Round One Qualifying Test for *Who Wants to Be a Mathematician*

1. What is the only positive solution to $3x^2 + 17x = 28$? ___4/3_____

2. What is the ones digit of 2017^{2015} ? ____3____

3. [Note: In this problem, $i = \sqrt{-1}$.] $(15 + i)(15 - i) =$ __226____

4. A cone of radius *r* and height *h* has a volume equal to that of a right circular cylinder having the same height. What is the radius of the right circular cylinder?

___ $\frac{r}{\sqrt{3}}$ _____

5. A palindromic number is one whose digits read the same backward and forward, for example 484 or 909. Which of the following prime numbers is a factor of every four-digit palindromic number? (choose one)

a. 3 b. 7 c. 11 d. 13 e. There is no such prime number (Ans: c)

6. How many solutions are there to the equation $\cos 2x - \sin x = 1$, for $0 \le x < 2\pi$ (*x* in radians)?

_____4_____

7. Which of the following is closest to $1 + \frac{1}{1+\frac{1}{1+\frac{1}{1+1}}}$ (circle one)?

a. $\frac{1+\sqrt{3}}{2}$ b. $\sqrt{2}$ c. $\frac{1+\sqrt{5}}{2}$ d. $\sqrt{\pi}$ e. $\frac{2\pi}{3}$ (Ans: c)

8. A right triangle has legs *a* and *b*, hypotenuse *c*, and perimeter 2*d*. Find $\sqrt{d(d-a)(d-b)(d-c)}$.

_____*ab*/2_____

9. A perfect number is a number greater than 1 that is equal to the sum of its proper factors/divisors (including the factor 1, but not including the number itself). Example: 6 = 1 + 2 + 3. How many perfect numbers are less than 10,000?

___4___

10. Which of the following is largest (circle one)?

a. 2016^{2016} b. 2016! c. $20^{(16^{20})}$ d. $16^{(20^{20})}$ e. $20^{(20^{16})}$ (Ans: d)

Thank you for participating.