

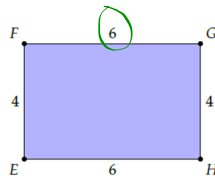
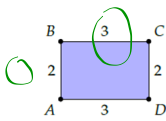
Lesson 13: Similar Figure Discovery / Recall Activity

April 16th
2024

1 Similar Figures

1.1 Activity

Consider the following two rectangles:



Answer the question in pairs

Answer the following questions:

- i. What is the proportion between the sides of the rectangles ABCD and EFGH?
ratio / fraction
- ii. What is the perimeter of rectangle ABCD?
 $P = 2 + 2 + 3 + 3 = 10$ units
- iii. What is the perimeter of rectangle EFGH?
 $P = 6 + 6 + 4 + 4 = 20$ units
- iv. What is the proportion between the perimeters of the rectangles? What do you notice?
 $\frac{20}{10} = 2$ units
- v. What is the area of rectangle ABCD?
 $A = l \cdot w = 3 \times 2 = 6$ unit²
- vi. What is the area of rectangle EFGH?
 $A = l \cdot w = 4 \times 6 = 24$ unit²

$$\frac{4 \text{ units}}{2 \text{ units}} = 2$$

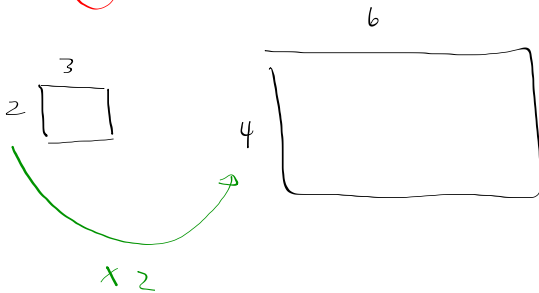
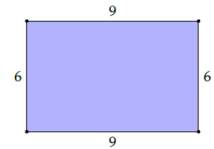
$$\frac{6}{3} = 2$$

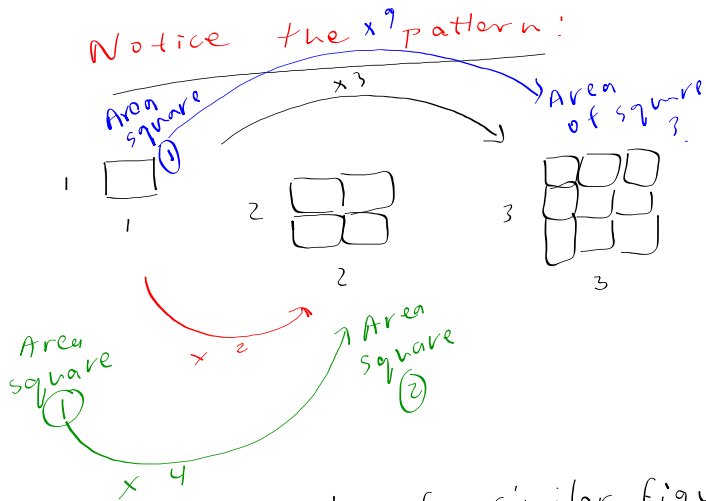
$$\frac{20}{10} = 2 \text{ units}$$

vii. What is the proportion between the areas of the rectangles? Now find the proportion between the area of the following two rectangles. Do you notice a pattern?

$$\frac{24}{6} = 4$$

$$\frac{24}{6} = 4$$



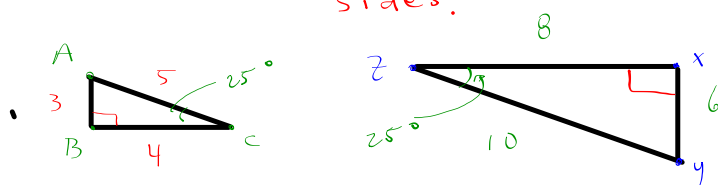


• When the length of a similar figure is $2x$, then the area is $4x$
 " " " " is $3x$, " " $9x$
 " " " " is $4x$, " " $16x$
 " " " " is $5x$, " " $25x$
 " " " " is $6x$, " " $36x$
 " " " " is kx , then the Area is k^2x

Constructing the Similar Ratio / Proportion / Fractions

↳ how? use corresponding sides!

← top / numerator
← bottom / denominator



$$\frac{\text{smallest of } \triangle B \triangle}{\text{smallest of } \triangle X \triangle} = \frac{\overline{XY}}{\overline{AB}} = \frac{\overline{ZY}}{\overline{AC}} = \frac{\overline{ZX}}{\overline{BC}}$$

← hypo of Big \triangle
← hypo of small \triangle

nota bene! Similar triangles have the same/congruent corresponding ratios. They also have congruent angles.

True for any 2D or 3D similar figure.

- i. $\frac{\text{corresponding side } ①}{\text{corresponding side } ②} = k$
- ii. $\frac{\text{area of figure } ①}{\text{area of figure } ②} = k^2$
- iii. $\frac{\text{volume of figure } ①}{\text{volume of figure } ②} = k^3$

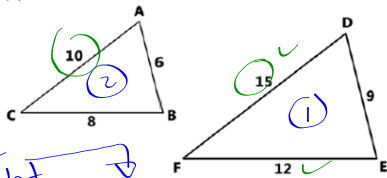
Determining if Figures are Similar

1.2.1 Example

Determine whether the following figures are similar. If they are similar, determine the scale factor = k

k:

(a)



how, you must check that all ratios are equal!

$$\frac{15}{10} = 1.5$$

$$\frac{9}{6} = 1.5 \therefore \text{the D's are similar}$$

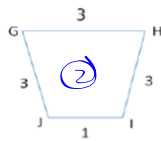
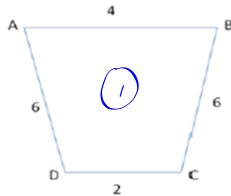
$$\frac{12}{8} = 1.5$$

scale factor (k) and $k=1.5$

ratio of similitude

not right since k is small or big

$$10 : 6 = \frac{10}{15} =$$



$$\frac{4}{3} = 1.3$$

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

the figures are NOT similar

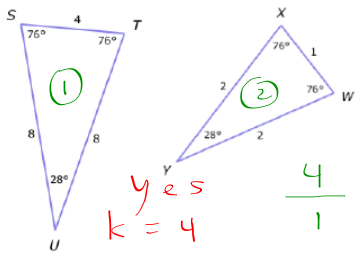
You do pg 2 and 3.

take up @ 12:35

1.2.2 Practice

Determine whether the following figures are similar. If they are similar, determine the scale factor k :

(a)

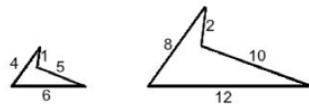


yes
 $k = 4$
 $k = \frac{1}{4}$

$$\frac{4}{1}$$

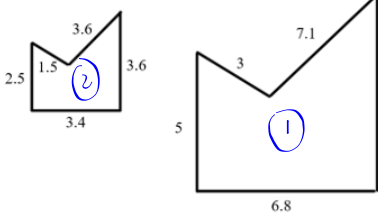
$$\frac{8}{2} = k$$

(b)



yes!
 $k = 2$
 or
 $k = \frac{1}{2}$

(c)



no they are not similar

$$\frac{6.8}{3.4} = 2$$

$$\frac{5}{2.5} = 2$$

$$\frac{7.1}{3.6} = 1.972$$

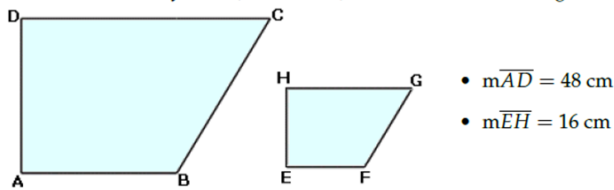
(not rounding)

$$\approx 1.97$$

(rounding)

1.3.1 Example

Determine the similarity ratio (scale factor) k between the following two similar figures:



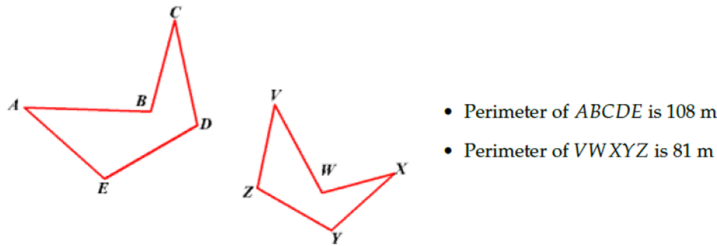
$$k = \frac{\text{side } \textcircled{1}}{\text{side } \textcircled{2}}$$

$$k = \frac{48}{16}$$

$$k = 3$$

1.3.2 Example

Determine the similarity ratio (scale factor) k between the following two similar figures:



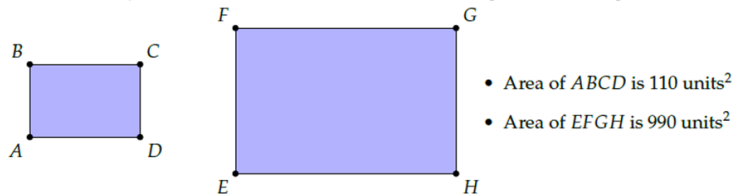
$$k = \frac{\text{perimeter } \textcircled{1}}{\text{perimeter } \textcircled{2}}$$

$$k = \frac{108}{81} \text{ or } k = \frac{81}{108}$$

$$k = \frac{4}{3} \quad k = \frac{3}{4}$$

1.3.3 Example

Determine the similarity ratio (scale factor) k between the following two similar figures:



$$k = 3$$

$$k^2 = \frac{\text{area } \textcircled{1}}{\text{area } \textcircled{2}}$$

$$k^2 = \sqrt{\frac{990}{110}}$$

$$k = 3$$

mini task: Solving for unknowns

- take notes + use given info
- translate sentences into equation.

$k = \frac{\text{side}}{\text{side}}$

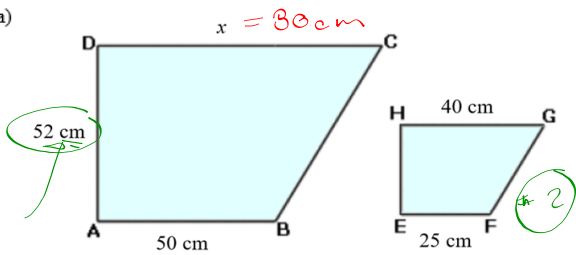
$k^2 = \frac{\text{area}}{\text{area}}$

$k^3 = \frac{\text{vol}}{\text{vol}}$

which one out of 3 → BASED ON Given INFO.

1.4.1 Example: Determine the missing measurement(s) given that the two figures are similar.

(a)



WANT: x

TOOL: $k = \frac{\text{side}}{\text{side}}$

$k = \frac{DG}{HG}$

INFO: $HG = 40$ $k = ?$

#1

WANT: k

TOOL: $k = \frac{\text{side}}{\text{side}}$

$k = \frac{AB}{EF}$

INFO: have all of it

↑ start with here

$k = \frac{AB}{EF}$

$k = \frac{50}{25}$

$k = 2$

find x sub $k=2$
 $k = \frac{DG}{HG}$ $HG = 40$

$40 \times 2 = \frac{x}{40} \times 40$. simplify . solve for x

$x = 80 \text{ cm}$

→ put answer back on graph to check

Solving emphasis on cross-multiplying

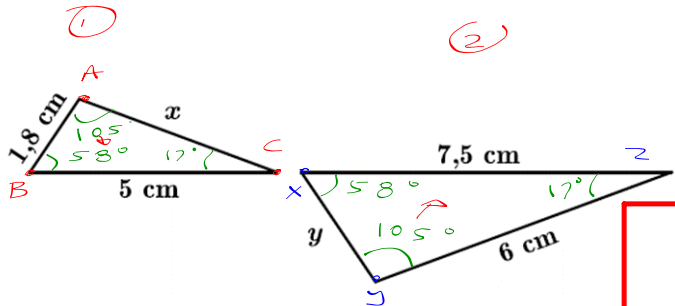
Find x and y .

b)

tips:

label
and

measure angles.



find x :

$$k = \frac{\text{side}}{\text{side}}$$

find k :

$$k = \frac{\text{side}}{\text{side}}$$

$$k = \frac{7.5}{5}$$

figure 2

figure 1

$$k = \frac{7.5}{5}$$

$$\frac{7.5}{5} = \frac{x}{6}$$

figure 1
X or
figure 2

$$\frac{7.5}{5} = \frac{6}{x}$$

figure 2
figure 1

$$\frac{7.5 \times x}{7.5} = \frac{(6 \times 5)}{7.5}$$

$$x = 4$$

find y :

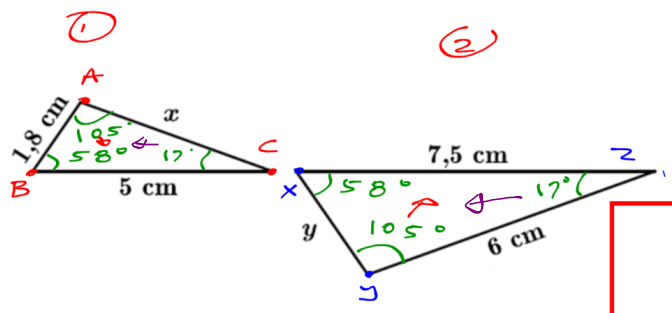
$$k = \frac{\text{side}}{\text{side}}$$

$$k = \frac{7.5}{5} \left\{ \begin{array}{l} \leftarrow \text{Big } \Delta \\ \leftarrow \text{Small } \Delta \end{array} \right.$$

$$\frac{y}{1.8} = \frac{7.5}{5}$$

$$5 \times y = (7.5 \times 1.8)$$

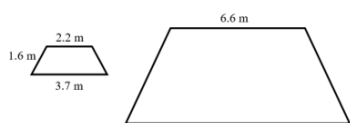
$$y = 2.7$$



check \bar{w} graph
you do pg 4 and 5
try the BONUS.

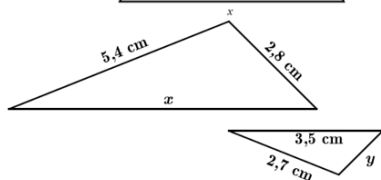
1.4.2 Practice: Determine the missing measurement(s) given that the two figures are similar.

(a)



$x = 11.1 \text{ m}$

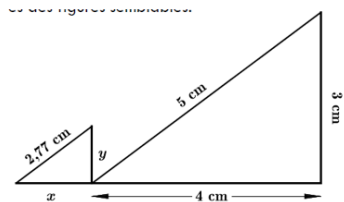
(b)



$x = 7 \text{ cm}$

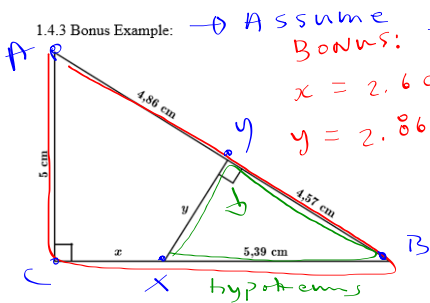
$y = 1.4 \text{ cm}$

(c)



$x = 2.216 \text{ cm}$

$y = 1.662 \text{ cm}$



Bonus:
 $x = 2.6$ cm
 $y = 2.86$ cm

$$k = \frac{\text{side}}{\text{side}}$$

$$k = \frac{\overline{AB}}{x\overline{B}}$$

$$k = \frac{(4.86 + 4.57)}{5.39}$$

$$k = 1.75 \quad \rightarrow \text{since } k > 1 \text{ then } \frac{\text{Big Figure}}{\text{Small Figure}}$$

$$1.75 = \frac{5}{y} \quad \text{cross multiply to get } y \text{ out of bottom}$$

$$y \cdot 1.75 = 5 \quad \text{solve}$$

$$y = 2.86 \text{ units}$$

$$k = \frac{\overline{CB}}{y\overline{B}}$$

sub $k = 1.75$

$$\overline{CB} = x + 5.39$$

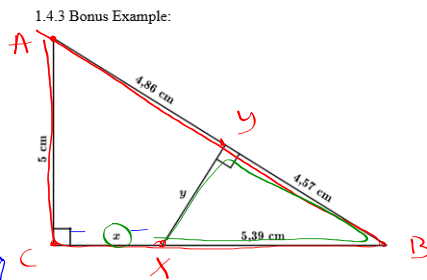
$$y\overline{B} = 4.57$$

$$1.75 = \frac{(x + 5.39) \times 4.57}{4.57} \quad \text{solve}$$

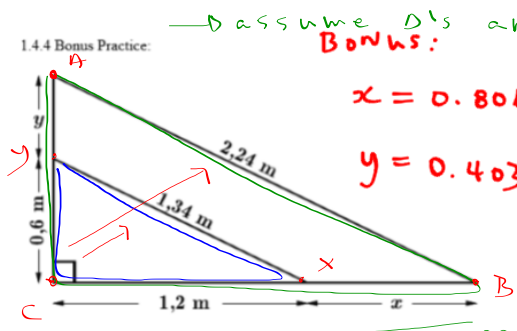
$$7.9975 = x + 5.39 \quad - 5.39$$

$$2.6075 = x$$

$$x = 2.61$$



$$k = \frac{\overline{AC}}{x\overline{Y}} \quad \rightarrow \text{smallest of } B \Delta \rightarrow \text{smallest of } S \Delta$$



→ assume D's are similar.

Bonus:

$x = 0.806$

$y = 0.403$

$k = \frac{\text{side}}{\text{side}}$

$k = \frac{1.34}{2.24}$

$k = 0.6$ if $k < 1$ then small figure big figure

$k = \frac{\overline{CD}}{\overline{CB}}$
 $\overline{CD} = 1.2$
 $\overline{CB} = 1.2 + x$

$\frac{0.6}{1} = \frac{1.2}{1.2 + x}$

$0.6 \times (1.2 + x) = 1.2$

$0.72 + 0.6x = 1.2$
 -0.72 solve for x

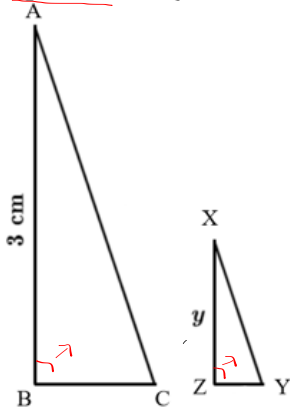
$0.6x + 0.72 = 1.2$
 -0.72

$\frac{0.6x}{0.6} = \frac{0.48}{0.6}$

$x = 0.8$



2.1.1 Example: The two triangles are similar. Line segment XY is 0.3 times line segment AC. Find y.



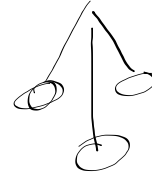
mini-task (2D)

tips: take notes

$$k = \frac{\text{side (1)}}{\text{side (2)}}$$

$$k^2 = \frac{\text{area (1)}}{\text{area (2)}}$$

- find tools/equation based on given
- translate sentences into equations (to find values of unknowns)



$$\overline{XY} = 0.3 \times \overline{AC}$$

$$\frac{\overline{XY}}{\overline{AC}} = 0.3 \times \frac{\overline{AC}}{\overline{AC}}$$

$$\frac{\overline{XY}}{\overline{AC}} = 0.3 \quad \leftarrow k$$

find y: which tool/equation

$$k = \frac{\overline{AB}}{\overline{XZ}}$$

X
since
 $k < 1$

$$k = \frac{\overline{XZ}}{\overline{AB}}$$

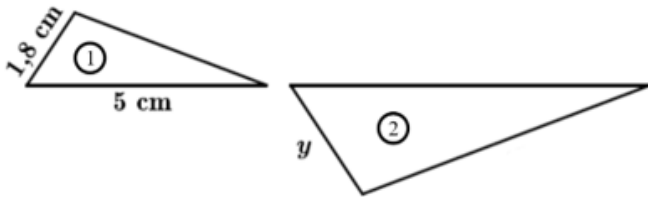
small B
big B
since $k = 0.3$

$$k = \frac{\overline{XZ}}{\overline{AB}}$$

$$3 \times 0.3 = \frac{y}{3} \times 3$$

$$y = 0.9 \text{ cm}$$

2.1.2 Example: The two triangles are similar. The area of the large triangle is 4 times greater than the area of the small triangle. Find y .



$$k = \frac{\text{side}}{\text{side}}$$

$$k^2 = \frac{\text{area}}{\text{area}}$$

$$A_2 = 4 \times A_1$$

cat = chat

cat = ibi

chat = ibi

$$\frac{A_2}{A_1} = \frac{4 \times A_1}{A_1}$$

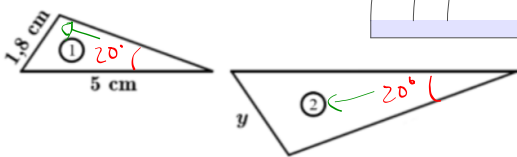
$$\frac{A_2}{A_1} = 4$$



find y :

$$k = \frac{\text{side}}{\text{side}}$$

$$k = \frac{y}{1.8}$$



$$\sqrt{4} = \sqrt{k^2}$$

$$2 = k$$

You do:

2.1.3
2.1.4

$$1.8 \times \frac{2}{1} = \frac{y}{1.8} \times 1.8$$

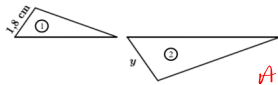
$$y = 3.6 \text{ cm}$$

nota bene:

if $k < 1$, small figure
big figure

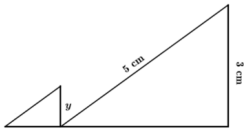
if $k > 1$, big figure
small figure

2.1.3 Practice: The two triangles are similar. The area of the triangle 1 is 0.36 times the area of triangle 2. Find y .



ANS:
 $y = 3$

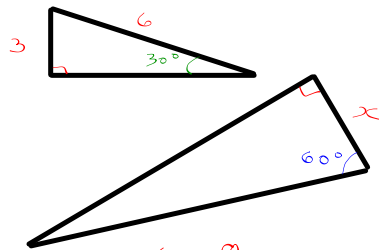
2.1.4 Practice: The two triangles are similar. The perimeter of the larger triangle is 1.6 times greater than the perimeter of the smaller triangle. Find y .



ANS:
 $y = 1.875$

2.1.5. a) Practice

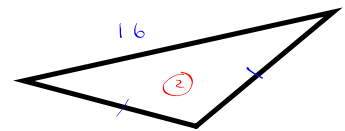
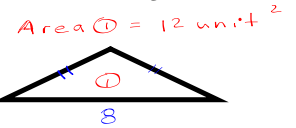
The 2 Δ 's are similar.
The area of the larger Δ is 9 times the area of the smaller Δ .
Find x .



ANS: $x = 9$

2.1.5b) Practice.

The 2 triangles are similar. What's the area of triangle 2?



ans:
 $A_2 = 48 \text{ units}^2$