

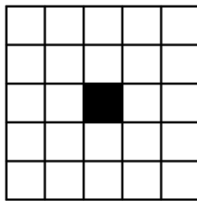
Name:

Grade 11

Answer the questions you are confident in. Guess at your own risk.

1. Suppose  $\frac{2x}{3} - \frac{x}{6}$  is an integer, what is true about  $x$ ?
  - a. It is negative
  - b. It is even, but not necessarily a multiple of 3
  - c. It is a multiple of 3 but not necessarily even
  - d. It is a multiple of 6 but not necessarily a multiple of 12
  - e. It is a multiple of 12
2. A  $3 \times 3 \times 3$  cube is made of 27 normal dice. Each die's opposite sides sum to 7. What is the possible sum of all the values visible on the 6 faces of the large cube?
  - a. 96
  - b. 90
  - c. 84
  - d. 72
  - e. 60
3. Which of the following describes the graph of the equation  $(x + y)^2 = x^2 + y^2$ ?
  - a. The empty set
  - b. One point
  - c. Two lines
  - d. A circle
  - e. The entire plane
4. What is the largest integer that is a divisor of  $(n + 1)(n + 3)(n + 5)(n + 7)(n + 9)$  for all positive integers  $n$ ?
  - a. 3
  - b. 5
  - c. 15
  - d. 105
  - e. 165
5. What is  $(\sqrt{-4})(\sqrt{-9})$ ?
  - a. 1
  - b. 6
  - c. -6
  - d. 6i
  - e. -6i

6. Find the value of  $(\frac{1}{1} + \frac{1}{1+2} + \frac{1}{1+2+3} + \frac{1}{1+2+3+4} + \frac{1}{1+2+3+4+5} + \dots)^2$  ?
- 1.5
  - 2.25
  - 4
  - 6.25
  - 9
7. What's the value of x if  $|x - 1| = |x - 2|$ ?
- $-\frac{1}{2}$
  - $\frac{1}{2}$
  - 1
  - $\frac{3}{2}$
  - 2
8. For how many real values is  $\sqrt{120 - \sqrt{x}}$  an integer?
- 3
  - 6
  - 9
  - 10
  - 11
9. For the cubic  $x^3 - 19x^2 + 31x + 57$ , there are three real roots, p, q, r. What is  $(p + q)(q + r)(r + p)$ ?
- 234
  - 352
  - 478
  - 646
  - 1345
10. The 5x5 grid shown contains a collection of squares with varying sizes from 1x1 to 5x5. How many squares contain the black center square?



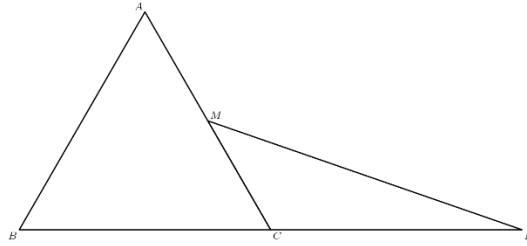
- 12
- 15
- 17
- 19
- 20

11. Six distinct integers are randomly chosen from 1 to 2019, inclusive. What is the probability that some pair of these integers has a difference that is a multiple of 5?
- $\frac{1}{2}$
  - $\frac{3}{5}$
  - $\frac{2}{3}$
  - $\frac{4}{5}$
  - 1
12. At a party, each man danced with exactly three women and each woman danced with exactly two men. Twelve men attended the party. How many women attended the party?
- 8
  - 12
  - 16
  - 18
  - 24
13. The number  $25^{64} * 64^{25}$  is the square of a positive integer N. The sum of the digits of N is
- 7
  - 14
  - 21
  - 28
  - 35
14. Four mice are on the corners of a square. All at the same time, they each randomly and independently choose to walk along one edge of the square to a new corner. What is the probability that there is at least one collision before the mice reach their destinations?
- $\frac{1}{8}$
  - $\frac{3}{8}$
  - $\frac{1}{2}$
  - $\frac{3}{4}$
  - $\frac{7}{8}$
15. Coin A is flipped three times and coin B is flipped four times. What is the probability that the number of heads from flipping, the two fair coins, is the same?
- $\frac{29}{128}$
  - $\frac{23}{128}$
  - $\frac{1}{4}$
  - $\frac{35}{128}$
  - $\frac{1}{2}$

16. If  $a \geq b > 1$ , what is the largest possible value of  $\log_a\left(\frac{a}{b}\right) + \log_b\left(\frac{b}{a}\right)$ ?

- a. -2
- b. 4
- c. 3
- d. 2
- e. 0

17. Equilateral triangle ABC has side length 2, M is the midpoint of AC, and C is the midpoint of BD. What is the area of triangle CDM?



- a.  $\frac{\sqrt{3}}{2}$
- b.  $\frac{\sqrt{2}}{2}$
- c.  $\frac{3}{4}$
- d. 1
- e.  $\sqrt{2}$

18. A rectangle with diagonal length  $x$  is twice as long as it is wide. What is the area of the rectangle?

- a.  $\frac{2}{5}x^2$
- b.  $\frac{1}{4}x^2$
- c.  $\frac{1}{2}x^2$
- d.  $x^2$
- e.  $\frac{3}{2}x^2$

19. In the eight-term sequence A, B, C, D, E, F, G, H, the value C is 5 and any three consecutive terms is 30. What is A + H?

- a. 17
- b. 18
- c. 25
- d. 26
- e. Cannot be determined

20. For what value of  $n$  is  $i + 2i^2 + 3i^3 + \dots + ni^n = 48 + 49i$ ? Note  $i = \sqrt{-1}$

- a. 48
- b. 97
- c. 98
- d. 99
- e. 100