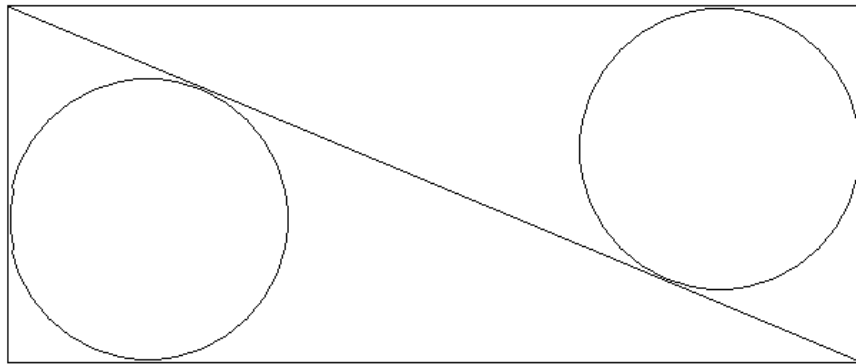


## Huddle 2004

1. The rectangle below is  $12 \times 5$ . The diagonal forms two triangles, and a circle is inscribed in each triangle. Find the distance between the centers of the two circles.



2. The function  $D$ , whose domain is the set of positive integers, satisfies the conditions
- (i)  $D(1) = 1$ ,
  - (ii)  $D(p) = 1$  for all prime numbers  $p$ , and
  - (iii)  $D(mn) = mD(n) + nD(m)$  for all positive integers  $m, n$ .
- Evaluate  $D(2004)$ .
3. What is the remainder when the polynomial  $p(x) = x^{1001}$  is divided by the polynomial  $d(x) = x^2 - 1$ ?

4. Suppose  $F(x, y) = \left( \frac{x}{x^2 + y^2}, \frac{y}{x^2 + y^2} \right)$ . Evaluate and simplify

$$F(F(x, y)).$$