BRAIN INTERNATIONAL SCHOOL

SESSION 2024-25

CLASS : XI **TERM 1 REVISION SHEET** **SUBJECT : MATHEMATICS**

SETS

Q1. A and B are two sets such that $n\ (A - B) = 14 + x, n\ (B - A) = 3x$ and $n(A \cap B) = x$, draw a Venn diagram to illustrate information and if $n\ (A) = n\ (B)$ then find the value of x.

Q2. A survey of 500 television viewers produced the given information; 285 watch football, 195 watch hockey, 115 watch cricket, 45 watch football and cricket, 70 watch football and hockey, 50 do not watch any of the three games. How many watch exactly one of the three games?

Q3. There are 20 students in a Chemistry class and 30 students in a Physics class. Find the number of students who are either in Physics class or Chemistry class in the following cases:

(i) Two classes meet at the same time.
(ii) The two classes meet at different hours and ten students are enrolled in both the courses.

Q4. If $A = \{1, 2, 3, 4, 5\}, B = \{1, 3, 5, 8\},\ C = \{2, 5, 7, 8\}$, verify that $A - (B \cup C) = (A - B) \cap (A - C)$.

Q5. In a class of 35 students, 17 have taken Mathematics, 10 have taken Mathematics but not Economics. Find the number of students who have taken both Mathematics and Economics and the number of students who have taken Economics but not Mathematics, if it is given that each student has taken either Mathematics or Economics or both.

Q6. If U $= \{x : x \leq 10,\ x \in N\},\ A = \{x : x \in N, x\ is\ prime\}, B = \{x : x \in N, x\ is\ even\}$, write $A \cap B'$ in roster form.

Q7. In a survey of 5,000 people in a town, 2250 were listed as reading English newspaper, 1750 as reading Hindi newspaper and 875 were listed as reading both Hindi as well as English. Find how many people do not read Hindi or English newspaper. How many people read only English newspaper?

Q8. If $A = \{1, 2, 3, 4, 5\}, B = \{2, 4, 6, 8\}$. Find A – B.

Q9. Write all subsets of set $A = \{1, 2, 3\}$.

Q10. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports. How many received medals in exactly two of the three sports?

RELATIONS AND FUNCTIONS

Q1. Find x and y, if $(x + 3, 5) = (6, 2x + y)$.

Q2. Let $f : R \to R$ be given by $f(x) = x^2 + 3$. Find

(i) $\{x : f(x) = 28\}$
(ii) The pre-images of 39 and 2 under 'f'

Q3. Determine the domain and range of the relation R defined by $R = \{(x + 1,\ x + 5) : x \in (0, 1, 2, 3, 4, 5)\}$.

Q4. Let $A = (1, 2, 3, 4, 6)$. Let R be the relation on A defined by $\{(a, b) : a, b \in A\ a\ divides\ b\}$

(i) Write R in roster form
(ii) Find the domain of R
(iii) Find the range of R

Q5. Draw the graph of Signum function $f : R \to R$ defined by $f(x) = \begin{cases} 1, & if\ x > 0 \\ 0, & if\ x = 0 \\ -1, & if\ x < 0 \end{cases}$.

Q6. Draw the graph of greatest integer function

Q7.

(i) Determine the domain and the range of the relation R, where $\{(x, x^3) : x$ is a prime number less than $10\}$
(ii) Let $f, g : R \to R$ be defined respectively by $f(x) = x + 1$ and $g(x) = 2x - 3$. Find $f + g; f - g;\ fg$.

Q8. The relation R is defined as $R = [(x,\ x + 5) : x \in (0, 1, 2, 3, 4, 5)]$. Write R in roster form. Write its domain and range.

Q9. Find domain and range of the real function $f(x)$, defined by $f(x) = \begin{Bmatrix} 1 - x, & x < 0 \\ 1, & x = 0 \\ x - 1, & x > 0 \end{Bmatrix}$ and draw its graph.

Q10. If $f : R \to R$ is defined by $f(x) = [x]$, the greatest integer function, find its domain, range and draw its graph.

TRIGONOMETRIC FUNCTIONS

Q1. Find the value of the following:

(i) $\tan \frac{19\pi}{3}$

(ii) $\cot\left(\frac{-15\pi}{4}\right)$

Q2. If $\tan x = \frac{3}{4}$ and x lies in the third quadrant, find the values of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $tan \frac{x}{2}$.

Q3. Prove that: $\cos 20^0\ \cos 40^0\ \cos 60^0\ \cos 80^0 = \frac{1}{16}$.

Q4. Prove that: $\tan 50^0 = \tan 40^0 + 2\ \tan 10^0$.

Q5. Prove that: $\frac{\sin A.\sin 2A+\sin 3A.\sin 6A}{\sin A.\cos 2A+\sin 3A.\cos 6A} = \tan 5A$.

Q6. If $\tan A = k \tan B$, show that $\sin(A+B) = \left(\frac{k+1}{k-1}\right)\sin(A-B)$.

Q7. Evaluate: $\sin\frac{7\pi}{12}\cos\frac{\pi}{4} - \cos\frac{7\pi}{12}\sin\frac{\pi}{4}$.

Q8. Prove that: $\sin 20^0 \ \sin 40^0 \ \sin 60^0 \ \sin 80^0 = \frac{3}{16}$.

Q9. Write $\frac{13\pi}{4}$ in the degrees.

Q10. Find the value of $\tan\frac{13\pi}{12}$.

COMPLEX NUMBERS

Q1. Find the value of x and y, if $\frac{(1+i)\,x-2i}{3+i} + \frac{(2-3i)\,y+i}{3-i} = i$.

Q2. If Z_1 and Z_2 are $1-i$ and $-2+4i$ respectively, find Im $\left[\frac{Z_1 \cdot Z_2}{Z_1}\right]$.

Q3. If $x+iy = \sqrt{\frac{a+ib}{c+id}}$, prove that $(x^2+y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$.

Q4. Express, $\frac{5+\sqrt{2}\,i}{1-\sqrt{2}\,i}$ in the form $a+ib$.

Q5. What are the real numbers 'x' and 'y' if $(x-iy)\,(3+5i)$ is the conjugate of $(-1-3i)$?

Q6. Find the magnitude and conjugate of the number $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$.

Q7. If α and β are different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$.

Q8. If $4x + i\,(3x-y) = 3 + i(-6)$, where x and y are real numbers, find the value of x and y.

Q9. If $a+ib = \frac{(x+i)^2}{2x^2+1}$, prove that $a^2+b^2 = \frac{\left(x^2+1\right)^2}{(2x^2+1)^2}$.

Q10. Find the multiplicative inverse of $(4-3i)$.

LINEAR INEQUALITIES

Q1. Solve the following system of inequalities graphically:
$2x + y \geq 4,\ x + y \leq 3,\ 2x - 3y \leq 6$.

Q2. Solve the following system of inequalities graphically:
$3x + 4y \leq 12,\ 4x + 3y \leq 12,\ x \geq 0,\ y \geq 0$.

Q3. Solve : $-5 \leq \frac{2-3x}{4} \leq 9$.

Q4. Solve the following system of inequalities graphically:
$2x + y - 3 \geq 0,\ x - 2y + 1 \leq 0,\ y > 3$.

Q5. Solve the following system of inequalities graphically:

$$x \geq y, \qquad y \geq 0,\ x + 2y \leq 8, \qquad x + y \geq 4, \qquad x - y \leq 0$$

Name the common region and write down its vertices.

Q6. Solve : $\frac{5-2x}{3} \leq \frac{x}{6} - 5$.

Q7. Solve the system of inequalities graphically:
$x + 2y \leq 10,\ x + 2y \geq 1,\ x - y \leq 0,\ x \geq 0, y \geq 0$.

Q8. Solve the following system graphically and name the vertices of the feasible region (solution set) along with their coordinates.

Q9. Solve the following system of inequalities graphically:
$x + 2y \leq 10,\ x + y \geq 1,\ x - y \leq 0,\ x \geq 0, y \geq 0$.

Q10. Solve the system of inequalities graphically:
$3x + 2y \leq 150,\ x + 4y \leq 80,\ x \leq 15,\ x \geq 0, y \geq 0$.

PERMUTATIONS AND COMBINATIONS

Q1. You can go from Delhi to Agra either by car or by bus or by train or by air. In how many ways can you plan your journey from Delhi to Agra?

Q2. An examination paper consists of 12 questions in two parts, part A has 7 questions and part B has 5 questions. A candidate is required to answer 8 questions, selecting at least 3 from each part. In how many ways can he make his selections?

Q3. How many of the natural numbers from 1 to 1000 have none of their digits repeated?

Q4. If $9_{P_5} + 5\ 9_{P_4} = 10_{P_r}$, then find r.

Q5. Find the number of different signals that can be generated by arranging at least two flags in order (one below the other) on a vertical staff, if five different flags are available.

Q6. How many words each of 3 vowels and 2 consonants can be formed from the letters of the word "INVOLUTE"?

Q7. If $n_{P_r} = 336, n_{C_r} = 56$. Find n and r and hence find $n - 1_{C_{r-1}}$.

Q8. 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 question in all, taking at least 2 questions from each part. In how many ways the student select the questions?

Q9. If $n_{C_5} = n_{C_7}$ find n.

Q10. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has at least one boy and one girl?

BINOMIAL THEOREM

Q1. If C_1 , C_2 , C_3 and C_4 are the coefficients of 2nd, 3rd, 4th and 5th terms, respectively in the binomial expansion of $(1+x)^n$, then prove that, $\frac{C_1}{C_1+C_2}+\frac{C_3}{C_3+C_4}=\frac{2\,C_2}{C_2+C_3}$

Q2. Evaluate : $\left(\sqrt{3}+\sqrt{2}\right)^6+\left(\sqrt{3}-\sqrt{2}\right)^6$.

Q3. Find $(a+b)^4-(a-b)^4$. Hence, evaluate $\left(\sqrt{3}+\sqrt{2}\right)^4-\left(\sqrt{3}-\sqrt{2}\right)^4$.

Q4. What is the number of terms in the expansion of $(a^2-2ab+b^2)^{10}$?

Q5. Expand the following $(1-x+x^2)^4$.