

Round One Qualifying Test
2016 National *Who Wants to Be a Mathematician*

1. Solve for x : $2x^2 - x = 15$. **-5/2, 3**

2. What is the ones digit of 2017^{2015} ? **3**

3. How many solutions are there in $[0, 2\pi]$ to the equation $\sin x = \cos x$? **2**

4. George Boole, who developed the logic upon which computers operate, was born in which of the following countries?
a. Austria **b. England** c. France d. Germany

5. How many subsets (including the set itself) of a four-element set have at least two elements?
11

6. What is the area of the quadrilateral formed by gluing together a 3-4-5 right triangle and a 5-12-13 right triangle along their common side of length 5? **36**

7. How many real solutions are there to the equation $\ln(x^2 + x) = \ln(x^2) + \ln(x)$? **1**

8. A prism has an equilateral triangle as its base and top and three rectangles for its lateral sides. A sphere of radius 1 fits inside the prism, touching all five of its faces. What is the volume of the prism?
 $6\sqrt{3}$

9. Bob and Jane have three children. Given that one child is their daughter Mary, what is the probability that Bob and Jane have at least two daughters? **4/7 (we also accepted $\frac{3}{4}$)**

10. What integer is closest to the square root of the product of the largest two-digit prime number and the smallest three-digit prime number?
99