

**College Bound Math Question Group #3**  
for the week of October 20, 2014

These problems are all related. Go as far as you can.

1. This problem is about squaring and square roots. Remember that *square* and *square root* undo each other. Find

(a)  $1.7 \times 1.7 =$  \_\_\_\_\_ (c)  $1.8 \times 1.8 =$  \_\_\_\_\_

(b)  $\sqrt{2.89} =$  \_\_\_\_\_ (d)  $\sqrt{3.24} =$  \_\_\_\_\_

2. Let's find the value of  $\sqrt{3}$  by a series of guesses that get closer and closer to the answer. If our first guess is 2, we find that it's too big since the square of 2 is 4 (which is more than 3). You might also try 1, but its square is 1 which is too small. So you need to guess a number between 1 and 2. What is the square of 1.5? \_\_\_\_\_ You should find that its square is less than 3. What about 1.7? Its square is also too small, but is it a better guess than 1.5? \_\_\_\_\_ Next confirm that 1.8 is too big. Which of the numbers 1.7 and 1.8 has a square that is closer to 3? \_\_\_\_\_ Why is 1.73 a good guess to try next? If you have a calculator, use it to confirm that 1.73 is too small but that it's a better guess than 1.74, which is too big.

3. Now you can use your result from problem #2 along with Pythagoras' Theorem to gain some understanding of the graph of a circle of radius 2. First, we'll find some right triangles, each having a hypotenuse of 2. To do that, the theorem tells us that the legs,  $x$  and  $y$ , satisfy the equation  $x^2 + y^2 = 2^2 (= 4)$ . In one solution  $x = 1$  and  $y = \sqrt{3}$ , which gets plotted as the point  $(1, \sqrt{3})$ . Why is this a solution?

Notice that this is a  $30^\circ$ - $60^\circ$ - $90^\circ$  right triangle as shown below. Another solution has the same numbers but in the opposite order  $(\sqrt{3}, 1)$ . Confirm that  $(2,0)$  and  $(0,2)$  are also solutions.

On the given graph draw  $x$ - and  $y$ -coordinates through point  $A$ . Use a scale where each little square is 0.5 by 0.5, so that the radius is 2. The points found so far all lie either on the positive axes or to the upper right of point  $A$ . However, other solutions involve negative numbers since, for example,  $(-1)^2 = 1$ . These solutions lie in other places. Now show them too on the same graph.

