1. Simplify $\sum_{n=1}^{\infty} \frac{2(3^{n-1})}{4^n}$

a. 1.5 b. 2 c. .5 d. 4.5 e. NOTA (none of the above)

2. If $5^{a+b} = 625\sqrt{5}$ and $2^{a-b} = 4096$, then find $a^2 + b^2$.

a. 16.5 b. 76.875 c. 82.125 d. 85 e. NOTA

3. Simplify $e^{\ln\left[e^{\ln(e^e)}\right]}$

a. 1 b. e c. e^2 d. e^e e. NOTA

4. Simplify $\frac{2(5^{x+1}) + 7(5^{x-3})}{6(5^{x-2})}$

a. 41.9 b. 25 c. 125.6 d. 1.5 e. NOTA

5. A population is growing constantly at the rate of 14% every year. To the nearest year, find out how many years it will take for this population to double.

a. 5 b. 6 c. 7 d. 8 e. NOTA

6. Find the sum of the values of x, between 0 and 2π radians, inclusive, that satisfy the equation:

$\cos(2x) + \cos(x) = 0$

a. 0 b. π c. 2π d. 3π e. NOTA

7. If $x + y = 6$ and $xy = 15$, then find $x^3 + y^3$.

a. 94 b. -94 c. -54 d. 90 e. NOTA

8. Find the value of x which satisfies the following equation.

$$2\left[{}_{11}C_{x}\right] = {}_{11}C_{x+1}$$

a. 9 b. 6 c. 3 d. 1 e. NOTA

9. If $\log_4 7 = n$, then find $\log_4 \frac{256}{343}$ in terms of n.

a. $\frac{4}{3n}$ b. $256 - 3n$ c. $4 - 3n$

d. $\log(64) - 3n$ e. NOTA

10. Simplify $\left[2 - \left[2\sqrt{3}\right]i\right]^5$

a. $256\sqrt{3} - 256i$ b. $256 - 256i\sqrt{3}$ c. $-512i\sqrt{3} + 512$

d. $1024i\sqrt{3} - 1024$ e. NOTA

11. The area of rhombus *ABCD* is 48 and the length of *BD* is 12. Find...

$$\cos(A) + \sin(A) - \cos\left[\frac{A}{2}\right] - \sin\left[\frac{A}{2}\right]$$

a. $\frac{48\sqrt{13}}{13}$ b. $\frac{7 - 5\sqrt{13}}{13}$ c. $\frac{2}{3}$

d. 1.5 e. NOTA

12. If $f(x) = \log_3(x-1)$, then find the sum of all the values of x that satisfy the following equation.

$$3^{f(x+1)} = x^5 - 4x^4 - 31x^3 - 14x^2 + 49x$$

a. 4 b. 1 c. 8 d. 7 e. NOTA

13. Convert $.5\overline{189}$ into a fraction in lowest terms.

a. $\frac{5137}{9900}$ b. $\frac{5135}{9900}$ c. $\frac{5138}{9900}$ d. $\frac{2567}{4950}$ e. NOTA

14. Find $A + B$ if A and B are in the interval $\left[0^{\circ} , 90^{\circ} \right]$, if $\frac{1}{2}\sin(A) - \frac{1}{2}\sin(B) = \sin\left[16^{\circ} \right]\cos\left[74^{\circ} \right]$, and if B has a maximum value in the interval.

a. 98° b. 120° c. 148° d. 162° e. NOTA

15. Solve for the inequality $x^2 \geq x$.

a. $x \geq 1$ b. $x \leq 0$ or $x \geq 1$ c. $0 \leq x \leq 1$

d. $x = 0$ e. NOTA

16. In the U.S. Open tennis tournament, Monica Seles's odds of winning the tournament are 1 to 3. Steffi Graf's odds of winning are 1 to 4. Katrina Adams has odds of 1 to 123 of winning the tournament. Find the probability that either Seles, Graf, or Adams wins the tournament.

a. $\frac{55}{92}$ b. $\frac{291}{492}$ c. $\frac{1}{130}$ d. $\frac{77}{150}$ e. NOTA

17. Solve the system below for all possible ordered pairs (x,y). Then **ADD** the values of the x-coordinates that satisfy the system.

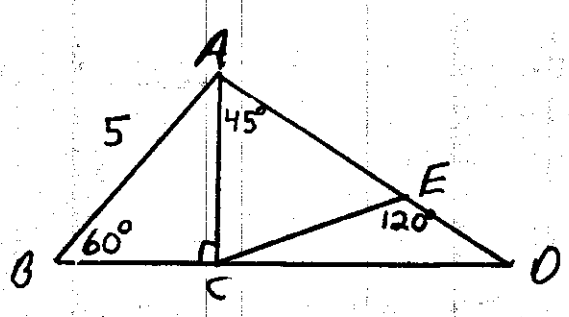
$$x^2 + y^2 = 25 \qquad x - y = 1$$

a. 0 b. 4 c. -2 d. 1 e. NOTA

18. Evaluate $\sum_{n=2}^{20} 111_n$

a. 3097 b. 3098 c. 3099 d. 3100 e. NOTA

19. Using the picture and the information at the right, find the length of *DE*.



a. 2.5 b. $\frac{5\sqrt{6} - 5\sqrt{2}}{4}$

c. $\frac{5\sqrt{6} + 5\sqrt{2}}{4}$ d. $\frac{5\sqrt{3}}{2}$ e. NOTA

20. Simplify $\sqrt{27-\sqrt{27-\sqrt{27-\sqrt{27-...}}}}$

a. $\frac{1 + \sqrt{109}}{2}$ b. $\frac{1 - \sqrt{109}}{2}$ c. $\frac{-1 + \sqrt{109}}{2}$

d. $\frac{-1 - \sqrt{109}}{2}$ e. NOTA

21. Find the angle between the vectors (3,7,-9) and (11,12,13).

a. 60° b. 90° c. 120° d. 135° e. NOTA

22. Which one or ones of the following lines is parallel to and 5 units from the line $4x - 3y + 8 = 0$?

I. $4x - 3y - 15 = 0$ II. $4x - 3y - 17 = 0$

III. $4x - 3y + 33 = 0$ IV. $4x - 3y + 41 = 0$

a. I and II only b. I and IV only c. III and IV only

d. II only e. NOTA

23. Which of the following represents the family of lines where the product of the x and y intercepts is 3 ? (a is any real number such that $a \neq 0$)

a. $6x + \frac{y}{a^2} = 1$ b. $3x + (a^2)y = 2$ c. $y = a^2 - 6(a^2)x$

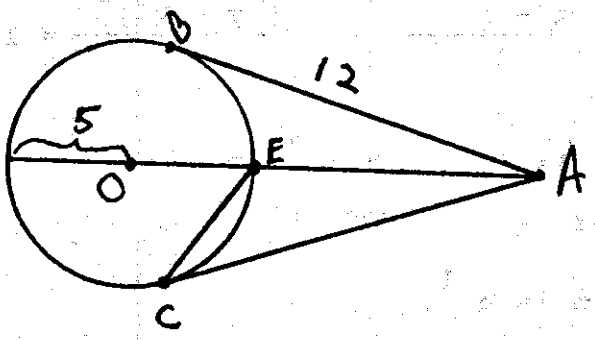
d. $y = \frac{3a - 3x}{a^2}$ e. NOTA

24. Find the length of a latus rectum of the hyperbola

$$\frac{(x-2)^2}{36} - \frac{(y+2)^2}{81} = 1$$

a. 8 b. 4 c. 13.5 d. 27 e. NOTA

25. In the circle below $\overline{AB}$ and $\overline{AC}$ are tangents to circle O and $\overline{ED}$ is a diameter of the circle. If $AB = 12$ and the length of the radius of circle O is 5, then find EC.



a. 5 b. $\frac{20\sqrt{13}}{13}$

c. $\frac{60}{13}$ d. $\frac{400}{13}$

e. NOTA

26. The sides of a triangle are of consecutive integral length. If the area of this triangle is two times the perimeter, then find the sum of the digits in the area of this triangle.

a. 6 b. 8 c. 10 d. 12 e. NOTA

27. Considering the graph of $y = 2^x$ as a base graph, how does the graph of $y = 2\ (\ 2^x\ )$ compare to this base graph.

a. Every point on the new graph is twice as far from the y-axis.
b. Every point on the new graph is half as far from the y-axis.
c. The graph is moved one unit to the right.
d. The graph is moved one unit to the left.
e. NOTA

28. Find the factor of $20^{48} - 17^{48}$ that is between 1020 and 1030.

a. 1029 b. 1027 c. 1025 d. 1023 e. NOTA

29. Find the tangent of the obtuse angle formed from the intersection of the lines $5x + 12y - 8 = 0$ and $8x + 15y - 10 = 0$.

a. $\frac{21}{200}$ b. $\frac{-21}{200}$ c. $\frac{13}{100}$ d. $\frac{-13}{100}$ e. NOTA

30. How many of the following statements are always true of the hyperbola whose equation is $\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$

I. One directrix of the hyperbola is $x = h + \frac{a}{e}$ (where e is the eccentricity of the hyperbola)

II. The length of a latus rectum is a^{-1}.

III. The square root of the length of the transverse axis squared plus the length of the conjugate axis squared is equal to the distance from a focus to the center.

a. 0 b. 1 c. 2 d. 3 e. NOTA