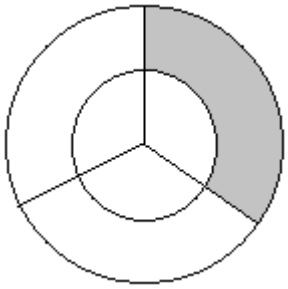
Knights of Pi Math Tournament – Dec. 15, 2012

Individual Test 7th/8th

1	Evaluate: $(50-1)(50^2+50+1)$.
2	Irving likes to eat goldfish, but he eats only the goldfish that have smiles on them. He has a package of 180 goldfish. If $4/9$ of them have smiles, how many goldfish in the package have smiles?
3	Ben and James each have identical pumpkin pies. Ben eats $2/3$ of his and James eats ¾ of his. If they put the remainder of their pies together, what fraction of a whole pie do they have left?
4	Eighteen is 30% of what number?
5	Bilbo has $\$18.32$. A slice of watermelon costs 34 cents and a glass of Kool-Aid costs 50 cents. If Bilbo buys 4 slices of watermelon, what is the maximum number of glasses of Kool-Aid he can buy?
6	The queen of England celebrates a Jubilee every 25 years. If her last Jubilee was 9 years ago, in how many years will she celebrate another Jubilee?
7	Express $.\overline{8}$ as a fraction in simplified form.
8	Mr. Totu's students did horribly on their last algebra test. If his six students scored $65, 71, 52, 10, 39,$ and 15, what was their average score?
9	What is the volume of a cone with a base of circumference 10π and a slant height of 13?
10	Chris and Kevin live 16.5 miles apart. They begin walking towards each other's houses at the same time. If Chris walks at 1.5 mph and Kevin walks at 4 mph, after how many hours will they meet?
11	The sum of Sophia's and Karl's ages is 24. Five years ago Sophia was twice as old as Karl will be in two years. How old is Sophia?
12	Bianca uses half a stick of butter to make a dozen cookies. She uses the same recipe to make two dozen more. How many sticks of butter did she use in total?
13	Cathy is training for a half marathon (13 miles). On the first day of her training, she runs one mile. On the second day, she runs two miles. On the third day, she runs three miles, increasing the number of miles she runs by one each day. After the thirteenth day, how many total miles has Cathy run?
14	If x is a real number, what is the minimum value of the expression x^2-2x+3?
15	Amy drives to the grocery store with a speed of 20 mph. On the way back, she drives at 25 mph. What is her average speed for the round trip? Express your answer as an improper fraction in mph.
16	The sum of two numbers is 42, and the positive difference between them is 24. What is the smaller number?
17	Sam is standing at the North Pole of a spherical planet with diameter 1000 miles. What is the shortest distance, in miles, he must travel in his planet-buggy to reach the South Pole?
18	Carly is baking a spherical cake in a large cake mold. She buys cake batter in small spherical containers. If the ratio of the surface areas of the smaller to the larger sphere is $1:9$, how many small containers of cake batter does Carly need to fill the large container?

19	The diagonals of kite $ABCD$ are perpendicular. If $AC = 10$ and $BD = 12$, find the area of $ABCD$.
20	I have a bag of beans. There are four coffee beans, six java beans, three string beans, three pinto beans, and four cool beans. I draw a bean from the bag randomly. If each bean is the same size, what is the probability that I get a java bean?
21	Each pack of gum has fourteen pieces. If Maggie chews three pieces of gum per day, how many whole packs of gum are in a year's supply?
22	What is the next number in the sequence $5, 6, 8, 11, 15,$ __?
23	What is the 2012^{th} digit to the right of the decimal expansion of $17/33$?
24	There is a 60% chance that Katniss will find ducks in the forest. If she finds ducks, the probability that she hits one is 90%. What is the probability that Katniss finds ducks but does not hit them? Express your answer as a percentage.
25	Five points are spaced evenly in a circle, and all possible lines connecting two points are drawn. How many lines are there?
26	What is the smallest positive integer with 4 distinct positive factors?
27	What is the least number of cuts required to cut a block of tofu into eight pieces?
28	In the five digit number 4X97X, each instance of X represents the same digit. If the five digit number 4X97X is divisible by 3 and the number formed by the last two digits is divisible by 6, find the sum of all possible values of X.
29	Let p be a prime number and q an odd integer. If $p^2 + q = 125$, what is pq?
30	A list of numbers has an arithmetic mean of 15. If one of the numbers were increased by 20, the arithmetic mean would increase by 4. How many numbers are in this list?
31	If $x + 2y = 12$, what is the value of $x^2 + 4xy + 4y^2$?
32	Emily wants to buy a grizzly bear that has a retail price of $\$100$. However, the bear store is having a sale where every item is given a discount of 30 percent. If she uses an additional bonus coupon with a 10% discount, how much does she have to pay for the bear?
33	In a sequence of numbers, the first term is 4, and each term can be found by multiplying the previous term by three. What is the positive difference between the second and fourth term of the sequence?
34	The function $y = x^2 + 6x + k + 3$ touches the x-axis at a single point. What is the value of k?
35	Dobby can wash 60socks in five hours, and Winky can wash 120 socks in three hours. If they work together, how many whole socks could these two house elves wash fully in 2 hours?
36	An electric circuit has two switches A and B, both of which must be closed for electricity to flow. The probability that switch A is closed is $1/2$. The probability that switch B is closed is $3/4$. If a light bulb in the circuit shines if electricity is flowing in the current, what is the probability that the light bulb is not shining?
37	The five digit integer $ABCDE$, where each letter represents a digit, not necessarily distinct, is divided by the numbers $2, 3, 4, 5,$ and 6. The remainders are $A, B, C, D,$ and E respectively. What is the integer $ABCDE$?

38	An ant is standing on one corner of a $2 \times 2 \times 3$ box. What is the shortest distance the ant must travel along the surface of the box to reach the opposite corner?
39	The inner circle of the rug below has a diameter half that of the rug, and each of the inner angles formed by the three radials is $120°$. Jordan's cat randomly picks a place on the rug to take a nap. What is the probability that his cat is sleeping in the shaded region? 
40	$ABCD$ is a trapezoid with bases AD and BC and $BC > AD = 6$. Let M be the midpoint of the AB and N be the midpoint of CD. Let E be the intersection of BD and MN and F be the intersection of AC and MN. If $ME = EF = FN$, find the length of BC.