Math Field Day 2015
Relay A

A1. How many 2-digit integers are there whose digits sum to 12?

A2. Let k be the number you receive. For what number n is $x + k$ a factor of $x^2 + (k+1)\,x + n$?

A3. Let k be the number you receive. Find the slope of the line through the points $(k+4,\ 7k+1)$ and $(3k+1,\ 2k^2+7)$.

A4. Let k be the number you receive. Multiplying out

$$(x - 2)\,(x - k + 1)\,(x + 2k)$$

gives

$$x^3 + bx^2 + cx + d$$

for numbers b, c, and d. Find b.

A5. Let k be the number you receive. Find the area of the region consisting of all points (x, y) with $0 \le x \le k$, $0 \le y \le k$, and $2x + y \ge k$.

1. 7 2. 7 3. 5 4. 4 5. 12

Math Field Day 2015
Relay B

B1. Find the larger of the two roots of the quadratic $2x^2 - x - 15$.

B2. Let k be the number you receive. Find the area of the square with perimeter $4k - 4$.

B3. Let k be the number you receive. If $f(x + 1) = 3x - 5$ for all x, find $f(k)$.

B4. Let k be the number you receive. Find the length of the hypotenuse of a right triangle with legs of lengths $k - 1$ and $2k^{\frac{1}{2}}$

B5. Let k be the number you receive. Let x and y satisfy the following two equations.

$$y^2 = x^2 + 2k$$
$$y = x + 2$$

Find $x + y$.

1. 3 2. 4 3. 4 4. 5 5. 5

Math Field Day 2015
Relay C

C1. How many pairs of integers a and b with $1 < a < b$ have product 96?

C2. Let k be the number you receive. Find the area of the triangle bounded by the lines $x = 0$, $y = 1$, and $x + y = k$.

C3. Let k be the number you receive. Find the smaller solution x to $|x - 2k| = k - 1$.

C4. Let k be the number you receive. Find the x-coordinate of the point of intersection of the following two lines.

$$kx + y = k^2 + 3$$
$$x + y = 4k$$

C5. Let k be the number you receive. For what number n do the points $(3,7)$, $(k, 2k+1)$ and $(k-1, n)$ lie on a line?

1. 5 2. 8 3. 9 4. 6 5. 11

Math Field Day 2015
Relay D

D1. How many prime numbers are factors of 165?

D2. Let k be the number you receive. Solve for x:

$$4^{3x} = 8^{2k}$$

D3. Let h be the number you receive from the front, and let k be the number you receive from the back. A right triangle with legs of lengths x and h has the same hypotenuse as a right triangle with legs of lengths $x+1$ and k. Find x.

D4. Let k be the number you receive from the back. What is the remainder when $x^3 + x^2 + 9x + k$ is divided by $x + 2$?

D5. How many ways are there to arrange the letters in MATH?

1. 3 2. 3 3. 2 4. 2 5. 24