Name _____

Teacher Note:

- Refer students to "Triangles" on page 15 in the *Student Reference Guide.*

page 623

Focus on

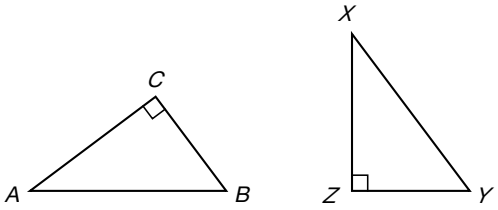
• Similar Figures

Math Language

Triangles are **similar** when they are the same shape. When they are exactly the same size and shape, they are **congruent.**

- **Congruent** figures have exactly the same size and shape.
- Rotate, translate, or flip congruent figures so that they exactly overlap.
- **Corresponding parts** of congruent figures are in the same place in each figure.

  In the triangles below,



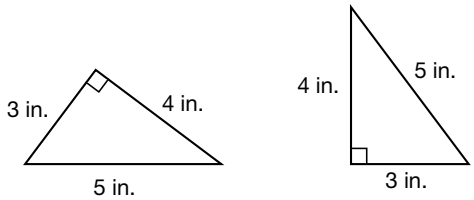
  $\angle A$ and $\angle X$ correspond, as do sides $\overline{AB}$ and $\overline{XY}$.

  $\angle B$ and $\angle Y$ correspond, as do sides $\overline{BC}$ and $\overline{YZ}$.

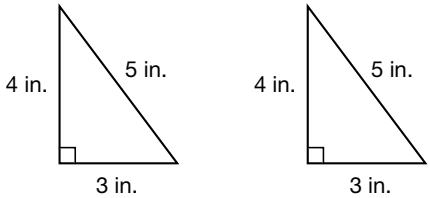
  $\angle C$ and $\angle Z$ correspond, as do sides $\overline{AC}$ and $\overline{ZX}$.
- If two figures are congruent, their corresponding parts (angles and sides) match exactly.

Example

a. Show that these triangles are congruent.



Rotate the triangle on the left.



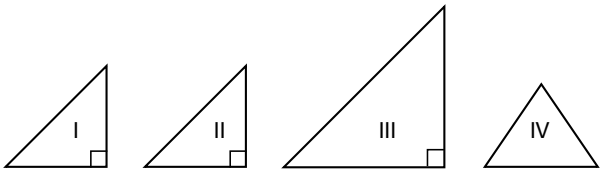
The triangles are congruent because **they have the same size and shape.**

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b. What is the perimeter of each triangle?

Perimeter of each triangle = 3 in. + 4 in. + 5 in. = **12 in.**

- If two figures are **similar,** they have the same *shape* but not necessarily the same *size.* Three of these four triangles are similar.



Triangles I and II are similar. Notice that they are also congruent. In fact, *all figures that are congruent are similar.*

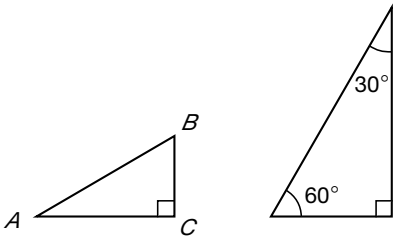
Triangle III is similar to triangles I and II. It has the same shape but it is not the same size. Similar figures can be different sizes.

Triangle IV is not similar to the other triangles, because its shape is different.

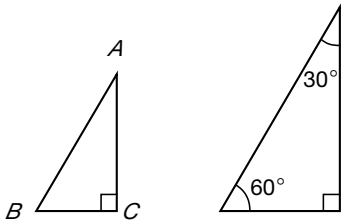
- **Corresponding angles** of similar figures have the same measure.

Example

These triangles are similar. What is the measure of angle *A?*



Rotate and reflect the triangle on the left



Angle *A* corresponds to the 30° angle.

The measure of angle *A* is **30°.**

- **Corresponding sides** of similar figures are proportional.

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- The lengths of corresponding sides of similar figures are related by a ratio called the **scale factor.**

  Scale factor from smaller figure to larger figure $= \frac{\text{smaller side}}{\text{larger side}}$

  Scale factor from larger figure to smaller figure $= \frac{\text{larger side}}{\text{smaller side}}$

  Make sure to use *corresponding sides.*

Example

These rectangles are similar. What is the scale factor?

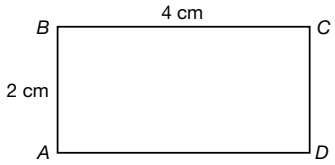
The scale factor is the ratio of the corresponding sides.

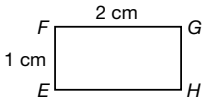
$$\frac{\text{Side } AB}{\text{Side } EF} = \frac{2}{1}$$

$$\frac{\text{Side } BC}{\text{Side } FG} = \frac{4}{2} = \frac{2}{1}$$

$$\frac{\text{Side } CD}{\text{Side } GH} = \frac{2}{1}$$

$$\frac{\text{Side } DA}{\text{Side } HE} = \frac{4}{2} = \frac{2}{1}$$





The sides of rectangle *ABCD* are 2 times greater than the corresponding sides of rectangle *EFGH.* The scale factor is $\frac{2}{1}$.

1. "All squares are similar." True or false? _____

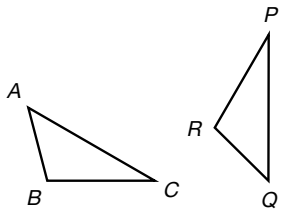
Figures that are the same s_____ but not necessarily the same s_____ are similar.

2. "All similar triangles are congruent." True or false? _____

Figures with the same s_____ and s_____ are _____.

3. "If two polygons are similar, then their corresponding angles are equal in measure." True or false? _____

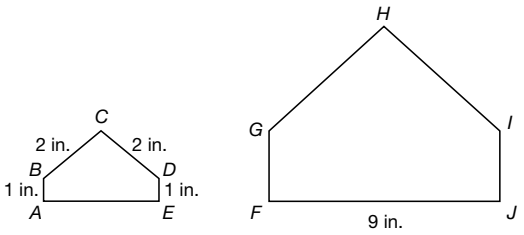
4. These two triangles are congruent. Which side of triangle *PQR* is the same length as $\overline{AB}$? _____



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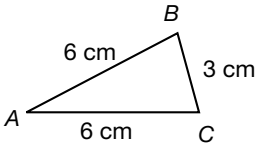
5. These two pentagons are similar. The scale factor for corresponding sides is 3. How long is segment *AE*? How long is segment *IJ*?

AE = _____ *IJ* = _____

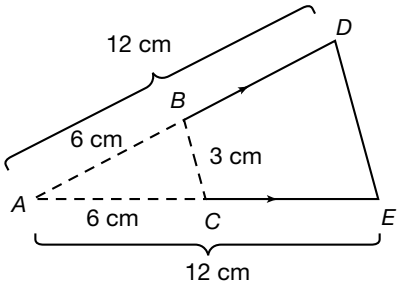


- Draw a triangle similar to a given triangle.
  1. Trace along two sides.
  2. Extend or shorten both sides by the scale factor you choose.
  3. Then draw the third side.

6. Draw triangle *ADE* similar to triangle *ABC* by tracing along sides *AB* and *AC.*



a. Double the side lengths of triangle *ABC.*

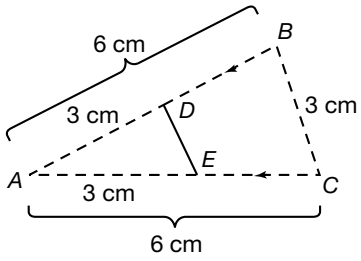


By what scale factor is the triangle you drew larger than triangle *ABC*?

$$\frac{\text{Side } AD}{\text{Side } AB} = \frac{12 \text{ cm}}{6 \text{ cm}} = _____$$

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b. Shorten the side lengths of triangle *ABC* by one-half.



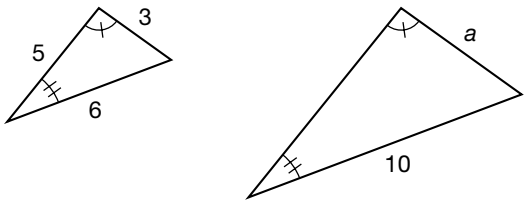
By what scale factor is the triangle you drew smaller than triangle *ABC*?

$$\frac{\text{Side } AD}{\text{Side } AB} = \frac{3 \text{ cm}}{6 \text{ cm}} = _____$$

- Find the lengths of unknown sides of similar triangles by writing proportions.
  1. Find the ratios of corresponding sides.
  2. Then write a proportion and solve for the unknown side.

Example

These triangles are similar.



a. Find the ratios of corresponding sides.

$$\frac{\text{large triangle}}{\text{small triangle}} = \frac{10}{6} = \frac{a}{3}$$

b. Then write a proportion and solve for *x*.

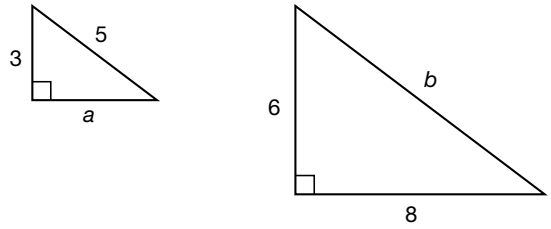
$$\frac{10}{6} \quad \frac{a}{3}$$

$$x = \frac{(10 \times 3)}{6}$$

$$\boldsymbol{x = 5}$$

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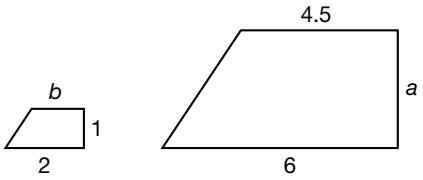
7. These two triangles are similar. Use a proportion to find lengths *a* and *b*.



$\frac{3}{6} = \frac{a}{8}$ $a = \text{—} = _____$

$\frac{3}{6} = \frac{5}{b}$ $b = \text{—} = _____$

8. These two trapezoids are similar. Use a proportion to find lengths *a* and *b.*



$\frac{2}{6} = \frac{1}{a}$ $a = \text{—} = _____$

$\frac{2}{6} = \frac{b}{4.5}$ $b = \text{—} = _____$

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