

MATH FIELD DAY 2011 RELAYS

Relay A

A1. Find the number of real solutions of the equation $3^{x^2} = 9$.

A2. Let k be the number you receive. Find the distance between the points $(-k, k+1)$ and $(k-1, 7)$.

A3. Let k be the number you receive. If $f(x-k) = kx - 13$, find $f(0)$.

A4. Let k be the number you receive. Find the area of the square whose perimeter is k .

A5. Let k be the number you receive. How many different prime numbers are factors of k ?

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Relay B

B1. Simplify the expression: $1 - \frac{1}{1 - \frac{1}{1 - \frac{1}{2}}}$.

B2. Let k be the number you receive. Find the number of negative solutions to the equation $|x - 2| = k + 1$.

B3. Let k be the number you receive. Find the integer nearest to $2\pi - 3k$.

B4. Let k be the number you receive. Find the remainder when $x^3 - 4x^2 + 2$ is divided by $x - k$.

B5. Let k be the number you receive. Find the x -coordinate of the point where the line $kx - (k - 1)y = 21$ intersects the x -axis.

1. 2

2. 1

3. 3

4. -7

5. -3

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Relay C

C1. How many integers from 1 to 49 are divisible by 2 or 3?

C2. Let k be the number you receive. If $4 = \frac{k}{2^{x+1}}$, find x .

C3. Let k be the number you receive. What is the smallest positive integer with $k + 1$ different prime factors?

C4. Let k be the number you receive. A right triangle with hypotenuse of length $k/2$ has a leg of length 12. Find the length of the other leg.

C5. Let k be the number you receive. Find the positive root of $x^2 - (k - 1)x - k = 0$.

1. 32

2. 2

3. 30

4. 9

5. 9

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Relay D

D1. If a right triangle has a hypotenuse of length 20 and one leg of length 12, find the length of the second leg.

D2. Let k be the number you receive. If the area of Square A is k times the area of Square B, what is the ratio of side length of Square A to the side length of Square B?

D3. Let k be the number you receive from the front and n be the number you receive from the back. Find $\frac{x}{y}$ if x and y are solutions of the system:
$$\begin{cases} x + y = k \\ x - y = n \end{cases}$$

D4. Let k be the number you receive. Find the positive solution of the equation $x(x + k) = 20$.

D5. If $s_0 = 1$, $s_1 = 5$, and for each positive integer k , $s_{k+1} = s_k - s_{k-1}$, find s_3 .

1. 16

2. 4

3. -9

4. 5

5. -1