10.2 Similarity

* when x is in the denominator, flip both fractions

1) Solve each proportion.

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

$8 \cdot \frac{8}{3} = \frac{x}{8} \cdot 8$

$\boxed{x = 21.33}$

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

$6 \cdot \frac{2}{5} = \frac{n}{6} \cdot 6$

$\boxed{n = 2.4}$

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

$7 \cdot \frac{5}{6} = \frac{x}{7} \cdot 7$

$\boxed{x = 5.83}$

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

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

$\frac{3}{3} = \frac{3x}{3}$ $\boxed{x = 1}$

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

$4 \cdot \frac{x+1}{4} = \frac{1}{12} \cdot 4$

$x + 1 = .33$

$-1 \quad -1$

$\boxed{x = -.67}$

* When x is in both numerator and denominator, cross multiply

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

$(x-4)(x-6) = 2(2x)$

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

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

$-4x \quad -4x$

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

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

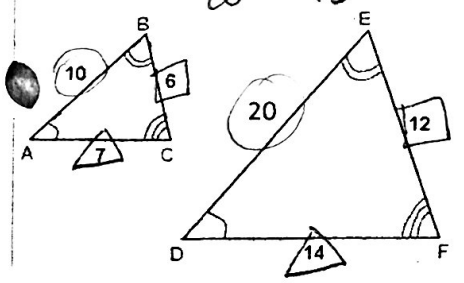
$\boxed{x=2}$ $\boxed{x=12}$

$24x^2$

$-2 \quad -12$

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

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



The angles are the same

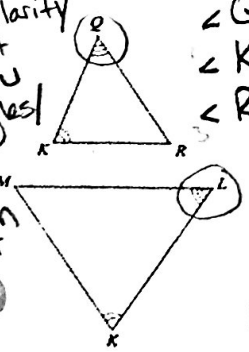
You can times the smaller triangle lengths by 2 to get the lengths of the bigger triangle

If two shapes are **similar**, then this means that corresponding angles are congruent & corresponding sides are proportional.

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

a. $\boxed{\triangle KLM \sim \triangle KQR}$

The similarity statement tells you which angles/sides correspond with each other



$\angle Q \cong \angle L$

$\angle K \cong \angle K$

$\angle R \cong \angle M$

$\overline{KL} \cong \overline{KQ}$

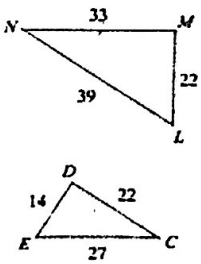
$\overline{LM} \cong \overline{QR}$

$\overline{KM} \cong \overline{KR}$

$\triangle KLM \sim \triangle KQR$

1 2 3 1 2 3

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



$\angle L \cong \angle E$

$\angle M \cong \angle D$

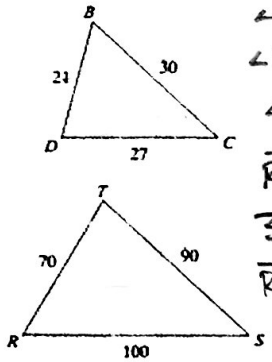
$\angle N \cong \angle C$

$\overline{LM} \cong \overline{ED}$

$\overline{MN} \cong \overline{DC}$

$\overline{LN} \cong \overline{EC}$

c. $\triangle RST \sim \triangle BCD$



$\angle R \cong \angle B$

$\angle S \cong \angle C$

$\angle T \cong \angle D$

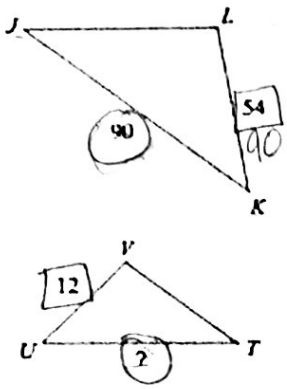
$\overline{RS} \cong \overline{BC}$

$\overline{ST} \cong \overline{CD}$

$\overline{RT} \cong \overline{BD}$

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

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

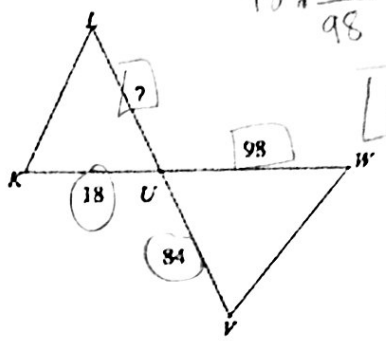


$\frac{90}{x} = \frac{54}{12}$

$90 \cdot \frac{x}{90} = \frac{12}{54} \cdot 90$

$\boxed{x = 20}$

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

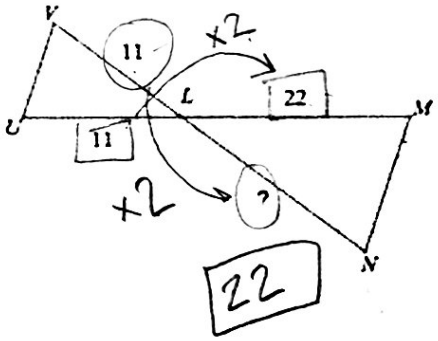


$98 \cdot \frac{x}{98} = \frac{18}{84} \cdot 98$

$\boxed{x = 21}$

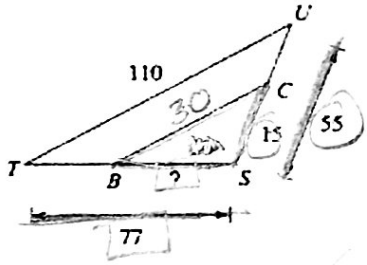
Use the similarity statement to pick out corresponding sides, then set up a proportion

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



$\boxed{22}$

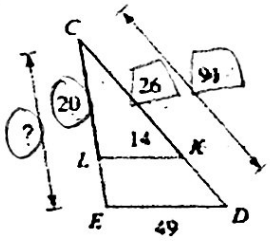
d.



$77 \cdot \frac{15}{55} = \frac{x}{77} \cdot 77$

$\boxed{x = 21}$

e.



$20 \cdot \frac{x}{20} = \frac{91}{26} \cdot 20$

$\boxed{x = 70}$

$\frac{20}{x} = \frac{26}{91} \rightarrow \frac{x}{20} = \frac{91}{26}$

$91 \cdot \frac{20}{26} = \frac{x}{91} \cdot 91$

$x = 70$

$\frac{\text{Big } \Delta}{\text{Small } \Delta} = \frac{\text{Big } \Delta}{\text{Small } \Delta}$

$\frac{\text{Small } \Delta}{\text{Big } \Delta} = \frac{\text{Small } \Delta}{\text{Big } \Delta}$

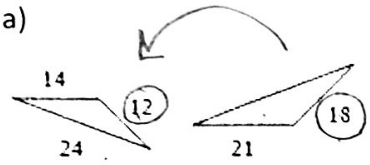
$\frac{\text{Small } \Delta}{\text{Small } \Delta} = \frac{\text{Big } \Delta}{\text{Big } \Delta}$

Any way you set up the proportion will work out

Scale Factor (K)	What you multiply the dimensions of one shape by to get the dimensions of the other
Enlargement	$K > 1$ (scale factor greater than 1)
Reduction	$K < 1$

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.

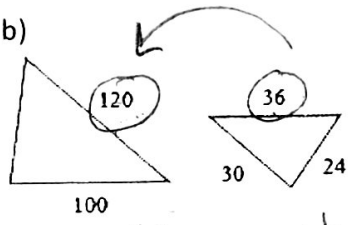
a)



Reduction

$K = \frac{12}{18} = \boxed{.67}$

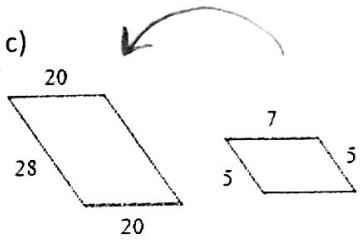
b)



Enlargement

$K = \frac{120}{36} = \boxed{3.33}$

c)

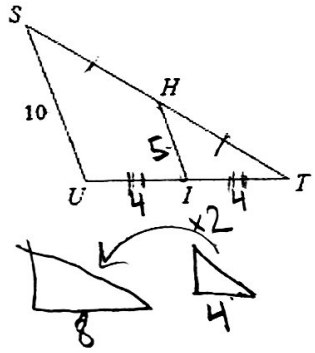


*smallest length goes with smallest length, biggest goes with biggest

5) Find the length indicated.

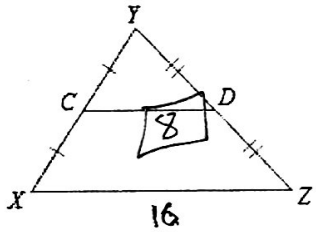
a)

$HI = \boxed{5}$



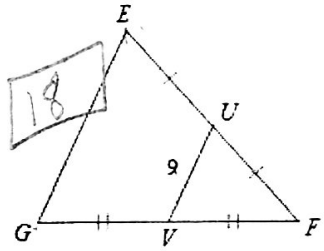
b)

Find CD



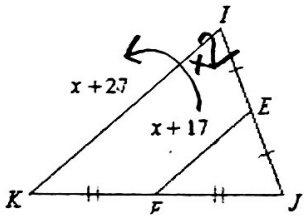
c)

Find EG



d)

Find EF



$2(x+17) = x+27$

$2x + 34 = x + 27$

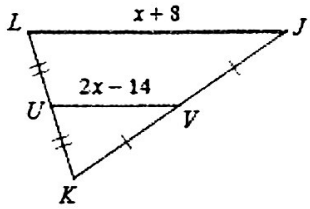
$-x \quad -34 \quad -x \quad -34$

$x = -7$

$EF = (-7) + 17 = \boxed{10}$

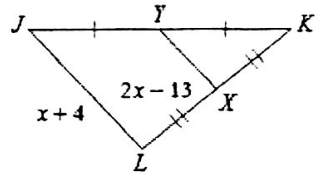
e)

Find VU



f)

Find JL

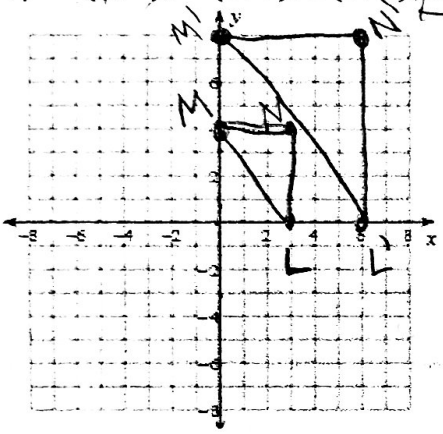


A **dilation** is a type of transformation that takes a figure and either enlarges it or reduces it based on a scale factor. The original figure is called the preimage and the figure after you have dilated is called the image. Dilations happen around a point of dilation.

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) $M(0,4), N(3,4), L(3,0); \boxed{k = 2}$



M (0,4) x2 → M'(0,8)
N (3,4) x2 → N' (6,8)
L (3,0) x2 → L' (6,0)

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