Knights of Pi Math Tournament – Dec. 12, 2015

Block Math 7th/8th

1	If $x @ y = x^2 + y^2$, $x \# y = 2xy$, and $x \$ y = (x @ y) + (x \# y)$, what is the value of $9 \$ 91$?
2	The sum of three prime numbers is 20. What is the largest possible difference between the largest and the smallest of the three?
3	How many permutations are there of the letters in the word CALCULATE?
4	Given that 2 gallons of paint are needed to paint a circle of radius 2, how many gallons of paint are needed to paint a circle of radius 6?
5	The ratio of red to blue to green balls in a large sack is 4:2:3. Given that there are 12 red balls, how many balls are there in total?
6	What is the largest five digit number divisible by 11?
7	On any given day, there is a ⅓ chance that it will rain and a ⅕ chance that Sean will have a headache. Sean is happy if he doesn't have a headache and if it isn't raining. What is the probability that Sean is not happy?
8	What is the distance between points (7, -5) and (3, -2)?
9	What is the largest area of a triangle, given that two of its sides are 3 and 6?
10	At Small High School, there are exactly 10 students: 5 girls, and 5 boys. All at once, each one of the boys randomly chooses one girl to date, without knowledge of who the other boys are choosing. What is the probability that everyone is perfectly matched up? (In other words, every girl is chosen by exactly one other boy)
11	Aurora, Bird, Cloud, Dawn, and Evening are watching a movie at a movie theater. Given that they sit down randomly at a row of five seats, what is the probability that Dawn is sitting at one the seats on the ends?
12	Let ABC be an equilateral triangle with side length 6. Then, we randomly choose a point K inside triangle ABC, and paint the region BKC blue and the rest of ABC red. What is the probability that more of ABC is painted blue than red?
13	David and Daniel are dwarfs that live on a number line. David's position is given by the equation $P(t) = 2(t-3)^2 + 4$, and Daniel's position is given by $Q(t)=mt$ for some integer constant m. What is the least positive value of m such that David and Daniel meet for the maximum number of times?

14	Let 6, 24, 60, … be the sequence with terms a_1, a_2, a_3 … such that $a_k = k(k+1)(k+2)$ for every k. How many of the terms a_1, a_2, … , a_{20} are not divisible by 4?
15	John rolls three six-sided die. What is the probability that the largest of the three rolls is 5 or 6?

