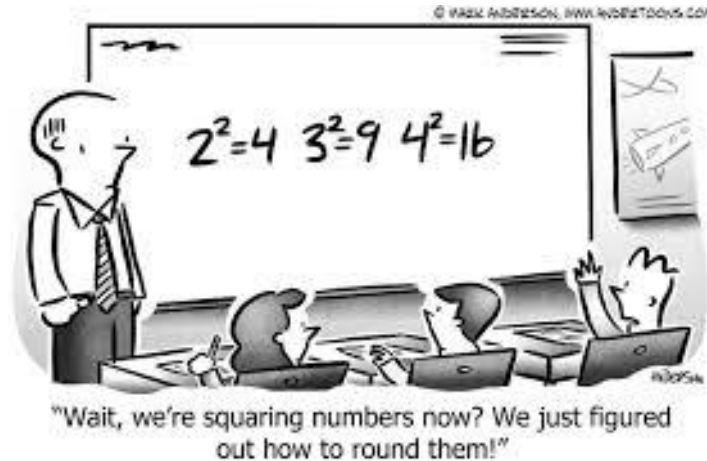


# Fourteenth Annual PI Competition

## Algebra 1 Team Test



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### Algebra Team Problem 1

Given the following equations:

$$g(x) = 2x^2 + 8x + 24$$

$$f(x) = 3x^2 + 1$$

Let  $Z = g(f(-1))$

Let  $N = g(3)$

Let  $E =$  the y-coordinate of the vertex of  $g(x)$

Let  $O = f(-2)$

What is  $Z + O + N + E$

## Algebra Team Problem 2

Simplify this equation:  $\frac{3x^4 + 6x^3 - 81x^2}{3x^2}$

Then,

Let B = the sum of the degrees

Let U = the product of all the coefficients

Let H = the highest degree

Let R = the lowest degree

What is  $B \times R \times U \times H$

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## Algebra Team Problem 3

Let  $A = 2 + \sqrt{4}$

Let  $B = 2\sqrt{100} + 4\sqrt{4}$

Let  $C = \sqrt{2} + 5\sqrt{2}$

Let  $D = \sqrt{5} \times \sqrt{10}$

Find  $A^2 + B + CD$  in simplest terms

### Algebra Team Problem 4

Let  $O$  = the sum of the real roots of  $x^2 + 2x + 1$

Let  $R$  = the sum of the real roots of  $x^2 + 6x + 9$

Let  $F$  = the sum of the real roots of  $x^2 - 4$

Let  $M$  = the sum of the real roots of  $x^4 - 6x^2 + 9$

What is  $F + O + R + M^2$

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### Algebra Team Problem 5

Bob Chorek invests in dogecoin. He invests an initial \$1000, at an interest rate of 10%, applied once a month.

Let  $N$  = the amount of money made in one month, rounded to the nearest integer

Let  $O$  = the amount of money made in three months, rounded to the nearest integer

Let  $C$  = the amount of money made in one year, rounded to the nearest integer

Let  $I$  = the amount of money made in two years, rounded to the nearest integer

What is  $C + O + I + N$

### Algebra Team Problem 6

$$\text{Let } K = (x-3)^2$$

$$\text{Let } O = (x+5)^3$$

$$\text{Let } A = (x+1)(x-4)(x+6)$$

$$\text{Let } Y = 2(x-7)^2$$

What is  $O + K + A + Y$ ? Express your answer as a polynomial with all like terms combined.

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### Algebra Team Problem 7

Consider that a line has a slope of 2, and passes through the point (0, 4)

Let  $C$  = the y-coordinate of the y-intercept of the line

Let  $T$  = the slope of a line perpendicular to the line

Let  $E$  = the x-coordinate of the x-intercept of the line

Let  $U$  = the value of  $b$  when the formula of the line is written in the form  $y=mx+b$

What is  $CU-TE$

### Algebra Team Problem 8

Let  $C$  = the largest  $x$ -coordinate of the  $x$ -intercept(s) of  $y = x^2 + 2x$ , if applicable

Let  $P$  = the largest  $x$ -coordinate of the  $x$ -intercept(s) of  $y = 3x + 15$ , if applicable

Let  $A$  = the largest  $x$ -coordinate of the  $x$ -intercept(s) of  $y = -3x^2 + 3$ , if applicable

Let  $K$  = the largest  $x$ -coordinate of the  $x$ -intercept(s) of  $y = 2^x - 1$ , if applicable

What is  $PA + CK$

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### Algebra Team Problem 9

Given the following equations:

$$3^x = 9^y$$

$$x + y = 9$$

$$2^{2m+1} = 8^n$$

$$m + n = 7$$

Let  $A = x$

Let  $B = y$

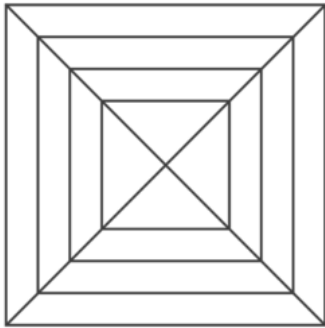
Let  $C = m$

Let  $D = n$

What is  $A \times B \times C \times D$

### Algebra Team Problem 10

How many triangles are in the figure below?



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