UNIVERSITY OF CALICUT

SCHOOL OF DISTANCE EDUCATION

BSc(MATHEMATICS)-VI SEMESTER-QUESTION BANK

MAT6B12-NUMBER THEORY AND LINEAR ALGEBRA

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1. If V is a vector space over the set of real numbers then $(V,+)$ is
   (a) a group
   (b) an abelian group
   (c) need not be an abelian group
   (d) not a group
   Answer : (**b**)

2. A subset W of a vector space V is a subspace if
   (a) the sum of elements of W belongs to W
   (b) the sum and scalar multiples of elements of W belongs to W
   (c) the scalar multiples of elements of W belongs to W
   (d) the sumof elements of V belongs to W
   Answer : (**b**)

3. A subspace of a real vector space $\mathbb{R}$ is
   (a) $\{0\}$
   (b) $\{1\}$
   (c) $\{0, 1\}$
   (d) $\{1, 1\}$
   Answer : (**a**)

4. A subspace of a real vector space $\mathbb{R}^2$ is
   (a) $\{(1, x); x \in \mathbb{R}\}$
   (b) $\{(x, 1); x \in \mathbb{R}\}$
   (c) $\{(x, 0); x \in \mathbb{R}\}$
   (d) $\{(1, 1 + x); x \in \mathbb{R}\}$
   Answer : (**c**)

5. A line in $\mathbb{R}^3$ is a subspace of $\mathbb{R}^3$ if
   (a) it passes through the origin
   (b) it does not passes through the origin
   (c) it passes through (1,0)
   (d) it passes through (-1,0)
   Answer : (**a**)

6. The intersection of any set of subspaces of a vector space V is
   (a) not a subspace of V
   (b) a subspace of V
   (c) need not be a subspace of V
   (d) a proper subspace of V
   Answer : (**b**)

7. The union of any two subspaces of a vector space V is
   (a) a subspace of V
   (b) not a subspace of V
   (c) need not be a subspace of V
   (d) a proper subspace of V
   Answer : (**c**)

8. The span of subset $\{(1, 0), (0, 1)\}$ of the real vector space $\mathbb{R}^2$ is
   (a) $\mathbb{R}^2$
   (b) $\mathbb{R}^3$

(c) $\mathbb{R}^4$
(d) $\mathbb{R}$
Answer : (**a**)

9. If $e_i = (0, 0, ..., 1, 0, ...0)$, where 1 is in the i^{th} position.Then the span of subset $\{e_1, e_2, ...e_n\}$ of the real vector space $\mathbb{R}^n$ is
(a) $\mathbb{R}^2$
(b) $\mathbb{R}^3$
(c) $\mathbb{R}^n$
(d) $\mathbb{R}$
Answer : (**c**)

10. The subspace of the real vector space $\mathbb{R}^3$ spanned by $\{(1, 0, 0), (0, 0, 1)\}$ is
(a) $\{(x, 0, z); x, z \in \mathbb{R}\}$
(b) $\{(x, y, z); x, y, z \in \mathbb{R}\}$
(c) $\{(0, 0, z); z \in \mathbb{R}\}$
(d) $\{(x, 0, 0); x \in \mathbb{R}\}$
Answer : (**a**)

11. The subset $\{(1, 0), (0, 1)\}$ of the real vector space $\mathbb{R}^2$ is
(a) linearly independent
(b) linearly dependent
(c) neither linearly independent nor dependent
(d) not a basis
Answer : (**a**)

12. A linearly independent subset of a vector space V does not contain
(a) 3
(b) 1
(c) 2
(d) 0_V
Answer : (**d**)

13. The vectors $\{(1, 1), (2, 2)\}$ of real vector space $\mathbb{R}^2$ is
(a) linearly independent
(b) linearly dependent
(c) neither linearly independent nor dependent
(d) a basis
Answer : (**b**)

14. The set $Mat_{m\times n}\mathbb{R}$ of all $m \times n$ matrices with real entries under the usual operations of addition of matrices and multiplication by scalars is
(a) a real vector space
(b) a complex vector space
(c) not a real vector space
(d) not a complex vector space
Answer : (**a**)

15. The subset $\{\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}, \begin{pmatrix} 0 & 2 \\ 0 & 2 \end{pmatrix}\}$ of $Mat_{2\times 2}\mathbb{R}$ is
(a) linearly independent
(b) linearly dependent

(c) neither linearly independent nor dependent
(d) not a basis
Answer : (**a**)

16. A basis of a vector space V is a subset of V which is
(a) linearly independent and spans V
(b) linearly dependent and spans V
(c) linearly independent only
(d) linearly dependent
Answer : (**a**)

17. A basis of a vector space $\mathbb{R}_3[X]$ of all polynomials of degree atmost three is
(a) $1, X, X^2, X^3, X^4$
(b)$1, X, X^2$
(c)1,X
(d) $1, X, X^2, X^3$
Answer : (**d**)

18. A basis of real vector space $\mathbb{R}^3$ is
(a) $\{(1,1,1),(2,2,2),(1,0,0)\}$
(b) $\{(1,1,1),(1,1,0),(1,0,0)\}$
(c) $\{(1,1,1),(1,1,1),(1,1,0)\}$
(d) $\{(1,1,1),(2,2,2),(3,3,3)\}$
Answer : (**b**)

19. If B_1 and B_2 are any two finite bases of a vector space V then
(a) number of elements in $B_1 >$ number of elements in B_2
(b) number of elements in $B_1 <$ number of elements inB_2
(c) number of elements in B_1 =number of elements in B_2
(d) number of elements in $B_1 \neq$ number of elements in B_2
Answer : (**c**)

20. The dimension of real vector space $\mathbb{R}^n$ is
(a) 2
(b) 4
(c) $n + 1$
(d) n
Answer : (**d**)

21. The dimension of the vector space $Mat_{m \times n}\mathbb{R}$ is
(a) $m + n$
(b) mn
(c) m
(d) n
Answer : (**b**)

22. The dimension of the vector space $\mathbb{C}$ over $\mathbb{C}$ is
(a) 2
(b) 4
(c) 1
(d) 3
Answer : (**c**)

23. The dimension of the vector space $\mathbb{C}$ over $\mathbb{R}$ is
(a) 2
(b) 4
(c) 1
(d) 3
Answer : (**a**)

24. If a vector space V is of dimension n then every linearly independent set containing n elements is
(a) a basis of V
(b) not a basis of V
(c) need not be a basis of V
(d) linearly dependent
Answer : (**a**)

25. If a vector space V is of dimension n then every subset containing more than n elements is
(a) linearly independent
(b) linearly dependent
(c) neither linearly independent nor dependent
(d) a basis
Answer : (**b**)

26. If W is a subspace of a finite dimensional vector space V then
(a) dim $V =$ dim W
(b) dim $V \leq$ dim W
(c) dim $V \geq$ dim W
(d) dim $V \neq$ dim W
Answer : (**c**)

27. The map $f : \mathbb{R}^2 \longrightarrow \mathbb{R}^3$ given by $f(a, b) = (a + b, a - b, b)$ is
(a) linear
(b) not linear
(c) not injective
(d) not surjective
Answer : (**a**)

28. The subset $\{(1, 1), (1, -1)\}$ of real vector space $\mathbb{R}^2$ is
(a) linearly independent only
(b) linearly dependent
(c) neither linearly independent nor dependent
(d) a basis
Answer : (**d**)

29. A subset of a linearly independent set is
(a) linearly independent
(b) linearly dependent
(c) neither linearly independent nor dependent
(d) need not be linearly independent
Answer : (**a**)

30. Let S_1 and S_2 be non empty subsets of a vector space such that $S_1 \subset S_2$. If S_1 is linearly dependent then S_2 is

(a) linearly independent
(b) linearly dependent
(c) neither linearly independent nor dependent
(d) need not be linearly dependent
Answer : (**b**)

31. The differentiation map, $D : \mathbb{R}_n[X] \longrightarrow \mathbb{R}_n[X]$ given by $D(a_0+a_1X+----+a_nX^n) = a_1 + 2a_2X + ---- +na_nX^{n-1}$ is
(a) linear
(b) not linear
(c) injective
(d) surjective
Answer : (**a**)

32. A map $f : \mathbb{R} \longrightarrow \mathbb{R}$ which is linear is
(a) $f(x) = x^2$
(b) $f(x) = 3x$
(c) $f(x) = x^3$
(d) $f(x) = \sqrt{x}$
Answer : (**b**)

33. If the map $f : V \longrightarrow W$ is linear then $f(0_V) = ------$
(a)0_V
(b) 0
(c) 0_W
(d) 1
Answer : (**c**)

34. If the map $f : V \longrightarrow W$ is linear then for all $x \in V$, $f(-x) = ------$
(a) $-f(x)$
(b) $f(x)$
(c) $(f(x))^2$
(d) 1
Answer : (**a**)

35. If the map $f : V \longrightarrow W$ is linear. If X is a subspace of V then $f^{\rightarrow}(X)$ is a
(a) a subspace of V
(b) not a subspace of W
(c) a subspace of W
(d) a subset of V
Answer : (**c**)

36. If the map $f : V \longrightarrow W$ is linear. If Y is a subspace of W then $f^{\leftarrow}(Y)$ is a
(a) a subspace of V
(b) not a subspace of V
(c) a subspace of W
(d) a subset of W
Answer : (**a**)

37. If the map $f : V \longrightarrow W$ is linear. Then the image or range of f is
(a) $f^{\rightarrow}(W)$
(b) $f^{\rightarrow}(V)$

(c) $f^{\leftarrow}(V)$
(d) $f^{\leftarrow}(W)$
Answer : (**b**)

38. If the map $f : V \longrightarrow W$ is linear. Then the kernel or null space of f is
(a) $f^{\rightarrow}(W)$
(b) $f^{\rightarrow}(\{0_V\})$
(c) $f^{\leftarrow}(\{0_W\})$
(d) $f^{\leftarrow}(W)$
Answer : (**c**)

39. The Im D of differentiation map, $D : \mathbb{R}_n[X] \longrightarrow \mathbb{R}_n[X]$ is
(a) $\mathbb{R}_n[X]$
(b) $\mathbb{R}_{n-2}[X]$
(c) $\mathbb{R}_{n-1}[X]$
(d) $\mathbb{R}_{n+1}[X]$
Answer : (**c**)

40. The Ker D of differentiation map, $D : \mathbb{R}_n[X] \longrightarrow \mathbb{R}_n[X]$ is
(a) $\mathbb{R}_n[X]$
(b) $\mathbb{R}^2$
(c) $\mathbb{R}_{n-1}[X]$
(d) $\mathbb{R}$
Answer : (**d**)

41. The i^{th} projection $pr_i : \mathbb{R}^n \longrightarrow \mathbb{R}$ defined by $pr_i(x_1, ..., x_n) = x_i$ is
(a) linear only
(b) not linear
(c) linear and surjective
(d) linear and injective
Answer : (**c**)

42. The image of i^{th} projection $pr_i : \mathbb{R}^n \longrightarrow \mathbb{R}$ defined by $pr_i(x_1, ..., x_n) = x_i$ is
(a) $\mathbb{R}$
(b) $\mathbb{R}^2$
(c) $\mathbb{R}^3$
(d) $\mathbb{R}^n$
Answer : (**a**)

43. The kernel of i^{th} projection $pr_i : \mathbb{R}^n \longrightarrow \mathbb{R}$ defined by $pr_i(x_1, ..., x_n) = x_i$ is
(a) $\mathbb{R}^n$
(b) $\mathbb{R}$
(c) $\mathbb{R}^3$
(d) the set of all n-tuples whose i-th component is zero
Answer : (**d**)

44. The map $f : \mathbb{R}^2 \longrightarrow \mathbb{R}^3$ given by $f(a, b) = (b, 0, a)$ is
(a) linear only
(b) not linear
(c) linear and surjective
(d) linear and injective
Answer : (**d**)

45. If the map $f : V \longrightarrow W$ is linear and injective then Ker$f$ is
(a) $\{0\}$
(b) V
(c) W
(d) $V + W$
Answer : (**a**)

46. Let V and W be vector spaces of finite dimension over a field F. If $f : V \longrightarrow W$ is linear then dim Im f+dim ker f is
(a) $dimW$
(b) $dimV$
(c) $dim(V + W)$
(d) $dim(V \cap W)$
Answer : (**b**)

47. The rank of 1^{st} projection $pr_1 : \mathbb{R}^3 \longrightarrow \mathbb{R}$ defined by $pr_1(x, y, z) = x$ is
(a) 1
(b) 2
(c) 3
(d) 4
Answer : (**a**)

48. If $f : V \longrightarrow W$, where V and W are vector spaces over a field F. Then f is a linear isomorphism if f is
(a) linear only
(b) linear and injective
(c) linear and surjective
(d) linear and bijective
Answer : (**d**)

49. Let V be a vector space of dimension $n \geq 1$ over a field F. Then V is isomorphic to the vector space
(a) $\mathbb{R}^{n-1}$
(b) $\mathbb{R}^n$
(c) $\mathbb{R}^5$
(d) $\mathbb{R}^4$
Answer : (**b**)

50. A linear mapping is completely and uniquely determined by its action on
(a) domain
(b) range
(c) a basis
(d) kernel
Answer : (**c**)

51. The quotient and reminder when 10 is divided by 3 is
(a) 3 and 1
(b) 2 and 1
(c) 3 and 2
(d) 4 and 1
Answer : (**a**)

52. If a, b, c are any integers and $a|b$ and $b|c$ then
(a) $c|a$
(b) $c|b$
(c) $b|a$
(d) $a|c$
Answer : (**d**)

53. Suppose a and b are integers with $a \neq 0$, then $a|b$ if
(a) $a = bc$, c is some integer
(b) $b = ac$, c is some integer
(c) $c = ab$, c is some integer
(d) $ab = 1$
Answer : (**b**)

54. If a and b are two non zero integers and $gcd(a, b) = d$, then d is the greatest positve integer with
(a) $d|a$ and $d|b$
(b) $d|a$ only
(c) $d|b$ only
(d) $a|d$ and $b|d$
Answer : (**a**)

55. $gcd(-5, 5) = ----$
(a) 3
(b) 1
(c) 5
(d) -5
Answer : (**c**)

56. a is an integer, $a|1$ if
(a) $a = \pm 1$
(b) $a = \pm 2$
(c) $a = 2$
(d) $a = \pm 3$
Answer : (**a**)

57. $gcd(-8, 36) = ----$
(a) 36
(b) -8
(c) 8
(d) 4
Answer : (**d**)

58. Let a and b be integers, not both zero. Then a and b are relatively primeif and only if there exists integers x and y such that
(a) $1 = ax + by$
(b) $2 = ax + by$
(c) $ab = ax + by$
(d) $a - b = ax + by$
Answer : (**a**)

59. $gcd(39, 42, 54) = ---$
(a) 8

(b) 39
(c) 3
(d) 6
Answer : (**c**)

60. Let a and b be integers.If $a|b$ and $b \neq 0$, then
(a) $|a| \leq |b|$
(b) $|b| < |a|$
(c) $|a| \neq |b|$
(d) $|a| \leq -|b|$
Answer : (**a**)

61. The Euclidean algorithm is used for finding the
(a) lcm of two integers
(b) gcd of two integers
(c) prime numbers
(d) composite numbers
Answer : (**b**)

62. If a, b, c are integers with $a|b$ and $b|a$, then
(a) $ab = \pm 1$
(b) $a = \pm b$
(c) $ab = 1$
(d) $a\ /x + b\ /y = 1$, x and y are integers
Answer : (**b**)

63. A linear combination of integers a and b is
(a) ab
(b) $a\ /x + b\ /y$, x and y are integers
(c) $ab = 1$
(d) $ax + by$, x and y are integers
Answer : (**d**)

64. The product of any three consecutive integers is divisible by
(a) 36
(b) 9
(c) 6
(d) 8
Answer : (**c**)

65. If $gcd(a, b) = 1$ then $gcd(a + b, a - b) = - - --$
(a) 3 or 4
(b) 1 or 2
(c) 5 or 6
(d) 7 or 8
Answer : (**b**)

66. If p is a prime, then $p^{\#}$ is the
(a) sum of all primes that are less than or equal to p
(b) product of all primes that are less than or equal to p
(c) sum of squares of all primes that are less than or equal to p
(d) product of all primes that are greater than or equal to p
Answer : (**b**)

67. $31^{\#} + 1$ is
(a) prime
(b) composite
(c) even integer
(d) irrational
Answer : (**a**)

68. If a and b are non zero integers with $a|b$, then $gcd(a, b) = - - -$
(a) $|a|$
(b) b
(c) ab
(d) a
Answer : (**d**)

69. The number of primes is
(a) finite
(b) infinite
(c) uncountable
(d) 1729
Answer : (**b**)

70. Two integers a and b, not both of which are zero, are said to be relatively prime if
(a) $gcd(a, b) = a$
(b) $a|b$
(c) $gcd(a, b) = 1$
(d) $b|a$
Answer : (**c**)

71. If $gcd(a, b) = d$, then $gcd(a\ /d, b\ /d) = - - -$
(a) 1
(b) b
(c) a
(d) d
Answer : (**a**)

72. If a, b, c are any integers with $a|bc$ and $gcd(a, b) = 1$, then
(a) $b|a$
(b) $a|c$
(c) $c|a$
(d) $c|b$
Answer : (**b**)

73. If a is an odd integer then $gcd(3a, 3a + 2) = - - -$
(a) 3
(b) 5
(c) 1
(d) 2
Answer : (**c**)

74. The $gcd(12378, 3054) = - - -$
(a) 6
(b) 1

(c) 3
(d) 2
Answer : (**a**)

75. If $k > 0$, then $gcd(ka, kb) = ---$
(a) $a\ gcd(k, b)$
(b) $b\ gcd(a, k)$
(c) kab
(d) $k\,\mathrm{gcd}(a, b)$
Answer : (**d**)

76. For any integer $k \neq 0$, then $gcd(ka, kb) = ---$
(a) $|k|\ gcd(a, b)$
(b) $b\ gcd(a, k)$
(c) $k\,\mathrm{gcd}(a, b)$
(d) $a\ gcd(k, b)$
Answer : (**a**)

77. The $lcm(a, b)$ is the least positive integer m with
(a) $a|m$ and $b|m$
(b) $a|m$ only
(c) $b|m$ only
(d) $m|a$ and $m|b$
Answer : (**a**)

78. For positive integers a and b, $gcd(a, b)lcm(a, b) = ---$
(a) $a + b$
(b) ab
(c) $a - b$
(d) $a\ /b$
Answer : (**b**)

79. The $lcm(3054, 12378) = ---$
(a) 6300402
(b) 6678
(c) 6300400
(d) 300402
Answer : (**a**)

80. If a and b are non zero integers and $k > 0$, then $lcm(ka, kb) = ---$
(a) $a\ lcm(k, b)$
(b) $b\ lcm(a, k)$
(c) $k\ lcm(a, b)$
(d) kab
Answer : (**c**)

81. The linear Diophantine equation $ax + by = c$ has a solution if and only if ———–
(a) $gcd(a, c)|b$
(b) $gcd(a, b)|c$
(c) $gcd(c, b)|a$
(d) $c|gcd(a, b)$
Answer : (**b**)

82. Which of the following Diophantine equation cannot be solved ?
(a) $6x + 51y = 22$
(b) $33x + 14y = 115$
(c) $14x + 35y = 93$
(d) $11x + 13y = 21$
Answer : (**c**)

83. An integer $p > 1$ is called a prime, if its only positive divisors are
(a) 1 and p
(b) 1 and 2
(c) 2 and p
(d) 3 and p
Answer : (**a**)

84. Every positive integer $n > 1$ can be expressed as a product of
(a) composite numbers
(b) prime numbers
(c) even numbers
(d) odd numbers
Answer : (**b**)

85. If n is an odd pseudoprime, then $2^n - 1$ is
(a) pseudoprime
(b) prime
(c) irrational
(d) not pseudoprime
Answer : (**a**)

86. If p is a prime and $p|ab$, then
(a) $p|a$ only
(b) $p|b$ only
(c) $p|a$ or $p|b$
(d) $p|a$ and $p|b$
Answer : (**c**)

87. The *Sieve of Eratosthenes* is used for finding,
(a) all primes below a given integer
(b) all even numbers below a given integer
(c) all odd numbers below a given integer
(d) all composite numbers below a given integer
Answer : (**a**)

88. If p is any prime then $\sqrt{p}$ is
(a) prime
(b) an integer
(c) irrational
(d) rational
Answer : (**c**)

89. If m and n are positive integers and $n|m$, then
(a) $R_n|R_m$
(b) $R_m|R_n$

(c) $R_n|m$
(d) $R_n|n$
Answer : (**a**)

90. If a and b are integers. Then $a \equiv b$ $(mod\ n)$ is equivalent to
(a) a is a multiple of n
(b) b is a multiple of n
(c) $a - b$ is a multiple of n
(d) $a + b$ is a multiple of n
Answer : (**c**)

91. $-- \equiv 24$ $(mod\ 7)$
(a) 1
(b) 2
(c) 4
(d) 3
Answer : (**d**)

92. If a is an odd integer, then $a^2 \equiv ---$ $(mod\ 8)$
(a) 1
(b) 2
(c) 3
(d) 4
Answer : (**a**)

93. Let $n > 1$ be fixed and a,b,c are integers. If $a \equiv b$ $(mod\ n)$ and $b \equiv c$ $(mod\ n)$, then
(a) $ac \equiv 1$ $(mod\ n)$
(b) $1 \equiv bc$ $(mod\ n)$
(c) $a \equiv c$ $(mod\ n)$
(d) $ab \equiv -1$ $(mod\ n)$
Answer : (**c**)

94. $(1001111)_2 = ----$
(a) 79
(b) 89
(c) 69
(d) 99
Answer : (**a**)

95. If a is a solution of $P(x) \equiv 0$ $(mod\ n)$ and $a \equiv b$ $(mod\ n)$, then
(a) ab is also a solution
(b) $a + b$ is also a solution
(c) $a - b$ is also a solution
(d) b is also a solution
Answer : (**d**)

96. Give an example for $a^2 \equiv b^2$ $(mod\ n)$ need not imply $a \equiv b$ $(mod\ n)$
(a) $a = 2,\ b = 3,\ n = 5$
(b) $a = 4,\ b = 9,\ n = 5$
(c) $a = 8,\ b = 13,\ n = 5$
(d) $a = 16,\ b = 11,\ n = 5$
Answer : (**a**)

97. If a is an odd integer then $a^2 - 1$ is
(a) a multiple of 7
(b) a multiple of 8
(c) a multiple of 11
(d) a multiple of 9
Answer : (**b**)

98. The International Standard Book Number(ISBN) consists of nine digits $a_1a_2, ...a_9$ followed by a tenth check digit a_{10}, which satisfies
(a) $a_{10} \equiv \sum_{k=1}^{9} ka_k (mod\ 9)$
(b) $a_{10} \equiv \sum_{k=1}^{9} ka_k (mod\ 11)$
(c) $a_{10} \equiv \sum_{k=1}^{9} ka_k (mod\ 10)$
(d) $a_{10} \equiv \sum_{k=1}^{9} ka_k (mod\ 7)$
Answer : (**b**)

99. The system of linear congruences $ax + by \equiv r\ (mod\ n)$, $cx + dy \equiv s\ (mod\ n)$ has a unique solution modulo n whenever
(a) $gcd(a - c, n) = 1$
(b) $gcd(a - d, n) = 1$
(c) $gcd(ad - bc, n) = 2$
(d) $gcd(ad - bc, n) = 1$
Answer : (**d**)

100. Any *palindrome* with even number of digits is divisible by
(a) 5
(b) 2
(c) 11
(d) 12
Answer : (**c**)

101. The solution of $25x \equiv 15\ (mod\ 29)$ is
(a) $x \equiv 18\ (mod\ 29)$
(b) $x \equiv 29\ (mod\ 29)$
(c) $x \equiv 18\ (mod\ 19)$
(d) $x \equiv 17\ (mod\ 19)$
Answer : (**a**)

102. The number of primes of the form $n^2 - 2$ is
(a) finite
(b) infinite
(c) 1729
(d) 1
Answer : (**b**)

103. Let p be a prime and suppose that $p \nmid a$ then $a^{p-1} - 1$ is
(a) a multiple of p^2
(b) a multiple of p
(c) a multiple of $2p$

(d) a multiple of $p - 1$
Answer : (**b**)

104. If p is a prime and a is any integer then $a^p - a$ is
(a) a multiple of p^2
(b) a multiple of $p - 1$
(c) a multiple of $2p$
(d) a multiple of p
Answer : (**d**)

105. If p and q are distinct prime with $a^p \equiv a\ (mod\ q)$ and $a^q \equiv a\ (mod\ p)$, then
(a) $a^{p+q} \equiv a\ (mod\ pq)$
(b) $a^{pq} \equiv a\ (mod\ pq)$
(c) $a^{p-q} \equiv a\ (mod\ pq)$
(d) $a^{p\ /q} \equiv a\ (mod\ pq)$
Answer : (**b**)

106. An integer n is called a pseudoprime if
(a) $n \mid 2^n - 2$
(b) n is composite and $n \mid 2^n - 2$
(c) n is prime and $n \mid 2^n - 2$
(d) n is composite and $n \mid 2^n - 1$
Answer : (**b**)

107. A composite number n for which $a^n \equiv a\ (mod\ n)$ is called
(a) a pseudoprime
(b) a prime
(c) a pseudoprime to the base a
(d) an absolute pseudoprime
Answer : (**c**)

108. The composite numbers n that are pseudoprime to every base a are called
(a) a pseudoprime
(b) a prime
(c) a pseudoprime to the base a
(d) absolute pseudoprimes
Answer : (**d**)

109. If p is a prime, then $(p - 1)! + 1$ is
(a) a multiple of p
(b) a multiple of $p - 1$
(c) a multiple of $p + 1$
(d) a multiple of p^2
Answer : (**a**)

110. The reminder when 12! is divided by 13 is
(a) 12
(b) 13
(c) 2
(d) 3
Answer : (**a**)

111. $\tau(12) = ---$
(a) 5
(b) 6
(c) 7
(d) 8
Answer : (**b**)

112. $\sigma(12) = ---$
(a) 28
(b) 26
(c) 23
(d) 32
Answer : (**a**)

113. If $n = p_1^{k_1} p_2^{k_2} ...... p_r^{k_r}$ is the prime factorization of $n > 1$, then $\tau(n) = ---$
(a) $k_1 + k_2 + ... + k_r$
(b) $(k_1 + 1)(k_2 + 1)......(k_r + 1)$
(c) $k_1 k_2 ...... k_r$
(d) $k_1 - k_2 - ...... - k_r$
Answer : (**b**)

114. A number theoretic function f is said to be *multiplicative* if whenever $gcd(m, n) = 1$, then
(a) $f(mn) = f(m) + f(n)$
(b) $f(mn) = f(m)f(n)$
(c) $f(mn) = f(m) - f(n)$
(d) $f(mn) = f(m) \ / f(n)$
Answer : (**b**)

115. The domain of number theoretic function is the
(a) set of prime numbers
(b) set of negative integers
(c) set of rational numbers
(d) set of positive integers
Answer : (**d**)

116. If m and n are relatively prime integers then $\tau(mn) = ---$
(a) $\tau(m) + \tau(n)$
(b) $\tau(m) - \tau(n)$
(c) $\tau(m)\tau(n)$
(d) $\tau(m) \ /\tau(n)$
Answer : (**c**)

117. If m and n are relatively prime integers then $\sigma(mn) = ---$
(a) $\sigma(m) + \sigma(n)$
(b) $\sigma(m) - \sigma(n)$
(c) $\sigma(m) \ /\sigma(n)$
(d) $\sigma(m)\sigma(n)$
Answer : (**d**)

118. The largest integer less than or equal to π, $[\pi] = ---$
(a) 3

(b) 4
(c) π
(d) $\pi - 1$
Answer : (**a**)

119. If n and r are positive integers with$1 \leq r < n$, then the binomial coefficient $\binom{n}{r} = \frac{n!}{r!(n-r)!}$ is
(a) an integer
(b) a prime
(c) irrational
(d) an even integer
Answer : (**a**)

120. If n is a prime, then $\phi(n) = ---$
(a) n
(b) $n - 1$
(c) $n + 1$
(d) $n - 2$
Answer : (**b**)

121. If m and n are relatively prime integers then $\phi(mn) = ---$
(a) $\phi(m) + \phi(n)$
(b) $\phi(m)\ /\phi(n)$
(c) $\phi(m) - \phi(n)$
(d) $\phi(m)\phi(n)$
Answer : (**d**)

122. For $n > 2$, $\phi(n)$ is
(a) an odd integer
(b) an even integer
(c) irrational
(d) prime
Answer : (**b**)

123. $\phi(360) = ---$
(a) 96 (b) 98 (c) 86 (d) 90
Answer : (**a**)

124. If $n \geq 1$ and $gcd(a, n) = 1$, then $a^{\phi(n)} - 1$ is
(a) a multiple of n^2
(b) a multiple of n
(c) a multiple of $n - 1$
(d) a multiple of $n + 2$
Answer : (**b**)

125. For any integer a, $a^{37} \equiv --- \ (mod\ 1729)$
(a) a
(b) $2a$
(c) a^2
(d) $a - 1$
Answer : (**a**)

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