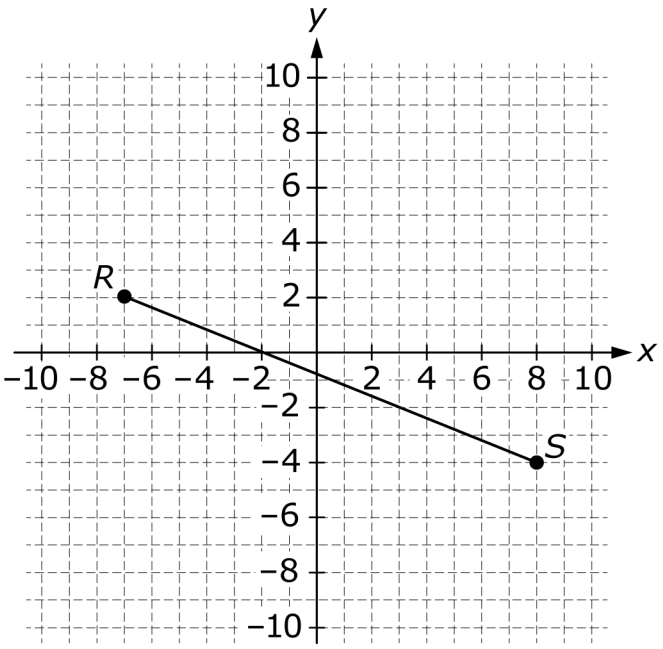
Name _____ Period _____ Date _____

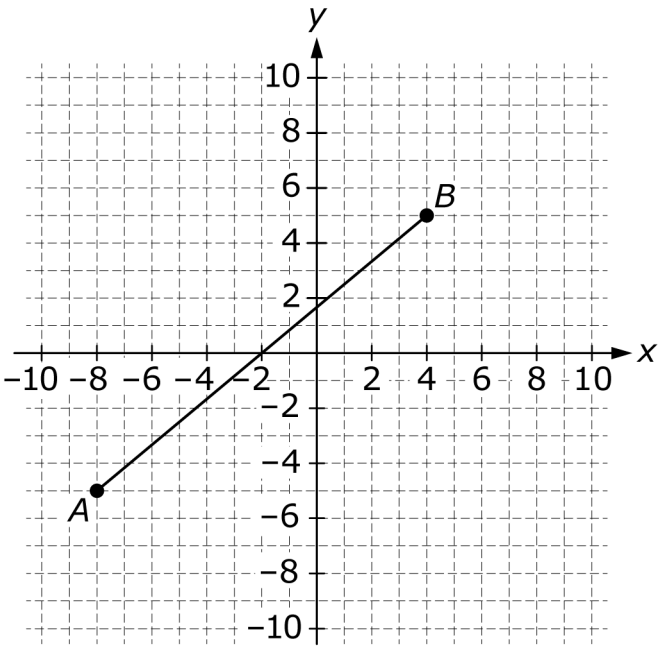
Geometry Unit 3 Model Curriculum Assessment

1.



On the directed line segment from R to S on the coordinate plane above, what are the coordinates of the point that partitions the segment in the ratio 2 to 3 ?

2.

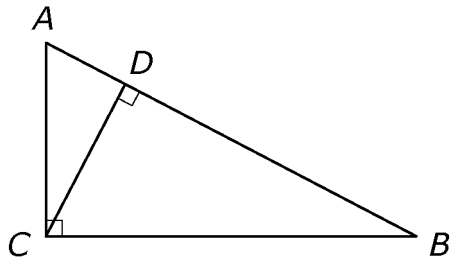


On the coordinate plane above, $\overline{AB}$ represents a walking path in a park. Lights have been installed at the locations represented by points A and B. The park manager wants to place two additional lights at equal intervals from A to B. What are the coordinates of the points that represent where the new lights should be placed?

3. Point P lies on the directed line segment from $A(2, 3)$ to $B(8, 0)$ and partitions the segment in the ratio 2 to 1. What are the coordinates of point P ?

4. Point R lies on the directed line segment from $L(-8, -10)$ to $M(4, -2)$ and partitions the segment in the ratio 3 to 5. What are the coordinates of point R ?

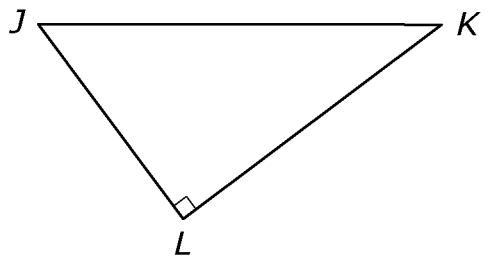
5.



In right triangle ACB above, $\overline{CD}$ is perpendicular to $\overline{AB}$. Complete the proof that $AC^2 + BC^2 = AB^2$ by providing a reason for each statement in the table below.

Statements	Reasons
Triangle ACB is a right triangle.	
$\angle ACB$ is a right angle.	
$\overline{CD}$ is perpendicular to $\overline{AB}$.	
$\angle ADC$ and $\angle BDC$ are right angles.	
$\angle ADC \cong \angle ACB$ and $\angle BDC \cong \angle ACB$	
$\angle A \cong \angle A$	
$\varsigma ACD : \varsigma ABC$	
$\angle B \cong \angle B$	
$\varsigma CBD : \varsigma ABC$	
$\frac{AD}{AC} = \frac{AC}{AB}$ and $\frac{BD}{BC} = \frac{BC}{AB}$	
$AC^2 = AB \cdot AD$ and $BC^2 = AB \cdot BD$	
$AC^2 + BC^2 = AB \cdot AD + AB \cdot BD$	
$AC^2 + BC^2 = AB(AD + BD)$	
$AB = AD + BD$	
$AC^2 + BC^2 = AB^2$	

6.



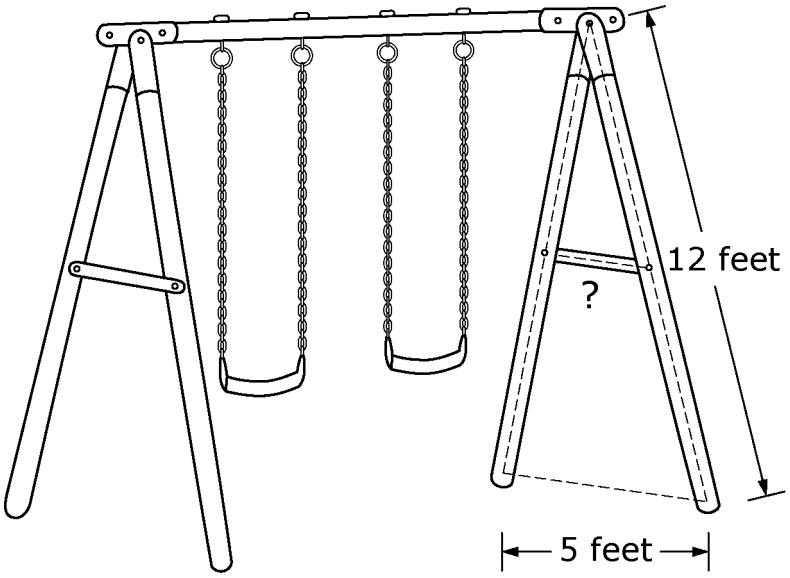
Triangle *JKL* above represents the boundary of a state wilderness area. An access road will be constructed that intersects side *JK* at a 90 degree angle and extends to point *L*. The road will intersect side *JK* 24 miles from point *K*, and the length of side *KL* is 30 miles.

Part A: What is the length, in miles, of the access road? Show your work.

Part B: What is the length, in miles, of side *JK* ? Show your work.

Part C: What is the length, in miles, of side *JL* ? Show your work.

7.



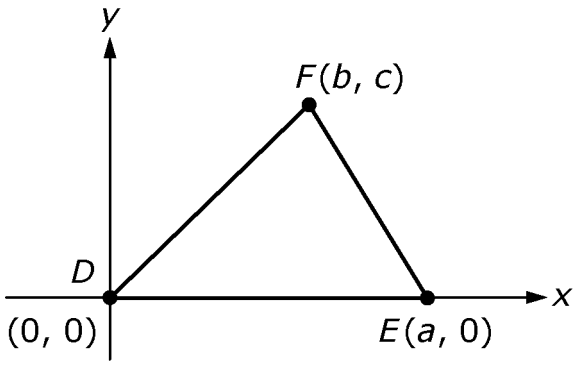
The figure above represents a swing set. The supports on each side of the swing set are contructed from two 12-foot poles connected by a brace at their midpoint. The distance between the bases of the two poles is 5 feet.

Part A: What is the length of each brace?

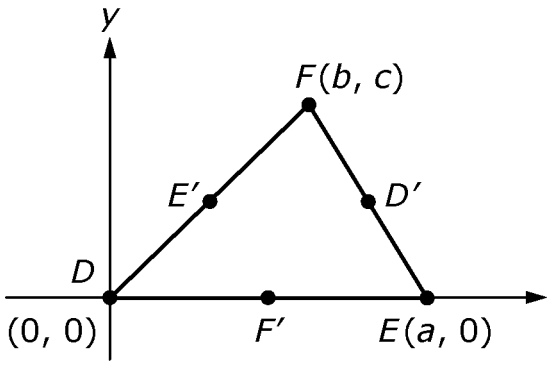
Part B: Which theorem about triangles did you apply to find the solution in Part A?

8. Answer Parts A–D below to complete some aspects of the proof that the medians of a triangle meet at a point.

Without loss of generality, we can assume that the vertices of the triangle are at the points $D(0, 0)$, $E(a, 0)$, and $F(b, c)$, as shown below.



Then the midpoints of $\overline{DE}$, $\overline{EF}$, and $\overline{DF}$ can be labeled as F', D', and E' respectively, as shown.



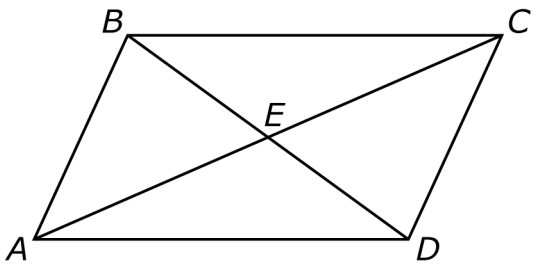
Part A: It can be shown that the coordinates of E' are $\left(\frac{b}{2}, \frac{c}{2}\right)$ and the coordinates of F' are $\left(\frac{a}{2}, 0\right)$. What are the coordinates of D' in terms of a, b, and c ?

Part B: Based on your answer to Part A, what is the slope of $\overline{DD'}$ in terms of a, b, and c ?

Part C: Based on your answer to Part B, what is the equation of $\overleftrightarrow{DD'}$?

Part D: It can be shown that $\overleftrightarrow{EE'}$ and $\overleftrightarrow{FF'}$ intersect at the point $\left(\frac{a+b}{3}, \frac{c}{3}\right)$. Show that $\left(\frac{a+b}{3}, \frac{c}{3}\right)$ is also a point on $\overleftrightarrow{DD'}$.

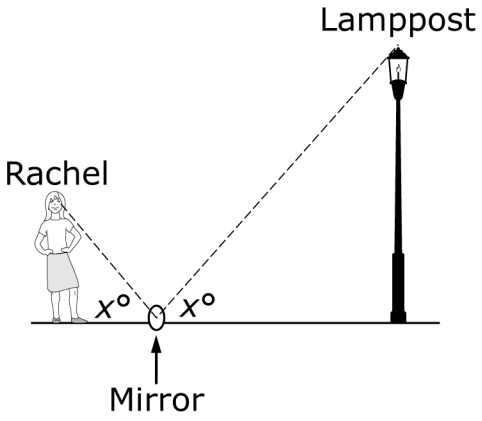
9.



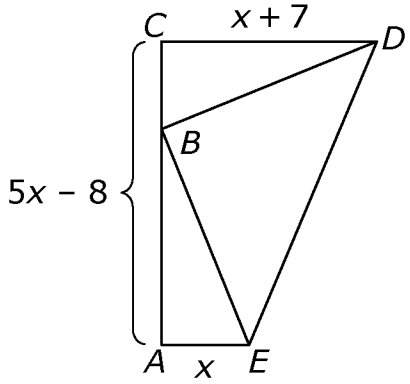
Refer to parallelogram *ABCD* above. Complete the proof that segment *AC* and segment *BD* bisect each other by providing the missing statements or reasons in the table below.

Statements	Reasons
	Given
$\overline{AB} \cong \overline{CD}$	
$\overline{AB} \parallel \overline{CD}$	
$\angle ABE \cong \angle CDE$	
$\angle BAE \cong \angle DCE$	
$\triangle ABE \cong \triangle CDE$	
	Corresponding parts of congruent triangles are congruent
	Definition of midpoint
Segment *AC* and segment *BD* bisect each other	

10. To find the height of a lamppost at a park, Rachel placed a mirror on the ground 20 feet from the base of the lamppost. She then stepped back 4 feet so that she could see the top of the lamp post in the center of the mirror. Rachel's eyes are 5 feet 6 inches above the ground. What is the height, in feet, of the lamppost?



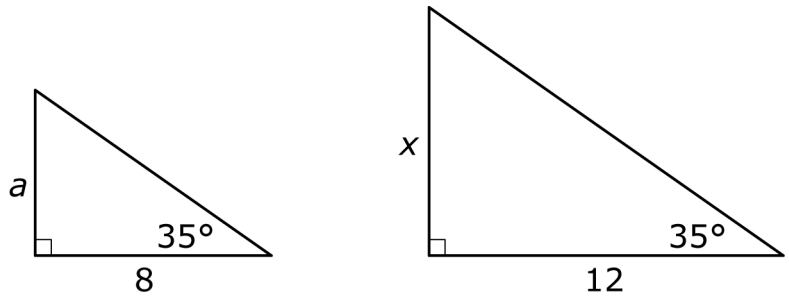
11. In trapezoid *ACDE* below, $\angle ABE$ is congruent to $\angle CDB$, the length of $\overline{AC}$ is $5x - 8$, and angle *A* is a right angle. What is the area of trapezoid *ACDE* ?



12. $\sin 50 = 0.7660$

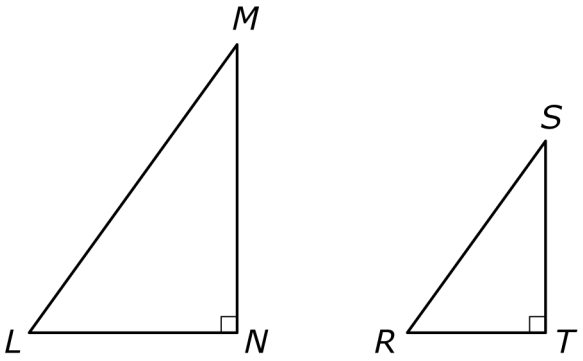
The equation above represents the display on a calculator in degree mode. Use right triangles to explain the meaning of the equation and why it can be applied to any size right triangle with a 50° angle.

13.



For the two right triangles above, explain why $\frac{a}{8} = \frac{x}{12}$. What trigonometric ratio is also equal to the two given ratios?

14.



In the right triangles above, $\angle L \cong \angle R$. For each ratio of side lengths in the table below, use the right triangles to identify another ratio of side lengths that is equal to the given ratio and all sine, cosine, or tangent ratios that are also equal to the given ratio.

	Side Ratio	Trigonometric Ratios
$\frac{LN}{MN}$		
$\frac{MN}{LN}$		
$\frac{LN}{LM}$		
$\frac{MN}{LM}$		

15. If angle X and angle Y are complementary angles, which of the following must be true?

a. $\sin X = \sin Y$

b. $\cos X = \cos Y$

c. $\tan X = \tan Y$

d. $\sin X = \cos Y$

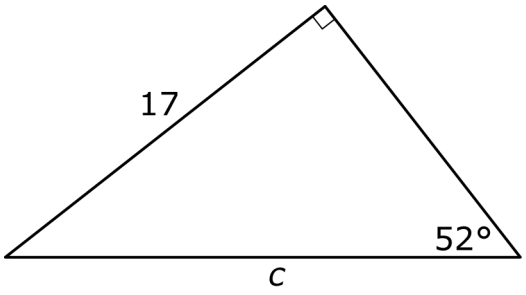
Explain your answer using words and figures.

16.

The figure above represents a plan for a wheelchair ramp to a step that has a height of 10 inches. Jodi and Kevin each used right-triangle trigonometry to determine the length of the ramp. Both solutions are shown below. Explain why both solutions resulted in the same answer.

Jodi's solution	Kevin's solution
$\sin 5^\circ = \frac{10}{x}$	$\cos 85^\circ = \frac{10}{x}$
$x \sin 5^\circ = 10$	$x \cos 85^\circ = 10$
$x = \frac{10}{\sin 5^\circ}$	$x = \frac{10}{\cos 85^\circ}$
$x \approx 114.7$ inches	$x \approx 114.7$ inches

17.



In the figure above, $\sin 52^\circ = \frac{17}{c}$. Based on the figure, which of the following equations is also true?

a. $\sin 38^\circ = \frac{c}{17}$

b. $\cos 38^\circ = \frac{17}{c}$

c. $\cos 52^\circ = \frac{17}{c}$

d. $\tan 52^\circ = \frac{c}{17}$

18. A 12-foot ladder that is leaning against a wall makes a 75.5° angle with the level ground. Which of the following equations can be used to determine the height, *y,* above the ground, in feet, that the ladder touches the wall?

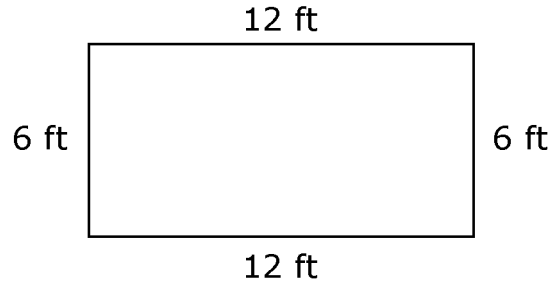
a. $\cos 75.5 = \frac{y}{12}$

b. $\cos 75.5 = \frac{12}{y}$

c. $\sin 75.5 = \frac{y}{12}$

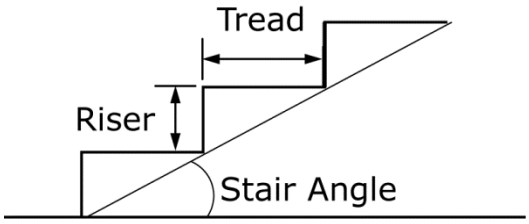
d. $\sin 75.5 = \frac{12}{y}$

19.



The figure above represents a plot of land that Susan has measured to use as a fenced garden. Before she builds the fence, she wants to make sure that the plot is rectangular. She measures the length of one of the diagonals. If Susan's plot is rectangular, what will be the length, in feet, of the diagonal she measured?

20. The diagram below shows a model of a staircase in which all the riser heights are equal and all the tread lengths are equal.



A carpenter wants to build a staircase in which each riser has a height of 6 inches and each tread has a length of 11 inches. Which of the following expressions is equal to the stair angle?

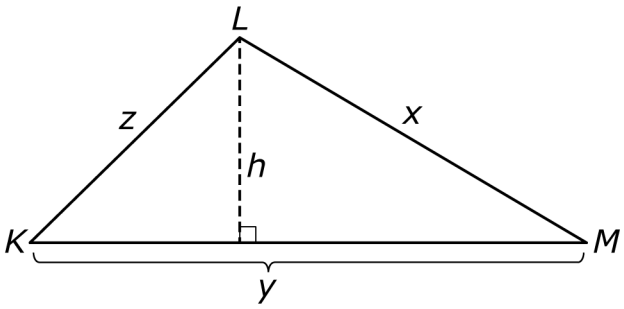
a. $\sin^{-1}\left(\frac{6}{11}\right)$

b. $\sin^{-1}\left(\frac{11}{6}\right)$

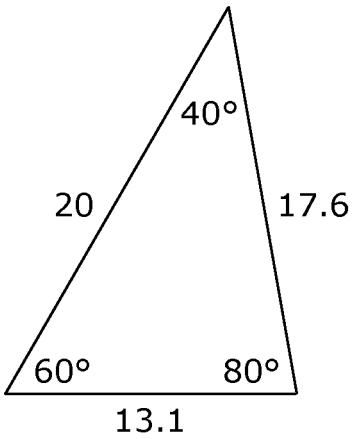
c. $\tan^{-1}\left(\frac{6}{11}\right)$

d. $\tan^{-1}\left(\frac{11}{6}\right)$

21. Use trigonometry to show that a formula for the area of $\triangle KLM$ below is $A = \frac{1}{2}xy\sin M$.

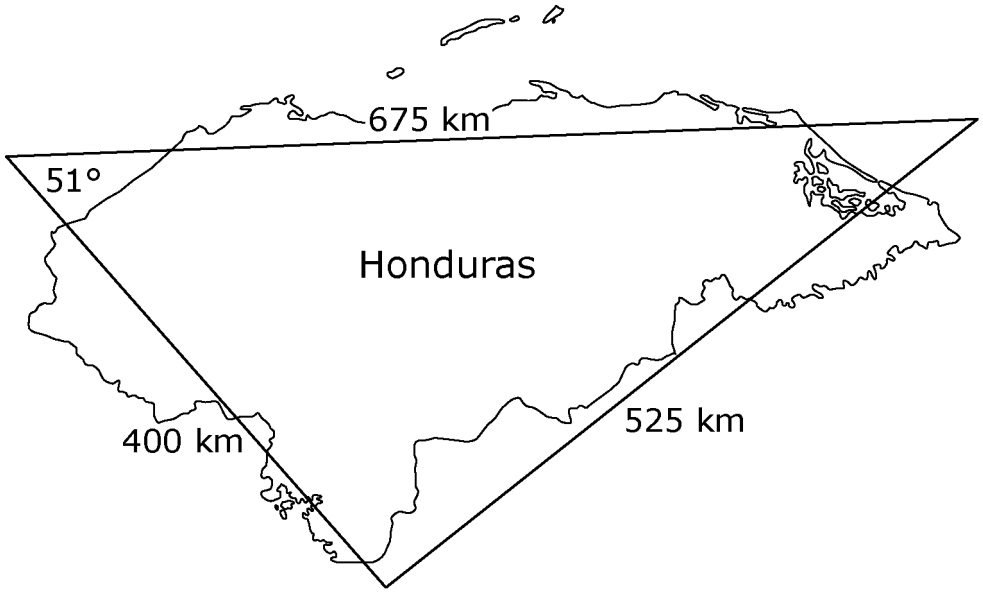


22. Which of the following expressions can be used to find the area of the triangle below? Select all that apply.



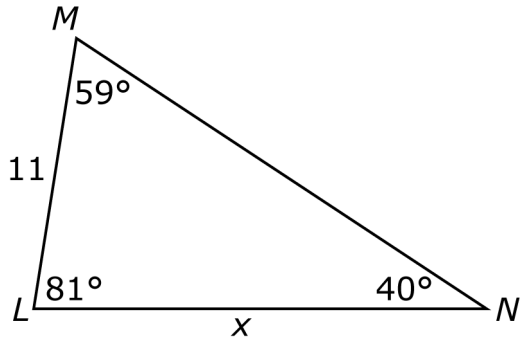
	Can Be Used
$\frac{1}{2}(17.6)(20)\sin 40^\circ$	○
$\frac{1}{2}(13.1)(20)\sin 40^\circ$	○
$\frac{1}{2}(13.1)(17.6)\sin 60^\circ$	○
$\frac{1}{2}(13.1)(20)\sin 60^\circ$	○
$\frac{1}{2}(17.6)(20)\sin 80^\circ$	○
$\frac{1}{2}(13.1)(17.6)\sin 80^\circ$	○

23.



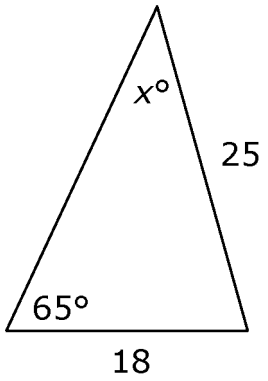
The figure above shows a triangle drawn over a map of Honduras. Use the measurements of the triangle to approximate the area, in square kilometers, of Honduras. Show your work.

24.



For $\triangle LMN$ above, determine whether the Law of Sines or the Law of Cosines is the best method to find the value of x. Do not solve for x. Justify your answer.

25.



Which of the following expressions gives the value of x in the triangle above?

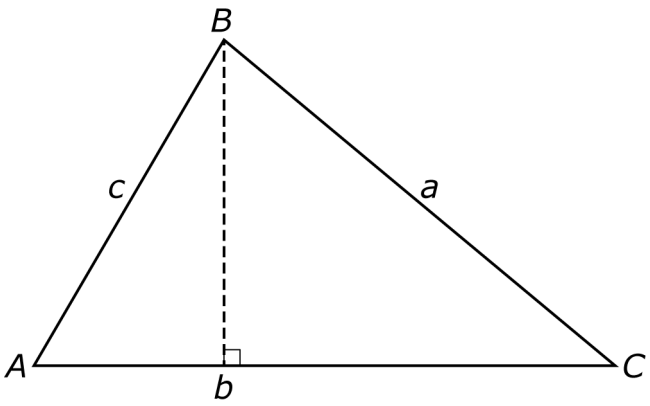
a. $\dfrac{18\sin 65^\circ}{25}$

b. $\sin^{-1}\left(\dfrac{18\sin 65^\circ}{25}\right)$

c. $\sin^{-1}\left(\dfrac{25}{18\sin 65^\circ}\right)$

d. $\sqrt{25^2 + 18^2 - 2(25)(18)\cos 65^\circ}$

26. Refer to the triangle below. Use the altitude to show why $\frac{\sin A}{a} = \frac{\sin C}{c}$.



27. The three sides of a triangle have lengths 20, 25, and 40. Which of the following expressions gives the measure of the largest angle of the triangle?

a. $\cos^{-1}\left(\frac{40^2 - 20^2 - 25^2}{-2(20)(25)}\right)$

b. $\cos^{-1}\left(\frac{25^2 - 20^2 - 40^2}{-2(20)(40)}\right)$

c. $\sqrt{25^2 + 20^2 - 2(25)(20)\cos 40^\circ}$

d. $\sqrt{25^2 + 40^2 - 2(25)(40)\cos 20^\circ}$