TEAM MATH ATTACK CONTEST
PART A

Saturday November 30th, 2019

Time: 30 minutes

Calculators are NOT allowed. Students are not allowed to leave the room during testing time.

Instructions

1. Do not open the contest paper until you are told to do so.
2. You may use rulers, compasses, protractors, and graph paper for rough work, but all problems can be solved without additional aid.
3. Write your team name, member names, and all corresponding schools at the top of the response sheet. Print clearly. When you are finished, submit the exam booklet with your answer sheet attached or tucked inside.
4. A box to place your answer follows each question on the response sheet. To receive full marks, you must simply write your answer in the appropriate blank space. Use exact values (i.e. $\sqrt{3}$, or $\pi + 2$ etc.) or rounded answers to the thousandths decimal place (i.e. 324.237).
5. Each correct answer in Part 1 is worth 1 point. Each correct answer in Part 2 is worth 2 points. Each correct answer in Part 3 is worth 3 points. There is no penalty for an incorrect answer. Partial marks will not be awarded.
6. When your supervisor tells you to begin, you will have 30 minutes of working time.

Good luck and have fun!

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Easy

Problem 1

Evaluate

$$\frac{1}{2}+\frac{1}{4}+\frac{1}{8}$$

Problem 2

The average of 7 consecutive positive integers is 49. Which number is the largest among these 7 integers?

Problem 3

I have a single bacterium in my bowl. It is known that each bacterium will duplicate every 5 minutes. How many bacteria will be in the bowl after 25 minutes?

Problem 4

Two numbers differ by 5 and their sum is 37. What is the larger number of the two?

Problem 5

Oliver has \$120 to spend at the fair. He first spends $\frac{1}{10}$ of it on rides, then spends $\frac{1}{9}$ of *what he has left* on food. How much money does Oliver have afterwards?

Medium

Problem 6

In a bag full of balls, each ball is a single colour. It is known that $\frac{1}{4}$ of these balls are green, $\frac{1}{8}$ are blue, $\frac{1}{12}$ are yellow and the remaining 13 are white. How many balls are blue?

Problem 7

A regular polygon has 6 sides. Let x be the value of each interior angle, measured in degrees. What is the value of x^2?

Problem 8

Consider the letter L where the length is twice as long as the base and the length is 2 units. Put the L on a circle. What is the radius of the smallest circle that completely contains the L, i.e. no point on L is OUTSIDE the circle?

Problem 9

A palindrome is a number that reads the same forward and backward. For example, 5995 and 8668 are palindromes, with 5959 and 8686 are not. How many seven-digit palindromes starting with 58 are there?

Problem 10

Alex had no friends before and finally met Andrew on June 1st when they both had a work break. They plan to hangout to further their friendship, but they realize their work breaks do not align. Alex gets a break every 8th day Andrew gets a break every 6th day. If they start work on June 1st. When will their 3rd hangout be (assuming there is one)?

Hard

Problem 11

How many integers from 1 to 100 are multiples of 2 or 3?

Problem 12

How many six-digit numbers have at least one even digit?

Note: You can express your answer in the form of an expression with two terms.

Problem 13

Let N be a positive integer such that $N = \sqrt{x^2 + 4x + 4}$. Let $x = (2 + 2^2 + 2^3 + \ldots + 2^{2018} + 2^{2019})$. What is the value of N?

Note: You can express your answer as an expression with one term.

Problem 14

Jerry and Ryan are standing in an empty hallway with 2019 closed doors, and they decide to play a game. In this game, Jerry goes first, and they alternate. Every turn, each person has the option of opening 1, 2, 3, 4, 5, 6, 7, 8, or 9 doors. A person wins the game by forcing the other person to open the 2019th door. On the first turn, how many doors should Jerry open in order to guarantee that he can win the game?

Problem 15

Consider the function

$$g(x) = \frac{5x^4 + x^3 + 2x^2 + xy + y^2 + 1}{x + y + 1}$$

It is known that $y = 1$. Let P be the product of all of the possible integer values x such that $g(x)$ is a positive integer. Let $f(a) = (a^2 + 1)^P$, where a is any real number. Find the value of

$$f(1) - 2f(3) + 3f(5) - 4f(7) + 5f(9)$$

Team Name:

_____

Team Members:

1. _____ 2. _____ 3. _____

School:

_____

Part: | A |

Please do not write anything in the columns labeled "Mark" or under "GRADER'S USE ONLY".

	Part 1	Mark
1.		
2.		
3.		
4.		
5.		

	Part 2	Mark
6.		
7.		
8.		
9.		
10.		

	Part 3	Mark
11.		
12.		
13.		
14.		
15.		

GRADER'S USE ONLY

Grader #1

1 × _____ = _____
2 × _____ = _____
3 × _____ = _____

Grader #2

1 × _____ = _____
2 × _____ = _____
3 × _____ = _____

Final Score: _____ / 30