PREVIOUS YEAR PAPER

UP TGT 2016 — Mathematics (Series A)

UP TGT · 8 or 9 March 2019

125 questions · +3.4 for a correct answer, −0 for a wrong one · 120 minutes

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Questions from the U.P. Secondary Education Services Selection Board's paper of 8 or 9 March 2019. Each question is followed by its answer, and the answer key is repeated on the last page.

Take it as a timed practice test: exambharo.com/up-tgt/previous-year-papers/up-tgt-2016-mathematics-series-a/

Mathematics

1. If $f(x) = \cos^2 x/(1 + \sin^2 x)$, then the value of $f(\pi/4) - 3\, f'(\pi/4)$ is

(a) 0

(b) 1

(c) 3

(d) 4

Answer: (c)

2. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors, such that $[\vec{b} \times \vec{c}, \vec{c} \times \vec{a}, \vec{a} \times \vec{b}] = 2[\vec{a}, \vec{b}, \vec{c}]$, then the value of $[\vec{a}, \vec{b}, \vec{c}]$ is equal to

(a) 0

(b) 1

(c) 2

(d) 4

Answer: (c)

3. Mohan is father of 3 children with atleast one boy. The probability that he has 2 boys and 1 girl is

(a) 1/2

(b) 1/3

(c) 1/4

(d) 2/3

Answer: (b)

4. If sum of n terms of an arithmetical progression is $5n^2 - 3n$, then its p^{th} term is

(a) 10p + 8

(b) 10p − 8

(c) 10p + 3

(d) 10p − 3

Answer: (b)

5. If each force $\vec{F1} + \vec{F2}$ and $\vec{F1} - \vec{F2}$ has magnitude $\sqrt{(F1^2 + F2^2)}$, then the angle between $\vec{F1}$ and $\vec{F2}$ is

(a) 90°

(b) 60°

(c) 45°

(d) 0°

Answer: (a)

6. Which of the following series converges ?
I. $\Sigma_{(n=1)}^{\infty} (3 + \cos n)/en$
II. $\Sigma_{(n=1)}^{\infty} \cos(1/n)$

(a) I only

(b) II only

(c) I and II both

(d) neither I nor II

Answer: (a)

7. If three forces, acting at a point, be in equilibrium, then each force is proportional to the sine of the angle between the other two. This theorem is called

(a) Law of triangle of forces

(b) Law of parallelogram of forces

(c) Lami's theorem

(d) Trigonometrical theorem

Answer: (c)

8. A sum of money doubles itself in 4 years at compound interest. It will amount to 8 times to itself at the same rate of interest in time

(a) 12 years

(b) 16 years

(c) 18 years

(d) 24 years

Answer: (a)

9. Which one of the following is true ?

(a) mean = 3 median − 2 mode

(b) median = 3 mode − 2 mean

(c) mode = 2 median − 3 mean

(d) mode = 3 median − 2 mean

Answer: (d)

10. If the geometric mean of two numbers is 6.0 and arithmetic mean is 6.5, then the difference of squares of these numbers is

(a) 65
(b) 120
(c) 130
(d) 140

Answer: (a)

11. The smallest number among the numbers 2^{25}, 3^{15}, 5^{100} and 4^{200} is

(a) 4^{200}
(b) 5^{100}
(c) 3^{15}
(d) 2^{25}

Answer: (b)

12. If a : b = 2/9 : 1/3, b : c = 2/7 : 5/14 and d : c = 7/10 : 3/5, then a : b : c : d = ?

(a) 2 : 3 : 5 : 7
(b) 3 : 15 : 7 : 40
(c) 16 : 24 : 30 : 35
(d) 18 : 24 : 30 : 49

Answer: (c)

13. If $9P5 + 5.9P4 = {}^{10}P_r$, then the value of r is

(a) 2
(b) 3
(c) 5
(d) 7

Answer: (c)

14. The value of the determinant $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix}$ is

(a) 0
(b) $-(a^2 + b^2 + c^2)$
(c) $4a^2b^2c^2$
(d) $2(ab + bc + ca)$

Answer: (c)

15. Sum of the series 1/2! + 1/4! + 1/6! + ... is

(a) $(e + 1)^2/(2e)$
(b) $(e - 1)^2/(2e)$
(c) $(e^2 - 1)/(2e)$
(d) $(e^2 + 1)/(2e)$

Answer: (b)

16. If the mapping f and g are given by
f = {(1, 2), (3, 5), (4, 1)}
g = {(2, 3), (5, 1), (1, 3)}
then gof is

(a) {(2, 5), (5, 2), (1, 5)}

(b) {(1, 2), (3, 5), (4, 1)}

(c) {(1, 3), (3, 1), (4, 3)}

(d) {(2, 3), (5, 1), (1, 3)}

Answer: (c)

17. In how many ways the letter of the word BALLOON be arranged so that two L do not come together ?

(a) 1260

(b) 360

(c) 900

(d) 1060

Answer: (c)

18. The sequence $\{\sin(n\pi/2)/n\}_{(n=1)}^{\infty}$ converges to

(a) 0

(b) 1

(c) π

(d) − 1

Answer: (a)

19. The value of $(\sin 75° - \sin 15°)/(\cos 75° + \cos 15°)$ is

(a) √3

(b) √3/2

(c) 1/√3

(d) 1/√2

Answer: (c)

20. The value of $\sin(\cot^{-1}(\tan(\cos^{-1} x)))$

(a) 0

(b) $\sqrt{(1 - x^2)}$

(c) π

(d) x

Answer: (d)

21. If A + iB = tan(x + iy), then the value of tan 2x is as

(a) $2A/(1 + A^2 + B^2)$

(b) $2A/(1 - A^2 + B^2)$

(c) $2A/(1 - A^2 - B^2)$

(d) None of these

Answer: (c)

22. If $\cos(A + B) = 3/5$ and $\sin(A - B) = 5/13$, where $0 \leq A, B \leq \pi/4$, then $\tan 2B$ is equal to

(a) 11/34

(b) 21/56

(c) 33/56

(d) 1

Answer: (c)

23. AB is a chord of a circle and AOC is its diameter such that $\angle ACB = 50°$, if AT is tangent to the circle at the point A, then $\angle BAT$ is equal to

(a) 50°

(b) 60°

(c) 65°

(d) None of these

Answer: (a)

24. The curve represented by the equations
$x = 3 (\cos t + \sin t)$
$y = 4(\cos t - \sin t)$
is

(a) A straight line

(b) A circle

(c) A hyperbola

(d) An ellipse

Answer: (d)

25. The equation of sphere is $x^2 + y^2 + z^2 - x$. $= 0$, its radius is

(a) $\sqrt{5}/2$

(b) $\sqrt{(5/2)}$

(c) $5/\sqrt{2}$

(d) 5

Answer: (b)

26. If the straight line $x \cos\alpha + y \sin\alpha = p$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$, then

(a) $p^2 = a^2b^2/4$

(b) $p^2 = a^2 \cos^2\alpha - b^2 \sin^2\alpha$

(c) $p^2 = a^2 \cos^2\alpha + b^2 \sin^2\alpha$

(d) None of these

Answer: (c)

27. Lines $x = ay + b$, $z = cy + d$ and $x = a'y + b'$, $z = c'y + d'$ are perpendicular, if

(a) $aa' + cc' + 1 = 0$

(b) $aa' + cc' - 1 = 0$

(c) $ac + a'c' - 1 = 0$

(d) $ac + a'c' + 1 = 0$

Answer: (a)

28. If $2x - y = 5$, then $(2x - 3)^3 - (y + 2)^3$ is equal to

(a) 0

(b) 25

(c) 40

(d) 125

Answer: (a)

29. The angle of intersection of the curves $y = 4 - x^2$ and $y = x^2$ is

(a) $\tan^{-1}(4\sqrt{2}/7)$

(b) $\tan^{-1}(2/7)$

(c) $\tan^{-1}(3\sqrt{2}/7)$

(d) $\pi/2$

Answer: (a)

30. The area of the region bounded by the curves $y^2 = x$ and $x^2 = y$ is

(a) 1/3

(b) 2/3

(c) 1

(d) 2

Answer: (a)

31. $d/dx\ (\tan(\cos^{-1}x))^2$ is equal to

(a) $-2/x^3$

(b) $2/x^3$

(c) $\sqrt{(1 - x^2)}/x$

(d) $- x/\sqrt{(1 - x^2)}$

Answer: (a)

32. $\sqrt{(3 + 2\sqrt{2})} - \sqrt{(3 - 2\sqrt{2})}$ is equal to

(a) 1

(b) $\sqrt{3} + 1$

(c) $\sqrt{3} - 1$

(d) 2

Answer: (d)

33. Which one of the following is not true ?

(a) $|\vec{a}| = |\vec{b}| \Rightarrow \vec{a} = \vec{b}$

(b) $|\vec{a} \times \vec{b}|^2 = (a)^2(b)^2 - (\vec{a} \cdot \vec{b})^2$

(c) $\vec{a} \times (\vec{b} \cdot \vec{c})$ is not defined

(d) If the adjacent sides of a parallelogram are represented by the vectors $\vec{a}$ and $\vec{b}$ respectively, then its area is $|\vec{a} \times \vec{b}|$

Answer: (a)

34. A particle is projected with velocity u at an inclination α with the horizontal. Then Maximum height (H) attained is

(a) $u^2 \sin^2\alpha / g$

(b) $2u^2 \sin^2\alpha / g$

(c) $u^2 \sin^2\alpha / 2g$

(d) $u^2 \sin 2\alpha / g$

Answer: (c)

35. If $|x+2\ 2\ 2;\ 2\ x+2\ 2;\ 2\ 2\ x+2| = 0$, then values of x satisfying this equation are

(a) 0, – 2, – 6

(b) 0, −1, −2

(c) 0, 0, – 2

(d) 0, 0, – 6

Answer: (d)

36. Series $\Sigma_{n=1}^{\infty} (((n+1)/n)n+^{1} - (n+1)/n) - n$ is

(a) divergent

(b) convergent

(c) oscillates finitely

(d) oscillates infinitely

Answer: (b)

37. $10^2 + 11^2 + 12^2 + ... + 19^2$ is equal to

(a) 1580

(b) 2010

(c) 2121

(d) 2185

Answer: (d)

38. The resultant force of two forces P and Q is R. If Q is doubled, R is doubled and if Q is reversed, R is again doubled. Then which one is the true relation ?

(a) $P/\sqrt{2} = Q/\sqrt{3} = R/\sqrt{2}$

(b) $P/1 = Q/2 = R/1$

(c) $P/\sqrt{3} = Q/\sqrt{2} = R/\sqrt{2}$

(d) $P/1 = Q/1 = R/\sqrt{2}$

Answer: (a)

39. The compound interest of ₹ 8,000 @ 10% per annum for 1.5 years, if the interest is calculated half yearly is

(a) ₹ 9,261

(b) ₹ 860

(c) ₹ 961

(d) ₹ 1,261

Answer: (d)

40. If the mean of 10 observations x1, x2, x3, ..., x10 is 20, then mean of x1 + 2, x2 + 4, x3 + 6, ..., x10 + 20 is

(a) 24
(b) 28
(c) 31
(d) 32

Answer: (c)

41. For showing the growth of population for the last 8 years, the best diagram is

(a) pie
(b) histogram
(c) scatter plot
(d) simple bar diagram

Answer: (d)

42. If non-zero a, b, c are such that a + b + c = 0, then the value of $a^2/bc + b^2/ac + c^2/ab$ is

(a) 3
(b) 2
(c) – 3
(d) 0

Answer: (a)

43. If $x + 1/x = \sqrt{3}$, then the value of $x^{18} + x^{12} + x6 +$

(a) 0
(b) 1
(c) 2
(d) 3

Answer: (a)

44. Factorisation of $x^3 - y^3$ is

(a) $(x + y)(x^2 - xy + y^2)$
(b) $(x - y)(x^2 - xy + y^2)$
(c) $(x - y)(x^2 - xy - y^2)$
(d) $(x - y)(x^2 + xy + y^2)$

Answer: (d)

45. The roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P., the common difference is

(a) 2
(b) 3
(c) – 2
(d) 4

Answer: (b)

46. If A = [[coshx, sinhx], [−sinhx, coshx]], then trace (A^2) is equal to
    (a) 2
    (b) − 2
    (c) cosh 2x
    (d) sinh 2x
    Answer: (a)

47. If x − 1 and x + 3 are the two factors of $x^3 + ax + b$, then remaining factor is
    (a) x + 2
    (b) x − 2
    (c) x − 3
    (d) x + 1
    Answer: (b)

48. If A is an open set and B is a closed set, then B − A is
    (a) Open set
    (b) Closed set
    (c) Both open and closed set
    (d) None of these
    Answer: (b)

49. $\lim_{y \to a} (\sin((y - a)/2) \tan(\pi y/2a))$ is equal to
    (a) 0
    (b) 1
    (c) π/a
    (d) − a/π
    Answer: (d)

50. The value of sin 18° is
    (a) $(\sqrt{5} - 1)/4$
    (b) $(\sqrt{5} + 1)/4$
    (c) $(\sqrt{5} - 1)/2$
    (d) $(\sqrt{5} + 1)/2$
    Answer: (a)

51. If $\sin^2(x + iy) = A + iB$, then value of A is
    (a) (1/2)(1 + cos 2x cos h 2y)
    (b) (1/2)(1 − cos 2x cos h 2y)
    (c) (1/2)(sin 2x sin h 2y)
    (d) − (1/2)(sin 2x sin h 2y)
    Answer: (b)

52. The general solution of sinx + cosx = 1 is given by

(a) x = 2nπ

(b) x = 2nπ + π/2

(c) x = nπ + (−1)n π/4 − π/4

(d) None of these

Answer: (c)

53. In an equilateral triangle, the ratio of the radius of circumcircle to that of incircle is

(a) 3 : 1

(b) 5 : 2

(c) 3 : 2

(d) 2 : 1

Answer: (d)

54. The tangent at a point C of a circle and diameter AB when extended intersect at D, if ∠DCA = 110°, then ∠CBA is equal to

(a) 60°

(b) 70°

(c) 55°

(d) 110°

Answer: (b)

55. The equation of a normal to the parabola $y^2 = 4x$ which passes through the point (6, 0) is

(a) y + 2x = 12

(b) y − 2x = 12

(c) y + 2x = 6

(d) y − 2x = 6

Answer: (a)

56. The equation $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represents

(a) A circle

(b) A hyperbola

(c) An ellipse

(d) A pair of perpendicular straight lines

Answer: (d)

57. The conic $x^2 + xy + y^2 + x + y = 1$ is

(a) an ellipse

(b) a hyperbola

(c) a parabola

(d) a pair of straight lines

Answer: (a)

58. If y-axis is generator line of the cone $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$, then value of b is equal to

(a) 1

(b) – 1

(c) 0

(d) None of these

Answer: (c)

59. The second degree equation $2x^2 + 2y^2 - 2x - 6y + 5 = 0$ represents

(a) a circle

(b) an ellipse

(c) a point

(d) none of the above

Answer: (c)

60. The equation of the normal at the point (1, 1) on the curve $2y + x^2 = 3$ is

(a) x + y = 0

(b) x + y + 1 = 0

(c) x – y = 0

(d) x – y = 1

Answer: (c)

61. The value of $\int_{(\pi/4)}^{(\pi/3)} dx/(\sin^2 x \cos^2 x)$ is

(a) 1

(b) 0

(c) $2/\sqrt{3}$

(d) $1/\sqrt{3}$

Answer: (c)

62. $\int_{-1}^{2} x|x|\, dx$ is equal to

(a) 0

(b) 2/3

(c) 5/3

(d) 7/3

Answer: (d)

63. H.C.F. of $x^3 - x^2 + 4x - 4$ and x6 – 1 is

(a) x + 1

(b) x – 1

(c) $x^2 - 1$

(d) $x^3 - 1$

Answer: (b)

64. The value of 'a' such that the vectors $2\hat{i} - \hat{j} + k\hat{}$, $\hat{i} + 2\hat{j} - 3k\hat{}$ and $3\hat{i} + a\hat{j} + 5k\hat{}$ are coplanar, is

(a) 1

(b) − 2

(c) 4

(d) − 4

Answer: (d)

65. A particle is projected in vertically upward direction. If after t1 and t2 time, its height is h, then h is equal to

(a) (1/2) g t1 t2

(b) g √(t1 t2)

(c) 2g (t1 + t2)

(d) none of these

Answer: (a)

66. If A = [[1, 3+x, 2], [1−x, 2, y+1], [2, 5−y, 3]] is a symmetric matrix, then 3x + y is equal to

(a) −1

(b) 0

(c) 1

(d) none of these

Answer: (a)

67. If in any projectile maximum height is equal to ho ntal range, then the angle of projection is

(a) $\tan^{-1}(1/4)$

(b) $\tan^{-1}(1/2)$

(c) $\tan^{-1} 2$

(d) $\tan^{-1} 4$

Answer: (d)

68. If ω is a complex cube root of unit, then $1 + \omega + \omega^2 + \ldots + \omega^{100}$ is equal to

(a) 0

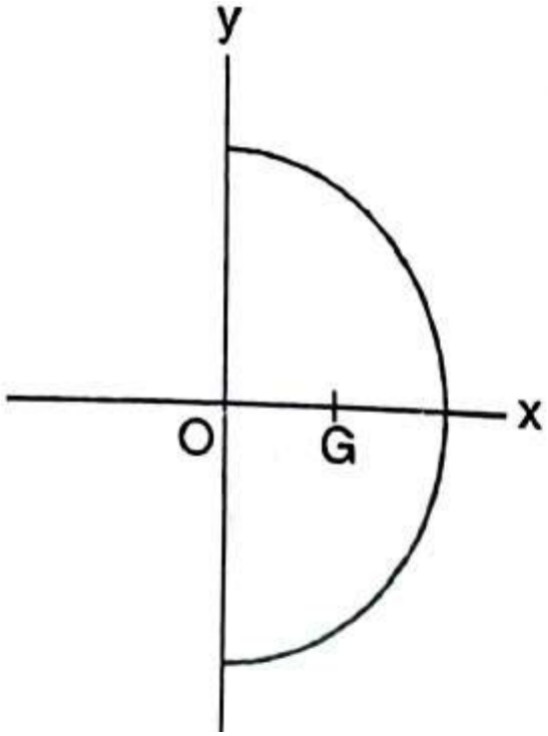
(b) 1 + ω

(c) 1 − ω

(d) ω

Answer: (b)

69. The centre of gravity of a semi-circular disc of radius 'a' is



(a) (2a/π, 0)
(b) (3a/4π, 0)
(c) (4a/3π, 0)
(d) (a/2, a/2)

Answer: (c)

70. When a train travels with speed (3/5)th o[illegible]al speed, it reaches its destination 4 hours late. What is the time taken by the train in travelling this distance with its normal speed ?

(a) 3 hours
(b) 6 hours
(c) 4 hours
(d) 5 hours

Answer: (b)

71. A 75 meter long train is moving at 20 km/hr. It will cross a man standing on the platform in time

(a) 12 seconds
(b) 14 seconds
(c) 13.5 seconds
(d) 15.5 seconds

Answer: (c)

72. Three dice are thrown randomly. The probability of coming 3 in at least one die is
(a) 180/216
(b) 91/216
(c) 5/216
(d) 125/216
Answer: (b)

73. If the algebraic sum of the deviations of 10 observations measured from 15 is 7, then the mean is
(a) 105
(b) 70
(c) 15.7
(d) 16.7
Answer: (c)

74. The equations $2x - ky + 7 = 0$ and $6x - 12y + 15 = 0$ have no solution for
(a) $k = -4$
(b) $k = 4$
(c) $k = 1$
(d) $k = -1$
Answer: (b)

75. If $a + b + c = 5$ and $ab + bc + ca = 10$, then the val of $a^3 + b^3 + c^3 - 3abc$ is
(a) − 25
(b) 25
(c) 0
(d) 75
Answer: (a)

76. If logx4 + logx16 + logx64 = 12, the value of x is
(a) 2
(b) 4
(c) 5
(d) 10
Answer: (a)

77. If a, b, c are in A. P. and x, y, z are in G. P., then the value of x^(b−c) y^(c−a) z^(a−b) is
(a) 0
(b) 1
(c) 2
(d) − 1
Answer: (b)

78. 1/log2x + 1/log3x + 1/log4x + ... + 1/log50x, x ≠ 1, is equal to
    (a) 50/log_(50!) x
    (b) 49/log_(49!) x
    (c) 1/log_(50!) x
    (d) 1/log_(49!) x
    Answer: (c)

79. If G is a group of even order, then it has an element a ≠ e, satisfying
    (a) $a^2 = e$
    (b) $a^3 = e$
    (c) a5 = e
    (d) a7 = e
    Answer: (a)

80. lim_x→1 (1 − √x)/cos⁻¹x is equal to
    (a) 0
    (b) 1/2
    (c) 1/4
    (d) 1
    Answer: (a)

81. The value of Σ_(r=1)^9 $\sin^2(r\pi/18)$ is
    (a) 1
    (b) 0
    (c) 5
    (d) π
    Answer: (c)

82. In the equation $\cos^{-1}((1 - a^2)/(1 + a^2)) - \cos^{-1}((1 - b^2)/(1 + b^2)) = 2\tan^{-1}x$, value of x is
    (a) (a + b)/(1 + ab)
    (b) (a − b)/(1 + ab)
    (c) (a − b)/(1 − ab)
    (d) None of the above
    Answer: (b)

83. The polar form of − 1 − √(−3) is
    (a) 2 (cos 2π/3 − i sin 2π/3)
    (b) 2 (cos π/3 + i sin π/3)
    (c) 2 (cos 2π/3 + i sin 2π/3)
    (d) 2 (cos π/3 − i sin π/3)
    Answer: (a)

84. If the sides of a right angled triangle are a, ar, ar^2 ($r < 1$), then r^2 is equal to

(a) $(\sqrt{5} - 1)/2$

(b) $(\sqrt{5} + 1)/2$

(c) $\sqrt{5} - 1$

(d) $\sqrt{5} + 1$

Answer: (a)

85. If $f(x) = \cos hx + \sin hx$, then which one of the following is correct ?

(a) $f(x)\, f(y) = f(x) + f(y)$

(b) $f(x)\, f(y) = f(xy)$

(c) $f(x)\, f(y) = f(x + y)$

(d) $f(x)\, f(y) = f(x/y)$

Answer: (c)

86. The equation of the base of an equilateral triangle is $x + y = 1$ and its vertex is $(1, -1)$, length of its side is

(a) 1

(b) $1/\sqrt{2}$

(c) $\sqrt{(2/3)}$

(d) $1/\sqrt{3}$

Answer: (c)

87. If a straight line makes angles α, β and γ with the -ordinate axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

(a) 0

(b) 1

(c) 2

(d) None of these

Answer: (c)

88. If the equation $3x^2 + 7xy + 2y^2 + 5x + 5y + k = 0$ represents a pair of straight lines, then the value of k is

(a) 1

(b) 2

(c) 3

(d) 4

Answer: (b)

89. The number of spheres that can be made to pass through the three given points (1, 0, 0), (0, 1, 0) and (0, 0, 1) is

(a) 1

(b) 2

(c) 3

(d) Infinite

Answer: (d)

90. The length of the common chord of two circles of radii 15 cm and 20 cm, whose centres are 25 cm apart, is (in cm)

(a) 10

(b) 12

(c) 20

(d) 24

Answer: (d)

91. $\lim_{n\to\infty} (1 - 1/(2n))^{n+1}$ is equal to

(a) $\sqrt{e}$

(b) $1/\sqrt{e}$

(c) e

(d) 1/e

Answer: (b)

92. The derivative of the function $y = 3|x| + 1$ at the point $x = 0$ is

(a) 3

(b) − 3

(c) 0

(d) not existing

Answer: (d)

93. The area enclosed between the curves $y = \sin x$, $\cos x$, $0 \le x \le \pi/2$ is

(a) $\sqrt{2} - 1$

(b) $\sqrt{2} + 1$

(c) $2(\sqrt{2} - 1)$

(d) $2(\sqrt{2} + 1)$

Answer: (c)

94. If $y(x)$ is a solution of the differential equation $dy/dx + 4xy = x^3$, $y(0) = 0$, then $\lim_{x\to 0} y(x)$ is

(a) 0

(b) − 2

(c) 1

(d) not existing

Answer: (a)

95. Two forces $\vec{F1} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{F2} = 4\hat{i} + 2\hat{j} + 3\hat{k}$ act on a particle and displace it from the point (0, 1, 2) to (1, − 2, 3), then the total work done is

(a) 2 unit

(b) 6 unit

(c) 4 unit

(d) 8 unit

Answer: (b)

96. The moment of the force $3\hat{i} + 4\hat{j} - 5\hat{k}$ acting through the point $\hat{i} - 2\hat{j}$ about the point $\hat{i} - \hat{j} + \hat{k}$ is

(a) $6\hat{i} + 2\hat{j} - 5\hat{k}$

(b) $8\hat{i} + 2\hat{j} - \hat{k}$

(c) $9\hat{i} + 3\hat{j} - 8\hat{k}$

(d) $9\hat{i} - 3\hat{j} + 3\hat{k}$

Answer: (d)

97. Value of the integral $\int_{-1}^{1} \log((2 - x)/(2 + x))\, dx$ is

(a) 2

(b) 1

(c) 1/2

(d) 0

Answer: (d)

98. If the foot of the perpendicular drawn from (−2, 1, 0) on a plane is (1, −2, 1), then the equation of the plane is

(a) $3x + 3y + z = 10$

(b) $3x + 3y - z = 10$

(c) $3x - 3y + z = 10$

(d) $3x - 3y - z = 10$

Answer: (c)

99. If $\hat{a}$, $\hat{b}$ and $\hat{c}$ are unit vectors and $|\hat{a} + \hat{b}|^2 = |\hat{b} + \quad = |\hat{c} + \hat{a}|^2 = 8$, then $|2\hat{a} + \hat{b} + \hat{c}|$ is equal to

(a) 2

(b) 4

(c) 6

(d) none of the above

Answer: (c)

100. If $f'(x) = g(x)$ and $g'(x) = f(x^2)$, then $f''(x^2)$ is equal to

(a) $g(x^2)$

(b) f(x4)

(c) $f(x^3)$

(d) g(x4)

Answer: (b)

101. A and B work together and complete a given work in x days. If A alone completes this work in x + 2 days and B alone completes this work in x + 8 days, then the value of x is

(a) 3

(b) 4

(c) 5

(d) 2

Answer: (b)

102. A person travels from A to B at an average speed of x km/hr and returns from B to A at an average speed of y km/hr. His average speed during the total journey, is

(a) $(x + y)/(2xy)$

(b) $2xy/(x + y)$

(c) $2/(x + y)$

(d) $1/x + 1/y$

Answer: (b)

103. How much will ₹ 25,000 amount to in 2 years at compound interest, if the rate of interest for successive years be 4% and 5% per year ?

(a) ₹ 25,300

(b) ₹ 26,300

(c) ₹ 27,300

(d) ₹ 28,300

Answer: (c)

104. If the median of the distribution 10, 12, 13, 16, x, 20, 25, 30 is 18, then the value of x is

(a) 24

(b) 22

(c) 23

(d) 20

Answer: (d)

105. If $x + 9/x = 6$, then the value of $x^2 + 9/x^2$ is

(a) 8

(b) 12

(c) 16

(d) 10

Answer: (d)

106. Values of x in the equation $1/(x - 3) - 1/(x + 5) = 1/6$ are

(a) 7, 9

(b) − 7, 9

(c) − 7, − 9

(d) 7, − 9

Answer: (d)

107. In the expansion of $(3x - 2/x^2)^{15}$ which term is free from x ?

(a) 4^{th}

(b) 5^{th}

(c) 6^{th}

(d) 7^{th}

Answer: (c)

108. If A = [[1, −1], [−1, 1]] and B = [[1, 1], [1, 1]], then the value of AB is

(a) [[1, −1], [−1, 1]]

(b) [[0, 1], [1, 0]]

(c) [[−1, 0], [0, −1]]

(d) [[0, 0], [0, 0]]

Answer: (d)

109. If $|x| < 1$, then $x^2/2 + 2x^3/3 + 3\times4/4 + ...$ is equal to

(a) $x/(1 - x) + \log_e(1 - x)$

(b) $x/(1 + x) + \log_e(1 + x)$

(c) $x/(1 - x) + \log_e(1 + x)$

(d) $x/(1 + x) + \log_e(1 - x)$

Answer: (a)

110. Given :
Statement A : All cyclic groups are abelian group.
Statement B : The order of the cyclic group is same as the order of its generator.

(a) A and B are false

(b) A is true, B is false

(c) B is true, A is false

(d) A and B both are true

Answer: (d)

111. If $f(x) = (x^2 - 3x + 2)/(x^2 - 2x)$, $x \neq 2$ is defined [illegible] function f(x) be continuous at x = 2, then the value of f(2) is

(a) 0

(b) 1/2

(c) 1

(d) 3/4

Answer: (b)

112. The function f(x) is defined by
$f(x) = |x|/x$, $x \neq 0$; 0 , $x = 0$
then, at x = 0 it is

(a) Continuous

(b) Discontinuous at x = 0 and has discontinuity of first kind

(c) Discontinuous at x = 0 and has removable discontinuity

(d) Discontinuous at x = 0 and has discontinuity of second kind

Answer: (b)

113. The value of $\cot(\text{cosec}^{-1}(5/3) + \tan^{-1}(2/3))$ is

(a) 5/17

(b) 3/17

(c) 4/17

(d) 6/17

Answer: (d)

114. If r1, r2, r3 are ex-radii and r the in-radius of triangle ABC and r1 = r + r2 + r3, then triangle ABC is

(a) Isoscales triangle

(b) Equilateral triangle

(c) Right angled triangle

(d) None of these

Answer: (c)

115. If $\sin\theta \cos\theta = 1/2$, then value of $\sin 6\theta + \cos 6\theta$ is

(a) 1/2

(b) 3/2

(c) 1

(d) 1/4

Answer: (d)

116. If ω is cube root of unity, then $(3 + \omega + 3\omega^2)6$ is ual to

(a) 32

(b) 64

(c) 128

(d) 16

Answer: (b)

117. If AB is diameter of the circle $x^2 + y^2 + 2x + 4y - 3 = 0$. If co-ordinates of A are (1, 0), then co-ordinates of B are

(a) (– 3, 1)

(b) (– 3, 2)

(c) (– 3, 3)

(d) (– 3, – 4)

Answer: (d)

118. The eccentricity of the ellipse, whose latus rectum is one half of its minor axis is

(a) $a/\sqrt{3}$

(b) $\sqrt{3}/2$

(c) $\sqrt{(3/2)}$

(d) $\sqrt{2}/3$

Answer: (b)

119. The angle between the straight lines represented by the equation $y^2 - xy - 6x^2 = 0$ is

(a) 30°

(b) 60°

(c) 45°

(d) 65°

Answer: (c)

120. In the conic $l/r = 1 + e\cos\theta$, the sum of the reciprocals of the segments of any focal chord is

(a) 1/l

(b) 3/l

(c) 4/l

(d) 2/l

Answer: (d)

121. The co-ordinates of the mid points of sides of a triangle are (5, 2), (3, 3) and (2, 2). Co-ordinates of its centroid is

(a) (7/3, 10/3)

(b) (10/3, 7/3)

(c) (7/3, 2/3)

(d) (2/3, 7/3)

Answer: (b)

122. In a geometric progression, first term is 7, the last term is 448 and the sum is 889. The common ratio of the geometric progression is

(a) 3/2

(b) 2

(c) 3

(d) 3.5

Answer: (b)

123. The value of $\int 0^{(\pi/2)} \sin x\, dx/(\sin x + \cos x)$ is

(a) 1

(b) π/2

(c) π/4

(d) π/8

Answer: (c)

124. The solution of the differential equation $(x + 2y^3)\, dy/dx = y$ is

(a) $x = y^3 - cy^2$

(b) $x = y^3 + cy$

(c) $y = x^3 + cx$

(d) $y = x^3 - cx^2$

Answer: (b)

125. Solution of the differential equation $(1 + 3x)\,dy - (1 - 3y)\,dx = 0$, $y(1) = 0$ is

(a) $x + y + 3xy = 1$

(b) $x - y + 3xy = 1$

(c) $x - y - 3xy = 1$

(d) $x + y - 3xy = 1$

Answer: (c)

Answer key

Answer key from the U.P. Secondary Education Services Selection Board's official answer key for this sitting. "—" means the key gave none.

Mathematics

1	**(c)**	2	**(c)**	3	**(b)**	4	**(b)**	5	**(a)**	6	**(a)**
7	**(c)**	8	**(a)**	9	**(d)**	10	**(a)**	11	**(b)**	12	**(c)**
13	**(c)**	14	**(c)**	15	**(b)**	16	**(c)**	17	**(c)**	18	**(a)**
19	**(c)**	20	**(d)**	21	**(c)**	22	**(c)**	23	**(a)**	24	**(d)**
25	**(b)**	26	**(c)**	27	**(a)**	28	**(a)**	29	**(a)**	30	**(a)**
31	**(a)**	32	**(d)**	33	**(a)**	34	**(c)**	35	**(d)**	36	**(b)**
37	**(d)**	38	**(a)**	39	**(d)**	40	**(c)**	41	**(d)**	42	**(a)**
43	**(a)**	44	**(d)**	45	**(b)**	46	**(a)**	47	**(b)**	48	**(b)**
49	**(d)**	50	**(a)**	51	**(b)**	52	**(c)**	53	**(d)**	54	**(b)**
55	**(a)**	56	**(d)**	57	**(a)**	58	**(c)**	59	**(c)**	60	**(c)**
61	**(c)**	62	**(d)**	63	**(b)**	64	**(d)**	65	**(a)**	66	**(a)**
67	**(d)**	68	**(b)**	69	**(c)**	70	**(b)**	71	**(c)**	72	**(b)**
73	**(c)**	74	**(b)**	75	**(a)**	76	**(a)**	77	**(b)**	78	**(c)**
79	**(a)**	80	**(a)**	81	**(c)**	82	**(b)**	83	**(a)**	84	**(a)**
85	**(c)**	86	**(c)**	87	**(c)**	88	**(b)**	89	**(d)**	90	**(d)**
91	**(b)**	92	**(d)**	93	**(c)**	94	**(a)**	95	**(b)**	96	**(d)**
97	**(d)**	98	**(c)**	99	**(c)**	100	**(b)**	101	**(b)**	102	**(b)**
103	**(c)**	104	**(d)**	105	**(d)**	106	**(d)**	107	**(c)**	108	**(d)**
109	**(a)**	110	**(d)**	111	**(b)**	112	**(b)**	113	**(d)**	114	**(c)**
115	**(d)**	116	**(b)**	117	**(d)**	118	**(b)**	119	**(c)**	120	**(d)**
121	**(b)**	122	**(b)**	123	**(c)**	124	**(b)**	12	**(c)**		