Lesson 2.10 - Sin and Cos

Measurment 2.9 – The Sine and Cosine Ratio

Today we will:
- Develop and apply primary trigonometric ratios (sine and cosine) to solve problems that involve right triangles.

*** Is your calculator in degree mode? ***

\[ \tan 45^\circ = 1 \]

Trigonometric Ratios:
- The ratio of the measures of two sides of a right triangle.
- There are three primary trig ratios:

\[
\begin{align*}
\sin A &= \frac{\text{Opp}}{\text{Hyp}} \\
\cos A &= \frac{\text{Adj}}{\text{Hyp}} \\
\tan A &= \frac{\text{Opp}}{\text{Adj}}
\end{align*}
\]

What would the sine and cosine ratios be for the triangle below?

\[
\begin{align*}
\sin A &= \frac{\text{Opp}}{\text{Hyp}} \\
\sin x &= \frac{BC}{AB} \\
\cos A &= \frac{\text{Adj}}{\text{Hyp}} \\
\cos x &= \frac{AC}{AB}
\end{align*}
\]
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Example: Write the sine and cosine ratios for angle A.

\[
\begin{align*}
\text{Sin } A &= \frac{\text{opp}}{\text{hyp}} = \frac{6}{10} \\
\text{Cos } A &= \frac{\text{adj}}{\text{hyp}} = \frac{8}{10}
\end{align*}
\]

SINE RATIO:

Example: Use the sine ratio to find the unknown side “x” of the triangles.

\[
\begin{align*}
\text{Sin } 35^\circ &= \frac{\text{opp}}{\text{hyp}} \\
\frac{(10)(\sin 35^\circ)}{x} &= \frac{x}{10} \\
(10)(\sin 35^\circ) &= x \\
x &= 5.73
\end{align*}
\]

\[
\begin{align*}
\text{Sin } 40^\circ &= \frac{\text{opp}}{\text{hyp}} \\
\frac{(x)(\sin 40^\circ)}{9} &= \frac{x}{\sin 40^\circ} \\
(x)(\sin 40^\circ) &= 9 \\
x &= 14
\end{align*}
\]
**Problem:** A kite has a string that is 400 ft. long. If the string makes an angle of 42° to the ground, what is the height of the kite to the nearest foot?

\[
\sin 42° = \frac{\text{Opp}}{\text{Hyp}} \Rightarrow x = 400 \times (\sin 42°)
\]

\[
(400)(\sin 42°) = x
\]

\[
x = 268 \text{ ft.}
\]

**Cosine Ratio:**

**Example:** Determine the measure of angle A.

\[
\cos A = \frac{\text{Adj}}{\text{Hyp}}
\]

\[
\cos \theta = \frac{12}{15}
\]

\[
\theta = \cos^{-1}(\frac{12}{15}) = 36.9°
\]

**Example:** Use the cosine ratio to find the unknown side “x” of the triangles.
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Practice: A plane takes off and steadily increases at an angle of 12.2°. Determine the horizontal distance the plane has travelled when it has climbed 5.4 km along its flight path. Give your answer to the nearest tenth of a kilometer.

Practice: A 6 meter long ladder is leaned up against a wall. If the ladder makes a 60° angle with the ground, how high up the wall does the ladder reach?