

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

1. Solve for x : $2x^2 - x = 15$. _____

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

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

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? _____

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? _____

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

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? _____

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? _____

[Note: This question was ambiguous, so we accepted two right answers.]

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? _____

Return completed test(s) to Mike Breen (email: paoffice at ams dot org; fax: 401-331-3842; or mail: c/o American Mathematical Society; 201 Charles St.; Providence, RI 02904)

Thank you for participating.