10.2 Similarity

Fraction = Fraction
Cross multiply

1) Solve each proportion.

a) $\frac{8}{3} \times \frac{x}{8}$

$3x = 64$

$\frac{3x}{3} = \frac{64}{3}$

$x = 21.33$

b) $\frac{2}{5} \times \frac{n}{6}$

$5n = 12$

$\frac{5n}{5} = \frac{12}{5}$

$n = 2.4$

c) $\frac{6}{5} = \frac{7}{x}$

d) $\frac{8}{4} = \frac{6}{3x}$

e) $\frac{x+1}{4} \times \frac{1}{12}$

$12(x+1) = 4$

$12x + 12 = 4$

$-12 \quad -12$

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

$x = -0.67$

f) $\frac{x-4}{2} \times \frac{2x}{x-6}$

$(x-4)(x-6) = 4x$ (2·2x)

$x^2 - 6x - 4x + 24 = 4x$

$x^2 - 10x + 24 = 4x$

$-4x \quad -4x$

$24x^2$

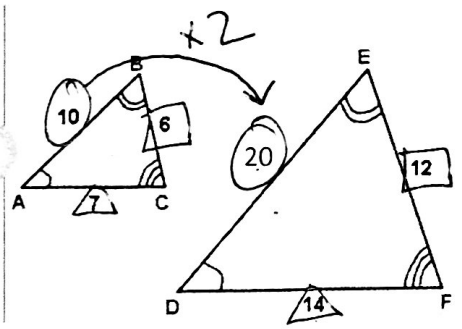
$-2x \quad -12x$

$x^2 - 14x + 24 = 0$

$(x-2)(x-12) = 0$

$x = 2, 12$

Examine the two triangles below. What are their similarities? What are their differences?



Smaller triangle is half the bigger triangle
or
Bigger triangle is twice the smaller triangle

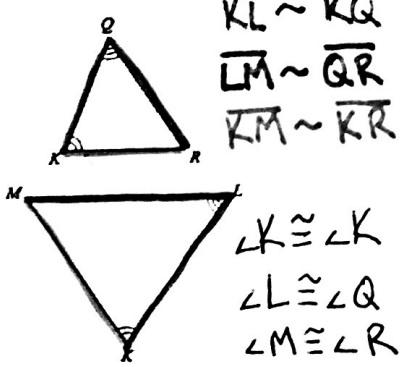
All angles are congruent

Proportional: $\frac{10}{20} = \frac{6}{12} = \frac{7}{14}$

If two shapes are **similar,** then this means that all angles are congruent and all side lengths are proportional (multiplied by a scale factor).

2) Identify corresponding sides and corresponding angles of each figure.

a. $\triangle KLM \sim \triangle KQR$



$\overline{KL} \sim \overline{KQ}$

$\overline{LM} \sim \overline{QR}$

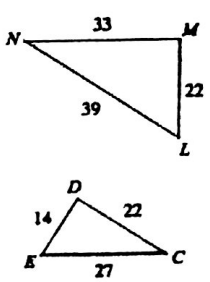
$\overline{KM} \sim \overline{KR}$

$\angle K \cong \angle K$

$\angle L \cong \angle Q$

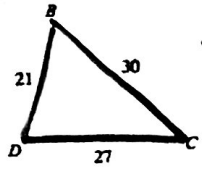
$\angle M \cong \angle R$

b. $\triangle LMN \sim \triangle EDC$



c. Similarity statement

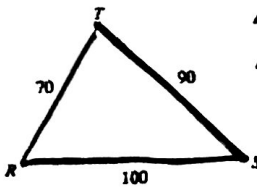
$\triangle RST \sim \triangle BCD$



$\overline{RS} \sim \overline{BC}$

$\overline{ST} \sim \overline{CD}$

$\overline{RT} \sim \overline{BD}$



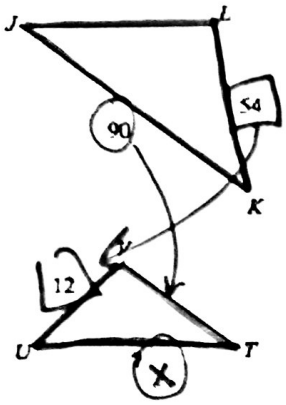
$\angle R \cong \angle B$

$\angle S \cong \angle C$

$\angle T \cong \angle D$

3) Given that the two figures are similar, find the missing length.

a. $\triangle JKL \sim \triangle TUV$

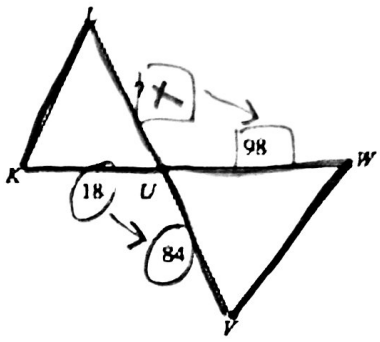


$\frac{90}{x} \times \frac{54}{12}$

$\frac{54x}{54} = \frac{1080}{54}$

$x = 20$

b. $\triangle UVW \sim \triangle UKL$

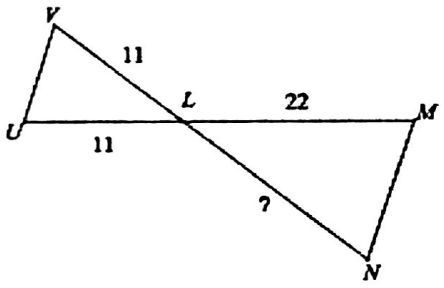


$\frac{x}{98} \times \frac{18}{84}$

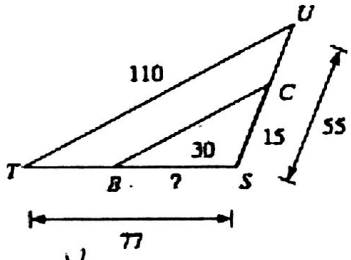
$\frac{84x}{84} = \frac{1764}{84}$

$x = 21$

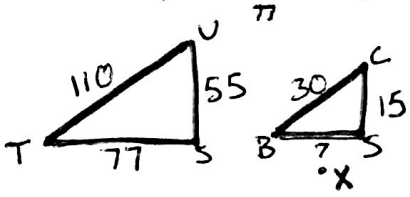
c. $\triangle LMN \sim \triangle LUV$



d.



Two triangles— split them up

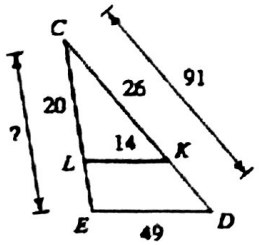


$\frac{77}{x} \times \frac{110}{30}$

$\frac{110x}{110} = \frac{2310}{110}$

$x = 21$

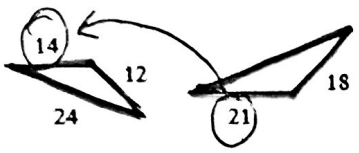
e.



Scale Factor k	The value all side lengths are multiplied by
Enlargement	Gets bigger $k>1$
Reduction	Gets smaller $k<1$

4) The polygons in each pair are similar. Find the scale factor of the polygon on the right to the polygon on the left. Then state if it is an enlargement or a reduction.

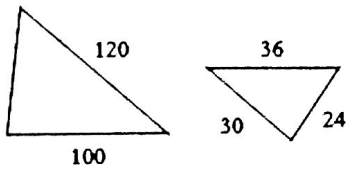
a)



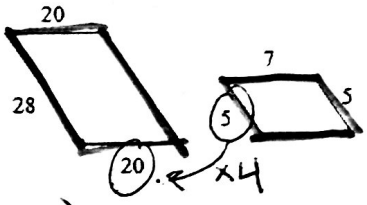
$k = \frac{14}{21}$ or ~~$k = \frac{21}{14}$~~ $(k>1)$

Reduction
$k = 0.67$

b)



c)



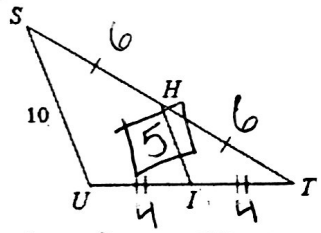
$(k<1)$ ~~$k = \frac{5}{20}$~~ or $k = \frac{20}{5}$

Enlargement
$k = 4$

5) Find the length indicated.

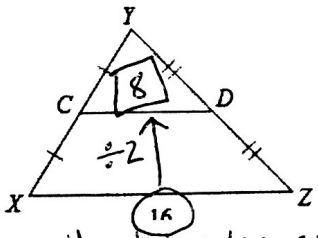
a)

Find HI



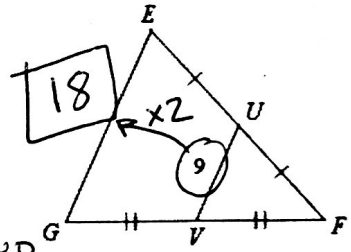
b)

Find CD



c)

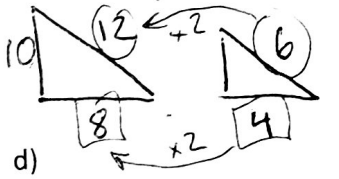
Find EG

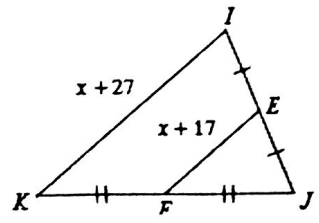


* When the triangles are set up like this, the smaller doubles to get the bigger

d)

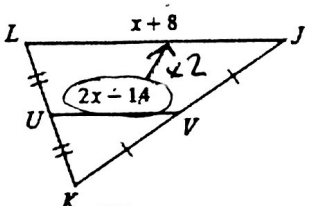
Find EF





e)

Find VU



$2(2x-14) = x+8$

$4x - 28 = x + 8$

$-x \quad +28 \quad -x \quad +28$

$\frac{3x}{3} = \frac{36}{3}$

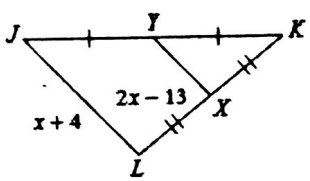
$x = 12$

$VU = 2(12) - 14$

$= 10$

f)

Find JL



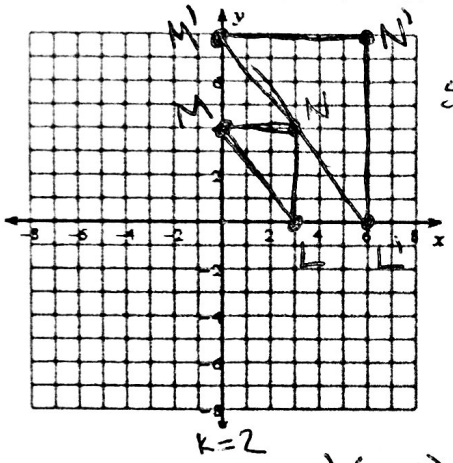
Multiplied by scale factor

A **dilation** is a type of transformation that takes a figure and either enlarges it or reduces it based on a scale factor. The original figure is called the preimage and the figure after you have dilated is called the image. Dilations happen around a point of dilation.

In order to perform a dilation, you can take each x and y coordinate and multiply it by the scale factor.

6) Use the origin as the center of dilation. Plot the preimage using the points given, then use the scale factor to find the coordinates of the vertices of the image, and plot them.

a) $M(0,4), N(3,4), L(3,0); k = 2$



scale factor

$M(0,4) \xrightarrow{\times 2} M'(0,8)$

$N(3,4) \xrightarrow{\times 2} N'(6,8)$

$L(3,0) \xrightarrow{\times 2} L'(6,0)$

b) G(2, 8), H(6, 6), I(4, 2), k(-2, 2); k=$\frac{1}{2}$