

QUESTION 1

Find all real values of y such that

$$(|y-1|)^2 - 7|y-1| + 10 = 0.$$

QUESTION 2

How many more distinguishable permutations are made by rearranging the letters in the word COLLAGE than by rearranging the letters in the word COLLEGE?

QUESTION 3

Let A = the sum of the first 9 terms of an arithmetic series with 1st term 16961 and 5th term 36889.

$$\text{Let } B = \left(1 - \frac{1}{6}\right)\left(1 - \frac{1}{7}\right)\left(1 - \frac{1}{8}\right)\dots\left(1 - \frac{1}{999}\right).$$

Find AB . Give an exact answer.

QUESTION 4

Mark rolls 2 fair 6-sided dice and 1 fair 4-sided die. What is the probability that the sum or the product of the numbers showing on the dice is a perfect square?

QUESTION 5

It takes Denise 6 days to perform a certain task at work. It takes Carol 9 days to perform the same task, and Barbara 12 days. How many less days would it take them all to perform the task together than it would if only Denise and Carol worked together?

QUESTION 6

There are three consecutive positive integers A , B , and C , where $A < B < C$. A plus the square of B plus the cube of C is a perfect square, and this perfect square's square root is the sum of A , B , and C . What is the value of C ?

QUESTION 14

The fifth term in the binomial expansion of $(2 - \sqrt{3})^{-1}$ is $X\sqrt{2}$. What is the exact value of X ?

QUESTION 15

Chords AC and BD intersect inside a circle at point P . If $AP = 12$, $CP = 4$, and $DP = 8$, find DB .

QUESTION 7

Let $A = \sqrt{380 + \sqrt{380 + \sqrt{380 + \dots}}}$

B = the number of positive integers LESS THAN 300 that are multiples of 5 or 7

C = the length of the diagonal of a cube with side length 6

D = the number of distinguishable ways to arrange 5 keys on a keyring

Find $A + B + C + D$ to the nearest whole number.

QUESTION 8

For what values of k will

$$3x^2 - x + k = 0$$

have two distinct real roots?

QUESTION 9

Let $f(x) = x^3 - 7x^2 + 14x - 8$.

Let A = the sum of the roots of $f(x)$.

Let B = the sum of the reciprocals of the roots of $f(x)$.

Let C = the product of the roots of $f(x)$.

Let D = the root of $f(x)$ which is also a root of $g(x) = 4x^4 - 6x^2 + x + 1$.

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

QUESTION 10

Let M = the average speed of a round trip between Tampa and Tallahassee if averaging 50 mph from Tampa to Tallahassee and 60 mph from Tallahassee to Tampa.

Let $N = 3 + \frac{1}{5} + 1 + \frac{2}{25} + \frac{1}{3} + \frac{3}{125} + \dots + \left(\frac{1}{3}\right)^{(n-2)} + \left(\frac{n}{5}\right)^n + \dots$

Find MN.

QUESTION 11

Each of the 92 eighth graders at North Florida Junior High has the option to enroll in one or more of the school's three elective classes. 47 students take Spanish, 36 take Art, and 49 take Typing. 15 students take both Spanish and Art, 16 take Spanish and Typing, and 22 take Art and Typing. 8 students take no elective classes. How many students take all 3 electives?

QUESTION 12

A semi-prime number is defined as a positive integer with only two factors other than 1 and the number itself (e.g. 6 is a semi-prime because its factors are 1, 2, 3, and 6). What is the product of the smallest set of 3 consecutive semi-primes?

QUESTION 13

A sphere with radius 4 and a right circular cylinder with radius 6 and height 3 have the same combined volume as a cone with radius 5. If A = the height of the cone and S = the cone's slant height, find AS to one decimal place.