STARTER 5.2

Find the reference angle for each angle in standard position.

1) 320^0 **2) -545^0** **3) -225^0** **4) 89^0**

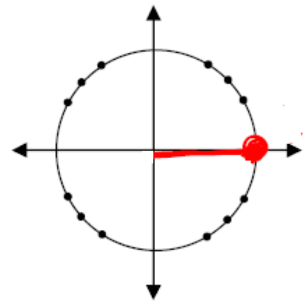
Vocabulary of Angles …

Initial side

Terminal side

Vertex

Standard position



Quadrant	I	II	III	IV
Reference Angle				

5.2: Trigonometric Ratios in Right Triangles

Objective:

- Find the values of trigonometric ratios for acute angles of right triangles.

In a right triangle, one of the angles measures 90°, and the remaining two angles are *acute* and *complementary*.

acute angle – an angle that measures less than 90°

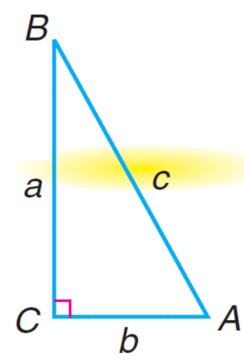
complementary angles – two angles that add up to 90°

hypotenuse – the longest side

legs – the two perpendicular sides of a right triangle

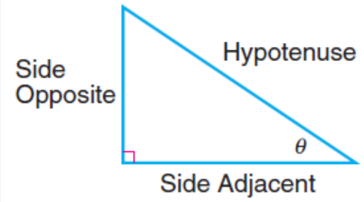
adjacent side – the leg that is a side of an acute angle

opposite side – the leg opposite an acute angle



TRIGONOMETRIC RATIOS

	Words	Symbol	Definition
Trigonometric Ratios	sine θ	$\sin\theta$	$\sin\theta = \dfrac{\text{side opposite}}{\text{hypotenuse}}$
	cosine θ	$\cos\theta$	$\cos\theta = \dfrac{\text{side adjacent}}{\text{hypotenuse}}$
	tangent θ	$\tan\theta$	$\tan\theta = \dfrac{\text{side opposite}}{\text{side adjacent}}$



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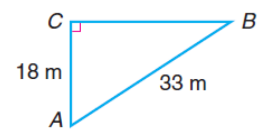
$$\textbf{Sin } \theta = \frac{\textbf{Opposite}}{\textbf{Hypotenuse}} \qquad \textbf{Cos } \theta = \frac{\textbf{Adjacent}}{\textbf{Hypotenuse}} \qquad \textbf{Tan } \theta = \frac{\textbf{Opposite}}{\textbf{Adjacent}}$$

CAUTION!!!

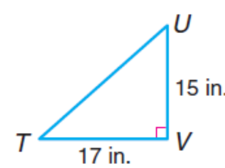
Sin θ is read "the sin of θ." Writing **"sin"** by itself is meaningless and **must be avoided**. NAKED TRIG FUNCTIONS!

***Example* 1:** Find the values of the sine, cosine, and tangent for $\angle B$.

Leave answers to simplest fraction or radical form.

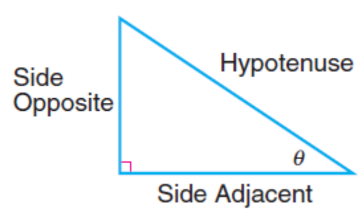


***PRACTICE 1*:** Find the values of the sine, cosine, and tangent for $\angle T$.
Leave answers to simplest fraction or radical form.



RECIPROCAL IDENTITIES

	Words	Symbol	Definition
Reciprocal Trigonometric Ratios	cosecant θ	$\csc\theta$	$\csc\theta = \dfrac{1}{\sin\theta}$ or $\dfrac{\text{hypotenuse}}{\text{side opposite}}$
	secant θ	$\sec\theta$	$\sec\theta = \dfrac{1}{\cos\theta}$ or $\dfrac{\text{hypotenuse}}{\text{side adjacent}}$
	cotangent θ	$\cot\theta$	$\cot\theta = \dfrac{1}{\tan\theta}$ or $\dfrac{\text{side adjacent}}{\text{side opposite}}$



$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

***Example* 2:**

a) If $\cos\theta = \frac{3}{4}$, find sec θ, sin θ, and cot θ.

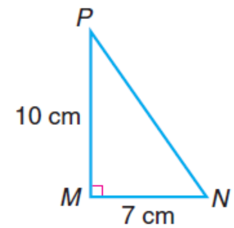
b) If $\csc\theta = 1.345$, find sin θ.

***PRACTICE* 2:**

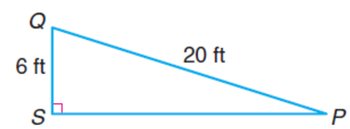
a) If $\sin\theta = \frac{2}{5}$, find csc θ, cos θ, and cot θ.

b) If $\cot\theta = 1.5$, find sin θ.

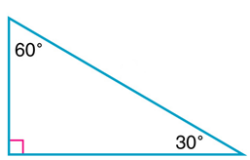
***Example* 3:** Find the values of the six trigonometric ratios for $\angle P$.
Leave answers to simplest fraction or radical form.

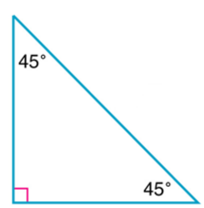


***PRACTICE* 3:** Find the values of the six trigonometric ratios for $\angle P$.
Leave answers to simplest fraction or radical form.



RECALL: Special Triangles 30°-60°-90° and 45°-45°-90°





Complete the table:

θ	sin θ	cos θ	tan θ	csc θ	sec θ	cot θ
30°						
45°						
60°						

Look at the values that are the same in this chart. Do you notice a pattern?

***Example* 4:** Evaluate the following expressions **<u>without using a calculator.</u>**

a) cos 30° sec 30°

b) $(\sin 60°)^2 + (\cos 60°)^2$

c) sin 45° cos 45°

RECALL:

- *Two angles are said to be **complementary** when they add up to* **90°**.
- *The angles* **θ** *and* **90° - θ** *are* ***complementary*** *since they add up to* **90°**.
- Sin **30°**= Cos (**90° - 30°**) = Cos **30°**.

	$\sin\theta = \cos(90^0 - \theta)$	$\cos\theta = \sin(90^0 - \theta)$
Cofunctions	$\tan\theta = \cot(90^0 - \theta)$	$\cot\theta = \tan(90^0 - \theta)$
	$\sec\theta = \csc(90^0 - \theta)$	$\csc\theta = \sec(90^0 - \theta)$

Example* 5:** ***Find the complements of each angle and the required cofunction. Complete the table.

θ	*Complement*	$\sin\theta$	$\cos(90^0 - \theta)$	$\tan\theta$	$\cot(90^0 - \theta)$	$\sec\theta$	$\csc(90^0 - \theta)$
26^0							
48^0							
72^0							
39^0							
16^0							