Trigonometry
Activity 4b - Area of a Triangle

Assume we know the formula for the area of a triangle

\[ Area = \frac{1}{2}(base)(height) \]

1. (SAS) Do as many of the following problems as are necessary for you to develop a process that you can describe in question 2. In each case, find \( h \) and the area of the triangle. Note that \( b \) is the entire length from \( A \) to \( C \), not just the portion that would be the adjacent side to angle \( A \) in the right triangle.

   (a) Given \( b = 7 \), \( c = 5 \) and \( A = 35^\circ \), find \( h \) and the area of the triangle.

   \[
   \begin{align*}
   A & \quad 35^\circ \\
   b = 7 & \quad C \\
   c = 5 & \quad B \\
   h & \\
   a & \\
   \end{align*}
   \]

   (b) Given \( b = 12 \), \( c = 8 \) and \( A = 52^\circ \), find \( h \) and the area of the triangle.

   (c) Given \( b = 4 \), \( c = 11 \) and \( A = 83^\circ \), find \( h \) and the area of the triangle.

   (d) Given \( b = 10 \), \( c = 9 \) and \( A = 115^\circ \), find \( h \) and the area of the triangle.

2. Describe, in words, the steps needed to find the area of a triangle, given \( A \), \( b \), and \( c \). (You may also use mathematical expressions in your description.)

3. Using \( c \) and \( A \), write a formula for \( h \). Then write a formula for the area of the triangle.

   \[
   \begin{align*}
   A & \quad b \\
   c & \quad B \\
   h & \quad a \\
   \end{align*}
   \]

4. Repeat using \( a \) and \( C \). That is, using \( a \) and \( C \), write a formula for \( h \). Then write a formula for the area of the triangle.
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5. (AAS = AAAS = ASA) Do as many of the following problems as are necessary for you to develop a process that you can describe in question 6. In each case, find $c$, then find $h$, then find the area of the triangle. Note that $b$ is the entire length from $A$ to $C$, not just the portion that would be the adjacent side to angle $A$ in the right triangle.

(a) Given $b = 7$, $A = 35^\circ$, $B = 65^\circ$ and $C = 80^\circ$

![Diagram](image)

- Find $c$
- Find $h$
- Find the area of the triangle

(b) Given $b = 12$, $A = 52^\circ$, $B = 67^\circ$ and $C = 61^\circ$

(c) Given $b = 5$, $A = 85^\circ$, $B = 23^\circ$ and $C = 72^\circ$

(d) Given $b = 11$, $A = 115^\circ$, $B = 43^\circ$ and $C = 22^\circ$

6. Describe, in words, the steps needed to find the area of a triangle, given $b$, $A$, $B$, and $C$. (You may also use mathematical expressions in your description.)

7. Derive a formula for the area of a triangle, given $b$, $A$, $B$ and $C$, by doing the following

![Diagram](image)

- Find $c$, as a function of $b$, $C$ and $B$
- Find $h$, as a function of $c$ and $A$
- Find $h$, as a function of $b$, $A$, $B$ and $C$
- Find the area of the triangle, as a function of $b$, $A$, $B$ and $C$