TEAM MATH ATTACK CONTEST
PART B

Saturday December 14th, 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

Find the value of

$$7 - (-4)^2$$

Problem 2

How many odd whole numbers (i.e. 1, 3, 5, 7,...) lie between 2^4 and 3^3 inclusive?

Problem 3

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

Problem 4

Two numbers differ by 6 and their sum is 34. What is the larger number of the two?

Problem 5

Consider an isosceles triangle with vertices $\triangle ROY$, where $RY = RO = 5$. If $OY = 6$, find the area of $\triangle ROY$.

Medium

Problem 6

Chicael is at a restaurant with his friend Man. There are 4 dishes at this restaurant: salad, steak, soup, and cookies. Man will try exactly one of each dish, while Chicael only eats salad. Each dish costs 15$. Without tax or tip, they pay a total of 105$. How many orders of salad does Chicael get?

Problem 7

Jason places 12 balls in a bag. Each ball is one of n colours. If Jason takes out 7 balls from the bag, he will always have a pair of the same colour. What is the maximum value for n?

Problem 8

Let P be the largest prime number strictly less than 100. Let Q be the smallest prime number strictly greater than 100. What is the value of $P \cdot Q$?

Problem 9

Let N be equal to the arithmetic mean of the following 9 numbers:

$$9, 99, 999, \ldots, 999999999$$

What is the value of N?

Problem 10

Riri just heard about a deal at a nearby convenience store. The poster tells her that if she buys a bubble tea for $2.40 using a gift card, the store will then double the money left on the card! Riri thinks this is a fantastic deal. She buys one bubble tea, and the money on her card doubles! She buys another... and another... and then realizes that she has no more money left on the gift card. How much money did Riri start with on her gift card?

Hard

Problem 11

Find two positive integers (x, y) such that:

$$103 + x^2 = y^2$$

Problem 12

Let S be the sum of every positive integer strictly less than 2020. Let $x = 2019 \cdot \frac{S}{10}$. What is the units digit of x?

Problem 13

Barack Obama is deciding whether or not to buy a dog for his wife, Michelle Obama. To make this decision, he decides to roll a 6 sided dice three times. If the sum of the three numbers is divisible by 9, then he will buy a dog for his wife. What is the probability that he will buy a dog for his wife?

Problem 14

Let N be a positive integer such that $N = \sqrt{4x^2 + 12x + 9}$. Let $x = (3+3^2+3^3+\ldots+3^{2018}+3^{2019})$. What is the value of N?

Problem 15

Michael is playing a game. He has 10 cards, each with a blue face on the top and a red face on the bottom, laid out in a line from left to right. The blue face is facing upwards for every card. On any given turn, exactly one of two moves can be made:

i. He may flip over a card that currently has its blue face up. Example: $R\underline{B}BB \rightarrow R\underline{R}BB$

ii. Given a blue card and then a sequence of entirely red cards to its right, he may flip over all such consecutive/adjacent red cards in exchange for flipping over the single blue card. Example: $B\underline{BRRR}B \rightarrow B\underline{RBBB}B$

Michael would like to play this game for as long as possible. What is the maximum number of turns Michael can make before he can no longer make any moves?

Team Name:

_____

Team Members:

1. _____ 2. _____ 3. _____

School:

_____

Part: | B |

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