QUESTION 1

A = If consecutive powers of 8 are added in the sequence: $8^0, 8^0 + 8^1, 8^1 + 8^2$ and onwards, what is the next term in the sequence?

B = If 4^6 can be expressed as $\left(\dfrac{1}{2}\right)^x$, find x.

C = If $x = 3$, $y = 4$, and $z = 2$, what is the value of $x^z \cdot y^{\frac{1}{z}} - \sqrt{\dfrac{y^x}{x^z}}$?

Find $\dfrac{AC}{B}$.

QUESTION 2

Cherry, Carson, Chanda, and Karthik go to RJ, the wicked witch of the Math Team, in order to fulfill their dreams. Cherry wants to fly, Carson wants x-ray vision, Chanda wants to be invisible, and Karthik wants to be a potato. RJ tells the group that he has 4 flying potions, 3 x-ray vision potions, 6 invisibility potions, and 1 potion that turns the consumer into a potato. However, RJ is wicked, so he puts all his potions in a bag and tells each member to draw one without replacing it.

A = If Cherry goes first and draws a potion from the bag, what is the probability that she draws a flying potion?

B = Unfortunately Cherry drew an invisibility potion; if Chanda goes after Cherry, what is the probability that she draws an invisibility potion?

C = Karthik really wants to be a potato, so he needs to maximize his chances of drawing the right potion. Should he draw first, second, third, or fourth if those who go before him don't draw the potato potion for themselves? For this part assume that first = 1, second = 2, third = 3, and fourth = 4.

D = If Carson draws last and by now we know that Cherry drew an invisibility potion and that Chanda and Karthik both drew x-ray vision potions, what is Carson's chance of drawing an x-ray vision potion?

Find $\dfrac{AC}{BD}$.

QUESTION 3

On the Cartesian plane, Nihar is traveling on line $2x + 3y = 5$ whereas Sri is traveling on line $4y - 3x = 18$. The two friends want to meet up at Josh's Ice Cream Parlor which is located at the intersection of the two lines.

$$
\begin{aligned}
A &= \text{the } x-\text{intercept of the line that Nihar is traveling on} \\
B &= \text{the slope perpendicular to the line that Sri is traveling on} \\
C &= \text{the sum of the } x \text{ and } y \text{ coordinates of Josh's Ice Cream Parlor}
\end{aligned}
$$

Find ABC.

QUESTION 4

Let:

$$
\begin{aligned}
A &= \text{the diameter of a circle with area } 36\pi \\
B &= \text{the area of a triangle with side lengths } 5, 12, \text{ and } 13 \\
C &= \text{the surface area of a rectangular prism with height 3, width 4, and length 5} \\
D &= \text{the volume of a cone with radius 4 and height 9, in terms of } \pi
\end{aligned}
$$

Find $A + B - C + \dfrac{D}{\pi}$.

QUESTION 5

For the following statements, assign a value of 4 to true statements and -1 to false statements.

- $a^b \cdot a^c = a^{bc}$

- The sum of the interior angles of any triangle is $360°$.

- The sum of the interior angles of an $n-$sided polygon is $180(n-2)$ degrees.

- The Triangle Inequality states that for any three points A, B, and C, we have $AB + BC \leq AC$.

- The sum of the coefficients of the expansion of $(x+y)^2$ is 4.

- Speed is the ratio of distance to time.

Find the sum of the values of the statements.

QUESTION 6

Let:

A = Find the smallest positive integer x so that the fraction $\dfrac{2}{20 + x}$ has a finite decimal representation.

B = If you add 20 to a number X and divide by 2, you get 3 plus 4 times that same number. What is X?

C = If $0.0003613 \times 10^{-5} = 0.03613 \times 10^{N}$, what is N?

Find $A + B + C$.

QUESTION 7

Ahad's Smoothies are very popular in town. The following table has the number of smoothies purchased over a 6 day period between 2:00 P.M. - 2:45 P.M.

Day	Number of Smoothies Purchased
Monday	21
Tuesday	27
Wednesday	20
Thursday	12
Friday	16
Saturday	18

A = Find the arithmetic mean of the data set.

B = Find the geometric mean of the number of smoothies purchased on Tuesday, Thursday, and Saturday.

C = How many smoothies does Ahad need to sell on Sunday to have his average increase by 2 smoothies?

Find: $A + B - C$.

QUESTION 8

Aman is shopping for sporting goods. He sees an FSU jersey for $25.50, an FSU hat for $12.50, and Garnet and Gold pompoms for $7.00. Being the hardcore FSU fan he is, he decides to purchase all of the merchandise.

A = If there is a 10% sales tax, how much will Aman pay in total?

B = Suppose that Aman decides to purchase only the jersey and hat because he found a 20% off coupon that only applies to clothing. How much money does he save if he still has to pay sales tax, and if the sales tax is applied after the discount?

Find $A - B$.

QUESTION 9

Given:

$$f(x) = x(x+2)^x + 4(x-1)^{-x}$$
$$g(y) = 3y^2 + 2y + y^{-\frac{1}{y}}$$
$$h(z) = z^2 - 5z + 6$$

Let:

$$
\begin{aligned}
A &= f(2) \\
B &= f(g(-1)) \\
C &= h(f(0)) \\
D &= \text{The minimum height of the function } h(z).
\end{aligned}
$$

Find $A - B + C - D$.

QUESTION 10

Chanda and Cherry decide to work together on their essay. Their teacher tells them that the essay needs to be 10 pages long. Chanda knows that she can write 3 pages in 2.25 hours if she works at a constant pace without taking a break, but Cherry doesn't know how fast she can write.

A = If Chanda and Cherry work together from the beginning and finish 4 hours and 30 minutes later, how long does it take Cherry to write 2 pages by herself? Give your answer in minutes.

B = Chanda had a head start on the essay and finished 4 pages before Cherry joined her (for this question assume that Cherry can write 4 pages in 1 hour and 40 minutes and that they work at a constant pace with no rest). In minutes, how long does Cherry work on the essay?

Find $\dfrac{14B}{A}$.

QUESTION 11

Given:

$$g(x) = x^3 - 2x^2 - x + 2$$

Let:

$$
\begin{aligned}
A &= \text{the degree of } g(x) \\
B &= \text{the sum of the roots of } g(x) \\
C &= \text{the sum of the reciprocals of the roots of } g(x) \\
D &= \text{the product of the roots of } g(x)
\end{aligned}
$$

Find $A - B - C - D$.

QUESTION 12

A $=$ Find the smallest nonnegative integer value of A such that $37A83192$ is divisible by 3.

B $=$ Find the sum of the integer values that satisfy the inequality $|2x + 6| < 4$.

C $=$ What is the remaining side length of a right triangle with hypotenuse 26 and side length 10?

Find $A + B + C$.

QUESTION 13

Solve for:

$$
\begin{aligned}
A &= \text{the sum of the first 100 natural numbers} \\
B &= \text{the } 89^{th} \text{ term in the sequence } 2, 4, 6, 8 \ldots \\
C &= \text{the sum of the infinite geometric sequence } \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16} \ldots
\end{aligned}
$$

Find $A - B - C$.

QUESTION 14

Find the distinct number of ways you could arrange the following words:

$$
\begin{aligned}
A &= \text{RICKARDS} \\
B &= \text{CHERRY} \\
C &= \text{PIKACHU} \\
D &= \text{AHAD}
\end{aligned}
$$

Find $A + B + C + D$.