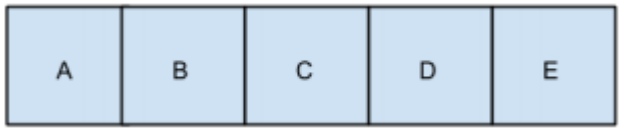
WSMA Math Bowl – March 29, 2014

Time Attack

1	What is the sum of all the positive integer factors of 2014?
2	How many positive integers less than 50 are relatively prime to 6?
3	 James the Farmer is planting 3 different types of plants on 5 square-shaped plots of land, as shown above. If he can plant only 1 plant per land, cannot plant the same type of plant on 2 adjacent lands, and must plant all 3 types of plants at least once, how many ways can Foris do this?
4	Points A, B, and C are non-collinear, and lines AD, BE, CF intersect at point P. If the ratio of BF to FA is 3:2 and the ratio of BD to DC is 2:1, find the ratio of the area of triangle BEA to triangle BEC.
5	You have 9 packages. They're all identical, except for one package, which is slightly lighter than the rest. Using only a basic two-sided scale, what is the minimum number of weighings required to identify the lightest package?
6	An angle bisector of angle A of triangle ABC touches side BC at point D. A line is drawn from point D to point E on side AC so that E is the midpoint of AC. If AB=4, AE=3, and BD=2, find the length of DE.
7	The average age of the residents of Mathville is 44. If the average age of the male residents is 40, and that of the female residents is 46, find the ratio of the number of male residents to the number of female residents.
8	If the sum of an odd number and the cube of a prime number is 2205, find the prime number.
9	The Time Attack round of WSMA Math Bowl 2014 has 24 questions and is worth 62 points. If questions may be worth 2, 3, and 4 points, and if all point values are used at least once, find the product of the maximum and minimum number of 2 point questions.
10	Washington license plates used to be created with 3 numbers followed by 3 letters. Now, license plates are created by putting 3 letters followed by 4 numbers. How many more license plates can be created with the current method than with the previous method?

11	line 1: x=4+t , y = 19+6t , z=12+5t line 2: x=-3+2t , y=-15+8t , z=-19+8t Do these two lines intersect? If so, give the point of intersection as your answer. If not, give the smallest distance between the two lines as your answer.
12	The Realm of Math is a mysterious place that uses base n numbers. Curious to know what the value of n is, Steven bought a laptop worth 340 dollars with 1000 dollars and received 330 dollars in change. What is the value of n?
13	How many integers with consecutive digits in strictly increasing order exist between 10000 and 40000 (e.g 12359 has its digits in an increasing order)?
14	How many positive three digit integers exist where the difference between the largest digit and the smallest digit is no larger than 1?
15	Steven randomly selected 40 people and asked if they have attended Math Bowl before. 28 people said they attended 2012-2013 Math Bowl. 22 people said they have attended 2011-2012 Math Bowl. What is the sum of the maximum and minimum number of people who have attended both 2011-2012 Math Bowl and 2012-2013 Math Bowl?
16	A certain fluid has a one-third-life (time to take for ⅔ of it to disappear) of 3 years. If 1g of this fluid reacts with 5g of coffee to form 6g of super coffee, and I have a jar of 162g of this certain fluid that is left out for 12 years, and, after that, I combine the remaining with 431g of coffee, how many grams of super coffee do I get?
17	Circle A is inscribed in triangle ABC. If the side lengths of triangle ABC are 10, 13, and 15, find the radius of circle A.
18	Convert 20.14 (base 8) to base 2.
19	Find the surface area of a sphere whose radius is equal to the length of the space diagonal of a cube with a side length of 5.
20	250g of solution A with concentration 8% is placed in a beaker. How much water needs to evaporate for the concentration of the solution to be 10%?
21	Find the area of the triangle formed by the points A(0,-1), B(1,1), and C(-1,0).
22	A triangle has side lengths 5,7, and 8. What is the largest value of cos(theta) where theta is an angle in the triangle?
23	What is the difference between the circumradius and the inradius of a triangle with side lengths 8,15,17?
24	Find the difference between the number of factors of 2014 and the number of factors in 2013.