

## QUESTION 1

Rumbleroar the lion is flying on the line  $4x - 3y = 15$ . There is a fireball traveling on the path  $x + 6y = 24$ .

Let

$A$  = the slope of Rumbleroar's path.

$B$  = the  $x$  coordinate of the  $x$ -intercept of the fireball's path.

$C$  = the  $y$  coordinate of the  $y$ -intercept of Rumbleroar's path.

$D$  = the sum of the  $x$  and  $y$  coordinates of the intersection of Rumbleroar and the fireball.

Compute  $AB + CD$ .

**QUESTION 2**

For the following statements, assign a value of 3 to true statements and -1 to false statements.

- Perpendicular lines intersect at  $70^\circ$  angles.
- If  $A$  and  $B$  are real, positive numbers, then  $(A - B)^2 = A^2 - B^2$ , for all real  $A$  and  $B$ .
- If Lazio is better than Napoli, and Napoli is better than Roma, then Roma is better than Lazio.
- The sum of the lowest 3 prime numbers is 6.
- $(A + B)^2 = A^2 + B^2$ , for all real  $A$  and  $B$ .

Find the sum of the values of the statements.

**QUESTION 3**

Linda and Liam are best friends. In 10 years, Linda will be twice of what Liam's age is now. In 3 years, Linda will be Liam's current age. Let

$A$  = the sum of Linda's and Liam's current ages in years.

$B$  = the average of Linda's and Liam's ages in years in 4 years.

$C$  = the number of years it will take Liam to be as old as the product of Linda's and Liam's current ages.

If  $A$ ,  $B$ , and  $C$  are in years, compute  $A + B + C$ .

## QUESTION 4

Lalitha is on a mission to consume pumpkin juice.

She has a cup in the shape of a right cylinder with a radius of 3 and a height twice the length of the diameter. Let  $A$  represent the volume of the cone.

Lalitha fills the cup with pumpkin juice. She fills 60% of the cup with pure pumpkin juice. The rest is filled with a 40% pumpkin juice solution. Let  $B$  represent the percentage of pure pumpkin juice in the entire cup.

Lalitha can drink 3 liters of pumpkin juice in 2 minutes. Let  $C$  represent how many liters Lalitha can drink in 12 minutes, assuming that the rate remains constant.

Compute the value of  $\frac{A}{C\pi} + B$

## QUESTION 5

Let  $a\&b = a^2 - b^2$  and  $c@d = c + 3d$ . Then

$A$  = the value of  $3\&2$ .

$B$  = the value of  $2\&(1@ - 4)$ .

$C$  = the positive value of  $x$  such that  $(-1\&x)@10 = -5$ .

$D$  = the value of  $y$  such that  $[3(100\& - 100)] + [4(2@y)] = 128$ .

Compute the value of  $\frac{AC}{D} + B$ .

**QUESTION 6**

Let  $A$  be the greatest common factor of 32 and 1024.

Let  $B$  be the greatest common factor of  $x^2yz^3$  and  $xz^4$ , if  $x$ ,  $y$ , and  $z$  are distinct prime numbers.

Let  $C$  be the degree of the polynomial  $x^4(x^6 + 32 + x^{20} + x^2)$ .

Let  $D$  be the simplification of  $\left(\frac{x^2y}{6}\right)\left(\frac{7x^3y^2}{8}\right)\left(\frac{2}{7xy^{-1}}\right)$ .

Compute the value of  $ABCD$ .

## QUESTION 7

The number of haystacks Appa eats is directly proportional to the number of miles he flies and inversely proportional to the hours of sleep he gets. For example, if Appa flies 6 miles and sleeps for 4 hours, he will eat 12 haystacks.

$A$  = the number of haystack eaten if Appa sleeps for 4 hours and flies 10 miles.

$B$  = the number of miles Appa flew if he ate 16 haystacks and slept for 5 hours.

$C$  = the number of minutes Appa slept if he ate 20 haystacks and flew for 10 miles.

Find  $\frac{A}{B} + \frac{C}{10}$ .

**QUESTION 8**

There are 800 students at the Hogwarts School of Witchcraft and Wizardry reunion. Every student is from one of four houses: Ravenclaw (R), Gryffindor (G), Hufflepuff (H), and Slytherin (S). One-fourth of the attendees are from Ravenclaw. Out of the remaining students, one-half are from Gryffindor. Two-thirds of the further remaining are from Hufflepuff. The rest are from Slytherin. If R is the number of people in Ravenclaw, H is the number of people in Hufflepuff, G is the number of people in Gryffindor, and S is the number of people in Slytherin...

Compute  $\frac{R + H}{G + S}$ .



## QUESTION 9

Let  $f(x) = 2x + 3$ ,  $g(x) = x^2 - 2$ , and  $h(x) = x^3 + 2x - 1$ .

$$A = f(g(1))$$

$$B = h(g(-2))$$

$$C = h(f(g(-1))) + f(1) \times g(2)$$

$$D = \text{the negative value of } y \text{ when } g(f(y)) = 7$$

Compute the value of  $AB + CD$ .

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**QUESTION 10**

Find the sum of the integer solutions that satisfy all of the following.

$$A = |x + 3| > 4$$

$$B = |2x + 1| < 23$$

$$C = x^2 + 3x - 18 = 0$$

## QUESTION 11

- Nidhi wants to buy a record at Lala's Music Store. She finds a record that costs \$25. However, Nidhi has a 10% off coupon. If sales tax is 8.0%, let  $A$  represent how much change Nidhi receives if she pays with a \$50 bill. (Assume that sales tax is calculated after discounts.)
- Nidhi then finds a \$20 bill on the street. She decides to distribute this money (and only this money) to her 8 friends. Let  $B$  represent how much money each friend receives from Nidhi.

Compute  $A + B$ .

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**QUESTION 12**

Let

$A$  = the acute angle made by the hour and minute hand of an analog clock at 3:10.

$B$  = the obtuse angle made by the hour and minute hand of an analog clock at 5:05.

Find  $A - B$

## QUESTION 13

Let

$$A = 4 \cdot 3 + 12 + 48 - 3$$

$$B = \frac{6.3 + 2.7}{3} - 32.4 \div 16.2 \cdot 7$$

$$C = (3 + 4 + 3600 - 45)\left(0 \cdot \frac{3}{4}\right)$$

$$D = (9 + 3) \div 4 - 10 \cdot 5 + 17$$

Compute the value of  $AC + BD$  (in simplest terms).

## QUESTION 14

Pamela has 50 stuffed animals in a bag. There are 10 pandas, 15 owls, 20 giraffes, and 5 hamsters.

$A$  = the probability of drawing a panda.

$B$  = the probability of drawing a hamster or owl.

$C$  = the probability of not drawing an owl.

$D$  = the probability of drawing a platypus.

Compute  $A + B + C + D$  (in simplest form).