

MATH FIELD DAY 2013
RELAY A

A1. Find the x -coordinate of the vertex of the parabola

$$y = 2x^2 - 8x + 7.$$

A2. Let k be the number you receive. Simplify

$$(1 - k^{-1})^{-1}.$$

A3. Let k be the number you receive. Find the remainder when $2x^3 - x^2 + k$ is divided by $x - 1$.

A4. Let k be the number you receive. Find the y -intercept of the line that contains the point $(-1, k)$ and is parallel to the line through the points $(2, 2)$ and $(3, 4)$.

A5. Let k be the number you receive. Let $f(x - k) = 2x - 9$ for all x . Find $f(0)$.

MATH FIELD DAY 2013
RELAY B

B1. Solve the equation

$$3^{x+1} - 2 = 25.$$

B2. Let k be the number you receive. Find the area of the triangle enclosed by the lines $x = 0$, $y = 0$, and $\frac{x}{k} + y = 1$.

B3. Let k be the number you receive. Find the area of a square if one of its sides is the diagonal of a square of side length k .

B4. Let k be the number you receive. Find x if

$$k^2 - kx + 4 = 0.$$

B5. Let k be the number you receive. Find the larger of two consecutive positive integers whose product is $4k^2 + 2k$.

MATH FIELD DAY 2013
RELAY C

C1. Find the positive solution to $|1 - x^2| = 99$.

C2. Let k be the number you receive. Find the largest 3-digit integer whose digits sum to k .

C3. Let k be the number you receive. Find the largest prime factor of k .

C4. Let k be the number you receive. Evaluate

$$\frac{1 + 2 + \cdots + k}{k}.$$

C5. Let k be the number you receive. If $x^2 - y^2 = k^2 - 4$, and $x - y = k - 2$, find x .

1. 10 2. 910 3. 13 4. 7 5. 7

MATH FIELD DAY 2013
RELAY D

D1. Find the least positive integer x such that $2013 - x$ is a multiple of 15.

D2. Let k be the number you receive. Find the x -coordinate of the point where the curves $y = (x + k)^2$ and $y = x^2 + 3k^2$ intersect.

D3. Let k be the number you receive from the front, and let m be the number you receive from the back. Solve for x :

$$(x - k)^3 = m^3 + 3m^2 + 3m + 1.$$

D4. Let k be the number you receive. Find the radius of the circle

$$x^2 - 6kx + y^2 = 0.$$

D5. For what number r is the line through the points $(r, 1492)$ and $(14, 2013)$ parallel to the line through the points $(1776, 1492)$ and $(1789, 2013)$?

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