1. What is $5 - 4 + 3 - 2 + 1$?

   (A) -1 **(B)** 3 **(C)** 5 **(D)** 6 **(E)** 8

2. It takes two faucets 30 minutes to completely fill one bucket with water. If both faucets drop water at an identical, constant rate, how long does it take one faucet to fill the same basket?

   (A) 15 minutes **(B)** 30 minutes **(C)** 45 minutes **(D)** 50 minutes **(E)** 1 hour

3. Which of the following polygons has the same number of diagonals as sides?

   (A) triangle **(B)** square **(C)** pentagon **(D)** hexagon **(E)** heptagon

4. Bella distributes 17 jelly beans into two empty jars. The first jar now has A jelly beans, and the second jar has B jelly beans. What is the greatest possible value of $A \cdot B$?

   (A) 60 **(B)** 66 **(C)** 70 **(D)** 72 **(E)** 81

5. You are taking this test in 2024, and the sum of the digits of this year is $2+0+2+4 = 8$. How many more years do you have to wait until the sum of the digits of that year is also 8?

   (A) 4 **(B)** 5 **(C)** 7 **(D)** 8 **(E)** 9

6. A local convenience sells two types of pizzas: normal pizzas and small pizzas. One normal pizza costs \$10.00. A small pizza has a diameter that is 40% smaller than a normal pizza's diameter. If the price of a pizza is proportional to its area, what is the price of a small pizza?

   (A) \$1.60 **(B)** \$3.60 **(C)** \$4.25 **(D)** \$4.75 **(E)** \$6.00

7. Two fair coins and a biased coin (with both sides showing heads) are simultaneously tossed in the air. What is the probability that all coins show heads?

   (A) $\frac{1}{8}$ **(B)** $\frac{1}{4}$ **(C)** $\frac{3}{8}$ **(D)** $\frac{1}{2}$ **(E)** $\frac{5}{8}$

8. Suppose M, A, T, and H are distinct positive integers that satisfy $M \cdot A \cdot T \cdot H = 48$. What is the greatest possible value of $|M - H|$?

   (A) 1 **(B)** 3 **(C)** 5 **(D)** 7 **(E)** 9

9. Jenny's piggy bank has three pennies. The rest of the bank's coins are nickels, dimes, or quarters. Which of the following *could* be the value of her piggy bank's worth of coins?

   (A) \$1.40 **(B)** \$4.49 **(C)** \$7.47 **(D)** \$14.58 **(E)** \$17.45

10. The median of the set $\{10, 1, 9, 4, A\}$ is A, where A is an unspecified number. What is the median of the set $\{5, 9, 23, 12, A, 10\}$?

    (A) $\frac{A+9}{2}$ **(B)** $\frac{A+10}{2}$ **(C)** 9 **(D)** 9.5 **(E)** cannot be determined

11. What is the *second* smallest positive integer with the following property: its square is three times a perfect cube?

(A) 9 **(B)** 48 **(C)** 72 **(D)** 144 **(E)** 243

12. Janelle finds that there are 25 prime numbers between 1 and 100, 20 prime numbers between 50 and 150, and 10 prime numbers between 50 and 100. Using this information, how many prime numbers can Janelle find between 1 and 150?

(A) 35 **(B)** 40 **(C)** 45 **(D)** 50 **(E)** 55

13. Janet rolls a standard 6-sided dice three times, and she records each roll as a side length of a triangle. Her first two rolls are 2 and 3. What is the probability that her third roll will determine the side length of a non-degenerate triangle?

(A) $\frac{1}{6}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{1}{2}$ **(D)** $\frac{2}{3}$ **(E)** $\frac{5}{6}$

14. May places two 3×4 rectangles entirely within a square of side length 5, such that each of the smaller rectangles' sides are parallel to a side of the square. What is the minimum possible area of the overlap of the two smaller rectangles?

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 5

15. What is the units (ones) digit of the sum

$$\underbrace{1 + 2(1 + 3(1 + 4(\cdots + 2023(1 + 2024))\dots)}_{4046 \text{ parentheses, } 2023\ 1\text{'s}}?$$

(A) 1 **(B)** 3 **(C)** 5 **(D)** 7 **(E)** 9

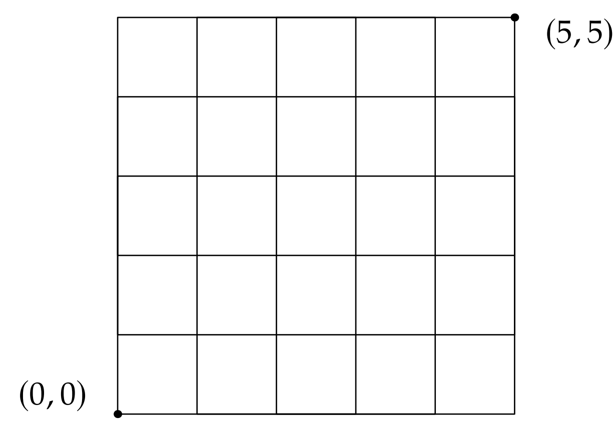
16. Maya is making a cookie from a square dough. She creates two cookies with equal areas by cutting the dough along a diagonal of length 25 cm. The perimeter of one piece is 73 cm. If the area of entire square cookie dough is N cm^2, what is the sum of the digits of N?

(A) 8 **(B)** 9 **(C)** 13 **(D)** 16 **(E)** 18

17. If $x + y = 20$ and the sum of the reciprocals of x and y is $\frac{1}{10}$, what is the value of $(x+1)(y+1)$?

(A) 51 **(B)** 101 **(C)** 120 **(D)** 201 **(E)** 221

18. Rey is navigating the streets along the lines of the evenly spaced integer coordinate grid shown below from $(0,0)$ to $(5,5)$ and back to $(0,0)$, where each intersection has integer coordinates. Rey makes exactly 5 right angle turns at intersections (including at $(5,5)$) and visits exactly one intersection besides $(0,0)$ more than once. How many intersections could be the other intersection Rey visits twice?



(A) 16 **(B)** 20 **(C)** 25 **(D)** 30 **(E)** 35

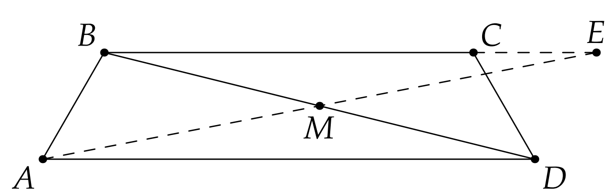
19. Prajith has a sufficiently large number of standard, fair, six-sided dice lined up in a row. He starts with two of the dice in hand and does the following every turn:

- He rolls the dice in his hands.
- If all the dice he rolls are equal in value, he picks up another die.
- Otherwise, he puts down one die.

On his third turn, how many possible values are there for the sum of Prajith's rolls?

(A) 16 **(B)** 20 **(C)** 21 **(D)** 23 **(E)** 24

20. In isosceles trapezoid $ABCD$ shown below with $AB = CD = 1$, $BC = 3$ and $AD \parallel BC$, let M be the midpoint of diagonal BD. If $\angle ABC = 120^\circ$ and lines AM and BC intersect at E, what is the area of quadrilateral $ABED$?



(A) $\frac{\sqrt{6}}{2}$ **(B)** $\sqrt{3}$ **(C)** 2 **(D)** $\sqrt{6}$ **(E)** $2\sqrt{3}$

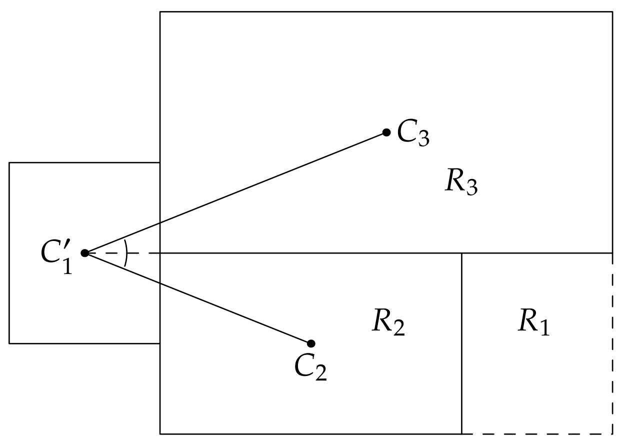
21. Jerry's office has a round table with 20 seats, equally spaced throughout the circumference. Jerry would like to seat N guests for pizza, so that each of the guests is seated opposite to an unoccupied seat and adjacent to two unoccupied seats. What is the maximum possible value of N?

(A) 6 **(B)** 9 **(C)** 10 **(D)** 12 **(E)** 15

22. William is practicing adding and subtracting fractions. He starts with the number $W = 0$. Treating $\frac{1}{1}$ as a fraction, William either adds it to W or subtracts it from W. He repeats performing either addition or subtraction of fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$. William is able to write W to be a fraction whose denominator is 60. What is the smallest possible positive integer value for its numerator?

(A) 1 **(B)** 2 **(C)** 3 **(D)** 5 **(E)** 7

23. Rectangle R has area 1. Kelin divides the rectangle in 3 pieces, rectangles R_1, R_2, and R_3 with centers C_1, C_2, and C_3, respectively. They are shown below, where the width of R_1 is $\frac{1}{3}$ that of R. Kelin then cuts out R_1 from R and attaches it (without changing orientation) so that R_1 is adjacent to the remainder of R and its center C_1' now lies on the line dividing R_2 and R_3. If this line bisects the angle $\measuredangle C_3C_1'C_2$, what is the area of R_2?

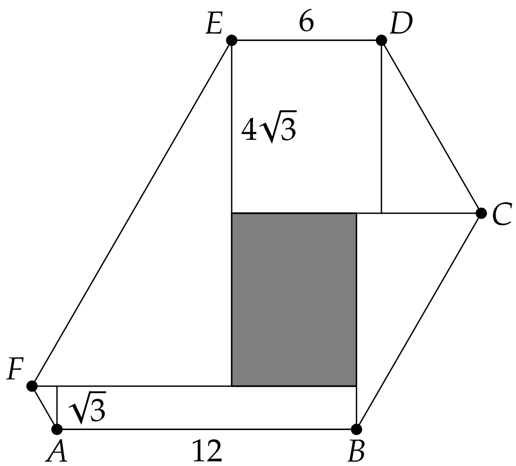


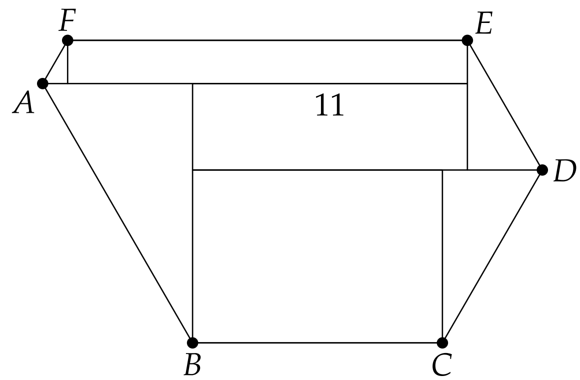
(A) $\frac{\sqrt{3}}{9}$ **(B)** $\frac{1}{5}$ **(C)** $\frac{1}{4}$ **(D)** $\frac{2}{7}$ **(E)** $\frac{1}{3}$

24. Given that $\frac{1}{7}$ has decimal form $0.\overline{142857}$, in other words, repeating digits $0.14285714285714\ldots$, which of the following fractions written in decimal form contain all 10 distinct decimal digits after its decimal point?

(A) $\frac{2777}{70000}$ **(B)** $\frac{1}{79}$ **(C)** $\frac{1349}{1400}$ **(D)** $\frac{153}{770}$ **(E)** $\frac{1522}{6300}$

25. Equiangular hexagon $ABCDEF$ is dissected into three rectangles and four right triangles in two different orientations. In the first orientation, the bottom rectangle has a length of 12 and a width of $\sqrt{3}$, and the top rectangle has a length of 6 and a width of $4\sqrt{3}$. In the second orientation, the middle rectangle has a length of 11. What is the area of the shaded rectangle in the first orientation?





(A) $10\sqrt{3}$ **(B)** $10\sqrt{6}$ **(C)** 30 **(D)** $20\sqrt{3}$ **(E)** $20\sqrt{6}$