March Regional — **Precalculus Team Question 1**

$A = 1 + 2 + 3 + \cdots + 25$.
$B = 1 + 4 + 9 + \cdots + 625$.
$C = 1 + 8 + 27 + \cdots + 15625$.

Find $A + B + C$.

March Regional — **Precalculus Team Question 2**

$$\sin(x) = 3/5,\ \sin(y) = 20/29,\ 0° < x < 90°, \text{ and } 90° < y < 180°.$$

$A = \sin(x + y)$.
$B = \sin(x - y)$.
$C = \cos(x + y)$.
$D = \cos(x - y)$.

Find $A + B + C + D$.

March Regional — **Precalculus Team Question 3**

$A =$ base 10 representation of 635_7.
$B =$ base 10 representation of $\dfrac{7_9}{5_9}$.
$C =$ base 10 representation of $5_6!$.
$D =$ base 10 representation of 9_{10}.

Find $ABCD$.

March Regional — **Precalculus Team Question 4**

$$\vec{E} = < 3, 4 > \text{ and } \vec{F} = < 12, 5 >.$$

$A = \vec{E} \bullet \vec{F}$.
$B =$ sine of the smaller angle between $\vec{E}$ and $\vec{F}$.
$C =$ cosine of the smaller angle between $\vec{E}$ and $\vec{F}$.
$D = |\vec{E} \times \vec{F}|$.

Find $A + B + C + D$. (Express your answer as a mixed number.)

March Regional — **Precalculus Team Question 5**

A non-uniform 9 sided figure has an area of 3.14 meter^2. If this figure is rotated around a line that is $\dfrac{13.37}{(2)(3.14)}$ meters away from the center of mass of the 9 sided figure, what is the volume of the resulting object? (Round your answer to the nearest integer do not include units.)

March Regional — Precalculus Team Question 6

$A = 1 + 2 + 3 + \cdots + 1000.$
$B = 1 + 3 + 5 + \cdots + 999.$
$C = 2 + 4 + 6 + \cdots + 2000.$
$D = 1 + 2 + 3 + \cdots + 999.$

Find $\dfrac{AB}{CD}$.

March Regional — Precalculus Team Question 7

If I is the set containing the reciprocals of all natural numbers whose prime factors include at least one 2, 3, or 5, but no other primes, what is the sum of all elements of I?

March Regional — Precalculus Team Question 8

$A =$ the number of ways you can arrange 5 distinguishable objects on a bracelet that has no clasp.
$B =$ the number of ways you can arrange 5 distinguishable objects on a bracelet that has a clasp.
$C =$ the number of ways you can arrange 5 indistinguishable objects on a bracelet that has no clasp.
$D =$ the number of ways you can arrange 5 indistinguishable objects on a bracelet that has a clasp.

Find $A + B + C + D$.

March Regional — Precalculus Team Question 9

$$f(x) = 4x^5 + 5x^4 + 4x + 1$$

$A =$ the sum of the roots of $f(x)$.
$B =$ the product of the roots of $f(x)$.
$C =$ the sum of the squares of the roots of $f(x)$.
$D =$ the sum of the reciprocals of the roots of $f(x)$.

Find $A + B + C + D$.

March Regional — Precalculus Team Question 10

$A =$ the number of seconds in 10 days.
$B = 10!$.
$C =$ the number of zeroes in $10!$.
$D =$ the number of positive factors of $10!$.

Find $A + B + C + D$.

March Regional Precalculus Team Question 11

The Seminole High School class of 1337 had a graduating class of 56. 16 of the graduating students took calculus. 13 of the graduating students took statistics. 23 of the graduating students took history. 9 took only calculus, 4 took calculus and history, 1 took all three, and 3 took only statistics.

$A =$ the number of students that took only calculus and statistics.
$B =$ the number of students that took only statistics and history.
$C =$ the number of students that took only history.
$D =$ the number of students that took none of the three classes.

Find $A + B + C + D$.

March Regional Precalculus Team Question 12

$$f(x) = x^2 + 3x - 4 \qquad g(x) = 3x^3 + 4x + 1 \qquad h(x) = 3x^2 + 4x + 1$$

$A = \lim_{\Delta x \to 0} \dfrac{f(x + \Delta x) - f(x)}{\Delta x}$.
$B = \lim_{\Delta x \to 0} \dfrac{g(x + \Delta x) - g(x)}{\Delta x}$.
$C = \lim_{\Delta x \to 0} \dfrac{h(x + \Delta x) - h(x)}{\Delta x}$.

Find $A + B + C$.

March Regional Precalculus Team Question 13

$A =$ the sum of the digits of 13_5 expressed in base 10.
$B =$ the number of positive factors of 13!.
$C =$ the sum of the elements of set $C \in \{1, 1/13, 1/13^2, \dots\}$.

Find $A + B + C$. (Express your answer as a mixed number.)

March Regional Precalculus Team Question 14

A circle has a circumference of 14. There exists a square that has an area that is equivalent to that of the circle. Find the perimeter of such a square.

March Regional Precalculus Team Question 15

In how many ways can 15 people sit around a round table?