1. The sum of two positive integers is 40. The difference of 5 times the larger number and four times the smaller number exceeds seven times the smaller number by 8. Find the <u>difference</u> of these two positive numbers.

a) 17 b) 16 c) 15 d) 14 e) none of these

2. Becky can run 400 meters in 64 seconds. Grace can run 400 meters in 75 seconds. Based on these facts, how many meters of headstart should Becky give Grace so that both girls will cross the finish line at about the same time. Becky is to run the full 400 meters.

a) $\frac{179}{3}$ b) $\frac{178}{3}$ c) $\frac{177}{3}$ d) $\frac{176}{3}$ e) none of these

3. Electrical current is directly proportional to the electromotive force (voltage). When the electrical current is 4 amperes, the electromotive force is 24 volts. Find the number of ampheres of electrical current when the electromotive force is 96 volts.

a) 15 b) 16 c) 17 d) 18 e) none of these

4. The sum of the current ages of a mother and son is 54 years. Four years ago, the mother's age then was two more than three times the son's age then. Find the mother's age when the son was born.

a) 24 b) 25 c) 26 d) 27 e) none of these

5. The perimeter of a rectangle is 156. When the length is decreased by 13 and the width is increased by 13, the rectangle becomes a square. Find the <u>area</u> of the rectangle.

a) 1364 b) 1360 c) 1356 d) 1352 e) none of these

6. Give the base 6 representation of the positive integer whose base 4 representation is 2103.

a) 401 b) 403 c) 404 d) 413 e) none of these

7. A tree casts a shadow seven meters long. At the same time and location, a person 1.7 meters tall casts a shadow 0.7 meters long. Find the number of meters in the height of the tree.

a) 17 b) 16.8 c) 16.6 d) 16.4 e) none of these

8. At full throttle, an airplane can go 930 km against the wind in the same time that it can go 1020 km with the wind. The rate of the wind is 15 km/hour. Find the speed of the airplane in still air at full throttle.

a) 335 km/hr b) 330 km/hr c) 325 km/hr d) 320 km/hr e) none of these

9. One pipe can fill a tank in 12 hours and another pipe can fill the same tank in 15 hours. If both pipes are used, how many hours should be needed to fill this same tank?

a) $\frac{23}{3}$ b) $\frac{22}{3}$ c) 7 d) $\frac{20}{3}$ e) none of these

10. A given alloy contains 10% zinc and 20% copper. How many pounds of zinc and how many pounds of copper should be melted along with 1000 pounds (lbs) of the given alloy to produce another alloy which is 20% zinc and 24% copper. All of these percentages are by weight.

a) 150 lbs of zinc, 100 lbs of copper
b) 100 lbs of zinc, 150 lbs of copper
c) 90 lbs of zinc, 120 lbs of copper
d) 120 lbs of zinc, 90 lbs of copper
e) none of these

11. Find the area of trapezoid ABCD if $\overline{AB}$ & $\overline{CD}$ are bases, AD = 10, DC = 20, angle CDA is 30 degrees, and angle BCD is 45 degrees.

a) $85-12.5\sqrt{3}$ b) $85+12.5\sqrt{3}$ c) $87.5-12.5\sqrt{3}$ d) $87.5+12.5\sqrt{3}$ e) none of these

12. ABCDEFGHIJKL is a regular polygon with 12 sides. Find the number of degrees in the obtuse angle formed by chords BG and EK.

a) 105 b) 107.5 c) 110 d) 112.5 e) none of these

13. Find the square of the length of the median of a triangle drawn from the vertex of the largest angle to the middle point of the opposite side when the sides of the triangle are 8, 9, and 10.

a) 48.5 b) 48 c) 47.5 d) 47 e) none of these

14. Find the area of a right triangle whose hypotenuse is 117 and whose perimeter is 270.

a) 2430 b) 2432 c) 2434 d) 2436 e) none of these

15. If no ties are possible and the probability of A winning a 100 yard race against B is $\frac{1}{3}$, find the probability that A will win at least one of three races against B.

a) $\frac{2}{3}$ b) $\frac{19}{27}$ c) $\frac{20}{27}$ d) $\frac{7}{9}$ e) none of these

16. How many ways can 6 men be seated in a row if 2 of the men must NOT be seated together?

a) 420 b) 480 c) 540 d) 600 e) none of these

17. A ball is dropped from a height of 45 feet. On each bounce, it rebounds 40% of the distance from which it last fell. Find the total distance traveled by this ball assuming that the number of bounces approaches infinity.

a) 60 feet b) 75 feet c) 90 feet d) 105 feet e) none of these

18. One of the lateral edges of a pyramid is 4 meters long. How far from the vertex will this edge be cut by a plane parallel to the base, which divides the pyramid into two equivalent parts (of equal volume). Round the final answer to the nearest 0.001 meter.

a) 3.175 m b) 3.176 m c) 3.177 m d) 3.178 m e) none of these

19. If the probability that the average freshman will complete four years of college is $\frac{2}{3}$, find the probability that of 4 randomly chosen freshmen, at least 3 will complete four years of college.

a) $\frac{19}{27}$ b) $\frac{17}{27}$ c) $\frac{16}{27}$ d) $\frac{5}{9}$ e) none of these

20. Find $\frac{d^2y}{dx^2}$ when T = 2: $y = 2T^3 - 6T^2$, $x = 5T^2 + 8$

a) $\frac{3}{100}$ b) $\frac{3}{50}$ c) $\frac{100}{3}$ d) 12 e) none of these

21. Solve for x: $12^{2x-1} = 5\left(4^x\right)$

a) $\frac{\log 5 + \log 12}{\log 4 - \log 12}$ b) $\frac{\log 12}{2\log 12 - \log 4}$

c) $\frac{\log 5 + \log 12}{2\log 12 + \log 4}$ d) $\frac{\log 5 + \log 12}{2\log 12 - \log 4}$ e) none of these

22. Let R be the region in the first quadrant bounded by $y = x^2$, x = 3, and the positive *x*-axis. Find the volume generated when region R is rotated about the line *x* = -1.

a) 57.5π b) 58π c) 58.5π d) 59π e) none of these

23. Find the *x* coordinate of the centroid of region R in problem number 22.

a) 2.20 b) 2.25 c) 2.30 d) 2.35 e) none of these

24. Line L has parametric equations $x = \frac{1}{2} + T$, $y = -\frac{3}{2} - T$, $z = -1 + 2T$. Suppose that the intersection of line L with the plane $2x - 2y + z = 12$ is the point (x_1, y_1, z_1). Find $10x_1 + 20y_1 + 30z_1$.

a) 1 b) 10 c) 20 d) 100 e) none of these

Answers:

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