

TEAM MATH ATTACK CONTEST

PART B

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

Find the value of

$$7 - (-5)^2$$

Problem 2

How many even whole numbers lie in between 3^2 and 3^3 ?

Problem 3

Find the positive integers (x, y) such that

$$5x + 7y = 26$$

Problem 4

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

Problem 5

A train leaves Calgary for Edmonton at 60 mph traveling at constant speed. Another train leaves Edmonton for Calgary at 40 mph traveling at constant speed. How far apart are the trains 1 hour before their front bumpers pass each other?

Medium

Problem 6

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 7

Alex, Andrew, Oliver, Alice, and Bob are in a chess tournament. Every win is worth 1 point, every draw is worth 0.5 points, and every loss is worth 0 points. They play a round-robin tournament, where every player plays every other player exactly once. After they have played all their games, Alex has 2 points, Andrew has 0.5 points, Oliver has 3 points, and Alice has 1.5 points. How many points does Bob have?

Problem 8

Alice just heard about a deal at a nearby convenience store. The poster tells her that if she buys a Slushy for \$2.40 using a gift card, the store will then double the money left on the card! Alice thinks this is a fantastic deal. She buys a Slushy, 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 Alice start with on her gift card?

Problem 9

What is the remainder of $49^{49^{49}}$ upon division by 5?

Problem 10

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

$$9, 99, 999, \dots, 999999999$$

What is the value of N ?

Hard

Problem 11

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 12

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?

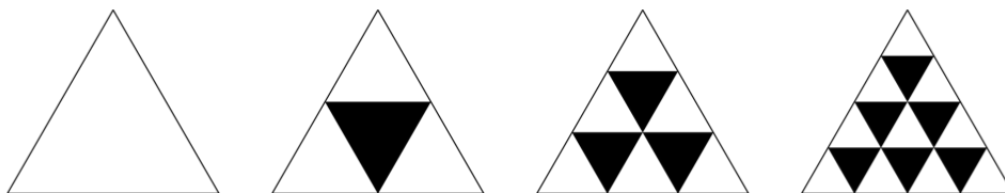
Problem 13

$$\begin{array}{rcccc} & J & E & R & \\ + & R & E & E & E \\ \hline & R & I & R & I \end{array}$$

Given that each letter represents a distinct digit from 1 - 9 and $I = 8$, find the value of $J + E + R + R + I$.

Problem 14

Consider the following sequence of triangles. The n -th triangle has n rows of smaller triangles. All smaller triangles are congruent to each other.



In the fifteenth triangle, what is the ratio between the area of the shaded region and the area of the non-shaded region?

Problem 15

Let (a, b, c, d) be a set of distinct positive integers such that $a^2 + b^2 = c^2 + d^2 = 625$. Let $P = a \cdot b \cdot c \cdot d$. Let $E(n)$ be the smallest positive integer greater than n where **all** the digits of n are even. For example, $E(13) = 20$. What is the value of $E(P)$?

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