

**MATH FIELD DAY 2007**  
**RELAY A**

- A1. Solve the equation:  $\ln(x - 7) = 0$
- A2. Let  $k$  be the number you receive. Find the radius of a circle whose circumference is  $k\pi$ .
- A3. Let  $k$  be the number you receive. Find the number of rational solutions of the equation  $x^{k-1} = 4kx$ .
- A4. Let  $k$  be the number you receive. Find the slope of the line passing through the points  $(k, k + 1)$  and  $(k - 1, 2k)$ .
- A5. Let  $k$  be the number you receive. How many prime numbers will be less than or equal to  $k$ ?

## RELAY B

- B1. Find the length of the line segment connecting two points  $(2,1)$  and  $(-1,-3)$ .
- B2. Let  $k$  be the number you receive. Find the absolute value of the difference of the two solutions of the equation  $x^2 = (k + 4)$ .
- B3. Let  $k$  be the number you receive. Find the sum of all positive factors of  $k$  (including 1 and  $k$ ).
- B4. Let  $k$  be the number you receive. Find the  $x$ -intercept of the line through  $(k - 11, k)$  with slope 2.
- B5. Let  $k$  be the number you receive. Simplify the expression  $\frac{|k - 1|}{k^2 + 2k - 9}$ .

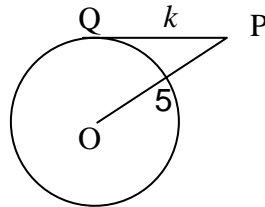
## RELAY C

C1. Find  $x$ :

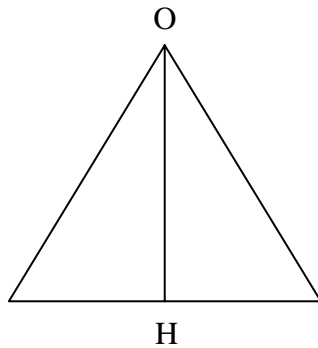
1      1      2      3      5       $x$       13      21

C2. Let  $k$  be the number you receive. Find the positive root of the equation  
 $x(x - 2) = k$ .

C3. Let  $k$  be the number you receive. Find the radius of the circle in this figure where  $OP = 5$  and  $PQ = k$ . The circle has center  $O$  and tangent  $PQ$ .



C4. Let  $k$  be the number you receive. Find the length of a side of an equilateral triangle with height  $OH = \sqrt{k}$ .



C5. Let  $k$  be the number you receive. Find  $x$ :

$$\frac{1}{x} \cdot \frac{x}{y} \cdot \frac{y}{k} = \frac{1}{x^3}$$

## RELAY D

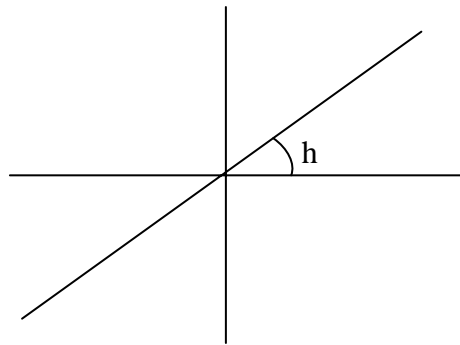
D1. Find the area of a square with diagonal  $\sqrt{2}$ .

D2. Let  $k$  be the number you receive. Find the  $k$ -th prime number.

D3. Let  $k$  be the number you receive from the front, and  $h$  be the number you receive from the back. Find the positive root of the equation.

$$x(x - h) = k$$

D4. Let  $h$  be the number you receive. Find the slope of the line with the angle of inclination  $h$  radians:



D5. For the given figure, find the ratio of the area of the circle over the area of the square:

