

1. What is the integer closest to $\frac{12}{13} + \frac{7}{8}$?
A. 1 B. 2 C. 19 D. 21 E. None of these
2. Herb's old car got 20 miles per gallon. He trades it in for a car that now gets 30 miles per gallon. His gas expenses will decrease by what percent?
A. 50% B. $33\frac{1}{3}\%$ C. 30% D. 20% E. None of these
3. In January a computer was priced at \$700. In February the price was cut by 10%. In March the price was raised by 20%. What was the price of the computer after the March raise in price?
A. 750 B. 756 C. 770 D. 840 E. None of these
4. A square field with a fence around it contains sixteen acres. It is divided into squares of one acre each. How many of the subdivided squares are fenced on exactly one side?
A. 16 B. 12 C. 8 D. 4 E. None of these
5. At 6:00 the minute and hour hands of a clock are 180° apart (opposite in directions). When will this first happen again?
A. 6:55 B. 7:05 C. $7:05\frac{4}{9}$ D. 7:06 E. None of these

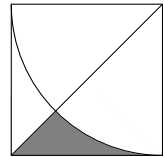
6. Zelma drove 600 miles. For the first 300 miles she averaged 50 miles per hour. For the second 300 miles she averaged 60 miles per hour. What was her average speed, in miles per hour, for the 600 mile trip?

- A. $600/10$ B. $550/10$ C. $600/11$ D. $550/11$ E. None of these

7. If $x = 101001$ in base 2, and $y = 2021$ in base 3, then in base 5, $x + y =$

- A. 102 B. 202 C. 402 D. 103022 E. None of these

8. A quarter circle of radius 4 meters is inscribed in a square with side length 4 meters. Determine the area of the shaded region.



- A. $8 - 2\pi \text{ m}^2$ B. $16 - \frac{11\pi}{2} \text{ m}^2$ C. $\pi \text{ m}^2$ D. $\frac{\pi}{2} \text{ m}^2$ E. None of these

9. The value of x satisfies the equation $\sqrt{x+7} + \sqrt{x} = 7$. What is the value of x ?

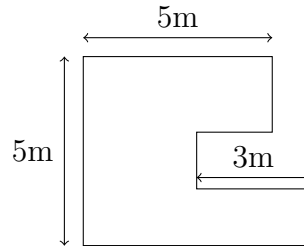
- A. 0 B. 3 C. 4 D. 7 E. None of these

10. Which of the following answers gives all the solutions of the equation $|x| + x = 0$?

- A. $x < 1$ B. $x = 0$ C. $x \geq 0$ D. $x = -7$ E. None of these

11. If $x = 3$ then the arithmetic sequence $x, x + 10, x + 20$ consists of three prime numbers, namely, 3, 13, 23. What is the next smallest value of x so that $x, x + 10, x + 20$ are all prime numbers?
- A. 7 B. 47 C. 127 D. 2017 E. None of these

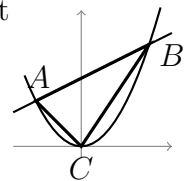
12. Determine the perimeter of the polygon.



- A. Not enough information B. 21 C. 24 D. 26 E. None of these

13. The number $5/7$ is written in decimal form starting as $0.714\dots$. What is the sum of the first 2019 digits after the decimal point?
- A. 9082 B. 9084 C. 9086 D. 9088 E. None of these

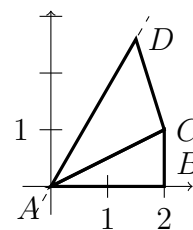
14. The line $y = x + 6$ intersects the parabola $y = x^2$ at points A and B . Point C is the vertex of the parabola $y = x^2$. Compute the area of triangle ABC .



- A. 15 B. $33/2$ C. 20 D. $65/2$ E. None of these

15. What is the sum of all three digit numbers whose digits sum to 9?
- A. 9,324 B. 10,224 C. 17,487 D. 17,820 E. None of these

16. Right triangle ABC has vertices $A(0,0)$, $B(2,0)$, and $C(2,1)$. Right triangle ACD has right angle ACD , $AC = \sqrt{5}$, and $CD = \sqrt{5}/2$. What is the slope of the line containing AD ?



- A. 0.5 B. 1 C. 1.5 D. 2 E. None of these

17. The *digital sum* of a number is found by taking the sum of the digits. If the sum is at least ten then take the sum of these digits. Continue this process until the sum is less than ten. For example, $2 + 0 + 1 + 9 = 12$ and $1 + 2 = 3$ so the digital sum process applied to 2019 ends at 3. Let p be the smallest prime larger than 2019 for which $p + 2$ is also prime. Where does the digital sum applied to $p(p + 2)$ end?

- A. 3 B. 5 C. 8 D. 9 E. None of these

18. Let the sum of the squares of the digits of a positive integer s_0 be represented by s_1 . In a similar way, let the sum of the squares of the digits of s_1 be represented by s_2 , and so on. If $s_i = 1$ for some $i \geq 1$, then the original integer s_0 is said to be *happy*. For example, 2019 is happy because $2^2 + 0^2 + 1^2 + 9^2 = 86$, $8^2 + 6^2 = 100$, and $1^2 + 0^2 + 0^2 = 1$.

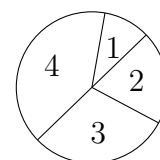
What is the next year after 2019 that is a happy number?

- A. 2020 B. 2021 C. 2022 D. 2023 E. None of these

19. Isosceles triangle ABC has $AC = BC$ and the area of triangle ABC is the same as the area of the semi-circle with diameter AB . Let x be the measure of angle BAC . Compute $\tan(x)$ to the nearest one-hundredth.

- A. 0.87 B. 1.57 C. 1.73 D. 3.14 E. None of these

20. A spinner has the numbers 1,2,3,4 which are formed by wedges of angles x° , $2x^\circ$, $3x^\circ$, and $4x^\circ$, respectively. The probability that any of the numbers is spun is proportional to the angle of the corresponding wedge. The spinner is spun four times. What is the probability that the sum of the numbers is a perfect square?



- A. 181/2000 B. 21/128 C. 81/125 D. 3/13 E. None of these