# Bergen County Academies Sunday Math Team
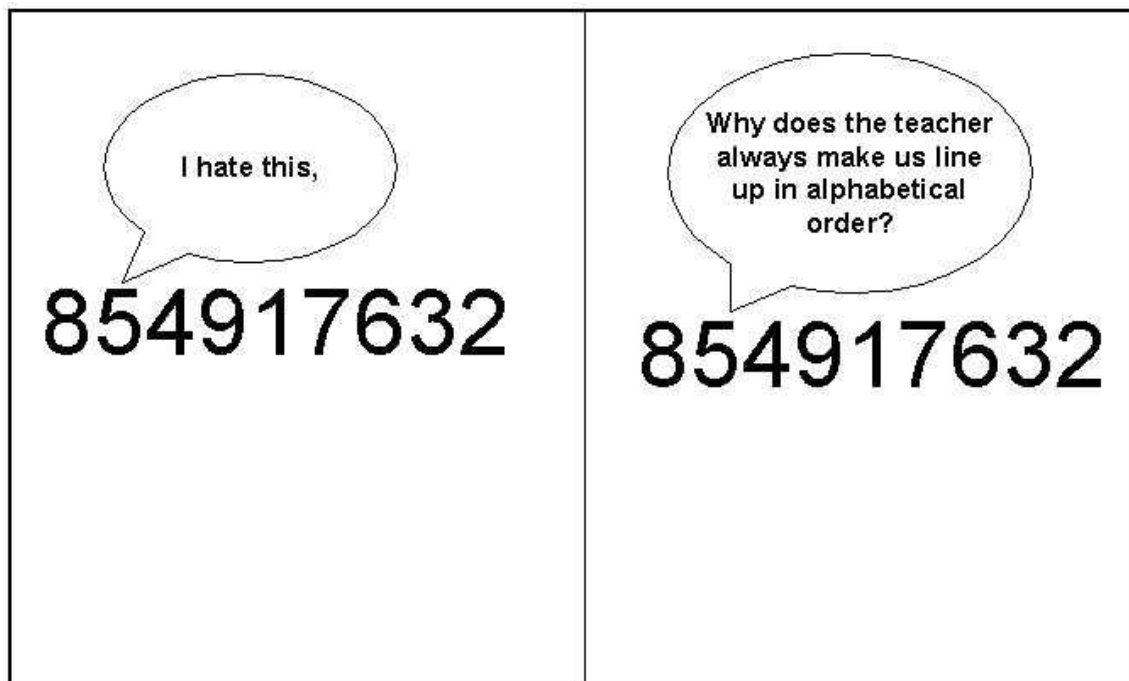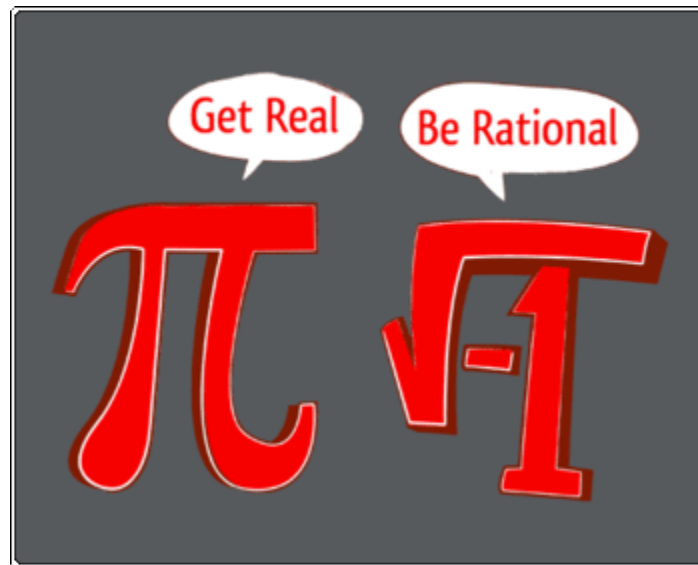## Mock AMC 8
### Sunday, November 16th, 2014

$2013 = 3 \times 11 \times 61$

$2014 = 2 \times 19 \times 53$

$2015 = 5 \times 13 \times 31$

1. In the following expression 2 ☐ 0 ☐ 1 ☐ 4 each box is replaced by one of the arithmetic operators addition (+), multiplication (×), or subtraction (−). Each operator can be used only once for each evaluation. How many different values for the expression is it possible to create?

   A) 2          B) 3          C) 4          D) 5          E) 6

2. Which of the following values can we put in the box to satisfy the equation?

   $$0.1 \times 0.2 \times 0.3 \times 0.4 \times \boxed{\phantom{x}} = 0.12$$

   A) 500        B) 100        C) 50         D) 0.5        E) 0.05

3. The closest integer to $\frac{2014}{2+0+1+4}$ is

   A) 286        B) 287        C) 288        D) 289        E) none of these

4. Esther is 2014 days old. How many months old is she?

   A) 64         B) 65         C) 66         D) 67         E) 68

5. What is the sum the numbers in the series $1 - 2 + 3 - 4 + 5 - \ldots - 2014$ ?

   A) 0          B) -1006      C) 1006       D) -1007      E) 1007

6. The product of four distinct natural numbers is 2014. What is their sum?

   A) 2017              B) 127        C) 93         D) 75         E) 74

7. How many even factors of $2013 \times 2014 \times 2015$ are there?

   A) 128        B) 256        C) 512        D) 1024       E) 2048

8. The sum of all of the divisors of 2014 is?

   A) 2160       B) 2237       C) 3221       D) 3240       E) 4028

9. If the pattern shown is continued, in which row will the number 2014 appear?

                          1
                       2   3   4
                    5   6   7   8   9
                10  11  12  13  14  15  16
                          . . .

   A) 41         B) 42         C) 43         D) 44         E) 45

10. Suppose $M$ and $N$ are natural numbers, and suppose that only one of the following sentences is true, which is it?

   A) $M$ is odd          B) $N^2$ is even          C) $M - N$ is odd
   D) $N$ is odd          E) $M \ and \ N$ have no common factors other than 1

11. Which of the following fractions is nearest to 1?

A) $\frac{2013}{2014}$       B) $\frac{1006}{1007}$       C) $\frac{1007}{1006}$       D) $\frac{2014}{2013}$       E) $\frac{2014}{2015}$

12. 19 Math Team members can eat 53 packages of Welch's Fruit Snacks in 4 minutes. How many minutes will it take 76 math team members to eat 2014 packages?

A) $9\frac{1}{2}$       B) 19       C) $28\frac{1}{2}$       D) 38       E) $47\frac{1}{2}$

13. A piece of paper in the shape of an equilateral triangle has one corner folded over, creating a 40° angle as shown. What is the value of x?

A) 80       B) 85       C) 90       D) 100       E) 110
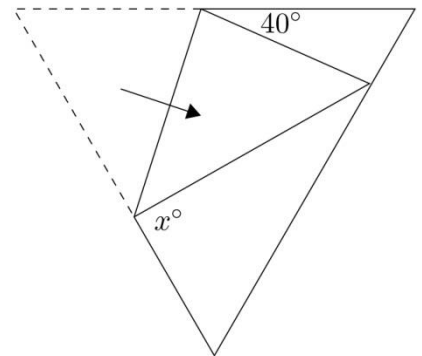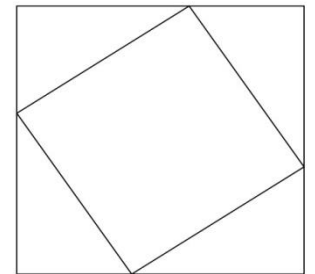
14. In triangle ABC, AC = 7. Point D lies on AB such that AD = BD = CD = 5. What is the value of BC?

A) $\sqrt{51}$       B) $5\sqrt{2}$       C) 7       D) 6       E) $\sqrt{35}$

15. A square of perimeter 20 in. is inscribed in a square of perimeter 28 in. What is the greatest distance between a vertex of the inner square and a vertex of the outer square, in inches?

A) $\sqrt{65}$       B) $\frac{7\sqrt{5}}{2}$       C) 8
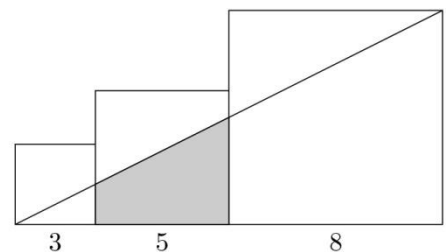
D) $\sqrt{58}$       E) $\frac{25}{2}$

16. A shell is formed from 4 triangular sections, as shown to the right. Each triangle has interior angles of 30°, 60°, and 90°. If AB has length 1 in., what is the length of AF, in inches?

A) $\sqrt{3}$       B) $\frac{8\sqrt{3}}{9}$       C) 2

D) $\sqrt{5}$       E) $\frac{16}{9}$
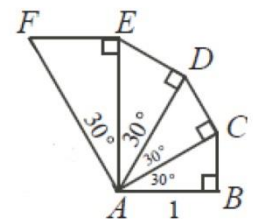
17. Three squares, with side lengths 3 in., 5 in., and 8 in. are arranged in a row as shown to the right.
The area, in square inches, of the shaded region is

A) $\frac{55}{4}$              B) $\sqrt{165}$              C) 13

D) $5\sqrt{5}$              E) $\frac{27}{2}$

18. The increasing sequence 2, 3, 5, 6, 7, 10, 11, …. is made up of all positive integers which are neither perfect squares nor perfect cubes. What is the 2014th term of this sequence?

A) 2066       B) 2067       C) 2068       D) 2069       E) 2070

19. The least common multiple of 312500 and 25600 is

A) 20,000,000   B) 40,000,000       C) 80,000,000       D) 160,000,000       E) 320,000,000

20. Suppose the six faces of two dice are numbered -3, -2, -1, 0, 1, 2. Suppose Vivian rolls these two dice and multiplies the two numbers shown together. What is the probability that her result is positive?

   A) $\frac{1}{4}$        B) $\frac{11}{36}$        C) $\frac{1}{3}$        D) $\frac{13}{36}$        E) $\frac{5}{12}$

21. In the diagram, ΔPQR and ΔLMN are both equilateral triangles and angle ∠QSM is 20°. What is the value of x?

   A) 80        B) 85        C) 90        D) 100        E) 110
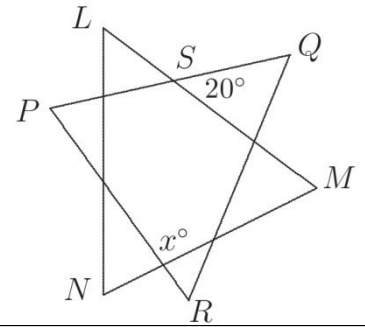
22. A farmer needs to divide equally a quarter-circle pasture between two of his cows. He considers three options for his linear fence, labeled A, B, and C. Which of the following inequalities holds among the length of options for the fences?



A          B          C
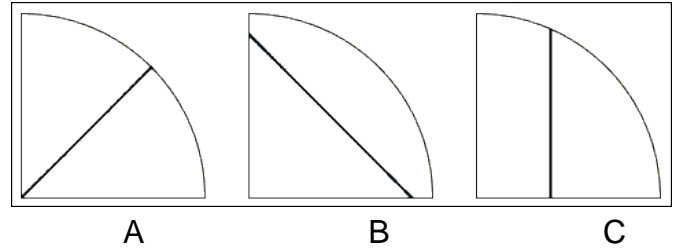
   A) $A < B < C$              B) $A < C < B$        C) $C < B < A$
   D) $C < A < B$              E) cannot be determined

23. Suppose the six faces of two dice are numbered -3, -2, -1, 0, 1, 2. Suppose Tracy rolls these two dice and adds the two numbers shown together. What is the probability that her result is non-negative?

   A) $\frac{1}{4}$        B) $\frac{11}{36}$        C) $\frac{1}{3}$        D) $\frac{13}{36}$        E) $\frac{5}{12}$

24. In the array below, two letters or numbers are called "neighboring" if they are adjacent to each other horizontally, vertically, or diagonally. Starting from any of the letters A on the outside of the array, find the number of ways of spelling AMC8 by moving only between neighboring letters.

| A | A | A | A | A | A | A |
|---|---|---|---|---|---|---|
| A | M | M | M | M | M | A |
| A | M | C | C | C | M | A |
| A | M | C | 8 | C | M | A |
| A | M | C | C | C | M | A |
| A | M | M | M | M | M | A |
| A | A | A | A | A | A | A |

   A) 128        B) 104        C) 96        D) 94        E) 64

25. Wen is a waiter at the International House of Pancakes (IHOP) and the cooks are very sloppy. When they prepare a stack of pancakes they come out all different sizes. Therefore, when Wen serves them to a customer, on the way to the table he rearranges them (so that the smallest winds up on top, and so on, down to the largest at the bottom) by grabbing several from the top and flipping them over, repeating this (varying the number he flips) as many times as necessary. If there are 4 pancakes in a stack, what is the maximum number of flips that he will ever have to use to rearrange them?

   A) 3        B) 4        C) 5        D) 6        E) 7

26. (BONUS) The unit squares in a 3 x 3 grid are colored blue and gray at random, and each color is equally likely. What is the probability that a 2 x 2 square in this grid will be all blue?

   A) $\frac{1}{4}$        B) $\frac{3}{16}$        C) $\frac{13}{64}$        D) $\frac{51}{256}$        E) $\frac{95}{512}$