Lesson 11.1 - Dilations

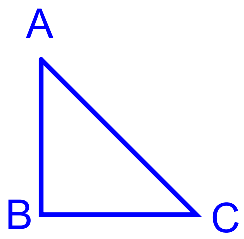
Key concepts:

Scale Factor

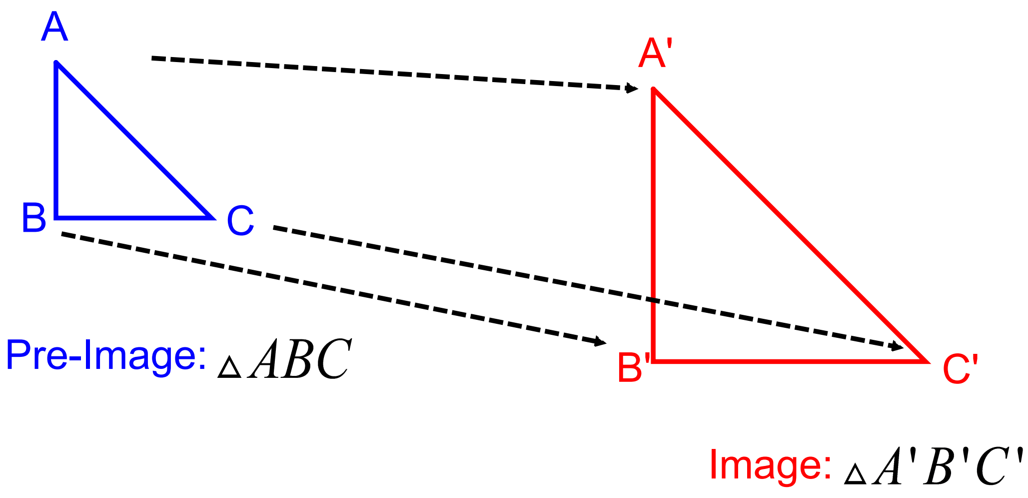
Center of Dilation

Similarity

A dilation changes the size of a figure.



Pre-Image: $\triangle ABC$

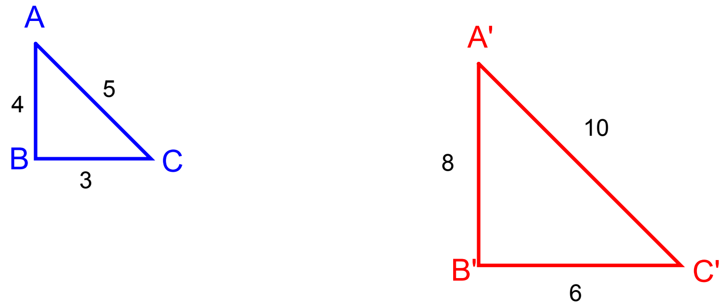


What does a dilation NOT change?

SHAPE!

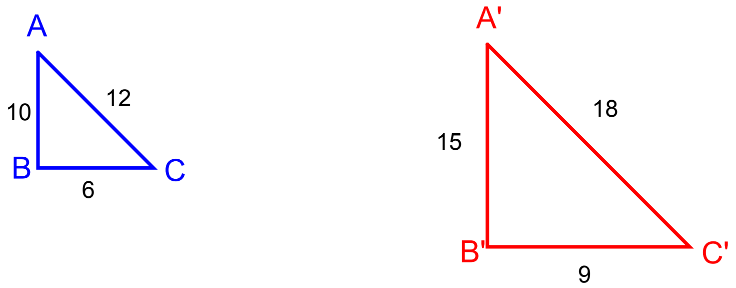
A dilation must make all sides of a shape larger (or smaller) by the exact same amount.

This amount is called the SCALE FACTOR.

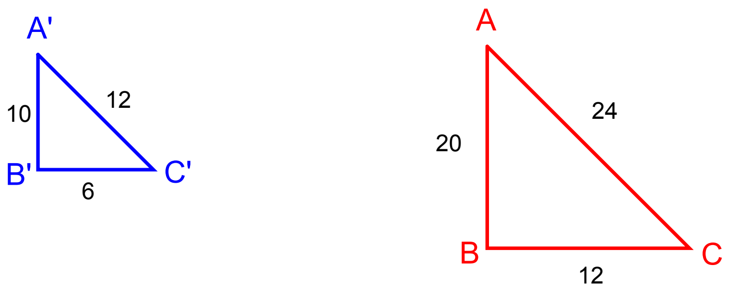


What is the scale factor that transforms the pre-image in blue to the image in red?

What is the scale factor that transforms the pre-image in blue to the image in red?



What is the scale factor that transforms the pre-image in red to the image in blue?

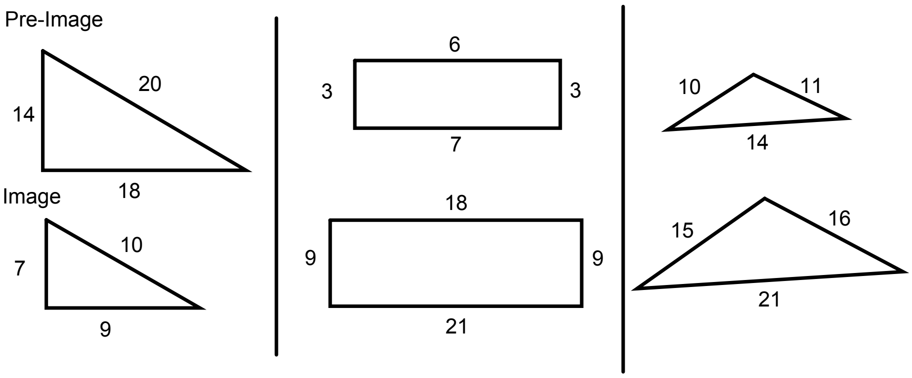


Scale Factor can be determined by the following formula:

$$\text{Scale Factor} = \frac{\text{Corresponding Side of Image}}{\text{Corresponding Side of Pre-Image}}$$

For a transformation to be a dilation, the scale factor must be the same for each corresponding part of the pre-image and image.

Determine which of the following transformations represents a dilation and which does not. Determine Scale Factor where appropriate.



Scale Factor can also be thought of as the constant being used to multiply the x and y coordinates when using coordinate notation for a transformation.

Example - Dilating by a scale factor of 2 is the same as:

$(x,y) \longrightarrow (2x, 2y)$

Which of the following represent a dilation?

(x,y) ⟶ (3x, 2y)

(x,y) ⟶ (1.5x, 1.5y)

(x,y) ⟶ (1/2x, 1/2y)

(x,y) ⟶ (3x, 1/3y)

Which of the following represent a dilation?

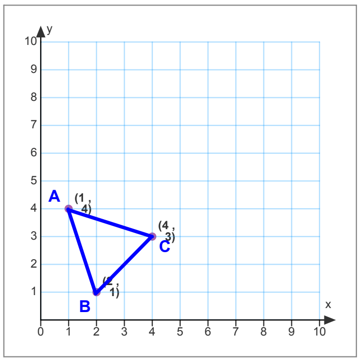
~~(x,y) ⟶ (3x, 2y)~~

(x,y) ⟶ (1.5x, 1.5y)

(x,y) ⟶ (1/2x, 1/2y)

~~(x,y) ⟶ (3x, 1/3y)~~

Dilation on a coordinate plane, example:



Transform pre-image ABC to image A'B'C' using the following coordinate notation:

(x,y) ⟶ (2x, 2y)

A(1,4)................A'(   )

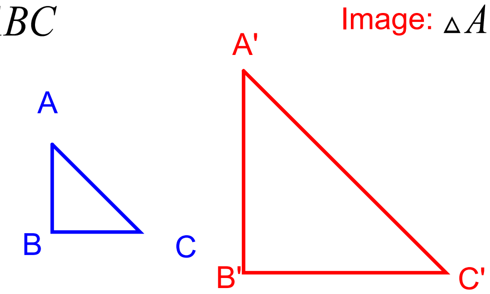
B(2,1)................B'(   )

C(4,3)................C'(   )

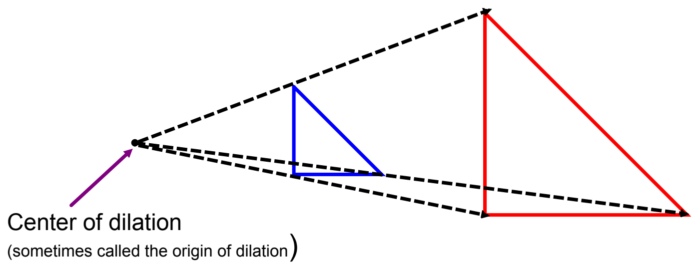
Center of Dilation

-When a shape is dilated, the center of dilation is the location from which the vector of dilation begins.

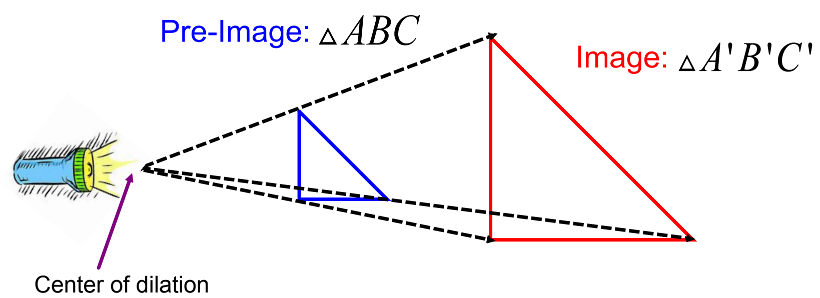
Pre-Image: $\triangle ABC$ Image: $\triangle A'B'C'$



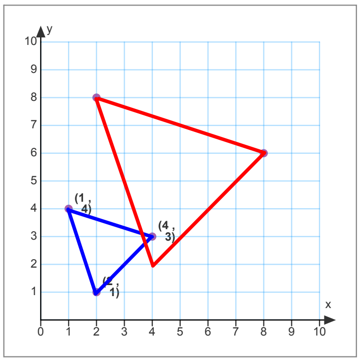
Pre-Image: $\triangle ABC$ Image: $\triangle A'B'C'$



Think of the center of dilation as the location where you might shine a flashlight from. The pre-image is then what you are shining your flashlight on, and your image is the shadow of the pre-image on a screen a certain distance away.



Here is the dilation from before - find the center of dilation.



Transform pre-image ABC to image A'B'C' using the following coordinate notation:

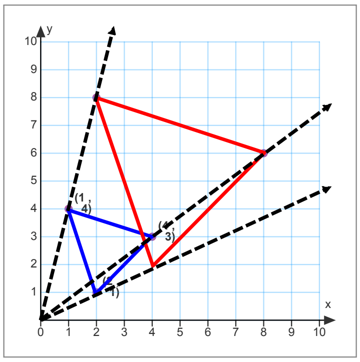
(x,y) ⟶ (2x, 2y)

A(1,4)................A'(2,8)

B(2,1)................B'(4,2)

C(4,3)................C'(8,6)

Here is the dilation from before - find the center of dilation.



The CENTER of DILATION is at the origin: (0,0)

Similarity, lesson 11.4

Two figures are **similar** if all of their corresponding sides are in proportion, and their angle measures are all the same.

In other words, similar figures are the same shape but not necessarily the same size.

Dilations create similar figures.

The sides of similar figures must be in proportion; they must have the same:

SCALE FACTOR!

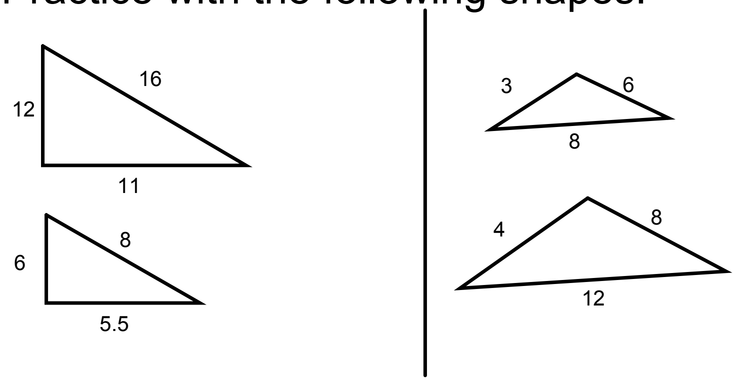
Similarity, Theorem 1

Side-Side-Side (SSS) Triangle Similarity Theorem

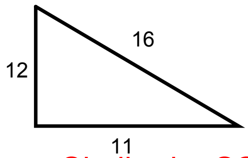
If the three sides of one triangle are proportional to the corresponding sides of another triangle, then the triangles are similar.

Check for SSS similarity by seeing if each pair of corresponding sides of two triangles have the same scale factor.

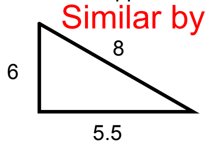
Practice with the following shapes:



Practice with the following shapes:



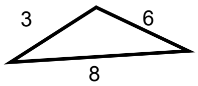
Similar by SSS



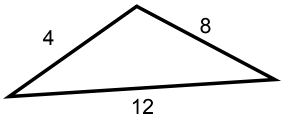
$\frac{12}{6} = 2$

$\frac{11}{5.5} = 2$

$\frac{16}{8} = 2$



Not Similar



$\frac{3}{4} = .75$

$\frac{6}{8} = .75$

$\frac{8}{12} = .\overline{6}$

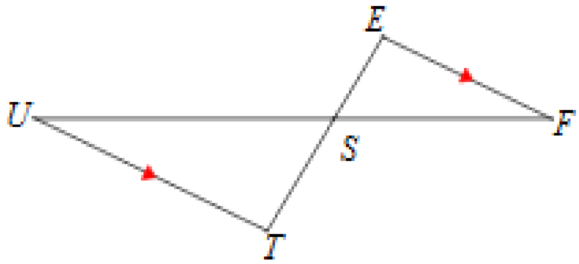
Similarity, Theorem 2

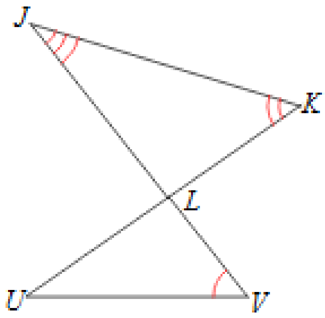
Angle-Angle (AA) Triangle Similarity Theorem

If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar.

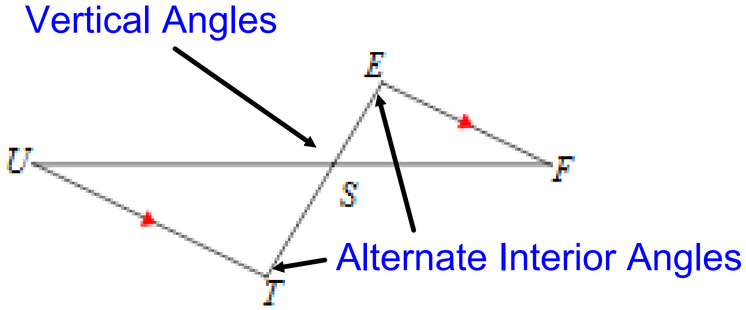
Check for angles labeled congruent, as well as vertical angles, and alternate interior angles.

Practice AA similarity:

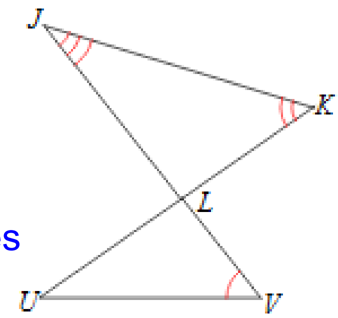




Practice AA similarity:

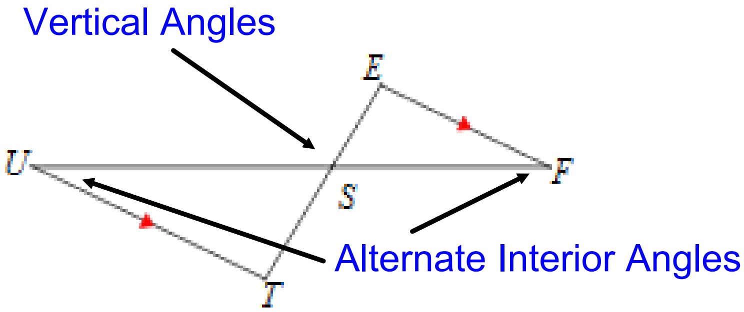


Similar by AA

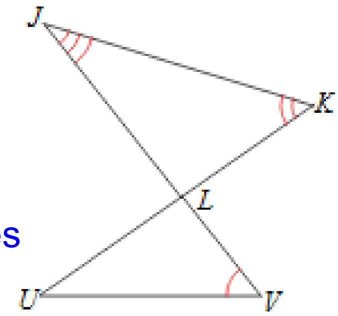


Not Similar

Practice AA similarity:



Similar by AA



Not Similar

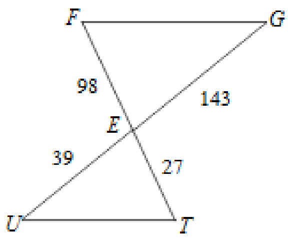
Similarity Theorem 3

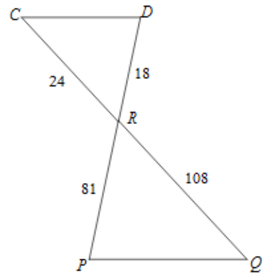
Side-Angle-Side (SAS) Triangle Similarity Theorem

If two sides of one triangle are proportional to the corresponding sides of another triangle and their included angles are congruent, then the triangles are similar.

Check for scale factor as well as one pair of congruent angles.

Practice SAS Similarity:

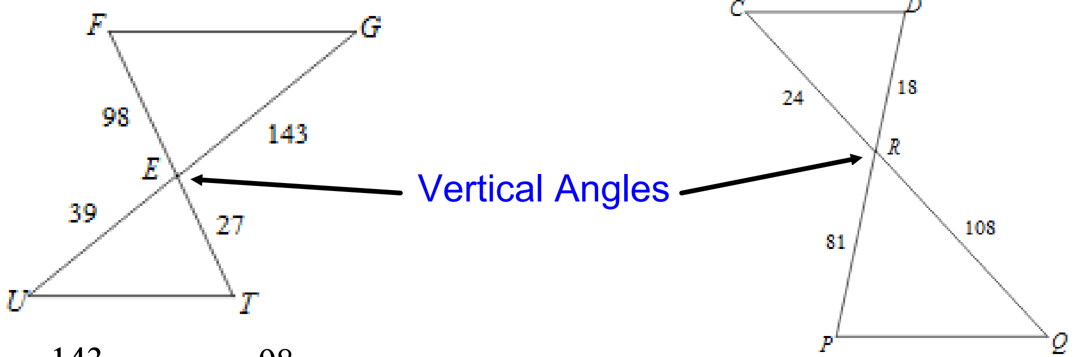




Practice SAS Similarity:

Not Similar

Similar by SAS



$\frac{143}{39} = 3.\overline{6}$ $\frac{98}{27} = 3.\overline{629}$

$\frac{108}{24} = 4.5$ $\frac{81}{18} = 4.5$

This week:

Friday - Module 11/12 test (Dilations, Similarity, and Proportions)

Thursday - quiz. An A on the quiz will give you a 5% bonus on your test.

Study Guides are by the door

Module 10 retake packets are by the door.

Must be COMPLETE for a retake.

Retakes by Friday, February 23

Today you will need:

Your notes

Your "textbook"

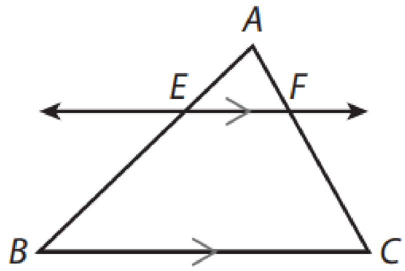
Module 12 - Proportional Relationships

-Triangle Proportionality Theorem

-Using Proportional Relationships to find missing lengths

Triangle Proportionality Theorem

$$\frac{AE}{EB} = \frac{AF}{FC}$$



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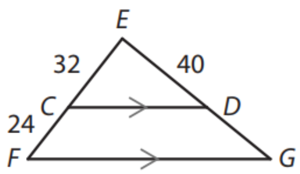
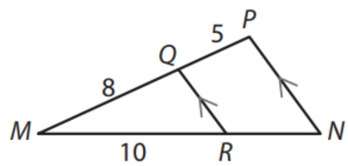
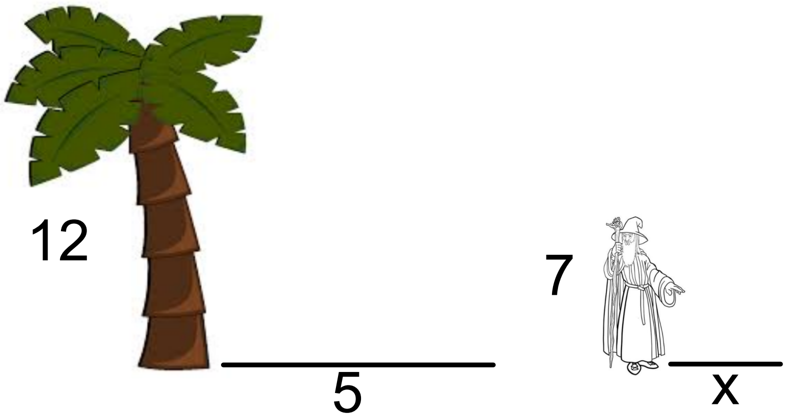
5. $\overline{DG}$



6. $\overline{RN}$





Do pages 657 and 658 - all problems

Today you will need your notes, and your study guide.

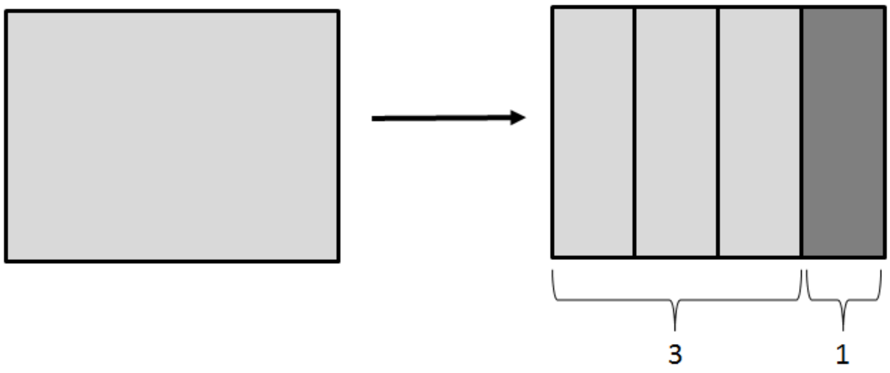
Quiz will be tomorrow (Wednesday)

Test Friday

11.2 - Ratios and Directed Line Segments

What does it mean to break something up by the ratio of 3 : 1?

A ratio of 3:1 means that one piece of the object we are breaking up is 3 times the size of the other piece.



How many total pieces of the same size do you actually have? ____________

Thus, think of a ratio in terms of a fraction with the denominator being the number of pieces you have:

Ratio of A : B = $\frac{A}{A+B}$ and $\frac{B}{A+B}$

So for the above ratio, your two pieces can be represented by two fractions:

Ratio of 3 : 1 = ——— and ———

Convert the following ratios into a pair of fractions:

2 : 1 ____________________________ 3 : 2 ________________________________

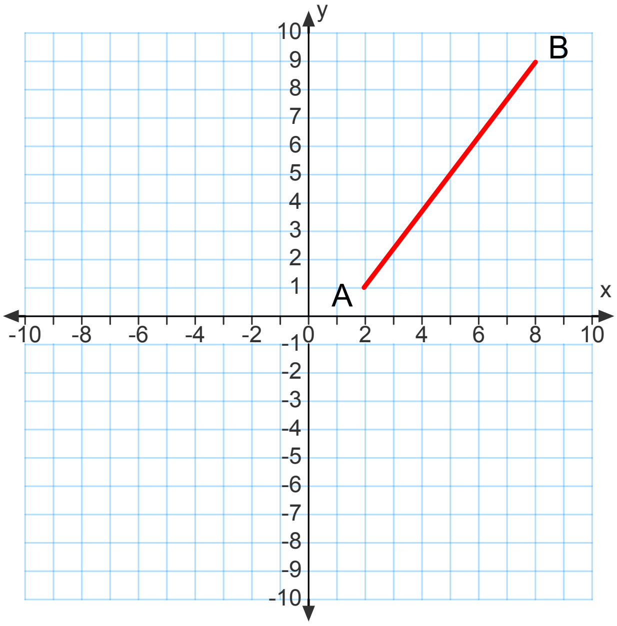
4 : 1 ____________________________ 5 : 3 ________________________________

1 : 7 ____________________________ 4 : 9 ________________________________

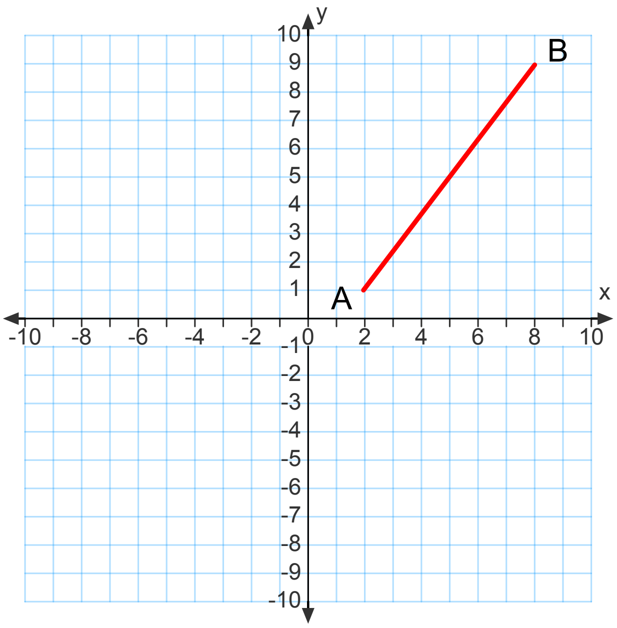
1 : 1 ____________________________ 12 : 3 _______________________________

Directed Line segment

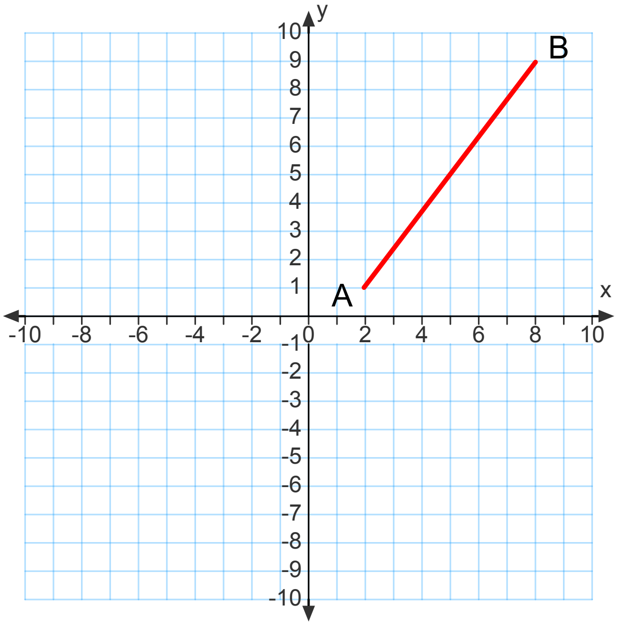
-Like a vector, a directed line segment has a beginning, a direction, and an end.



Directed line segment AB

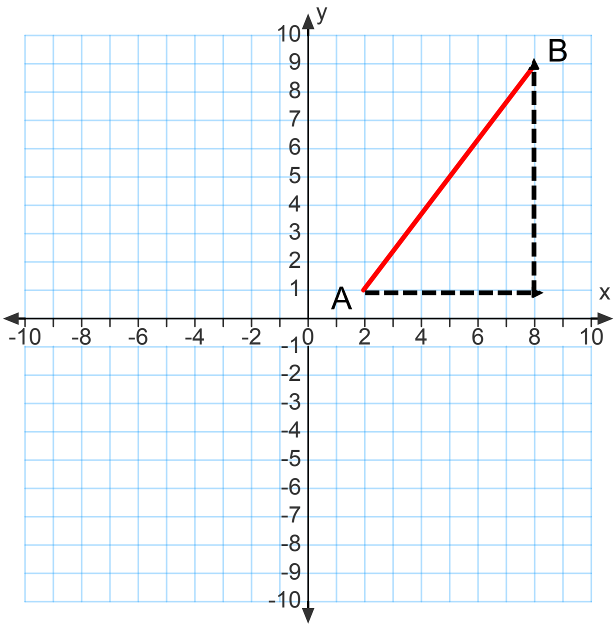


Partitioning a directed line segment means to use a ratio to go a certain distance from the beginning of the line segment to the end.



Example:

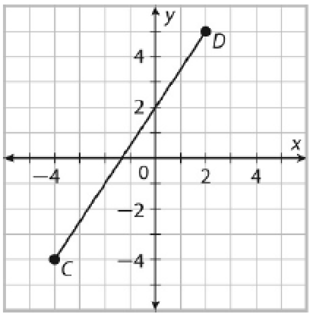
Partition AB by a ratio of 3:1 really means to go 3/4 of the way from A to B.



We do this by creating our right triangles, and going 3/4 of the way in the x direction and the y direction.

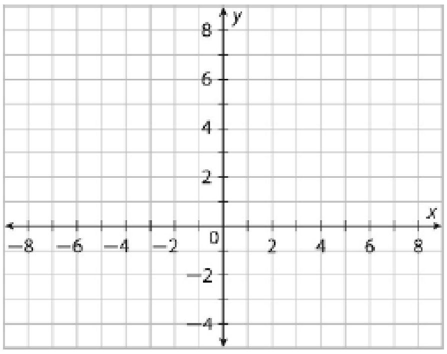
Grab the homework and let's practice.

Partition $\overline{CD}$ into a 2 to 1 ratio.



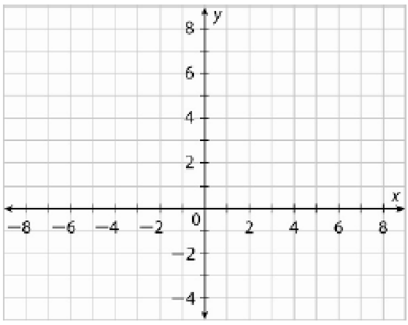
1. The coordinates of *C* are _______.
2. The coordinates of *D* are _______.
3. The rise from *C* to *D* is _______ units.
4. The run from *C* to *D* is _______ units.
5. With a 2 to 1 ratio, move _______ of the rise and _______ of the run to get to the point of partition.
6. Add _______ to the *x*-coordinate of *C* and _______ to the *y*-coordinate of *C* to get to the point of partition.
7. The coordinates of the point of partition are _______.
8. Plot the point of partition and label it *X*.

1. endpoints: $A(-4, -2)$, $B(1, 8)$
   ratio: 4 to 1



Q (______, ______)

2. endpoints: $S(-6, 6)$, $T(6, -2)$
   ratio: 1 to 4



Q (______, ______)