QUESTION 1

At a small school in the United States, there are 3 possible language classes that a 7th grader can apply to take: Spanish, French, and Chinese; each student takes at least 1 of these classes. Only 3 students take all three language classes. 17 students take Spanish, 19 take French, and 13 take Chinese. 11 students take only Spanish, 10 take only French, and 5 take only Chinese.

$$
\begin{aligned}
A &= \text{How many students take only 1 language class?} \\
B &= \text{How many students take only Chinese and Spanish?} \\
C &= \text{How many students take only 2 language classes?} \\
D &= \text{How many students take only French and Chinese?}
\end{aligned}
$$

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

QUESTION 2

Let:

A = The slope of the line segment with end points $(26, 23)$ and $(17, 18)$

B = The y-coordinate of the y-intercept of the parabola that goes through the points $(-1, 0)$, $(4, -50)$, and $(9, 0)$

C = The sum of the abscissas and ordinates of the points that split the line segment with endpoints $(20, 3)$ and $(29, 15)$ into 3 parts

D = The ordinate of the point of intersection between the lines $3x + y = 2$ and $7x + 2y = 4$

Compute $AB + CD$.

QUESTION 3

Let $x@y{=}17x - 13y$. For

$$\begin{aligned} A &= 17@13 \\ B &= 11@9 \\ C &= 9@11 \\ D &= 13@17 \end{aligned}$$

Calculate $A + B + C + D$.

QUESTION 4

Let:

$$\begin{aligned} A &= 1+2+\ldots+49+50 \\ B &= 1-2+3-4+\ldots+49-50 \\ C &= 2+4+6+\ldots+48+50 \\ D &= 1+3+5+\ldots+47+49 \end{aligned}$$

Compute $(A-B)-(C-D)$.

QUESTION 5

It takes Albert 12 minutes, Bradley 20 minutes, Chico 30 minutes and Daniel 60 minutes to write a full question for the Algebra 1 team test. Let:

A = The time, in hours, for Albert to write 10 questions for the test.

B = The time, in hours, for Albert and Bradley to write 10 questions for the test if they're working together.

C = The time, in hours, for Albert, Bradley, and Chico to write 10 questions for the test if they're working together.

D = The time, in hours, for Albert, Bradley, Chico, and Daniel to write 10 questions for the test if they're working together.

Find $ABCD$, rounded to the nearest integer.

QUESTION 6

Start with $x = 2017$. For every true statement, add 3 to x. For every false statement, subtract 7 from x.

- 2017 is not a prime number.
- π is the only irrational number.
- $2_{10} * 2017_8 > 2017_{10}$
- 12 is the largest integer such that $x^3 < 2017$.
- $5^4 < 4^5$.
- If x is odd, then $2017(x - 1)$ is also odd

What is the final value of x?

QUESTION 7

Sri asks that you help him find the values of the following unknown digits - A, B, C, and D - and asks for you to calculate $A - B - C - D$ (A, B, C, and D represent distinct digits, in base 10).

$$A234 + 5B78 + 90C2 = 2150D$$

QUESTION 8

Given the functions $f(x) = 2x^2 + 3x - 21$ and $g(x) = 7x - 19$, let:

$$\begin{aligned} A &= f(5) \\ B &= g(7) \\ C &= f(g(2)) \\ D &= g(f(-5)) \end{aligned}$$

Calculate $D - C - B - A$.

QUESTION 9

Let:

$$\begin{aligned} A &= \text{The value of } 16.49 \text{ rounded to the nearest integer} \\ B &= \text{The value of } \sqrt{5!} \text{ rounded to the nearest integer} \\ C &= \text{The value of } \sqrt{3^6 - 3^5 - 3^4} \text{ rounded to the nearest integer} \\ D &= \text{The value of } \sqrt{44^2 - 33^2 - 22^2} \text{ rounded to the nearest integer} \end{aligned}$$

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

QUESTION 10

Let:

$$\begin{aligned} A &= \sqrt{36x^4y^5} \\ B &= \sqrt{\frac{8y^2z}{x^{-1}y^{-1}}} \\ C &= y\frac{3}{2}\sqrt{\frac{18x^3}{y}} \\ D &= \sqrt{\frac{64xy^8}{y^3}} \end{aligned}$$

Compute $\dfrac{AB}{CD}$ in terms of x, y, and z.

QUESTION 11

Let:

$$\begin{aligned} A &= \frac{3+\sqrt{8}}{3-\sqrt{8}}, \text{ with a rationalized denominator} \\ B &= \text{The sum of the roots of } 2x^2 + x - 6 = 0 \\ C &= \text{The value of } x, \text{ where } 4^x = 32^3 \\ D &= \text{The number of real solutions to the equation } 3x^2 + 6x - 1 = 2x^2 + 4x - 6 \end{aligned}$$

Calculate $A + B + C + D$

QUESTION 12

Given the followng stem and leaf plot:

Table 1: Key: $1|1 = 11$

3	3 9
4	1 3 5 7 8
5	1 4 7 8
6	0 9 9
7	8

Let:

A = Mean, rounded to the nearest integer
B = Median
C = Mode
D = Range

Find $A + B + C + D$.

QUESTION 13

Let:

$$\begin{aligned} A &= \text{The y-intercept of the line that goes through the points } (3,5) \text{ and } (8,11) \\ B &= \text{The slope of a line parallel to } 5x+4y=7 \\ C &= \text{The slope of a line perpendicular to } 5x+4y=7 \\ D &= \text{The value of } a, \text{ where } x=a \text{ is the axis of symmetry of } y=x^2+10x+2017 \end{aligned}$$

Compute $ABCD$.

QUESTION 14

Let:

$$\begin{aligned} A &= 2(6 * 2.5 + 3 - 8 + 15) \\ B &= 5(18.8 + 1.7 - 8.9) \\ C &= 2^{-3} + 2^{-2} + 2^{-1} \\ D &= \frac{1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13 + 14 + 15 + 16}{17} \end{aligned}$$

Calculate $B - A + CD$.