

Relay A

A1. For what digit k is the three-digit number $7k7$ evenly divisible by 9?

A2. Let k be the number you receive. For what integer r does

$$1 - \frac{1}{2} - \frac{1}{2^2} - \frac{1}{2^3} - \dots - \frac{1}{2^k} = \frac{1}{2^r}?$$

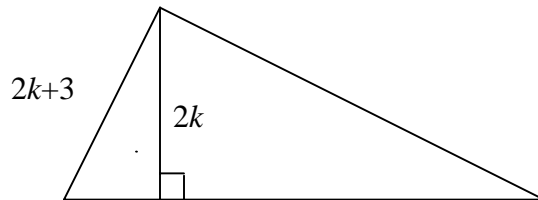
A3. Let k be the number you receive. For which integer n is the probability $\frac{1}{3}$ of drawing a yellow ball from a box with k yellow and n blue balls?

A4. Let k be the number you receive. A line has x -intercept $(k, 0)$ and y -intercept $(0, 24)$. For what number n does the line contain the point (n, n) ?

A5. Let k be the number you receive. What is the sum in degrees of the measures of the interior angles of a polygon with k sides?

Relay B

- B1. For what positive integer k does the equation $x^2 + 2kx + 4k = 0$ have exactly one solution?
- B2. Let k be the number you receive. A hockey team has k goalies but only one can play at a time. They rotate getting to play, each one playing a third of a game before the next one takes over. What is the smallest number of full games that must be played for each goalie to play the same amount of time?
- B3. A *prime* is a positive whole number with exactly two different factors (so 1 is not a prime, and 2 and 3 are the first two primes). Let k be the number you receive. How many primes are there less than $4k$?
- B4. Let k be the number you receive. The marked angle in the figure is a right angle. Find x .

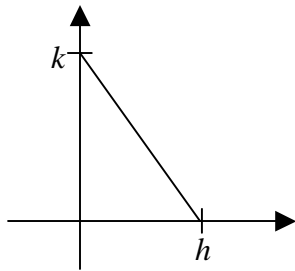


- B5. Let k be the number you receive. In a computer game, success at the first level is worth k points. Success at each higher level is worth twice as many points as the immediately preceding level, and you accumulate points as you go through the levels. After which level will you accumulate a total of 375 points?

Relay C

C1. How many ways are there to write 96 as a product of two positive integers (counting $a \cdot b$ and $b \cdot a$ as one way)?

C2. Let k be the number you receive. The triangle shown below has an area of 12. Find h .



C3. Let k be the number you receive, and let $f(x) = \begin{cases} \sqrt{x} + 1, & \text{if } x \text{ is a perfect square} \\ x + 2, & \text{otherwise} \end{cases}$.
Find $f(k)$.

C4. Let k be the number you receive. Find the area of a circle of radius $\frac{k}{\sqrt{\pi}}$.

C5. Let k be the number you receive. Find one coordinate of the point of intersection of the two lines with equations:

$$\begin{cases} \frac{x}{k} + \frac{y}{2k} = 1 \\ \frac{x}{2k} + \frac{y}{k} = 1 \end{cases}$$

Relay D

D1. If a dance troupe has three male and three female dancers, in how many ways can the choreographer divide up the troupe into three male/female couples?

D2. Let k be the number you receive. If a circle has circumference πk^2 , what is its radius?

D3. Let k be the number you receive from the person in front of you, and let h be the number you receive from the person behind you. Find the smallest solution of:

$$x^2 - 2hx = k^2 - h^2$$

D4. Let k be the number you receive. If a cube has sides that are $\frac{k}{2}$ long, what is its volume?

D5. A polynomial $x^3 + ax^2 + bx + c$ has value 0 at $x = 1$, $x = -2$, and $x = 3$. Find c .