ABHINAV PUBLIC SCHOOL

SUMMATIVE ASSESSMENT -1

SESSION 2022-23

SUBJECT: MATHEMATICS (SET-A)

GRADE: XI

Name of the student: Nadia

Day and Date: Friday, 14th October 2022

Max. Marks: 80

Duration: 3 Hrs

General Instructions:

(i) This question paper contains – five sections – A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.

(ii) Section-A has 18 MCQ's and 2 Assertion-Reason based questions of 1 mark each.

(iii) Section-B has 5 Very Short Answer (VSA)-type questions of 2 marks each.

(iv) Section-C has 6 Short Answer (SA)-type questions of 3 marks each.

(v) Section-D has 4 Long Answer (LA)-type questions of 5 marks each.

(vi) Section-E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

SECTION – A

(Multiple Choice Questions)
Each question carries 1 mark

Q.1 If $\frac{1}{6!}+\frac{1}{7!}=\frac{x}{8!}$, find x.

(a) 640 (b) 28

(c) 64 (d) None of these

Q.2 How many 5-digit telephone numbers can be constructed using the digit 0 to 9 if each number starts with 67 and no digit appears more than once?

(a) 336 (b) 790

(c) 490 (d) None of these

Q.3 Find r, if $5^4 p_r = 6^5 p_{r-1}$

(a) 8 (b) 3

(c) both 8 and 3 (d) None of these

OR

If ${}^nC_8 = {}^nC_2$, find ${}^nC_2$.

(a) 45 (b) 54

(c) 10 (d) None of these

Q.4 Solve the following in equation:

$$\frac{2x-3}{4}+9 \geq 3+\frac{4x}{3}$$

(a) $\left(0, \frac{63}{p}\right)$ (b) $\left(-\infty, \frac{63}{10}\right]$

(c) $\left(0, \frac{63}{10}\right)$ (d) $\left[0, \frac{63}{10}\right)$

Q.5 Representation of Set A = $\{x : x \in Z, x^2 < 20\}$ in the roster form is

(a) {1, 2, 3...20}
(b) {1, 2, 3, 4}
(c) {0, 1, 2, 3, 4}
(d) {−4, −3, −2, −1, 0, 1, 2, 3, 4}

Q. 6 If $A \subset B$ than

(a) $a \in A \Rightarrow a \notin B$
(b) $a \in A \Rightarrow a \in B$
(c) $a \notin A \Rightarrow a \in B$
(d) $a \notin B \Rightarrow a \in A$

Q.7 For disjoint set A and B

n (A) = 5, n(B) = 5 then $n(A \cap B)$ is

(a) 0
(b) 3
(c) 5
(d) 8

Q. 8 Which of the following is a null set?

(a) $\{x \in N : x+3=3\}$
(b) $\{x \in w : x+3=5\}$
(c) $\{n \in Q : x+3=1\}$
(d) $\{n \in R : 3x=1\}$

Q. 9 The radius of the circle whose arc of length 15π cm makes an angle of $\frac{3\pi}{4}$ radian at the centre is

(a) 10 cm
(b) 20 cm
(c) $11\frac{1}{4}$ cm
(d) $22\frac{1}{2}$ cm

Q.10 If $\tan\theta \frac{-1}{\sqrt{5}}$ and θ lies in the IV quadrant, then the value of $\cos\theta$ is

(a) $\frac{\sqrt{5}}{\sqrt{6}}$
(b) $\frac{2}{\sqrt{6}}$
(c) $\frac{1}{2}$
(d) $\frac{1}{\sqrt{6}}$

Q.11 The value of $Sin^2 75° - Sin^2 15°$ is

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

Q.12 The value of $\tan\theta \sin\left(\frac{\pi}{2}+\theta\right)\cos\left(\frac{\pi}{2}-\theta\right)$ is

(a) 1
(b) −1
(c) $\frac{1}{2}\sin 2\theta$
(d) None of these

Q.13 Given Set A = {a, b} and Set B {1, 2), possible relations from Set A to Set B are

(a) 2
(b) 4
(c) 16
(d) 8

Q.14 The value of [4.97] is

(a) 4.97 (b) – 4.97

(c) 5 (d) 4

Q.15 If P×Q is an empty set then which of the following is a null set?

(a) Only P (b) Only Q

(c) Either P or Q (d) Both P and Q

Q.16 Conjugate of complex number $i^3 - 4$ is

(a) $i^3 + 4$ (b) $4 - i$

(c) $-4 + i$ (d) $-4 - i$

Q.17 $1 + i^2 + i^4 + i^6 + \ldots\ldots + i^{2n}$ is

(a) positive (b) negative

(c) 0 (d) can not be evaluated

Q.18 If $(3 + 4i)^2 = a - bi$, then

(a) $a = 25, b = 24$ (b) $a = -16, b = 24$

(c) $a = -7, b = -24$ (d) $a = -7, b = 24$

ASSERTION-REASON BASED QUESTIONS

Q.19 **Assertion (A):** We can list the months a year starting with T.

Reason (R): We can write all months of a year and then decide

Q.20 **Assertion (A):** For a set A, $n(A \times A) \neq 12$

Reason (R): $(x, y) \in A \times B \Rightarrow x \in A$ *and* $y \in A$

SECTION-B

(This section comprises of Very Short answer type questions)
VSA of 2 marks each.

Q.21 Find all pairs of consecutive even positive integers, both of which are larger than 8, such that their sum is less than 25.

OR

IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$ when MA is mental age and CA is chronological age. If $80 \leq 140$ for a group of 12 year children, find the range of this mental age.

Q.22 If R is the set of real number and Q is the set of rational numbers, then what is R – Q. Also draw Venn Diagram.

Q.23 Taking the set of natural numbers as the universal set, write down the complent of {x: x+5 = 8}.

Q.24 Let A {1, 2} and B = {3, 4}, write A×B. How many subsets will A×B have? List them.

Q.25 Prove that

$$\frac{\cos(\pi + x)\cos(-x)}{\sin(\pi - x)\left(\frac{\pi}{2} + x\right)} = \cot^2 x$$

608

SECTION-C

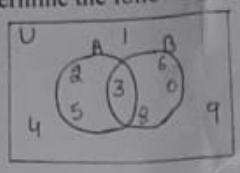
(This section comprises of Short Answer Type questions (SA) of 3 marks each.

Q.26 From given figures, determine the following sets

(i) $A \cup B$

(ii) A – B

(iii) $(A \cap B)'$



OR

Let $A=\{x: x \in N\}$, $B=\{x: x=2n \ \ x \in N\}$, $C=\{x: x=2n-1 \ \ x \in N\}$.

Find: (i) $A \cap B \cap C$ (ii) $A-B$ (iii) $A \cap B$

Q.27 Let A = {1, 2, 3….,14). Define a relation R from a set A to A by R = {(x, y): 3x – y = 0, where $x, y \in A$ }. Write 'R' in Roster form and hence write its domain, range and codomain.

Q.28 Prove that:

$\sin x+\sin 3x+\sin 5x+\sin 7x=4\cos x\cos 2x\sin 4x$

OR

Show that:

$\tan 3x \tan 2x \tan x=\tan 3x-\tan 2x-\tan x$

Q.29 Show that: $(x+iy)^3=u+iv$, then show that $\frac{u}{x}+\frac{v}{y}=4\left(x^2-y^2\right)$

Q.30 Let $Z_1 = 2 - i$, $Z_2 = -2 + i$, find $\operatorname{Im}\left(\frac{1}{Z_1 \overline{Z_2}}\right)$

OR

If $Z_1 = 2 - i$, Z_2 1 + i, find $\left|\frac{z_1+z_2+1}{z_1-z_2+1}\right|$

Q.31 A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done, when the committee consists of at least 3 girls?

SECTION-D

(This section comprises of Long Answer type questions (LA) of 5 marks each.

Q.32 A mathematics paper consists of 10 questions divided into two parts I and II, each part containing 5 questions. A student is required to attempt 6 questions in all, taking at least 2 questions each part. In how many ways the students select the questions?

OR

If the different permutations of all letter of the word EXAMINATION are listed in a dictionary, how many words are there in this list before the first word starting with E?

Q.33 Find domain and range of the real function f(x) defined by

$$f(x)=\begin{cases}1-x & x<0\\ 1 & x=0\\ x-1 & x>0\end{cases}$$ and have its graph.

Also draw its graph.

Q.34 If, $\tan x = \frac{3}{4}$, $\pi < x < \frac{3\pi}{2}$ find the value of $\sin\frac{x}{2}$, $\cos\frac{x}{2}$ *and* $\tan\frac{x}{2}$

Q.35 The longest side of a triangle is three times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm. Find the minimum length of the shortest side.

SECTION – E

(This section comprises of 3 case study question of 4 marks each having three sub parts (i), (ii), (iii) of marks 1, 1, 2 respectively)

Q.36 **CASE STUDY 1**

A school administration decides to send some of its students of class XI to an educational tour. From a class of 25 students, 10 are to be chosen for the tour. There are 3 friends – Rajesh, Shreya and Deepa – who decide that either all of them will join or none of them will join.

Based on the above information, answer the following:

(i) In how many ways can the students be chosen for this educational tour, if these three friends will join?

(ii) In how many ways can the students be chosen for this educational tour, if these three friends will not join?

(iii) In how many ways can the students be chosen for this educational tour?

Q.37 **CASE STUDY 2**

Given complex number is

$Z = (1+i)^2$

Based on the above information, answer the following question:

(i) Write standard form of Z.

(ii) Write conjugate of complex number of Z.

(iii) Calculate inverse of Z.

Q.38 A manufacturer has 640 litres of 8% boric acid solution and 1300 litres of 2% boric acid solution. To dilute the 8% boric acid solution, manufacturer added some amount of 2% boric acid solution into it.

(i) The maximum amount of 2% boric acid solution to be added so that the resulting mixture is to be more than 4% boric acid is

(a) 1280 litre (b) 1278 litre

(c) 1300 litre (d) 1200 litre

(ii) The maximum amount of 2% boric acid solution left after adding to 8% boric acid solution so that the resulting mixture to be less than or equal to 6% boric acid is

(a) 20 litre (b) 800 litre

(c) 980 litre (d) 1200 litre

(iii) If the manufacturer used water in place of boric acid solution for dilution of 8% boric acid solution, then find the amount of water to be added so that the resulting mixture is more than 2% boric acid solution.

1201.