ULTIMATE MATHEMATICS COMPETITION

Past Questions

1. Find n, if $34_n = 100112$
   (a) 5
   (b) 6
   (c) 7
   (d) 8

2. Find the sum of 25_6, 52_6 and 43_6.
   (a) 411
   (b) 141
   (c) 114
   (d) 417

3. If $0.0000152 \times 0.00042 = A \times 10^B$, where $1<A<10$. Find A and B.
   (a) 9 and 6.38
   (b) 6.38 and -9
   (c) 6.38 and 9
   (d) -9 and 6.38

4. An operation * is defined on the set of real numbers by: a*b = ab + 2(a+b+1). Find the identity element
   (a) 2
   (b) 1
   (c) -1
   (d) -2

5. If the term of an arithmetic progression is 11 and the first term is 1, Find the common difference.
   (a) $^{12}/_{5}$
   (b) $^{5}/_{3}$
   (c) -2
   (d) 2

6. Given that log 2=0.69, log 3=1.10 and log 7= 1.90 all to fixed base, find log 10.3 to the same base, without using tables
   (a) 1.03
   (b) 2.31
   (c) 3.69
   (d) 10.5

7. In a basket, there are 6 grapes, 11 bananas, 13 Oranges. If One fruit is chosen at random, what is the probability that the fruit is either a grape or a banana?
   (a) $^{6}/_{30}$
   (b) $^{5}/_{30}$
   (c) $^{17}/_{30}$

(d) $^{11}/_{30}$

8. The third term of a G.P is 4, while the sixth term is 32. Find its common ratio
   (a) ½
   (b) 8
   (c) 4
   (d) 2

9. All in base two, Evaluate log 8 + log 16 – log 4
   (a) 3
   (b) 4
   (c) 5
   (d) 6

10. Find the sum of the first 21 terms of the progression -10, -8, -6, ...
    (a) 180
    (b) 190
    (c) 200
    (d) 210

11. Divide 2434_6 by 42_6
    (a) 23_6
    (b) 35_6
    (c) 52_6
    (d) 55_6

12. $(3.2)^2 – (1.8)^2$ equals
    (a) 7.0
    (b) 2.56
    (c) 13.48
    (d) 2.0

13. If X={all prime factors of 44}and Y={all prime factors of 60}. The elements of X∪Y and X∩Y respectively are:
    (a) {2,4,3,5,11} and {4}
    (b) {4,3,5,1} and {3,4}
    (c) {2,5,11} and {2}
    (d) {2,3,5,11} and {2}

14. Express 37.05 × 0.0042 in standard form
    (a) 15.561×10^2
    (b) 1.5561×10^{-4}
    (c) 1.5561×10^1
    (d) 1.5561×10^{-1}

15. Given that $\sqrt{2} = 1.414$, find without using tables, the values of $1/\sqrt{2}$
    (a) 0.141
    (b) 0.301
    (c) 0.667

(d) 0.707

16. What is the number whose logarithms to base 10 is 2.3482?
    (a) 223.6
    (b) 0.228
    (c) 2.235
    (d) 0.02229

17. Given $Ur = a + (r - 1)d$ in the sequence 2,5,8,11 .... Find the sum of the first tenth term.
    (a) 155
    (b) 551
    (c) 625
    (d) 550

18. If $x*y= x+y^2$, find the value of (2*3) *5
    (a) 25
    (b) 11
    (c) 55
    (d) 36

19. How many subsets will set containing 6 elements have?
    (a) 25
    (b) 32
    (c) 36
    (d) 64

20. What is the product of $^{27}/_{5}$, 3^3 and $(^{1}/_{5})^{-1}$
    (a) 5
    (b) 3
    (c) 1
    (d) $^{1}/_{25}$

21. Find the sum of the first twenty-five odd numbers
    (a) 526
    (b) 625
    (c) 562
    (d) 265

22. Write the decimal number 39 to base 2
    (a) 100111
    (b) 110111
    (c) 111001
    (d) 100101

23. Find x, y in the sequence x, 25/4 , 5, b. If the first three terms are in arithmetic sequence and the last three are in geometric sequence. Find x and b.
    (a) 4, $^{25}/_{4}$
    (b) 4, $^{15}/_{2}$

(c) $^{15}/_{2}, 4$
(d) $4, -^{15}/_{2}$

24. Simplify: $(\sqrt{0.7} + \sqrt{70})^{2}$
(a) 70.7
(b) 84.7
(c) 217.7
(d) 168.7

25. Find the sum of infinity of the following series: 0.5 + 0.05 + 0.005 + 0.0005 +...
(a) $^{5}/_{8}$
(b) $^{5}/_{7}$
(c) $^{5}/_{11}$
(d) $^{5}/_{9}$

26. In a basket, there are 6 grapes, 11 bananas, 13 Oranges. If One fruit is chosen at random, what is the probability that the fruit is either a grape or a banana?
(a) $^{6}/_{30}$
(b) $^{5}/_{30}$
(c) $^{17}/_{30}$
(d) $^{11}/_{30}$

27. Find the sum to which the series converges 1/6 + 1/12 + 1/24 + ⋯
(a) $^{1}/_{6}$
(b) 2
(c) 3
(d) 4

28. Two dice are thrown. What is the probability that the sum of the numbers is divisible by 3?
(a) $^{2}/_{3}$
(b) ½
(c) $^{1}/_{3}$
(d) ¼

29. An arithmetic progression has first term 11 and the fourth term 32. The sum of the first nine terms is
(a) 351
(b) 531
(c) 135
(d) 315

30. The first term if an arithmetic progression is 3 and the fifth term is 9. Find the number of terms in the terms in the progression if the sum is 81
(a) 12

(b) 27
(c) 9
(d) 4

31. What does the set {x: x∉A and x∈B}defines
(a) set containing elements in A and not in B
(b) set containing elements not in A and in B
(c) set containing elements both in A and B
(d) set containing elements both not in A and B

32. Express the product of 0.21 and 0.34 in standard form
(a) 7.14×10^{-2}
(b) 7.14×10^{-1}
(c) 7.14×10^{-4}
(d) 7.14×10^{-3}

33. Divide (1.28×10^{4}) by (6.4×10^{2})
(a) 2×10^{-5}
(b) 2×10^{-1}
(c) 2×10^{0}
(d) 2×10^{1}

34. Simplify: $(\sqrt{6} + 2)^{2} - (\sqrt{6} - 2)^{2}$
(a) $2\sqrt{6}$
(b) $4\sqrt{6}$
(c) $8\sqrt{6}$
(d) $16\sqrt{6}$

35. The first term of an arithmetic series is 3, the common difference is and the sum of all term is 82 . Find the number of terms and the last term.
(a) 79, 20
(b) 20, 79
(c) -20.5, 80
(d) 80, -20.5

36. Which of the following is not a factor of $12^{4}-5^{4}$?
(a) 7
(b) 13
(c) 17
(d) 49

37. Find y, if $\sqrt{12} - \sqrt{147} + y\sqrt{3} = 0$
(a) 3
(b) 7
(c) 1
(d) 5

38. Given that $\sqrt{2} = 1.414$, find without using tables, the values of $1/\sqrt{2}$
(a) 0.141

(b) 0.301
(c) 0.667
(d) 0.707

39. Four Members of a school first eleven cricket team are also members of the first fourteen rugby team. How many boys play for at least one of the two teams?
(a) 25
(b) 21
(c) 16
(d) 3

40. What is the ninth term of the geometric sequence if the third term and the seventh term are -1 and -81 ?
(a) 3
(b) $-{}^{1}/_{9}$
(c) -729
(d) -927

41. The symmetric difference of A and B expressed A△ B is equal to _____
(a) (A−B)∩(B−A)
(b) (A−B)∪(B−A)
(c) (A∩B)∪(B∩A)
(d) (AUB)∩(BUA)

42. Simplify: $\frac{2\sqrt{2}-\sqrt{3}}{\sqrt{2}+\sqrt{3}}$
(a) $3\sqrt{3}-7$
(b) $3\sqrt{3}+7$
(c) $3\sqrt{6}-1$
(d) $3\sqrt{6}+1$

43. All in base 6, Find the sum of 25, 52 and 43. Convert your answer to base 8
(a) 411
(b) 141
(c) 114
(d) 417

44. Find the first term of the exponential function whose common ratio of the second term and last term are ${}^{1}/_{3}$and ${}^{2}/_{27}$
(a) ${}^{2}/_{3}$
(b) ${}^{3}/_{2}$
(c) $-{}^{2}/_{3}$
(d) $-{}^{1}/_{3}$

45. The consecutive terms of a geometric progression are as n-2,n and n+3. Find the common ratio
(a) ${}^{3}/_{2}$

(b) $^{2}/_{3}$
(c) ½
(d) ¼

46. The binary operation ¶ defined on the set of real numbers such that x ¶ y =$\frac{xy}{6}$ for x and y are real numbers. Find the inverse of 20 under the operation when the identity element is 6
(a) $^{9}/_{5}$
(b) $^{1}/_{20}$
(c) $^{10}/_{3}$
(d) $^{1}/_{12}$

47. Solve the system of equations: $2^{x+y}=32$ and $3^{3y-x}=27$. The value of x and y are
(a) 3, 2
(b) -3,2
(c) 3, -2
(d) -3, -2

48. Evaluate: 2,700,000 × 0.03 ÷ 18,000
(a) 4.5×10^{0}
(b) 4.5×10^{1}
(c) 4.5×10^{2}
(d) 4.5×10^{3}

49. Find p in term of q if $\log_3 P + 3\log_3 q = 3$
(a) $(\frac{3}{q})^{3}$
(b) $(\frac{q}{3})^{1/3}$
(c) $(\frac{q}{3})^{3}$
(d) $(\frac{3}{q})^{1/3}$

50. In a class of 46 students,22play football and 26 play volleyball. if 3 students play both games. How many play neither?
(a) 1
(b) 2
(c) 3
(d) 4

51. The first term and the last term of a geometric series are 3and 768, if the sum of the terms is 1533. Find the common ratio.
(a) 3
(b) ½
(c) 2
(d) - ½

52. Given that log 2=0.3010, log 7=0.8451. Evaluate log 112
(a) 2.1461

(b) 2.0491
(c) 3.1461
(d) 2.5441

53. Rationalize the expression: $\frac{1}{\sqrt{2}+\sqrt{5}}$
(a) $\frac{\sqrt{5}-\sqrt{2}}{3}$
(b) $\frac{\sqrt{2}-\sqrt{5}}{3}$
(c) $\sqrt{2}-\sqrt{5}$
(d) $3(\sqrt{2}-\sqrt{5})$

54. A coin is thrown thrice, What is the probability that at least one head is obtained?
(a) ½
(b) $^1/_8$
(c) $^7/_8$
(d) ¼

55. The sixth term of an arithmetical progression is half of its twelfth term. The first term is equal to
(a) the common difference
(b) half of the common difference
(c) zero
(d) double the common difference

56. If log 2=x, express log 12.5 in terms of x
(a) 2(1-x)
(b) 2(1+x)
(c) 2-3x
(d) 2+3x

57. If $5^{(x+2y)}$ =5 and $4^{(x+3y)}$ = 16. Find $3^{(x+y)}$
(a) 0
(b) 1
(c) 3
(d) 27

58. In a class of 60 students, 30 offer physics and 40 offers chemistry. If a students is picked at random from the class, what is the probability that the student offer both physics and chemistry.
(a) $^1/_3$
(b) ¼
(c) ½
(d) $^1/_6$

59. Find the nth term of the sequence:3,6,10,15,21...
(a) $\frac{n(n-1)}{2}$
(b) $\frac{n(n+1)}{2}$

(c) $\frac{(n+1)(n+2)}{2}$
(d) n(2n+1)

60. If U= {0,2,3,6,7,8,9,10} is the universal set. E={0,4,6,8,10} and F={x:$x^2=2^6$, x is odd}, find (E n F).
(a) (E n F)
(b) {0}
(c) U
(d) {}

61. If the sixth term of an arithmetic progression is 11 and the first term is 1, find the common difference
(a) 2
(b) ½
(c) ¼
(d) 4

62. _____ is a set that contains another set
(a) Subset
(b) Power set
(c) Super set
(d) Proper Set

63. What is the common ratio of the G.P: (√10+√5) + (√10 +2√5)+...?
(a) √2
(b) √5
(c) 3
(d) 5

64. Given that the first and fourth terms of G.P are 6 and 162 respectively, find the sum of the first three terms of the progression
(a) 8
(b) 27
(c) 48
(d) 78

65. The binary operation* is defined by x*y=xy-y-x for all real values of x and y. if x*3=2*x, Find the value of x
(a) -1
(b) -2
(c) 1
(d) 5

66. Three bags contain 3 red, 7 black; 8 red, 2 black, and 4 red & 6 black balls respectively. 1 of the bags is selected at random and a ball is drawn from it. If the ball drawn is red, find the probability that it is from the third bag.
(a) $^2/_{15}$
(b) $^4/_{15}$
(c) $^1/_{10}$
(d) $^1/_{15}$

67. Two perfect dice are thrown together. Determine the probability of obtaining a total score of 8
    (a) $^{1}/_{12}$
    (b) $^{5}/_{36}$
    (c) $^{1}/_{6}$
    (d) $^{7}/_{36}$

68. How many terms are there in a sequence of arithmetic progression whose the sum of the first and last term are 4 and 26 is 180 respectively
    (a) 12
    (b) 10
    (c) 4
    (d) 30

69. In a science class of 41 students, each student offers atleast one of Mathematics and Physics. If 22 Students offer Physics and 28 Students offer Mathematics, how many Students offer Physics only?
    (a) 19
    (b) 9
    (c) 13
    (d) 14

70. C= {1,2,3,4, ...}. what is the name of the set C?
    (a) Finite Set
    (b) Infinite Set
    (c) Universal Set
    (d) Closed Set