QUESTION 1

If $x\%y =$ the remainder of x divided by y, let:

$$A = 12 \% 5$$
$$B = 10 \% 2$$

If $x * *y = x(x+y)^2$, let:

$$C = 5 \text{ ** } 12$$
$$D = 2 \text{ ** } 10$$

Find $AC + BD$.

QUESTION 2

Tanvi loves cooking pasta, but one day she accidentally burned herself with boiling water. The shape of the burn was a regular hexagon with an area of $54\sqrt{3}$. Let:

$$
\begin{aligned}
A &= \text{the side length of the burn} \\
B &= \text{the measure of 1 interior angle of the burn in degrees} \\
C &= \text{the length of the diagonal (from one corner to the opposite corner)} \\
D &= \text{the length of the apothem (shortest line from the center to a side)}
\end{aligned}
$$

Find $\dfrac{AB}{C} + D$.

QUESTION 3

Tanusri is walking down line $y = 3x + 15$ to meet Ria, who is walking down a line perpendicular to Tanusri's. Ria's path goes through the point (3,3). Tanusri and Ria meet at their point of intersection. Let:

$$
\begin{aligned}
A &= \text{the reciprocal of the slope of the line Ria is walking on} \\
B &= \text{the y-intercept of the line Ria is walking on} \\
C &= \text{the x-coordinate of their point of intersection} \\
D &= \text{the y-coordinate of their point of intersection}
\end{aligned}
$$

Find $A + B + C + D$.

QUESTION 4

Sanjita wins a fruit basket in a raffle but she has Oral Allergy Syndrome, meaning she is allergic to apples and cherries. The fruit basket contains 3 kinds of fruit: apples, cherries, and strawberries. The apples make up $\frac{1}{6}$ of all the fruits, cherries make up $\frac{2}{3}$ of all the fruits, and there are 15 strawberries. Let:

$$
\begin{aligned}
A &= \text{the total number of apples in the basket} \\
B &= \text{the total number of fruits in the basket} \\
C &= \text{the probability a fruit chosen at random is a strawberry} \\
D &= \text{the probability Sanjita is allergic to a fruit chosen at random}
\end{aligned}
$$

Find $ABCD$.

QUESTION 5

On the Raider Farm, there are 57 chickens and goats, with a total of 184 legs. Given every chicken has 2 legs and every goat has 4 legs, let:

$$A = \text{the number of chickens on the farm}$$
$$B = \text{the number of goats on the farm}$$

On Tuesday nights, the Raider Theater offers a special deal where child and adult tickets are 40% off. Last Tuesday night, 87 tickets are sold in total, and the theater earned $1089. Given, regular prices are $10 for a child and $25 for an adult, let:

$$C = \text{the sum of the cost of a child ticket and adult ticket on a Tuesday}$$
$$D = \text{the number of adult tickets sold last Tuesday}$$

Find $A + B + C + D$.

QUESTION 6

Let:

$$
\begin{aligned}
A &= \text{the Greatest Common Factor of } 12x^6y^3 \text{ and } 8x^4 \\
B &= \text{the Least Common Multiple of } 12x^3y^7 \text{ and } 8y^4 \\
C &= \text{the Greatest Common Factor of } 10y^{12}z^5 \text{ and } 25x^{10}y^5z^{10} \\
D &= \text{the Least Common Multiple of } 10x^7y^5 \text{ and } 25y^{12}z^5
\end{aligned}
$$

Evaluate $\dfrac{D}{ABC}$ and express as a fraction.

QUESTION 7

If $f(x) = 3x^2 - 7x + 4$, let:

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

Find $A + B + C + D$ and express as a fraction.

QUESTION 8

Let:

$$
\begin{aligned}
A &= \text{the sum of the first 10 whole numbers} \\
B &= \text{the sum of the squares of the first 10 positive integers} \\
C &= \text{the sum of the first 10 terms in the sequence 2, 4, 6...} \\
D &= \text{the sum of the first 10 terms in the sequence 2, 4, 8...}
\end{aligned}
$$

Find $A + B + C + D$.

QUESTION 9

In Raider currency, one Anna is worth six Aaris, five Aaris are worth sixteen Alis, and two Alis are worth twenty-five Anis. Let:

$$
\begin{aligned}
A &= \text{the number of Annas worth forty-eight Alis} \\
B &= \text{the number of Aaris worth one-hundred Anis} \\
C &= \text{the number of Annas worth five Anis} \\
D &= \text{the number of Anis worth five Annas}
\end{aligned}
$$

Find $A + B - \dfrac{CD}{5}$.

QUESTION 10

Let:

$$
\begin{aligned}
A &= 2.\overline{2} \\
B &= 5.\overline{15} \\
C &= 0.3\overline{52} \\
D &= 1.03\overline{48}
\end{aligned}
$$

If $A + B + C + D = \dfrac{X}{9900}$, find X.

QUESTION 11

Let:

$$
\begin{aligned}
A &= \text{the area of a circle with circumference 4} \\
B &= \text{the volume of a sphere with surface area } 32\pi \\
C &= \text{the surface area of a cylinder with volume } 150\pi \text{ and height 6} \\
D &= \text{the perimeter of a rectangle with area of 20 where the length is 2 times the width}
\end{aligned}
$$

Find $AB + C + D$.

QUESTION 12

Anirudh wants an average of at least an 90 in his math class. He has taken 9 tests so far and currently has an average of 88. Let A be the minimum grade Anirudh must receive on his 10th test to achieve his goal.

Rayyan's math class has 19 other people in it, and has an overall class average of 78. Sanjita's math class has 14 other students, and has an overall class average of 96. Let B be the overall average of both Rayyan and Sanjita's classes combined rounded to the nearest integer.

Find $A - B$.

QUESTION 13

Rohan is in love with Tacos from Taco Bell. On Monday he ate 6 tacos, on Tuesday he ate 24 tacos, on Wednesday he ate 11 tacos, on Thursday he ate 6 tacos, on Friday he ate 7 tacos, on Saturday he ate 6 tacos, and on Sunday he ate 10 tacos. Rohan put the number of tacos he ate each day in a list. Let:

$$
\begin{aligned}
A &= \text{the mean of the list} \\
B &= \text{the median of the list} \\
C &= \text{the mode of the list} \\
D &= \text{the range of the list}
\end{aligned}
$$

Find $A + B + C + D$.

QUESTION 14

Let:

$$
\begin{aligned}
A &= \text{number of distinct ways to arrange the word "JAMES"} \\
B &= \text{number of distinct ways to arrange the word "RICKARDS"} \\
C &= \text{number of distinct ways to arrange the word "MATHEMATICS"} \\
D &= \text{number of distinct ways to arrange the word "INVITATIONAL"}
\end{aligned}
$$

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