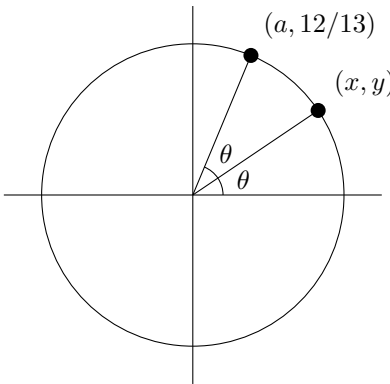


**2017 MATH FIELD DAY  
HUDDLE PROBLEMS**

**Problem 1.** Find a real number  $x$  satisfying the following equation:

$$x^5 - \sqrt{1 - (x - 4)^2} = 5^x - \sqrt{x(12 - x)} - 35$$

**Problem 2.** The figure below shows two points on the unit circle and two equal angles. Evaluate  $\frac{1}{x^4 - y^4}$ .



**Problem 3.** A Ruth-Aaron pair is a pair of consecutive integers such that the sum of their prime divisors is the same. For example, 77 and 78 form a Ruth-Aaron pair since  $77 = 7 \cdot 11$ ,  $78 = 2 \cdot 3 \cdot 13$ , and  $7 + 11 = 2 + 3 + 13$ .

If  $p$  and  $q$  are prime numbers such that  $102p$  and  $115q$  form a Ruth-Aaron pair, find  $p + q$ .

**Problem 4.** The right triangle below has been cut by two lines parallel to its two legs to divide it into two triangular regions, of respective areas 175 and 63, and a rectangular region of area  $A$ . Find  $A$ .

