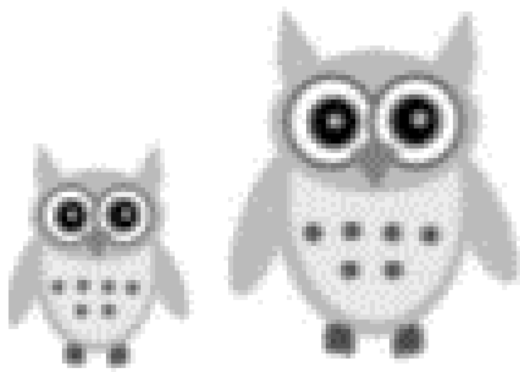
Name: ___________________________________

Geometry Period ________

Unit 7: Similarity



Part 2 of 2: Lessons 7-6 →7-9

In this unit you must bring the following materials with you to class every day:

- ✓ **Calculator**
- ✓ Pencil
- ✓ This Booklet
- ✓ A device
- ✓ Headphones!

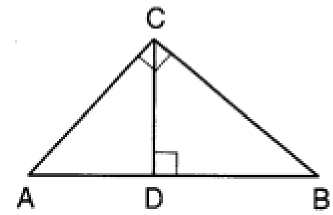
Please note:

- ❖ You may have random material checks in class
- ❖ Some days you will have additional handouts to support your understanding of the learning goals in that lesson. Keep these in a folder and bring to class every day.
- ❖ All homework for part one of this unit is in this booklet.
- ❖ Answer keys will be posted as usual for each daily lesson on our website

7-6 Proficiency Practice Day

Warm up:

In the diagram below, CD is the altitude drawn to hypotenuse AB of right triangle ABC. AB = 15 and AD = 3, solve for CD.



Organizing our thinking:

a) Which rule of SAASHLLS SHOULD you use? Why?

b) What segment length should you additionally add into your diagram to use this rule? Go for it!

C) Solve for CD!

You are going to be faced with problems today where you might have to consider an extra step, and take your time!

Every problem you are provided today is possible! They will require grit, persistence and a POSITIVE MINDSET!
Let's go over some tips before we begin:

Problem Solving Strategy #1: Multiple Choice Questions – Take your time and go through each answer choice to find the appropriate answer. Organize your work space (or scrap paper) in to sections for each multiple choice.

Problem Solving Strategy #2: When there are overlapping triangles re-draw with labels!

Problem Solving Strategy #3: Use color and highlight key features of diagrams.

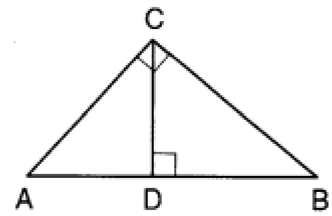
Problem Solving Strategy #4: Take time in reading your questions. Occasionally you get the "which of the following is not enough information"

Problem Solving Strategy #5: Annotate the question - - write notes to yourself before you dive into the problem

PROBLEM SOLVING STRATEGY #6: TRUST YOUR SKILLS, TRUST YOUR TEAM MATES AND STICK WITH IT!

READ FIRST: In multiple choice problems with SAAS HLLS, you have to test EACH choice until you get the answer that checks out. On your Regents, you will have to create your own "workspace" as you see below, REMEMBER, you have scrap paper!

1. In the diagram below, CD is the altitude drawn to hypotenuse AB of right triangle ABC.

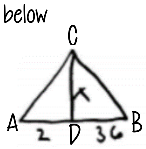


Which lengths would *not* produce an altitude that measures $6\sqrt{2}$?

(1) $AD = 2 \text{ and } DB = 36$ (3) $AD = 6 \text{ and } DB = 12$

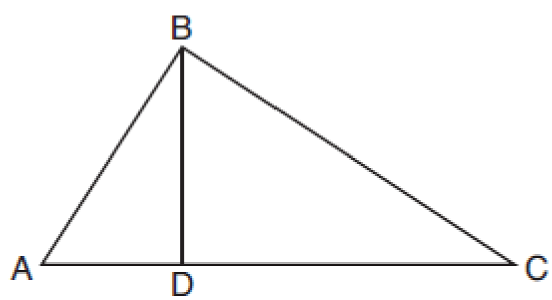
(2) $AD = 8 \text{ and } AB = 17$ (4) $AD = 3 \text{ and } AB = 24$

Work space:

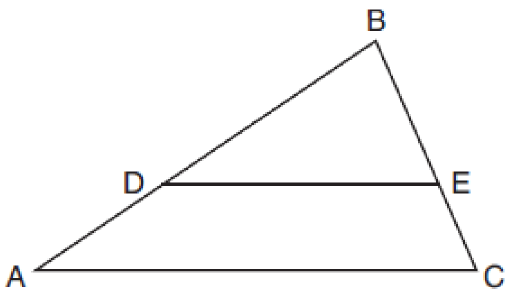
(1) * I used the original diagram for reference and filled into a mini diagram below  $\frac{2}{x} = \frac{x}{36}$ $x^2 = 72$ $\sqrt{72}$ $\boxed{6\sqrt{2}}$ 72 2 36 6 6	(2)
(3)	(4)

2. In the diagram below of right triangle *ABC*, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.

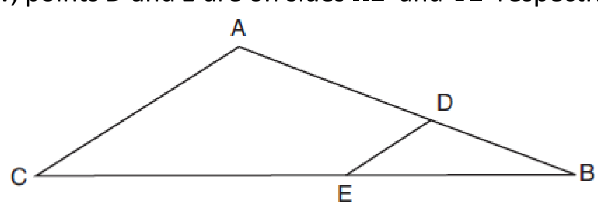
If $BD = 4$, $AD = x - 6$, and $CD = x$, what is the length of $\overline{CD}$?



3. In triangle *ABC*, points *D* and *E* are on sides $\overline{AB}$ and $\overline{BC}$, respectively, such that $\overline{DE} \parallel \overline{AC}$, and $AD:DB = 3:5$. If $DB = 6.3$ and $AC = 9.4$, what is the length of $\overline{DE}$, to the *nearest tenth*?



4. In the diagram of $\triangle ABC$ below, points *D* and *E* are on sides $\overline{AB}$ and $\overline{CB}$ respectively, such that $\overline{DE} \parallel \overline{AC}$.



If *EB* is 3 more than *DB*, $AB = 14$, and $CB = 21$.

a) What is the length of DB?

What is the length of AD?

7-6 Homework

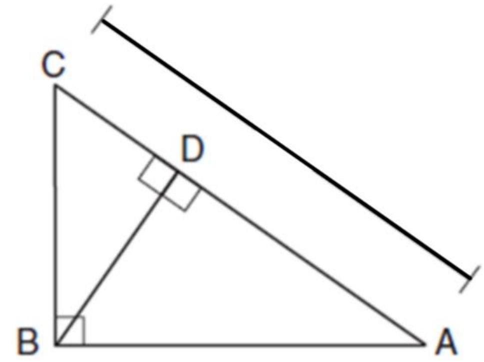
1. In the diagram below of $\triangle ABC$, $\angle ABC$ is a right angle, AC = 20, AD = 16 and altitude BD is drawn. What is the length of $\overline{BC}$?

1) $4\sqrt{2}$

2) $4\sqrt{3}$

3) $4\sqrt{5}$

4) $4\sqrt{6}$

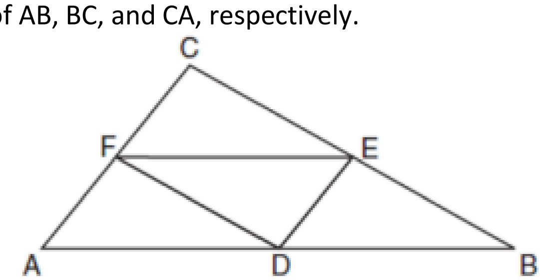


2. In the diagram below of triangle ABC, D, E and F are the midpoint of AB, BC, and CA, respectively.

special!

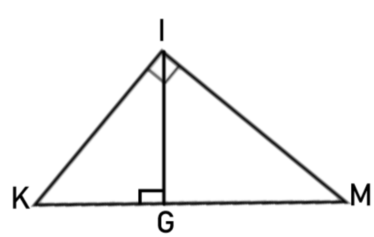
What is the ratio of the area of $\triangle CFE$ to the area of $\triangle CAB$?

1) 1:1
2) 1:2
3) 1:3
4) 1:4



Hint: Go back to Problem Solving Strategy #3 and 5!

3. In the diagram below of right triangle KMI, altitude IF is drawn to hypotenuse KM. If KG = 9 and IG = 12, determine and state the length of IM.

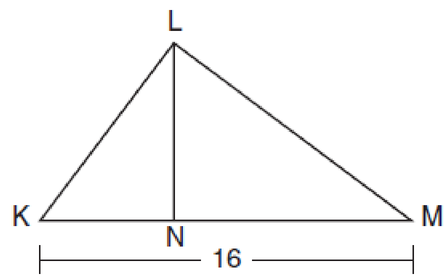


This concept is on the regents every year…

4. The coordinates of the endpoints of $\overline{AB}$ are $A(-8,-2)$ and $B(16,6)$. Point *P* is on $\overline{AB}$. What are the coordinates of point *P*, such that $AP{:}PB$ is 3:5?

1) $(1,1)$
2) $(7,3)$
3) $(9.6,3.6)$
4) $(6.4,2.8)$

5. Kirstie is testing values that would make triangle *KLM* a right triangle when $\overline{LN}$ is an altitude, and $KM = 16$, as shown below.



Which lengths would make triangle *KLM* a right triangle?

1) $LM = 13$ and $KN = 6$
2) $LM = 12$ and $NM = 9$
3) $KL = 11$ and $KN = 7$
4) $LN = 8$ and $NM = 10$

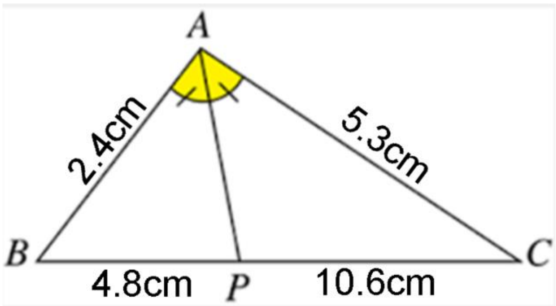
Set up your work space here:

7-7 Notes

Angle Bisector Theorem

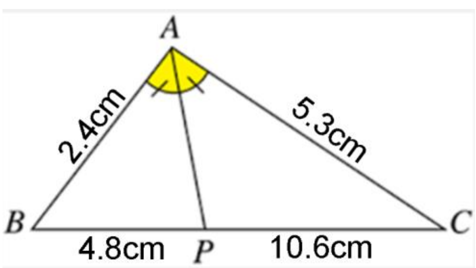
Today's Goals: How can we use the angle bisector theorem to find missing segments in a given triangle?

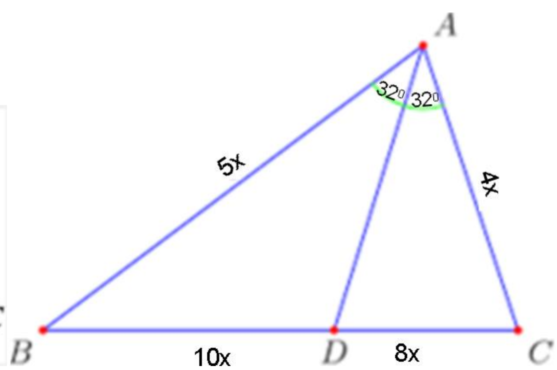
Together!

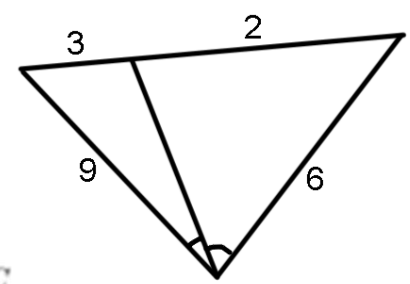


What type of segment is AP? How do you know?

With a partner!



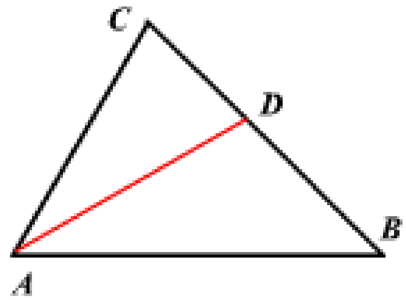




- **What do all three diagrams above have in common?**

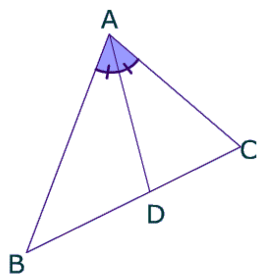
- **Do you notice any relationships that exist?**

ANGLE BISECTOR THEOREM: An ________________ of a vertex angle in a triangle divides the ____________ side in two segments that are ________________ to the other two sides of the triangle.



LET'S TRY SOME:

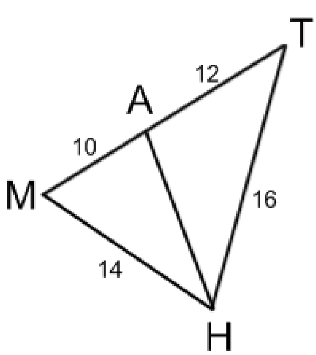
1. Given that $\overline{AD}$ is the angle bisector of $\angle BAC$, $\overline{AD}$ divides the sides of the triangle proportionally. This proportion can be represented as,



______________ = _____________

***Is is true that AB * DC = AC * BD? Explain why.**

2. Look at the measurements given below to determine if $\overline{AH}$ *is* or *is not* an angle bisector. *Explain your reasoning.*

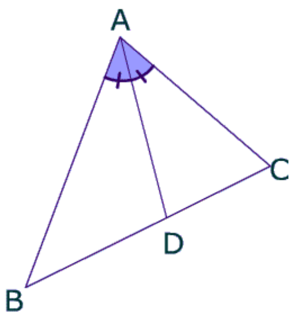


Stations Practice - Work Space

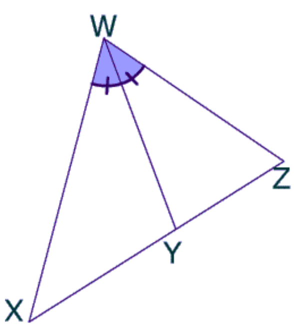
Stations Practice - Work Space

7-7 Homework

1. Use the angle bisector theorem to find the missing side length of the segment in the triangle below:
CA = 12, CD = 6, BA = 15, DB = ?



2. What is the length of WX in the triangle below, given that WZ = 24, ZY = 12, XY = 15.



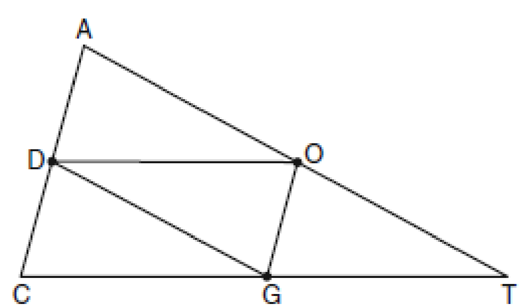
3. In the diagram below of $\triangle ACT$, *D* is the midpoint of $\overline{AC}$, *O* is the midpoint of $\overline{AT}$, and *G* is the midpoint of $\overline{CT}$. If AC = 20, AT = 36, and CT = 22, what is the perimeter of parallelogram *CDOG*?

1) 42

2) 50

3) 78

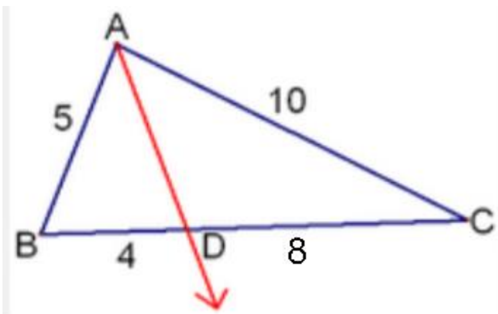
4) 32



4. Factor: $8y^3z + 16xy$

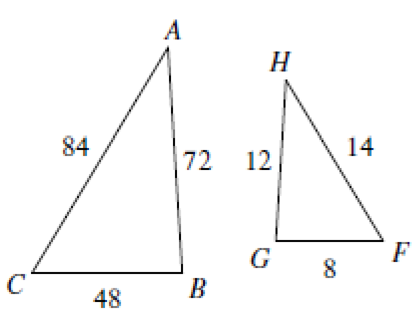
5. Solve: $z^2 - 2z = 24$

6. Is AD an angle bisector? Explain why or why not.



Follow up: can we identify a shortcut method that would allow us to conclude that $\Delta ABD \sim \Delta ACD$?

7. Using properties of similarity and specific vocabulary we've learned in this unit, describe why the two triangles below are similar to each other.



7-8 Notes

Mean Proportional and Angle bisector Theorem Practice

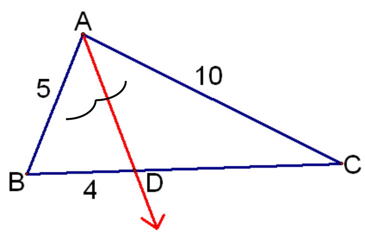
Today's goal: How do we apply what we know about right triangle ratios and angle bisector ratios?

Do now- on your own!

SAASHLLS VS ANGLE BISECTOR THEOREM

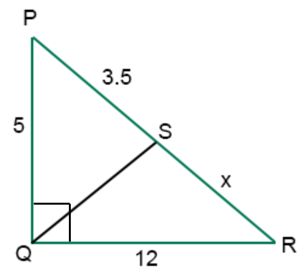
Examine the problems below, IDENTIFY which theorem you would use to solve for x and explain what helped you identify it. *DO NOT ACTUALLY SOLVE.*

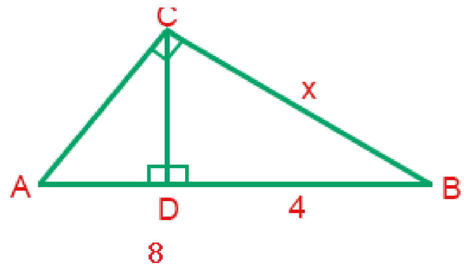
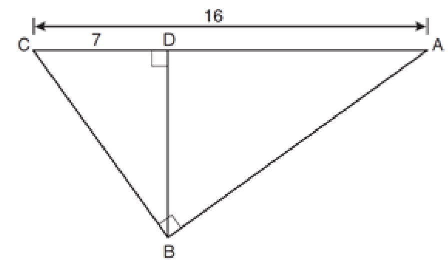
1.. Solve for x



x

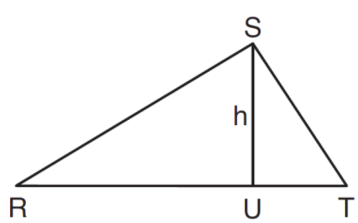
2. $\measuredangle PQS \cong \measuredangle RQS$, solve for x



3. Solve for x 	**4.** In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$, $AC = 16$, and $CD = 7$.  Solve for DB.

Working backwards! Identifying SAASHLLS

In $\triangle RST$ shown below, altitude $\overline{SU}$ is drawn to $\overline{RT}$ at *U*.



If $SU = h$, $UT = 20$, and $RT = 45$, which value of *h* will make $\triangle RST$ a right triangle with $\angle RST$ as a right angle?

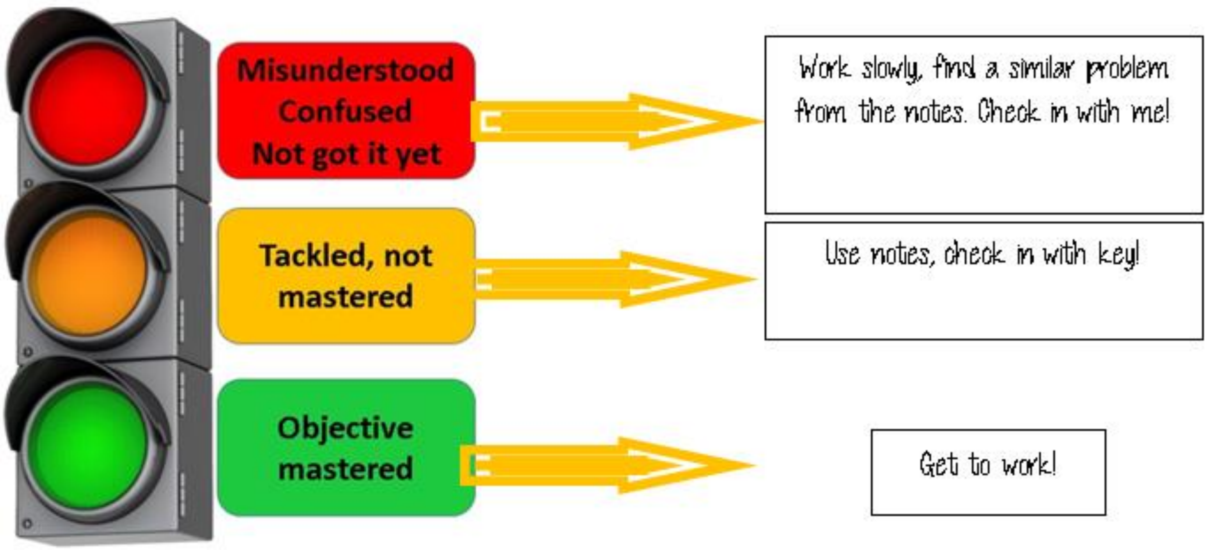
1) If triangle RST *were* a right triangle with a right angle at $\angle RST$ and an altitude drawn to RT (its hypotenuse) , what proportions would exist?

2) We are solving for a value of *h* , which proportion should we use in this case?

Therefore:

If *h* is ________ →the proportion ________________ would be true,→ $\Delta\ RST$ ***must*** be ______________.

SELF ASSESS FOR SUCCESS!

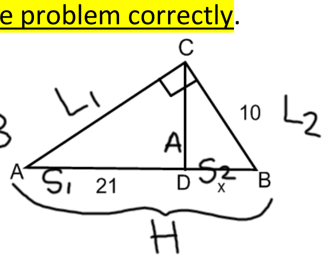


7-8 PRACTICE FOR SUCCESS!

CHECK IN WITH ANSWER KEY AT THE END OF EACH PAGE!

1) **Directions:** The following problem and solution comes from a student's geometry test. The student did not receive full credit for this work. Analyze the solution, by *explaining in words*, what the student did correctly and incorrectly. Then, solve the problem correctly.

Find CD



Leg Rule to find DB

$\frac{H}{L} = \frac{L}{S}$

$\frac{21+x}{10} = \frac{10}{x}$

$x(x+21) = 100$

$x^2 + 21x - 100 = 0$

$(x+25)(x-4) = 0$

$x+25=0 \quad x-4=0$

$\cancel{x=-25} \quad x=4$

$DB = 4$

Altitude Rule to find CD

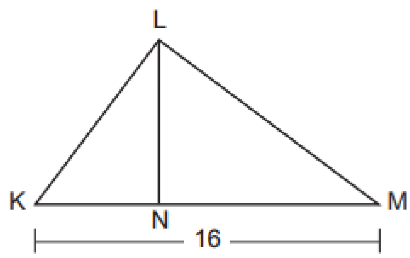
$\frac{21}{A} = \frac{4}{A}$

$\frac{21A}{4} = \frac{4A}{4}$

$5.25A = A$???

2) The altitude to the hypotenuse of a right triangle divides the hypotenuse into segments with lengths in the ratio 1:2. The length of the altitude is 8. How long is the hypotenuse to the nearest whole number?

3) Kirstie is testing values that would make triangle KLM a right triangle when $\overline{LN}$ is an altitude, and $KM = 16$, as shown below.

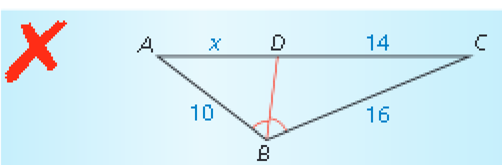


Which lengths would make triangle KLM a right triangle?

(1) $LM = 13$ and $KN = 6$ (3) $KL = 11$ and $KN = 7$

(2) $LM = 12$ and $NM = 9$ (4) $LN = 8$ and $NM = 10$

4) a) **ERROR ANALYSIS** Describe and correct the error in solving for x.

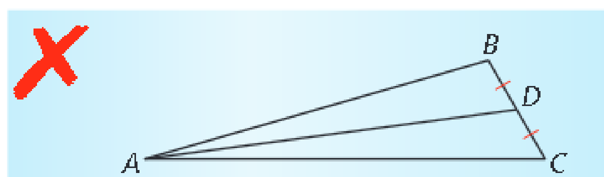


$$\frac{AB}{BC} = \frac{CD}{AD} \Rightarrow \frac{10}{16} = \frac{14}{x}$$

$$10x = 224$$

$$x = 22.4$$

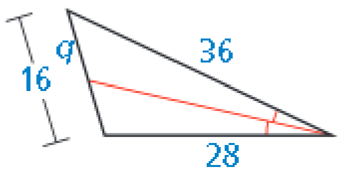
b) **ERROR ANALYSIS** Describe and correct the error in the student's reasoning.



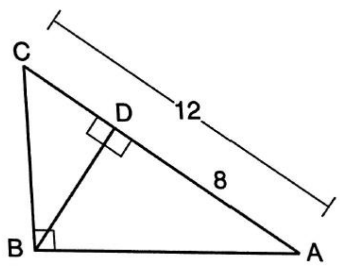
Because $\frac{BD}{CD} = \frac{AB}{AC}$ and $BD = CD$, it follows that $AB = AC$.

Check Answer key!

5) Solve for q.



6) In the diagram below of $\triangle ABC$, $\angle ABC$ is a right angle, $AC = 12$, $AD = 8$, and altitude $\overline{BD}$ is drawn.



What is the length of $\overline{BC}$? In simplest radical form

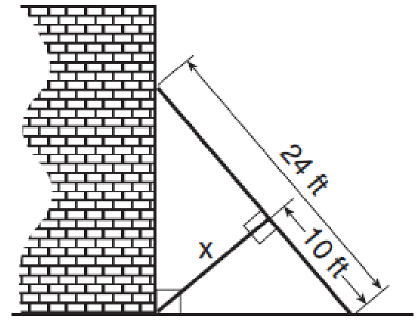
Check Answer key!

7-8 Homework

Directions: Answer all of the questions on the assignment to the best of your ability. Show all work.

1. The accompanying diagram shows a 24-foot ladder leaning against a building. A steel brace extends from the ladder to the point where the building meets the ground. The brace forms a right angle with the ladder.

What is the length of the steel brace in simplest radical form?



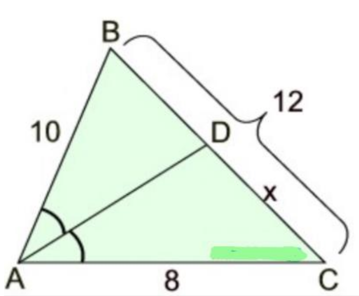
How far is the bottom of the ladder from the wall? (label it y)

2. In triangle DEF, the altitude $\overline{EG}$ is drawn in to hypotenuse $\overline{DF}$. Leg $\overline{DE}$ is 10 inches long. If $\overline{GF}$ is 10 inches longer than $\overline{DG}$, what is the length of the hypotenuse $\overline{DF}$?

3. If $\triangle ABC \sim \triangle ZXY$, m $< A = 30$ and m $< C$ = 70, what is $m\angle X$?

4. The ratio of the perimeters of two similar triangles is 3:7. Find the ratio of the **areas** and the **sides**.

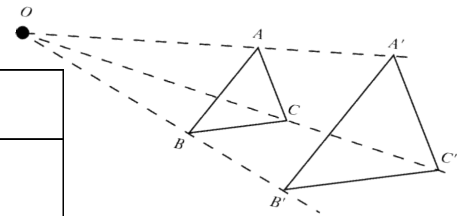
5. Solve for the value of x . Round to the nearest tenth.



NOW Go to our classroom and watch the EDPUZZLE video . There will be no lesson in class on this content you are responsible for understanding it prior to our next lesson.

Learning Goal: What type of transformation is ***dilation***? What is important vocabulary we should know moving forward?

Vocab to Know about Dilations



Term	Definition
DILATION	A transformation that ___________________ or _______________ the size of a geometric figure
	Used to measure the distances to the pre-image and the dilation image. The point a pre-image in a dilation expand/shrinks from
	Ratio of the distance/length of the image over the pre-image Typically uses the symbol, ***k***.

Facts to Know about Dilations

1) Since corresponding sides are multiplied by the same scale factor in a dilation, the pre-image and image will always be ______________________________ by ________________

2) The center of dilation, a pre-image point, and its corresponding image points are all ______________________.

This means that they are _____________________________

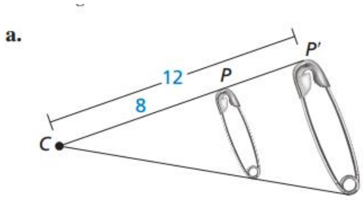
3) The notation for **dilation** is: ____________ *Center of dilation will always be specified

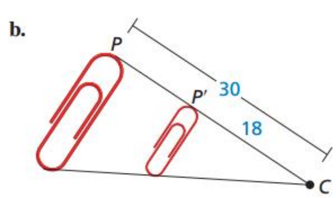
HOW TO DETERMINE THE SCALE FACTOR:

Remember: scale factors are the **ratio:**

K =

Example: Determine the scale factor of the following dilations





a: $\dfrac{CP\prime}{CP}$ b: $\dfrac{CP\prime}{CP}$

Dilation Outcomes Depending on Scale Factor

When the dilation made the pre-image **bigger**, the scale factor was ___________________________

Vs.

When the dilation made the pre-image **smaller**, the scale factor was __________________________

7-9 Notes

Dilating a figure on the coordinate plane

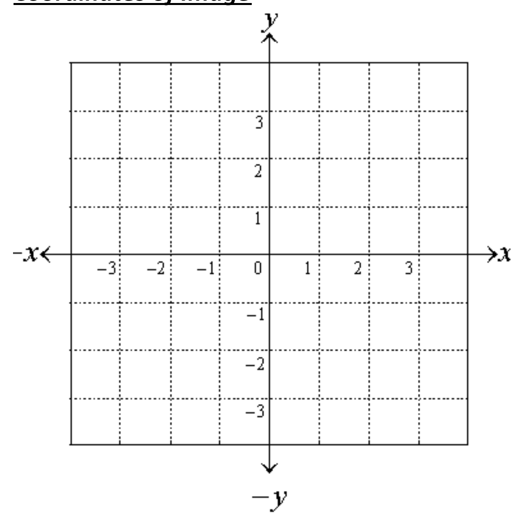
Today's Goals: What type of transformation is ***dilation***? How do we perform dilations with different centers of dilations?

Now that we know what scale factors are, we can learn to use them to perform dilations on the coordinate plane!

Graph Rectangle EFGH with coordinates E(-2,-2) , F(-2,4), G(2,4) and H(2,-2) and its Image after a dilation with a scale factor of $\frac{1}{2}$ and a center of dilation at (2, 0). NOTATION: $D_{(2,0),\ \frac{1}{2})}$

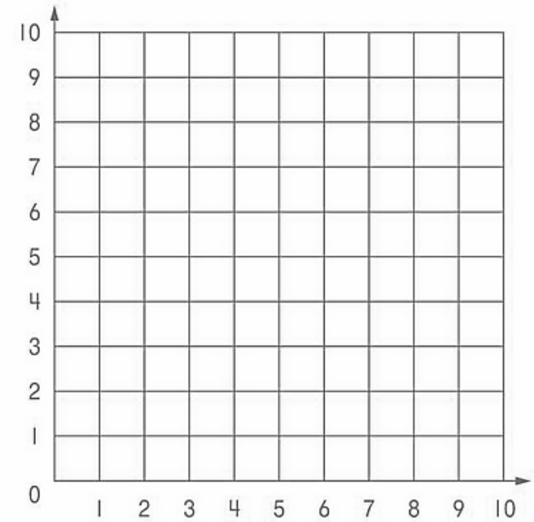
Will the Image be larger or smaller than the Pre-image? _______________

C:_________ **K:_________**

Coordinates of Pre-Image	***Finding our Distance to Move***	***Coordinates of Image***
	1. *Plot pre-image and center of dilation.* **2.** *Count Rise/ Run distance* ***from center*** *of dilation* ***to each point*** *on Pre-image* **3.** *Multiply distance by scale factor* **4.** ***FROM center-*** *count the new distance to the image* **5.** ***Write down new coordinates.***	
E(-2,-2)	***From center*** Rise:____ x ____ = ___ → **this is new distance *from C* to the image.** ***From center*** Run:______x____=____ → **this is new distance *from C* to the image.**	
F(-2,4),	Rise:____ x ____ =___ → **this is new distance *from C* to the image.** Run:______x____=____ → **this is new distance *from C* to the image.**	
G(2,4)	Rise:____ x ____ =___ → **this is new distance *from C* to the image.** Run:______x____=____ → **this is new distance *from C* to the image.**	
H(2,-2)	Rise:____ x ____ = → **this is new distance *from C* to the image.** Run:______x____= → **this is new distance *from C* to the image.**	

You Try!

Graph △PQR with vertices P (0, 2), Q (1, 0), and R (2, 2) and its image after a dilation with scale factor 3 and a center of dilation at point (0, 0).

<u>Coordinates of Pre-Image</u>	***<u>Finding our Distance to Move</u>*** ***1.*** *Count Rise/ Run distance from center of dilation to Pre-image point* ***2.*** *Multiply distance by scale factor* ***3.*** ***<u>FROM center-</u>*** *count the new distance to the image* ***4.*** ***<u>Write down new coordinates.</u>***	***<u>Coordinates of Image</u>*** 
	Rise:____ x ____ = ___ → **this is new distance *<u>from C</u>* to the image.** Run:______x____=____ → **this is new distance *<u>from C</u>* to the image.**	
	Rise:____ x ____ =___ → **this is new distance *<u>from C</u>* to the image.** Run:______x____=____ → **this is new distance *<u>from C</u>* to the image.**	
	Rise:____ x ____ =___ → **this is new distance *<u>from C</u>* to the image.** Run:______x____=____ → **this is new distance *<u>from C</u>* to the image.**	

Turn and talk

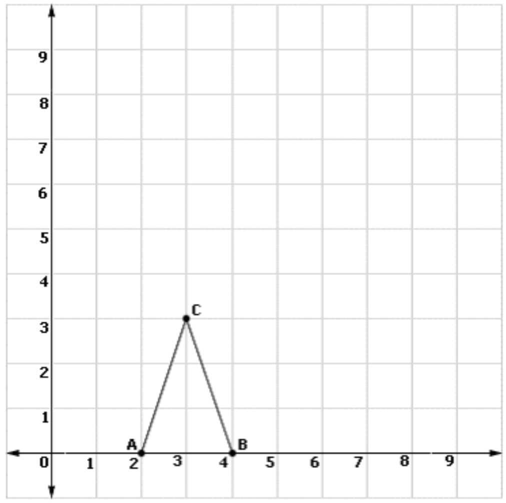
What is the relationship between the corresponding sides of the pre-image and image?

**When a figure is dilated, *corresponding sides* between image and pre-image will always be ____________________.

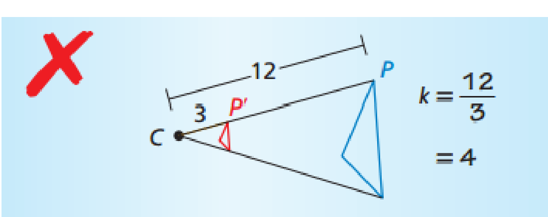
7-9 Practice

1. Triangle *ABC* is shown in the figure. Find the vertices of the triangle under dilation with *center A* and *scale factor 3*.

C:________ **K:________**

<table>
<tr><td>Pre-Image</td><td>Work
</td><td>Image</td></tr>
<tr><td></td><td>Rise:____ x ____ =___
→ this is new distance from C to the image.
Run:______x____=____
→ this is new distance from C to the image.</td><td></td></tr>
<tr><td></td><td>Rise:____ x ____ =___
→ this is new distance from C to the image.
Run:______x____=__
→ this is new distance from C to the image.</td><td></td></tr>
<tr><td></td><td>Rise:____ x ____ =___
→ this is new distance from C to the image.
.
Run:______x____=____
→ this is new distance from C to the image.</td><td></td></tr>
</table>

2. *Describe and correct the error* in finding the scale factor of the dilation.



3. **a)** Which figure shows $\Delta P'Q'R'$, the image of ΔPQR after a dilation with center *M* and scale factor 2?

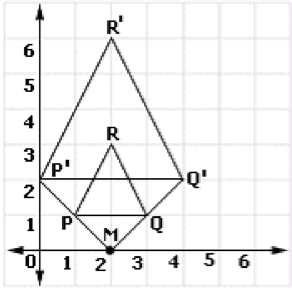


Figure 1

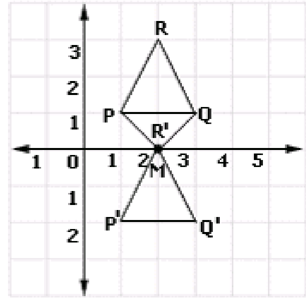


Figure 2

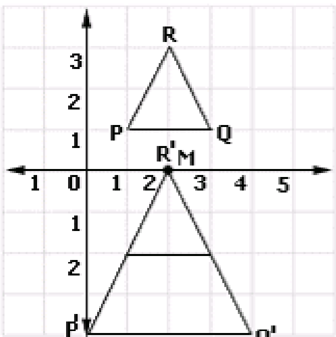


Figure 3

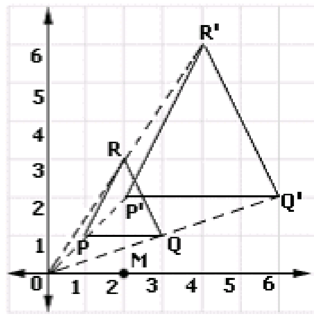
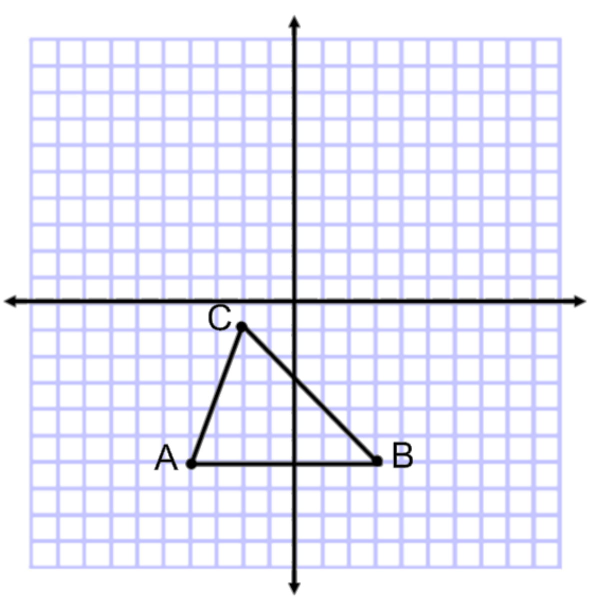


Figure 4

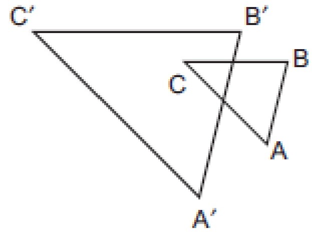
b) Which of the figures has a center of dilation at the origin? Explain.

Remember! Pre-image, Center of Dilation and image point s must be COLINEAR!

4. Graph and state the coordinates of $\Delta A'B'C'$, the image of ΔABC after a dilation of scale factor 2 and a center at P(-4, -9).

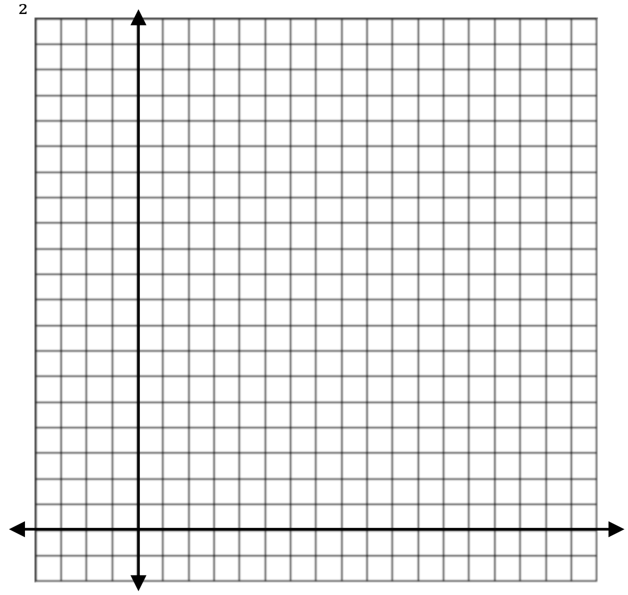


5. In the accompanying diagram, $\triangle ABC$ is similar to but not congruent to $\triangle A'B'C'$.



Which transformation is represented by $\triangle A'B'C'$
1) rotation
2) translation
3) reflection
4) dilation

6. On the accompanying set of axes, graph ΔABC with coordinates A(-4,4), B(0,12), and C(10,8). Then, state the coordinates of ΔA'B'C', and graph the image of ΔABC after $D_{\frac{1}{2}}$ centered at the origin.



7-9 Homework

1. Answer TRUE or FALSE about the following diagram of pre-image ΔABC that was dilated to image ΔDEF.

a) The center of dilation is point A _______________

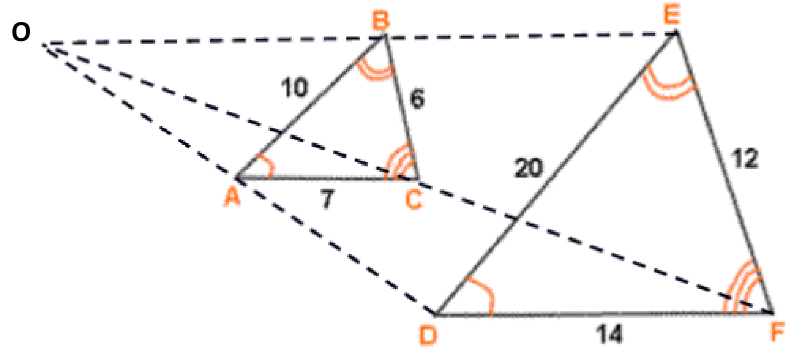
b) The scale factor is ½ _______________

c) The scale factor is 2 _______________

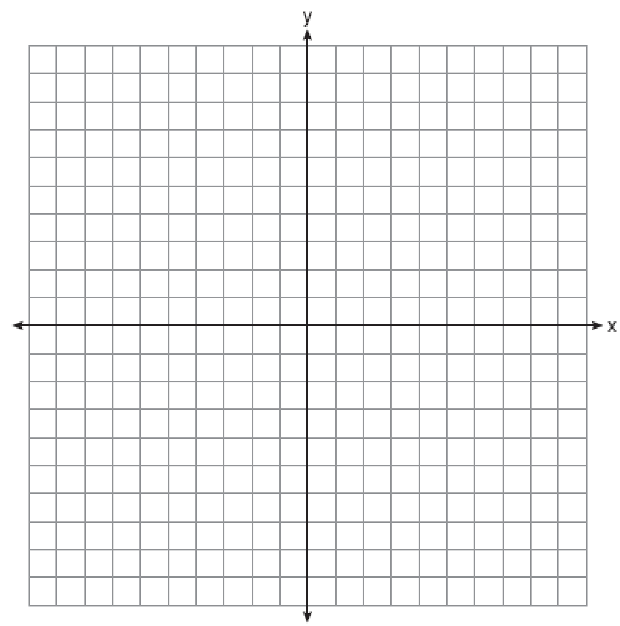
d) Q, B, and E are collinear _______________

e) ABC is congruent to DEF _______________

f) AB||DE _______________



2. On the accompanying set of axes, graph ΔABC with coordinates A(1,2), B(0,-5), and C(5,4). Then, graph ΔA'B'C', the image ofΔABC after D_2 centered at the origin. ***(Set up a table like we did in class!)***



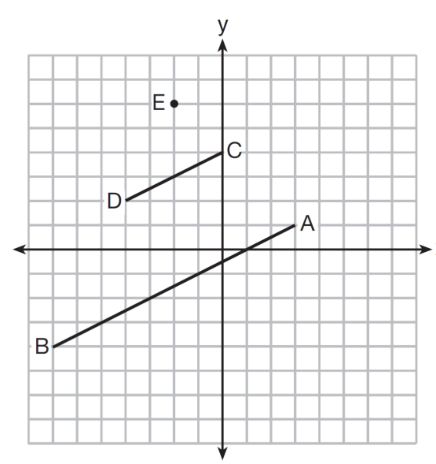
3. In the diagram below, $\overline{CD}$ is the image of $\overline{AB}$ after a dilation of scale factor *k* with center *E*. Which ratio is equal to the scale factor *k* of the dilation?

1) $\frac{EC}{EA}$

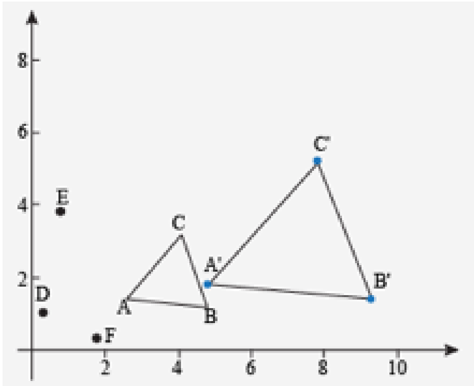
2) $\frac{BA}{EA}$

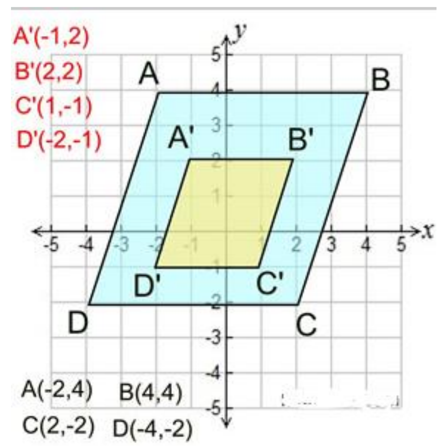
3) $\frac{EA}{BA}$

4) $\frac{EA}{EC}$



4. Which point is the center of dilation for ΔABC and its image $\Delta A'B'C'$? **Explain how you know!** *(Hint: What do we know about centers of dilations, pre-image and image points in terms of their location?)*





5. a) What is the scale factor that maps the pre-image to the image here?

b) What is the relationship between the corresponding sides of the pre-image and image?

6. Graph and state the coordinates of $\Delta A'B'C'$, the image of ΔABC after a dilation of scale factor 2 and a center at P(1, 0).