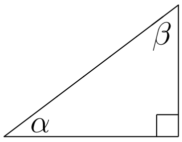
January 20, 2006 Math 026 Quiz #1 Name: ____________________

The number in brackets gives how many points the question is worth. You have 10 minutes for this quiz; no books, notes, calculators, or partridges in pear trees are allowed.

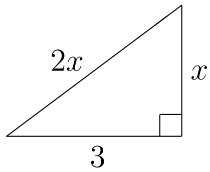
(2) 1. In a right triangle, such as the one shown, α and β are always which of the following? (Circle the *two* correct answers)



acute angles	straight angles	coterminal angles
intersecting rays	obtuse angles	quadrantal angles
right angles	complementary angles	supplementary angles

Solution: The angles in a triangle add up to 180°, and the right angle has measure 90°, so α and β must add up to 90°, making them complementary angles. Since they both have positive measure, they must both be less than 90°, making them acute angles.

(2) 2. Solve for x in the diagram at right. Remember to show your work!

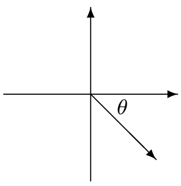


Solution #1: Using the Pythagorean theorem, we have

$$\begin{aligned} x^2 + 3^2 &= (2x)^2 \\ x^2 + 9 &= 4x^2 \\ 3x^2 &= 9 \\ x^2 &= 3 \\ x &= \sqrt{3} \end{aligned}$$

Solution #2: Since the hypotenuse is twice the length of one of the legs (which has length x), this is a 30°-60°-90° triangle. So we know that the other leg must have length equal to $x\sqrt{3}$. From the diagram, this length is 3, so $x\sqrt{3} = 3$, which reduces to $x = \frac{3}{\sqrt{3}} = \sqrt{3}$.

(3) 3.



Let θ be an angle in standard position with measure -45°.

Give the coordinates of a point on the terminal side of θ, besides the origin: ________

What is the distance from your point to the origin? ________

Give the measure of an angle coterminal with θ: ________

Solution: Any point on the terminal side of θ will have the form $(t, -t)$ for some $t > 0$. An easy choice would be $(1, -1)$. Using the distance formula, or drawing in a 45°-45°-90° triangle, we find that the distance to the origin is $t\sqrt{2}$, which is just $\sqrt{2}$ if we choose $(1, -1)$ as our point.

Any angle whose measure differs from $-45°$ by a multiple of $360°$ will be coterminal with θ. The easiest choice is $-45° + 360° = 315°$.

(3) 4. If $\cos\theta = \frac{2}{3}$ and θ is in quadrant IV, find $\sin\theta$ and $\tan\theta$. (Always show your work!)
Hint: Find a point (x, y) on the terminal side of θ.

Solution: Let (x, y) be a point on the terminal side of θ, with distance $r = \sqrt{x^2 + y^2}$ from the origin. Then $\cos\theta = \frac{x}{r} = \frac{2}{3}$, so we can choose our point (x, y) to have $x = 2$, $r = 3$. We must solve for y:

$$\begin{aligned} x^2 + y^2 &= r^2 \\ y^2 &= r^2 - x^2 = 3^2 - 2^2 \\ y^2 &= 9 - 4 = 5 \\ y &= \pm\sqrt{5} \end{aligned}$$

Since the terminal side of θ lies in quadrant IV, where y is negative, we now know that $y = -\sqrt{5}$. So we can write down $\sin\theta$ and $\tan\theta$:

$$\begin{aligned} \sin\theta &= \frac{y}{r} = \frac{-\sqrt{5}}{3} \\ \tan\theta &= \frac{y}{x} = \frac{-\sqrt{5}}{2} \end{aligned}$$