Homework: none

Note: Proportions and Pythagorean Theorem

Using proportions is a basic mathematical process when problem solving and will become increasingly important as we explore trigonometry. Recall, $\frac{x}{3} = \frac{5}{12}$ is a proportion where x is our unknown or our variable.

In order to solve for x we might use a process known as ‘cross multiplication’.

\[
\begin{align*}
\frac{x}{3} &= \frac{5}{12} \\
12x &= 5(3) \quad \text{multiply both sides} \\
12x &= 15 \\
\frac{12x}{12} &= \frac{15}{12} \quad \text{divide both sides by 12} \\
x &= \frac{5}{4} \quad \text{don't forget to reduce your answer if necessary}
\end{align*}
\]

Proportions are especially important when solving similar triangles. For example, given triangles ABC and ADE are similar, (meaning that the sides are proportional), find the unknown.

a)

\[
\begin{align*}
\frac{9}{x} &= \frac{15}{14} \\
9(14) &= 15x \quad \text{cross multiply} \\
126 &= 15x \\
\frac{126}{15} &= \frac{15x}{15} \quad \text{divide both sides by the same number} \\
8.4cm &= x \quad \text{round your decimal to the nearest tenth}
\end{align*}
\]
\[
\frac{7.5}{9} = \frac{5}{9-x}
\]

\[9(5) = 7.5(9-x) \quad \text{cross multiply}\]

\[45 = 67.5 - 7.5x\]

\[-22.5 = -7.5x\]

\[-7.5\]

\[3m = x \quad \text{round your decimal to the nearest tenth if necessary}\]

**Pythagorean Theorem** is another important aspect leading to trigonometry. Recall the Pythagorean Theorem says the hypotenuse squared is equal to the sum of the squares of the other two sides. If we write it as an algebraic sentence, it looks like \(a^2 + b^2 = c^2\) where \(c\) represents the hypotenuse. Solve the following triangles using this theorem.

a)

\[x^2 = 5.9^2 + 7.2^2\]

\[x^2 = 34.81 + 51.84\]

\[x^2 = 86.65\]

\[x = \sqrt{86.65}\]

\[x = 9.3m\]

b)

\[15^2 = 8^2 + x^2\]

\[225 = 64 + x^2\]

\[225 - 64 = x^2\]

\[161 = x^2\]

\[\sqrt{161} = x\]

\[12.7m = x\]

**Homework**: Similar Triangles and Pythagorean Theorem Assignment (Kuta geometry)