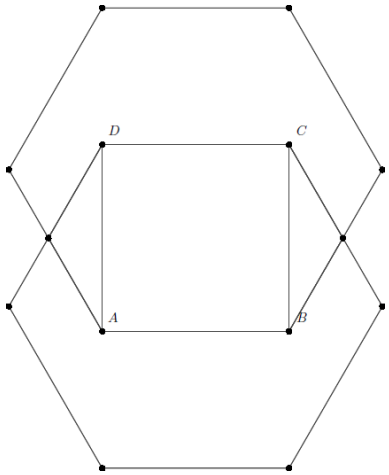
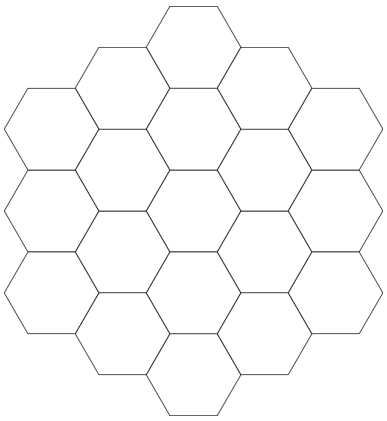
1. Roll two dice. What is the probability that the sum of the rolls is prime?
2. Compute the sum of the first 20 squares.
3. How many integers between 0 and 999 are not divisible by 7, 11, or 13?
4. Compute the number of ways to make 50 cents using only pennies, nickels, dimes, and quarters.
5. A rectangular prism has side lengths 1, 1, and 2. What is the product of the lengths of all of the diagonals?
6. What is the last digit of $7^{6^{5^{4^{3^{2^{1}}}}}}$?
7. Given square $ABCD$ with side length 3, we construct two regular hexagons on sides AB and CD such that the hexagons contain the square. What is the area of the intersection of the two hexagons?



8. Brooke is driving a car at a steady speed. When she passes a stopped police officer, she begins decelerating at a rate of 10 miles per hour per minute until she reaches the speed limit of 25 miles per hour. However, when Brooke passed the police officer, he immediately began accelerating at a rate of 20 miles per hour per minute until he reaches the rate of 40 miles per hour. If the police officer catches up to Brooke after 3 minutes, how fast was Brooke driving initially?
9. Find the ordered pair of positive integers (x, y) such that $144x - 89y = 1$ and x is minimal.
10. How many zeroes does the product of the positive factors of 10000 (including 1 and 10000) have?
11. There is a square configuration of desks. It is known that one can rearrange these desks such that it has 7 fewer rows but 10 more columns, with 13 desks remaining. How many desks are there in the square configuration?
12. Given that there are 168 primes with 3 digits or less, how many numbers between 1 and 1000 inclusive have a prime number of factors?

13. In the diagram below, we can place the integers from 1 to 19 exactly once such that the sum of the entries in each row, in any direction and of any size, is the same. This is called the magic sum. It is known that such a configuration exists. Compute the magic sum.

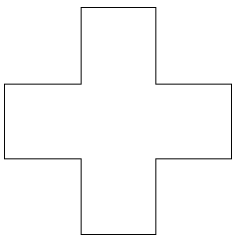


14. Let E be a random point inside rectangle $ABCD$ with side lengths $AB = 2$ and $BC = 1$. What is the probability that angles ABE and CDE are both obtuse?

15. Draw all of the diagonals of a regular 13-gon. Given that no three diagonals meet at points other than the vertices of the 13-gon, how many intersection points lie strictly inside the 13-gon?

16. A box of pencils costs the same as 11 erasers and 7 pencils. A box of erasers costs the same as 6 erasers and a pencil. A box of empty boxes and an eraser costs the same as a pencil. Given that boxes cost a penny and each of the boxes contain an equal number of objects, how much does it costs to buy a box of pencils and a box of erasers combined?

17. In the following figure, all angles are right angles and all sides have length 1. Determine the area of the region in the same plane that is at most a distance of 1/2 away from the perimeter of the figure.



18. Given that $468751 = 5^8 + 5^7 + 1$ is a product of two primes, find both of them.

19. Your wardrobe contains two red socks, two green socks, two blue socks, and two yellow socks. It is currently dark right now, but you decide to pair up the socks randomly. What is the probability that none of the pairs are of the same color?

20. Consider a cylinder with height 20 and radius 14. Inside the cylinder, we construct two right cones also with height 20 and radius 14, such that the two cones share the two bases of the cylinder respectively. What is the volume ratio of the intersection of the two cones and the union of the two cones?