

- ❖ **Answers should be recorded on the answer sheet provided, and only the answer sheet should be turned in.**
- ❖ **Write your school name on the answer sheet.**
- ❖ **You team will earn 1 point for each correct answer in the correct form and in the event of a tie the school that handed their answer sheet in first will win.**

- 1) The function f satisfies $f(x) = ax^2 + bx + c$. Find the ordered pair of real numbers (a, b) for which $f(x + 1) - f(x) = 14x - 4$ for all real values of x .

- 2) A 10-meter long line of soldiers is marching from their basic training camp to the mess hall. Their cruel drill sergeant was marching three times as fast as his men. Hurling insults the entire trip, he walked from the end of the line to the beginning of the line and when he got there, he turned around and made it back to the end of the line as the soldiers reached the mess hall. Over what distance did the soldiers have to tolerate his abuse?

- 3) In base 10 numeration, $16 + 16 + 16 + 16 = 59$ is not true. However, this sum is true in a different base. In what base is this sum true?

- 4) A man is traveling upriver, against the current. He passes under a bridge and his hat is knocked off of his head. He doesn't notice this and continues up river as the hat flows downstream with the current. After 10 minutes of paddling the man notices the hat's absence and turns around to retrieve it. Assuming the man paddles a constant speed and he catches up with the lost hat one mile away from the bridge where he lost it. How fast is the current of the river?

- 5) $\sqrt{(MADAM)} = MAM$ where each different letter of the alphabet stands for a distinct digit. What 5 digit number does $MADAM$ represent?
- 6) A convex quadrilateral $ABCD$ whose diagonals are perpendicular has side lengths $AB = 15$, $BC = 7$, and $CD = 20$. Find AD .
- 7) Find the remainder when 7^{25} is divided by 16 .
- 8) If $x = 2 + \sqrt{2}$ express $x^2 + 4/(2 + \sqrt{2})$ as an integer.
- 9) An equilateral triangle and a regular hexagon have equal areas. Find the ratio of the perimeter of the equilateral triangle to the perimeter of the regular hexagon.
- 10) Find the smallest positive perfect square cube that has 56 as a divisor.
- 11) Out of two candles with different length and thickness, the 10cm long one burns away in 5 hours. The other candle burns away in 6 hours. If you start burning them at the same time in two hours they will have the same length. How long was the “other” candle originally?
- 12) If $f(x) = ax^8 + bx^6 + cx^4 + dx^2 + 4x$ and $f(5) = 17$, what is $f(-5)$?

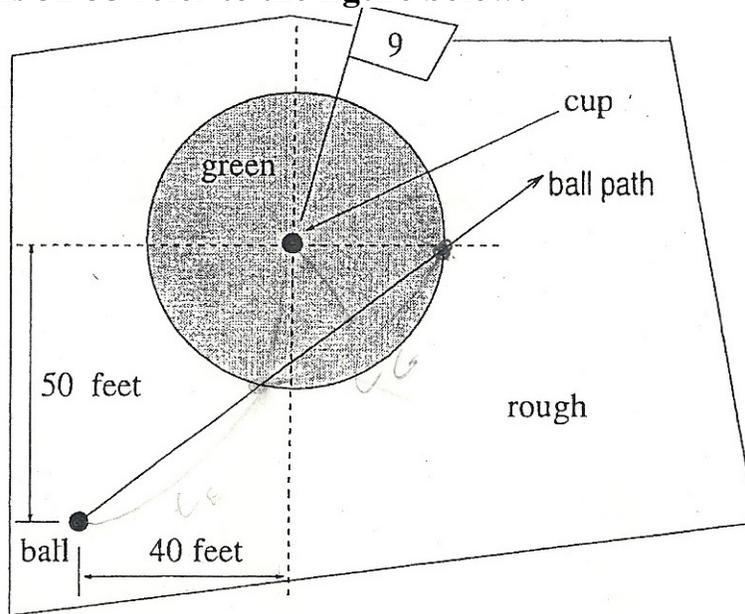
- 13) The triangle ABC has sides $AB = 137$, $AC = 241$, and $BC = 200$. There is a point D , on line BC , such that both incircles of the triangle ABD and ACD touch line AD and the same point, E . Determine the length CD .
- 14) One root of $x^2 + 8x + k$ is three times the other root. (k is a real number.) Find both roots.
- 15) Mike made a journey from City P to City Q . In the first half hour of the journey he covered *one-seventh* of the total distance and paused to rest and refuel. In the second half hour he covered *one-third of the remaining distance*. Finally he took another half hour to complete the journey by traveling 72km/hr . What is Mike's average speed for the whole journey?
- 16) A leaky faucet drips at a steady rate. If time is measured from the instant the first drop falls to the instant the last drop falls, it takes 72 seconds for 9 drops to fall. How many seconds does it take for 6 drops to fall?
- 17) Find the smallest natural number N such that $N/2$ is a perfect square and $N/3$ is a perfect cube.
- 18) Calculate the sum: $5 + 9 + 13 + 17 + \dots + 3997$

- 19) Find all solutions of : $|x - 2| = |x + 2| - 2$
- 20) In the x - y coordinate plane, a circle is tangent to the positive sections of the x and y -axes. The center of the circle is on the line $2x + 5y = 10$. Find the radius of the circle.
- 21) The sum of 10 positive whole numbers is 1001. What could the *highest* possible greatest common factor of these numbers be?
- 22) On Sunday, Judy went to see her grandmother who lives 150km from her. After cycling at an average speed of 15km/hr for a few hours she got tired and took a lift from a passing truck. The truck's average speed is 75km/hr. When she got to her grandma's house, she checked the time and new the total trip was six hours. Neglecting the time it took to board the truck how long did Judy cycle?
- 23) In base x (x is a positive integer) $35 + 35 + 35 + 35 = 164$. In base 10, what is x ?
- 24) What fraction is halfway between $1/11$ and $1/13$ on the number line?
- 25) Each letter in the following sum stands for one of the digits 0 through 9 and no two letters stand for the same digit. Find the 7-digit numerical value of the sum's answer:

$$\begin{array}{r} \text{C R E K L G} \\ + \text{R U T A N G} \\ \hline \text{C K G L E L K} \end{array}$$

- 26) When a ball falls it bounces $\frac{2}{3}$ of the distance through which it has fallen. If the fifth rebound is 96cm, determine the original height, in cm, through which the ball fell.
- 27) At what angle are the minute hand and hour hand of a clock that reads 2:20?
- 28) When asked about their ciphering performance four students Archie, Rich, Veronica, and Betty reported:
Archie: "Rich had the best score"
Rich: "Veronica had the best score"
Veronica: "I did not earn the best score"
Betty: "I did not earn the best score"
As it turns out only one of these statements is true. Who earned the best score?
- 29) When the digits of the two-digit whole number N are reversed, the result is M . The sum of M and N is 66 times the *tens* digit of N . Find N .
- 30) What is the 100th term of the sequence: 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, ...?
- 31) Willie answered every question on a 50 question true or false and never got 3 correct answers in a row. What is the maximum number of questions Willie answered correctly?

For questions 32-35 refer to the figure below:



The cup on the 9th hole of a golf course is located dead center in the middle of a circular green that is 70 feet in diameter. Your ball is located as in the picture above – 50 feet south and 40 feet east of the hole.

The ball follows a straight-line path, misses the hole, and exits the green at the right most edge. Assume the ball travels a constant 10ft/sec :

- 32) To the nearest *foot*, how far has the ball traveled when it enters the green?
- 33) To the nearest *tenth* of a second, when does the ball enter the green?
- 34) To the nearest *tenth* of a second, how long does the ball spend in the green?
- 35) To the nearest *foot*, How close did the ball come to the cup?

Answers

School Name: _____

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|--|---------------------------------|
| 1) <u>$(7, -11)$</u> | 26) <u>$729cm$</u> |
| 2) <u>$7.5 meters$</u> | 27) <u>$50deg$</u> |
| 3) <u>$base 15$</u> | 28) <u>$Betty$</u> |
| 4) <u>$3mph$</u> | 29) <u>15</u> |
| 5) <u>$10,201$</u> | 30) <u>14</u> |
| 6) <u>$AD = 24$</u> | 31) <u>34</u> |
| 7) <u>7</u> | 32) <u>$32 feet$</u> |
| 8) <u>12</u> | 33) <u>$3.2sec$</u> |
| 9) <u>$\frac{1}{2}\sqrt{6}$</u> | 34) <u>$6.0sec$</u> |
| 10) <u>2744</u> | 35) <u>$25ft$</u> |
| 11) <u>$9cm$</u> | |
| 12) <u>-23</u> | |
| 13) <u>152</u> | |
| 14) <u>(-2) and (-6)</u> | |
| 15) <u>$42km/hr$</u> | |
| 16) <u>$45 seconds$</u> | |
| 17) <u>648</u> | |
| 18) <u>$1,998,999$</u> | |
| 19) <u>1</u> | |
| 20) <u>$10/7$</u> | |
| 21) <u>91</u> | |
| 22) <u>$5 hours$</u> | |
| 23) <u>8</u> | |
| 24) <u>$12/143$</u> | |
| 25) <u>$1,056,460$</u> | |