PREVIOUS YEAR PAPER

UP TGT 2021 — Mathematics (Series A)

UP TGT · 7 or 8 August 2021

125 questions · +4 for a correct answer, −0 for a wrong one · 120 minutes

The official booklet is a scan with no text; ExamBharo typed this paper from it by hand. Report a typing slip through exambharo.com/contact/.

Questions from the U.P. Secondary Education Services Selection Board's paper of 7 or 8 August 2021. 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-2021-mathematics-series-a/

Mathematics

1. A person travels from A to B at a speed of 40 kmph and returns by increasing his speed by 50%. What is his average speed for both the trips ?

(a) 40 kmph
(b) 45 kmph
(c) 48 kmph
(d) 50 kmph

Answer: (c)

2. What is the real part of (sin x + i cos x)4, i = $\sqrt{-1}$?

(a) – cos 4x
(b) – cos 2x
(c) cos 4x
(d) cos 2x

Answer: (c)

3.

$$\int_0^{\pi/2} \frac{\sin x \cos x}{\cos^2 x + 3\cos x + 2}\, dx$$

is equal to

(a) log (3/2)
(b) log (9/8)
(c) log 2
(d) 1

Answer: (b)

4. If ω is an imaginary cube root of unity, then value of

$$\begin{vmatrix} 1 & \omega^6 & \omega^8 \\ \omega^6 & \omega^3 & \omega^7 \\ \omega^8 & \omega^7 & 1 \end{vmatrix}$$

is

(a) 0
(b) 3
(c) 4
(d) 1

Answer: (b)

5. The sides of a triangle are 15 cm, 20 cm and 25 cm respectively, then the radius of in-circle is

(a) 10 cm
(b) 12.5 cm
(c) 5 cm
(d) 7.5 cm

Answer: (c)

6. If the arithmetic mean from the following data
x: 5, 15, 25, 35, 45
f: 6, 4, 3, k, 2
is 21.5, the value of k will be

(a) 3
(b) 3.5
(c) 4
(d) 5

Answer: (d)

7. The value of $[(x - y)^3 + (y - z)^3 + (z - x)^3] / [9(x - y)(y - z)(z - x)]$ is

(a) 0
(b) 1/9
(c) 1/3
(d) 1

Answer: (c)

8. Find the equation of the cone with vertex at the origin and direction cosines of its generators satisfy the equation $l^2 + 2m^2 - 3n^2 = 0$.

(a) $x^2 + y^2 - z^2 = 0$

(b) $x^2 + 2y^2 - 3z^2 = 0$

(c) $x^2 - 2y^2 + 3z^2 = 0$

(d) $xy + yz + zx = 0$

Answer: (b)

9. A balloon is moving upward with uniform acceleration g/8 cm/sec². After half minute a body is dropped from them. The time taken by the body to reach on the ground is

(a) 10 seconds

(b) 15 seconds

(c) 20 seconds

(d) 24 seconds

Answer: (b)

10.

$$\lim_{x \to \infty} \left(\frac{x+6}{x+1} \right)^{x+4}$$

is equal to

(a) 1

(b) e^2

(c) e4

(d) e5

Answer: (d)

11.

$$\int_{\pi/4}^{\pi/3} \frac{dx}{\sin^2 x \cos^2 x}$$

is equal to

(a) 1

(b) 0

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

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

Answer: (c)

12. If $\vec{u} = \hat{i} \times (\vec{a} \times \hat{i}) + \hat{j} \times (\vec{a} \times \hat{j}) + \hat{k} \times (\vec{a} \times \hat{k})$ then $\vec{u}$ is equal to

(a) $\vec{0}$

(b) $\vec{a}$

(c) $2\vec{a}$

(d) $3\vec{a}$

Answer: (c)

13. If z is a complex number of unit modulus and argument θ, then arg((1 + z)/(1 + $\bar{z}$)) is equal to

(a) − θ

(b) π/2 − θ

(c) θ

(d) π − θ

Answer: (c)

14. The equations of tangents to the ellipse $3x^2 + 4y^2 = 12$ which are parallel to the line y + 2x = 4 are

(a) y + 2x = ±4

(b) y + 2x = ±7

(c) y + 2x = ±√15

(d) y + 2x = ±√19

Answer: (d)

15. Which one of the following is not a measure of c ral tendency ?

(a) Mean

(b) Range

(c) Median

(d) Mode

Answer: (b)

16. $\sin^{-1}(3/5) - \cos^{-1}(12/13)$ equals to

(a) $\sin^{-1}(56/65)$

(b) $\sin^{-1}(16/65)$

(c) 1

(d) 0

Answer: (b)

17. The point on the curve $y^2 = x$, the tangent at which makes an angle π/4 with x − axis, is

(a) (−1/4, 1/2)

(b) (1/4, 1/2)

(c) (−1/4, −1/2)

(d) (1/4, −1/2)

Answer: (b)

18. A sum becomes double in 5 years in C.I. When will it become 8 times at the same rate of interest ?

(a) 10 years
(b) 15 years
(c) 7 years
(d) 20 years

Answer: (b)

19. What is the principal value of $\sin^{-1}(\sin(2\pi/3))$?

(a) π/4
(b) π/2
(c) π/3
(d) 2π/3

Answer: (c)

20.

$$\int_0^1 \frac{\tan^{-1} x}{(1+x^2)}\,dx$$

is equal to

(a) 1
(b) $\pi^2/8$
(c) $\pi^2/32$
(d) $\pi^2/3$

Answer: (c)

21. Sum of the series 2 + 3/2 + 1 + 5/8 + ... ∞ is

(a) 2
(b) 4
(c) 6
(d) 12

Answer: (c)

22.

$$\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}}$$

is equal to

(a) 2 sin θ
(b) 2 cos θ
(c) sin 2θ
(d) cos 2θ

Answer: (b)

23. The distances travelled by a body falling freely from rest in the first, second and third second are in the ratio

(a) 1 : 4 : 9

(b) 1 : 3 : 5

(c) 1 : 2 : 3

(d) 1 : 4 : 5

Answer: (b)

24. The number of real solutions of the equation $|x|^2 - 3|x| + 2 = 0$ is

(a) 4

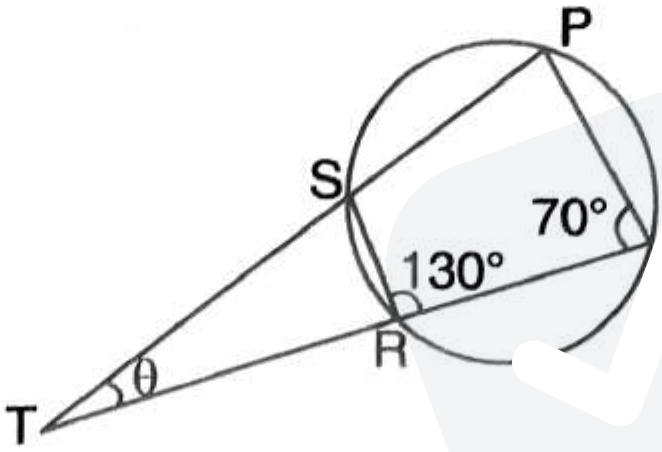
(b) 1

(c) 3

(d) 2

Answer: (a)

25. In the following figure the value of θ is



(a) 110°

(b) 70°

(c) 60°

(d) 50°

Answer: (c)

26. The position vectors of the points A, B, C and D are $3\hat{i} - 2\hat{j} - \hat{k}$, $2\hat{i} + 3\hat{j} - 4\hat{k}$, $-\hat{i} + \hat{j} + 2\hat{k}$ and $4\hat{i} + 5\hat{j} + \lambda\hat{k}$ respectively. If the points A, B, C and D lie on a plane, the value of λ is

(a) −146/17

(b) −73/17

(c) 7

(d) 13

Answer: (a)

27.

$$\lim_{n \to \infty} \frac{1^2 + 2^2 + 3^2 + ... + n^2}{n^3}$$

is equal to

(a) 0

(b) 1/3

(c) 2/3

(d) Does not exist

Answer: (b)

28. Three numbers are chosen at random from numbers 1 to 15. The probability that they are consecutive is

(a) 1/15

(b) 2/25

(c) 1/35

(d) 1/30

Answer: (c)

29. The points with position vectors 60î + 3ĵ, 40î − 8ĵ, - 52ĵ are collinear if a is equal to

(a) − 40

(b) 40

(c) 20

(d) 25

Answer: (a)

30. If the mean of x, x + 2, x + 4, x + 6, x + 8 is 11, then what is the mean of the last three observations ?

(a) 8

(b) 10

(c) 12

(d) 13

Answer: (d)

31. ((1 + i)/√(2))8 + ((1 − i)/√(2))8 is equal to

(a) 1

(b) 2

(c) 4

(d) 8

Answer: (b)

32.

$$\int_1^3 (e^{\log x} + 1)\,dx$$

is equal to

(a) 2

(b) 6

(c) 0

(d) −2

Answer: (b)

33. The speeds of three cars are in the ratio 2 : 3 : 4. The ratios of the times taken by these cars in travelling 100 km distance will be

(a) 2 : 3 : 4

(b) 4 : 3 : 2

(c) 4 : 3 : 6

(d) 6 : 4 : 3

Answer: (d)

34. In the equation

$$\cos^{-1}\frac{1-a^2}{1+a^2} - \cos^{-1}\frac{1-b^2}{1+b^2} = 2\tan^{-1}x$$

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)

35. Integral of

$$\int \frac{\cot x}{\log \sin x}\,dx$$

is

(a) log(sin x) + C

(b) log(cos x) + C

(c) log(log tan x) + C

(d) log(log sin x) + C

Answer: (d)

36. If

$$A=\begin{bmatrix}1 & -2\\ -1 & 2\end{bmatrix} \text{ and } B=\begin{bmatrix}2 & 6\\ 1 & 3\end{bmatrix}$$

then AB is equal to

(a)

$$\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$$

(b)

$$\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

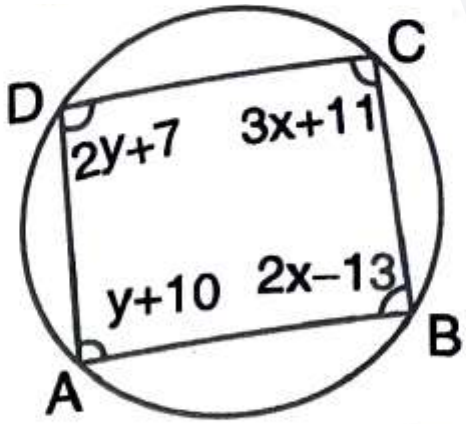
(c)

$$\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$$

(d) None of the above

Answer: (a)

37. In the figure $\angle A$ is equal to



(a) 70°

(b) 45°

(c) 80°

(d) 60°

Answer: (a)

38. Find 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.

(a) 1

(b) 2

(c) 4

(d) – 4

Answer: (d)

39. If x1 and x2 are the roots of the equation

$$\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$$

then the value of $x1^2 + x2^2$ is

(a) 1

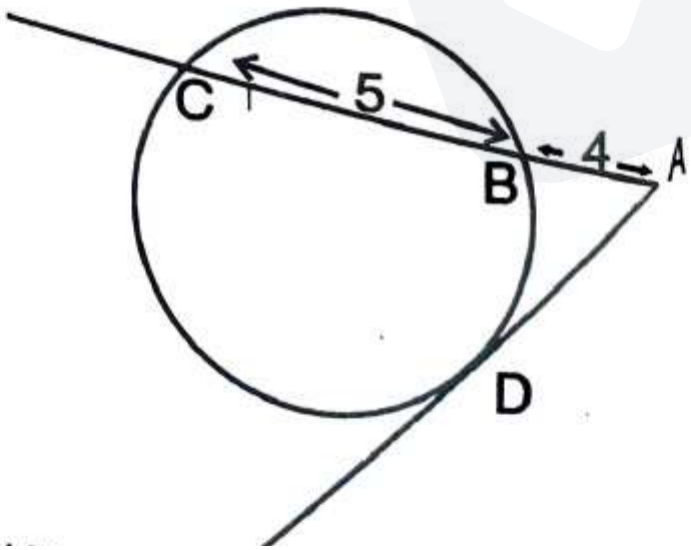
(b) 3

(c) 5

(d) 0

Answer: (c)

40. In the following figure AD is tangent of the circle and ABC is secant. If AB = 4 cm and BC = 5 cm, then the length of tangent AD is



(a) 3 cm

(b) 4 cm

(c) 5 cm

(d) 6 cm

Answer: (d)

41. A particle is projected with a velocity u so that its range on a horizontal plane is twice the greatest height attained, the range is

(a) $2u^2/3g$

(b) $u^2/2g$

(c) $3u^2/2g$

(d) $4u^2/5g$

Answer: (d)

42. If $f(x) = \tan^{-1}x$ and $g(x) = \sin x$, then (gof) (x) is equal to

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

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

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

(d) 1

Answer: (b)

43. Solution of the differential equation $\log(dy/dx) = ax + by$ is

(a) $be^{ax} + ae^{-by} + C = 0$

(b) $e^{ax}/a - e^{-by}/b + C = 0$

(c) $e^{ax} + e^{-by} + C = 0$

(d) $e^{ax+by} = C(ax + by)$

Answer: (a)

44. If â and b̂ are unit vectors such that â + 2b̂ and 5 4b̂ are perpendicular to each other, then the angle between â and b̂ is

(a) π/4

(b) $\cos^{-1}(1/3)$

(c) $\cos^{-1}(2/7)$

(d) π/3

Answer: (d)

45. If the mean of the observations 6, 8, 5, 7, x and 4 is 7, then the median of these observations is

(a) 6.5

(b) 6

(c) 5.5

(d) 7

Answer: (a)

46. If x1 and x2 are roots of $x^2 - 2x + 4 = 0$, then the value of $x1^3 + x2^3$ is equal to

(a) 16

(b) 8

(c) − 16

(d) 4

Answer: (c)

47. If y = log5x + logx5, then what will be the value of dy/dx at x = 5 ?

(a) 5

(b) 1/5

(c) 0

(d) 1

Answer: (c)

48. If 3 men working 3 hours per day make 3 toys in 3 days, then the number of toys which can be made by 6 men working 6 hours per day in 6 days is

(a) 6

(b) 12

(c) 24

(d) 48

Answer: (c)

49. If A + iB = tan (x + iy), then tan 2x is equal to

(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)

50. For all real x, the minimum value of $(1 - x + x^2)/(1 + x + x^2)$ is

(a) 0

(b) 1/3

(c) 1

(d) 3

Answer: (b)

51. The term independent of x in the expansion of (2x + 1/(3x))6 is

(a) 160/9

(b) 80/9

(c) 160/27

(d) 80/3

Answer: (c)

52. Two parallel chords of a circle of radius 5 cm are in opposite side of the centre and if the chords are at distances 3 cm and 4 cm from the centre, then the difference of the lengths of the chords is

(a) 10 cm

(b) 5 cm

(c) 2 cm

(d) 1 cm

Answer: (c)

53. An aeroplane is flying at height h with horizontal velocity u. The velocity of a dropped packet on reaching the ground will be

(a) $\sqrt{(u^2 + 2gh)}$

(b) $\sqrt{(2gh)}$

(c) $2gh$

(d) $\sqrt{(u^2 - 2gh)}$

Answer: (a)

54. Function $f(x) = (x + 1)^{\cot x}$ will be continuous at $x = 0$ if the value of $f(0)$ is

(a) $1/e$

(b) 0

(c) e

(d) 1

Answer: (c)

55. If the equation $x^2 + y^2 + (c - 2)xy - 4x - 4y + c^2 = 0$ represents a circle, then its radius is

(a) 1

(b) 2

(c) 3

(d) 5

Answer: (b)

56. If the radius of a hemisphere is a, then its centre of gravity from its centre is at a distance

(a) 3a/8

(b) 5a/8

(c) a/2

(d) 2a/5

Answer: (a)

57. The sequence $\langle \log (1/n) \rangle$ is

(a) Convergent

(b) Divergent to ∞

(c) Divergent to $-\infty$

(d) None of the above

Answer: (c)

58. Two consecutive sides of a parallelogram are $4x + 5y = 0$ and $7x + 2y = 0$. If the equation of one diagonal is $11x + 7y = 9$, the equation of other diagonal is

(a) $x + y = 0$

(b) $7x - 11y = 0$

(c) $7x + 11y = 0$

(d) $x - y = 0$

Answer: (d)

59. The multiplicative group {1, − 1, i, − i} is a cyclic group, its generators are

(a) 1 and i

(b) 1 and − 1

(c) i and − i

(d) only i

Answer: (c)

60. The mean weight of 9 items is 15 kg. If one more item is added then the mean weight becomes 16 kg, then the weight of tenth item will be

(a) 20 kg

(b) 15 kg

(c) 25 kg

(d) 30 kg

Answer: (c)

61. The smallest positive integer n for which $((1 + i)/(1 - i))n = 1$, is

(a) 8

(b) 12

(c) 4

(d) 16

Answer: (c)

62. $\int e^x(x - 1)/(x + 1)^3 \, dx$ equals to

(a) $e^x/(x + 1)^2 + C$

(b) $e^x/(x + 1) + C$

(c) $-e^x/(x + 1)^2 + C$

(d) $e^x/(x - 1)^2 + C$

Answer: (a)

63. If $(b - c)^2$, $(c - a)^2$, $(a - b)^2$ are in A.P., then $1/(b - c)$, $1/(c - a)$, $1/(a - b)$ will be in

(a) H.P.

(b) G.P.

(c) A.P.

(d) None of the above

Answer: (c)

64. If $i = \sqrt{-1}$, then $(1 + i)4 - (1 - i)4$ is equal to

(a) − 4i

(b) 4i

(c) 0

(d) 2

Answer: (c)

65. The general equation to the cone of second degree which passes through the axes, is

(a) $x^2/a + y^2/b + z^2/c = 0$

(b) $fyz + gzx + hxy = 0$

(c) $ax^2 + by^2 + cz^2 = 0$

(d) $\sqrt{(fx)} + \sqrt{(gy)} + \sqrt{(hz)} = 0$

Answer: (b)

66. If one zero of the third degree polynomial $x^3 + ax^2 + bx + c$ is -1, then the product of other two zeroes is

(a) $b - a + 1$

(b) $b - a - 1$

(c) $a - b + 1$

(d) $a + b + 1$

Answer: (a)

67. The equation of the sphere on the join of $(2, -3, 1)$ and $(3, -1, 2)$ as diameter is

(a) $x^2 + y^2 + z^2 - 5x + 4y + 3z - 11 = 0$

(b) $x^2 + y^2 + z^2 + 5x - 4y + 3z - 11 = 0$

(c) $x^2 + y^2 + z^2 + 11 = 0$

(d) $x^2 + y^2 + z^2 - 5x + 4y - 3z + 11 = 0$

Answer: (d)

68. Three forces P, 2P and 3P are acting along sides , BC and CA of equilateral Δ ABC. Magnitude of resultant force is

(a) $P\sqrt{3}$

(b) $P\sqrt{2}$

(c) Zero

(d) $2P/3$

Answer: (a)

69. In a triangle ABC if $\cos A = \sin B/(2 \sin C)$, then triangle is

(a) Isosceles

(b) Equilateral

(c) Right angled

(d) None of the above

Answer: (a)

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

(a) 1

(b) 2

(c) 1/3

(d) 2/3

Answer: (c)

71. If $x^2 + 1/x^2 = 11$, then value of $x^3 - 1/x^3$ may be equal to

(a) 22
(b) 25
(c) 33
(d) 36

Answer: (d)

72. The order of the element $(-i)$ of the multiplicative group $G = \{1, -1, i, -i\}$ is

(a) 4
(b) 3
(c) 2
(d) 1

Answer: (a)

73. In ΔABC, $a = 2b$ and $|A - B| = \pi/3$, then $\angle C$ is

(a) $\pi/2$
(b) $\pi/3$
(c) $\pi/6$
(d) $\pi/4$

Answer: (b)

74. The area cut off the parabola $4y = 3x^2$ by the straight line $2y = 3x + 12$ is

(a) 15 sq. units
(b) 18 sq. units
(c) 24 sq. units
(d) 27 sq. units

Answer: (d)

75. If $\lim_{x \to a} (a^x - x^a)/(x^x - a^a) = -1$, then

(a) $a = 1$
(b) $a = 0$
(c) $a = e$
(d) none of these

Answer: (a)

76. If $y = x^x$, then dy/dx will be

(a) $x^x \log x$
(b) $x^x (1 - \log x)$
(c) $x^x (1 + \log x)$
(d) $x^x + \log x$

Answer: (c)

77. The work done in moving an object along a straight line from (3, 2, −1) to (2, −1, 4) in a force field given by $\vec{F} = 4\hat{i} - 3\hat{j} + 2\hat{k}$ is

(a) 15 units

(b) 18 units

(c) 20 units

(d) 24 units

Answer: (a)

78. Equation of a circle, with center (0, 0) and 2x + 3y = 5 as a tangent, is

(a) $x^2 + y^2 = 5$

(b) $x^2 + y^2 + 2x = 25$

(c) $x^2 + y^2 + y = 25$

(d) $13x^2 + 13y^2 = 25$

Answer: (d)

79. Sequence log x, log (x^2/y), log (x^3/y^2), ... is

(a) a G.P.

(b) an A.P.

(c) a H.P.

(d) both G.P. and H.P.

Answer: (b)

80. If the probability for A to fail in an examination is 0 and that of B to fail is 0.30, then the probability that either A or B fails is

(a) 0.50

(b) 0.54

(c) 0.44

(d) 0.45

Answer: (c)

81. In a group of 300 people, 150 speak Hindi and 200 can speak English. How many can speak both Hindi and English ?

(a) 40

(b) 50

(c) 60

(d) 85

Answer: (b)

82. In a ΔABC, b = 5 cm, a = 2 cm and sin A = 3/7. How many such triangles are possible ?

(a) 0

(b) 1

(c) 2

(d) 3

Answer: (a)

83. If for a moderately symmetrical distribution mean deviation is 12, then the value of standard deviation is

(a) 15

(b) 12

(c) 24

(d) None of the above

Answer: (a)

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

(a) $-2/x^3$

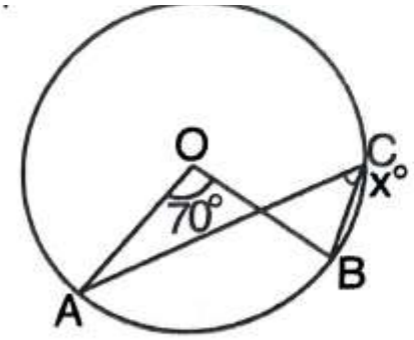
(b) $2/x^3$

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

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

Answer: (a)

85. In the given figure O is the centre of the circle and $\angle AOB = 70°$ then $70° - x°$ is equal to



(a) 70°

(b) 35°

(c) 15°

(d) 25°

Answer: (b)

86. If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, then $\alpha^2\beta^2 + \alpha^2\gamma^2 + \beta^2\gamma^2$ is equal to

(a) $q^2 - 2pr$

(b) $q^2 + 2pr$

(c) $q^2 + p^2$

(d) $q^2 - p^2$

Answer: (a)

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

(a) $(1/2)gt1t2$

(b) $g\sqrt{(t1t2)}$

(c) $2g\ (t1 + t2)$

(d) None of the above

Answer: (a)

88. If points (a, 0), (0, b) and (1, 1) are collinear, then 1/a + 1/b is equal to

(a) 1

(b) √2

(c) −1

(d) 2

Answer: (a)

89. The system of equations
x + z = 3
ax + y = 2
3x + y + bz = 7
has a unique solution if (a, b) is equal to

(a) (1, 2)

(b) (2, 1)

(c) (1, 1)

(d) (− 1, 4)

Answer: (c)

90. The greatest resultant which two forces can have is P and the least is Q. If they act at an angle α , then the resultant is of magnitude

(a) $\sqrt{(P^2 + Q^2)}$

(b) $\sqrt{(P^2 - Q^2)}$

(c) $\sqrt{(P^2 \cos^2(\alpha/2) + Q^2 \sin^2(\alpha/2))}$

(d) $\sqrt{(P^2 \cos^2 \alpha + Q^2 \sin^2 \alpha)}$

Answer: (c)

91. The equation $x^2/(1 - r) - y^2/(1 + r) = 1$, $|r| < 1$ represents

(a) an ellipse

(b) a hyperbola

(c) a circle

(d) none of the above

Answer: (b)

92. The function defined by

$$f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

at x = 0 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)

93. A force represented by $\hat{i} + 2\hat{j} + \hat{k}$ passes through a point (2, 3, 1). The moment of the force about point (1, 2, − 1) is

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

(b) $3\hat{i} - \hat{j} - \hat{k}$

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

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

Answer: (c)

94. The tangent to the curve $x = 2at^2/(1 + t^2)$, $y = 2at^3/(1 + t^2)$ at the point for which $t = 1/2$, is

(a) $13x - 16y = 2a$

(b) $13x + 16y = 2a$

(c) $13x - 8y = 4a$

(d) $13x + 8y = 4a$

Answer: (a)

95. If $x + 1/x = 2 \cos(\pi/5)$, then $x5 + 1/x5$ is equal to

(a) − 2

(b) 0

(c) 1

(d) 5

Answer: (a)

96. A, B and C undertake to do a work for ₹ 500. A and B together do 2/5 of the work and rest is done by C alone. How much amount should C get ?

(a) ₹ 300

(b) ₹ 360

(c) ₹ 200

(d) ₹ 180

Answer: (a)

97. A body is projected with velocity 40 metre per second inclined at an angle 60° with horizontal. The velocity of the body when it is at maximum height is

(a) 10 m/s

(b) 20 m/s

(c) 15 m/s

(d) 5 m/s

Answer: (b)

98. If 1, ω, ω^2 are the cube roots of unity, then the value of $(1 + \omega^2)(1 + \omega4)(1 + \omega8)(1 + \omega^16)$ is

(a) −1

(b) 0

(c) 1

(d) 2

Answer: (c)

99. For any two sets A and B, A − (A − B) equals

(a) A − B

(b) B

(c) A ∪ B

(d) A ∩ B

Answer: (d)

100. The distance of centre of gravity of uniform semicircular lamina of radius a, from the centre is

(a) a/2

(b) 2a/3π

(c) a/3

(d) 4a/3π

Answer: (d)

101. The intercept on the line y = x by the circle $x^2 + y^2 - 2x = 0$ is AB. Equation of circle with AB as diameter is

(a) $x^2 + y^2 = 1$

(b) $x^2 + y^2 = 2$

(c) $x^2 + y^2 - x - y = 0$

(d) $x^2 + y^2 - 3x - 3y + 4 = 0$

Answer: (c)

102. If A and B are two matrices such that AB = B an A = A, then $A^2 + B^2$ is equal to

(a) 2AB

(b) 2BA

(c) A + B

(d) AB

Answer: (c)

103. A stone thrown up is caught by the thrower after 6 sec. What will be the velocity of stone after 2 sec of its throwing ? ($g = 9.8\ m/s^2$)

(a) 9.8 m/s

(b) 10.2 m/s

(c) 19.6 m/s

(d) 20.0 m/s

Answer: (a)

104. The equation of the directrix of the parabola $y^2 + 4x + 4y + 2 = 0$ is

(a) x = −1

(b) x = 1

(c) x = −3/2

(d) x = 3/2

Answer: (d)

105. $\lim_{y \to a} \left(\sin\left(\frac{y-a}{2}\right) \cdot \tan\left(\frac{\pi y}{2a}\right)\right)$ is equal to

(a) 0

(b) 1

(c) π/a

(d) $-a/\pi$

Answer: (d)

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

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

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

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

(d) $\pi/2$

Answer: (b)

107. For any complex number z, the minimum value of $|z + 1| + |z - 2|$ is

(a) −1

(b) 1

(c) 2

(d) 3

Answer: (d)

108. The number of generators of a cyclic group of or 10 is

(a) 2

(b) 3

(c) 4

(d) 5

Answer: (c)

109. Distance between the straight lines $x + 2y = 5$ and $2x + 4y = 11$ is

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

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

(c) $\sqrt{5}$

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

Answer: (b)

110. If three forces acting in one plane upon a rigid body, keep the body in equilibrium, then

(a) They must meet in a point

(b) They must be parallel

(c) They must either meet in a point or be parallel

(d) They must be perpendicular

Answer: (c)

111. The value of n, for which $(an+^{1} + bn+^{1})/(an + bn)$ is the harmonic mean of a and b, is

(a) – 1

(b) 0

(c) 1

(d) 1/2

Answer: (a)

112. If x is a real number, then the function $f(x) = x^3 + x^2 + x + 1$ has

(a) maximum value at x = 0

(b) minimum value at x = 1

(c) maximum value at x = – 1

(d) neither maximum nor minimum value

Answer: (d)

113. The minimum value of 4 cos θ + 3 is

(a) −3

(b) −1

(c) 0

(d) 1

Answer: (b)

114. Two finite sets have m and n elements respectively. The number of subsets of the first set is greater than the number of the subsets of the second by 56. Then the value of $m^2 + n^2$ is equal to

(a) 40

(b) 38

(c) 42

(d) None of the above

Answer: (d)

115. Ram can throw a ball vertically to a maximum height of 40 metres, then he can throw the ball in horizontal direction to which maximum distance ?

(a) $40\sqrt{2}$ metre

(b) $20\sqrt{2}$ metre

(c) 20 metre

(d) 80 metre

Answer: (d)

116. How many words can be formed with the letters of the word 'POSTMAN', if every word begins with T and ends with M ?

(a) 60

(b) 120

(c) 360

(d) 720

Answer: (b)

117. If $f(x + 1/x) = x^3 + 1/x^3$, then $f(\sqrt{3})$ is equal to

(a) 0

(b) 1

(c) $\sqrt{3}$

(d) $3\sqrt{3}$

Answer: (a)

118. The order of the differential equation $y - x(dy/dx)^3 = a(y^2 + (dy/dx)^2)$ is

(a) 3

(b) 1

(c) 2

(d) 4

Answer: (b)

119. If the foci of the ellipse $x^2/16 + y^2/b^2 = 1$ and the hyperbola $x^2/144 - y^2/81 = 1/25$ coincide, then the value of b^2 is

(a) 1

(b) 5

(c) 7

(d) 9

Answer: (c)

120. If $\vec{A}$ and $\vec{B}$ are two vectors, then angle between vectors $\vec{A} + \vec{B}$ and $\vec{A} \times \vec{B}$ is

(a) 0°

(b) 60°

(c) 90°

(d) 120°

Answer: (c)

121. Which of the following is an open set ?

(a) S = {1, 1/2, 1/3, ...}

(b) N

(c) Z

(d) $S = \{x \in R : 1 < x < 3\}$

Answer: (d)

122. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three vectors in such a way that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 1$, $|\vec{b}| = 4$, $|\vec{c}| = 2$, then the value of $2(\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a})$ is equal to

(a) 21

(b) −21

(c) 19

(d) −21/2

Answer: (b)

123. The co-ordinates of a moving point are $(2t^2 + 4, 4t + 6)$. Its locus will be

(a) Circle

(b) Straight line

(c) Parabola

(d) None of the above

Answer: (c)

124. For all $x \in (-1, 1)$, $\tanh^{-1}x$ is equal to

(a) $\log(x + \sqrt{(x^2 + 1)})$

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

(c) $(1/2) \log ((1 + x)/(1 - x))$

(d) $(1/2) \log ((x + 1)/(x - 1))$

Answer: (c)

125. The number of generators of the cyclic group G of order 8 is

(a) 1

(b) 2

(c) 3

(d) 4

Answer: (d)

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