1. The point (a, b) is two-thirds of the way from (6, -2) to (5, 8). Find $a + b$.

a) $9.\overline{3}$ b) $9.\overline{6}$ c) 10 d) $10.\overline{3}$ e) None of these

2. The numerator of a fraction is 497 more than the denominator. If the numerator and denominator were both decreased by 58, the new fraction would equal two. Find the sum of the numerator and denominator of the original fraction.

a) 1607 b) 1609 c) 1611 1613 e) None of these

3. Find the number of positive integers that are exact divisors of 100.

a) 15 b) 12 c) 10 d) 9 e) None of these

4. The ratio of goats to pigs is 11 to 7. There are a total of 234 goats and pigs. If there are x goats and y pigs, find $\frac{7}{4}(x-y)$.

a) 78 b) 84 c) 91 d) 98 e) 104

5. If $\frac{a+b}{a}=3$ and $\frac{b+c}{c}=5$, find the value of $\frac{c}{a}$.

a) $\frac{1}{2}$ b) $\frac{3}{5}$ c) $\frac{5}{3}$ d) 2 e) None of these

6. How many different sets of two parallel edges are there in a cube?

a) 6 b) 8 c) 12 d) 18 e) None of these

7. A line with slope 3 intersects a line with slope 5 at the point (10, 15). Find the distance between the *x*-intercepts of these two lines.

a) 2 b) 5 c) 12 d) 20 e) None of these

8. Suppose A, B, and C are three numbers for which 1001C = 4004 + 2002A and 1001B + 3003A = 5005. Find A + B + C.

a) 9 b) 12 c) 15 d) 18 e) None of these

9. If *a*, *b*, and *c* are positive real numbers such that $a(b + c) = 152$, $b(c + a) = 162$, and $c(a + b) = 170$, then *abc* is

a) 672 b) 688 c) 704 d) 720 e) None of these

10. The perimeter of a square is A. The perimeter of an equilateral triangle is B. A + B = 90. The sides of the triangle are 2 longer than the sides of the square. Find the area of the square.

a) 12 b) 14 c) 48 d) 144 e) None of these

11. Find the area of a regular octagon whose perimeter is 80. Round the final answer to the nearest 0.001.

a) 482.842 b) 482.843 c) 482.844 d) 482.845 e) None of these

12. The minute hand of a clock is 16 inches long and the hour hand is 10 inches long. Find the distance between the tip ends of the hands when the angle between the hands is 30°. Round your answer to the nearest inch.

a) 11 in b) 12 in c) 13 in d) 14 in e) None of these

13. The focus of the parabola $3x - 8y = 31 + y^2$ is (*a*, *b*). Find *a* + *b*.

a) 1.4 b) 1.6 c) 1.75 d) 2.75 e) None of these

14. The asymptotes of the hyperbola $25x^2 = 4y^2 - 100x - 24y + 36$ are $y = mx + b$ and $y = c - mx$. Find $|m| + b + c$.

a) 8.5 b) 9 c) 9.5 d) 10 e) None of these

15. A square and an equilateral triangle have the same perimeter. Let A be the area of the circumcircle for the square. Let B be the area of the circumcircle for the triangle. Find $\frac{A}{B}$.

a) $\frac{9}{16}$ b) $\frac{3}{4}$ c) $\frac{27}{32}$ d) $3\sqrt{6}$ e) None of these

16. The quadratic equation $x^2 + mx + n = 0$ has roots that are twice those of $x^2 + px + m = 0$ and $mnp \neq 0$. Find the value of $\frac{n}{p}$.

a) 1 b) 2 c) 4 d) 8 e) None of these

17. If $\{x : a < x < b\}$ is the set of the all real numbers which are solutions of $|x - 3| + |x + 2| < 11$, find *b* – *a*.

a) 9.5 b) 10 c) 10.5 d) 11 e) None of these

18. Find the SUM of all of the positive integers which are exact divisors of 12006.

a) 28044 b) 28080 c) 28440 d) 29340 e) None of these

19. The distance from the line $y = \frac{2}{3}x - 5$ to the point (6, 8) is $\sqrt{\frac{a}{b}}$ where *a* and *b* are positive integers and the fraction $\frac{a}{b}$ is in lowest terms. Find *a* – *b*.

a) 718 b) 716 c) 714 d) 712 e) None of these

20. Evaluate $\lim_{h\to 0} \frac{2(x+h)^3 - (x+h)^2 - 2x^3 + x^2}{h}$.

a) $2x^3 - x^2$ b) $6x^2 + 6hx - 2x$

c) $6x^2 - 2x$ d) undefined e) None of these

21. Find the equation of the tangent line to the graph of $x^2 + 3xy + y^2 + 1 = 0$ at the point (2, -1).

a) x – 8y = 10 b) x – 4y = 6 c) x + 4y = -2 d) x + 8y = 6 e) None of these

22. When $10^{61} - 1$ is written as an integer, find the SUM of its digits.

a) 1 b) 499 c) 540 d) 549 e) None of these

23. For any one trial, the probability of event A is $\frac{2}{3}$. Find the probability that event A will occur exactly 4 times in 6 trials.

a) $\frac{80}{243}$ b) $\frac{75}{243}$ c) $\frac{70}{243}$ d) $\frac{65}{243}$ e) None of these

24. Find the length of the median drawn to the longest side of a triangle with sides 6, 8, and 12.

a) $\sqrt{14}$ b) $\sqrt{15}$ c) $\sqrt{16}$ d) $\sqrt{17}$ e) None of these

Solutions

1. C
2. A
3. D
4. C
5. A
6. D
7. A
8. A
9. D
10. D
11. B
12. E
13. C
14. A
15. C
16. D
17. D
18. B
19. B
20. C
21. C
22. D
23. A
24. A