

Theta Team Question 1

When $Ax^2 + Bx + C$ is divided by $x + 2$, the quotient is $x - 5$ and the remainder is -3 .
Find $A + B + C$.

Theta Team Question 2

Given: $f(x) = 3x - 2$

$$g(x) = \frac{1}{2}x - \frac{5}{2}$$

Let A = the sum of the abscissa and ordinate of the point of intersection of $f(x)$ and $g^{-1}(x)$

B = the sum of the slopes of $f^{-1}(x)$ and $g(x)$

C = the sum of the x -intercept of $f(x)$ and the y -intercept of $g(x)$

D = the sum of $f(g(-1))$ and $g(g^{-1}(-1))$

Find $A + B + C + D$.

Theta Team Question 3

The graph of the equation $9x^2 - 4y^2 - 18x + 16y - 43 = 0$ has two asymptotes.
Find the product of the y -intercepts of these asymptotes.

Theta Team Question 4

The inhabitants of the planet Notelgnis have four fingers on each of their two hands and therefore use a base 8 numeration system. On the planet Riabuz, inhabitants have three fingers on each of their four hands; thus, a base 12 numeration system is used. Similarly, since inhabitants have only one hand with six fingers, the planet Salguod employs a base 6 numeration system. Using their respective numeration systems, the number 543 has different values on the planets Notelgnis and Riabuz. How would the positive difference of these two values be numerically represented on the planet Salguod using its base 6 numeration system?

Theta Team Question 5

Let $A = (\log_6 4)(\log_3 6)(\log_2 81)(\log_4 2)$

B = the sum of all solutions of $\log_3(x - 5) + \log_3(x - 3) = 1$

$C = \log_{1993} 1993^{1993} - 3^{2 \log_3 5}$

$D = 3^3 \cdot 3^4 \cdot 3^5 \cdot 3^6 \dots$

Find $D - \frac{C}{AB}$.

Theta Team Question 6

Altitude \overline{CD} to hypotenuse \overline{AB} of right triangle ABC is a diameter of circle O . This circle intersects \overline{AC} at point E and intersects \overline{BC} at point F . If $AC = 9$ and $BC = 12$, find EF .

Theta Team Question 7

A = the 25th term of an arithmetic sequence whose first term is 4 and whose common difference is 3

B = the common ratio of a geometric sequence whose 5th term is 6 and whose 6th term is 5

$$C = \sum_{n=1}^{\infty} 8\left(\frac{2}{3}\right)^{n-1}$$

D = the third of five arithmetic means between 14 and 50

Find $A + BC + D$.

Theta Team Question 8

Given: $a^2 + b^2 + c^2 = a + b + c = abc = 5$

Find $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$.

Theta Team Question 9

Consider the function $f(x) = x^2 - 2x - 8$.

Let P = the minimum value of the function

Q = the sum of all x and y -intercepts of the graph

Find the product PQ .

Theta Team Question 10

Find the sum of all solutions of the equation $(x^2 - 5x + 5)^{x^2 + 6x + 4} = 1$

Theta Team Question 11

Find x if $\left(\frac{x}{9}\right)^{\log_3 9} - \left(\frac{x}{11}\right)^{\log_3 11} = 0$.

Theta Team Question 12

Find the following sum:

$$1 + 1^2 + 1^3 + 2 + 2^2 + 2^3 + 3 + 3^2 + 3^3 + \dots + 9 + 9^2 + 9^3 + 10 + 10^2 + 10^3$$

Theta Team Question 13

Find the distance between the focus and the directrix of the parabola with the following equation:

$$8x = 2y^2 + 3y + 7$$

Theta Team Question 14

Ann starts from home and walks 3 miles north, 5 miles east, 6 miles north, 2 miles east, and 1 mile south. What is the shortest distance she can walk to get home?

Theta Team Question 15

Let P and Q be the roots of $2x^2 + 3x + 12 = 0$.

$$A = P + Q$$

$$B = PQ$$

$$C = \frac{1}{P} + \frac{1}{Q}$$

Find the product ABC .