SATLUJ PUBLIC SCHOOL

PRE-ANNUAL EXAMINATION (2024)

Set-B

MATHEMATICS (XI)

Time: 3 Hours MM: 80

General Instructions:
Question.1 to Question.20 - 1 Mark each.
Question.21 to Question.25 - 2 mark each.
Question.26 to Question.31 – 3mark each.
Question.32 to Question.35 - 5 mark each.
Question.36 to Question.38 – 4 Marks.

Q.1 The empty set is represented by
i) ∅ ii) {∅} iii) { } iv) { {} }

a) i) and ii) b) i) and iii) c) ii) and iii) d) i) and iv)

Q.2 The value of sin 105^0 is

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

Q.3 If $f(x) = x - \frac{22}{7}$, *then* $f(x)$*is*

a) 0 b) $\pi - \frac{22}{7}$ c) $\pi + \frac{22}{7}$ d) $\frac{22}{7}$

Q.4 The set $\{x : x \in R, -2 < x \leq 3\}$ in Roster form is:

a) {-2, 3} b) (-2, 3] c) [-2, 3] d) (-2, 3)

Q.5 cos(n+2)x cos (n + 4) x + sin (n +2) x sin (n +4) x is equal to:

a) sin 2n b) sin 2(n + 3)x c) $\sin^2 x - \cos^2 x$ d) $2\cos^2 - 1$

Q.6 If $y = \frac{10}{x^4}$, then $\frac{dy}{dx}$ is equal to:

a) $-\frac{40}{x^5}$ b) 40 x^3 c) $\frac{10}{x^3}$ d) None of these

Q.7 If lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel, then

a) $a_1a_2 + b_1b_2 = 0$ b) $a_1b_2 + a_2b_1 = 0$ c) $a_1a_2 - b_1b_2 = 0$ d) $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

Q.8 The number which does not indicate variability of data, is called
a) Range b) Median c) Standard Deviation d) Mean deviation

Q.9 The number of different message that can be represented by three 0's and two 1's is
a) 120 b) 20 c)10 d) 60

Q.10 If A, B and C are three mutually exclusive and exhaustive events of an experiment such that 4P(A) = 2P(B) = P(C), then P(A) is equal to
a) $\frac{3}{7}$ b) $\frac{4}{7}$ c) $\frac{1}{7}$ d) $\frac{2}{7}$

Q.11 Let set A = {2}, B = {3, 4, 5} and C = {5, 6}, then n [A x (B – C)] is
a) 1 b) 2 c) 3 d) 6

Q.12 The length of latus rectum of the parabola $y^2 = -15x$ is
a) $\frac{15}{2}$ b) -15 c) 15 d) 30

Q.13 In a hyperbola, if length of transverse axis is 2a and length of conjugate axis is 2b, then the length of latus rectum is:
a) $\frac{b^2}{a}$ b) $\frac{a^2}{b}$ c) $\frac{2b^2}{a}$ d) $\frac{2a^2}{b}$

Q.14 If ${}^nC_5 = {}^nC_7$, then ${}^nC_{n-2}$ is
a) 132 b) 120 c) 66 d) 6

Q.15 If A = {2, 3, 5, 7, 8}, B = {1, 5, 9} and U = {x : x ∈ *N and* x ≤ 9}A'∩B is
a) {1,2,9} b) {2, 9} c) {1, 9} d) None of these

Q.16 If $y = \left(\sqrt{x} - \frac{1}{2\sqrt{x}}\right)^2$, $\frac{dy}{dx}$ is
a) $2 - \frac{1}{4x^2}$ b) $1 - \frac{1}{2x^2}$ c) $1 - \frac{1}{x^2}$ d) $1 - \frac{1}{4x^2}$

Q.17 The solution set of inequality $4x - 1 < 15$, $x \in N$ is

a) {1, 2, 3, 4} b) (1, 3) c) {1, 2, 3} d) $(x : x \in R, x < 4\}$

Q.18 The standard form $i^{19} - 2i^{27} + 6$ is

a) $6 + 2i$ b) $6 + i$ c) $6 - i$ d) $6i$

Q.19 **Assertion (A):** The minimum value of $\sqrt{\tan x} + \sqrt{\cot x}$ is 2.
Reason (R) : A.M. $\geq$G.M.

A Both (A) and (R) are true, but (R) is not the correct explanation of (A).
B Both (A) and (R) are true and (R) is the correct explanation of (A).
C Both (A) and (R) are false.
D (A) is false, but (R) is true.

Q.20 **Assertion (A):** The sum of 8 terms of the progression 3, 6, 12, ...is 765
Reason (R) : In G.P., $a_n = ar^{n-1}$

A Both (A) and (R) are true, but (R) is not the correct explanation of (A).
B Both (A) and (R) are true and (R) is the correct explanation of (A).
C Both (A) and (R) are false.
D (A) is false, but (R) is true

Q.21 Show that two formulae for standard deviation

$\sigma = \sqrt{\frac{1}{n}\sum(x_i - \overline{x})^2}$ and $\sigma = \sqrt{\frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2}$ are equivalent.

Or

Find the mean deviation from median of the set of observations 3, 9, 5, 3, 12.

Q.22 The angle between two lines is $\frac{\pi}{4}$ and slope of one line is $\frac{1}{2}$, then find slope of other line.

Or

Two vertices of a triangle ABC are A(3, 4, 2) and B(1,3,2). The medians of a triangle intersect at (2, 4, 3). Find the coordinates of third vertex C.

Q.23 Write the Set A = {-1, 1, $-\frac{1}{2}$, i} in set builder form.

Q.24 Find the derivative of $\frac{x^2}{\cos x}$ with respect of x.

Q.25 Find the value of $\sin 22\frac{1}{2}^0$.

Q.26 The hypotenuse of an isosceles right angled triangles has its ends at the points (1, 3) and (-4, 1). Find the equation of the legs (perpendicular sides) of the triangle.

Or

Find the equation for the ellipse that satisfies the given conditions: Vertices $(0, \pm 13)$, foci $(0, \pm 5)$

Q.27 In how many ways can the letters of the word 'MATHEMATICS' be arranged so that all the vowels are not together?

Q.28 If $a = \cos\theta + i\sin\theta$, then find the value of $\frac{1+a}{1-a}$

Or

If a, b, c are in A.P., then prove that $a^3 + 4b^3 + c^3 = 3b(a^2 + c^2)$

Q.29 Prove that: $\left(1 + \cos\frac{\pi}{8}\right)\left(1 + \cos\frac{3\pi}{8}\right)\left(1 + \cos\frac{5\pi}{8}\right)\left(1 + \cos\frac{7\pi}{8}\right) = \frac{1}{8}$

Q.30 Find the derivatives of f(x) from the first principles where f(x)= sin x + cos x.

Or

Evaluate : $\lim_{x \to a} \frac{\sin x - \sin a}{\sqrt{x} - \sqrt{a}}$

Q.31 Find the well shuffled deck of 52cards, a card is drawn at random. Find the probability of getting
i) a heart ii) a black card iii) a face card

Q.32 Prove that $\sin 10^0 . \sin 30^0, \sin 50^0 . \sin 70^0 = \frac{1}{16}$
Hence find the value of $\cos 20^0 \cos 40^0 \cos 60^0 \cos 80^0$

Q.33 If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, *prove that:* $\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$

Or

Let $f : [3, \infty) \to R$ *and* $g : [-2, \infty) \to R$ be two real functions defined by
$f(x) = \sqrt{x - 3}$, $g(x) = \sqrt{x + 2}$. Find f + g, fg and $\frac{f}{g}$.

Q.34 Show that the middle term in the expansion of $\left(x^2+\frac{1}{x^2}-2\right)^2$ is $(-1)^n\frac{1,3,5.....(2n-1)}{n!}2^n$

Or

Find the mean, variance and standard deviation for the following data –

C.I.	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	3	6	13	15	14	5	4

Q.35 Find n geometric means between two quantities and prove that the product of n geometric means between two quantities is equal to the nth power if single geometric mean of those two quantities.

Or

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

Q.36 In a class of 50 students, 20 students play football and 16 students play hockey. It is found that 10 students play both the games:

a) Find the number of students who play football only.
b) Find the number of students who play hockey only.
c) Find the number of students who play at least one of these games.

Or

Find the number of students who neither play football nor hockey.

Q.37 A group of students of class 11th planned for the movie. The first students spends ₹ 50/- in interval and there after every students spent double the amount spent by previous students.

a) Name the progression of amount spent.
b) Find the amount spent by Seventh student.
c) Find the total amount spent by first 5 students.

Q.38 Three students of class 11 named A, B, C are standing in a play ground at positions (1, 4), (2, -3) and (-1, -2) with respect to two mutually perpendicular lines drawn in the play ground. AM is the altitude from vertex A on side BC and AD is the medium meeting side BC at D.

Based on the above information, answer the following questions:

a) Find the coordinates of mid point D of side BC.
b) Find the distance between A and B.
c) Find the equation of the median AD through A.

Or

Find the equation of the altitude passing through A.