1. The area of each face of a cube is 81 square inches. Find the total length of all the edges of this cube.

a) 94 in b) 99 in c) 105 in d) 108 in e) None of these

2. Find the perimeter of a square with vertices (0, 6), (-6, 0), (0, -6), and (6, 0).

a) $24\sqrt{2}$ b) $20\sqrt{2}$ c) $24\sqrt{3}$ d) $20\sqrt{3}$ e) None of these

3. If $x * y = \frac{x+y}{xy}$, find $10*(6*5)$.

a) $\frac{110}{311}$ b) $\frac{311}{110}$ c) $\frac{111}{310}$ d) $\frac{310}{111}$ e) None of these

4. A segment of length 144 is cut into 2 parts so that one part is $\frac{4}{5}$ as long as the other. Find the (positive) difference in the lengths of these two parts.

a) 16 b) 18 c) 20 d) 22 e) None of these

5. Two angles are supplementary. The first angle is 6° larger than five times the second angle. Find the size of the first angle.

a) 76° b) 29° c) 104° d) 151° e) None of these

6. The average of a set of 50 numbers is 38. Two numbers, 55 and 45, are discarded. Find the average of the remaining numbers.

a) 36 b) 36.5 c) 37 d) 37.5 e) None of these

7. ABCDE is a regular pentagon. Find the size of angle DAE.

a) 30° b) 34° c) 36° d) 40° e) None of these

8. A tank with a capacity of 30 gallons is one-third full. A pump can deliver a gallons every b seconds. How many minutes will it take to fill the tank with this pump?

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

9. Find the length of a 226° arc of a circle whose area is 72.25π square units. Use $\frac{355}{113}$ as the value of π.

a) $\frac{1205}{36}$ b) $\frac{1207}{36}$ c) $\frac{1209}{36}$ d) $\frac{1211}{36}$ e) None of these

10. A and B can do a job in six hours working together. A is twice as productive as B. Find the number of hours for A to do 6 of these same jobs when he works alone.

a) 50 b) 51 c) 52 d) 53 e) None of these

11. Find the number of degrees in the acute angle formed by the hands of a clock at exactly 4:15 pm.

a) 35 b) 36 c) 37 d) 38 e) None of these

12. Find $972.\overline{72}\,\%$ of the number that is $\frac{2}{7}$ of the way from $\frac{5}{3}$ to $\frac{-41}{9}$.

a) $\frac{-109}{99}$ b) $\frac{-107}{99}$ c) $\frac{-105}{99}$ d) $\frac{-103}{99}$ e) None of these

13. The number of circular pipes with inside diameter 1 inch which will carry the same amount of water as a pipe with an inside diameter 6 inches is

a) 6π b) 6 c) 12 d) 36 e) None of these

14. Evaluate $\cos\left[\operatorname{Arc}\cot\left(\frac{5}{12}\right)\right]-\sin\left[\operatorname{Arc}\cos\left(\frac{4}{5}\right)\right]$.

a) $\frac{-23}{60}$ b) $\frac{14}{65}$ c) $\frac{-14}{65}$ d) $\frac{23}{65}$ e) None of these

15. Evaluate for all $x\neq 0$, $\log_3 243+\log_8(64)^3+\log_5\left(\frac{x}{x}\right)$.

a) 9 b) 10 c) 11 d) 12 e) None of these

16. Find the sum of the first 200 terms of the arithmetic sequence whose eleventh term is -210 and whose 30^{th} term is -153.

a) 11331 b) 11430 c) 11610 d) 11700 e) None of these

17. A golf ball is dropped from a height of 12 feet. Each time it strikes the ground, it rebounds $\frac{2}{3}$ of the distance from which it last fell. Find the total vertical distance traveled by this golf ball.

a) 60 ft. b) 90 ft. c) 100 ft. d) 120 ft. e) None of these

18. With his eyes 75 feet above water, an observer spots 2 ships in the distance. The 2 ships and the observer are all coplanar. The angle of depression to one ship is 5° and to the other it is 10°. Find the distance between the two ships rounded to the nearest foot.

a) 430 ft b) 432 ft c) 434 ft d) 436 ft e) None of these

19. The radius of a circle is increasing at 2 inches per second. When the radius is 10 inches, the area is increasing at the rate of

a) 24π in^2/sec b) 36π in^2/sec c) 40π in^2/sec d) 42π in^2/sec e) None of these

20. Find the slope of the tangent line to the curve $x^2 + 4xy = 5 + y^2$ at the point (1, 2).

a) $\frac{-3}{2}$ b) $\frac{-3}{4}$ c) $\frac{-3}{5}$ d) $\frac{-3}{8}$ e) None of these

21. Given position function $s(t) = -16t^2 + v_0 t + s_0$. A ball is dropped from 900 feet above the ground. What is its speed when it hits the ground? (Ignore air resistance.)

a) 660 ft/sec b) 560 ft/sec c) 460 ft/sec d) 360 ft/sec e) None of these

22. What value of *a* will make $f(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3 \end{cases}$ continuous at $x = 3$.

a) $\frac{3}{4}$ b) $\frac{-3}{4}$ c) $\frac{4}{3}$ d) $\frac{-4}{3}$ e) None of these

23. Find the shortest distance from the line with parametric equations $x = 3t - 2$, $y = -2t$, and $z = 4t + 1$ to the point (3, -1, 4).

a) $\sqrt{5}$ b) $\sqrt{6}$ c) $\sqrt{7}$ d) $\sqrt{8}$ e) None of these

24. Find the volume of the largest right circular cylinder that can be inscribed in a sphere with diameter 20. Round the final answer to the nearest tenth of a cubic unit.

a) 2418.4 b) 2418.5 c) 2418.6 d) 2418.7 e) None of these

Solutions:

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