Trigonometry: The Law of Sines

The LAW OF SINES is a powerful triangle tool which is used to find missing sides or angles of ANY triangle. By matching up angles with their opposite sides, the equation is:

\[
\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}
\]

Example: Find the missing side \(x\):

\[
\frac{\sin 19^\circ}{16} = \frac{\sin 40^\circ}{x}
\]

\[
.326 = \frac{.643}{x}
\]

\[
.326x = 10.288
\]

\[
x = 31.56\text{ cm}
\]

Solve each triangle:

1) \(\begin{array}{c}
26 \\
29^\circ \\
50 \\
\end{array}\)

2) \(\begin{array}{c}
20^\circ \\
40 \\
62^\circ \\
\end{array}\)

3) \(\begin{array}{c}
73^\circ \\
25 \\
24 \\
\end{array}\)

4) \(\begin{array}{c}
21^\circ \\
140^\circ \\
100 \\
\end{array}\)

5) Find the perimeter of \(\triangle DEF\).

This worksheet was adapted from http://www.bgsd.k12.wa.us/riv/homework/Geometry/LawOfSines.doc
The LAW OF SINES can also be used to find missing angles.

**Example:** Find the missing angle $x$:

\[
\frac{\sin x^\circ}{36} = \frac{\sin 75^\circ}{50}
\]
\[
\sin x^\circ = \frac{.966}{36} 
\]
\[
50(\sin x^\circ) = 34.776
\]
\[
\sin x^\circ = .69532
\]
\[
x = 44^\circ \text{ (using inverse sine on your calculator)}
\]

What about the other unknowns?

**Solve each triangle:**

6) 

7) 

8) 

9) 

10) Find the area of circle $C$ by using the Law of Sines to find the radius. **Hint:** What kind of triangle is $ABC$?

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