

**BVN SCHOOL KHAMBI  
PALWAL**

**Academic Session 2024-2025**

**Roll No.....**

**Date.....**

**11th Mathematics Set - A**

**Total Time: 3 Hrs 00 Mins**

**Max Marks: 80**

**General Instructions**

This Question Paper is Divided into 4 Sections

Section A Consists of 20 Questions

Section B Consists of 5 Questions

Section C Consists of 6 Questions

Section D Consists of 7 Questions

**Standard/Class: 11th**

**Subject: MATHEMATICS**

**Section A**

**Objective(MCQ) - (1 Marks)**

1. For any set A,  $(A')'$  is equal to [1]  
(a)  $A'$       (b)  $A$       (c)  $\emptyset$       (d) none of these
2. If R is a relation from a finite set A having m elements to a finite set B having n elements, then the number of relations from A to B is [1]  
(a)  $2^{mn}$       (b)  $2^{mn} - 1$       (c)  $2^{mn}$       (d)  $m^n$
3. If  $x = r \sin \theta \cos \Phi$ ,  $y = r \sin \theta \sin \Phi$  and  $z = r \cos \theta$ , then  $x^2 + y^2 + z^2$  is independent of [1]  
(a)  $\theta, \Phi$       (b)  $r, \theta$       (c)  $r, \Phi$       (d)  $r$
4.  $(\sqrt{-2})(\sqrt{-3})$  is equal to [1]  
(a)  $\sqrt{6}$       (b)  $-\sqrt{6}$       (c)  $i\sqrt{6}$       (d) none of these
5. The number of ways to arrange the letters of the word CHEESE are [1]  
(a) 240      (b) 120      (c) 720      (d) 6
6. If  ${}^n C_{12} = {}^n C_8$ , then  $n =$  [1]  
(a) 20      (b) 6      (c) 12      (d) 30

**Subjective - (1 Marks)**

7. Let  $A = \{2, 4, 6, 8\}$  and  $B = \{6, 8, 10, 12\}$ . Find  $A \cup B$ . [1]
8. Write the set  $\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}\}$  in the set-builder form. [1]
9. If  $(x + 1, y - 2) = (3, 1)$ , find the values of x and y. [1]
10. Convert  $40^\circ 20'$  into radian measure. [1]

11. Find the values of the trigonometric function  $\tan \frac{19\pi}{3}$  [1]
12. Express  $(-\sqrt{3} + \sqrt{-2})(2\sqrt{3} - i)$  in the form of  $a + ib$  [1]
13. Find the multiplicative inverse of  $-i$  [1]
14. Evaluate :  $4! - 3!$  [1]
15. From a class of 30 students, 3 are to be chosen for a competition. In how many ways can they be chosen. [1]
16. Write the first three terms of the following sequence defined by the following: [1]
- $$a_n = \frac{n-3}{4}.$$
17. Find the 10th and  $n^{\text{th}}$  terms of the G.P. 5, 25, 125, ... [1]
18. If  $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$ , find A and B. [1]
19. Solve:  $4x + 3 < 5x + 7$ . [1]
20. How many elements has  $P(A)$ , if  $A = \emptyset$ ? [1]

### Section B

#### **Subjective - (2 Marks)**

21. List all the subsets of the set  $\{-1, 0, 1\}$ . [2]
22. Find the domain of the function [2]
- $$f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}.$$
23. Prove that [2]
- $$\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x$$
24. If  $x + iy = \frac{a+ib}{a-ib}$ , prove that  $x^2 + y^2 = 1$ . [2]
25. Find the sum of the sequence 7, 77, 777, 7777, ... to n terms. [2]

### Section C

#### **Subjective - (3 Marks)**

26. How many different signals can be given using any number of flags from 5 flags of different colours ? [3]

27. If  $(x + iy)^3 = u + iv$ , then show that [3]

$$\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2).$$

28. Using binomial theorem, expand  $[(x + 1)^6 + (x - 1)^6]$ . [3]

29. If the first and the  $n^{th}$  term of a G.P. are  $a$  and  $b$ , respectively, and if  $P$  is the product of  $n$  terms, prove that  $P^2 = (ab)^n$ . [3]

30. If [3]

$\cot x = -\frac{5}{12}$ ,  $x$  lies in second quadrant, find the values of other five trigonometric functions.

31. Let  $A = \{1, 2\}$ ,  $B = \{1, 2, 3, 4\}$ ,  $C = \{5, 6\}$  and  $D = \{5, 6, 7, 8\}$ . Verify that [3]

(i)  $A \times (B \cap C) = (A \times B) \cap (A \times C)$ .   (ii)  $A \times C$  is a subset of  $B \times D$ .

### Section D

#### Subjective - (5 Marks)

32. Let [5]

$$f = \left\{ \left( x, \frac{x^2}{1+x^2} \right) : x \in \mathbf{R} \right\}$$

be a function from  $\mathbf{R}$  into  $\mathbf{R}$ . Determine the range of  $f$

**OR**

Find the domain and range of the following real functions:

$$(i) \quad f(x) = -|x| \qquad (ii) \quad f(x) = \sqrt{9 - x^2}.$$

33. If  $\alpha$  and  $\beta$  are different complex numbers with  $\beta \neq 1$ , then find [5]

$$\left| \frac{\beta - \alpha}{1 - \bar{\alpha}\beta} \right|$$

34. The sum of two numbers is 6 times their geometric mean, show that [5] numbers are in the ratio  $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$ .

**OR**

The sum of first three terms of a G.P. is  $39/10$  and their product is 1. Find the common ratio and the terms.

35. Prove that

$$\cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} = 6 \quad 2 \sin^2 \frac{3\pi}{4} + 2 \cos^2 \frac{\pi}{4} + 2 \sec^2 \frac{\pi}{3} = 10$$

[5]

### Case-Study

36.

[4]

**36** Anil and Sunil were playing with Word Scrabble game. Anil made the word "OBJECTIVE" and Sunil made the word "SUBJECTIVE".



Let X and Y respectively denote the set of letters of the words formed by Anil and Sunil.

Based on the above information, attempt any 4 questions.

- (i) Number of elements in X are  
(a) 6      (b) 7      (c) 8      (d) 9
- (ii) Find  $X \cap Y$ .  
(a) {J, E, C, T, I, V}      (b) {T, I, V, E}  
(c) {B, J, E, C, T, I, V}      (d) None of these
- (iii)  $n(X \cup Y) =$   
(a) 8      (b) 10      (c) 12      (d) 13
- (iv) Number of all possible subsets of X are  
(a)  $2^6$       (b)  $2^8$       (c)  $2^9$       (d)  $2^{11}$

37.

[4]

**37.** A company produces certain items. The manager in the company maintain record about cost and revenue of these items on daily basis. The cost and revenue functions of product are given by  $C(x) = 15x + 3000$  and  $R(x) = 45x + 1500$  respectively, where  $x$  is the number of items produced and sold.

Based on the given information, answer the following questions.

- (i) How many items must be sold to gain some profit?  
(a)  $x \geq 50$       (b)  $x < 50$       (c)  $x > 50$       (d)  $x \leq 50$
- (ii) How many items must be produced, so that the cost is less than 4500 rupees?  
(a) more than 100      (b) less than 100  
(c) 100      (d) 1000
- (iii) What will the minimum quantity of items to be sold so that, the revenue is greater than or equal to 10500 rupees?  
(a) 200      (b) 150      (c) 300      (d) 250
- (iv) If number of items produced lies between 200 to 250 then what will be the cost?  
(a)  $600 < C(x) < 675$       (b)  $6000 < C(x) < 6750$   
(c)  $6750 < C(x) < 7500$       (d)  $200 < C(x) < 250$

**38.** Amit and Purnima were discussing about trigonometric functions and identities. Amit said that I am an expert in solving problems based on trigonometry. So, Purnima said that she will give him two values,

$$\sin A = \frac{-3}{5} \text{ and } \cos B = \frac{5}{13}; \quad 0 < B < \frac{\pi}{2} \text{ and } \pi < A < \frac{3\pi}{2}$$

and asked to Amit to find out some other values.



Based on the given information, attempt any 4 questions.

(i) What will be the value of  $\cos A + \sin B$ ?

- (a)  $\frac{8}{65}$       (b)  $\frac{16}{65}$       (c)  $\frac{112}{65}$       (d)  $\frac{-16}{65}$

(ii) Find the value of  $\cos(A + B)$ .

- (a)  $\frac{112}{65}$       (b)  $\frac{16}{65}$       (c)  $\frac{65}{16}$       (d)  $\frac{65}{112}$

(iii) Calculate  $\tan(A + B)$ .

- (a)  $\frac{16}{63}$       (b)  $\frac{-63}{16}$       (c)  $\frac{112}{65}$       (d)  $\frac{63}{65}$

(iv) value of  $\sin 2A$  is

- (a)  $\frac{12}{5}$       (b)  $\frac{16}{5}$       (c)  $\frac{24}{25}$       (d)  $\frac{16}{25}$