TEAM MATH ATTACK CONTEST
PART A

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!

Easy

Problem 1

Find the simplified value of

$$\frac{6+16}{12+32}$$

Note: The simplified value is either a decimal or a fraction $\frac{a}{b}$ such that a, b are not both simultaneously divisible by the same prime.

Problem 2

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 3

Jerry can run down a 100m track in 15 seconds. Jason can run down a 250m track in 30 seconds. Assuming they can both run at constant speed, who is running faster?

Problem 4

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?

Problem 5

Andrew is trying to learn a new language called Esenihc. Apparently the number system for Esenihc is very similar to English, and each digit from 0-9 is represented by a distinct character. For example, 十五= 15. In English numerals (i.e. 1,2,3, etc.), find the value of

$$十五 + 五十$$

Medium

Problem 6

Ryan wants to buy Math-bits for him and his friends. Him Tortons sells 10, 15 and 20 Math-bits for 3$, 3.50$, and 5$ respectively. What is the least amount of money Ryan will have to spend to evenly distribute his Math-bits, without any leftovers, among himself and 5 friends?

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

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 9

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 10

Roy had no friends before and finally met Riri on the 1st of June. They plan to hangout to further their friendship, but they realize their work breaks do not align. Roy gets a work break every 9th day and Riri gets a work break every 6th day. If they start work on June 1st, and they hangout every time their work breaks align, when will their 4th hangout be?

Hard

Problem 11

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

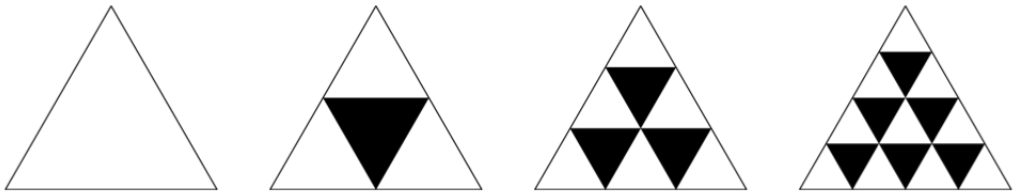
Problem 12

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

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

Problem 13

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 14

A circle with radius r has 2019 distinct points on the circumference. Two points, A and B, are chosen at random from these 2019 points and a chord is drawn from A to B. Of the 2017 remaining points, two points, C and D, are then chosen at random and a chord is drawn from C to D. What is the probability that these two chords intersect?

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