

**Nagaland Board
Class XI
Mathematics**

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) Three numbers are in G.P. if each is multiplied by 2, the resulting sequence is
- (i) A G.P. with the same common ratio as the original G.P.
 - (ii) A G.P. with the double common ratio as the original G.P.
 - (iii) A G.P. with the common ratio 2 more than the common ratio of the original G.P.
 - (iv) A G.P. with half the common ratio as the original G.P.
- (b) Which of the following is finite set?
- (i) Set of natural numbers.
 - (ii) The set of numbers which are multiples of 5.
 - (iii) The set of line parallel to y – axis.
 - (iv) Sets of roots of the equation $x^2 - 25 = 0$.
- (c) In ΔABC , $\sin 2A = ?$
- (i) $2\sin(B + C)\cos(B - C)$
 - (ii) $2\sin(B - C)\cos(B + C)$
 - (iii) $2\sin(B - C)\cos(B - C)$
 - (iv) $-2\sin(B + C)\cos(B + C)$
- (d) Let E and F be two events than the notation for probability of neither E nor F occurs is
- (i) $P(\overline{E} \cap \overline{F})$
 - (ii) $P(\overline{E \cup F})$
 - (iii) $1 - P(E \cup F)$
 - (iv) All of the above
- (e) Compute : $\frac{7!}{5! \times 3!}$
- (i) 7
 - (ii) 5
 - (iii) 6

- (iv) 3
- (f) Which is not true for the graph of the real function $y = x^2$
- The graph of the given function is a parabola.
 - The parabola will be open upward.
 - The least value of x^2 is one and will be so when $x = 1$.
 - For this function domain \neq Real numbers.
- (g) In the ellipse $x^2 + 3y^2 = 9$ the distance between the foci is
- $3\sqrt{6}$
 - 3
 - $\sqrt{6}$
 - $2\sqrt{6}$
- (h) Equation of a line through the points (2,3) and (5,3) is:
- $y = 5$
 - $y = 3$
 - $x - y = 2$
 - $x + 2y = 5$
- (i) Coefficient of variation is
- The standard deviation of the data set for which mean is unity.
 - The variance of the data set for which mean is unity.
 - Both A and B
 - None
- (j) $\lim_{x \rightarrow 0} \frac{e^x + e^{-x} - 2}{x^2}$
- 1
 - 0
 - $\frac{1}{2}$
 - 1

Section B

2×5

- If the sum of n terms of an A.P is $(pn + qn^2)$ where p, q are constants, find the common difference.
- Find the equation of a circle which passes through the points (2, -2), and (3, 4) and whose centre lies on the line $x + y = 2$.
- Shankar has 6 friends. In how many ways can he invite one or more of them to a party at his home?
- Find the general solution of the equation $\sec^2 2x = 1 - \tan 2x$
- If $x - iy = \sqrt{\frac{a-ib}{c-id}}$, find $(x^2 + y^2)^2$.

Section C

3×10

7. Evaluate: $\lim_{x \rightarrow 0} f(x)$, where

$$f(x) = \begin{cases} x, & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$$

OR

Differentiate: $y = \sqrt{\sin x}$ by using first principle.

8. Find the derivative of $f(x) = \frac{2}{x+1} - \frac{x^2}{3x-1}$

9. Prove that $\cos^2 x + \cos^2(x + \frac{\pi}{3}) + \cos^2(x - \frac{\pi}{3}) = \frac{3}{2}$

10. Prove that: $\cos 2\theta \cos \frac{\theta}{2} - \cos 3\theta \cos \frac{9\theta}{2} = \sin 5\theta \sin \frac{5\theta}{2}$

11. Find the domain and range of $f(x) = \sqrt{x-5}$

OR

Find the domain and range of $f(x) = \frac{3}{(2-x^2)}$

12. If the two diameters of a circle lie along the line $x - y - 9 = 0$ and $x - 2y - 7 = 0$ and the area of the circle is 154 sq. units, find its equation.

OR

Find the equation of the hyperbola with co-ordinates of foci as $(\pm 3\sqrt{5}, 0)$ and latus rectum of length 8 units.

13. Find the sum to infinity of the series: $\frac{1}{3} + \frac{1}{5^2} + \frac{1}{3^3} + \frac{1}{5^4} + \frac{1}{3^5} + \frac{1}{5^6} + \dots$

14. Evaluate: $(99)^5$ using the Binomial theorem

OR

Find the ratio of the co-efficient of x^2 and x^3 in the binomial expansion $(3 + ax)^9$

15. Determine the point in the XY plane which is equidistant from the points A(4, 0, 5), B(0, 5, 4) and C(0, 0, 1).

16. Evaluate: $\lim_{x \rightarrow \sqrt{2}} \frac{x^4 - 4}{x^2 + 3\sqrt{2x} - 8}$

OR

Differentiate $y = \sin(x^2 + 3)$ by the first principle.

Section-D

5×6

17. Plot the given linear inequations and shade the region which is common to the solution of all inequations $x \geq 0, y \geq 0, 5x + 3y \leq 500; x \leq 70$ and $y \leq 125$.

OR

Solve the inequality given below and represent the solution on the number line.

$$\frac{1}{2} \left(\frac{3x+20}{5} \right) \geq \frac{1}{3} (x-6)$$

18. Sum the series to n terms $2 + 4 + 7 + 11 + 16 + \dots$

OR

The sequence of natural numbers is divided into rows as follows:

			1	2			
		3	4	5	6		
	7	8	9	10	11	12	
13	14	15	16	17	18	19	20
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Find the sum of the numbers in the n^{th} row.

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. From a frequency distribution consisting of 18 observations the mean and the standard deviation were found to be 7 and 4 respectively. But on comparison of the original data, it was found that a figure 12 was misread as 21 in calculations. Calculate the correct mean and standard deviation.

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.

22. When two dice are thrown simultaneously, find the probability that neither a doublet nor a total of 10 will appear.

OR

(i) A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that

(a) all will be blue? (b) atleast one will be green?

(ii) A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If die is rolled once, determine

- (a) $P(2)$ (b) $P(1 \text{ or } 3)$ (c) $P(\text{not } 3)$