Name Key

7.1 Ratio and Proportion

Goal: Use ratios and proportions.

Ratio: a comparison of a number *a* and a nonzero number *b* using divison $2/3$ $2:3$ 2 to 3

Proportion: an equation that states that two ratios are equal

Means: the numbers *b* and *c* in the proportion $\frac{a}{b}=\frac{c}{d}$

Extremes: the numbers *a* and *d* in the proportion $\frac{a}{b}=\frac{c}{d}$

Simplify the ratio.

a) $6\ days: 15\ days$

3 days : 5 days

b) $\frac{2\ ft}{2\ yd} = \frac{2\ ft}{6\ ft} = \frac{1\ ft}{3\ ft}$

c) $\frac{3\ ft}{18\ in} = \frac{36\ in}{18\ in} = \frac{2\ in}{1\ in}$

d) $600\ ft : 1\ mi$

600 ft : 5280 ft

5 ft : 44 ft

e) $\frac{8\ yd}{2\ ft} = \frac{24\ ft}{2\ ft} = \frac{12\ ft}{1\ ft}$

f) $\frac{4\ weeks}{6\ days} = \frac{28\ days}{6\ days} = \frac{14\ days}{3\ days}$

Cross Product Property
In a proportion, the product of the extremes is equal to the product of the means.
$If\ \frac{a}{b}=\frac{c}{d}, then\ ad = bc$

Solve each proportion.

a) $\frac{x}{2} = \frac{7}{14}$

$14x = 14$

$x = 1$

b) $\frac{5}{7} = \frac{y+1}{21}$

$7(y+1) = 105$

$7y + 7 = 105$

$7y = 98$

$y = 14$

c) $\frac{27}{x-5} = \frac{3}{2}$

$54 = 3(x-5)$

$54 = 3x - 15$

$69 = 3x$

$x = 23$

d) $\frac{3}{2} = \frac{9}{x-1}$

$18 = 3(x-1)$
$18 = 3x-3$
$21 = 3x$
$x = 7$

e) $\frac{m+2}{5} = \frac{14}{10}$

$70 = 10(m+2)$
$70 = 10m+20$
$50 = 10m$
$m = 5$

f) $\frac{39}{72} = \frac{x}{24}$

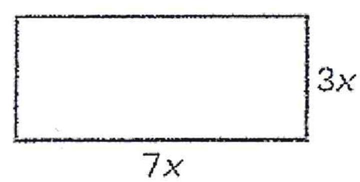
$936 = 72x$
$x = 13$

Find each ratio.

$AB:DE$ 2:3 $BC:DE$ 4:3 $EF:CD$ 1:3 $BD:AE$ 7:12

The perimeter of a rectangle is 80 feet. The ratio of the length to the width of 7:3. Find the length and the width.

Length: 28 ft Width: 12 ft



$2(7x) + 2(3x) = 80$
$14x + 6x = 80$
$20x = 80$
$x = 4$

$7(4) = 28$
$3(4) = 12$

Teresa is maintaining a camp fire. She can keep the fire burning for 4 hours with 6 logs. How many logs does Teresa need to maintain for the fire for 18 hours?

$\frac{4 \text{ hr}}{6 \text{ logs}} = \frac{18 \text{ hr}}{x}$

$108 = 4x$
$x = 27$ logs

Ms. Blaseg has a candle that is 14 cm tall which burns for 8 hours before going out. How long would a 21 cm tall candle for burn for?

$\frac{14 \text{ cm}}{8 \text{ hr}} = \frac{21 \text{ cm}}{x}$

$168 = 14x$
$x = 12$ hours

7.2 Similar Polygons

Goal: Identify similar polygons.

Similar Polygons: two polygons whose corresponding angles are congruent and whose corresponding side lengths are proportional. They are the same shape but different sizes

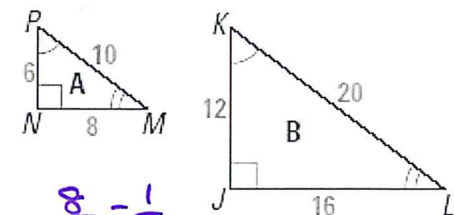
Scale Factor: in similar polygons, the ratio of the lengths of the two corresponding sides

Perimeters of Similar Polygons
If two polygons are similar, then the ratio of their perimeters is equal to the ratio of their corresponding side lengths.

Identify all congruent angles and sides. Then find the scale factor of the left figure to the right figure.

$\Delta PNM \sim \Delta KJL$

Congruent angles: $\angle P \cong \angle K$, $\angle N \cong \angle J$, $\angle M \cong \angle L$

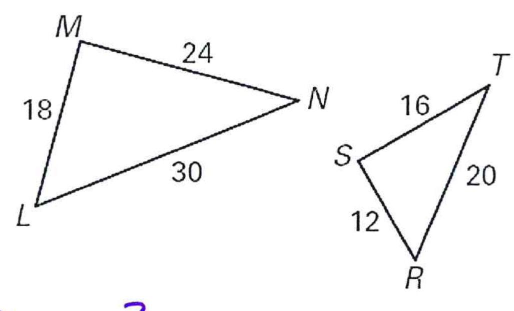


Ratio of Corresponding Sides: $\frac{PN}{KJ} = \frac{NM}{JL} = \frac{PM}{KL}$

Scale Factor: 1/2

$\frac{6}{12} = \frac{1}{2}$ $\frac{10}{20} = \frac{1}{2}$ $\frac{8}{16} = \frac{1}{2}$

$\Delta LMN \sim \Delta RST$



Congruent angles: $\angle L \cong \angle R$, $\angle M \cong \angle S$, $\angle N \cong \angle T$

Ratio of Corresponding Sides: $\frac{LM}{RS} = \frac{MN}{ST} = \frac{LN}{RT}$

Scale Factor: 2/3

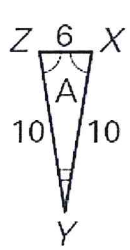
$\frac{18}{12} = \frac{24}{16} = \frac{30}{20} = \frac{2}{3}$

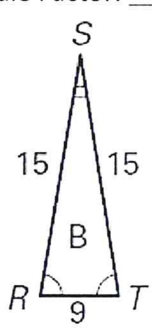
Determine whether the polygons are similar by checking the ratio of all sides. If they are similar, find the scale factor of figure A to figure B.

a) Similar? Yes Scale Factor: 2/3

$\frac{10}{15} = \frac{2}{3}$

$\frac{6}{9} = \frac{2}{3}$

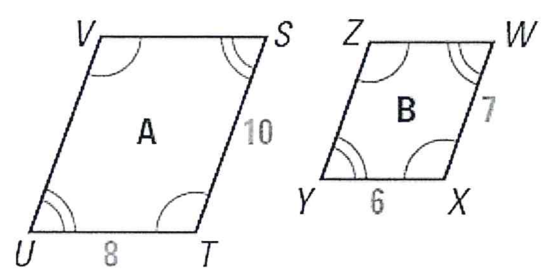




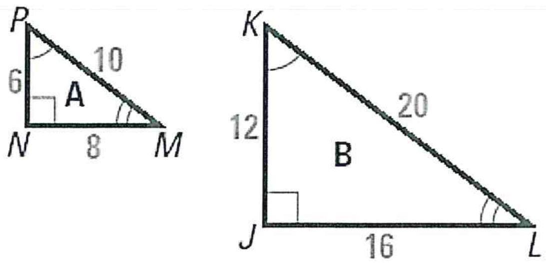
b) Similar? No Scale Factor: ________

$\frac{10}{7}$

$\frac{8}{6} = \frac{4}{3}$

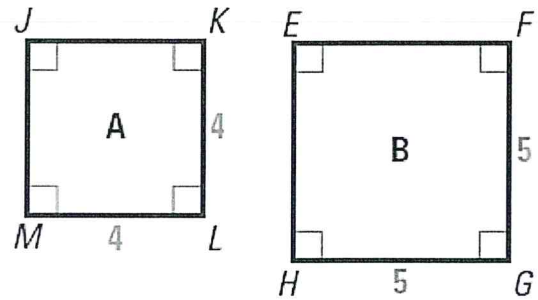


c) Similar? Yes Scale Factor: 1/2



$\frac{6}{12} = \frac{1}{2}$ $\frac{8}{16} = \frac{1}{2}$ $\frac{10}{20} = \frac{1}{2}$

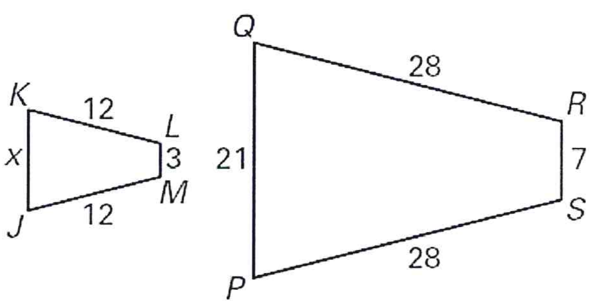
d) Similar? Yes Scale Factor: 4/5



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

The two polygons are similar. Write a proportion to find the value of each variable.

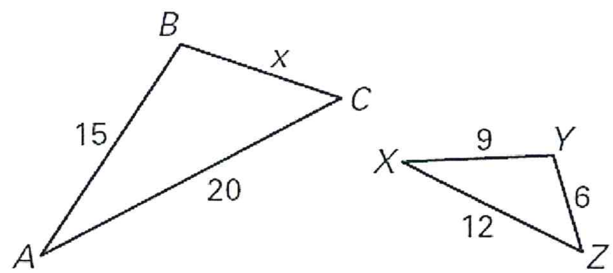
a) x = 9



$\frac{x}{21} = \frac{12}{28}$ $28x = 252$

$x = 9$

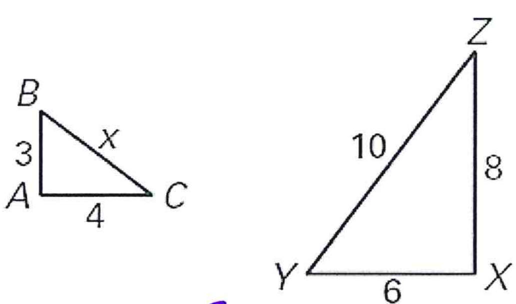
b) x = 10



$\frac{x}{6} = \frac{15}{9}$

$90 = 9x$

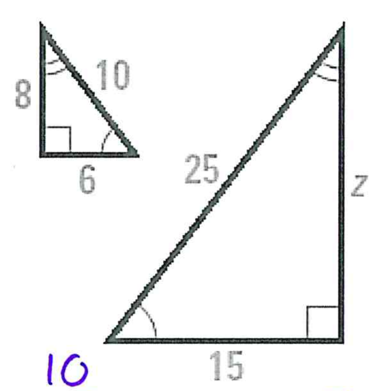
c) x = 5



$\frac{x}{10} = \frac{3}{6}$

$6x = 30$

d) z = 20

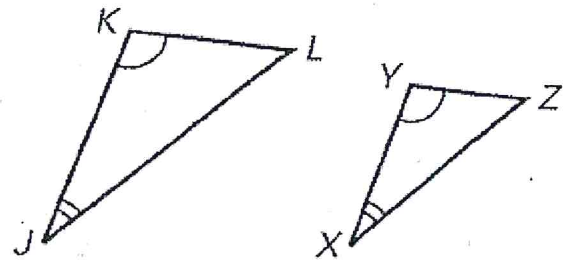


$\frac{8}{z} = \frac{10}{25}$ $200 = 10z$

7.3 Showing Triangles Similar: AA

Goal: Show that two triangles are similar using the AA Similarity Postulate.

Angle-Angle Similarity Postulate (AA)
If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar   If $\angle$ K $\cong \angle$ Y and $\angle$ J $\cong \angle$ X   then Δ JKL $\cong \Delta$ XYZ

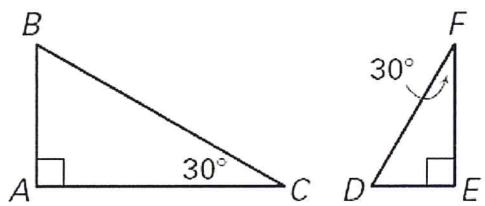


Determine if the triangles are similar. If so, write a similarity statement.

a) Similar?: Yes

Postulate: AA ~

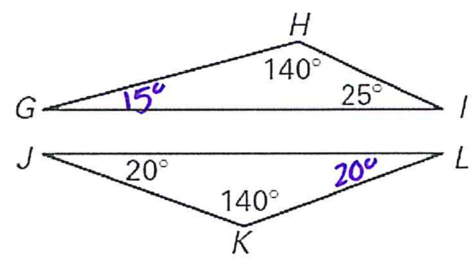
Statement: ΔABC ~ ΔEDF



b) Similar?: NO

Postulate: ________

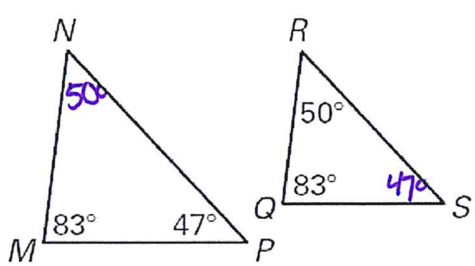
Statement: ________ ~ ________



c) Similar?: Yes

Postulate: AA~

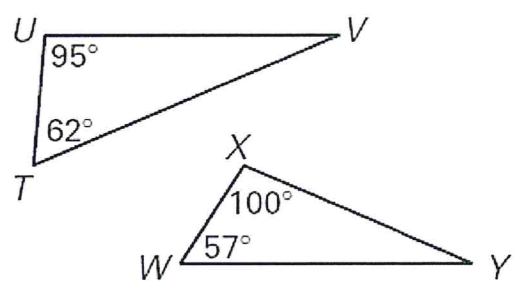
Statement: ΔMNP ~ ΔQRS



d) Similar?: NO

Postulate: ________

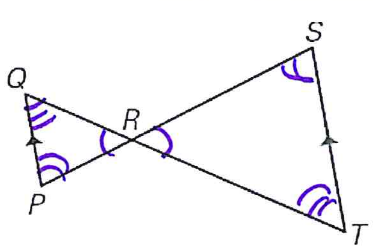
Statement: ________ ~ ________



e) Similar?: Yes

Postulate: AA~

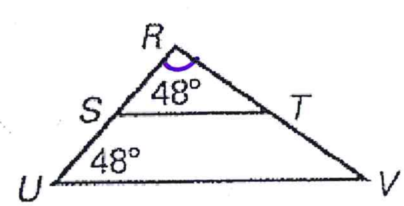
Statement: ΔPQR ~ ΔSTR



f) Similar?: Yes

Postulate: AA~

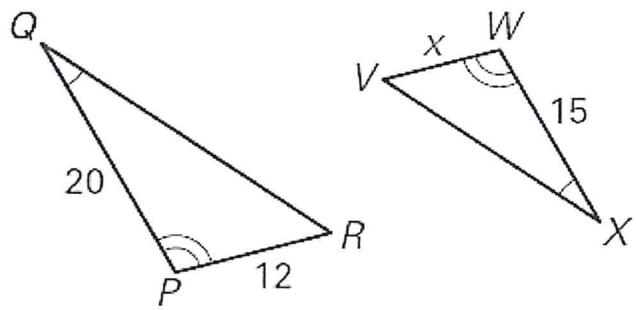
Statement: ΔRST ~ ΔRUV



Write the similarity statement for the triangles. Then find the value of the variable.

a) Statement: ΔQPR ~ ΔXWV

x = 9

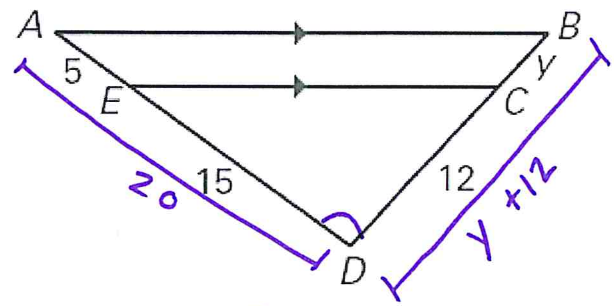


$$\frac{x}{12} = \frac{15}{20}$$

$$20x = 180$$

b) Statement: ΔABD ~ ΔECD

y = 4



$$\frac{15}{20} = \frac{12}{y+12}$$

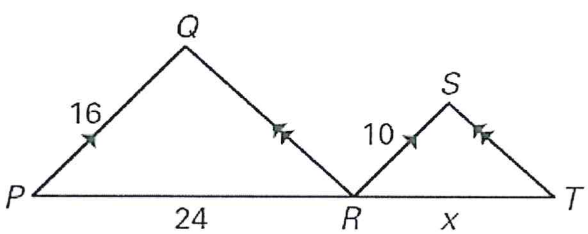
$$240 = 15(y+12)$$

$$240 = 15y + 180$$

$$15y = 60$$

c) Statement: ΔPQR ~ ΔRST

x = 15

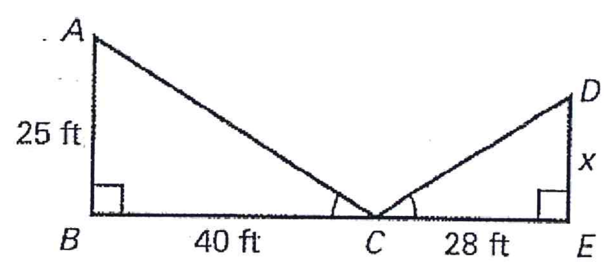


$$\frac{16}{10} = \frac{24}{x}$$

$$240 = 16x$$

d) Statement: ΔABC ~ ΔDEC

x = 17.5



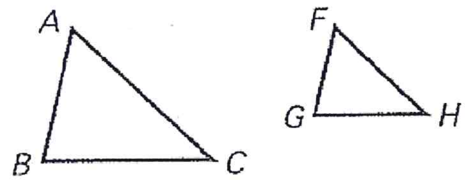
$$\frac{25}{40} = \frac{x}{28}$$

$$40x = 700$$

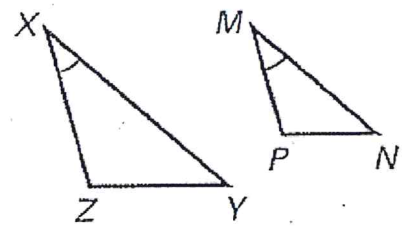
7.4 Showing Triangles Similar: SSS and SAS

Goal: Show that two triangles are similar using the SSS and SAS Similarity Postulates.

Side-Side-Side (SSS) Similarity Theorem
If the corresponding sides of two triangles are proportional, then the triangles are similar. $If\ \frac{AB}{FG} = \frac{BC}{GH} = \frac{AC}{FH}, then\ \Delta ABC \sim \Delta FGH$



Side-Angle-Side (SAS) Similarity Theorem
If an angle of one triangle is congruent to an angle of a second triangle and the lengths of the sides that include these angles are proportional then the triangles are similar. $If\ \angle X \cong \angle M\ and\ \frac{PM}{ZX} = \frac{MN}{XY}$, then $\Delta XYZ \sim \Delta MNP$

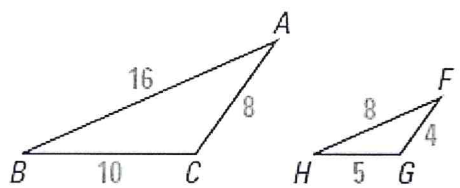


Determine whether the triangles are similar. If they are similar, state why and write a similarity statement.

a) Similar?: Yes Postulate: SSS ~

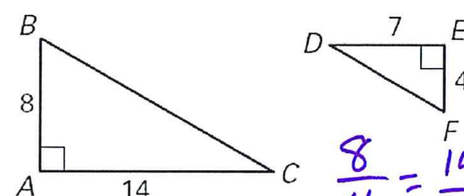
Statement: ΔABC ~ ΔFHG

$\frac{16}{8} = \frac{8}{4} = \frac{10}{5}$



b) Similar?: Yes Postulate: SAS ~

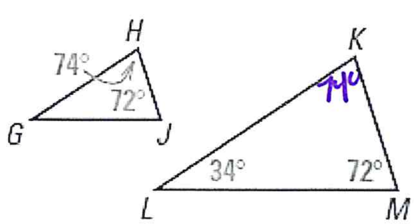
Statement: ΔABC ~ ΔEFD



$\frac{8}{4} = \frac{14}{7}$

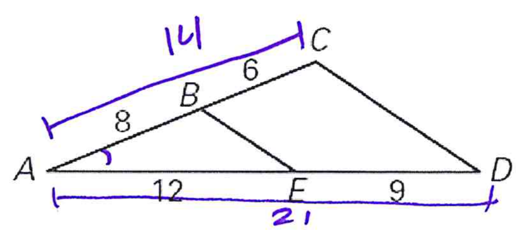
c) Similar?: Yes Postulate: AA ~

Statement: ΔGHJ ~ ΔLKM



d) Similar?: Yes Postulate: SAS ~

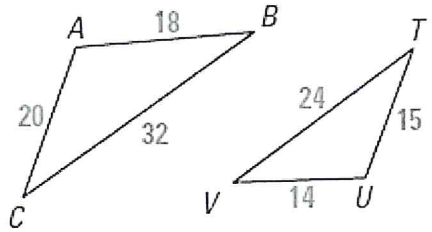
Statement: ΔABE ~ ΔACD



$\frac{8}{14} = \frac{12}{21}$

e) Similar?: NO Postulate: ___________

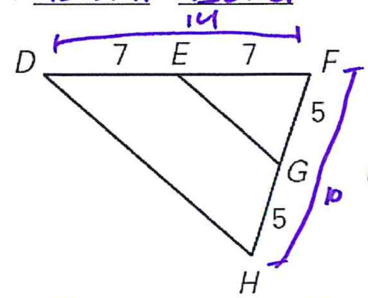
Statement: _________ ~ _________



$\frac{18}{14} \neq \frac{20}{15} \neq \frac{32}{24}$

f) Similar?: Yes Postulate: SAS~

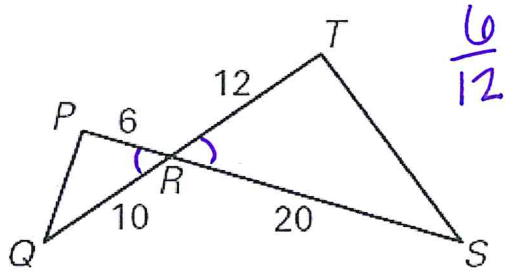
Statement: $\triangle DFH$ ~ $\triangle EFG$



$\frac{7}{14} = \frac{5}{10}$

g) Similar?: Yes Postulate: SAS~

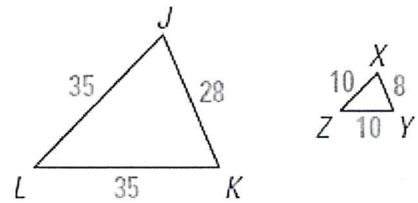
Statement: $\triangle PQR$ ~ $\triangle TSR$



$\frac{6}{12} = \frac{10}{20}$

h) Similar?: Yes Postulate: SSS~

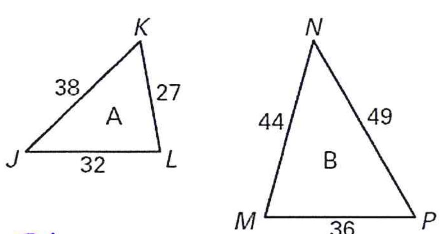
Statement: $\triangle LJK$ ~ $\triangle ZXY$



$\frac{35}{10} = \frac{28}{8}$

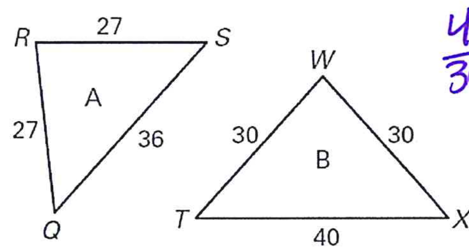
Determine whether the two triangles are similar by SSS. If they are similar, find the scale factor of Triangle B to Triangle A.

a) Similar? No Scale Factor: _________



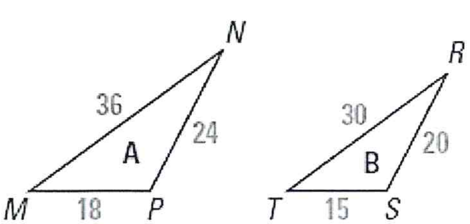
$\frac{36}{27} \neq \frac{44}{32} \neq \frac{49}{38}$

b) Similar? Yes Scale Factor: 10/9



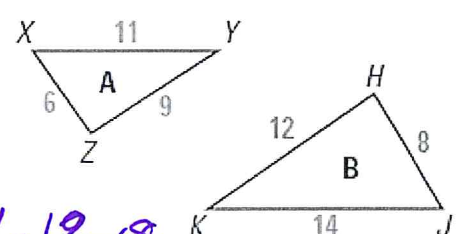
$\frac{40}{36} = \frac{30}{27} = 10/9$

c) Similar? Yes Scale Factor: 5/6



$\frac{30}{36} = \frac{20}{24} = \frac{15}{18} =$

d) Similar? NO Scale Factor: _________



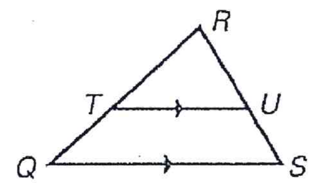
$\frac{14}{11} \neq \frac{12}{9} \neq \frac{8}{6}$

7.5 Proportions and Similar Triangles

Goal: Use the Triangle Proportionality Theorem and its converse.

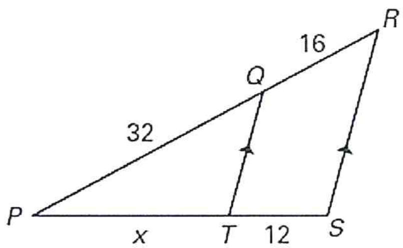
Midsegment of a triangle: a segment that connects the midpoints of two sides of a triangle

Triangle Proportionality Theorem
If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally
$In\ \Delta QRS, if\ \overline{TU} \parallel \overline{QS}\ then \frac{RT}{QT} = \frac{RU}{US}$



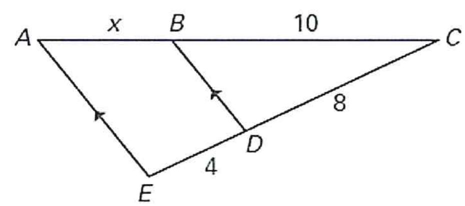
Use the Triangle Proportionality Theorem to find the value of the variable.

a) x = 24



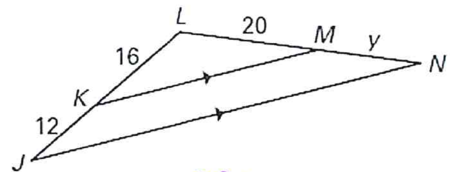
$\frac{x}{12} = \frac{32}{16}$

b) x = 5



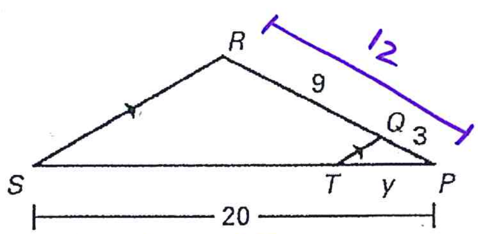
$\frac{x}{10} = \frac{4}{8}$

c) y = 15



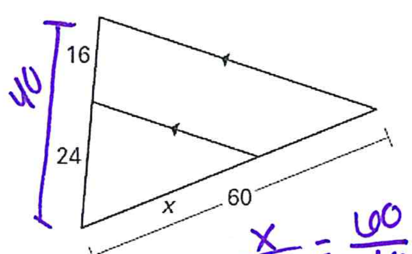
$\frac{16}{12} = \frac{20}{y}$

d) y = 5



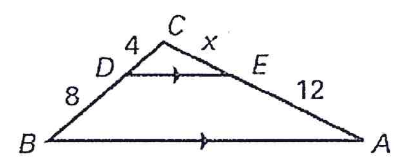
$\frac{y}{3} = \frac{20}{12}$

e) x = 36



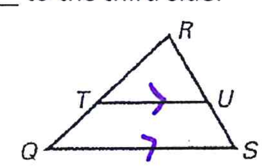
$\frac{x}{24} = \frac{60}{40}$

f) x = 6



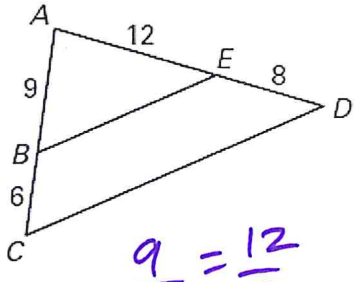
$\frac{4}{8} = \frac{x}{12}$

Converse of the Triangle Proportionality Theorem
If a line divides two sides of a triangle proportionally, then is it parallel to the third side.
$In\ \Delta QRS, if \frac{RT}{TQ}\ and \frac{RU}{US}, then\ \overline{TU} \parallel \overline{QS}$



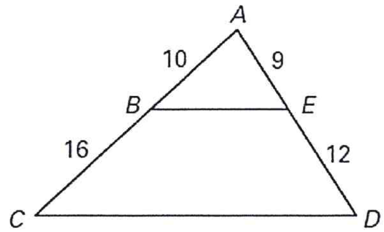
Given the diagram, determine whether $\overline{BE}$ is parallel to $\overline{CD}$. *Explain.*

a) Yes



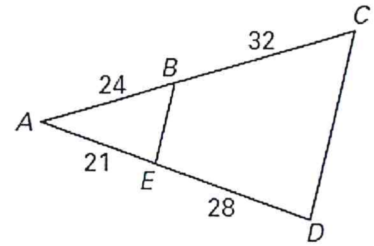
$\frac{9}{6} = \frac{12}{8}$

b) NO



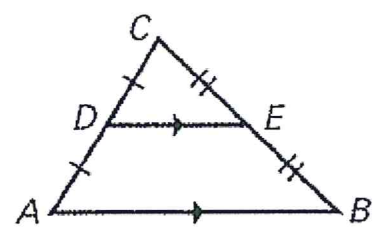
$\frac{10}{16} \neq \frac{9}{12}$

c) Yes



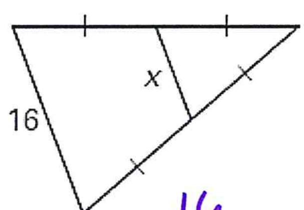
$\frac{24}{32} = \frac{21}{28}$

Midsegment Theorem
The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long. *In* ΔABC, *if* $CD = DA$ *and* $CE = EB$, *then* $\overline{DE} \parallel \overline{AB}$ *and* $DE = \frac{1}{2}AB$



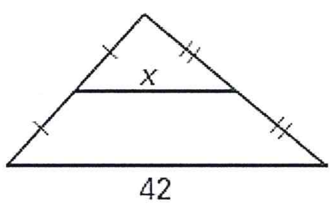
Find the value of each variable.

a) x = 8



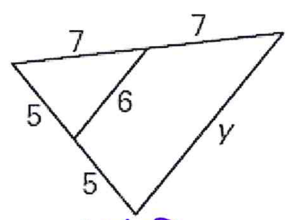
$\frac{16}{2}$

b) x = 21



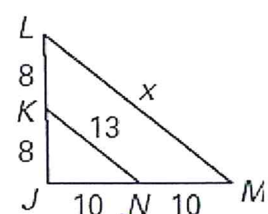
$\frac{42}{2}$

c) y = 12



6(2)

d) x = 26



13(2)

Complete each statement.

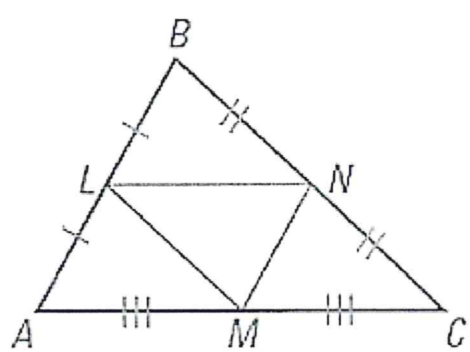
$\overline{AC} \parallel \overline{LN}$

$\overline{BC} \parallel \overline{LM}$

If AB = 32, then MN = 16

If LM = 17, then BC = 34

If BL = 4.5, then MN = 4.5



7.6 Dilations

Goal: Identify dilations and scale factors.

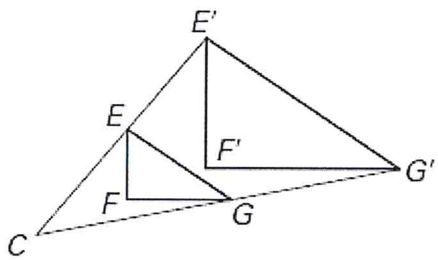
Dilation: a transformation that changes the Size of a figure

Reduction: a dilation in which the image is smaller than the original figure

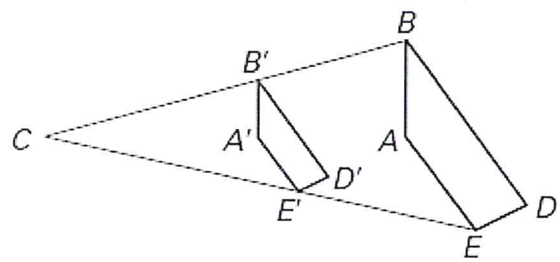
Enlargement: a dilation in which the image is larger than the original figure

Tell whether the dilation is a reduction or an enlargement.

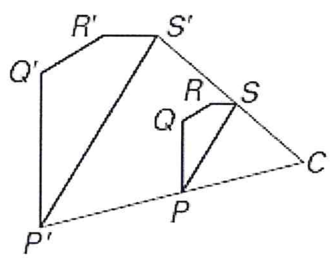
a) Enlargement



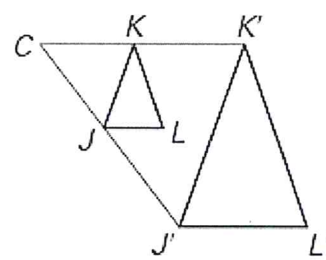
b) Reduction



c) Enlargement



d) Enlargement

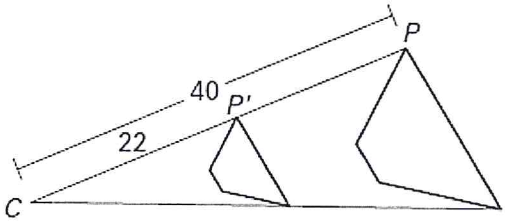


To find the scale factor of a dilation, simplify the ratio: $\frac{CP'}{CP}$

Determine if the dilation is an enlargement or reduction. Then find the scale factor of the dilation.

a) Reduction

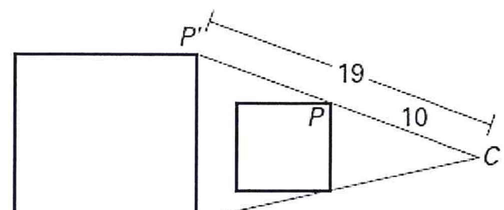
Scale Factor: 11/20



$\frac{22}{40}$

b) Enlargement

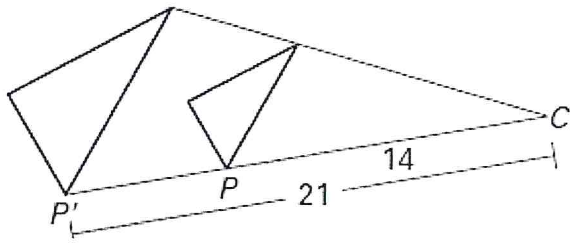
Scale Factor: 19/10



$\frac{19}{10}$

c) Enlargement

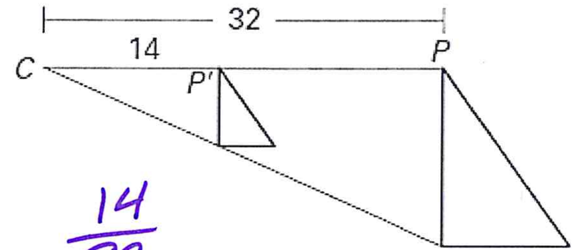
Scale Factor: 3/2



$\frac{21}{14}$

d) Enlargement

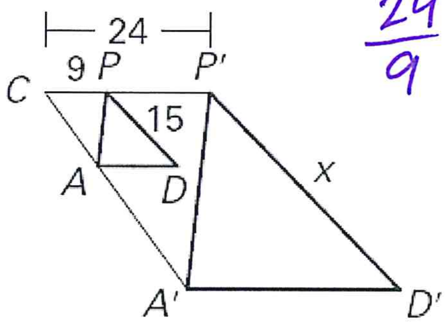
Scale Factor: 7/16



$\frac{14}{32}$

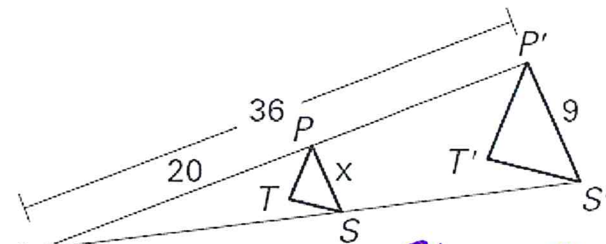
Find the value of the variable.

a) x = 40



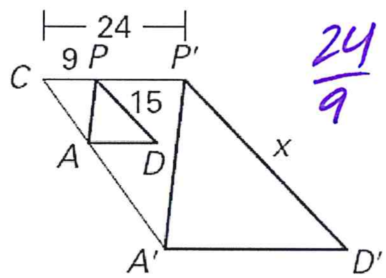
$\frac{24}{9} = \frac{x}{15}$

b) x = 5



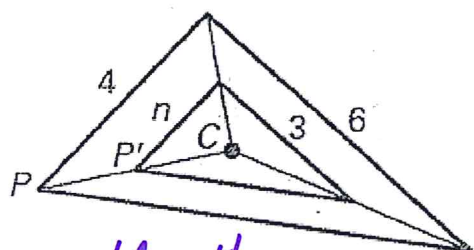
$\frac{36}{20} = \frac{9}{x}$

c) x = 40



$\frac{24}{9} = \frac{x}{15}$

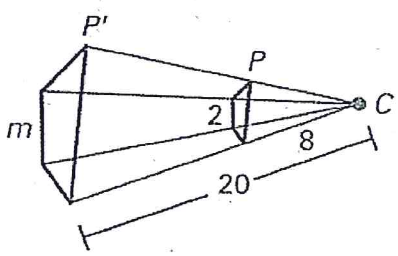
d) n = 2



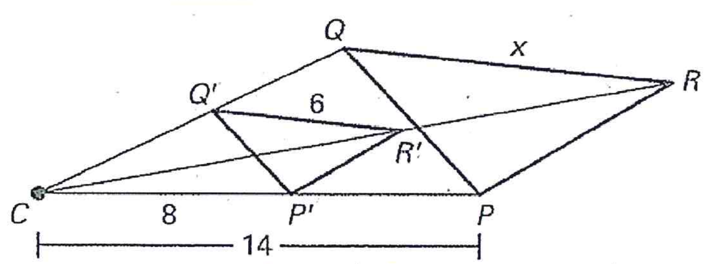
$\frac{6}{3} = \frac{4}{n}$

e) m = 5

$\frac{20}{8} = \frac{m}{2}$



f) x = 10.5



$\frac{14}{8} = \frac{x}{6}$

7.6 Extension – Dilations on the Coordinate Plane

Goal: Graph dilations on the coordinate plane.

Dilate: to enlarge or reduce a figure

Scale Factor: determines how much a figure is being enlarged or reduced.

*A scale factor greater than one enlarges a figure

* A scale factor between 0 and 1 reduces a figure

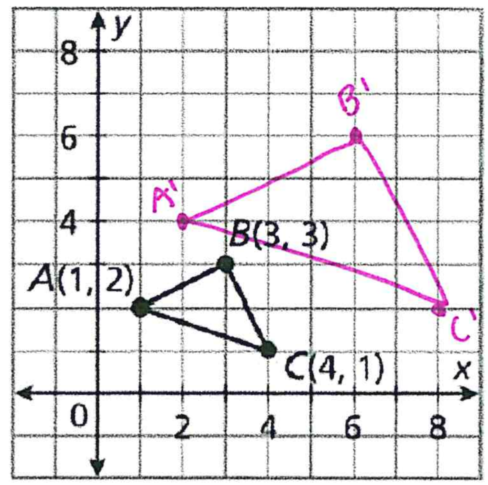
Identify the coordinates of the pre-image. Then use the scale factor to graph and identify the coordinates of the image.

a) Scale Factor: 2

A: (1,2) A': (2,4)

B: (3,3) B': (6,6)

C: (4,1) C': (8,2)

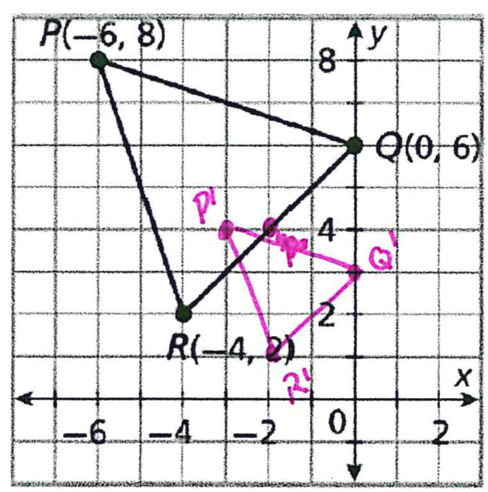


b) Scale Factor: ½

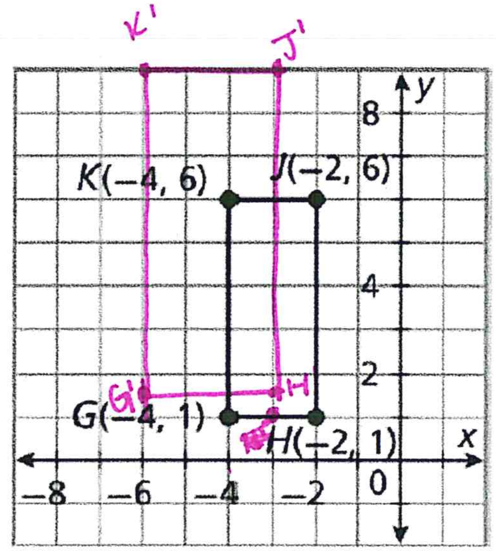
P: (-6,8) P': (-3,4)

Q: (0,6) Q': (0,3)

R: (-4,2) R': (-2,1)



c) Scale Factor: 1.5



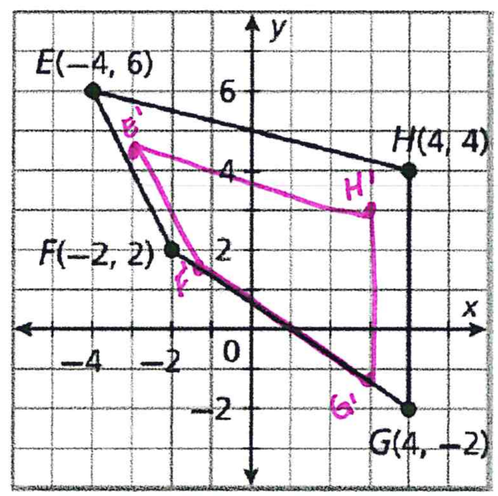
G: (-4, 1) G': (-6, 1.5)

H: (-2, 1) H': (-3, 1.5)

J: (-2, 6) J': (-3, 9)

K: (-4, 6) K': (-6, 9)

d) Scale Factor: ¾



E: (-4, 6) E': (-3, 4.5)

F: (-2, 2) F': (-1.5, 1.5)

G: (4, -2) G': (3, -1.5)

H: (4, 4) H': (3, 3)