



ST. MARGARET SR. SEC. SCHOOL

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SAMPLE PAPER-2023-24

SUBJECT: MATHEMATICS (041)

CLASS: XI

Time: 3Hr

MM- 80

General Instructions:

1. This question paper contains 5 sections A, B, C, D and E. Each section is compulsory.
2. Section A has 18 MCQ's and 2 Assertion- Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer type questions of 2 marks each.
4. Section C has 6 Short Answer type questions of 3 marks each.
5. Section D has 4 Long Answer type questions of 5 marks each.
6. Section E has 3 source based / case based / passage / integrated assessment of 4 marks each with sub-parts.

SECTION-A

1. If $A = \{1, 0\}$ and $n(B) = 3$ then $n(A \times B)$ will be

- (a) 2 (b) 3 (c) 6 (d) 9

2. If $(x+1, y-1) = (-1, 0)$ then value of x is

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

3. Value of $\cos 55^\circ + \cos 125^\circ + \cos 300^\circ$ is

- (a) 0 (b) $-\frac{1}{2}$ (c) $-\frac{\sqrt{3}}{2}$ (d) $\frac{1}{2}$

4. Domain of $\sqrt{1-x^2}$ is

- (a) $[-1, 1]$ (b) $(-1, 1)$ (c) $[0, 1]$ (d) None

5. Roaster form of $A = \{x | x \in \mathbb{N} \text{ and } x^3 < 10\}$ is

- (a) $A = \{1, 2\}$ (b) $A = \{1, 2, 3\}$ (c) $A = \{1\}$ (d) $A = \{0\}$

6. If $\sin x = \frac{3}{5}$, then $\cos x$ will be given $x \in$ III Quadrant

- (a) $\frac{4}{5}$ (b) $\frac{3}{4}$ (c) $-\frac{4}{5}$ (d) $-\frac{3}{4}$

7. If $n(A) = 2$ and $n(B) = 3$ then number of functions from A to B will be

- (a) 6 (b) 8 (c) 9 (d) None

8. If $A = \{1, 2\}$ and $B = \{2, 3\}$ then codomain of relation R from B to A will be

- (a) $\{1, 2\}$ (b) $\{2, 3\}$ (c) $\{1, 3\}$ (d) None

9. If $x, y \in \mathbb{R}$ and $(x+3y)+4i = 2+(2x-y)i$ then (x, y) will be

- (a) (2, 2) (b) (0, 2) (c) (2, 0) (d) (1, 1)

10. If $\frac{x}{10!} = \frac{1}{8!} + \frac{1}{9!}$ then value of x is

- (a) 90 (b) 80 (c) 72 (d) 100

11. If $z = (2-3i)^2$ then $\text{Re}(Z)$ will be

- (a) 13 (b) 12 (c) 5 (d) -5

12. The value of $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is
 (a) i^n (b) i^{n+1} (c) 0 (d) None
13. If $x \in \mathbb{N}$ and $4x + 3 < 6x + 7$ then the least value of x is
 (a) 0 (b) 1 (c) 2 (d) None
14. If $-\frac{2}{7}$, P and $-\frac{7}{2}$ are in GP, then the value of P is
 (a) 1 (b) -1 (c) Both 1 and -1 (d) None
15. Radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$ is
 (a) 7 (b) 4 (c) 5 (d) 49
16. Focus of the parabola $y^2 = 8x$ is
 (a) (0,2) (b) (2,0) (c) (0,4) (d) (4,0)
17. Length of major axis of $\frac{x^2}{4} + \frac{y^2}{9} = 1$ is
 (a) 4 (b) 9 (c) 6 (d) 16
18. Mean of first n natural numbers is
 (a) n (b) $\frac{n}{2}$ (c) $\frac{n(n+1)}{2}$ (d) $\frac{n+1}{2}$

19. Given below are two statements. One is labelled as assertion A and the other is labelled as reason R.

A: Simple event of an experiment of throwing a coin twice is $\{HH\}$ or $\{HT\}$ or $\{TT\}$ or $\{TH\}$.

R: In simple event of an experiment we always get only one outcome.

Now choose the correct option:

- (a) Both A and R are incorrect.
 (b) A is correct and R is incorrect.
 (c) Both A and R are correct.
 (d) A is incorrect and R is correct.

20. Given below are two statements. One is labelled as assertion A and the other is labelled as reason R.

A: Probability of getting either a prime number or an even number when die is thrown ones is $\frac{5}{6}$.

R: Events are mutually exclusive.

Now choose the correct option:

- (a) Both A and R are incorrect.
 (b) A is correct and R is incorrect.
 (c) Both A and R are correct.
 (d) A is incorrect and R is correct.

SECTION-B

21. Let $f = \{(1,1), (2,3), (-1,3)\}$ be a linear function from Z to Z , find $f(x)$.

22. Show that $\tan 3x \cdot \tan 2x \cdot \tan x = \tan 3x - \tan 2x - \tan x$.

OR

Show that $\cot x \cdot \cot 2x - \cot 2x \cdot \cot 3x = 1 + \cot 3x \cot x$.

23. Express $(2-3i)^3$ in the form of $a+bi$.

OR

Find the modulus of $Z = \frac{-16}{1+i\sqrt{3}}$

24. Solve for x ; $x \in R$

$$\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$$

25. Are the points $A(3,6,9)$, $B(10,20,30)$ and $C(25,-41,5)$ the vertices of right angle triangle?

SECTION-C

26. Find the range of the function $f(x) = \frac{x^2}{1+x^2}$; $x \in R$.

OR

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

27. Find the value of $\tan\left(\frac{\pi}{8}\right)$.

28. Find the conjugate of $\frac{(3-2i)}{(1+2i)} \cdot \frac{(2+3i)}{(2-i)}$.

29. Using the binomial theorem, Prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.

30. Find the equation of circle which passes through the points $(2,-2)$ and $(3,4)$ and whose centre lies on the line $x + y = 2$.

31. Find $\frac{dy}{dx}$ if $y = \frac{x \sin x}{2+3 \tan x}$.

OR

Find $\frac{dy}{dx}$ if $y = \frac{x^2 \cos x}{x+3}$

SECTION- D

32. If $\tan x = \frac{3}{4}$, $\pi < x < \frac{3\pi}{2}$, find the value of $\sin\left(\frac{x}{2}\right)$ and $\tan\left(\frac{x}{2}\right)$.

OR

Prove that $\sin 2x + 2 \sin 4x + \sin 6x = 2 \sin 2x \sin 5x \cos 5x$.

33. If arithmetic mean and geometric mean of two positive numbers a and b are 10 and 8 respectively, find the numbers.

34. Using first principle/ delta method find $\frac{dy}{dx}$ if $y = x \sin 2x$.

OR

Using first principle/ delta method find $\frac{dy}{dx}$ if $y = x^2 \tan x$.

35. Calculate standard deviation of the given data

CLASSES	30-40	40-50	50-60	60-70	70-80	80-90	90-100
FREQUENCY	3	7	12	15	8	3	2

SECTION-E (CASE-STUDIES/PASSAGE BASED QUESTIONS)

36. Letters of the word "PERMUTATIONS" are to be arranged by a student. In how many ways it can be done if

i) There are 6 letters between P and S. (2)

ii) All vowels are together. (2)

37. A person standing at the crossing of two straight lines represented by the is equations $2x-3y+4=0$ and $3x-5y+4=0$ wants to reach the path whose equation.

$6x-7y+8=0$ in the least time. Find:

i) the point at which the person is standing. (2)

ii) the equation of the path that he should follow. (2)

38. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of those students is selected at random. What is the probability that

i) The student opted for NCC or NSS. (2)

ii) The student has opted neither NCC nor NSS. (2)