1. The second angle of a triangle is 4° less than the third angle. The first angle is 8° larger than $\frac{1}{3}$ of the 2nd angle. Find the positive difference in degrees between the largest and smallest angles of this triangle.

a) 40°   b) 41°   c) 42°   d) 43°   e) None of these

2. Find the product of two positive numbers whose sum and difference are $\frac{1}{2}$ and $\frac{1}{6}$, respectively.

a) $\dfrac{1}{12}$ b) $\dfrac{1}{18}$ c) $\dfrac{1}{24}$ d) $\dfrac{1}{30}$ e) None of these

3. How many seconds will it take Bo to go m miles if he can go x miles in y seconds?

a) $\dfrac{xm}{y}$ b) my c) $\dfrac{xy}{m}$ d) xm e) None of these

4. The middle point of the line segment from the point (-3, 4) to the point (6, -2) is (h, k). Find $6h - 2k$.

a) 6   b) 7   c) 8   d) 9   e) None of these

5. On a trip, the average speed for the first 36 miles is 12 mph. The average speed for the next 45 miles is 15 mph. The average speed for the remaining 54 miles is x mph. Find x where the average speed for the entire trip is 15 mph.

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

6. A chess league has 14 schools. Every school plays every other school twice (home and away). Find the total number of matches that need to be played.

a) 186   b) 184   c) 182   d) 180   e) None of these

7. Find the number of sides of a convex polygon if the sum of the interior angles is eight times the sum of the exterior angles (one exterior angle per vertex).
a) 22   b) 20   c) 18   d) 16   e) None of these

8. Find the sum of the two diagonals of an isosceles trapezoid with bases 9 and 21 and legs 10.
a) 40   b) 38   c) 36   d) 34   e) None of these

9. Find the area of the triangle whose vertices are the points (1, 7) , (9, 2), and (5, -3).
a) 24   b) 26   c) 28   d) 30   e) None of these

10. Find the number of distinct diagonals which can be drawn for the convex polygon in problem number 7.
a) 150   b) 135   c) 120   d) 108   e) None of these

11. Find $m+b$ where $y = mx+b$ is the equation of the straight line k. Line k is perpendicular to the line whose equation is $3x+2y = 71$. Line k contains the point where the two lines $y = 3x-2$ and $2y-6 = x$ intersect.
a) $\dfrac{8}{3}$ b) 3   c) $\dfrac{10}{3}$ d) $\dfrac{11}{3}$ e) None of these

12. Find the SQUARE of the sum of the diagonals of a rectangle whose area is 55 and whose perimeter is 49.
a) 1961   b) 1962   c) 1963   d) 1964   e) None of these

13. How many minutes past 2 pm will the minute hand and the hour hand first form a zero degree angle?

a) $10.\overline{72}$ b) $10.\overline{81}$ c) $10.\overline{90}$ d) 11   e) None of these

14. From a point P outside a circle whose radius is 4 inches a secant through the center and a tangent are drawn. The secant is three times as long as the tangent. Find the distance from point P to the center of this circle.

a) $\sqrt{25}$ b) $\sqrt{24}$ c) $\sqrt{20}$ d) $\sqrt{18}$ e) None of these

15. A 14 inch chord of a circle subtends a 58° arc. Find the area of the circle. ROUND your final answer to the nearest 0.001 square unit.

a) 654.949   b) 654.948   c) 654.947   d) 654.946   e) None of these

16. X worked on a job for 4 hours and then asked for help because he saw that it would take exactly 6 more hours to finish the job by himself. Y started helping and this caused X & Y to finish the job in two more hours. (So X worked a total of 6 hours.) How many MINUTES should it have taken Y to finish this job working alone?

a) 210   b) 200   c) 190   d) 180   e) None of these

17. If $f(x) = y$ contains the point (a, b), then the new equation $f\left(\dfrac{2}{3}x\right) = \dfrac{5}{7}y$ will send (a, b) to the new location (h, k). Find $\left(\dfrac{h}{a} + \dfrac{k}{b}\right)$.

a) 3.2   b) 3.1   c) 3   d) 2.9   e) None of these

18. Give the value of k where $x = k$ is the directrix of the parabola with equation $y^2 = 6x + 8y + 2$.

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

19. A ship follows a course which is parallel to the straight line of the shore and 4 miles from the shore. A gun is mounted on the shore line which has a range of 8 miles. If the ship moves at 20 mph, for how many MINUTES is the ship within the range of the gun. Treat the ship as if it is a point and round your answer to the nearest half minute.
a) 40   b) 40.5   c) 41   d) 41.5   e) None of these

20. The solution of $\log(5x+1) = 2 + \log(2x-3)$ is the number $\dfrac{p}{q}$ where p and q are relatively prime positive integers. Find $p-q$.
a) 108   b) 107   c) 106   d) 105   e) None of these

21. Find the length of the latus rectum of the conic section with equation
$9(x-1)^2 - 4(y+3)^2 = 36$
a) 12   b) 11   c) 10   d) 9   e) None of these

22. What is the eccentricity of the conic section whose equation is $9x^2 + 25y^2 = 225$?
a) $\dfrac{5}{3}$ b) $\dfrac{3}{5}$ c) $\dfrac{5}{4}$ d) $\dfrac{4}{5}$ e) None of these

23. The radius of a wheel is 20 inches. Its angular velocity is 200 radians per second. Its linear velocity is x miles per hour. Find x.
a) $227.\overline{36}$ b) $227.\overline{45}$ c) $227.\overline{54}$ d) $227.\overline{63}$ e) None of these

24. $\displaystyle\lim_{x \to a} \frac{x^3 - a^3}{x^4 - a^4}$, where a does not equal zero, is
a) $\dfrac{3a}{4}$ b) $\dfrac{3}{4a}$ c) $\dfrac{4a}{3}$ d) $\dfrac{4}{3a}$ e) None of these

Solutions

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