1. P is the product of *a*, *b*, and *c*. If *a* is increased by 40%, *b* is decreased by 25%, and *c* is decreased by 10%, what is the percent change in P?

a) 5.5% increase b) 5.5% decrease

c) 9.45% increase d) 9.45% decrease e) None of these

2. Find the units digit of 2^{473}.

a) 2 b) 4 c) 8 d) 6 e) None of these

3. A has $6x + 3$ quarters. B has $2x + 7$ quarters. The <u>difference</u> in their money in nickels is

a) $10(2x+3)$ nickels b) $10(2x-3)$ nickels

c) $20(x+1)$ nickels d) $20(x-1)$ nickels e) None of these

4. On a 25 question test, Bo earns 6 points for each correct answer, 2 points for each question not answered, and 0 points for each wrong answer. Bo answered 18 questions with a score of 98. Find the positive difference between the number right and wrong.

a) 11 b) 10 c) 9 d) 8 e) None of these

5. Bo has \$6.36 in pennies, nickels, and dimes. He has twice as many dimes as nickels and $\frac{2}{3}$ as many nickels as pennies. Find the total numbers of coins in Bo's piggy bank.

a) 100 b) 102 c) 104 d) 106 e) None of these

6. Find the number solutions in positive integers for $2x+3y=479$.

a) 80 b) 79 c) 78 d) 77 e) None of these

7. Find the area of the circle inscribed in an equilateral triangle with perimeter 36.

a) 16π b) 14π c) 12π d) 10π e) None of these

8. Given a cube with total surface area 600. Find the distance from the center of one face to a vertex in a different plane.

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

9. Find $7m + 7b$ where $y = mx + b$ is the perpendicular bisector of the segment from (2, -3) to (8, 11).

a) 42 b) 41 c) 40 d) 39 e) None of these

10. Given triangle ABC with AC = 7 and BC = 4. D is any point on ray AC with AD > AC. Choose point E on ray AB where AE = 9, AE > AB, and ray CE bisects angle DCB. Find BE.

a) 4 b) 5 c) 6 d) 7 e) None of these

11. Given triangle ABC with AB = 5, BC = 7, and AC = 9. D is a point on side AC where ray BD bisects angle ABC. Find AD.

a) 3.25 b) 3.50 c) 3.75 d) 4.00 e) None of these

12. In a given circle chords AB and CD have length 7 and 8, respectively. P is the point outside the circle where rays AB and CD intersect. If PB = 9, find PD.

a) $4\sqrt{10} - 8$ b) $4\sqrt{10} - 6$ c) $4\sqrt{10} - 4$ d) $4\sqrt{10} - 2$ e) None of these

13. Find the height upon the longest side of triangle with vertices (2, 3), (5, -2), and (-3, 4).

a) 2 b) 2.1 c) 2.2 d) 2.3 e) None of these

14. Find the least value of the expression $10x^2 - x - 21$ for all real values of x.

a) -21.025 b) -21.030 c) -21.035 d) -21.040 e) None of these

15. Find the area of a regular pentagon whose circumcircle has area 36π.

a) $90\cos 18°$ b) $90\sin 36°$ c) $81\sin 72°$ d) $81\cos 18°$ e) None of these

16. Find the angular velocity in radians per second of a wheel doing 100 miles per hour with diameter 20 inches.

a) 170 radians/sec b) 172 radians/sec

c) 174 radians/sec d) 176 radians/sec e) None of these

17. $(y+1)^2 = -12(x+2)$ has vertex (h, k), focus (a, b), directrix $x = l$, and the upper endpoint of the latus rectum is (c, d). Find $h+k+a+b+l+c+d$.

a) -7 b) -8 c) -9 d) -10 e) None of these

18. An ellipse has vertices (-7, 1) and (3, 1) and covertices (-2, 3) and (-2, -1). The equation is $\frac{(x+p)^2}{m^2} + \frac{(y+q)^2}{n^2} = 1$. Find $m^2 + n + p + q$.

a) 27 b) 28 c) 29 d) 30 e) None of these

19. Given: $x^2 + y^2 = 25$. Find $\frac{d^2y}{dx^2}$ at (0, 5).

a) -0.2 b) 0.2 c) -0.1 d) 0.1 e) None of these

20. Find the minimum area of the right triangle with vertices (0, 0), (0, b), and (a, 0) whose hypotenuse contains (10, 6). Assume a > b > 0.

a) 112 b) 114 c) 116 d) 118 e) None of these

21. $y = \frac{1}{3}x^3 + \frac{3}{2}x^2 - 10x + 4000$ has a local minimum at $x = a$, a point of inflection at $x = b$, and a local maximum at $x = c$. Find $10a + 2b + c$.

a) 15 b) 14 c) 13 d) 12 e) None of these

22. Find $m - b$ where $y = mx + b$ is the line tangent to $x^2 - y^2 = 12$ at (4, 2).

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

23. A box contains 5 good and 3 bad bulbs. Bulbs are removed 1 at a time (at random) and tested until a good bulb is found. Find the expected number of bulbs removed.

a) 1.48 b) 1.50 c) 1.52 d) 1.54 e) None of these

24. Find the area bounded by $y^2 = x$ and $y = 2 - x$.

a) 4.2 b) 4.3 c) 4.4 d) 4.5 e) None of these

Solutions

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