

**NAGALAND
Class XI
Mathematics
Sample Paper 1**

Time allowed: 3 hours

Maximum Marks: 80

General Instructions:

- i. Approximately 15 minutes is allotted to read the question paper and revise the answer.
- ii. The question paper consists of 22 questions.
- iii. All questions are compulsory.
- iv. Internal choice has been provided in some questions.
- v. Marks allocated to every question are indicated against it.

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

Section A

1. Choose the correct answer from the given alternatives.

1×10

- (a) The slope and y - intercept of the line $2x + 2y = 7$ are
- (i) Slope = -1 and y-intercept = $\frac{7}{2}$
 - (ii) Slope = 1 and y-intercept = $\frac{7}{2}$
 - (iii) Slope = -2 and y-intercept = $\frac{2}{7}$
 - (iv) Slope = 2 and y-intercept = 7
- (b) Which one of them is the solution for x, when x is integer and $12x > 30$?
- (i) 3
 - (ii) 1
 - (iii) 0
 - (iv) -1
- (c) Eccentricity of a circle is
- (i) 0
 - (ii) 1
 - (iii) Less than or equal to 1
 - (iv) None
- (d) The first negative term of the A.P. 62,57,52,..... is the
- (i) 10th
 - (ii) 18th
 - (iii) 14th
 - (iv) 12th
- (e) How many 7-digit numbers can be formed using the digits 1,2,0,2,4,2,4?
- (i) 420
 - (ii) 340

- (iii) 450
(iv) 360
- (f) The solution of $\sin\theta\cos\theta = \frac{\sqrt{3}}{4}$ is
- (i) $\theta = \frac{n\pi}{2} + \frac{\pi}{6}, n \in \mathbb{Z}$
(ii) $\theta = \frac{n\pi}{2} + (-1)^n \frac{\pi}{6}, n \in \mathbb{Z}$
(iii) $\theta = \frac{\pi}{2} + (-1)^n \frac{\pi}{6}, n \in \mathbb{Z}$
(iv) $\theta = \frac{n\pi}{2} - \frac{\pi}{6}, n \in \mathbb{Z}$
- (g) Find the points on z-axis which are at a distance $\sqrt{21}$ from the point (1, 2, 3)
- (i) (2, 7, 0), (-3, 2, 0)
(ii) (1, 7, 0), (4, 3, 0)
(iii) (0, 0, 7), (0, 0, -1)
(iv) (0, 0, -7), (0, 0, 1)
- (h) $\frac{1 + \cos A}{\sin A} = ?$
- (i) $\tan \frac{A}{2}$
(ii) $\cot \frac{A}{2}$
(iii) $\sin \frac{A}{2}$
(iv) $\cos \frac{A}{2}$
- (i) A is a set with 6 elements. So, the number of subsets is:
- (i) 12
(ii) 24
(iii) 32
(iv) 64
- (j) $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x - 2}$
- (i) 14
(ii) 16
(iii) 12
(iv) 18

Section B

2×5

2. Represent the complex number $z = 1 + i\sqrt{3}$ in the polar form.
3. In how many ways can 5 children be arranged in a row such that 2 boys x and y, (i) are always together (ii) are never sit together?
4. Prove that:
 $\cos 7x + \cos 5x + \cos 3x + \cos x = 4 \cos x \cdot \cos 2x \cdot \cos 4x$
5. If f and g are two functions: $R \rightarrow R$; $f(x) = 2x - 1$, $g(x) = 2x + 3$, then evaluate
(i) $(f + g)(x)$ (ii) $(f - g)(x)$ (iii) $(fg)(x)$ (iv) $\left(\frac{f}{g}\right)(x)$
6. Find the co-ordinates of foci for the conic represented by the equation $4x^2 + y^2 = 100$.

Section C

3×10

7. Insert three numbers between 1 and 256 so that the resulting sequence is a G.P.

OR

Find the sum of the n terms of the series $5 + 11 + 19 + 29 + \dots$

8. If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$
9. A pendulum, 36 cm long, oscillates through an angle of 10 degrees. Find the length of the path described by its extremity.
10. A school gave out medals on its sports day. 38 medals were given for soccer, 15 for basketball, and 20 for cricket. These medals were given to 58 students in all. Only three students got medals in all three sports. How many students received medals in exactly two of the three sports?
11. A person is working as a carpenter in a firm. The employer gave him the option of getting paid in two schemes
I – Rs 500 fixed and Rs 50 per hour
II – Rs 250 per hour
If the job takes x hours to get over then, for what values of x does the scheme I is beneficial for him.

OR

Solve graphically the following inequations:

$$2x + 3y \leq 6, x + 4y \leq 4, x \geq 0, y \geq 0$$

12. Find the sum of the following series upto n terms:

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots + \dots$$

OR

If S_1, S_2, S_3 be the sum of n, 2n and 3n terms of a GP respectively.

$$\text{Prove that } S_1(S_3 - S_2) = (S_2 - S_1)^2$$

13. A ladder 12 m long leaning against a wall begins to slide down. Its one end always remains on the wall and the other on the floor. Find the equation of the locus of a point P

which is 3 m from the end in contact with the floor. Identify the conic section represented by the equation.

14. Prove that: $\tan 70^\circ = \tan 20^\circ + 2\tan 50^\circ$

OR

Prove that:

$$\frac{\sin 3x + \sin 5x + \sin 7x + \sin 9x}{\cos 3x + \cos 5x + \cos 7x + \cos 9x} = \tan 6x$$

15. Solve $\sqrt{5}x^2 + x + \sqrt{5} = 0$.

16. Find the equation of the ellipse, with major axis along the x-axis and passing through the points (4, 3) and (-1, 4).

OR

Find the length of the axes, the eccentricity, co-ordinates of foci, equation of directrix for the ellipse whose equation is given by $25x^2 + 16y^2 = 400$

Section-D

5×6

17. Graph the given inequalities and shade the common solution region.

$$2x + y \geq 40, \quad x + 2y \geq 50, \quad x + y \geq 35$$

OR

(i) Find the derivative of $f(x) = -\frac{1}{x}$, using the first principle.

(ii) Evaluate: $\lim_{x \rightarrow 0} \frac{6^x - 3^x - 2^x + 1}{x^2}$

18. Find x and y if $\frac{(1+i)x - 2i}{3+i} + \frac{(2-3i)y + i}{3-i} = i$

OR

In an university, out of 100 students 15, offered Mathematics only; 12 offered Statistics only; 8 offered Physics only; 40 offered Physics and Mathematics; 20 offered Physics and Statistics; 10 offered Mathematics and Statistics, 65 offered Physics. Find the number of students who

(i) Offered Mathematics

(ii) Offered Statistics

(iii) Did not offer any of the above three subjects.

19. Show that $10^n + 3 \cdot 4^{n+2} + 5$ is divisible by 9 for each natural number n.

OR

Prove that: $1 + \frac{1+2}{2} + \frac{1+2+3}{3} + \dots + \frac{1+2+\dots+n}{n} = \frac{n(n+3)}{4}$

20. Find the mean and variance of the following data

Classes	0 - 30	30 - 60	60 - 90	90 - 120	120 - 150	150 - 180	180 - 210
Frequency	2	3	5	10	3	5	2

OR

The mean and standard deviation of 100 observations were calculated as 40 and 5.1 respectively by a student who took by mistake 50 instead of 40 for one observation. What are the correct mean and the standard deviation?

21. Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ where $\tan x = -\frac{4}{3}$, x is in quadrant II

OR

In a town of 10,000 families it was found 40% of families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three newspapers, find the number of families which buy newspaper:

- (i) A only
- (ii) B only
- (iii) None of A, B, and C

22.

$$5(2x - 7) - 3(2x + 3) \leq 0; 2x + 19 \leq 6x + 47 \text{ and } 7 \leq \frac{(3x+11)}{2} \leq 11$$

OR

How many litres of water will have to be added to 1125 litres of a 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?