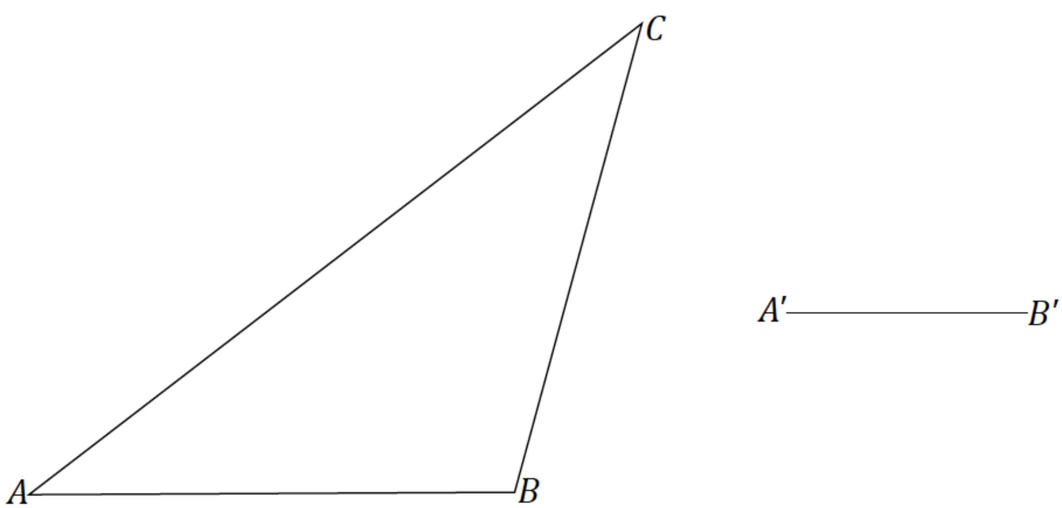
Name ________________________________ Date ________________

Lesson 1: Scale Drawings

Exit Ticket

Triangle ABC is provided below, and one side of scale drawing $\triangle A'B'C'$ is also provided. Use construction tools to complete the scale drawing and determine the scale factor. What properties do the scale drawing and the original figure share? Explain how you know.



Name ____ Date ____________________

Lesson 2: Making Scale Drawings Using the Ratio Method

Exit Ticket

One of the following images shows a well-scaled drawing of $\triangle ABC$ done by the ratio method; the other image is not a well-scaled drawing. Use your ruler and protractor to measure and calculate to justify which is a scale drawing and which is not.

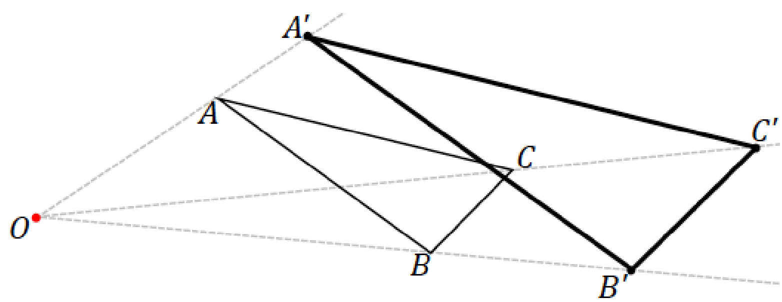


Figure 1

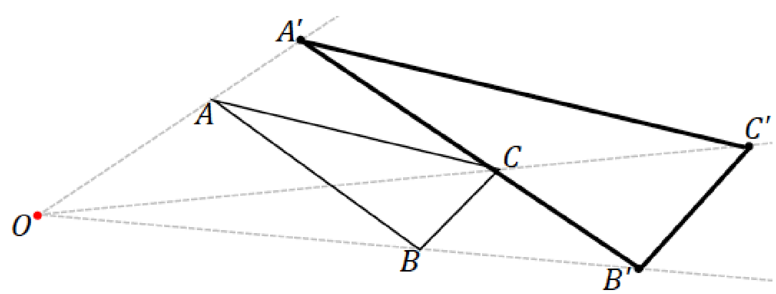


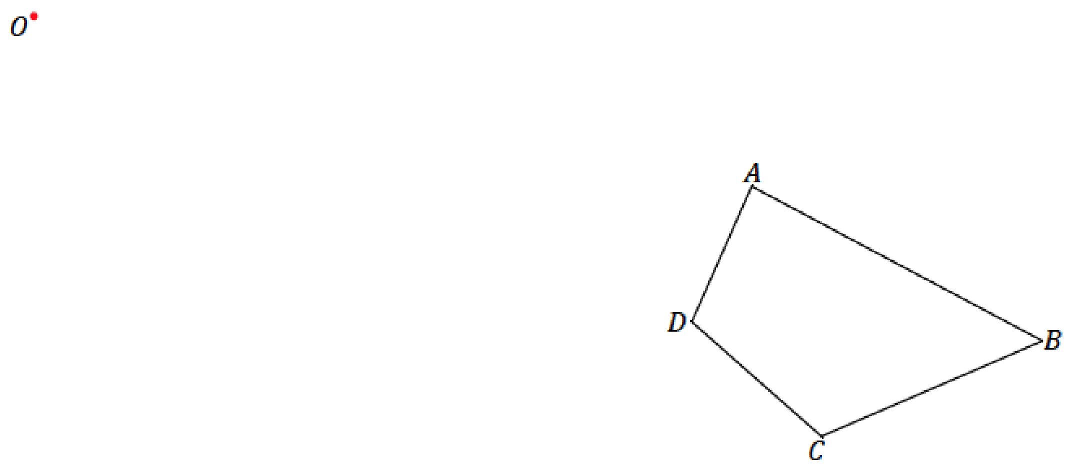
Figure 2

Name ______________________________ Date ______________

Lesson 3: Making Scale Drawings Using the Parallel Method

Exit Ticket

With a ruler and setsquare, use the parallel method to create a scale drawing of quadrilateral $ABCD$ about center O with scale factor $r = \frac{3}{4}$. Verify that the resulting figure is in fact a scale drawing by showing that corresponding side lengths are in constant proportion and that the corresponding angles are equal in measurement.



What kind of error in the parallel method might prevent us from having parallel, corresponding sides?

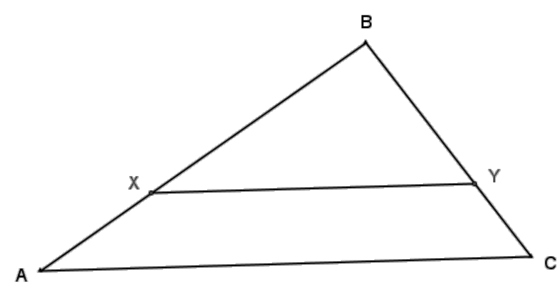
Name ____ Date ____________________

Lesson 4: Comparing the Ratio Method with the Parallel Method

Exit Ticket

In the diagram, $\overline{XY} \parallel \overline{AC}$. Use the diagram to answer the following:

1. If $BX = 4$, $BA = 5$, and $BY = 6$, what is BC?



Not drawn to scale

2. If $BX = 9$, $BA = 15$, and $BY = 15$, what is YC?

Name ____ Date ____________________

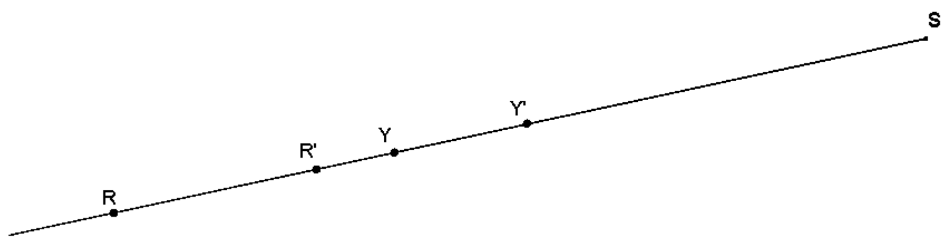
Lesson 5: Scale Factors

Exit Ticket

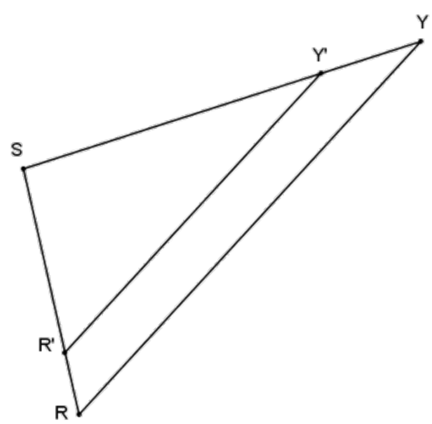
1. Two different points R and Y are dilated from S with a scale factor of $\frac{3}{4}$, and $RY = 15$. Use the dilation theorem to describe two facts that are known about $R'Y'$.

2. Which diagram(s) below represents the information given in Question 1? Explain your answer(s).

a.



b.



Name ____ Date ____________________

Lesson 6: Dilations as Transformations of the Plane

Exit Ticket

1. Which transformations of the plane are distance-preserving transformations? Provide an example of what this property means.

2. Which transformations of the plane preserve angle measure? Provide one example of what this property means.

3. Which transformation is not considered a rigid motion and why?

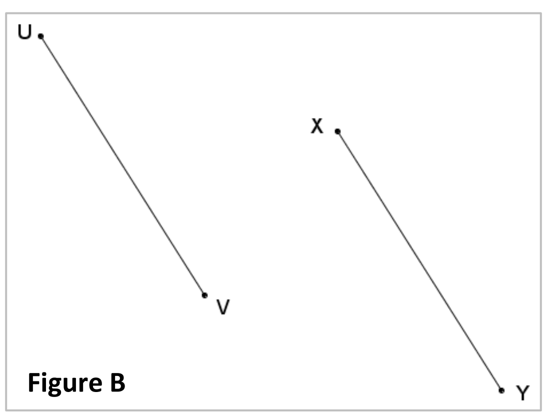
Name ____ Date ____________________

Lesson 7: How Do Dilations Map Segments?

Exit Ticket

1. Given the dilation $D_{O,\frac{3}{2}}$, a line segment PQ, and that O is not on $\overleftrightarrow{PQ}$, what can we conclude about the image of $\overline{PQ}$?

2. Given figures A and B below, $\overline{BA} \parallel \overline{DC}$, $\overline{UV} \parallel \overline{XY}$, and $\overline{UV} \cong \overline{XY}$, determine which figure has a dilation mapping the parallel line segments and locate the center of dilation O. For one of the figures, a dilation does not exist. Explain why.

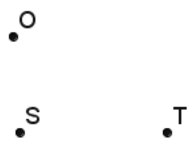


Name ____ Date____________________

Lesson 8: How Do Dilations Map Rays, Lines, and Circles?

Exit Ticket

Given points O, S, and T below, complete parts (a)–(e):



a. Draw rays $\overrightarrow{ST}$ and $\overrightarrow{TS}$. What is the union of these rays?

b. Dilate $\overrightarrow{ST}$ from O using scale factor $r = 2$. Describe the image of $\overrightarrow{ST}$.

c. Dilate $\overrightarrow{TS}$ from O using scale factor $r = 2$. Describe the image of $\overrightarrow{TS}$.

d. What does the dilation of the rays in parts (b) and (c) yield?

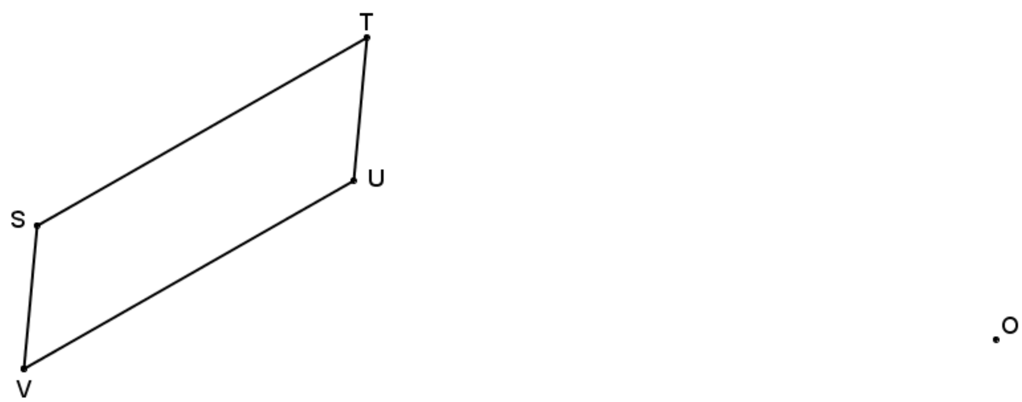
e. Dilate circle C with radius TS from O using scale factor $r = 2$.

Name ______________________________ Date ______________

Lesson 9: How Do Dilations Map Angles?

Exit Ticket

1. Dilate parallelogram $STUV$ from center O using a scale factor of $r = \frac{3}{4}$.



2. How does $m\angle T'$ compare to $m\angle T$?

3. Using your diagram, prove your claim from Problem 2.

Name ______________________________ Date ________________

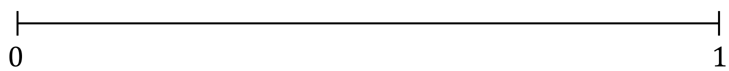
Lesson 10: Dividing the King's Foot into 12 Equal Pieces

Exit Ticket

1. Use the side splitter method to divide $\overline{MN}$ into 7 equal-sized pieces.

2. Use the dilation method to divide $\overline{PQ}$ into 11 equal-sized pieces.

3. If the segment below represents the interval from zero to one on the number line, locate and label $\frac{4}{7}$.

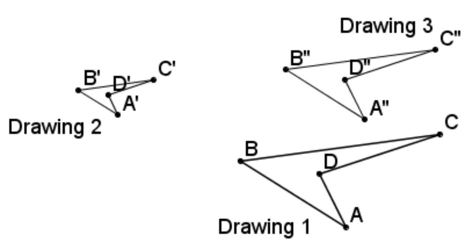


Name ____ Date ____________________

Lesson 11: Dilations from Different Centers

Exit Ticket

Marcos constructed the composition of dilations shown below. Drawing 2 is $\frac{3}{8}$ the size of Drawing 1, and Drawing 3 is twice the size of Drawing 2.



1. Determine the scale factor from Drawing 1 to Drawing 3.

2. Find the center of dilation mapping Drawing 1 to Drawing 3.

Name ____ Date ____________________

Lesson 12: What Are Similarity Transformations, and Why Do We Need Them?

Exit Ticket

1. Figure A' is similar to Figure A. Which transformations compose the similarity transformation that maps Figure A onto Figure A'?

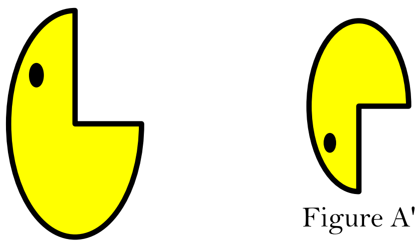


Figure A Figure A'

2. Is there a sequence of dilations and basic rigid motions that takes the small figure to the large figure? Take measurements as needed.

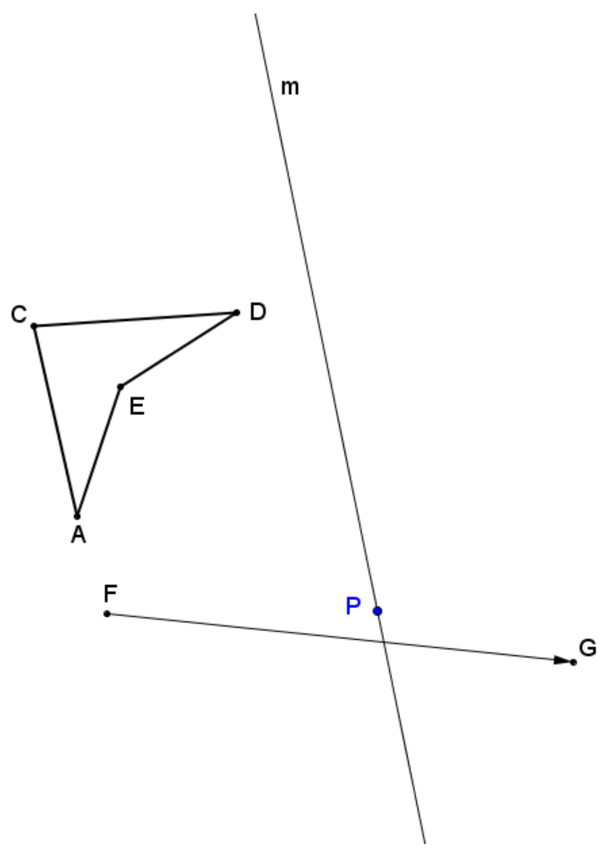
Figure A Figure B

Name ___________________________________ Date ____________________

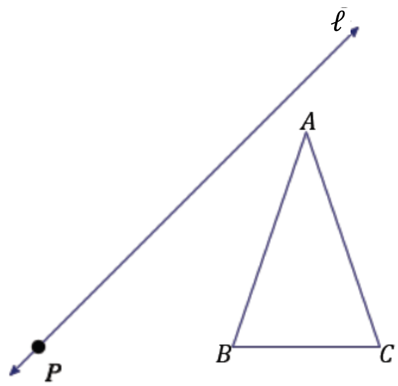
Lesson 13: Properties of Similarity Transformations

Exit Ticket

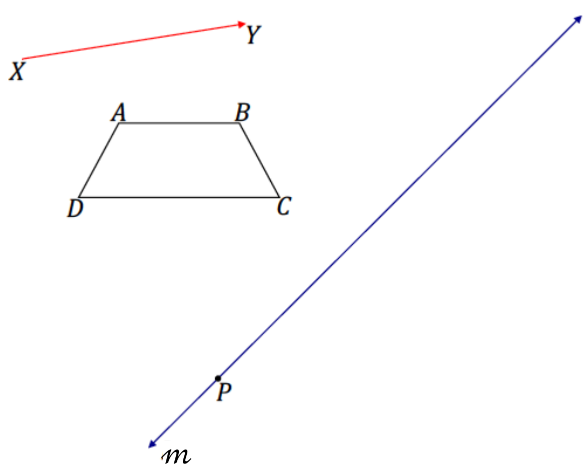
A similarity transformation consists of a translation along the vector $\overrightarrow{FG}$, followed by a dilation from point P with a scale factor $r = 2$, and finally a reflection over line m. Use construction tools to find $A'''C'''D'''E'''$.



Example 1



Example 2

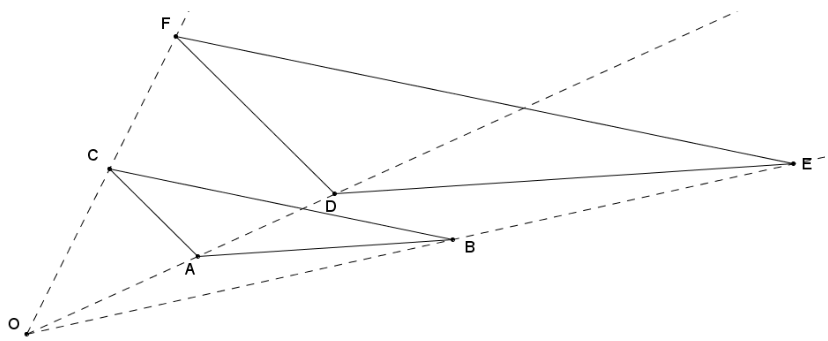


Name ____ Date ____________________

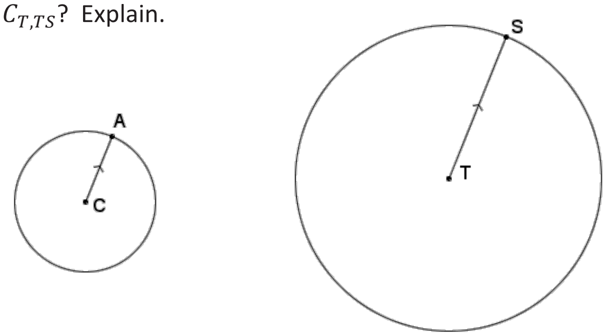
Lesson 14: Similarity

Exit Ticket

1. In the diagram, $\triangle ABC \sim \triangle DEF$ by the dilation with center O and scale factor r. Explain why $\triangle DEF \sim \triangle ABC$.



2. Radii $\overline{CA}$ and $\overline{TS}$ are parallel. Is circle $C_{C,CA}$ similar to circle $C_{T,TS}$? Explain.



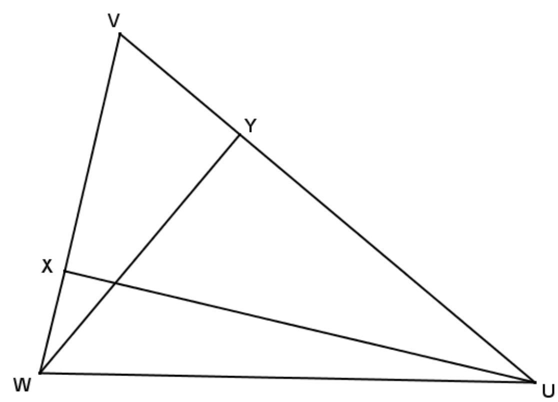
3. Two triangles, $\triangle ABC$ and $\triangle DEF$, are in the plane so that $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$, and $\frac{DE}{AB} = \frac{EF}{BC} = \frac{DF}{AC}$. Summarize the argument that proves that the triangles must be similar.

Name ____ Date ____________________

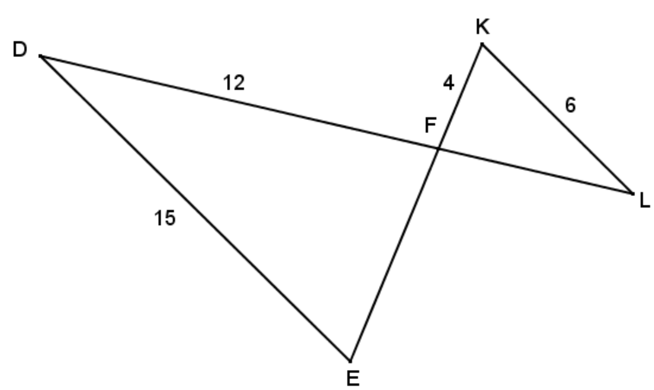
Lesson 15: The Angle-Angle (AA) Criterion for Two Triangles to be Similar

Exit Ticket

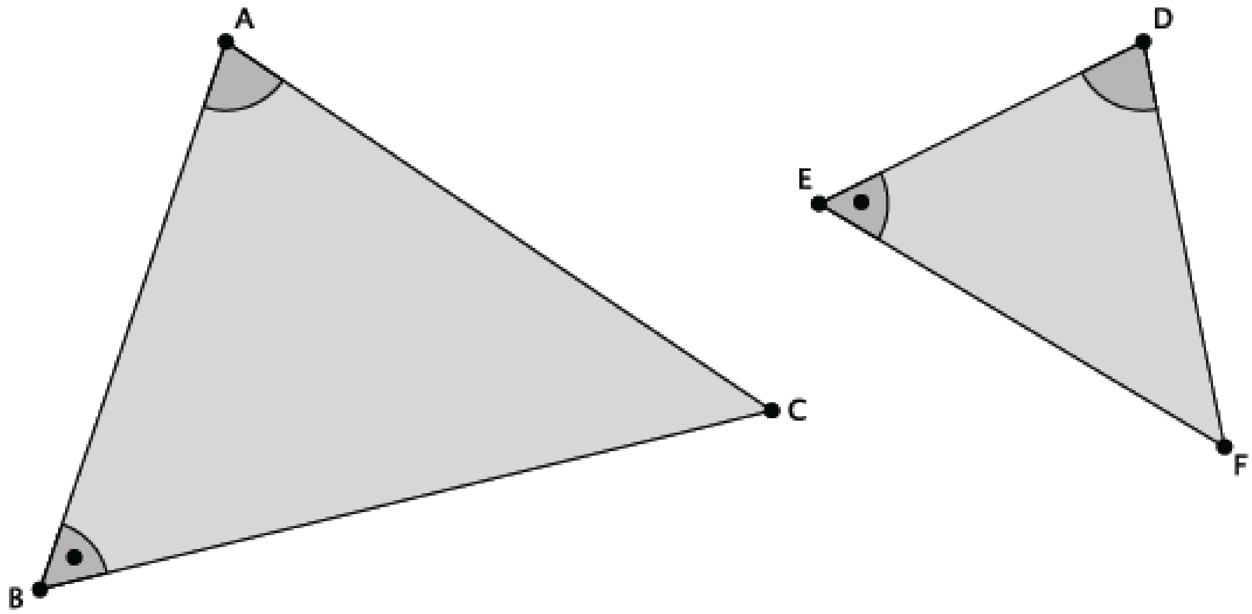
1. Given the diagram to the right, $\overline{UX} \perp \overline{VW}$, and $\overline{WY} \perp \overline{UV}$. Show that $\Delta UXV \sim \Delta WYV$.

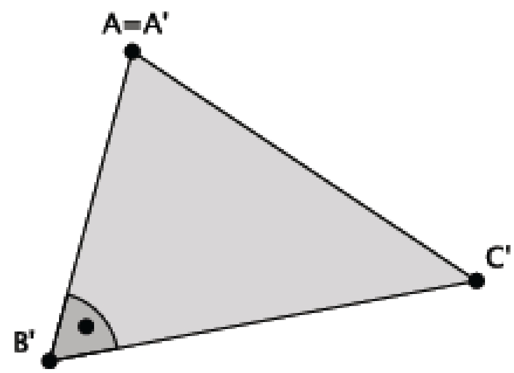


2. Given the diagram to the right and $\overline{DE} \parallel \overline{KL}$, find FE and FL.



Cutouts to use for in-class discussion:



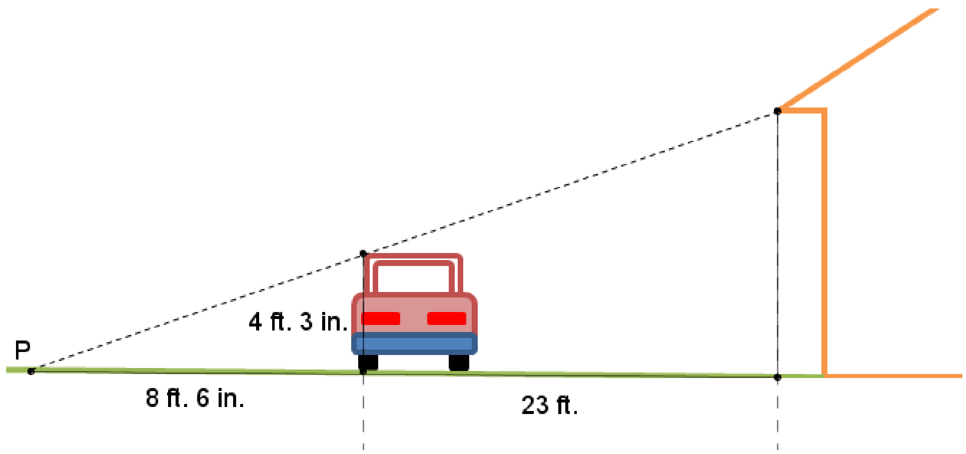


Name ______________________________ Date ______________

Lesson 16: Between-Figure and Within-Figure Ratios

Exit Ticket

Dennis needs to fix a leaky roof on his house but does not own a ladder. He thinks that a 25-foot ladder will be long enough to reach the roof, but he needs to be sure before he spends the money to buy one. He chooses a point P on the ground where he can visually align the roof of his car with the edge of the house roof. Help Dennis determine if a 25-foot ladder will be long enough for him to safely reach his roof.

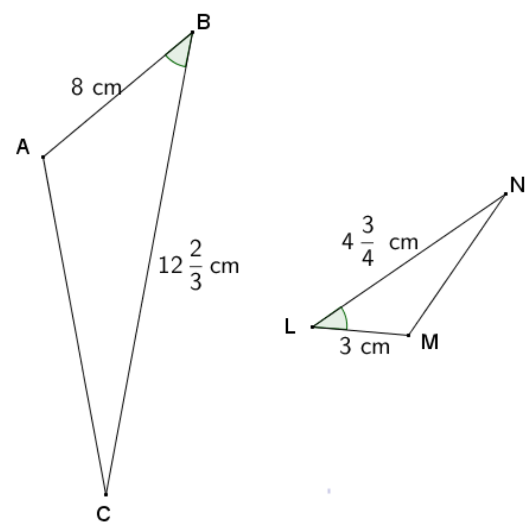


Name ____ Date ____________________

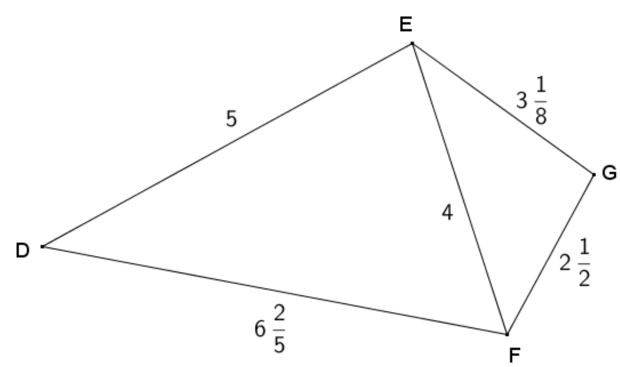
Lesson 17: The Side-Angle-Side (SAS) and Side-Side-Side (SSS) Criteria for Two Triangles to be Similar

Exit Ticket

1. Given ΔABC and ΔLMN in the diagram below, and $\angle B \cong \angle L$, determine if the triangles are similar. If so, write a similarity statement, and state the criterion used to support your claim.



2. Given ΔDEF and ΔEFG in the diagram below, determine if the triangles are similar. If so, write a similarity statement, and state the criterion used to support your claim.

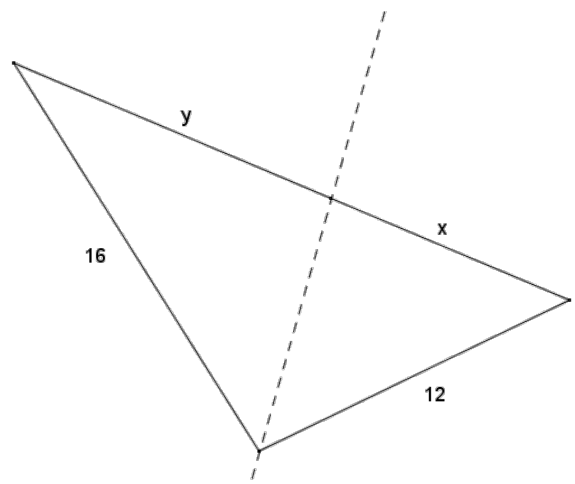


Name ____ Date ____________________

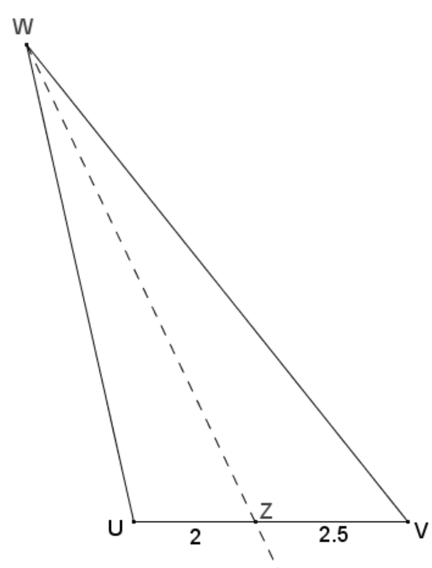
Lesson 18: Similarity and the Angle Bisector Theorem

Exit Ticket

1. The sides of a triangle have lengths of 12, 16, and 21. An angle bisector meets the side of length 21. Find the lengths x and y.



2. The perimeter of ΔUVW is $22\frac{1}{2}$. $\overrightarrow{WZ}$ bisects $\angle UWV$, $UZ = 2$, and $VZ = 2\frac{1}{2}$. Find UW and VW.

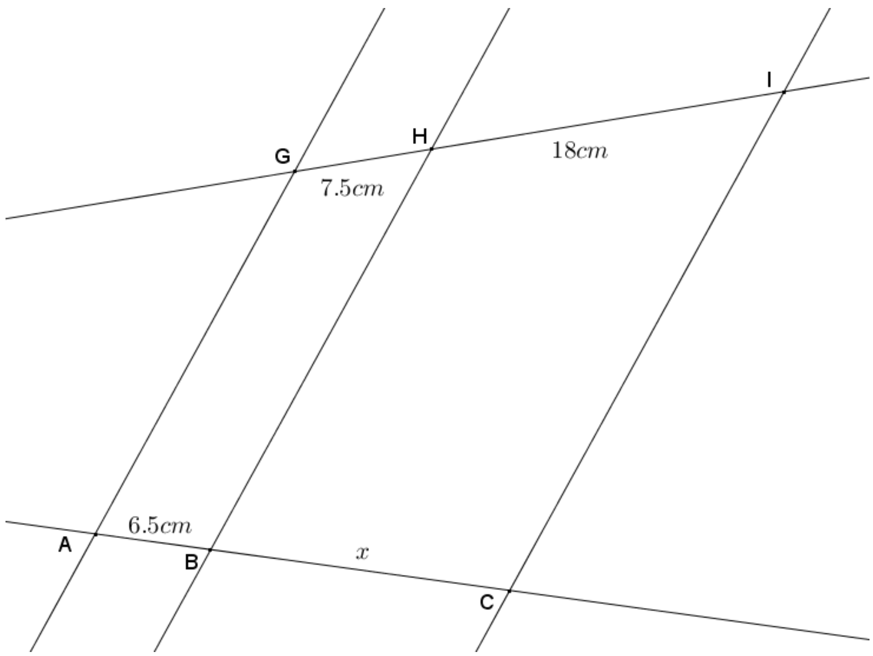


Name ____ Date ____________________

Lesson 19: Families of Parallel Lines and the Circumference of the Earth

Exit Ticket

1. Given the diagram to the right, $\overline{AG} \parallel \overline{BH} \parallel \overline{CI}$, $AB = 6.5$ cm, $GH = 7.5$ cm, and $HI = 18$ cm, find BC.



2. Martin the Martian lives on Planet Mart. Martin wants to know the circumference of Planet Mart, but it is too large to measure directly. He uses the same method as Eratosthenes by measuring the angle of the sun's rays in two locations. The sun shines on a flag pole in Martinsburg, but there is no shadow. At the same time the sun shines on a flag pole in Martville, and a shadow forms a $10°$ angle with the pole. The distance from Martville to Martinsburg is 294 miles. What is the circumference of Planet Mart?

Name ____ Date ____________________

Lesson 20: How Far Away Is the Moon?

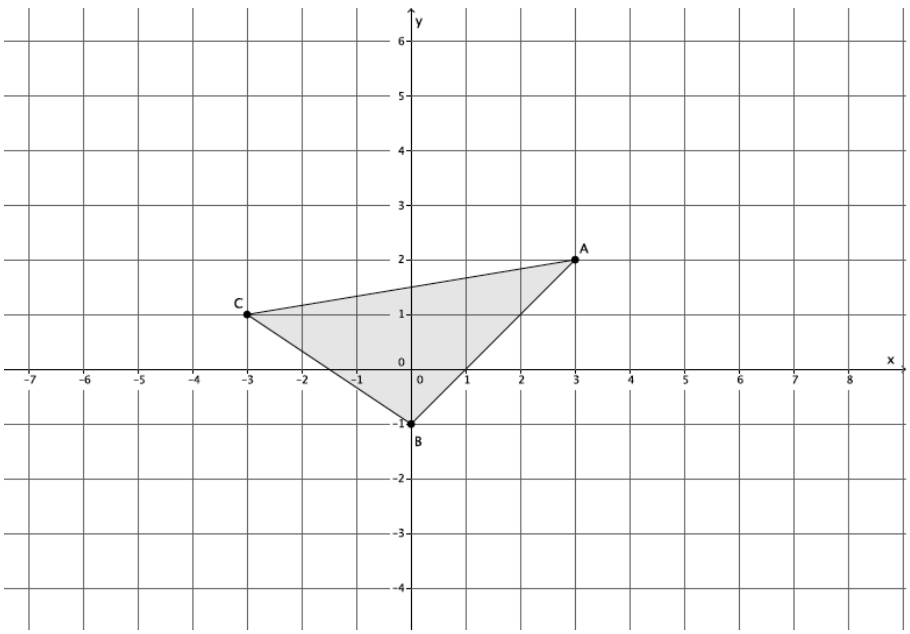
Exit Ticket

1. On Planet A, a $\frac{1}{4}$ inch diameter ball must be held at a height of 72 inches to *just* block the sun. If a moon orbiting Planet A just blocks the sun during an eclipse, approximately how many moon diameters is the moon from the planet?

2. Planet A has a circumference of $93{,}480$ miles. Its moon has a diameter that is approximated to be $\frac{1}{8}$ that of Planet A. Find the approximate distance of the moon from Planet A.

Name ______________________________ Date ________________

1. The coordinates of triangle $\triangle ABC$ are shown on the coordinate plane below. Triangle $\triangle ABC$ is dilated from the origin by scale factor $r = 2$.



a. Identify the coordinates of the dilated $\triangle A'B'C'$.

b. Is $\triangle A'B'C' \sim \triangle ABC$? Explain.

2. Points A, B, and C are not collinear, forming angle $\angle BAC$. Extend ray $\overrightarrow{AB}$ to point P. Line ℓ passes through P and is parallel to segment BC. It meets ray $\overrightarrow{AC}$ at point Q.

   a. Draw a diagram to represent the situation described.

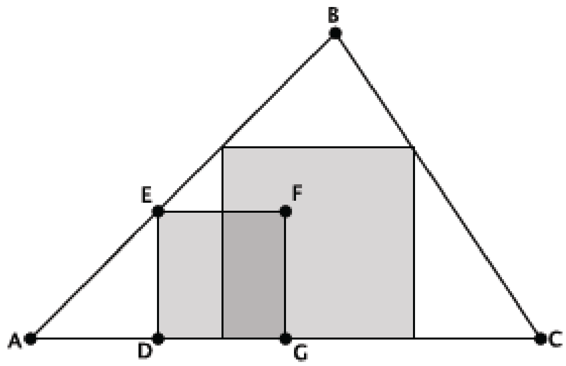
   b. Is $\overline{PQ}$ longer or shorter than $\overline{BC}$?

   c. Prove that $\triangle ABC \sim \triangle APQ$.

   d. What other pairs of segments in this figure have the same ratio of lengths that $\overline{PQ}$ has to $\overline{BC}$?

3. There is a triangular floor space $\triangle ABC$ in a restaurant. Currently, a square portion $DEFG$ is covered with tile. The owner wants to remove the existing tile, and then tile the largest square possible within $\triangle ABC$, keeping one edge of the square on $\overline{AC}$.

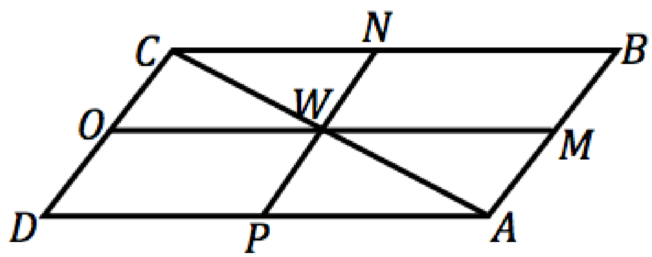
   a. Describe a construction that uses a dilation with center A that can be used to determine the maximum square $D'E'F'G'$ within $\triangle ABC$ with one edge on $\overline{AC}$.



   b. What is the scale factor of $\overline{FG}$ to $\overline{F'G'}$ in terms of the distances $\overline{AF}$ and $\overline{AF'}$?

c. The owner uses the construction in part (a) to mark off where the square would be located. He measures AE to be 15 feet and EE' to be 5 feet. If the original square is 144 square feet, how many square feet of tile does he need for $D'E'F'G'$?

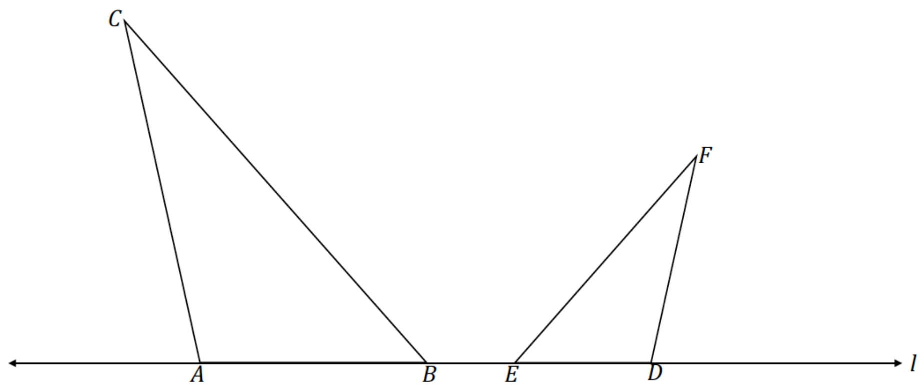
4. $ABCD$ is a parallelogram, with the vertices listed counterclockwise around the figure. Points M, N, O, and P are the midpoints of sides $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$, respectively. The segments MO and NP cut the parallelogram into four smaller parallelograms, with the point W in the center of $ABCD$ as a common vertex.



a. Exhibit a sequence of similarity transformations that takes $\triangle AMW$ to $\triangle CDA$. Be specific in describing the parameter of each transformation; e.g., if describing a reflection, state the line of reflection.

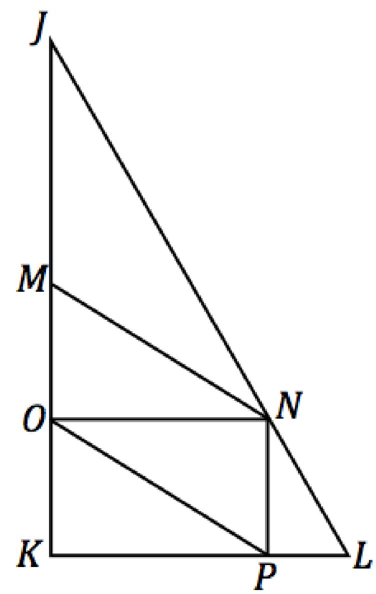
b. Given the correspondence in $\triangle AMW$ similar to $\triangle CDA$, list all corresponding pairs of angles and corresponding pairs of sides. What is the ratio of the corresponding pairs of angles? What is the ratio of the corresponding pairs of sides?

5. Given two triangles, $\triangle ABC$ and $\triangle DEF$, $m\angle CAB = m\angle FDE$, and $m\angle CBA = m\angle FED$. Points A, B, D, and E lie on line l as shown. Describe a sequence of rigid motions and/or dilations to show that $\triangle ABC \sim \triangle DEF$, and sketch an image of the triangles after each transformation.



6. $\triangle JKL$ is a right triangle, $\overline{NP} \perp \overline{KL}$, $\overline{NO} \perp \overline{JK}$, $\overline{MN} \parallel \overline{OP}$.

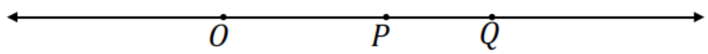
   a. List all sets of similar triangles. Explain how you know.



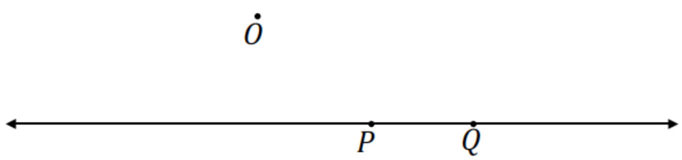
   b. Select any two similar triangles, and show why they are similar.

7.

a. The line PQ contains point O. What happens to $\overleftrightarrow{PQ}$ with a dilation about O and scale factor of $r = 2$? Explain your answer.



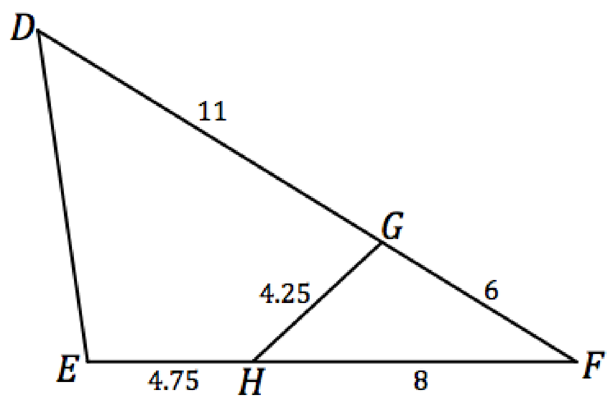
b. The line PQ does not contain point O. What happens to $\overleftrightarrow{PQ}$ with a dilation about O and scale factor of $r = 2$?



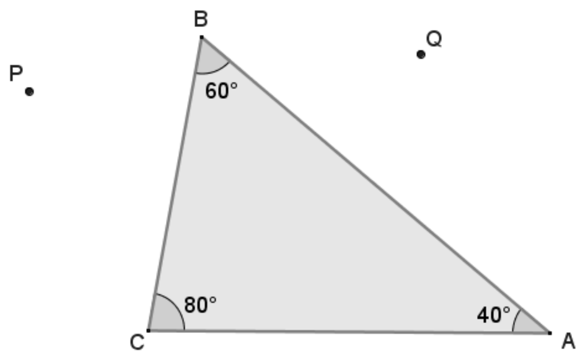
8. Use the diagram below to answer the following questions.

   a. State the pair of similar triangles. Which similarity criterion guarantees their similarity?

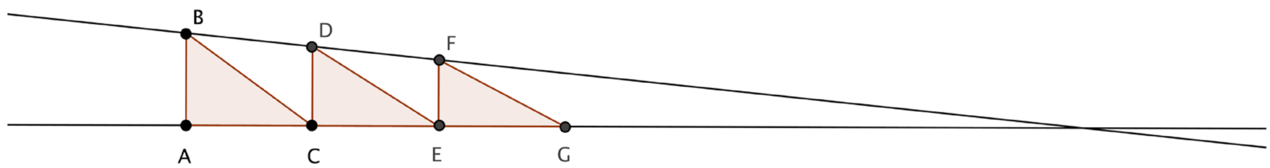
   b. Calculate DE to the hundredths place.



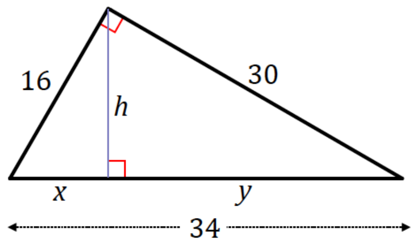
9. In triangle $\triangle ABC$, $\mathrm{m}\angle A$ is $40°$, $\mathrm{m}\angle B$ is $60°$, and $\mathrm{m}\angle C$ is $80°$. The triangle is dilated by a factor of 2 about point P to form triangle $\triangle A'B'C'$. It is also dilated by a factor of 3 about point Q to form $\triangle A''B''C''$. What is the measure of the angle formed by line $A'B'$ and line $B''C''$? Explain how you know.



10. In the diagram below, $|AC| = |CE| = |EG|$, and angles $\angle BAC$, $\angle DCE$, and $\angle FEG$ are right. The two lines meet at a point to the right. Are the triangles similar? Why or why not?



11. The side lengths of the following right triangle are 16, 30, and 34. An altitude of a right triangle from the right angle splits the hypotenuse into line segments of length x and y.

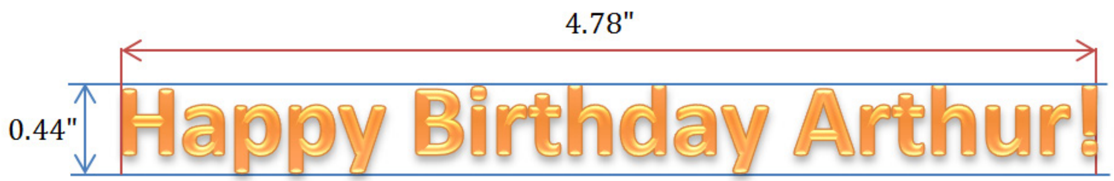


a. What is the relationship between the large triangle and the two sub-triangles? Why?

b. Solve for h, x, and y.

c. **Extension:** Find an expression that gives h in terms of x and y.

12. The sentence below, as shown, is being printed on a large banner for a birthday party. The height of the banner is 18 inches. There must be a minimum 1 inch margin on all sides of the banner. Use the dimensions in the image below to answer each question.



a. Describe a reasonable figure in the plane to model the printed image.

b. Find the scale factor that maximizes the size of the characters within the given constraints.

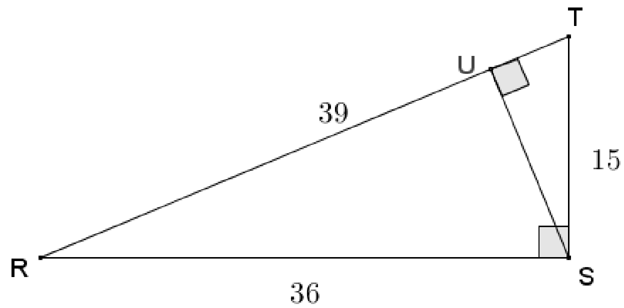
c. What is the total length of the banner based on your answer to part (a)?

Name ____ Date ____________________

Lesson 21: Special Relationships Within Right Triangles—Dividing into Two Similar Sub-Triangles

Exit Ticket

Given $\triangle RST$, with altitude $\overline{SU}$ drawn to its hypotenuse, $ST = 15$, $RS = 36$, and $RT = 39$, answer the questions below.



1. Complete the similarity statement relating the three triangles in the diagram.

$$\triangle RST \sim \triangle \_\_\_\_\_\_\_\_ \sim \triangle \_\_\_\_\_\_\_\_$$

2. Complete the table of ratios specified below.

	shorter leg: hypotenuse	longer leg: hypotenuse	shorter leg: longer leg
$\triangle RST$			
$\triangle RSU$			
$\triangle STU$			

3. Use the values of the ratios you calculated to find the length of SU.

Name ____ Date ____________________

Lesson 22: Multiplying and Dividing Expressions with Radicals

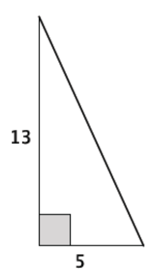
Exit Ticket

Write each expression in its simplest radical form.

1. $\sqrt{243} =$

2. $\sqrt{\frac{7}{5}} =$

3. Teja missed class today. Explain to her how to write the length of the hypotenuse in simplest radical form.



Perfect Squares of Numbers 1–30

$1^2 = 1$	$16^2 = 256$
$2^2 = 4$	$17^2 = 289$
$3^2 = 9$	$18^2 = 324$
$4^2 = 16$	$19^2 = 361$
$5^2 = 25$	$20^2 = 400$
$6^2 = 36$	$21^2 = 441$
$7^2 = 49$	$22^2 = 484$
$8^2 = 64$	$23^2 = 529$
$9^2 = 81$	$24^2 = 576$
$10^2 = 100$	$25^2 = 625$
$11^2 = 121$	$26^2 = 676$
$12^2 = 144$	$27^2 = 729$
$13^2 = 169$	$28^2 = 784$
$14^2 = 196$	$29^2 = 841$
$15^2 = 225$	$30^2 = 900$

Name ______________________________ Date ____________________

Lesson 23: Adding and Subtracting Expressions with Radicals

Exit Ticket

1. Simplify $5\sqrt{11} - 17\sqrt{11}$.

2. Simplify $\sqrt{8} + 5\sqrt{2}$.

3. Write a radical addition or subtraction problem that cannot be simplified, and explain why it cannot be simplified.

Name ____ Date ____________________

Lesson 24: Prove the Pythagorean Theorem Using Similarity

Exit Ticket

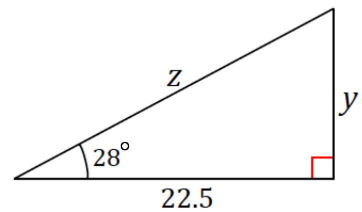
A right triangle has a leg with a length of 18 and a hypotenuse with a length of 36. Bernie notices that the hypotenuse is twice the length of the given leg, which means it is a 30–60–90 triangle. If Bernie is right, what should the length of the remaining leg be? Explain your answer. Confirm your answer using the Pythagorean theorem.

Name ______________________________ Date ____________

Lesson 25: Incredibly Useful Ratios

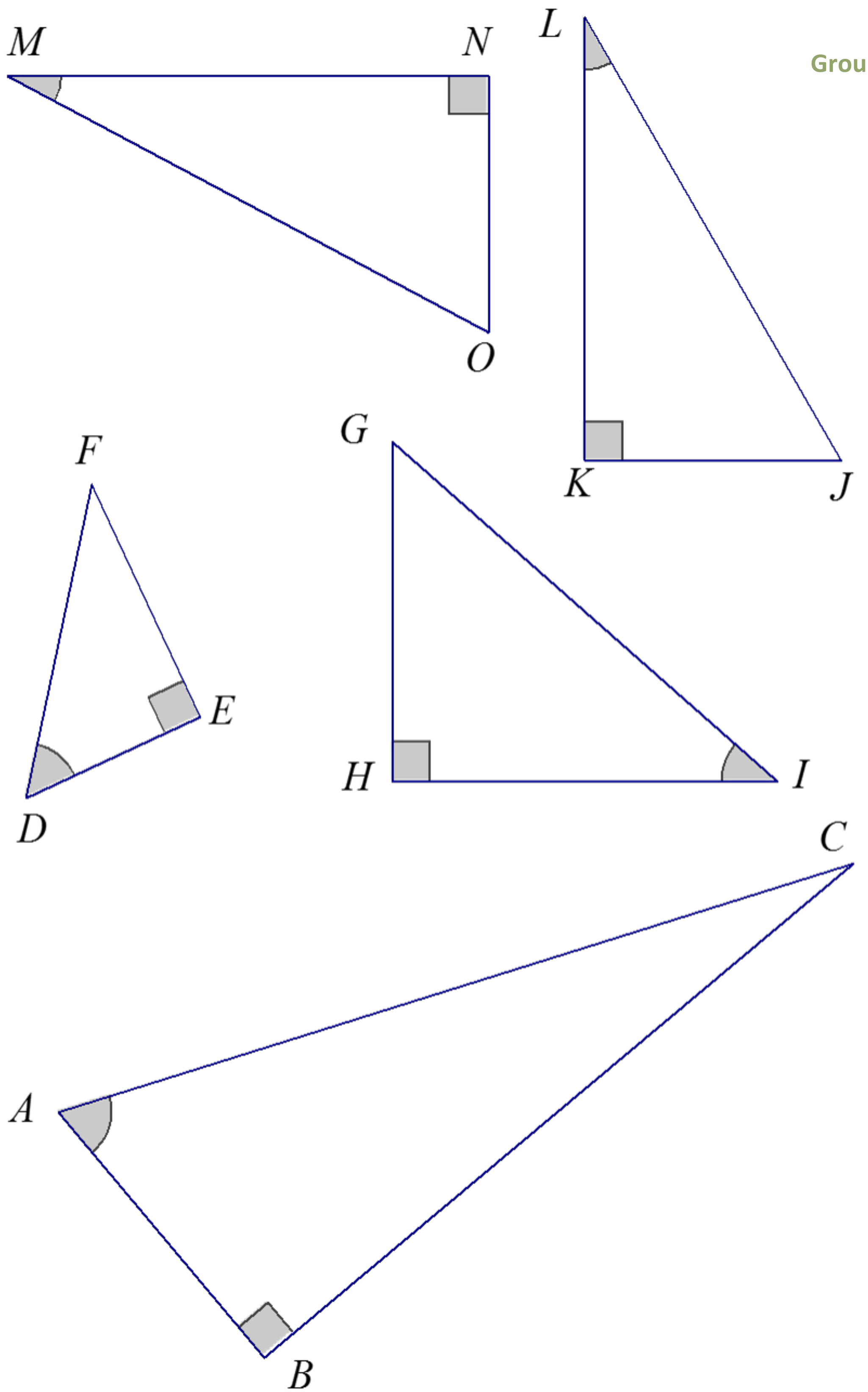
Exit Ticket

1. Use the chart from the Exploratory Challenge to approximate the unknown lengths y and z to one decimal place.

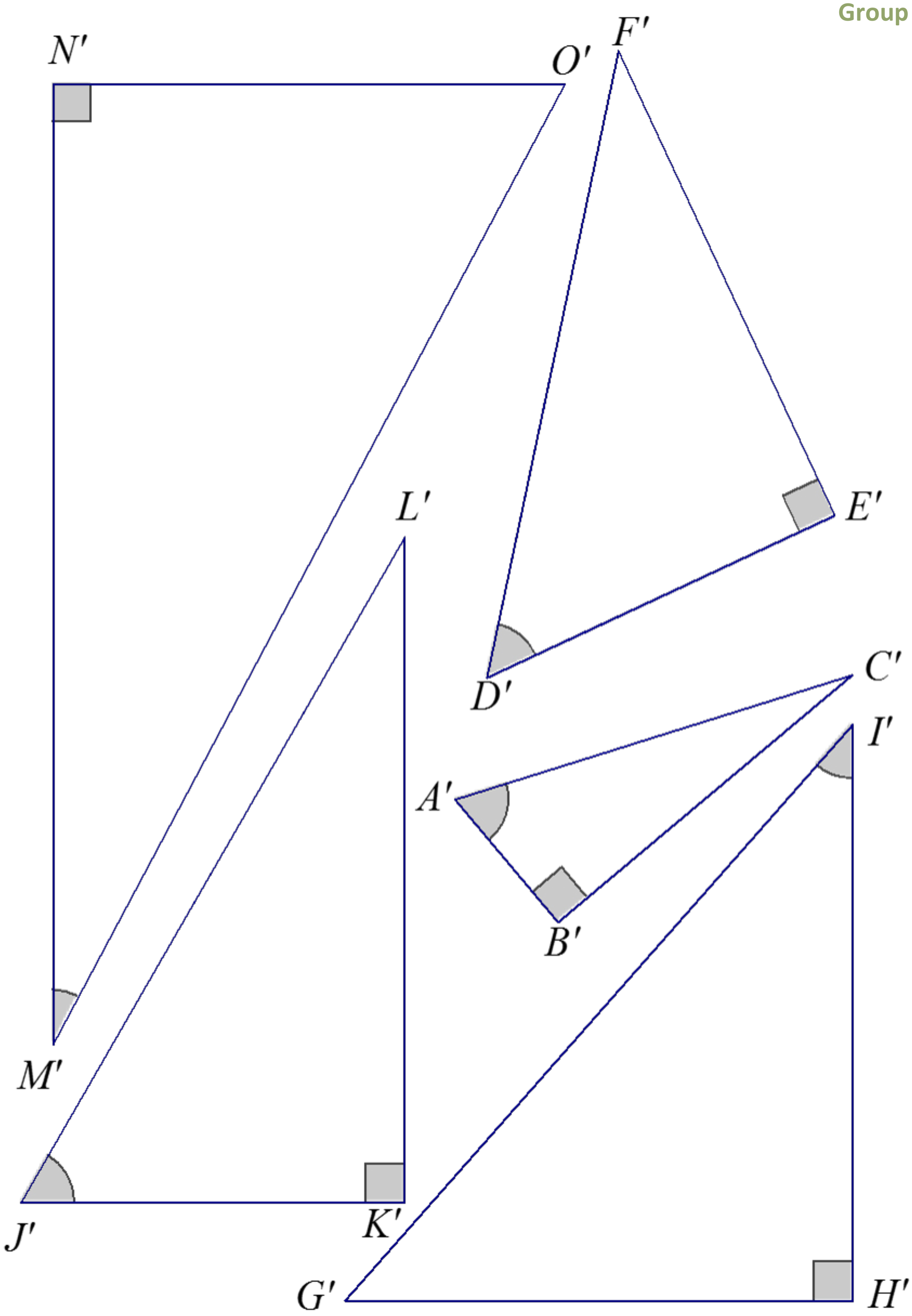


2. Why can we use the chart from the Exploratory Challenge to approximate the unknown lengths?

Group 1

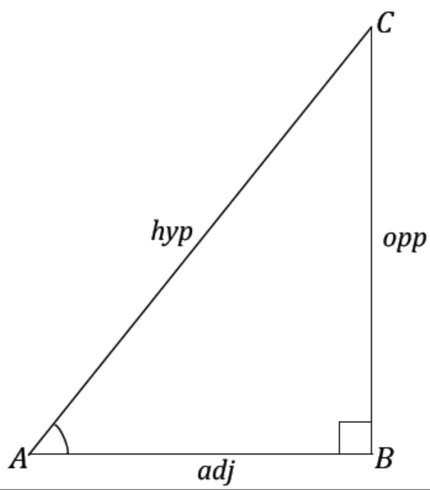


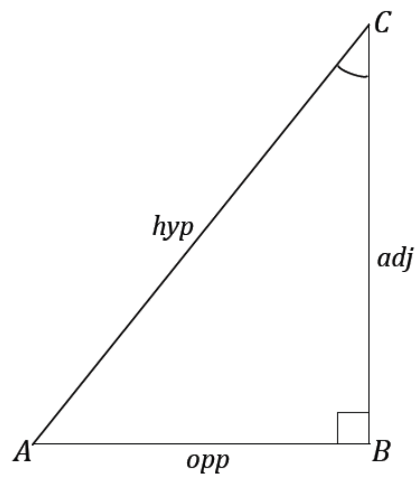
Group 2



Identifying Sides of a Right Triangle with Respect to a Given Right Angle

Poster





- With respect to $\angle A$, the opposite side, opp, is side $\overline{BC}$. - With respect to $\angle A$, the adjacent side, adj, is side $\overline{BC}$. - The hypotenuse, hyp, is side $\overline{AC}$ and is always opposite from the 90° angle.	- With respect to $\angle C$, the opposite side, opp, is side $\overline{AB}$. - With respect to $\angle C$, the adjacent side, adj, is side $\overline{BC}$. - The hypotenuse, hyp, is side $\overline{AC}$ and is always opposite from the 90° angle.

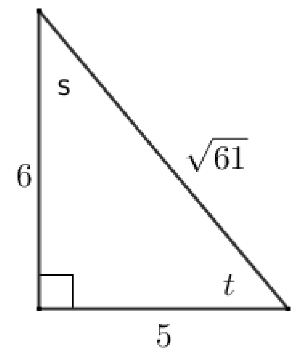
Name ____________________ Date ____________________

Lesson 26: The Definition of Sine, Cosine, and Tangent

Exit Ticket

1. Given the diagram of the triangle, complete the following table.

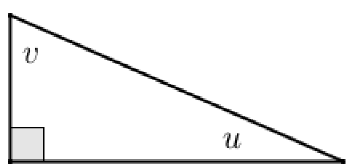
Angle Measure	$\sin\theta$	$\cos\theta$	$\tan\theta$
s			
t			



a. Which values are equal?

b. How are $\tan s$ and $\tan t$ related?

2. If u and v are the measures of complementary angles such that $\sin u = \frac{2}{5}$ and $\tan v = \frac{\sqrt{21}}{2}$, label the sides and angles of the right triangle in the diagram below with possible side lengths.



Name ____ Date ____________________

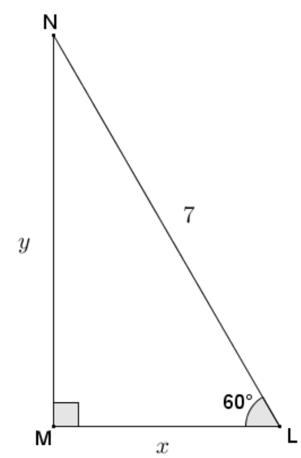
Lesson 27: Sine and Cosine of Complementary Angles and Special Angles

Exit Ticket

1. Find the values for θ that make each statement true.
   a. $\sin\theta = \cos 32$

   b. $\cos\theta = \sin(\theta + 20)$

2. $\triangle LMN$ is a 30–60–90 right triangle. Find the unknown lengths x and y.

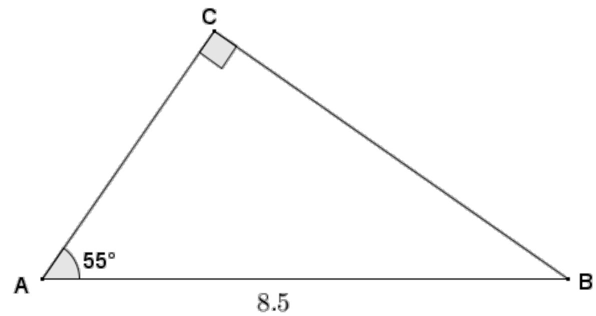


Name ____ Date ____________________

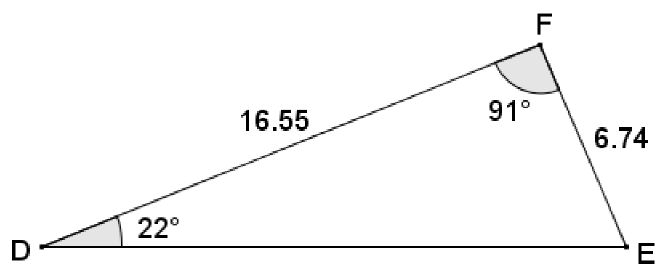
Lesson 28: Solving Problems Using Sine and Cosine

Exit Ticket

1. Given right triangle ABC with hypotenuse $AB = 8.5$ and $\angle A = 55°$, find AC and BC to the nearest hundredth.



2. Given triangle DEF, $\angle D = 22°$, $\angle F = 91°$, $DF = 16.55$, and $EF = 6.74$, find DE to the nearest hundredth.

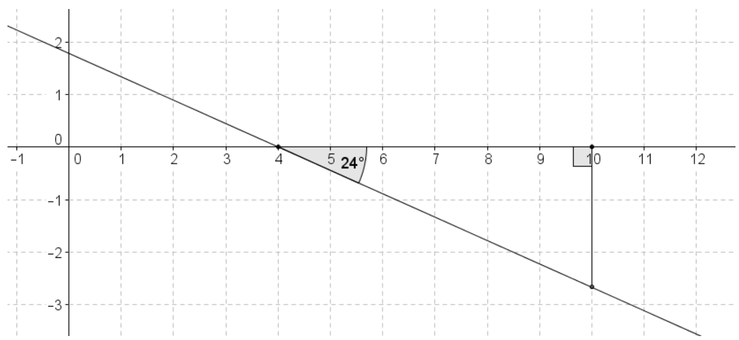


Name ____ Date ____________________

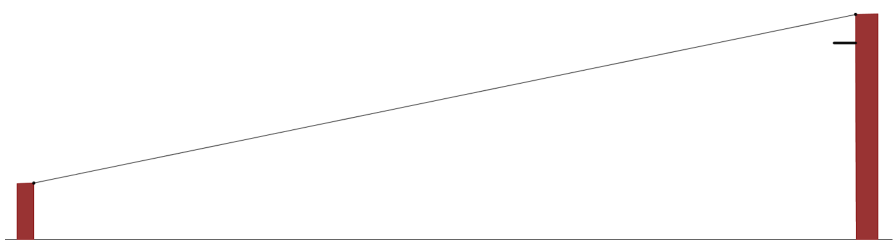
Lesson 29: Applying Tangents

Exit Ticket

1. The line on the coordinate plane makes an angle of depression of $24°$. Find the slope of the line, correct to four decimal places.



2. Samuel is at the top of a tower and will ride a trolley down a zip-line to a lower tower. The total vertical drop of the zip-line is 40 ft. The zip line's angle of elevation from the lower tower is $11.5°$. What is the horizontal distance between the towers?



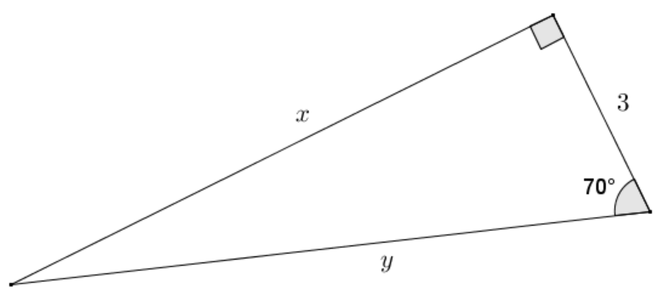
Name ____ Date ____________________

Lesson 30: Trigonometry and the Pythagorean Theorem

Exit Ticket

1. If $\sin\beta = \frac{4\sqrt{29}}{29}$, use trigonometric identities to find $\sin\beta$ and $\tan\beta$.

2. Find the missing side lengths of the following triangle using sine, cosine, and/or tangent. Round your answer to four decimal places.

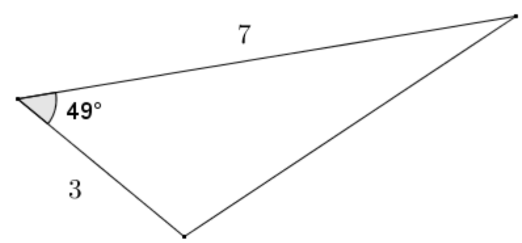


Name ______________________________ Date ____________________

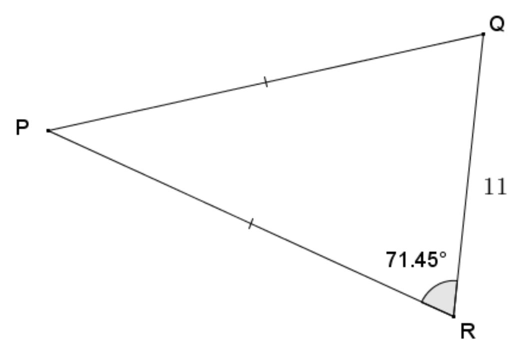
Lesson 31: Using Trigonometry to Determine Area

Exit Ticket

1. Given two sides of the triangle shown, having lengths of 3 and 7, and their included angle of $49°$, find the area of the triangle to the nearest tenth.



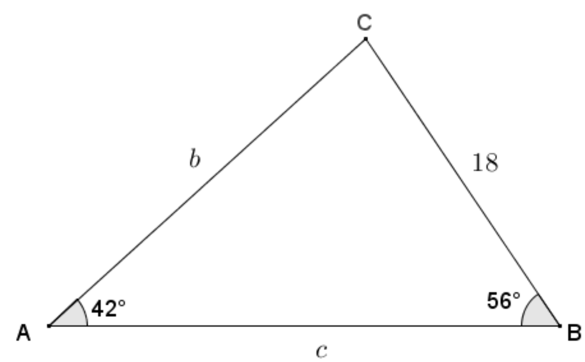
2. In isosceles triangle PQR, the base $QR = 11$, and the base angles have measures of $71.45°$. Find the area of $\triangle PQR$.



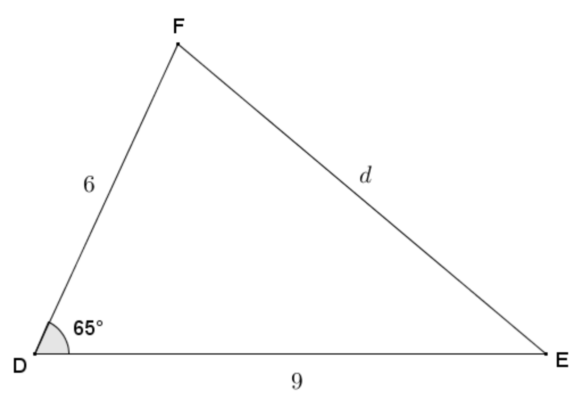
Name ____ Date ____________________

Lesson 32: Using Trigonometry to Find Side Lengths of an Acute Triangle

1. Use the law of sines to find lengths b and c in the triangle below. Round answers to the nearest tenth as necessary.



2. Given $\triangle DEF$, use the law of cosines to find the length of the side marked d to the nearest tenth.

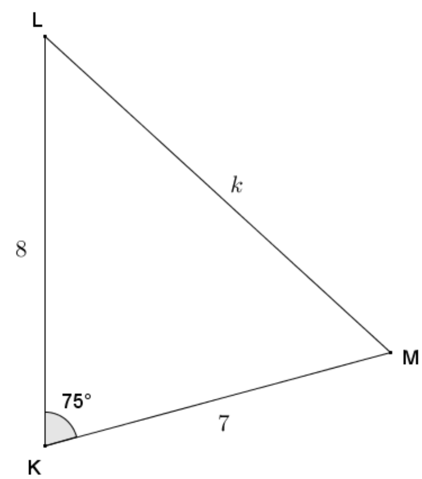


Name ______________________________________ Date ____________________

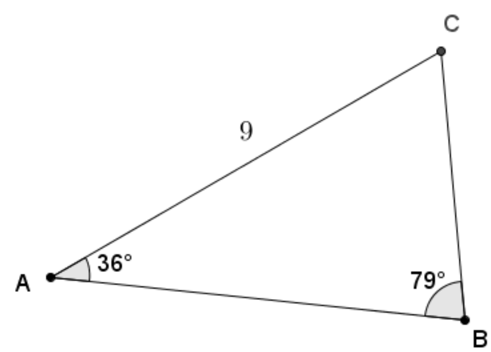
Lesson 33: Applying the Laws of Sines and Cosines

Exit Ticket

1. Given triangle MLK, $KL = 8$, $KM = 7$, and $m\angle K = 75°$, find the length of the unknown side to the nearest tenth. Justify your method.



2. Given triangle ABC, $m\angle A = 36°$, $m\angle B = 79°$, and $AC = 9$, find the lengths of the unknown sides to the nearest tenth.



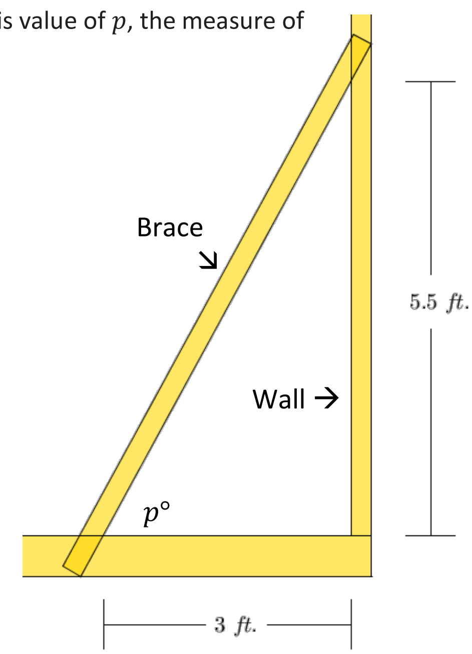
Name ____ Date____________________

Lesson 34: Unknown Angles

Exit Ticket

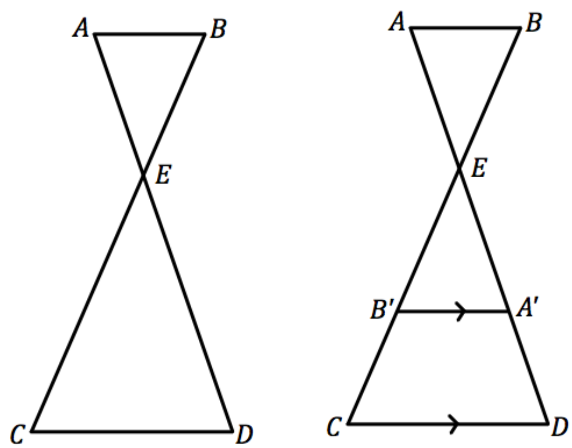
1. Explain the meaning of the statement "$\arcsin\left(\frac{1}{2}\right) = 30°$." Draw a diagram to support your explanation.

2. Gwen has built and raised a wall of her new house. To keep the wall standing upright while she builds the next wall, she supports the wall with a brace, as shown in the diagram below. What is value of p, the measure of the angle formed by the brace and the wall?

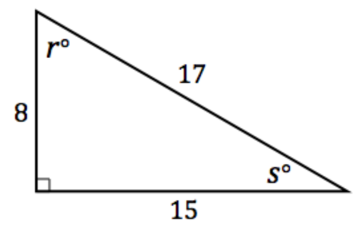


Name ______________________________ Date ________________

1. In the figure below, rotate $\triangle EAB$ about E by $180°$ to get $\triangle EA'B'$. If $\overline{A'B'} \parallel \overline{CD}$, prove that $\triangle EAB \sim \triangle EDC$.



2. Answer the following questions based on the diagram below.



a. Find the sine and cosine values of angles r and s. Leave answers as fractions.

$\sin r° =$ $\sin s° =$

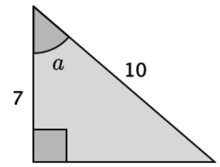
$\cos r° =$ $\cos s° =$

$\tan r° =$ $\tan s° =$

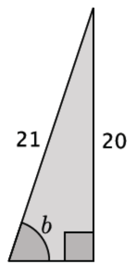
b. Why is the sine of an acute angle the same value as the cosine of its complement?

c. Determine the measures of the angles to the nearest tenth of a degree, in the right triangles below.

i. Determine the measure of $\angle a$.



ii. Determine the measure of $\angle b$.



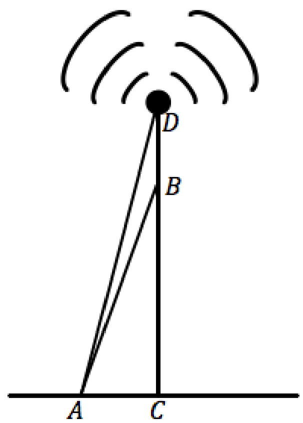
iii. Explain how you were able to determine the measure of the unknown angle in part (i) or part (ii).

d. A ball is dropped from the top of a 45 ft building. Once the ball is released a strong gust of wind blew the ball off course and it dropped 4 ft from the base of the building.

   i. Sketch a diagram of the situation.

   ii. By approximately how many degrees was the ball blown off course? Round your answer to the nearest whole degree.

3. A radio tower is anchored by long cables called guy wires, such as AB in the figure below. Point A is 250 m from the base of the tower, and $\angle BAC = 59°$.



a. How long is the guy wire? Round to the nearest tenth.

b. How far above the ground is it fastened to the tower?

c. How tall is the tower, DC, if $\angle DAC = 71°$?

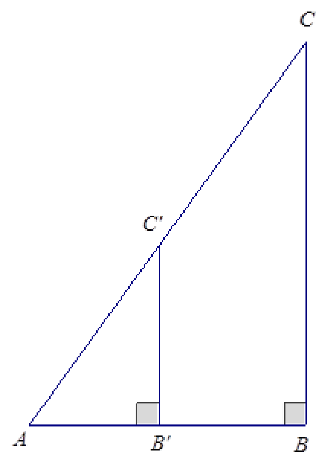
4. The following problem is modeled after a surveying question developed by a Chinese mathematician during the Tang Dynasty in the seventh century A.D.

   A building sits on the edge of a river. A man views the building from the opposite side of the river. He measures the angle of elevation with a hand-held tool and finds the angle measure to be $45°$. He moves 50 feet away from the river and re-measures the angle of elevation to be $30°$.

   What is the height of the building? From his original location, how far away is the viewer from the top of the building? Round to the nearest whole foot.

5. Prove the Pythagorean theorem using similar triangles. Provide a well-labeled diagram to support your justification.

6. In right triangle $\triangle ABC$ with $\angle B$ a right angle, a line segment $B'C'$ connects side AB with the hypotenuse so that $\angle AB'C'$ is a right angle as shown. Use facts about similar triangles to show why $\cos C' = \cos C$.



7. Terry said, "I will define the zine of an angle x as follows. Build an isosceles triangle in which the sides of equal length meet at angle x. The zine of x will be the ratio of the length of the base of that triangle to the length of one of the equal sides." Molly said, "Won't the zine of x depend on how you build the isosceles triangle?"

   a. What can Terry say to convince Molly that she need not worry about this? Explain your answer.

   b. Describe a relationship between zine and sin.