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**Problem 2.** The area of a circle is  $100\pi$  units<sup>2</sup>. If the radius is increased by 1 unit, how much will the area change?

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**Problem 3.** If 
$$x + \frac{1}{x} = 3$$
, what is  $x^2 + \frac{1}{x^2}$ ?

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**Problem 4.** What is the length of the shortest path from (0,0) to (7,7) that does not go inside the square shown? The path may touch the square.



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**Problem 5.** Find the nearest integer to  $1024^{\log_2(256)} - 256^{\log_2(1024)}$ .



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**Problem 6.** If A and B are midpoints of the sides in the 1 by 1 square shown, what is the area of the shaded region?



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**Problem 7.** What is the largest prime factor of the binomial coefficient  $\binom{100}{50}$ ?



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**Problem 8.** How many rectangles are in the grid below? Only count those rectangles whose edges lie on the lines shown.



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**Problem 9.** The positive integers a and b each have exactly two prime factors: 2 and 3. If a does not divide b and b does not divide a, what is the smallest that a can be?

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**Problem 10.** What is the first row of Pascal's triangle that has an entry larger than 2018? The  $n^{\text{th}}$  row is the one that begins  $1, n, \ldots$ .

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