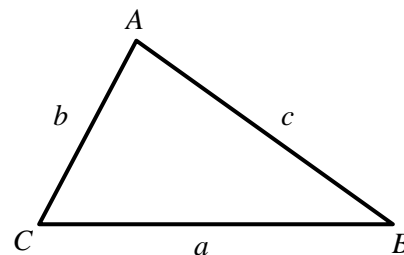


**THE LAW OF SINES**  
**ALGEBRA 2 WITH TRIGONOMETRY**

In the last lesson we found a very simple formula for calculating the area of a triangle. This formula can be manipulated to produce what is known as the **Law of Sines**. We shall see how this is accomplished in the first exercise.

**Exercise #1:** A general triangle  $ABC$  is shown below. Answer the following questions based on this triangle.

- (a) Write three different equations that express the area of this triangle.



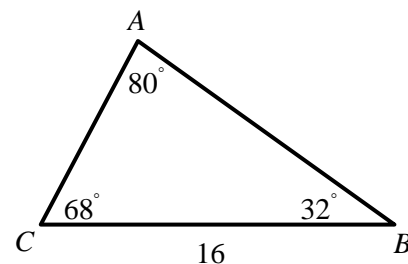
- (b) Write an extended equality (more than one equal sign) that relates the three expressions from part (a).

- (c) Divide each “side” of this equation by the quantity  $\frac{1}{2}abc$ , producing the Law of Sines.

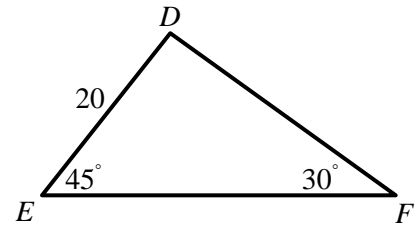
**THE LAW OF SINES**

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \quad \text{or equivalently} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

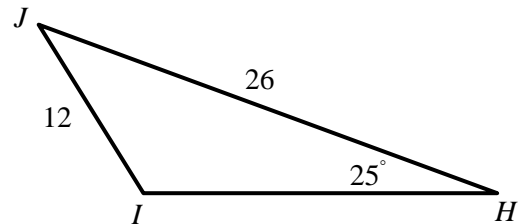
**Exercise #2:** In triangle  $ABC$  shown below,  $BC = 16$ ,  $m\angle A = 80^\circ$ ,  $m\angle B = 32^\circ$ , and  $m\angle C = 68^\circ$ . Determine the lengths of  $\overline{AB}$  and  $\overline{AC}$  to the nearest *tenth*.



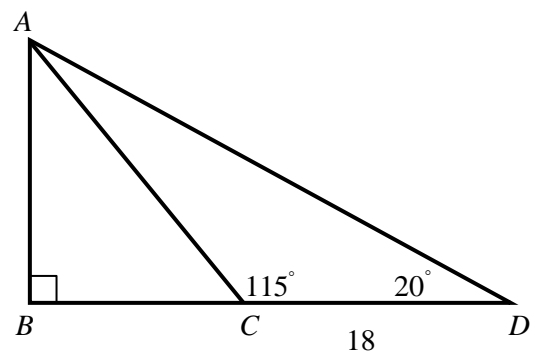
**Exercise #3:** In  $DEF$  shown below  $DE = 20$ ,  $m\angle E = 45^\circ$ , and  $m\angle F = 30^\circ$ . Find the length of  $\overline{DF}$  in exact and simplest form.



**Exercise #4:** In  $\triangle HIJ$  shown below it is known that  $IJ = 12$ ,  $HJ = 26$ , and  $m\angle H = 25^\circ$ . Determine all possible value for  $m\angle I$  to the nearest tenth of a degree.



**Exercise #5:** In the diagram shown below it is given that points  $B$ ,  $C$ , and  $D$  are collinear (fall in a straight line). It is also known that  $m\angle D = 20^\circ$ ,  $m\angle ACD = 115^\circ$ ,  $m\angle B = 90^\circ$  and  $CD = 18$ . Determine the length of  $\overline{AB}$  to the nearest tenth. Note that you will need to apply the Law of Sines twice to solve this problem.



**THE LAW OF SINES**  
**ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK**

**SKILLS**

1. In  $\triangle ABC$ ,  $\sin A = \frac{2}{3}$ ,  $\sin B = \frac{1}{2}$  and  $b = 9$ . Which of the following represents the value of  $a$ ?

(1) 15

(3) 12

(2) 18

(4) 6

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2. In  $\triangle DEF$ ,  $DE = 8$ ,  $DF = 14$ , and  $\sin E = \frac{3}{4}$ . Which of the following is the value of  $\sin F$ ?

(1)  $\frac{2}{7}$ (3)  $\frac{3}{14}$ (2)  $\frac{7}{8}$ (4)  $\frac{3}{7}$ 

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3. In  $\triangle PQR$ ,  $m\angle Q = 112^\circ$ ,  $m\angle R = 35^\circ$ , and  $PR = 28$ . The length of  $\overline{PQ}$  is closest to

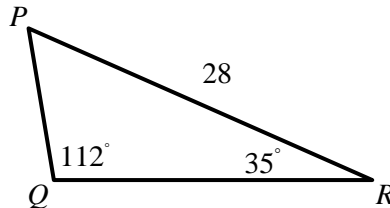
(1) 17.3

(3) 45.3

(2) 8.8

(4) 27.4

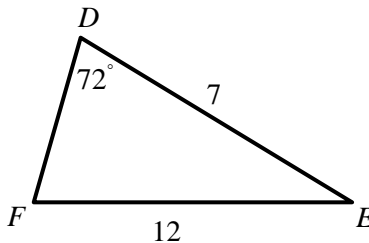
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4. In acute  $\triangle DEF$  it is known that  $m\angle D = 72^\circ$ ,  $DE = 7$ , and  $EF = 12$ . To the nearest degree  $m\angle F =$

(1)  $62^\circ$ (3)  $34^\circ$ (2)  $42^\circ$ (4)  $51^\circ$ 

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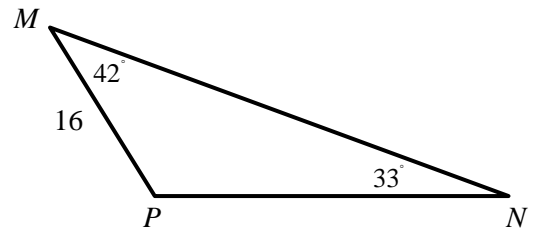


5. A triangle has angles that measure  $25^\circ$ ,  $48^\circ$  and  $107^\circ$ . If the shortest side of this triangle has a measure of 12 inches, find the length of its longest side to the nearest *tenth* of an inch.



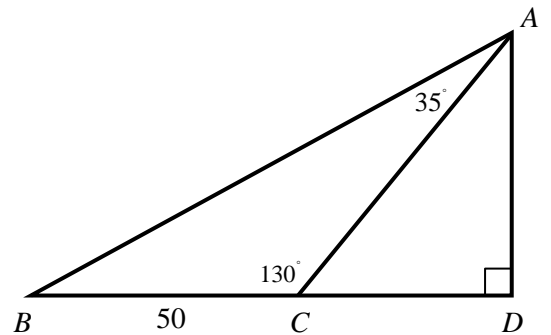
6. In  $\triangle MNP$ ,  $m\angle M = 42^\circ$ ,  $m\angle N = 33^\circ$ , and  $MP = 16$  inches.

(a) Find the length of  $\overline{PN}$  to the nearest *tenth* of an inch.



(b) Using your answer from (a), determine the area of  $\triangle MNP$  to the nearest square inch.

7. In the diagram shown below it is given that points  $B$ ,  $C$ , and  $D$  are collinear. It is also known that  $m\angle BAC = 35^\circ$ ,  $m\angle BCA = 130^\circ$ ,  $m\angle D = 90^\circ$  and  $BC = 50$ . Determine the length of  $\overline{AD}$  to the nearest *tenth*.



8. In quadrilateral  $ABCD$ ,  $m\angle A = 100^\circ$ ,  $m\angle ADB = 22^\circ$ ,  $m\angle CBD = 94^\circ$ , and  $m\angle C = 35^\circ$ . If  $AB = 24$ , find  $CD$  to the nearest *tenth*.

