1. Bo's gourmet coffee costs \$18 per pound. It is composed of type A coffee at \$12 per pound and type B coffee at \$32 per pound. The ratio of type A coffee to type B coffee in this gourmet blend should be

a) $\frac{7}{2}$ b) $\frac{7}{3}$ c) $\frac{8}{3}$ d) $\frac{7}{5}$ e) none of these

2. A jogger's daily workout is to jog the 0.75 miles from home to the local 0.125 mile track, do 40 laps, and then jog back home. He averages 8 mph on the track and 6 mph otherwise. The total time spent jogging during one of these workouts is $x$ **minutes**. Find $x$.

a) 52.25 b) 52.50 c) 52.75 d) 53 e) none of these

3. On Monday morning the price of a chair is reduced by 12% from A to B dollars. On Tuesday morning (the next day) the price is reduced by 25% from B to C dollars. The overall reduction in price from A to C is reduction of $x$%. Find $x$.

a) 37 b) 36 c) 35 d) 34 e) none of these

4. Find $\frac{2a-2b}{3a+3b}$ in terms of $x$ whenever $x=\frac{a}{b}$, $|a| \neq |b|$, and $b \neq 0$.

a) $\frac{2x+2}{3x}$ b) $\frac{2x-2}{3x+3}$ c) $\frac{2x+2}{3x-3}$ d) $\frac{2}{3}$ e) none of these

5. Find $m + b$ where $y = mx + b$ is the perpendicular bisector of the line segment from (-4, 6) to (18, 10).

a) 41 b) 41.5 c) 42 d) 42.5 e) none of these

6. Find N + D where N and D are positive integers and $x=\frac{N}{D}$, given that $x$ is in lowest terms and $1.\overline{6}-2(x-4)^{-1}=0.5$

a) 47 c) 48 c) 49 d) 50 e) none of these

7. Find the SUM of the lengths of the diagonals of a rhombus with a 72° angle and perimeter 44 units. Round the answer to the nearest 0.001.

a) 30.727 b) 30.728 c) 30.729 d) 30.730 e) none of these

8. Find the future value (FV) of $2500 at 7.2% APR (annual percentage rate) compounded monthly for 40 years. Round your answer to the nearest cent. **Hint**: A present value (PV) of $100 at 9% per year compounded monthly will yield a

FV of $100(1.0075)$ after 1 month

FV of $100(1.0075)^2$ after 2 months

FV of $100(1.0075)^3$ after 3 months

a) $44,154.07 b) $44,154.09 c) $44,154.11 d) $44,154.13 e) none of these

9. In ΔFDC, medians CA and BD intersect at point G. Find BD – GA whenever CA = 15 and GD = 7.

a) 4.5 b) 5 c) 5.5 d) 6 e) none of these

10. The right triangle ACE has horizontal leg $\overline{CE}$, vertical leg $\overline{CA}$, and hypotenuse $\overline{AE}$. Points M and R are on $\overline{CA}$ and $\overline{AE}$, respectively. Segment MR is horizontal. Segments MC, CE, and MR have lengths 12, 15, and 6, respectively. Find the perimeter of ΔAMR.

a) 22 b) 24 c) 26 d) 28 e) none of these

11. Find N + D where N and D are positive integers with $x = \frac{N}{D}$ in lowest terms and

$$81^{2x-6} = \left(27^{-2/3}\right)^{x-2}$$

a) 13 b) 15 c) 17 d) 19 e) none of these

12. Find the area BETWEEN a regular hexagon with perimeter 60 and its circumcircle. Round your answer to the nearest 0.001.

a) 54.349 b) 54.350 c) 54.351 d) 54.352 e) none of these

13. A 90 pound boy is 56 inches tall. Three years later he is 64 inches tall and weighs *x* pounds. Find *x*. Assume similar solids where the ratio of weight to volume remains constant. Round your answer to the nearest 0.001.

a) 134.342 b) 134.343 c) 134.344 d) 134.345 e) none of these

14. Find the SUM of three real numbers *a*, $|b|$, and *c* where $a \pm bi$ and *c* are the three solutions of $x^3 = 64$. Round the final answer to the nearest 0.001.

a) 5.461 5.462 5.463 d) 5.464 e) none of these

15. Find the SUM of the digits of the positive integer 17*x* where $\log_2 6 = \left(\log_2 \sqrt{x}\right)\left(\log_{15} 36\right)$.

a) 13 b) 14 c) 15 d) 16 e) none of these

16. Find $a + b + c + d$ where $(a, b)$ and $(c, d)$ are the two points where the straight line $y - 2x = 1$ intersects the circle $x^2 + y^2 = 1$.

a) -0.6 b) -0.5 c) -0.4 d) -0.3 e) none of these

17. The real numbers which are the solutions $\left|\frac{2x-3}{x}\right| < \frac{1}{2}$ are precisely the members of $\{x : a < x < b\}$. Find $a + b + ab$.

a) 5 b) 5.2 c) 5.4 d) 5.6 e) none of these

18. Find $a + b + c$ where $(a, b, c)$ is the unique solution of the linear system $\begin{cases} 0.5x - 0.\overline{3}y = 0.1\overline{6} \\ 0.\overline{3}x + 0.4z = 2.6 \\ 0.\overline{3}y + 0.\overline{6}z = 4 \end{cases}$

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

19. Find $a + b + c$ where $a(x-b) = (y-c)^2$ is the equation of the parabola with directrix $x = 2$ and focus (-6, 5).
a) -13 b) -12 c) -11 d) -10 e) none of these

20. Find the volume generated by revolving the region bounded by $y = \sqrt{x}$, $y = 0$, and $x = 5$ in the first quadrant about the $y$-axis. Round your final answer to the nearest 0.001.
a) 140.495 b) 140.496 c) 140.497 d) 140.498 e) none of these

21. Nine books consisting of 4 different math books, 3 different physics books, and 2 different chemistry books are placed on a shelf from left to right at random. Find N + D where $\frac{N}{D}$ is the probability in lowest terms that the result will have the 4 math books together, the 3 physics books together, and the 2 chemistry books together.
a) 211 b) 215 c) 219 d) 223 e) none of these

22. Point A is the center of a sphere with diameter 20 sitting on top of a desk. Plane M is parallel to the desktop and 16 units above the desktop. The intersection of plane M and sphere A is a circle with center at point C. Point P is any point on the circumference of circle C. Find the volume inside sphere A bounded by the zone (spherical surface) above circle C and all possible positions of line segment AP. **FYI**: You are being asked to find the volume of a spherical sector. Round your answer to the nearest 0.001 unit.
a) 837.738 b) 837.748 c) 837.758 d) 837.768 e) none of these

23. Find the length of the arc of the curve $y = x^{3/2}$ for $x = 0$ to $x = 5$. Round your answer to the nearest 0.001.
a) 12.405 b) 12.407 c) 12.409 d) 12.411 e) none of these

24. You borrow \$100,000 to buy a house at 5.4% APR on 24 February, 2004. You will repay this debt by paying $x$ dollars per month for 20 years starting 24 March, 2004. Find $x$. Round your answer to the nearest cent. **Hint**: Each payment will include one month's interest on the unpaid balance with the surplus used to reduce the unpaid balance. Let $PV_1$ denote the present value of the 1st payment and so on. Now find $x$ by using the fact that $PV_1 + PV_2 + \cdots + PV_{240} = \$100{,}000$ OR (an easier way) using the fact that the PV of the last payment (#240) will equal that part of the 1st payment used to reduce the unpaid balance.
a) 682.15 b) 682.20 c) 682.25 d) 682.30 e) none of these

Answers

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