft person casts a 4 ft shadow. At the same time a building casts a 36 ft shadow. How tall is the building?

Step 1	Person: height over shadow.	
Step 2	Building: x over shadow.	
Step 3	Set the two ratios equal.	
Step 4	Cross multiply. Then divide.	
Check	Does 45 over 36 match 5 over 4?	

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Are They Similar? Sides

Write the three ratios. Check yes or no.

Divide each side of the right triangle by the matching side of the left triangle. Short goes with short.

1 Match short to short, long to long. Write the three ratios. Are the triangles similar?

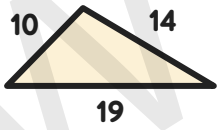


Ratios ☐ ☐ ☐

Similar? ☐ yes ☐ no

2 Match short to short, long to long. Write the three ratios. Are the triangles similar?

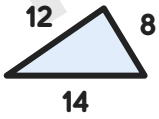


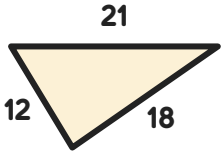


Ratios ☐ ☐ ☐

Similar? ☐ yes ☐ no

3 Match short to short, long to long. Write the three ratios. Are the triangles similar?

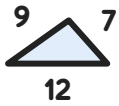


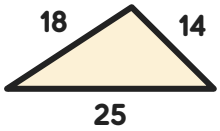


Ratios ☐ ☐ ☐

Similar? ☐ yes ☐ no

4 Match short to short, long to long. Write the three ratios. Are the triangles similar?





Ratios ☐ ☐ ☐

Similar? ☐ yes ☐ no

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Scale Factor: Smaller

Find the scale factor. Then find x.

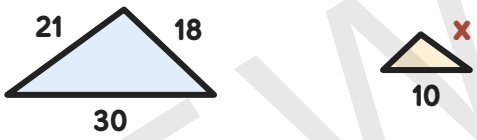
The right triangle is smaller, so the scale factor is a fraction less than 1. Divide a matching pair of sides.

1 The triangles are similar. Find the scale factor from the left triangle to the right triangle. Then find x.



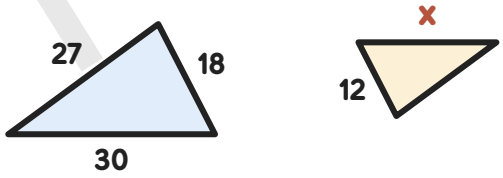
Scale factor = ☐ x = ☐

2 The triangles are similar. Find the scale factor from the left triangle to the right triangle. Then find x.



Scale factor = ☐ x = ☐

3 The triangles are similar. Find the scale factor from the left triangle to the right triangle. Then find x.



Scale factor = ☐ x = ☐

4 The triangles are similar. Find the scale factor from the left triangle to the right triangle. Then find x.



Scale factor = ☐ x = ☐

PREVIEW

Preview - Bright Ezee Shed

My name _____ Date _____

Set Up and Solve B

Write a proportion. Solve for x.

The triangles may be flipped or turned. Match short to short and long to long.

1 The triangles are similar. Write a proportion. Solve for x.



x =

2 The triangles are similar. Write a proportion. Solve for x.



x =

3 The triangles are similar. Write a proportion. Solve for x.



x =

4 The triangles are similar. Write a proportion. Solve for x.



x =

PREVIEW

Preview - Bright Ezee Shed

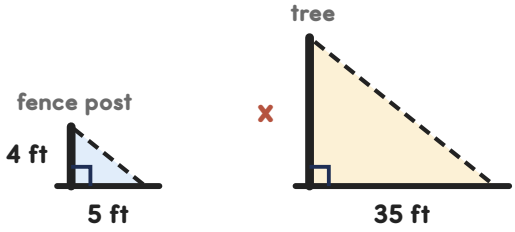
My name _____ Date _____

Shadow Problems A

Read each story. Solve for x.

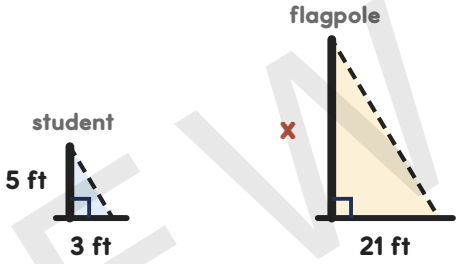
The pictures show the shape, not the real size. At the same time of day the sun makes similar triangles.

1 A fence post is 4 ft tall and casts a 5 ft shadow. At the same time, a tree casts a 35 ft shadow. How tall is the tree?



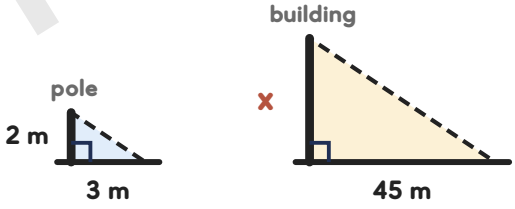
x = _____ ft

2 A student is 5 ft tall and casts a 3 ft shadow. At the same time, a flagpole casts a 21 ft shadow. How tall is the flagpole?



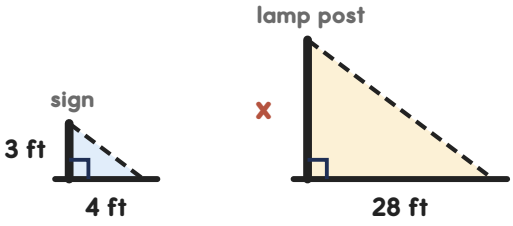
x = _____ ft

3 A pole is 2 m tall and casts a 3 m shadow. At the same time, a building casts a 45 m shadow. How tall is the building?



x = _____ m

4 A sign is 3 ft tall and casts a 4 ft shadow. At the same time, a lamp post casts a 28 ft shadow. How tall is the lamp post?



x = _____ ft

PREVIEW

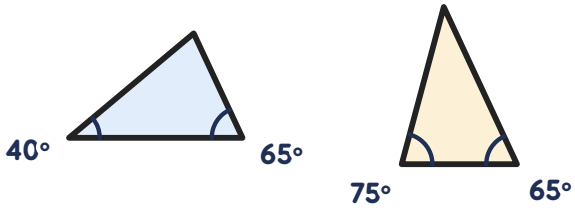
My name _____ Date _____

Quiz

Solve each one. Show your work.

Take your time. Show your work in the box.

1 Find the third angle in each triangle. Are the triangles similar?



Third angles ☐° ☐°

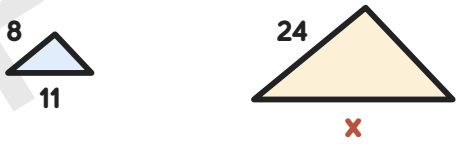
Similar? ☐ yes ☐ no

2 The triangles are similar. Find the scale factor from the left triangle to the right triangle. Then find x.



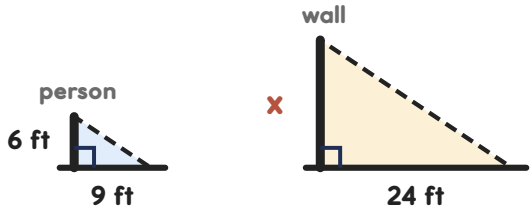
Scale factor = ☐ x = ☐

3 The triangles are similar. Write a proportion. Solve for x.



x = ☐

4 A person is 6 ft tall and casts a 9 ft shadow. At the same time, a wall casts a 24 ft shadow. How tall is the wall?



x = ☐ ft

PREVIEW

Answer Key: Words, Examples, Identify

The ratios are the right triangle's side divided by the left triangle's matching side.

The Words page 4

Card	Blank	Answer
Similar	Similar triangles have the same ___	shape
Corresponding sides	The side that matches 7	14
Scale factor	6 times ___ = 12	2
Ratio	14 / 7 =	2
Proportion	9/18 = 1/___	2
Indirect measurement	Shadows give triangles that are ___	similar

Three Tests page 5

Card	Blank	Answer
AA	The first triangle's third angle	75° (the other is 45°)
SSS	22 / 11 =	2
SAS	8/16 = 5/___	10
Set up	6x = 36, so x =	6

Worked Example 1: your turn page 6

Step	Answer
Match	4 and 12, 5 and 15, 8 and x
Scale factor	12 / 4 = 3
Find x	x = 8 times 3 = 24
Check	15 / 5 = 3

Worked Example 2: your turn page 7

Step	Answer
Step 1	5/4 (5 over 4)
Step 2	x/36 (x over 36)
Step 3	5/4 = x/36
Step 4	4x = 180, so x = 45
Check	45/36 = 5/4 (both are 1.25)

Are They Similar? Angles page 8

Item	Angles shown	Third angles; similar?
8.1	25, 65 and 65, 90 degrees	90° and 25°; Yes (AA)
8.2	30, 50 and 50, 105 degrees	100° and 25°; No
8.3	35, 105 and 40, 105 degrees	40° and 35°; Yes (AA)
8.4	50, 50 and 50, 85 degrees	80° and 45°; No

Are They Similar? Sides page 9

Item	Sides	Ratios; similar?
9.1	6-7-10 and 12-14-20	2, 2, 2; Yes
9.2	5-7-10 and 10-14-19	2, 2, 19/10; No
9.3	8-12-14 and 12-18-21	3/2, 3/2, 3/2; Yes
9.4	7-9-12 and 14-18-25	2, 2, 25/12; No

How the answers were made

Every answer was computed twice: from how the triangle pair was built, and by the proportion a student would write. The two had to agree. Accept any correct setup: a proportion can be written with the triangles either way up, as long as both ratios go the same way.

PREVIEW

Answer Key: Shadows, Mistakes, Quiz, Sort

Sam, in the Find the Mistake problems, is invented. Pieces are named by row and column in the cutting grid, left to right and top to bottom.

Item	Mistake	What went wrong	Right answer
17.1	Line 1	Both ratios must go the same way. 7/14 is small over big, so x/9 is wrong: the 9 goes with x as 7/14 = 9/x. Then 7x = 126 and x = 18.	x = 18
17.2	Line 1	Similar triangles grow by multiplying, not adding. 30 = 10 x 3, so the longest side is 18 x 3 = 54.	54
17.3	Line 1	11/22 compares two parts of the same side. Triangle ADE goes with the WHOLE triangle ABC: AB = 11 + 22 = 33. 11/33 = 6/x, so x = 18.	x = 18
17.4	Line 1	Height goes over shadow on both sides: 4/6 = x/18. Sam put the tree's shadow on top. Then 6x = 72 and x = 12.	x = 12

Shadow Problems pages 15, 16

Item	Proportion	Answer
15.1	4/5 = x/35	x = 28 ft
15.2	5/3 = x/21	x = 35 ft
15.3	2/3 = x/45	x = 30 m
15.4	3/4 = x/28	x = 21 ft
16.1	6/4 = 48/x	x = 32 ft
16.2	12/9 = 20/x	x = 15 ft
16.3	15/2 = x/6	x = 4.5 m
16.4	8/5 = x/40	x = 64 ft

Quiz page 18

Item	Type	Answer
18.1	AA	75° and 40°; Yes (AA)
18.2	Scale	scale factor 2; x = 28
18.3	Prop	x = 33
18.4	Shadow	x = 16 ft

Cut and Paste page 19

Piece	Sides	Box
r1 c1	5-7-11 and 15-21-33	Scale factor 3
r1 c2	6-8-11 and 12-17-22	Not similar
r1 c3	8-11-13 and 16-22-26	Scale factor 2
r2 c1	7-9-15 and 21-27-45	Scale factor 3
r2 c2	6-10-13 and 12-20-26	Scale factor 2
r2 c3	7-9-10 and 14-18-21	Not similar

PREVIEW

Class Progress Grid

Every student on one grid: items right by page type.

Class or group _____ Month _____

Student	Identify (of 8)	Scale factor (of 8)	Set up and solve (of 12)	Shadows (of 8)	Mistakes (of 4)	Quiz (of 4)	Sort (of 6)

PREVIEW

How to fill this in

For each column, add up how many items that student has right with no prompt (the tracker rows). One glance across a row shows which skill is easiest and which is next.

Grouping for small-group time

Students low in Identify need the words and tests (pages 4 and 5). Students low in Set up and solve need the worked examples (pages 6 and 7) and the scale factor pages first. Students near full marks can move to the mistakes and the quiz (pages 17 and 18).

Maya's Tracker (Invented Student)

Maya R. is invented; nothing on this page describes a real student. The blank tracker is on page 23.

Student	Teacher	Month
Maya R. (an invented student)	Mr. Okafor (invented)	October

Page	Page type and set	Items	Right	Date	Notes
8	Are They Similar? Angles	4	3	10/6	Checked one angle only
9	Are They Similar? Sides	4	4	10/8	-
10	Scale Factor: Bigger	4	3	10/10	Divided small by big once
11	Scale Factor: Smaller	4	2	10/13	Said 2 for a smaller triangle
12	Set Up and Solve A	4	3	10/15	Matched the wrong sides once
13	Set Up and Solve B	4	2	10/17	Flipped one ratio on a turned triangle
14	Triangle Inside a Triangle	4	-	-	-
15	Shadow Problems A	4	4	10/20	-
16	Shadow Problems B	4	-	-	-
17	Find the Mistake	4	3	10/22	Found the line, one fix not finished
18	Quiz	4	-	-	-
19	Cut and Paste: Sort the Pairs	6	-	-	-

PREVIEW

How to read it

Maya R. has done **8 of 12** scored pages and got **24 of 32** items right with no prompt. **2** pages were all right and **6** carry a note. Every number comes from the table.

What the table points to

The lowest pages are Scale Factor: Smaller (2 of 4) and Set Up and Solve B (2 of 4). Those are where the next practice goes. The 4 pages left blank are not tried yet, never wrong.