

MATH FIELD DAY 2003 - Relay A

A1 Given a right triangle with a hypotenuse of 3 and one leg of  $2\sqrt{2}$ , find the length of the other leg.

A2 Let  $k =$  the number you receive.

Find the value of 
$$\frac{1}{1 + \frac{1}{1 + \frac{1}{k}}}$$

A3 Let  $k =$  the number you receive.

Solve for  $x$ :  $2 = \frac{k(k+x)}{2}$

A4 Let  $k =$  the number you receive.

If  $f(x-1) = 3x - 4$ , find  $f(k)$ .

A5 Let  $k =$  the number you receive.

Find  $A$  if  $p(x) = x^2 + kx + A$   
and one zero of  $p(x)$  is 4 times the other.

1

$\frac{2}{3}$

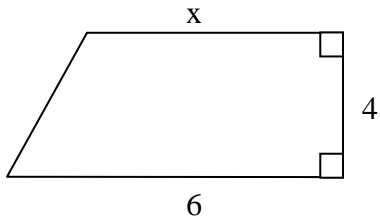
$\frac{16}{3}$

15

36

MATH FIELD DAY 2003 - Relay B

- B1 The top and bottom are perpendicular to the right edge.  
The figure has area 16. What is  $x$ ?



- B2 Let  $k =$  the number you receive. What is the remainder when  $x^3 - x^2 + 4$  is divided by  $x - k$ ?
- B3 Let  $k =$  the number you receive. The line  $y = -kx + k$  forms a triangle with the lines  $x = 0$  and  $y = 0$ . What is the area of the triangle?
- B4 Let  $k =$  the number you receive. How many quarts of water must be added to  $k$  quarts of antifreeze to give a solution that is 80% antifreeze?
- B5 Let  $k =$  the number you receive. If  $\tan \theta = k$ , evaluate  $\sin^2 \theta$ .

2

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4

1

1/2

MATH FIELD DAY 2003 - Relay C

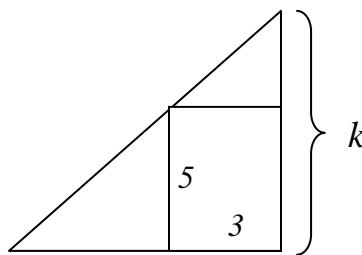
C1 How many ways are there to choose two students to get A's out of a seminar with four students?

C2 Let  $k =$  the number you receive. If  $2^k x = y$ ,  $x^5 y = 8^k$ , and  $x = 2^r$ , what is  $r$ ?

C3 Let  $k =$  the number you receive. If  $(k + \sqrt{2})^3 = a + b\sqrt{2}$  for integers  $a$  and  $b$ , what is  $b$ ?

C4 Let  $k =$  the number you receive. Find the  $y$ -coordinate of the vertex of the parabola  $y = x^2 + kx + 55$ .

C5 Let  $k =$  the number you receive. A rectangle of base 3 and height 5 is inscribed in a right triangle of height  $k$ . How long is the base of the triangle?



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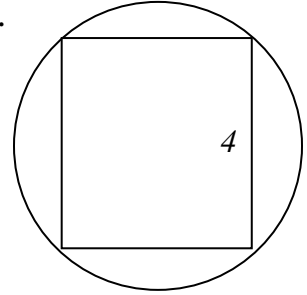
14

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18

MATH FIELD DAY 2003 - Relay D

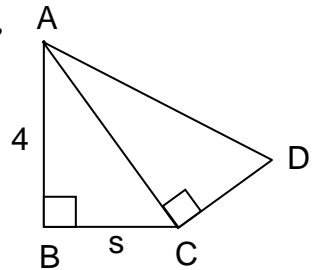
D1 A rectangle of height 4 is inscribed in a circle of area  $5\pi$ .  
How long is the base of the rectangle?



D2 Let  $k =$  the number you receive.

If  $x = k + \frac{2k^2}{x}$  and  $x > 0$ , what is  $x$ ?

D3 Let  $s =$  the number you receive from the person in front of you,  
and  $t =$  the number you receive from the person behind you.  
If  $\angle ABC = 90^\circ = \angle ACD$ ,  $BC = s$ , and  $CD = t$ , find  $AD$ .



D4 Let  $k =$  the number you receive.

What is the radius of the circle  $x^2 + y^2 - 8y + k = 0$ ?

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

