Algebra II Team Question #1 — March 14, 1992

In terms of A ($A \neq 0$), what number gives the same result when it is added to $1\frac{1}{A}$ as when it is multiplied by $1\frac{1}{A}$?

Algebra II Team Question #2 — March 14, 1992

$Ax + By + C = 0$ is the equation of the perpendicular bisector of the segment connecting points (2, 3) and (−5, 7), where A, B, and C are relatively prime integers and A is positive. Find $A + B + C$.

Algebra II Team Question #3 — March 14, 1992

$A =$ the value of x for which $f(g(x)) = g(f(x))$ where $f(x) = x^2 + 2x - 2$ and $g(x) = x - 2$

$B = f\left(\frac{1}{3}\right)$ where $f(x) = 9x^5 + 62x^3 - 27x^2 + 16x - 5$

$C =$ the larger of the two values of k such that the equation $x^2 + (k-5)x = 10 - 2k$ has a double real root.

$D =$ the value of h for which the graph of $f(x+h)$ is symmetric about the line $x = 4$ where $f(x) = x^2 + 6x + 10$.

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

Algebra II Team Question #4 — March 14, 1992

Sequence x, y, 8 is an arithmetic sequence.
If 1 is subtracted from y, the sequence becomes geometric.
Find all possible ordered pairs (x, y).

Algebra II Team Question #5 — March 14, 1992

$$A = \frac{1}{\sqrt{2} + \sqrt{3} + \sqrt{5}}$$

$$B = \sqrt{46 + 8\sqrt{30}}$$

$$C = \sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots}}}$$

Find $12A + B - C$ in simplest form.

Algebra II Team Question #6 — March 14, 1992

Evaluate in the form $a+bi$ where a and b are real numbers and $i^2=-1$:

$$(1-i)^9$$

Algebra II Team Question #7 — March 14, 1992

Three fair, six-sided dice are rolled simultaneously.

A = the probability that all three dice show the same number

B = the probability that exactly two dice show the same number

C = the probability that each die shows a different number

D = the probability that the sum of the numbers rolled is 18

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

Algebra II Team Question #8 — March 14, 1992

Solve for all real values of x:

$$36\left(\frac{x-3}{x+2}\right)+13\left(\frac{x+2}{x-3}\right)-\left(\frac{x+2}{x-3}\right)^2=48$$

Algebra II Team Question #9 — March 14, 1992

$A=$ the largest integer n such that 3^n is a factor of 36!

$$B=\frac{(3+5)!}{3!+5!}$$

$$C={}_6C_0+{}_6C_1+{}_6C_2+\ldots+{}_6C_6$$

Find $A+B+C$.

Algebra II Team Question #10 — March 14, 1992

A certain hyperbola has axes which coincide with the coordinate axes, a conjugate axis of length $2\sqrt{5}$, and a focus at (3, 0). If the equation of this hyperbola is written in the form $Ax^2+By^2=C$ where A, B, and C are relatively prime integers with $C>0$, find $A+B+C$.

Algebra II Team Question #11

March 14, 1992

$A = (\log_{216} 4096)(\log_2 81)(\log_3 6)$

$B = 3 \cdot \sqrt{3} \cdot \sqrt[4]{3} \cdot \sqrt[8]{3} \ldots$

$C =$ the number of digits in the expanded base - ten representation of 2^{200}
(Hint: Express 2^{200} as a power of ten using $\log 2 \approx .301$)

Find $A + B + C$.

Algebra II Team Question #12

March 14, 1992

Evaluate: $(123455)(123457) - (123454)(123458)$

Algebra II Team Question #13

March 14, 1992

Evaluate: $a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$ if $a = \frac{3}{5}$ and $b = -\frac{7}{5}$.

Algebra II Team Question #14

March 14, 1992

Given the function $y = 16x^2 + 16x - 9$:

A = the sum of the y-intercepts

B = the sum of the x-intercepts

C = the sum of the squares of the x-intercepts

Find $A + B + C$

Algebra II Team Question #15

March 14, 1992

Let $A = \begin{bmatrix} 4 & 1 \\ 6 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 3 \\ 9 & 2 \end{bmatrix}$.

W = the product of the elements in $(A + B)$

$X =$ the sum of the elements in A^{-1}

$Y = (A \cdot B)_{21}$ (the element in the second row, first column of the product AB)