KCATM 2012 HIGH SCHOOL MATHLETICS

Team #_____

Problem #1

3 minutes, 3 points

Question #1: Find the area of the annulus formed when $(x-3)^2 + (y-1)^2 = 36$ is placed inside $x^2 - 6x + y^2 - 2y = 71$. Express your answer in terms of pi.

Team #_____

Problem #2

2 minutes, 2 points

<u>Question #2</u>: Find the area of the triangle with vertices at (-1, 4), (5, 12) and (5, 6). Give an exact answer.

Team #_____

Problem #3

1 minute, 1 point

Question #3: Find the number of ways to arrange the letters in the word MISSISSIPPI?

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Problem #4

2 minutes, 2 points

Question #4: Solve the system and give all solutions: $\begin{cases} y = \dfrac{1}{2}x^2 - 5 \\ x^2 + y^2 = 25 \end{cases}$

Team #_____

Problem #5

2 minutes, 2 points

Question #5: At the University of Wisconsin during home football games, the mascot does pushups corresponding to the team's score. For example, if Wisconsin's first score is a touchdown, the mascot does 7 pushups. If Wisconsin's second score is a field goal (bringing their point total to 10), the mascot does an additional 10 pushups. (So, he has now done 17 total pushups.) Determine how many <u>total</u> pushups the mascot will do given the sequence of scores below:

1st possession – field goal (3 total points)
2nd possession – field goal (3 more points)
3rd possession – touchdown (7 more points)
4th possession – field goal (3 more points)
5th possession – touchdown (7 more points)
6th possession – touchdown (7 more points)
7th possession – touchdown (7 more points)

Team #_____

Problem #6

3 minutes, 3 points

Problem #6: Solve for n (n must be a positive integer): $\dfrac{(n+2)!}{n!2!} = 465$

Team #_____

Problem #7

1 minute, 1 point

Problem #7: Find the sum of the first 200 integers.

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Problem #8

2 minutes, 2 points

Question #8: How many integers lie in the domain of $f(x) = \csc\left(\dfrac{\pi}{2}x\right)\sqrt{16-x^2}$?

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Problem #9

2 minutes, 2 points

Question #9: Suppose $\log(2) = A$, $\log(3) = B$, and $\log(5) = C$. Express $\log\left(\dfrac{2\sqrt[3]{9}}{25}\right)$ in terms of A, B and C.

Team #_____

Problem #10

1 minute, 1 point

Question #10: Evaluate the series:

$25 + 20 + 14 + 11.2 + \ldots$

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Problem #11

2 minutes, 2 points

Question #11: If $x + 3y + 5z = 200$ and $x + 4y + 7z = 225$, then what does $x + y + z$ equal?

Team #_____

Problem #12

2 minutes, 2 points

Question #12: Joan can mow a lawn in 90 minutes, and Sylvia can mow the same lawn in 60 minutes, how long will it take them working together?

Team #_____

Problem #13

3 minutes, 3 points

Question #13: A car travels up a hill with an average speed of 60 miles per hour. With what average speed does it have to travel down the hill to have an average speed of 70 miles per hour for the entire trip?

Team #_____

Problem #14

2 minutes, 2 points

Question #14: A class consists of 28 students. The class has 16 girls and 12 boys. The teacher is looking to randomly construct a student committee consisting of 7 students. Find the probability that the randomly selected committee consists of <u>exactly</u> 3 girls and 4 boys. Round your answer to the nearest percent.

Team #_____

Problem #15

2 minutes, 2 points

A six-sided die is constructed so that there is a 1/21 chance of rolling a 1, a 2/21 chance of rolling a 2, a 3/21 chance of rolling a 3, a 4/21 chance of rolling a 4, a 5/21 chance of rolling a 5, and a 6/21 chance of rolling a 6. The six-sided die is rolled twice. Find the probability that the sum of the two rolls is exactly 7. Express your answer as a fraction in lowest terms.

Team #_____

Problem #16

3 minutes, 3 points

<u>Question #16:</u> A certain function f satisfies $f(x) + 2f(6 - x) = x$ for all real numbers x. Find the value of $f(1)$.