Problem 1. Suppose distinct integers \( a, b, c, \) and \( d \) are chosen between 1 and 9 inclusive. What is the largest integer that \( \frac{a+b}{c+d} \) can be? (Remark: “Distinct” means that no two are the same.)
Problem 2. We are given two concentric circles. Each chord of the larger circle that is tangent to the smaller circle is 6 in long. What is the area of the ring between the two circles?
Problem 3. Two points are picked at random on the circle $x^2 + y^2 = 1$. What is the probability that the chord they determine is longer than 1?
Problem 4. A circle of radius 1 inch rolls inside a circle of radius 12 inches. How many full revolutions does it make before returning to its original position?
Problem 5. How many hours does it take Rachel the Rower to oar from point $A$ to point $B$ if the diameter of the lake is $2\sqrt{3}$ miles and she rows 3 mph? (In the picture, $AC$ is a diameter.)
Problem 6. How many different primes appear as entries in the first 20 rows of Pascal’s triangle?
Problem 7. \[
\frac{1}{\log_2 120} + \frac{1}{\log_3 120} + \frac{1}{\log_4 120} + \frac{1}{\log_5 120} =
\]
Problem 8. How many integers between 1 and 2010 inclusive are divisible by neither 3 nor 5?
Problem 9. Mildred prefers her brownies from the center of the pan, and Millicent prefers them from around the edge. If they bake a $9 \times 12$ pan of brownies, how far from the edges of the pan should they cut so that each get equal areas of brownies?
Problem 10. The number

$$(8 \ 1 \ 1 \ _)_{\text{nine}}$$

(where this is a base 9 numeral) is a perfect square. What must the last digit be?