DATE: _____

4.2 Trigonometric Functions of Acute Angles (Target 5B)

Review of Prior Concepts

1. Convert each radian measure to degrees:

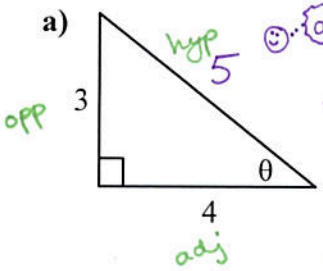
a) $\frac{\pi}{6}$ $\left(\frac{\pi}{6}\text{ radian}\times\frac{180^\circ}{\pi\text{ radian}}\right)$ 30°

b) $\frac{\pi}{4}$ $\left(\frac{\pi}{4}\text{ radian}\times\frac{180^\circ}{\pi\text{ radian}}\right)$ 45°

c) $\frac{\pi}{3}$ $\left(\frac{\pi}{3}\text{ radian}\times\frac{180^\circ}{\pi\text{ radian}}\right)$ 60°

2. Find the values of $\sin\theta$, $\cos\theta$, $\tan\theta$.

a)



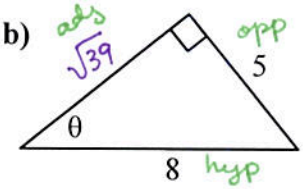
$a^2+b^2=c^2$

$\sin\theta=\frac{3}{5}$

$\cos\theta=\frac{4}{5}$

$\tan\theta=\frac{3}{4}$

b)



$a^2+5^2=8^2$

$a^2+25=64$

$\sqrt{a^2}=\sqrt{39}$

$\sin\theta=\frac{5}{8}$

$\cos\theta=\frac{\sqrt{39}}{8}$

$\tan\theta=\frac{8}{\sqrt{39}}$

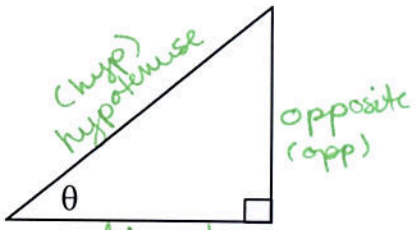
rationalize optional

Six Trigonometric Ratios

$\sin\theta=\frac{\text{opp}}{\text{hyp}}$ $\qquad$ $\csc\theta=\frac{\text{hyp}}{\text{opp}}=\frac{1}{\sin\theta}$

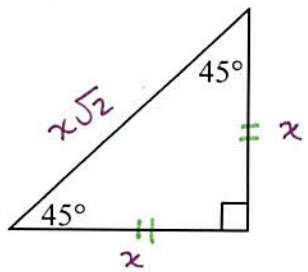
$\cos\theta=\frac{\text{adj}}{\text{hyp}}$ $\qquad$ $\sec\theta=\frac{\text{hyp}}{\text{adj}}=\frac{1}{\cos\theta}$

$\tan\theta=\frac{\text{opp}}{\text{adj}}$ $\qquad$ $\cot\theta=\frac{\text{adj}}{\text{opp}}=\frac{1}{\tan\theta}$



Special Right Triangles

45°–45°–90° Δ



$x^2+x^2=c^2$

$2x^2=c^2$

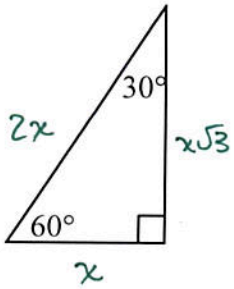
$\sqrt{2x^2}=c$

$x\sqrt{2}=c$

What do you know about a 45°–45°–90° Δ?

Sides are: $x, x, x\sqrt{2}$

30°–60°–90° Δ



$a^2+x^2=(2x)^2$

$a^2+x^2=4x^2$

$a^2=3x^2$

$a=\sqrt{3x^2}$

$a=x\sqrt{3}$

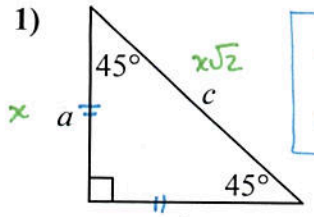
What do you know about a 30°–60°–90° Δ?

Sides are: $x, x\sqrt{3}, 2x$

Examples:

Find the value of the variables.

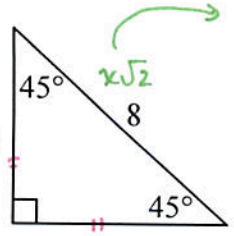
1)



$x \quad a = 3 \quad c = 3\sqrt{2}$

$3 \quad x \rightarrow x = 3$

2)



$8 = x\sqrt{2}$

$\frac{8}{\sqrt{2}} = x$

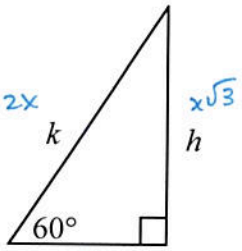
$\frac{8\sqrt{2}}{2} = x$

$4\sqrt{2} = x$

$x \quad d = 4\sqrt{2} \quad f = 4\sqrt{2}$

$x \quad f$

3)



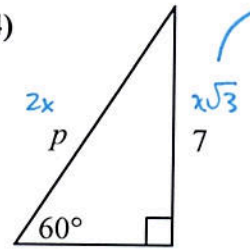
$k = 2(5)$

$k = 10$

$h = 5\sqrt{3}$

$5 \quad x \rightarrow x = 5$

4)



$7 = x\sqrt{3}$

$\frac{7}{\sqrt{3}} = x$

$\frac{7\sqrt{3}}{3} = x$

$m = \frac{7\sqrt{3}}{3} \quad p = \frac{14\sqrt{3}}{3}$

$m \quad x$

Evaluate without using a calculator:

5) $\tan\left(\frac{\pi}{3}\right)$ $\quad \frac{\pi}{3} \cdot \frac{180^\circ}{\pi} = 60^\circ$

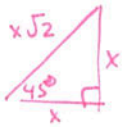
$\tan(60^\circ)$

$\tan 60^\circ = \frac{\text{opp}}{\text{adj}} = \frac{x\sqrt{3}}{x}$

$\tan\left(\frac{\pi}{3}\right) = \sqrt{3}$

6) $\csc\left(\frac{\pi}{4}\right)$ $\quad \frac{\pi}{4} \cdot \frac{180^\circ}{\pi} = 45^\circ$

$\csc(45^\circ)$



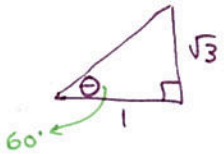
$\csc(45^\circ) = \frac{\text{hyp}}{\text{opp}} = \frac{x\sqrt{2}}{x}$

$\csc\left(\frac{\pi}{4}\right) = \sqrt{2}$

Find the acute angle θ, in both degrees and radians, without using a calculator.

7) $\tan\theta = \sqrt{3}$ $\quad$ which △ uses $\sqrt{3}$? 30-60-90° △

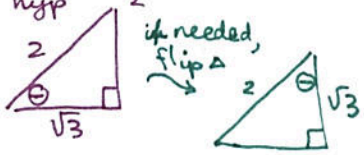
$\frac{\text{opp}}{\text{adj}} = \frac{\sqrt{3}}{1}$



$\theta = 60^\circ$ or $\frac{\pi}{3}$

8) $\cos\theta = \frac{\sqrt{3}}{2}$ $\quad$ which △ uses $\sqrt{3}$? 30°-60°-90°

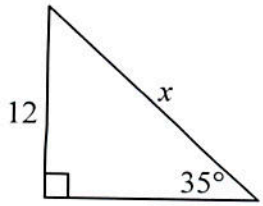
$\frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{3}}{2}$



$\theta = 30^\circ$ or $\frac{\pi}{6}$

Find the value of *x* in the triangle.

9)



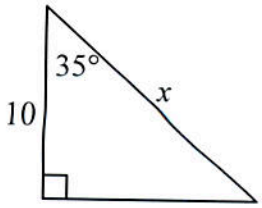
$\sin 35^\circ = \frac{12}{x}$

$x \sin 35^\circ = 12$

$x = \frac{12}{\sin 35^\circ}$

$x = 20.921$

10)



$\cos 35^\circ = \frac{10}{x}$

$x \cos 35^\circ = 10$

$x = \frac{10}{\cos 35^\circ}$

$x = 12.208$