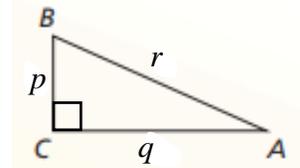## Core Concept

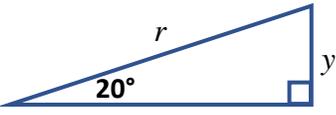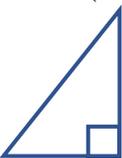### Sine and Cosine of Complementary Angles

The sine of an acute angle is equal to the cosine of its complement. The cosine of an acute angle is equal to the sine of its complement.

Let A and B be complementary angles. Then the following statements are true.

$$\sin A = \cos(90° - A) = \cos B \qquad \sin B = \cos(90° - B) = \cos A$$

$A + B =$ _____
$\sin(A) =$
$\cos(B) =$

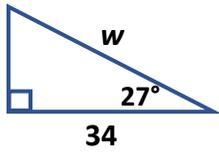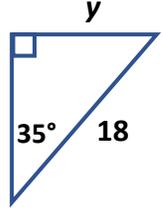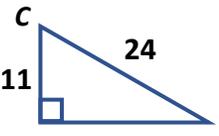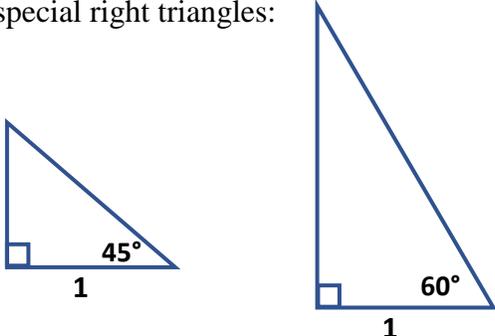| 2) $\sin(20°) = \cos($ $)$	3) $\cos(50°) = \sin($ $)$	4) $\cos(10°) - \sin(80°) =$ _____
5) $\sin(25°) = \cos($ $)$	6) $\cos(10°) = \sin($ $)$	7) $\dfrac{\sin(30°)}{\cos(60°)} =$ ____

Complete the following problems on separate paper. Draw a diagram for each.

1) A firefighter is rescuing a cat in a tree. If the branch that the cat is on is 15 feet above the ground and the ladder makes an angle of 63° with the ground, how long is the ladder?	2) A cable that is 245 feet long is used to support a flag pole. If the angle that the cable makes with the ground is 78°, how long is pole?
3) A surveyor needs to find out how far away she is from a 300 foot cliff. Looking up at the cliff, the angle of elevation is 22°. How far is she from the base of the cliff?	4) At a location 50 meters from the base of a tree, the angle of elevation is 33°. Determine the height of the tree.
5) A ladder makes an 80° angle with the ground. If the ladder is 20 feet long how far is the bottom of the ladder from the wall?	6) The angle of depression from the top of a building to object on the ground is 50°. The building is 55 feet tall. How far away (line of sight distance) is the object?
7) A truck traveled 1600 m down a hill. The elevation change from the top of the hill to the bottom is 64 m. What is the angle of depression from the top of the hill to the bottom?	8) A building 14.5 meters tall casts a shadow of 11.4 meters along level ground. What is the angle of elevation of the sun at that time?
9) A train travels 100 meters on an uphill track. If the train gained 5 meters in elevation, what is the angle of elevation of the track?	10) A lighthouse built at sea level is 150 feet high. From its top, the angle of depression to a buoy is 25°. Find the distance from the buoy to the bottom of the lighthouse.

Front Side: Jumbled Answers: 2.3°, 2.9°, 3.47, 16.83 ≈ 17, 32.47 ≈ 33, 51.8°, 71.80 ≈ 72, 239.65 ≈ 240, 321.68 ≈ 322, 742.53 ≈ 740

Back Side: $\dfrac{3}{4}, \dfrac{\sqrt{7}}{4}, \dfrac{3\sqrt{7}}{7}$, 41.8°, 45.31, 38.16, 70.6°, 10.32, 62.7°, ≈ 350, $\dfrac{1}{2}, \dfrac{\sqrt{2}}{2}, \dfrac{\sqrt{3}}{3}, \dfrac{\sqrt{6}}{6}, \dfrac{-1}{2}$, C, 30, 42

Practice Quiz

1) Fill in a fraction for each trig ratio. Leave answer in simple radical form. Don't find the measure of $\angle A$. $\sin(A) =$ $\cos(A) =$ $\tan(A) =$	2) Find the value the $m\angle A$.
3) Find the value of x.	4) Find the value of w.
5) Find the $m\angle B$	6) Find the value of y.
7) Find the $m\angle C$.	8) A lighthouse built at sea level is 90 feet high. From its top, the angle of depression to a boat is 15°. Find the distance from the boat to the top of the lighthouse.
9) Fill in the missing sides and angles on the special right triangles:	10) Find the exact (no decimals approximations) value of each expression. Leave answer in simple radical form. a) $\sin(30°)$ d) $\cos(45°)\tan(30°)$ b) $\cos(45°)$ e) $\sin(30°) - \tan(45°)$ c) $\tan(30°)$
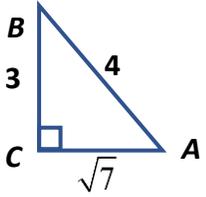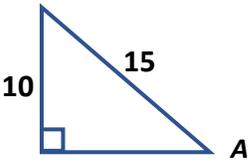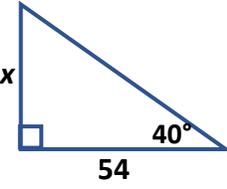
11) Which one of the following is true?
  a) $\cos(70°) = \sin(70°)$
  b) $\cos(20°) = \sin(20°)$
  c) $\cos(20°) = \sin(70°)$
	12) Fill in the blank to make each statement true.
	  a) $\cos(60°) = \sin\left(\quad °\right)$
	
	  b) $\sin(48°) = \cos\left(\quad °\right)$