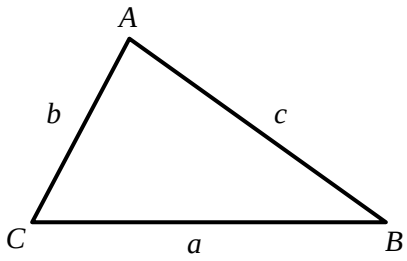
Name: _____ Date: _____

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.

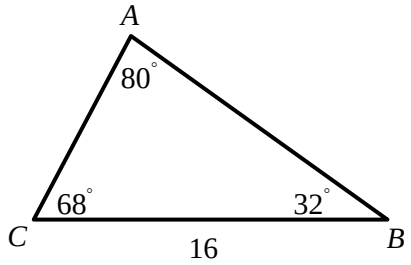
(b) Write an extended equality (more than one equal sign) that relates the three expressions from part (a).

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

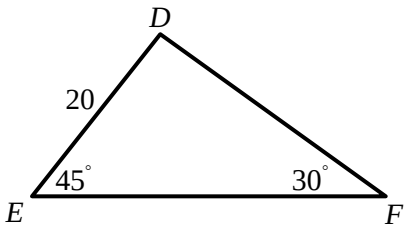
THE LAW OF SINES

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

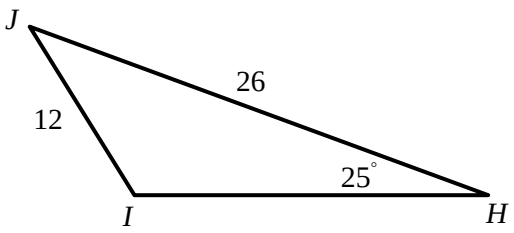
***Exercise* #2:** In triangle *ABC* shown below, $BC = 16$, $m\angle A = 80^\circ$, $m\angle B = 32^\circ$, and $m\angle C = 68^\circ$. Determine the lengths of $\overline{AB}$ and $\overline{AC}$ to the nearest *tenth*.



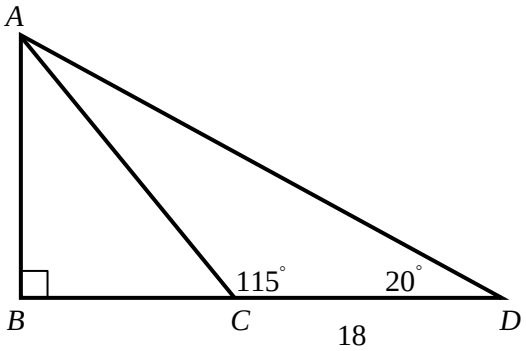
***Exercise* #3:** In DEF shown below $DE = 20, m\angle E = 45^\circ,$ and $m\angle F = 30^\circ$. Find the length of $\overline{DF}$ in exact and simplest form.



***Exercise* #4:** In ΔHIJ 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.



Name: _____ Date: _____

THE LAW OF SINES
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

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

   (1) 15 (3) 12

   (2) 18 (4) 6 _____

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

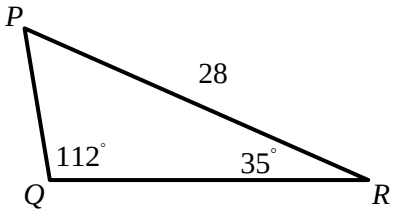
   (1) $\frac{2}{7}$ (3) $\frac{3}{14}$

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

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

   (1) 17.3 (3) 45.3

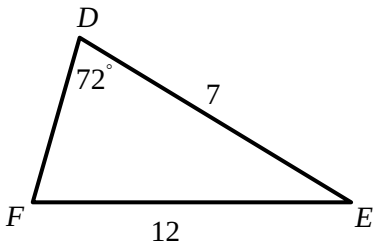
   (2) 8.8 (4) 27.4 _____



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

   (1) 62° (3) 34°

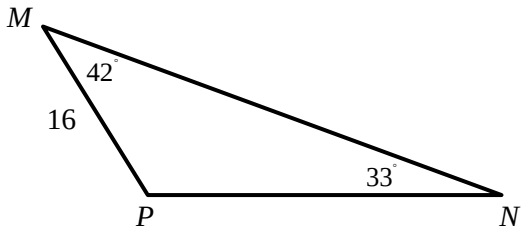
   (2) 42° (4) 51° _____



5. A triangle has angles that measure 25°, 48° and 107°. 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.

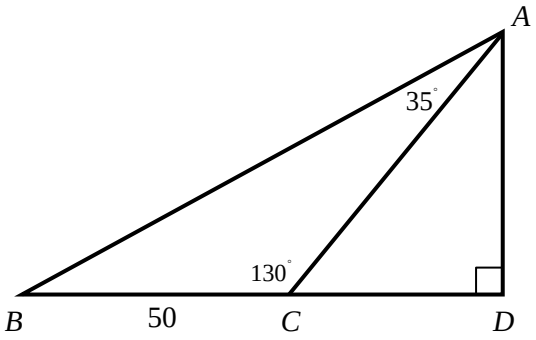
6. In ΔMNP, $m\angle M = 42^\circ$, $m\angle N = 33^\circ$, and $MP = 16$ inches.

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



(b) Using your answer from (a), determine the area of ΔMNP 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*.