

MATH FIELD DAY 2008

Relay A

- A1. Find the sum of the coordinates of the point of intersection of the lines with equations $x - 2y = 6$ and $x + y = 5$.
- A2. Let k be the number you receive. Find the area of the region that remains when a circle of radius 3 is cut out of a circle of radius $4 + k$.
- A3. Let k be the number you receive. Find the positive solution of the equation $(x + 5)(x + 6) = k / \pi$.
- A4. Let k be the number you receive. Find the x -intercept of the line with equation $\frac{x}{k} + \frac{y}{2k} = 1$.
- A5. Let k be the number you receive. Mary is $3k$ years older than Tom. In k years, she will be twice as old as Tom is then. How many years old is Tom now?

1. 5

2. 72π

3. 3

4. 3

5. 6

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Relay B

- B1. Find the y -coordinate of the point in the first quadrant where the line $x + y = 5$ intersects the parabola $y = x^2 + 2x + 1$.
- B2. Let k be the number you receive. If the length of a rectangle is k more than its width and the area of the rectangle is 96, find the rectangle's width.
- B3. Let k be the number you receive. Find the largest two-digit number whose digits sum to k .
- B4. Let k be the number you receive. Find the smallest positive integer x such that kx is a perfect square.
- B5. Let k be the number you receive. Find the area of an isosceles right triangle whose legs have length $2k$.

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Relay C

C1. Find area of the triangle in the first quadrant whose edges lie on the coordinate axes and the line $2x + 3y = 6$.

C2. Let k be the number you receive. Find the negative solution of the equation $|2x + 1| = k$.

C3. Let k be the number you receive. Find the x -coordinate of the vertex of the parabola with equation $y = x^2 - 2kx + 5$.

C4. Let k be the number you receive. Simplify $\frac{1}{1 + \frac{1}{k + 1 + \frac{1}{k + 1}}}$

C5. Let k be the number you receive. If the area of a circle is k square units, how many units long is the radius?

1. 3

2. -2

3. -2

4. 2

5. $\sqrt{2/\pi}$

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Relay D

D1. Given that $f(x+1) = 2x^2 + 5x - 1$, find $f(-2)$.

D2. Let k be the number you receive. Find the slope of the line passing through $(1, 1)$ and $(k, 4)$.

D3. Let x and y be the numbers you receive from the front and the back. Simplify $(x^{-1} + y^{-1})^{-1}$.

D4. Let k be the number you receive. Find the radius of the circle $x^2 + y^2 - 4x - 6y = 8 - k$.

D5. Find the remainder when $p(x) = x^4 + 3x^2 - x$ is divided by $x + 1$.

1. 2

2. 3

3. $\frac{12}{7}$

4. 4

5. 5