1. Simplify the reciprocal of the sum of a^{-1} and b^{-1}.

a) $\frac{ab}{a+b}$ b) $a+b$ c) $\frac{a+b}{ab}$ d) $\frac{1}{a+b}$ e) none of these

2. The length of a 60° arc of a circle is 12π inches. Find the area of this circle.

a) 5184π in^2 b) 3136π in^2 c) 2440π in^2 d) 1496π in^2 e) none of these

3. Which statements are true for a kite?
   1. Both pairs of opposite sides are parallel.
   2. The diagonals bisect each other.
   3. The diagonals are perpendicular.
   4. Both pairs of opposite angles are congruent.
   5. One diagonal bisects a pair of opposite angles.

a) 1, 2, 3, 4, 5 b) 3, 5 only c) 2, 3, 4 only d) 3 only e) none of these

4. The sum of the ages of A and B is 68. In 15 years, three times A's age increased by B's age will equal 168. Find the absolute value of the difference in their ages.

a) 31 b) 30 c) 29 d) 28 e) none of these

5. You have cheap coffee worth \$5 per pound and expensive coffee worth \$5.50 per pound. How much of the expensive coffee should go in a drum if you want 125 pounds of mixture that is worth \$5.18 per pound?

a) 45 pounds b) 46 pounds c) 47 pounds d) 48 pounds e) none of these

6. Find the product of two positive numbers whose sum is 108 if twice their positive difference subtracted from the smaller number is nine.

a) 2840 b) 2835 c) 2830 d) 2825 e) none of these

7. Find the value of A whenever $A = (x-1)^4 + 4(x-1)^3 + 6(x-1)^2 + 4(x-1) + 1$.

a) $(x+1)^4$ b) $(x-1)^4$ c) x^4 d) $x^4 + 1$ e) none of these

8. Al can run around a circular track in 40 seconds. Bob starts at the same time and place as Al but runs in the opposite direction. Bob meets Al every 15 seconds. If both run at a constant rate, how many seconds should it take Bob to complete 1 lap around this track?

a) 42 b) 40 c) 24 d) 20 e) none of these

9. A farmer has a single sprinkler which supplies water to an area in the shape of a circle. He puts this sprinkler in the center of a square field. What percentage of this square field is not watered if the circular area watered touches each side of the square at exactly one point? Round your answer to the nearest one-tenth of one percent.

a) 32.3% b) 26.4% c) 22.8% d) 21.8% e) none of these

10. Suppose $x+1$ varies inversely with y and x =3 when y = -5. Find y when x = 5.

a) $\frac{-13}{3}$ b) 4 c) $\frac{-11}{3}$ d) $\frac{-10}{3}$ e) none of these

11. The solution set of $x^2 = 11x - 1$ is {a, b} where a > b. Find c + d where c and d are positive integers such that $c + \sqrt{d} = 3a + b$.

a) 137 b) 138 c) 139 d) 140 e) none of these

12. The graphs of $x^2 + y^2 = 9$ and y = x – 1 intersect in two distinct places. If one of these two points of intersection is (a, b) where (a, b) is in the first quadrant, find ab.

a) 5 b) 4 c) 3 d) 2 e) none of these

13. Rewrite $\dfrac{\sin x}{\cos x - 1}$ so that it is not in fractional form.

a) $1 - \cot x$ b) $\sin x \cos x + \sin x$ c) $1 - \tan x$
d) $-\cot x - \csc x$ e) none of these

14. If you pretend that $\log_x 2 = 0.2789$ and that $\log_x 3 = 0.4421$ are both exact values, then the value of $\log_x 18$ should be

a) 1.1631 b) 1.1633 c) 1.1635 d) 1.1637 e) none of these

15. A and B play 24 chess matches. A wins 12, loses 8, and 4 matches end in a draw. Use this information to find the probability that B will win at least one the next 3 matches.

a) $\dfrac{19}{27}$ b) $\dfrac{20}{27}$ c) $\dfrac{7}{9}$ d) $\dfrac{22}{27}$ e) none of these

16. Bo makes 80% of his foul shots. What is the probability that he will make exactly 8 out of his next 10 attempts? Round your answer to the nearest 0.001.

a) 0.304 b) 0.303 c) 0.302 d) 0.301 e) none of these

17. Given a triangle with sides 5, 6, and 8, find x if the length of the median drawn to the longest side is $\sqrt{x}$.

a) 14.6 b) 14.5 c) 14.4 d) 14.3 e) none of these

18. The solutions of $2\sin^2 x + \cos x = 2$ over the domain $0° \le x < 360°$ are $a°$, $b°$, $c°$, and $d°$ where $a < b < c < d$. Find $3a + 2b + d - c$.

a) 360 b) 370 c) 380 d) 390 e) none of these

19. A solid metal sphere of radius 10 is melted and recast as a hollow sphere. The spherical cavity has radius 16. Find the thickness of the shell. Round your answer to the nearest 0.01.

a) 1.20 b) 1.21 c) 1.22 d) 1.23 e) none of these

20. Use $a(t) = -32$ ft/sec^2 as the acceleration due to gravity. A ball is thrown vertically upward from the ground with an initial velocity of 96 ft/sec. How high will the ball go? Round your answer to the nearest foot.

a) 120 ft b) 130 ft c) 140 ft d) 150 ft e) none of these

21. A ball is dropped from a height of 10 feet and on each bounce it rises to a height which is 85% of the height from which it last fell. Find the total distance traveled by this ball.

a) $122.\overline{6}$ ft b) 123 ft c) $123.\overline{3}$ ft d) $123.\overline{6}$ ft e) none of these

22. Find the average value of the function $y = x^2 + 6$ over the domain $3 \le x \le 8$.

a) 38 b) $38.\overline{1}$ c) $38.\overline{2}$ d) $38.\overline{3}$ e) none of these

23. Find the arc length of the function $y = x^2 + 6$ over the domain $3 \le x \le 8$. Round your answer to the nearest 0.001.

a) 55.240 b) 55.241 c) 55.242 d) 55.243 e) none of these

24. The area inside the circle $x^2 + y^2 = 100$ in the first quadrant which is above the line $y = 8$ is rotated about the y-axis to generate a volume. Find this volume.

a) $37.\overline{2}\pi$ b) $37.\overline{3}\pi$ c) $37.\overline{4}\pi$ d) $37.\overline{5}\pi$ e) none of these

Solutions

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