KENDRIYA VIDYALAYA SANGATHAN

SUBJECT: MATHEMATICS

CLASS: XI

STUDENT SUPPORT MATERIAL

	KENDRIYA VIDYALAYA SANGATHAN **MATHS CONTENT** **CLASS-XI** **CHAPTER: SETS** MCQS – SETS
Q.1	The set of intelligent students in a class is : (a) A null set (b) A singleton set (c) A finite set (d) Not a well defined collection
Q.2	If the sets A and B are given by A = {1, 2, 3, 4}, B = {2, 4, 6, 8, 10} and the universal set U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, then: (a) $(A \cup B)' = \{5, 7, 9\}$ (b) $(A \cap B)' = \{1, 3, 5, 6, 7\}$ (c) $(A \cap B)' = \{1, 3, 5, 6, 7, 8\}$ (d) None of these
Q.3	If A = {1, 2, 3, 4}, B = {2, 3, 5, 6} and C = {3, 4, 6, 7}, then (a) $A - (B \cap C) = \{1, 3, 4\}$ (b) $A - (B \cap C) = \{1, 2, 4\}$ (c) $A - (B \cup C) = \{2, 3\}$ (d) $A - (B \cup C) = \{\emptyset\}$
Q.4	The set {x : x is an even prime number} can be written as: (a) {2} (b) {2, 4} (c) {2,14} (d) {2, 4, 14}
Q.5	The number of the proper subset of {a, b, c} is: (a) 3 (b) 8 (c) 6 (d) 7
Q.6	Which one is different from the others? (i) empty set (ii) void set (iii) zero set (iv) null set : (a) (i) (b) (ii) (c) (iii) (d) (iv)
Q.7	Given the sets A = {1, 3, 5}, B = {2, 4, 6} and C = {0, 2, 4, 6, 8}. Which of the following may be considered as universal set for all the three sets A, B and C: (a) {0, 1, 2, 3, 4, 5, 6} (b) $\emptyset$ (c) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10} (d) {1, 2, 3, 4, 5, 6, 7, 8}
Q.8	Which of the following collections is a set ? (a) The collection of all the days of a week (b) A collection of 11 best hockey player of India. (c) The collection of all rich person of Delhi (d) A collection of most dangerous animals of India.
Q.9	If $A \cup B = \emptyset$ then $n(A \cup B)$ is equal to: (a) $n(A) + n(B) - n(A \cap B)$ (b) $n(A) - n(B) + n(A \cap B)$ (c) $n(A) + n(B) + n(A \cap B)$ (d) $n(A) - n(B) - n(A \cap B)$

Q.10	Let V = {a, e, i, o, u} and B = {a, i, k, u} then value of (V – B) and (B – V) are respectively: (a) {e, o} and {k} (b) {e} and {k} (c) {o} and {k} (d) {e, o} and {k, i}
Q.11	Let A = {a, b}, B = {a, b, c} then AUB is: (a) {a, b} (b) {a, c} (c) {a, b, c} (d) {b, c}
Q.12	The number of subsets of a set containing n elements is: (a) n (b) 2^n- 1 (c) n^2 (d) 2^n
Q.13	If A = {1,2,3} , B = {1,4,6, 9} , and R is a relation from A to B defined by 'x is greater than y ' the range of R is: (a) {1,4,6,9} (b) {4,6,9} (c) {1} (d) none of these
Q.14	Let R be a relation from a set A to set B then: (a) R = A U B (b) R = A ∩ B (c) R ≤ A×B (d) R ≤ B×A
Q.15	The number of subsets of a set containing n elements is: (a) n (b) 2^n- 1 (c) n^2 (d) 2^n
Q.16	If A = {1, 2, 3} , B = {1, 4, 6, 9}, and R is a relation from A to B defined by 'x is greater than y ' the range of R is: (a) {1, 4, 6, 9} (b) {4,6,9} (c) {1} (d) None of these
Q17	Set A = {0, 7, 26, 63} in set-builder form is: (a) {x: x ∈ N, x = n^3 – 1 and n ≤ 7} (b) {x: x ∈ N, x = n^2 – 1 and n ≤ 5} (c) {x: x ∈ N, x = n^2 – 1 and n < 4} (d) {x: x ∈ N, x = n^3 – 1 and n ≤ 4}
Q18	Let A, B, C be three sets. If A ∈ B and B ⊂ C, then: (a) A ⊂ C (b) A ⊄ C (c) A ∈ C (d) A Ø C
Q19	If B = {Ø} then: (a) B is an empty set (b) B is a finite set (c) B is an infinite set (d) B is not a set
Q20	If A = {3, 5, 7, 9, 11}, B = {7, 9, 11, 13}, C = {11, 13, 15} and D = {15, 17}, Then (A U B) ∩ C is: (a) {11, 13, 15} (b) {9, 11, 13, 15} (c) {9, 11, 13} (d) {11, 13}
Q21	If n(A) = 2 then n[P(P(A))] is: (a) 8 (b) 4 (c) 12 (d) 16

Q22 Let P be a set of squares, Q be set of parallelograms, R be a set of quadrilaterals and S be a set of rectangles. Consider the following :

(I) $P \subset Q$ (II) $R \subset P$ (III) $P \subset S$ (IV) $S \subset R$

Which of the above are correct?

(a) I, II and III (b) I, III and IV (c) I, II and IV (d) III and IV

Q23 $A = \{1, 2, 3, 4\}$, $B = \{-1, 1, 0, -2, 2\}$, $C = \{1, 3, 4\}$ are subset of which set?

(a) [1, 4] (b) [–1, 4] (c) [–2, 2] (d) [–2, 4]

Q24 Let $A = \{(1, 2), (3, 4), 5\}$, then which of the following is incorrect?

(a) $\{3, 4\} \not\in A$ as (3, 4) is an element of A
(b) $\{5\}, \{(3, 4)\}$ are subsets of A but not elements of A
(c) $\{1, 2\}, \{5\}$ are subsets of A
(d) $\{(1, 2), (3, 4), 5\}$ is a subset of A

Q25 Match the following sets in column I with the intervals in column II:

Column – I	Column – II
A. $\{x : x \in R,\ a < x < b\}$	1. $(a, b]$
B. $\{x \in R : a \le x \le b\}$	2. $[a, b)$
C. The set of real numbers x such that $a \le x < b$	3. (a, b)
D. $\{x : x \in R \text{ and } a < x \le b\}$	4. $[a, b]$

Codes:

	A	B	C	D
(a)	4	1	2	3
(b)	2	3	4	1
(c)	1	2	3	4
(d)	3	4	2	1

Q26 Two finite sets have m and n elements. The number of elements in the power set of first set is 48 more than the total number of elements in power set of the second set. Then the value of m and n are:

(A) 7, 6 (B) 6, 3 (C) 6, 4 (D) 7, 4

Q27 Which of the following is correct?

I. Number of non-empty subsets of a set having n elements are $2^n - 1$.
II. The number of non-empty subsets of the set {a, b, d} are 15:

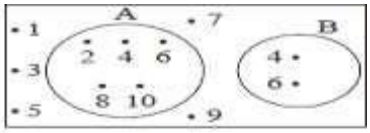
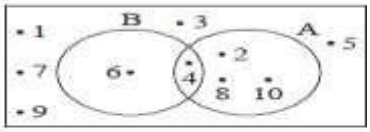
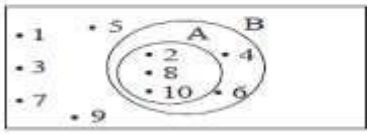
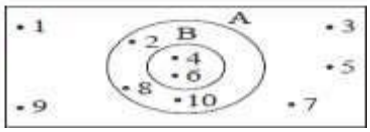
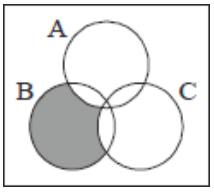
(a) Only I is false (b) Only II is false
(c) Both I and II are false (d) Both I and II are true

Q28 Which of the following is not a null set?

(a) Set of odd natural numbers divisible by 2
(b) Set of even prime numbers
(c) {x: x is a natural number, $x > 5$ and $x < 6$}
(d) {y: y is a point common to any two parallel lines}

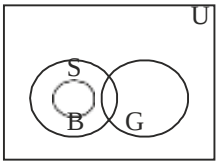
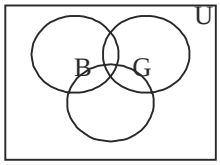
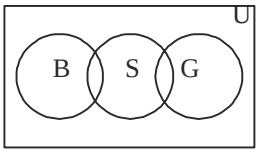
Q29 If n (A) = 4, how many proper subsets does the set A has:

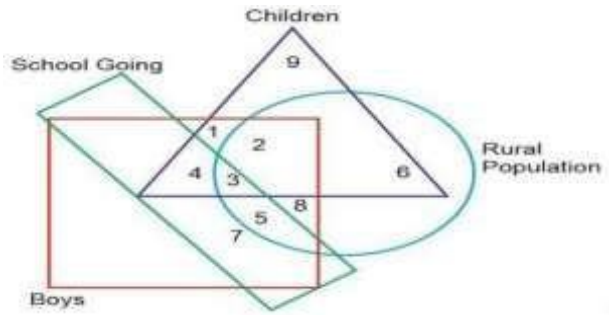
(a) 15 (b) 16 (c) 3 (d) 14

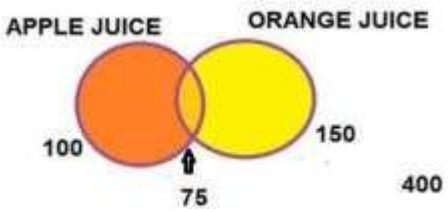
Q30	A and B are not singleton sets and n(A × B) = 21. If A ⊂ B then n(B) is equal to: (a) 3 (b) 7 (c) 21 (d) 1
Q31	Which of the following are disjoint sets: (a) {a, b, c} & {b, c, a} (b) {a, e, b, d} & {d, a, b, e} (c) {2, 5, m, n} & {n, m, 5, 2} (d) {(2, 4, 6, 8) & {x: x is an even number}
Q32	A and B are non-empty sets, then P(A) U P(B) is equal to: (a) P(A U B) (b) P(A ∩ B) (c) P(A) = P(B) (d) None of these
Q33	Consider the sets A = {0}, B = {x : x > 15 and x < 5}, C = {x : x – 5 = 0}, D = {x : x^2 = 25} and E = {x : x is an integral positive root of the equation {x^2 – 2x – 15 = 0} Choose the pair of equal sets: (a) A and B (b) C and D (c) C and E (d) B and C
Q34	If U = {1, 2, 3, 4, ..., 10} is the universal set of the sets A ={2, 4, 6, 8, 10} and B ={4, 6}, then given sets can be represented by Venn diagram as: (a)  (b)  (c)  (d) 
Q35	The shaded region in the given figure is (a) B ∩ (A U C) (b) B U (A ∩ C) (c) B ∩ (A – C) (d) B – (A U C) 
Q36	Which of the following sets is a finite set? (a) A = {x : x ∈ Z and x^2 – 5x + 6 = 0} (b) B = {x : x ∈ Z and x^2 is even} (c) D = {x : x ∈ Z and x > –10} (d) All of these

Q37	Which of the following has only one subset: (a) { } (b) {4} (c) {4, 5} (d) {0}
Q38	If A and B be any two sets, then A ∩ (A U B)' is equal to: (a) A (b) B (c) Ø (d) None of these
Q39	A survey shows that 63% of the people watch a news channel whereas 76% watch another channel. If x% of the people watch both channel, then: (a) x = 35 (b) x = 63 (c) 39 ≤ x ≤ 63 (d) x = 39
Q.40	A = {x : x ≠ x} represents: (a) {x} (b) {1} (c) { } (d) {0}
Q41	In a group of 52 persons, 16 drink tea but not coffee, while 33 drink tea. How many persons drink coffee but not tea: (a) 17 (b) 36 (c) 23 (d) 19
Q42	There are 600 student in a school. If 400 of them can speak Telugu, 300 can speak Hindi, then the number of students who can speak both Telugu and Hindi is: (a) 100 (b) 200 (c) 300 (d) 400
Q43	Which one of the following is an infinite set : (a) The set of human beings on the earth (b) The set of water drops in a glass of water (c) The set of trees in a forest (d) The set of all primes
Q44	If Ø denotes the empty set, then which one of the following is correct: (a) Ø∈ Ø (b) Ø∈ {Ø} (c) {Ø} ∈ {Ø} (d) 0 ∈ Ø
Q45	If B = {x: x is a student presently studying in both classes X and XI}. Then, the number of elements in set B are: (a) finite (b) infinite (c) zero (d) None of these
Q46	The set {x : x is a positive integer less than 6 and $3^x - 1$ is an even number} in roster form is: (a) {1, 2, 3, 4, 5} (b) {1, 2, 3, 4, 5, 6} (c) {2, 4, 6} (d) {1, 3, 5}
Q47	If A ⊂ B and A ≠ B, then: (a) A is called a proper subset of B (b) A is called a super set of B (c) A is not a subset of B (d) B is a subset of A

Q48	Which of the following is true: (a) $a \in \{\{a\}, b\}$ (b) $\{b, c\} \subset \{a, \{b, c\}\}$ (c) $\{a, b\} \subset \{a, \{b, c\}\}$ (d) None of these
Q49	The set of real numbers $\{x : a < x < b\}$ is called: (a) open interval (b) closed interval (c) semi-open interval (d) semi-closed interval
Q50	The set of all letters of the word 'SCHOOL' is represented by: I. {S, C, H, O, O, L} II. {S, C, H, O, L} III. {C, H, L, O, S} IV. {S, C, H, L} The correct code is: (a) I and II (b) I, II and III (c) II and III (d) I, II, III and IV
Q.51	The empty set is represented by: I. Ø II. {Ø} III. { } IV. {{ }} (a) I and II (b) I and III (c) II and III (d) I and IV
Q.52	Which of the following is correct? I. Number of non-empty subsets of a set having n elements are $2^n - 1$. II. The number of non-empty subsets of the set {a, b, c, d} are 15. (a) Only I is false (b) Only II is false (c) Both I and II are false (d) Both I and II are true
Q53	Let A = {(1, 2), (3, 4), 5}, then which of the following is incorrect: (a) {3, 4} Ø A as (3, 4) is an element of A (b) {5}, {(3, 4)} are subsets of A but not elements of A (c) {1, 2}, {5} are subsets of A (d) {(1, 2), (3, 4), 5} are subset of A
Q54	From 50 students taking examination in Mathematics,Physics and Chemistry, each of the students has passed in at least one of the subject, 37 passed Mathematics, 24 Physics and 43 Chemistry. Atmost 19 passed Mathematics and Physics, atmost 29 Mathematics and Chemistry and atmost 20 Physics and Chemistry. Then, the largest numbers that could have passed all three examinations, are: (a) 12 (b) 14 (c) 15 (d) 16

Q55	Let U be the set of all boys and girls in school. G be the set of all girls in the school. B be the set of all boys in the school and S be the set of all students in the school whotake swimming. Some but not all students in the school take swimming:  (a)  (b)  (c) (d)None of these
	ASSERTION & REASON TYPE QUESTIONS
	Directions : Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion. (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion (c) Assertion is correct, reason is incorrect (d) Assertion is incorrect, reason is correct.
Q56	Assertion : The number of non-empty subsets of the set {a, b, c, d} are 15. Reason : Number of non-empty subsets of a set having n elements are $2^n - 1$.
Q57	Suppose A, B and C are three arbitrary sets and U is a universal set. Assertion : If B = U – A, then n(B) = n(U) – n(A). Reason : If C = A – B, then n(C) = n(A) – n(B).
Q58	Assertion : Let A = {1, {2, 3}}, then P(A) = {{1}, {2, 3}, Ø, {1, {2, 3}}}. Reason : Power set is set of all subsets of A.
Q59	Assertion : The subsets of the set {1, {2}} are { }, {1}, {{2}} and {1, {2}}. Reason : The total number of proper subsets of a set containing n elements is $2^n - 1$.
Q60	Assertion : For any two sets A and B, A – B ⊂ B' Reason : If A be any set, then A ∩ A' = Ø
	INTEGER TYPE QUESTIONS

	Directions : This section contains integer type questions. The answer to each of the question is a single digit integer, ranging from 0 to 9. Choose the correct option.
Q61	If X = {1, 2, 3, …, 10} and 'a' represents any element of X, then the set containing all the elements satisfy a + 2 = 6, a ∈ X is: (a) {4} (b) {3} (c) {2} (d) {5}
Q62	If a set is denoted as B = Ø, then the number of element in B is: (a) 3 (b) 2 (c) 1 (d) 0
Q63	The number of non-empty subsets of the set {1, 2, 3, 4} is 3 ∈ a. The value of 'a' is: (a) 3 (b) 4 (c) 5 (d) 6
Q64	If X = {1, 2, 3}, then the number of proper subsets is: (a) 5 (b) 6 (c) 7 (d) 8
Q65	If A = {(x, y) : $x^2 + y^2 = 25$} and B = {(x, y) : $x^2 + 9y^2 = 144$} then the number of points, A ∩ B contains is: (a) 1 (b) 2 (c) 3 (d) 4
	CASE BASED QUESTIONS
	Venn diagrams were invented by a logician John Venn as a way of picturing relationships between different groups of things. These diagrams, also called Set diagrams or Logic diagrams, are widely used in mathematics, statistics, logic, teaching, linguistics, computer science and business In the following diagram, triangle shows children, circle shows rural population, rectangle shows school going population & square shows boys.  Based on the information stated above answer the below given questions-:
Q66	(i) The rural boys not going to school are denoted by which number? (a)1 (b) 2 (c)1,2 (d) 2,8

Q67	(ii) The children from rural population not going to school are denoted by which number? (a)1 (b) 2 (c) 6 (d) 2,6
Q68	(iii) What is represented by number 4? (a) Children who are not from rural population (b) Children who are boys (c) School going boys (d) School going boys who are not from rural population
Q69	(iv) School going boys from village are denoted by which number? (a) 3 (b) 3,5 (c) 3,4 (d) 3, 4, 5,7
Q70	(v) Number of children who are not from rural population? (a) 8 (b) 2 (c) 7 (d) 9
	In D.A.V School, Bahadurgarh, a survey was done on 400 students it was found that 100 like to take apple juice , 150 like to take orange juice and 75 like both apple as well as orange juice.  Based on above information, answer the following questions:
Q71	(i) Number of students who like either of the drink : (a) 400 (b) 175 (c) 250 (d) 325
Q72	(ii) Number of students who likes neither apple juice nor orange juice : (a) 225 (b) 325 (c) 75 (d) 25
Q73	(iii) Number of students who likes only apple juice: (a) 125 (b) 75 (c) 100 (d) 25
Q74	(iv) Number of students who likes only orange juice : (a) 75 (b) 25 (c) 100 (d) 125
Q75	(v) Which information we get from the given data : (a) n (A U B) =n(A) + n (B) (b) n(A U B) < n (A ∩ B) (c) n(A U B) < n (U) (d) n (A ∩ B) = n(A) + n (B)

	1 MARK QUESTIONS
Q76	Write down the set {5, 25, 125, 625} in the set builder form
Q77	If n(A) = 2 then find n[P(P(A))]
Q78	Define equal sets with example.
Q79	Write down $\{x: x \in R, -4 < x \leq 6\}$ as interval.
Q80	If A = {1, 2, 3, 4, 5, 6} and B = {2, 4, 6, 8}, find A - B.
Q81	Write the set A ={x: x ∈ R, 2x + 11= 15} in the roaster form.
Q82	Define disjoint sets with example.
Q83	What universal set would you propose for the set of rectangles.
Q84	If A and B are two sets such that $A \subset B$, then what is $A \cup B$?
Q85	Write down the power set for the set {a, b}
Q86	If S = {x: x is a positive multiple of 3 less than 100} and P = {x: x is a prime number less than 20}. Then find n(S) + n(P)
Q87	Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. Find the values of m and n.
Q88	Let S = the set of all triangles, P = the set of all isosceles triangles, Q = the set of all equilateral triangles, R = the set of all right-angled triangles. What do the sets $P \cap Q$ and R – P represents respectively ?
Q89	Let V = {a, e, i, o, u}, V – B = {e, o} and B – V = {k}. Find the set B.
Q90	If A = {a, {b}}, then find P(A)

	2 MARKS QUESTIONS
Q91	Write down all the subsets of the set {1, 2, 3}
Q92	Draw appropriate venn diagram for each of the following: (a) (A ∪ B)' (b) A – B
Q93	Write the set A= {5, 25, 125, 625} in set-builder form
Q94	Prove that A= B if P(A) = P(B)
Q95	A survey shows that 63%of Indians like cheese where as 76% like apples. If x % of Indians like cheese and apples. Find the value of x.
Q96	If n (A) = 4, how many proper subsets does the set A has?
Q97	Using properties of sets prove that $(A \cup B)' = A' \cap B'$.
Q98	Using Venn Diagram prove that: $A \cap (B - C) = (A \cap B) - (A \cap C)$.
Q99	For all sets A, B and C, if A ⊂ B, then A ∪ C ⊂ B ∪ C
Q100	For all sets A and B, (A −B) ∪ (A ∩ B) = A
	4 MARK QUESTIONS
Q101	If A = {3, 5, 7, 9, 11}, B = {7, 9, 11, 13} , C= {11, 13, 15} , D = {15, 17}, Find (a) (A ∪ B) ∩ C (b) C - D (c) (A ∩ B) ∩ (B ∪ C) (d) B ∩ D
Q102	If S and T are two sets such that S has 21 elements, T has 32 elements, and S ∩ T has 11 elements, how many elements does S ∪ T have?
Q103	In a survey of 100 students the number of students studying the various languages were found to be: English only18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24.Find *(i)* How many students were studying Hindi? *(ii)* How many students were studying English and Hindi? *(iii)* How many students were studying Sanskrit only?
Q104	Define the following with the help of an example: (a) Null set (b) Singleton Set (c) Sub-Set (d) Power Set.

Q105	In each of the following, determine whether the given statement is true or false. If true prove it, and if false, give an example. (a) If $x \in A$ and $A \in B$, then $x \in B$ (b) If $x \in A$ and $A \quad B$, then $x \in B$
Q106	In a survey of 25 students of a school it was found that 15 study Mathematics, 12 study Physics, 11 study Chemistry, 9 study both Mathematics & Physics, 4 study both Physics & Chemistry, 5 study both Chemistry and Mathematics and 3 students all of the above three subjects. Find the number of students who study: (a) Only Mathematics (b) At least one of the three subjects.
Q107	In a group of students ,100 students know Hindi, 50 know English and 25 know both . Each of the students know either Hindi or English. How many students are there in the group .
Q108	If $n(A - B) = 18$, $n(A \cup B) = 70$ and $n(A \cap B) = 25$, then find $n(B)$.
Q109	If $L = \{1, 2, 3, 4\}$, $M = \{3, 4, 5, 6\}$ and $N = \{1, 3, 5\}$, then verify that $L - (M \cup N) = (L - M) \cap (L - N)$.
Q110	If A, B and C be sets. Then, show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION

MATHS CONTENT

CLASS: XI

CHAPTER: RELATIONS AND FUNCTIONS

	MCQs
Q1	If A × B = {(a, 1), (b, 3), (a, 3), (b, 1), (a, 2), (b, 2)}, then set B is (a) {a} (b) {a, b} (c) {1, 2} (d) {1, 2, 3}
Q2	If $(\frac{x}{3}+1, y-\frac{2}{3}) = (\frac{5}{3}, \frac{1}{3})$, find the values of *x* and *y* respectively are: (a) 3,3 (b) 1,2 (c) 2,1 (d) 3/2,2
Q3	U = {1, 2, 3, 4} and relation R = {(*x, y*): *y* > *x*; *x*, *y*∈ U} then range of R is ..... (a) {1, 2, 3, 4} (b) {2, 3, 4} (c) {4} (d)
Q4	If A = {1, 2, 3} and B = {4, 5} then number of relations from A to B is: (a) 6 (b) 8 (c) 9 (d) 64
Q 5	If set A has 2 elements and set B has 4 elements then how many relations are possible? (a) 32 (b) 128 (c) 256 (d) 64
Q 6	If A×B={(5, 5),(5, 6),(5, 7),(8, 6),(8, 7),(8, 5)},then the set A: (a) {5} (b) {8} (c) {5, 8} (d) {5, 6, 7, 8}
Q 7	Let A = {1, 2, 3, 4, 5} and B = {1, 3, 5, 7, 9}. Which of the following relation is a function from A to B? (a) R_1 = {(*x*, *y*) | *y* = 2 + *x*, *x*∈A , y ∈ B } (b) R_2 = {(1, 1), (2, 1), (3, 3), (4, 3), (5, 5)} (c) R_3 = {(*x*, *y*) | *y*= 5 – *x*, *x*∈A , y ∈ *B*} (d) R_4 = {(1, 3), (2, 5), (2, 4), (7, 9)}

Q 8	A = {5, 10, 15, 20}, B = {2, 4, 6, 8, 10}. Out of the following, which is a function? (a) {(5, 2), (10, 4), (15, 6), (20,9)} (b) {(5, 2), (10, 4)} (c) {(5, 2), (10, 4), (15, 6), (20, 10)} (d) {(5, 1), (5, 10), (15, 6), (20, 9)}
Q 9	If A is the set of even natural number less than 8 and B is the set of prime number less than 7, then the number of relations from A to B is (a) 2^9 (b) 9^2 (c) 3^2 (d) 2^{9-1}
Q10	Let O be the set of odd natural numbers and E be the set of even natural numbers. Relation S from O to E defined as S = {(a, b):a, b even number}. What is the Range of S? (a) E (b) O (c) N (d) None of these
Q11	Let f: R → R, $f(x) = \frac{x}{x^2+1}$ Range of f is ... (a) (−1, 0) (b) (−1, 1) (c) [0, 1) (d) {1}
Q 12	Let A = {9, 10, 11, 12, 13} and f: A → N defined by $f(n)$ = the highest prime factor of n. Range of f is ..... (a) {2, 3, 5, 7} (b) {3, 5, 11, 13} (c) {11, 13} (d) {13}
Q13	The relation f is defined by $f(x) = \{x^3, 0 \le x \le 3\ 9x, 3 \le x \le 10$ and the relation g is defined by $g(x) = \{x^2, 0 \le x \le 5\ 3x, 5 \le x \le 10$, then which one of the following is true? (a) f, g are functions (b) f is not a function and g is a function. (c) f is a function and g is not a function. (d) f and g both are not functions.
Q14	If f (x) = 7 – 4x then $f(x-2)$ = ... (a) 5 – 4x (b) –1 –4x (c) 15 – 4x (d) 9 – 4x
Q15	If f: N→N, $f(x)$ = 3x then image of 4 = ..., pre-image of 51 =.... (a) 12, 51 (b) 12, 17 (c) 17, 12 (d) 4, 51
Q16	The range of f: R→R, f(x) = x^2 is... (a) R (b) Z (c) $R^+ \cup \{0\}$ (d) R – {0}

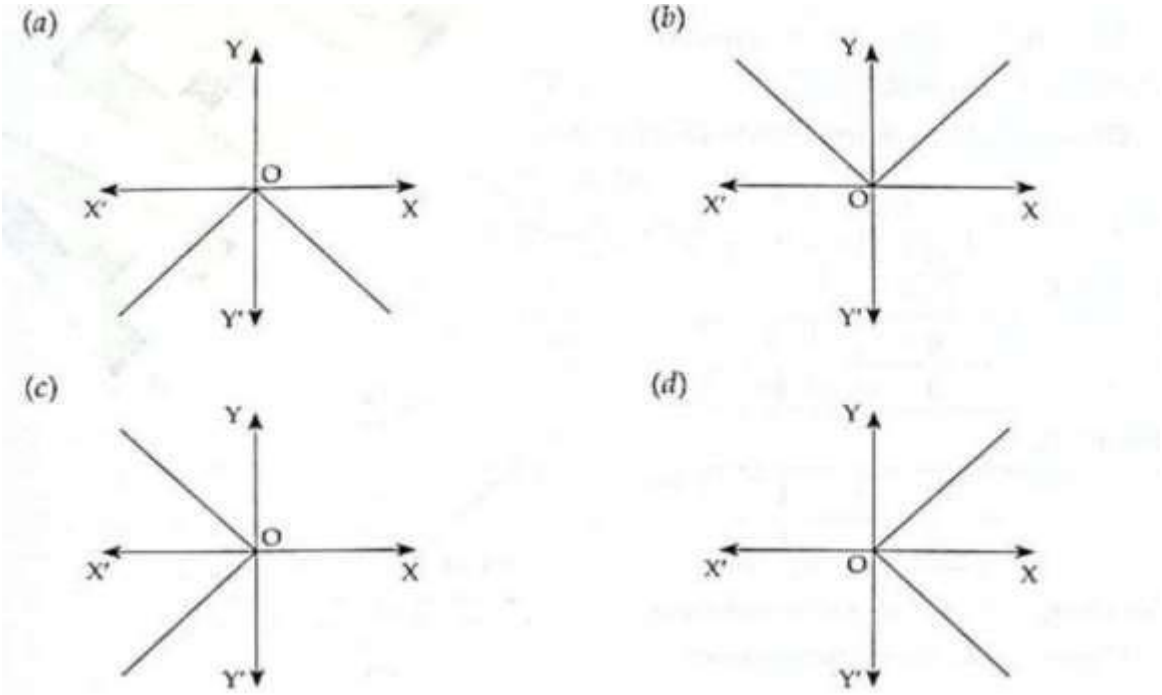
Q 17	$If\, t(c) = \frac{9c}{5} + 32$, then t(-10): (a) 14 (b) 41 (c) 50 (d) None of these
Q 18	If the domain of function $f(x) = x^2 - 6x + 7$ is R, then the range is (a) $(-\infty, \infty)$ (b) $[-2, \infty)$ (c) (-2,3) (d) $(-\infty, -2)$
Q 19	$f = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ is defined is $f(x) = ax + b$, then values of a and b are respectively .....and ..... (a) 2, –1 (b) –2, 1 (c) –1, 2 (d) 1, 2
Q 20	If $f(x) = \frac{1}{1-x}$ then $f[f\{f(x)\}]$= ..... (a) $\frac{1}{x}$ (b) x (c) $\frac{1}{1+x}$ (d) $\frac{1}{1-x}$
	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	Given two non-empty sets A = {x: x<5, x ∈ N} and B= {x: x<2 x ∈ W}, based on this information answer the following questions: (i) A×B as set of ordered pairs is: (a) {(1, 0), (1,1), (J, 2), (2,0), (2,1), (Z 2), (3,0), (3,1), (3, 2), (4,0), (4,1), (4,2)} (b) {(1,1), (1,2), (2,1), (2,2), (3,1), (3, 2), (4,1), (4, 2), (5,1), (5,2)} (c) {(1,1), (1,2), (2,1), (2,2), (3,1), (3,2), (4,1), (4, 2)} (d) {(1,0), (1,1), (1,2), (2,0), (2,1) ,(2,2), (3, 0), (3,1), (3, 2), (4,0), (4,1), (4,2), (5,0), (5,1), (5, 2)} (ii) (A U B) x (A ∩ B) as a set of ordered pairs is (a) {(1,0), (1,1), (1,2), (2, 0), (2,1), (2, 2), (3,0), (3,1),(3, 2),(4,0), (4,1), (4,2)} (b) {(0,1), (0,2), (1, 1), (1, 2),(2,1), (2,2),(3,1),(3,2),(4,1),(4,2)} (c) {(1, 0), (1,1),(1,2),(2,0),(2,1),(2,2),(3,0),(3,1),(3,2),(4,0),(4,1),(4,2),(5,0),(5,1) ,(5,2)} (d) {(1,1), (1,2), (2,1), (2, 2), (3,1),(3, 2), (4, 7), (4, 2), (5,1), (5,2)} (iii) A *relation R from A to B* defined by R = {(x, y): x + y = 4, x ∈ A, y ∈ B } as a set of ordered pairs is (a) R = {(1, 3), (3, 1), (0,4), (4,0)} (b) R = {(2,2), (3,1), (1,3)}

	(c) R = {(2,2), (3,1), (4,0)} (d) R= {(2,2), (1,3), (0,4)} (iv) Domain of R is (a) {0,1,3,4} (b) {1, 2, 3} (c) {2,3,4} (d) {0,1,2} (v) Range of R is (a) {0,1,2} (b) { 2, 3, 4} (c) {1, 2,3} (d) {0,1,3, 4}
Q 22	Let A, B be any two (non-empty) sets and R be a relation from A to B, then inverse of relation R denoted by R^{-1} is a relation from B to A i.e. $R^{-1} \leq$ B x A. Also, R^{-1} = {(b, a): (a, b) ∈ R}. Clearly, (a, b) ∈ R ⇔ (b, a) ∈ R^{-1}, If A = {2,3,4,5}, B = {3,6,7,10} and a relation R from A to B is defined as R = {(x, y): x divides y, x ∈ A, y ∈ B}. Based on the above information, answer the following questions: **(i) R as a set of ordered pairs is:** (a) {(2,2), (2, 6), (2,10), (3,3), (3,6), (4,4), (5,5), (5,10)} (b) {(2,6), (2,10), (3,3), (3,6), (5,10)} (c) {(2,2), (2,6), (2,10), (3,3), (3, 6), (5,5), (5,10)} (d) {(2,2), (2,6), (2,10), (3,3), (3,6), (5,10)} **(ii) R^{-1} as a set of ordered pairs is:** (a) {(6,2), (10,2), (3,3), (6,3), (10,5)} (b) {(2,2), (6,2), (10,2), (3,3), (6,3), (4,4), (5,5), (10,5)} (c) (2,2), (6,2), (10,2), (3,3), (6,3), (10,5)1 (d) {(2,2), (6,2), (10,2), (3,3), (6,3), (5,5), (10,5)} **(iii) Domain of R^{-1} is:** (a) {2,3,4,5,6,10} (b) {3,6,10} (c) {2,3,6,10} (d) {2,3,5,6,10} **(iv) Co-Domain of R^{-1} is:** (a) {3,6,7,10} (b) {2,3,6,7,10} (c) {2,3,4,5} (d) {2,3,4,5,6,7,10} **(iv) Range of R^{-1} is:** (a) {2,3,6,10} (b) {3,6,7,10} (c) {2,3,4,5} (d) {2,3,5}

Q 23	Let f and g are two functions defined as $f(x) = \sqrt{x-1}$ and $g(x) = 2 - 3x$. Based on the above information answer the following questions: (i) Domain of f is: (a) (1, ∞) (b) [1, ∞) (c) (-∞,1) (d) (-∞,1] (ii) Domain of $\frac{1}{g}$ is: (a) R- $\{\frac{3}{2}\}$ (b) R (c) R-$\{\frac{2}{3}\}$ (d) R-$\{-\frac{3}{2}\}$ (iii) Domain of $f + g$ is: (a) (1, ∞) (b) R - (1, ∞) (c) [1, ∞) (d) R-$\{\frac{2}{3}\}$ (iv) Domain of $\frac{g}{f}$ is: (a) (1, ∞) (b) [1, ∞) (c) R- $\{\frac{3}{2}\}$ (d) R (v) Domain of $\frac{f}{g}$ is: (a) R- $\{\frac{3}{2}\}$ (b) R (c) R-$\{\frac{2}{3}\}$ (d) [1, ∞) -$\{\frac{3}{2}\}$
Q 24	Read the following text and answer the following questions based on the same. Consider the following real valued functions f(x), g(x) and h(x) defined as: $f(x) = x$ $g(x) = e^x$ $h(x) = x^2$ (i) The domain of f(x) is: (a) R (b) Z (c) (0,1) (d) {-1,1} (ii) the range of f(x) is: (a) R (b) Z (c) (0,∞) (d) (-∞,∞) (iii) the range of g(x) is: (a) R (b) Z (c) [0,∞) (d) (-∞,∞) (iv) The range of h(x) is: (a) R (b) Z (c) (0,∞) (d) (-∞,∞) (v) The value of h(-5) is: (a) 16 (b)e^{-5} (c) 25 (d) -5
Q 25	Read the following text and answer the following questions based on the same. The function f: R→[0,∞) is defined by $f(x) = \|x\|$ and $g(x) = f(x+1) + f(x-1)\ for\ all\ x \in R$. (i) The domain of f(x) is:

(a) R (b) Z (c) [0,∞) (d) {-1,1}

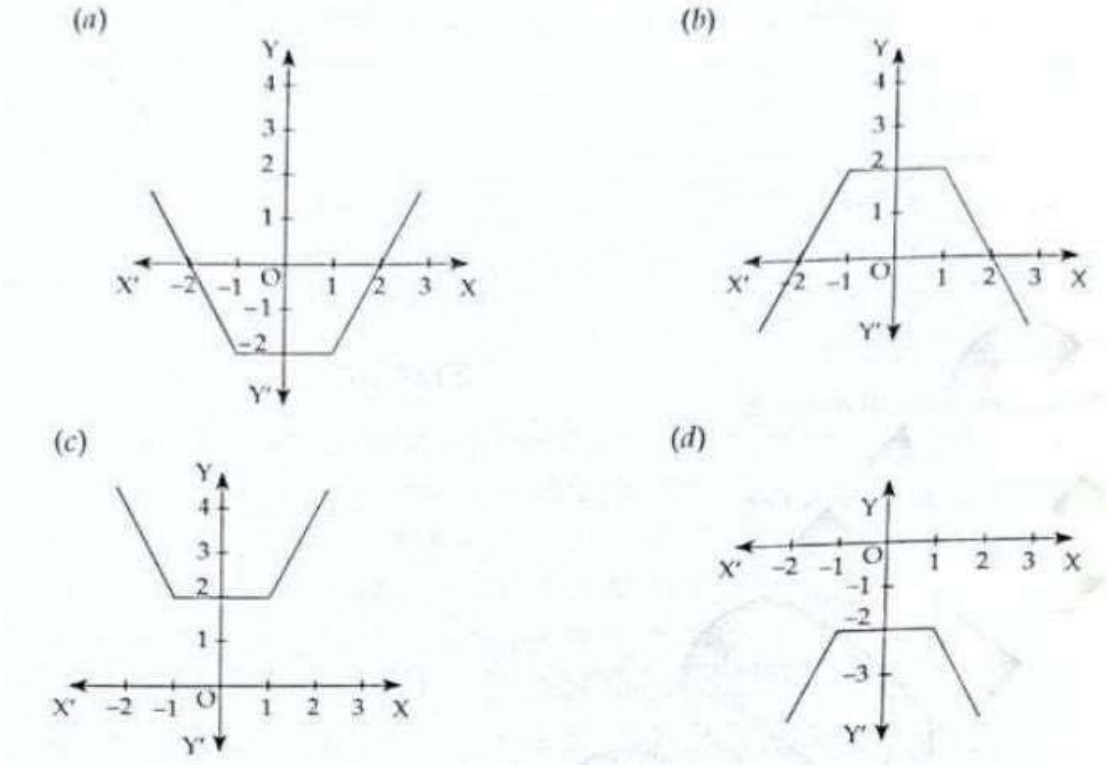
(ii) The graph of f(x) is:



(iii) the range of f(x) is:

(a) R (b) Z (c) [0,∞) (d) (-∞,∞)

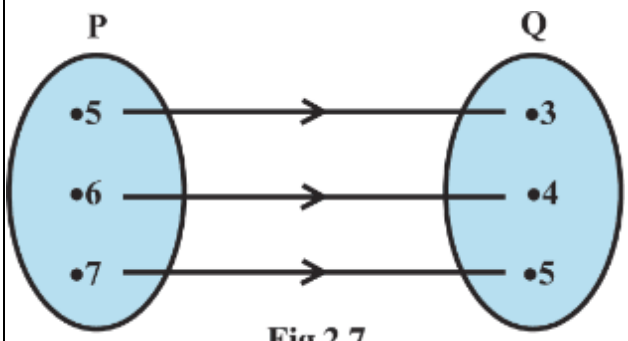
(iv) The graph of g(x) is:



(iii) the range of g(x) is:

(a) [-2,∞) (b) (-∞,2] (c) (-∞,- 2] (d) [2,∞)

	ASSERTION REASONING QUESTIONS: In the following questions, a statement of assertion (A) is followed by a statement of reason(R). Choose the correct answer out of the following choices: (A) Both A and R are true and R is the correct explanation of A. (B) Both A and R are true but R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.
Q 26	**Assertion (A):** if A= {1,2} then A×A={(1,1), (2,2)} **Reason (R):** A and B to be two non-empty sets and the Cartesian Product is given by A x B is the set of all ordered pairs (a, b) where a ∈ A and b ∈ B.
Q 27	**Assertion (A):** The relation {(1, 3), (1, 5), (2, 5)} defined from {1,2}→ $\{3,5\}$ is a function. **Reason (R):** A relation is said to be a function if each element of domain has one and only one image.
Q 28	**Assertion (A):** if n(A)=p and n(B)=q, then total number of relations that can be defined from A to B are 2^{pq} **Reason (R):** since $n(A \times B) = n(A) \times n(B)$ and total number of subsets of a set having n elements is given by 2^n
Q 29	**Assertion (A):** The range of the greatest integer function defined by $f(x) = [x]$ is the set of integers. **Reason (R):** The inputs of the greatest integer function can take any real number but the output will always be an integer
Q 30	**Assertion (A):** The range of the modulus function defined by $f(x) = \|x\|$ is the set of integers. **Reason (R):** The inputs of the modulus function can take any real number but the output will always be a non-negative real number.
	VERY SHORT ANSWER TYPE QUESTIONS
Q 31	Let A ={*x*, *y*, *z*} and B ={1, 2}, find the number of relations from A to B.
Q 32	Find *x* and *y*, if (*x* + 3, 5) = (6, 2*x* + *y*).
Q 33	Is the following relation a function? Give reason. If it is a function,

	determine its domain and range. {(1, 3), (1, 5), (2, 5)}
Q 34	Find the domain and range of the real functions $f(x) = -|x|$.
Q 35	Determine the domain and range of the relation R defined by, R = {(x, x + 5): $x \in \{0, 1, 2, 3, 4, 5\}$}.
Q 36	The Cartesian product A × A has 9 elements among which are found (– 1, 0) and (0, 1). Find the set A and the remaining element A × A
Q 37	If A × B = {(a, x), (a, y), (b, x), (b, y)}. Find A and B.
Q 38	What is the domain of the real valued function $f(x) = \frac{1}{3x-2}$
Q 39	Is the given relation a function? Give reasons for your answer. h = {(4, 6), (3, 9), (–11, 6), (3, 11)}
Q 40	Is the given relation a function? Give reasons for your answer. s = {(n, n^2) | n is a positive integer}
Q 41	What will be total number of relations from A to B where n(a) =p and n(b) =q.
Q 42	Write the range of the function $f(x) = -x^2$.
Q 43	Let A= {1,2} and B= {2,3} then find $A \times (A \cap B)$
Q 44	A function f is defined as f(x)=3-2x. find the value of f (7).
Q 45	The following figure shows a relationship between the sets P and Q. Write  Fig 2.7 this relation in set-builder form:
Q 46	Let A = {1,2,3,4}, B = {1,4,9,16,25} and R be a relation defined from A to B as, R = {(x, y): x ∈ A, y ∈ B and y = x^2}

	i) Depict this relation in roster form. ii) Find domain of R. iii) Find range of R. iv) Write co-domain of R.
Q 47	If R = {(x + y) | x and y are integers and $x^2 + y^2 = 64$} is a relation, then find R.
Q 48	Let A = {1, 2, 3, 4} and B = {10, 12, 13, 14, 20}. Whether f: A→ B defined by f(1) = 10, f(2) = 12, f(3)= 13 and f(4)= 20 is a function?
Q 49	If n(A) = 3 and B ={1,2,3} then find n(A×B)
Q 50	Draw the graph of the modulus function.
	SHORT ANSWER TYPE QUESTIONS
Q 51	If f and g are two real valued functions defined as f(x) = 2x + 1, g(x) = x^2 + 1 then find f + g, f-g, f.g and f/g
Q 52	Given R = {(x, y): x, y ∈ W, $x^2 + y^2 = 25$}, find the domain and range of R.
Q 53	If A = {−1, 1}, find A × A × A.
Q 54	Define a relation R on the set N of natural numbers by R = {(x, y): $y = x$ + 5, x is a natural number less than 4; x, y ∈ N}. Depict this relationship using roster form. Write down the domain and range.
Q 55	Determine the domain and range of the relation R defined by, R = {(x, x + 5): x ∈ (0, 1, 2, 3, 4, 5)}.
Q 56	Let A = {1, 2, 3, ..., 14}. Define a relation R from set A to A by R = {(x, y): $3x - y = 0$, where x, y ∈ A}. Write down its domain, co-domain, and range.
Q 57	A = {1, 2, 3, 5} and B = {4, 6, 9}. Define a relation R from A to B by R = {(x, y): the difference between x and y is odd, x ∈ A and Y ∈ B}. Write R in roster form.
Q 58	Let A = {9,10,11,12,13} and let f: A→N be defined by f (n) = the highest prime factor of n. Find the range of f.
Q 59	Let A = {1, 2, 6, 8} and let R be a relation on A defined by {(a, b): a, b ∈

	A, b is exactly divisible by a} (i) Write R in roster form. (ii) Find the domain of R. (iii) Find the range of R.
Q 60	If R = {(x, y) | y = 2x + 7, where x ∈ R and - 5 < x < 5} is a relation. Then find the domain and Range of R.
Q 61	Draw the graph of f(x) defined by $f(x) = \begin{cases} 1-x, & \text{if } x < 0 \\ 1, & \text{if } x = 0 \\ x+1, & \text{if } x > 0 \end{cases}$
Q 62	Let f(x) = x^2 and g(x) = 2x + 1 be two real functions. Find (f + g) (x), (f –g) (x), (fg) (x), (f/g) (x)
Q 63	Let *f*: R → R be given by $f(x) = x^2 + 3$ Find (i) *x* if $f(x) = 28$} (*ii*) The pre-images of 39 and 2 under '*f* '.
Q 64	Find the range of the following function given by: $f(x) = \frac{\|x-4\|}{x-4}$
Q 65	Find the range of the following functions given by: $f(x) = 1 - \|x - 2\|$
Q 66	Find the range of the following functions given by: $f(x) = \|x - 3\|$
Q 67	Find the domain and the range of the real function *f* defined by $f(x) = \sqrt{x-1}$
Q 68	Express the function f: A→R, f(x) = $x^2 - 1$. where A = { -4, 0, 1, 4) in roster form.
Q 69	Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers *a* and *b*. Determine *a*, *b*.
Q 70	Find the range of the following functions f(x) = $\sqrt{9-x^2}$

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION

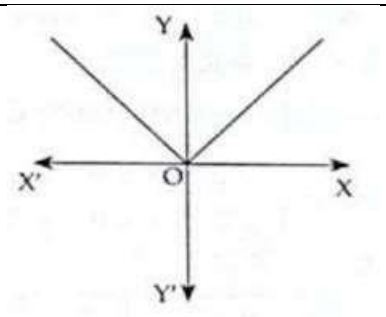
SOLUTIONS TO MATHS CONTENT

CLASS: XI

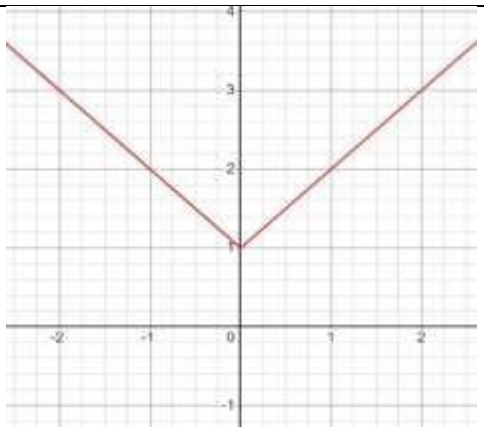
CHAPTER: RELATIONS AND FUNCTIONS

	MCQs
Q1	(d)
Q2	(c)
Q3	(b)
Q4	(d)
Q 5	(c)
Q 6	(c)
Q 7	(b)
Q 8	(c)
Q 9	(a)
Q10	(a)
Q11	(c)
Q 12	(b)
Q13	(c)
Q14	(c)
Q15	(b)
Q16	(c)
Q 17	(a)
Q 18	(b)
Q 19	(a)
Q 20	(b)
	CASE BASED/SOURCE BASED / PASSAGE BASED

Q 21	(i) (b) (ii) (a) (iii) (b) (iv) (c) (v) (d)
Q 22	(i) (b) (ii) (a) (iii) (c) (iv) (a) (v) (d)
Q 23	(i) (b) (ii) (b) (iii) (c) (iv) (a) (v) (d)
Q 24	(i) (a) (ii) (a) (iii) (c) (iv) (c) (v) (c)
Q 25	(i) (a) (ii) (b) (iii) (c) (iv) (c) (v) (d)
	ASSERTION REASONING
Q 26	(d)
Q 27	(d)
Q 28	(a)
Q 29	(a)
Q 30	(d)
	ANSWERS TO VERY SHORT ANSWER TYPE QUESTIONS
Q 31	n (A × B) = 3 × 2 = 6. Total subsets, Relations are $2^6 = 64$
Q 32	$x + 3 = 6$, $2x + y = 5 \Rightarrow x = 3$, $y = 1$
Q 33	Not a function, first entry repeated R={(x,x+5):$x \in$ (0, 1, 2, 3, 4, 5)} ⇒ R = {(0, 5), (1, 6), (2, 7), (3, 8), (4, 9), (5, 10)} Domain = {0, 1, 2, 3, 4, 5}, Range = {5, 6, 7, 8, 9, 10}
Q 34	$f(x) = - \mid x \mid$ Domain is R and Range is (– ∞, 0]
Q 35	Domain={0,1,2,3,4,5} Range={5,6,7,8,9,10}
Q 36	A = {–1, 0, 1} The other elements of A x A are (–1, –1), (–1, 1), (0, –1), (0, 0), (1, –1), (1, 0), (1, 1)}
Q 37	Given, A × B = {(a, x), (a, y), (b, x), (b, y)} Then A = {a, b}, B = {x, y}
Q 38	Zero of $3x - 2$ is 2/3 ∴ Domain = R –{2/3}
Q 39	Not a function as an element of domain has more than one image (i.e. The first entry 3 is repeated in (3, 9) and (3, 11).

Q 40	It is a function, as each positive integer has a unique (one and only one) image.
Q 41	2^{pq}
Q 42	$(-\infty, 0]$
Q 43	$A \times (A \cap B)$ $=\{1,2\} \times \{2\} = \{(1,2),(2,2)\}$
Q 44	f(7)=3-2(7)=3-14=-11
Q 45	It is given in the figure that P = {5,6,7}, Q = {3,4,5} Therefore, the relation in set builder form is , R=$\{(x,y): y = x - 2; x \in P\}$
Q 46	(i) R in roster form is given by R= {(1,1), (2,4), (3,9), (4,16)} (ii) Domain of R= {1,2,3,4} (iii) Range of R= {1,4,9,16} (iv) Co-domain of R= {1,4,9,16,25}
Q 47	Given that: $x^2 + y^2 = 64$, x, y ∈ Z The sum of the squares of two integers is 64 For x = 0, y = + 8 For, x= ± 8, y = 0 Hence, R= {(0, 8), (0, -8), (8, 0), (-8, 0)}
Q 48	No, it is not a function as the 4 ∈ domain, but it has no image in co-domain, hence f is not a function.
Q 49	n(AxB)=n(A)xn(B)=2x3=6
Q 50	
	ANSWERS TO SHORT ANSWER TYPE QUESTIONS
Q 51	Given that: f(x) = 2x+ 1 and $g(x) = x^2 + 1$ f + g: f(x) + g(x) = 2x + 1 +x^2 + 1 = x^2 + 2x + 2 f-g: f(x) - g(x) = (2x + 1) - (x^2 + 1) = 2x +1 -x^2-1 = 2x-x^2 f.g: f(x).g(x) = (2x + 1) (x^2 + 1) => $2x^3$ +x^2 + 2x + 1 f/g: f(x)/g(x)=(2x+1)/x^2+1, x^2G -1

Q 52	Given that: R = {(x, y): x, y ∈ W, $x^2 + y^2 = 25$} So, the ordered pairs satisfying the given condition $x^2 + y^2 = 25$ are (0, 5), (3,4), (5, 0), (4, 3). Hence, the domain = {0, 3, 4, 5} and the range = {0, 3,4, 5}.
Q 53	A × A × A= {−1, 1} × {−1, 1} × {−1, 1} = {(−1, −1), (−1, 1) (1, −1) (1, 1)} × {−1, 1} = {(−1, −1, −1), (−1, 1, −1), (1, −1, −1), (1, 1, −1), (−1, −1, 1), (−1, 1, 1), (1, −1, 1), (1, 1, 1)}
Q 54	Given: R = {(*x*, *y*): *y* = *x* + 5, *x* is a natural number less than 4, *x*, *y* ∈ N} *x* can take values 1, 2, 3. ∴ R = {(1, 6), (2, 7), (3, 8)} Domain = {1, 2, 3}, Range = {6, 7, 8}
Q 55	R = {(*x*, *x* + 5): *x* ∈ (0, 1, 2, 3, 4, 5)} ⇒ R = {(0, 5), (1, 6), (2, 7), (3, 8), (4, 9), (5, 10)} Domain = {0, 1, 2, 3, 4, 5}, Range = {5, 6, 7, 8, 9, 10}
Q 56	Given, set A = {1, 2, 3, ..., 14} Relation R = (*x*, *y*) : 3*x* − *y* = 0, *x*, *y* ∈ A} 3*x* − *y* = 0 ⇒ 3*x* = *y*, When *x* = 1, *y* = 3 ; *x* = 2, *y* = 6 ... ∴ R = {(1, 3), (2, 6), (3, 9), (4, 12)} Domain of R= {1, 2, 3, 4} Co-domain of R = A Range of R = {3, 6, 9, 12}.
Q 57	Given, A = {1, 2, 3, 5} and B = {4, 6, 9}. and A × B = {(x, y) : The difference between *x* and *y* is odd} We notice difference of 1 and 4 is odd, difference of 1 and 6 is odd, difference between 2 and 9 is odd. ∴ R in roster form = {(1,4),(1,6),(2,9),(3,4),(3,6),(5,4),(5,6)}
Q 58	It is given that A = {9,10,11,12,13} and f : A → N be defined by f(n) = the highest prime factor of n. Now, Prime factor of 9 = 3 Prime factor of 10 = 2,5 Prime factor of 11 = 11 Prime factor of 12 = 2,3 Prime factor of 13 = 13 f(n) = the highest prime factor of n. Hence, f(9) = the highest prime factor of 9 = 3 f(10) = the highest prime factor of 10 = 5 f(11) = the highest prime factor of 11 = 11 f(12) = the highest prime factor of 12 = 3

Q 59	(i) R in roster form can be written as: R= {(1,1),(1,2),(1,6),(1,8),(2,2),(2,6),(2,8),(6,6),(8,8)} (ii) Domain of R ={1,2,6,8} (iii) Range of R ={1,2,6,8}
Q 60	Given that: R = {(x, y) | y = 2x + 7 where x ∈ R and -5 < x < 5} Since R is defined for all real numbers that are greater than or equal to-5 and less than or equal to 5, therefore domain of R = {x: x ∈ R, 5 < x < 5} = [-5, 5] Range: here 5 < x < 5 and y = 2x + 7. Since x ∈ R and 5 < x < 5 $\Rightarrow -10 < 2x < 10$ $\Rightarrow -10 + 7 < 2x + 7 < 10 + 7$ $\Rightarrow -3 < y < 17$ range of R = [-3,17] Hence, the domain of R=[-5, 5] and range of R=[-3,17]
Q 61	
Q 62	Given, f(x) = x^2 and g(x) = 2x + 1 (f + g) (x) = x^2 + 2x + 1 (f – g) (x) = x^2 -(2x + 1) = x^2 – 2x – 1 (fg) (x) = x^2(2x + 1) = $2x^3$ + x^2 (f/g) (x) = x^2/(2x + 1), x ≠ -1/2
Q 63	: (*i*) 28 = x^2 + 3 ⇒ x^2 = 25 ⇒ x = ± 5 (*ii*) 39 = x^2 + 3 ⇒ x^2 = 36 ⇒ x = ± 6 ; Hence the pre images of 39 are -6 & 6. 2 = x^2 + 3 ⇒ x^2 = – 1, not possible.

	There is no pre image of 2 under the given function.
Q 64	$y = \frac{(x-4)}{x-4} or \frac{-(x-4)}{x-4}$ i.e. 1 or -1 ∴ range {–1, 1}
Q 65	$y = 1 - \lvert x - 2 \rvert$ For every x, $\lvert x - 2 \rvert \geq 0$ $\Rightarrow - \lvert x - 2 \rvert \leq 0 \Rightarrow 1 - \lvert x - 2 \rvert \leq 1 \Rightarrow y \leq 1$ ∴ range $]-\infty, 1]$
Q 66	$f(x) = \lvert x - 3 \rvert \geq 0 \Rightarrow$ Range = $[0, \infty)$
Q 67	Given $f(x) = \sqrt{x-1}$ Function is defined if $x - 1 \geq 0 \Rightarrow x \geq 1$ ∴ Domain = $\{x \in R \mid x \geq 1\}$ Range = $R^+ \cup \{0\}$. [∵ Positive square root function]
Q 68	Given, A = {-4, 0, 1, 4} $f(x) = x^2 - 1$ $f(-4) = (-4)^2 - 1 = 16 - 1 = 15$ $f(0) = (0)^2 - 1 = -1$ $f(1) = (1)^2 - 1 = 0$ $f(4) = (4)^2 - 1 = 16 - 1 = 15$ Therefore, f in roster form is = {(-4, 15), (0, -1), (1, 0), (4, 15)}
Q 69	Given, $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ and $f(x) = ax + b$ …(i) (1, 1) ⇒ when $x = 1$, $f(x) = 1$ (2, 3) ⇒ when x = 2, $f(x) = 3$ From (i) we get $1 = a + b$ …(ii) and $3 = 2a + b$ …(iii) Solving (ii) and (iii) we get $a = 2$, $b = -1$.

Q 70	$f(x) = \sqrt{9 - x^2}$ Let y=f(x) $y = \sqrt{9 - x^2}$ Squaring both sides we get $y^2 = 9 - x^2 x^2 = 9 - y^2 x = \sqrt{9 - y^2}$ Since x is real , for that $9 - y^2 \geq 0$ $\Rightarrow y^2 \leq 9$ $\Rightarrow \lvert y \rvert \leq 3$ $\Rightarrow -3 \leq y \leq 3$ ---------- (i) But $y = \sqrt{9 - x^2}$ i.e. y is positive square root of $(9 - x^2)$ $\therefore\ y \geq 0$ ..... (ii) from (i) and (ii) $-3 \leq y \leq 3$ & $y \geq 0$ $\Rightarrow 0 \leq y \leq 3$ $\Rightarrow y \leq [0,3]$ Range of function f(x) is [0,3]

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : TRIGONOMETRIC FUNCTIONS

TRIGONOMETRIC FORMULA

- An angle can be measured in degrees or in radians.
- 1 radian is an angle subtended at the centre of a circle by an arcwhose length is equal to the radius of the circle.
- π radian = 180 degrees
- Radian measure = $\frac{\pi}{180} \times$ Degree measure

  Degree measure = $\frac{180}{\pi} \times$ Radian measure
- 1° = 60′
  1′ = 60″
- 1 radian = 57° 16′ approximately
  1° = 0.01746 radian approximately
- If an arc of length *l* makes an angle θ radian at the centre of a circle of radius *r*, we have $l = r\theta$
- Signs of trigonometric functions

	I	II	III	IV
sin x	+	+	-	-
cos x	+	-	-	+
tan x	+	-	+	-
cosec x	+	+	-	-
sec x	+	-	-	+
cot x	+	-	+	-

- Domain and Range of trigonometric functions

Function	Domain	Range
sin x	R	[-1, 1]
cos x	R	[-1, 1]
tan x	$R - \{(2n+1)\frac{\pi}{2} : n \text{ c } N\}$	R
cosec x	$R - \{(n\pi : n \text{ c } N\}$	R – (-1, 1)
sec x	$R - \{(2n+1)\frac{\pi}{2} : n \text{ c } N\}$	R – (-1, 1)
cot x	$R - \{(n\pi : n \text{ c } N\}$	R

- $sin^2x + cos^2x = 1$
  $sec^2x - tan^2x = 1$
  $cosec^2x - cot^2x = 1$

- $1.\sin(\frac{\pi}{2} - x) = \cos x$ $2.\cos(\frac{\pi}{2} - x) = \sin x$
  $3.\tan(\frac{\pi}{2} - x) = \cot x$ $4.\cot(\frac{\pi}{2} - x) = \tan x$
  $5.\sec(\frac{\pi}{2} - x) = \text{cosec}\, x$ $6.\text{cosec}(\frac{\pi}{2} - x) = \sec x$

- $1.\ \sin(\frac{\pi}{2}+x)=\cos x$ $2.\ \cos(\frac{\pi}{2}+x)=-\sin x$
  $3.\ \tan(\frac{\pi}{2}+x)=-\cot x$ $4.\ \cot(\frac{\pi}{2}+x)=-\tan x$
  $5.\ \sec(\frac{\pi}{2}+x)=-\operatorname{cosec} x$ $6.\ \operatorname{cosec}(\frac{\pi}{2}+x)=\sec x$

- $1.\ \sin(\pi-x)=\sin x$ $2.\ \cos(\pi-x)=-\cos x$
  $3.\ \tan(\pi-x)=-\tan x$ $4.\ \cot(\pi-x)=-\cot x$
  $5.\ \sec(\pi-x)=-\sec x$ $6.\ \operatorname{cosec}(\pi-x)=\operatorname{cosec} x$

- $1.\ \sin(\pi+x)=-\sin x$ $2.\ \cos(\pi+x)=-\cos x$
  $3.\ \tan(\pi+x)=\tan x$ $4.\ \cot(\pi+x)=\cot x$
  $5.\ \sec(\pi+x)=-\sec x$ $6.\ \operatorname{cosec}(\pi+x)=-\operatorname{cosec} x$

- $1.\ \sin(2\pi-x)=-\sin x$ $2.\ \cos(2\pi-x)=\cos x$

  $3.\ \tan(2\pi-x)=-\tan x$ $4.\ \cot(2\pi-x)=-\cot x$
  $5.\ \sec(2\pi-x)=\sec x$ $6.\ \operatorname{cosec}(2\pi-x)=-\operatorname{cosec} x$

- $1.\ \sin(2\pi+x)=\sin x$ $2.\ \cos(2\pi+x)=\cos x$
  $3.\ \tan(2\pi+x)=\tan x$ $4.\ \cot(2\pi+x)=\cot x$
  $5.\ \sec(2\pi+x)=\sec x$ $6.\ \operatorname{cosec}(2\pi+x)=\operatorname{cosec} x$

- The values of sin x, cos x, cosec x and sec x repeat after an interval of 2π.
  The values of tan x and cot x repeat after an interval of π.

- $\sin(x+y)=\sin x\cos y+\cos x\sin y$
  $\sin(x-y)=\sin x\cos y-\cos x\sin y$
  $\cos(x+y)=\cos x\cos y-\sin x\sin y$
  $\cos(x-y)=\cos x\cos y+\sin x\sin y$

- $\tan(x+y)=\frac{\tan x+\tan y}{1-\tan x\tan y}$ $\tan(x-y)=\frac{\tan x-\tan y}{1+\tan x\tan y}$

- $\cot(x+y)=\frac{\cot x\cot y-1}{\cot y+\cot x}$ $\cot(x-y)=\frac{\cot x\cot y+1}{\cot y-\cot x}$

- $\sin 2x=2\sin x\cos x=\frac{2\tan x}{1+\tan^2 x}$
  $\cos 2x=\cos^2 x-\sin^2 x=2\cos^2 x-1=1-2\sin^2 x=\frac{1-\tan^2 x}{1+\tan^2 x}$
  $\tan 2x=\frac{2\tan x}{1-\tan^2 x}$

- $\sin 3x=3\sin x-4\sin^3 x$
  $\cos 3x=4\cos^3 x-3\cos x$
  $\tan 3x=\frac{3\tan x-\tan^3 x}{1-3\tan^2 x}$

	• $\cos x + \cos y = 2\cos\frac{x+y}{2}\cos\frac{x-y}{2}$ $\cos x - \cos y = -2\sin\frac{x+y}{2}\sin\frac{x-y}{2}$ $\sin x + \sin y = 2\sin\frac{x+y}{2}\cos\frac{x-y}{2}$ $\sin x - \sin y = 2\cos\frac{x+y}{2}\sin\frac{x-y}{2}$ • $2\cos x\cos y = \cos(x+y) + \cos(x-y)$ $-2\sin x\sin y = \cos(x+y) - \cos(x-y)$ $2\sin x\cos y = \sin(x+y) + \sin(x-y)$ $2\cos x\sin y = \sin(x+y) - \sin(x-y)$
	MCQ
Q1	Value of sin 10° + sin 20° + sin 30° +. ....+sin360° is (a) 1 (b) 0 (c) 2 (d) 1/ 2
Q2	If sin A = 3 /5 , 0 < A < $\frac{\pi}{2}$ and cos B = -12/ 13 , π< B < $\frac{3\pi}{2}$, then value of sin (A – B) is (a) -13/ 82 (b) -15 /65 (c) -13/ 75 (d)- 16 /65
Q3	The large hand of a clock is 42 cm long. How much distance does its extremity move in 20 minutes? (a) 88 cm (b) 80 cm (c) 75 cm (d) 77 cm
Q4	The value of tan 20° + 2 tan 50° – tan 70° is equal to (a) 1 (b) 0 (c) tan 50° (d) None of these
Q 5	If sin x + cos x = 1/5 then tan 2x is (a) 25 /17 (b) 7 /25 (c) 25 /7 (d) 24/ 7
Q 6	Consider the following statements. **I.** cot x decreases from 0 to −∞ in first quadrant and increases from 0 to ∞ in third quadrant. **II.** sec x increases from −∞to −1 in second quadrant and decreases from ∞to 1 in fourth quadrant. **III.** cosec x increases from 1 to∞ in second quadrant and decreases from −1 to −∞in fourth quadrant. Choose the correct option. (a) I is incorrect (b) II is incorrect (c) III is incorrect (d) IV is incorrect

Q 7	1 + cos 2x + cos 4x + cos 6x = (a) 2 cos x cos 2x cos 3x (b) 4 sin x cos 2x cos 3x (c) 4 cos x cos 2x cos 3x (d) None of these
Q 8	The value of sin $(-\frac{11\pi}{3})$ is $\frac{\sqrt{3}}{m}$Value of 'm' is (a) 1 (b) 2 (c) 3 (d) 5
Q 9	The number of solutions sinx=cos x for all x $[-\pi, \pi]$ from graph will be (a) 1 (b) 2 (c) 3 (d) 5
Q10	The value of expression sin A + cosA lies between (a) –2 and 2 both inclusive (b) 0 and 2 both inclusive (c) – 2 and 2 both inclusive (d) 0 and 2 both inclusive
Q11	If sinθ + cosθ T= 1, then sinθ .cosθ = (a) 0 (b) 1 (c) 2 (d) 1/ 2
Q 12	The degree measure of $\frac{11}{16}$radian is (a) 39° 22′ 30″ (b)39° 22.3′ (c) 39° 30′ 22″ (d)39°
Q13	If in two circles, arcs of the same length subtend angles 45° and 60° at Centre, find the ratio of their radii. (a) 2:3 (b) 2:5 (c) 3:4 (d) 4:3
Q14	Consider the statements given below: I. sin x is positive in first and second quadrants. II. cosec x is negative in third and fourth quadrants. III. tan x and cot x are negative in second and fourth quadrants. IV. cos x and sec x are positive in first and fourth quadrants. Choose the correct option. (a) All are correct (b) Only I and IV are correct (c) Only III and IV are correct (d) None is correct
Q15	The value of sin$(\pi - \theta)$sin$(\pi + \theta)cosec^2\theta$ = (a) 0 (b) 1 (c) -1 (d) 1/ 2
Q16	If tanA=1/2 and tanB=1/3,then the value of A+B= (a)) 45° (b))60° (c))30° (d)0°
Q 17	The value of tan 3A – tan 2A – tan A is equal to (a) tan 3A tan 2A tan A (b) –tan 3A tan 2A tan A (c) tan A tan 2A – tan 2A tan 3A – tan 3A tan A (d) None of these

Q 18	The value of t 75° – cot 75° is equal to (a) 2 $\sqrt{3}$ (b) 2+$\sqrt{3}$ (c) 2– $\sqrt{3}$ (d) 1
Q 19	The value of $\frac{1}{sin\ 10^{\circ}}$ - $\frac{\sqrt{3}}{cos10^{\circ}}$= (a) 0 (b) 1 (c) -1 (d) 4
Q 20	If tan A=b/a,then value of acos2A+bsin2A= (a) -b (b) a (c) -a (d) b
	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	CASE STUDY -1 :- Trigonometry is the combination of 2 words – 'Trigonon' means Triangle and 'metron' means measure. It is a branch of geometry that studies relationship between lengths and angles of a triangle. Degree and radian units of measurement of angles are used, also called Indian system of measurement of triangles. In this system $\pi\ radian = 180^{\circ}$;$1^{\circ}$=60minuteand 1minute=60 seconds;1 rt angle =90°.The length of arc l is given by $\theta = lr$.On the basis of above information answer the following questions: (i) 11/36 radians into degree minutes and seconds (a) $17^{\circ}14'30''$ (b)$17^{\circ}14'$ (c)$17^{\circ}30''$ (d) None of these (ii) $\frac{7\pi}{18}$into degrees will be (a)60° (b)70° (c)100° (d)80° (iii) Find the length of arc made by minute's hand of a clock in 5 minutes having radius 7cm. (a)$\frac{7\pi}{5}$ (b)$\frac{7\pi}{6}$ (c)$\frac{7\pi}{3}$ (d)$\frac{7\pi}{4}$ (iv) If the arcs of the same length in two circles subtend angles 65 and 80 at the centre, then the ratio of their radii. (a)13:16 (b) $3:16$ (c)16:13 (d) $5:16$
Q 22	CASE STUDY-2-Domain and range of the following trigonometric functions are given below:- Based on the following information, answer the following questions:- • Domain and Range of trigonometric functions

Function	Domain	Range
sin x	R	[-1, 1]
cos x	R	[-1, 1]
tan x	R – $\{(2n+1)\frac{\pi}{2} : n\ c\ N\}$	R
cosec x	R – $\{(n\pi : n\ c\ N\}$	R – (-1, 1)

sec x	R − $\{(2n+1)\frac{\pi}{2} : n \text{ c } N\}$	R – (-1, 1)
cot x	R − $\{(n\pi : n \text{ c } N\}$	R

(i) Domain of f(x)=$\frac{1}{\sqrt{1+cosx}}$is

(a) R (b) R-(2n+1)π (c)R-2n π (d) R-nπ

(ii) Domain of f(x)= $\frac{1}{sinx+cosx}$

(a) R-(4n-1)$\frac{\pi}{4}$ (b) R-(4n+1)$\frac{\pi}{4}$ (c)R-$\frac{n\pi}{4}$ (d) R-nπ

(iii) Range of f(x)= sin2x

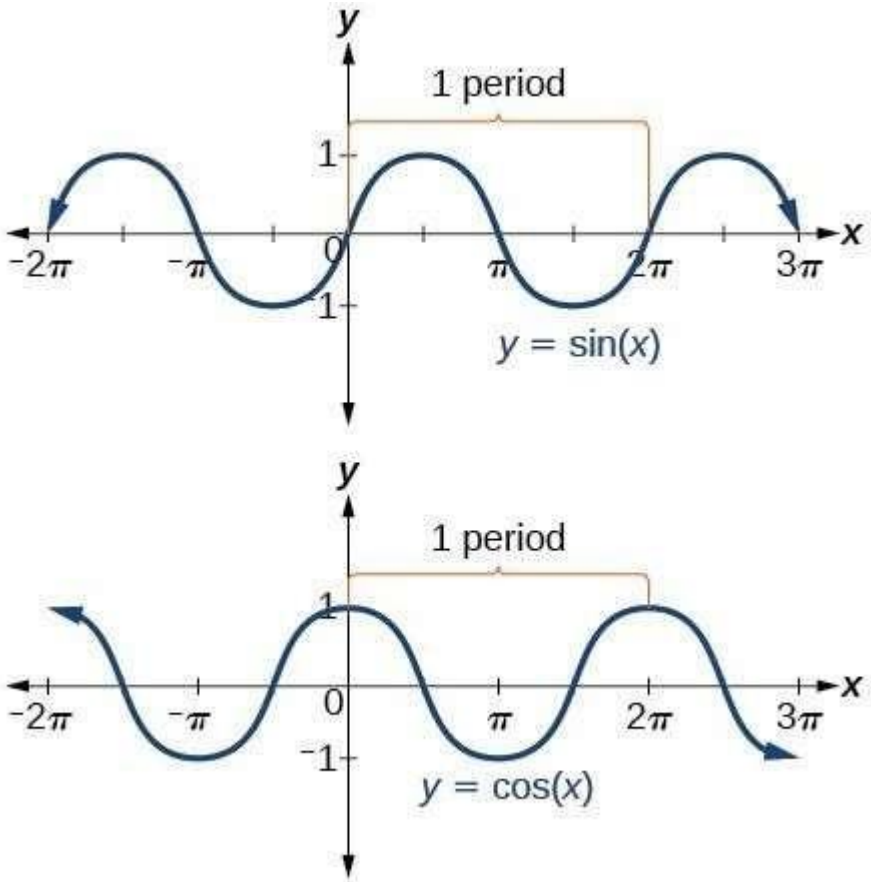
(a) [-1,1] (b) (-1,1) (c)[0,1] (d) (-1,0)

(iv) Range of f(x)=sinx+cosx

(a) $(-\sqrt{2},\sqrt{2})$ (b) $[-\sqrt{2},\sqrt{2}]$ (c) $(-\sqrt{2},0)$ (d) $(0,\sqrt{2})$

Q 23

CASE STUDY -3: Sine and cosine functions can be used to model many real life scenarios-radio waves, tides, musicaltones, electricalsignals. Following are shown the graphs of sine and cosine curves. Looking to these graphs ,answer the following questions:-



	(i) If we draw line y=1/2,at how many points the graph of sine and this line intersects between interval [-π,π] (a) 0 (b) 1 (c) 2 (d) 3 (ii)If both sine and cosine curve are drawn on the same graph and on the same interval[-2 $\pi, 2\pi$] (a) 4 (b) 5 (c) 6 (d) 8 (iii) The graph of cosine cuts on X axis between (0,2π) (a) 0 (b) 1 (c) 2 (d) 3 (iv) At how many points will be sinx=$\sqrt{2}$ in interval[-π,π] (a) 0 (b) 1 (c) 2 (d) 3
Q 24	It can be obtained that sin$18^\circ=\frac{\sqrt{5}-1}{4}$ and cos$36^\circ=\frac{\sqrt{5}+1}{4}$.Using these values,answer the following: (i)sin47°+sin$18^\circ - sin11^\circ - sin25^\circ$is equal to (a) sin$36^\circ$ (b) cos36° (c) sin7° (d) cos7° (ii) cos12°+cos$84^\circ + cos156^\circ - cos132^\circ$is equal to (a) -1 (b)$-\frac{1}{2}$ (c)$\frac{1}{2}$ (d)1 (iii) sin6°-sin$66^\circ + sin78^\circ - sin42^\circ$is equal to (a) 1 (b)$-\frac{1}{2}$ (c)$\frac{1}{2}$ (d)-1 (iv)tan81°-tan$63^\circ - \tan27^\circ + \tan9^\circ$is equal to (a) 1 (b) 2 (c) 3 (d) 4
Q 25	Given cosx=-4/5and siny=5/13,x&y both lie in second quadrant. Based on the following questions, answer the following:- (i)The value of sin(x+y)= (a)$-\frac{56}{65}$ (b)$-\frac{33}{65}$ (c)$-\frac{16}{65}$ (d)$\frac{63}{65}$ (ii) The value of cos(x+y)= (a)$-\frac{56}{65}$ (b)$-\frac{33}{65}$ (c)$-\frac{16}{65}$ (d)$\frac{63}{65}$ (iii) The value of sin(x-y)= (a)$-\frac{56}{65}$ (b)$-\frac{33}{65}$ (c)$-\frac{16}{65}$ (d)$\frac{63}{65}$ (iv) The value of cos(x-y)= (a)$-\frac{56}{65}$ (b)$-\frac{33}{65}$ (c)$-\frac{16}{65}$ (d)$\frac{63}{65}$

	ASSERTION REASONING
	Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion. (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion (c) Assertion is correct, reason is incorrect (d) Assertion is incorrect, reason is correct.
Q 26	**Assertion** : The ratio of the radii of two circles at the centres of which two equal arcs subtend angles of 30° and 70° is 21 : 10. **Reason** : Number of radians in an angle subtended at the centre of a circle by an arc is equal to the ratio of the length of the arc to the radius of the circle.
Q 27	**Assertion:** cosec x is negative in third and fourth quadrants. **Reason** : cot x decreases from 0 to −∞ in first quadrant and increases from 0 to ∞ in third quadrant
Q 28	**Assertion:** $cos^3\alpha + cos^3(\alpha + \frac{2\pi}{3}) + cos^3(\alpha + \frac{4\pi}{3}) = 3\cos\alpha\cos(\alpha + \frac{2\pi}{3})\cos(\alpha + \frac{4\pi}{3})$ **Reason** :If a+b+c=0 then $a^3+b^3+c^3=3abc$
Q 29	**Assertion:**tan5A-tan3A-tan2A=tan5Atan3Atan2A **Reason** :x=y+z⇒ tanx-tany-tanz=tanxtanytanz.
Q 30	**Assertion:The maximum value of sinx+cosx is 2** **Reason** :The maximum value of sinx is 1 and maximum value cos is 1
	VERY SHORT
Q 31	If sin (A+B)=m and sin(A-B)=n then find cos^2B-cos^2A
Q 32	If the arcs of the same lengths in two circles subtend angles 65° and 110° at the centre, find the ratio of their radii
Q 33	If tan(A – B) = 1, sec(A + B) = $\frac{2}{\sqrt{3}}$ the smallest positive value of B is…….
Q 34	Find the value of $cos^2$75-$sin^2$15
Q 35	Evaluate :$\sqrt{3}$ cosec20-sec20
Q 36	Find the value of cos($\frac{3\pi}{4}$-x)- cos($\frac{3\pi}{4}$+x)
Q 37	Evaluate: sin$\frac{\pi}{10}$ + sin$\frac{13\pi}{10}$
Q 38	Evaluate : 2cos$\frac{\pi}{13}$ $cos\frac{9\pi}{13}$+ $cos\frac{3\pi}{13}$ + $cos\frac{5\pi}{13}$
Q 39	Evaluate the value of sin105°

Q 40	Find the value of k if tanA-cotA=k cot2A
Q 41	Convert 1 radian in degree,minute and seconds
Q 42	Convert $40^{\circ}20'$ into radian measure
Q 43	In a circle of diameter 56cm,the length of the chord is 28 cm,find the length of the minor arc.
Q 44	A wheel makes 540 revolutions in one minute. Through how many radians does it turn in 12 seconds.
Q 45	Find the value of 2 sin75° sin15°.
Q 46	Find **a** if sin(-420°) cos390° + cos(-660°) sin330° = - a
Q 47	If sinx + cosec x= 2, then find $\sin^8 x + \operatorname{cosec}^8 x$
Q 48	What will be the domain and range of f(x)=$sin\frac{x}{2}$
Q 49	Evaluate the value of sin(-1140)+cos(-450)
Q 50	Find the value of$\tan 15^{\circ}.\tan 45^{\circ}\tan 75^{\circ}$
	SHORT QUESTIONS
Q 51	If x=ycos$\frac{2\pi}{3}$ =zcos$\frac{4\pi}{3}$,then find the value of xy+yz+zx
Q 52	Prove that sin(45+A) sin(45-A)=$\frac{cos2A}{2}$
Q 53	Prove that : cot x cot 2x – cot 2x cot 3x – cot 3x cot x=1
Q 54	If A + B = 45°, then (cot A – 1) (cot B – 1) is equal to…….
Q 55	Find $\sin\frac{x}{2}, \cos\frac{x}{2} and \tan\frac{x}{2}$ if tan x = - $\frac{3}{4}$, x lies in the 2nd quadrant
Q 56	Evaluate: sin$\frac{\pi}{8}$
Q 57	If tan($\frac{\pi}{4}+\theta$) - tan($\frac{\pi}{4}-\theta$)=k tan2θ ,find k
Q 58	Evaluate: cos$\frac{\pi}{7}$ cos$\frac{2\pi}{7}$ cos$\frac{4\pi}{7}$
Q 59	Prove that: $\frac{\text{sinA}-\text{sinB}}{cosB-cosA}$ =cot($\frac{A+B}{2}$)
Q 60	Evaluate: $\sin 12^{\circ}.\sin 48^{\circ}.\sin 54^{\circ}$
Q 61	Evaluate the value of tan2A if sinA=-3/5
Q 62	Evaluate the value of $\sin 75^{\circ}-\cos 75^{\circ}$
Q 63	Prove that: $\frac{sin2A}{1+cos2A}$ =tanA
Q 64	If $\frac{sinA+sin2A}{1+cosA+cos2A}$ =k tanA,find k

Q 65	Evaluate the value of (sin3x+sinx)sinx+(cos3x-cosx) cosx
Q 66	The railway train is travelling on a circular curve of 1500 metres radius at the rate of 66km/hr.Through what angle it has turned in10 seconds.
Q 67	Evaluate: $\frac{\sin(180+\theta)\cos(90+\theta)\tan(270-\theta)\cot(360-\theta)}{\sin(360-\theta)\cos(360+\theta)cosec(-\theta)\sin(270-\theta)}$
Q 68	If sinA=-3/5 and A lies in 3rd Quadrant and cosB= 12/13 and B lies in 4th Quadrant ,then find the value of tan (A+B)
Q 69	In any cyclic quadrilateral ABCD,prove that cosA+ cosB+ cosC +cosD=0
Q 70	Show that tan 3x tan 2x tan x = tan 3x – tan 2x – tan x.
	LONG QUESTIONS
Q 71	Prove that :$(1+COS\frac{\pi}{8})(1+COS\frac{3\pi}{8})(1+COS\frac{5\pi}{8})(1+COS\frac{7\pi}{8})=1/8$
Q 72	Prove that : $sin^4\frac{\pi}{8}+sin^4\frac{3\pi}{8}+sin^4\frac{5\pi}{8}+sin^4\frac{7\pi}{8}=3/2$
Q 73	Prove that : $\sin20.\sin40.\sin60.\sin80=3/16$
Q 74	Prove that: $cos^2\alpha+cos^2(\alpha+120)+cos^2(\alpha-120)=3/2$
Q 74	Prove that : $\frac{\sin(4A-2B)+\sin(4B-2A)}{\cos(4A-2B)+\cos(4A-2B)}$ =tan(A+B)
Q 75	Prove that : $\frac{sinA-sin5A+sin9A-sin13A}{cosA-cos5A-cos9A+cos13A}$=cot4A
Q 76	Prove that :$\sqrt{2+\sqrt{2+\sqrt{2+2cos8A}}}$ =2cosA
Q 77	Prove that : $\sin4A=4\sin A cos^3A-4cosAsin^3A$
Q 78	If A+B+C=π,then prove that: $\tan\frac{A}{2}\tan\frac{B}{2}+tan\frac{B}{2}tan\frac{C}{2}+tan\frac{C}{2}tan\frac{A}{2}=1$
Q 79	Prove that $2\,sin^2\beta+4\cos(a+\beta)\sin a\sin\beta+\cos2(a+\beta)$ is independent of β.
Q 80	Sketch the graph of cos2x and cos(2x-$\frac{\pi}{4}$)

SOLUTIONS:- MCQs

1.b	2.d	3.a	4.b	5.d
6.a	7.c	8.b	9.b	10.c
11.a	12.a	13.d	14.a	15.c
16.a	17.a	18.a	19.d	20.b

21.CASE STUDY-1	(i)c	(ii)b	(iii)b	(iv)c
22. CASE STUDY-2	(i)b	(ii)a	(iii)a	(iv)b
23.CASE STUDY-3	(i)c	(ii)a	(iii)c	(iv)a
24.CASE STUDY-4	(i)d	(ii)b	(iii)c	(iv)d
25.CASE STUDY-5	(i)a	(ii)b	(iii)c	(iv)d

ASSERTION AND REASON:-

26. d	**27. c**	**28. a**	**29. a**	**30. d**

VERY SHORT QUESTIONS:-

31. $m^2 - n^2$	**32.** 22:13	**33.** $\frac{7\pi}{24}$	**34.**0	**35.**4
36. $\sqrt{2}\sin x$	**37.** $-\frac{1}{2}$	**38.**0	**39.** $\frac{\sqrt{3}+1}{2\sqrt{2}}$	**40.** k=-2
41. $57^{\circ}16'22''$	**42.** $\frac{121}{540}$	**43.** $\frac{28\pi}{3}$	**44.** 216π	**45.**1/2
46.a=1	**47.**2	**48.** Domain-R Range-[-1,1]	**49.**0	**50.**1

SHORT QUESTIONS:-

51.	x=ycos$\frac{2\pi}{3}$=z cos $\frac{4\pi}{3}$ $\Rightarrow \frac{x}{1}=\frac{-y}{-2}=\frac{-z}{-2}$=k(let) $\Rightarrow$ x=k;y=-2k;z=-2k Now xy+yz+zx =(k).(-2k)+(-2k)(-2k)+(-2k)(k) =-2k^2+4k^2-2k^2 =0
52.	sin(A+B)sin(A-B)=sin^2A-sin^2B sin(45+A)sin(45-A)=$sin^2$45-sin^2A =$(\frac{1}{\sqrt{2}})^2$ -sin^2A

	$=\frac{1-2sin^2A}{cos2A}$ $=\frac{2}{2}$
53.	cot x cot 2x – cot 2x cot 3x – cot 3x cot x We have 3x = x + 2x cot 3x = cot (x + 2x) $\cot 3x=\frac{\cot x \cot 2x-1}{\cot x+\cot 2x}$ By cross multiplication cot 3x (cot x + cot 2x) = cot x cot 2x – 1 ⇒ cot x cot 3x + cot 2x cot 3x =cos x cot 2x – 1 ⇒cos x cot 2x – cot 2x cot 3x – cot 3x cot x = 1
54.	cot(A+B)=cot45 ⇒cot(A+B)=1 $\Rightarrow \frac{cotB+cotA}{cotA.cotB-1}=1$ ⇒cotB+cotA=cotAcotB-1 $\Rightarrow cotB+cotA-cotAcotB+1=0$ ⇒ (cotA-1)(cotB-1)=0
55.	If x lies in second Quadrant ,then x/2 is lies in first Quadrant. tanx=-3/4 ,then cosx=-4/5 $\sin\frac{x}{2}=\pm\sqrt{\frac{1-cosx}{2}}$; $\cos\frac{x}{2}=\pm\sqrt{\frac{1+cosx}{2}}$ $\sin\frac{x}{2}=\pm\sqrt{\frac{1-(-4)}{2\ 5}}=\frac{3}{\sqrt{10}}$ and $\cos\frac{x}{2}=\sqrt{\frac{1+(-4)}{2\ 5}}=\frac{1}{\sqrt{10}}$ $\tan\frac{x}{2}=\frac{\sin\frac{x}{2}}{\cos\frac{x}{2}}=3$
56.	$\sin\frac{\pi}{8}=\sqrt{\frac{1-\cos\frac{\pi}{4}}{2}}$ $=\sqrt{\frac{1-\frac{1}{\sqrt{2}}}{2}}$ $=\sqrt{\frac{(\sqrt{2}-1}{2\sqrt{2}}}$
57.	$\tan(\frac{\pi}{4}+\theta)-\tan(\frac{\pi}{4}-\theta)=[\frac{\tan\frac{\pi}{4}+\tan\theta}{1-\tan\frac{\pi}{4}\tan\theta}]-[\frac{\tan\frac{\pi}{4}-\tan\theta}{1+\tan\frac{\pi}{4}\tan\theta}]$ $=[\frac{1+tan\theta}{1-tan\theta}]-[\frac{1-tan\theta}{1+tan\theta}]$ $\Rightarrow \frac{4tan\theta}{1-tan^2\theta}=2\tan2\theta$ ⇒k=2
58.	$\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}$ Divide and multiply with 2 $\sin\frac{\pi}{7}$ $=\frac{2\sin\frac{\pi}{7}}{2\sin\frac{\pi}{7}}[\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}]$

	$[\sin \quad \cos \quad \cos$ $=\frac{}{2\sin\frac{7\pi}{7}\frac{7}{}}$ Divide and multiply by2 $=[\frac{2\sin\frac{2\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}}{2.2\sin\frac{4\pi}{7}\sin\frac{4\pi}{7}\cos}]$ $=\frac{}{2.2\sin\frac{\pi}{7}}$ Again divide and multiply2 $=\frac{2\sin\frac{4\pi}{7}\cos\frac{4\pi}{7}}{2.2.2\sin\frac{\pi}{7}}$ $=\frac{\sin\frac{8\pi}{7}}{2.2.2\sin\frac{\pi}{7}}$ $=\frac{\sin(u+\frac{\pi}{7})}{2.2.2\sin\frac{\pi}{7}}$ $=\frac{-\sin(\frac{\pi}{7})}{2.2.2\sin\frac{\pi}{7}}$ $=\frac{-1}{8}$
59.	$=\frac{2\cos(\quad)\sin(\quad)}{2\sin(\frac{A+B}{2})\sin(\frac{A-B}{2})}$ $=\cot(\frac{A+B}{2})$
60.	$\sin12^{\circ}.\sin48^{\circ}.\sin54^{\circ}$ Divide and multiply by 2 $= 1/2(2\sin12^{\circ}.\sin48^{\circ}.\sin54^{\circ})$ $=\frac{1}{2}\{(\cos(12-48)-COS(12+48)\}\sin54$ $=\frac{1}{2}(COS36-\cos60)\cos36$ $=\frac{1}{2}(\frac{\sqrt{5}+1}{4}-\frac{1}{2})(\frac{\sqrt{5}+1}{4})$ $=\frac{1}{2}(\frac{\sqrt{5}-1}{4})(\frac{\sqrt{5}+1}{4})$ $=\frac{1}{32}(5-1)$ =4/32 =1/8
61.	. $\tan2A=\frac{2tanA}{1-tan^2A}$ $=\frac{2.(\frac{-3}{4})}{1-(\frac{-3}{4})^2}$ $=\frac{-24}{7}$
62.	sin75-cos75 =sin75-sin15=$2\cos\frac{(75+15)}{2}\sin\frac{(75-15)}{2}$ =2cos45sin30 $=2.\frac{1}{\sqrt{2}}.\frac{1}{2}$ $=\frac{1}{\sqrt{2}}$

63.	$\frac{sin2A}{1+cos2A}$ $=\frac{2sinAcosA}{2cos^2A}$ =tanA
64.	$=\frac{sinA+sin2A}{1+cosA+cos2A}$ $=\frac{sinA+2sinAcosA}{1+cosA+2cos^2A-1}$ $=\frac{sinA(1+2cosA)}{cosA(1+2cosA)}$ =tanA
65.	sin3x+sinx)sinx+(cos3x-cosx) cosx $=2\sin\frac{(3x+x)}{2}\cos\frac{(3-x)}{2})sinx-2sin\frac{(3x+x)}{2}sin\frac{(3x-x)}{2}$ cosx =2sin2xcosxsinx-2sin2xsinxcosx =0
66.	Speed=66km/hr=66x5/18=55/3m/sec Therefore distance travelled in 10 seconds=550/3m $\Longrightarrow \theta = l/r$ $\Longrightarrow \theta = \frac{550}{3} \div 1500$ $\Longrightarrow \theta = \frac{11}{90} rad.$
67.	$=\frac{(-\sin\theta).(-\sin\theta)\cot\theta(-\cot\theta)}{(-sin\theta)cos\theta(-cosec\theta)(-cos\theta)}$ $=\frac{sin^2\theta}{cos^2\theta} cot^2\theta$ =1
68.	sinA=-3/5and cosB=12/13 $\Longrightarrow$tanA=3/4;tanB=-5/12 tan(A+B)=$\frac{tanA+tanB}{1-tanAtanB}$ =place the values ,we get 16/63
69.	A+C=π(Opposite angles of cyclic quadrilateral are supplementary) . A=$\pi - C$ .cos A=cos (π-C) .cosA=-cosC cosA+cosC=0 Similarly .cosB+cosD=0 =cosA+cosB+cosC+cosD=0
70.	tan3x=tan(2x+x) .$\Rightarrow$tan3x=$\frac{tan2x+tanx}{1-tan2x.tanx}$.$\Rightarrow$tan3x-tanx-tan2x=tanx.tan2x.tan3x

LONG QUESTIONS

71.	:$(1+COS\frac{\pi}{8})(1+COS\frac{3\pi}{8})(1+COS\frac{5\pi}{8})(1+COS\frac{7\pi}{8})$ $=(1+COS\frac{\pi}{8})(1+COS\frac{7\pi}{8})(1+COS\frac{5\pi}{8})(1+COS\frac{3\pi}{8})$ $=:(1+COS\frac{\pi}{8})(1-COS\frac{\pi}{8})(1-COS\frac{3\pi}{8})(1+COS\frac{3\pi}{8})$ $=:(1-COS^2\frac{\pi}{8})(1-COS^2\frac{3\pi}{8})$ $=sin^2\frac{\pi}{8}.sin^2\frac{3\pi}{8}$ $=(\frac{1-cos\frac{\pi}{4}}{2})(\frac{1-cos\frac{3\pi}{4}}{2})$ $=(\frac{1-\frac{1}{\sqrt{2}}}{2})(\frac{1+\frac{1}{\sqrt{2}}}{2})$ $=(\frac{\sqrt{2}-1}{2\sqrt{2}})(\frac{\sqrt{2}+1}{2\sqrt{2}})$ $=\frac{(\sqrt{2})^2-1}{8}$ =1/8
72.	$sin^4\frac{\pi}{8}+sin^4\frac{3\pi}{8}+sin^4\frac{5\pi}{8}+sin^4\frac{7\pi}{8}$ $=sin^4\frac{\pi}{8}+sin^4\frac{7\pi}{8}+sin^4\frac{5\pi}{8}+sin^4\frac{3\pi}{8}$ $=sin^4\frac{\pi}{8}+sin^4\frac{\pi}{8}+sin^4\frac{3\pi}{8}+sin^4\frac{3\pi}{8}$ $=2sin^4\frac{\pi}{8}+2sin^4\frac{3\pi}{8}$ $=2(\frac{1-cos\frac{\pi}{4}}{2})^2+2(\frac{1-cos\frac{3\pi}{4}}{2})^2$ $=2(\frac{1-\frac{1}{\sqrt{2}}}{2})^2+2(\frac{1+\frac{1}{\sqrt{2}}}{2})^2$ $=2(\frac{\sqrt{2}-1}{2\sqrt{2}})^2+2(\frac{\sqrt{2}+1}{2\sqrt{2}})^2$ $=2\{(\frac{\sqrt{2}-1}{2\sqrt{2}})^2+(\frac{\sqrt{2}+1}{2\sqrt{2}})^2\}$ $=\frac{2}{8}\{(\sqrt{2}-1)^2+(\sqrt{2}+1)^2\}$ $=\frac{1}{4}$(3+3) =3/2
73.	sin20.sin40.sin60.sin80 =1/2{2 sin20.sin40.sin60.sin80} =1/2[{cos(40-20)-cos(40+20)}$\frac{\sqrt{3}}{2}$sin80] $=\frac{\sqrt{3}}{4}$[{cos20-cos60}sin80] $=\frac{\sqrt{3}}{4}[cos20.sin80-cos60.sin80]$ $=\frac{\sqrt{3}}{4}[cos20.sin80-\frac{1}{2}.sin80]$ $=\frac{\sqrt{3}}{8}[2cos20.sin80-sin80]$ $=\frac{\sqrt{3}}{8}[\{sin(80+20)+\cos(80-60)-sin80]$ $=\frac{\sqrt{3}}{8}$[sin100 + $\frac{1}{2}$ - sin80] $=\frac{\sqrt{3}}{8}$[sin80-sin80 + $\frac{\sqrt{3}}{2}$] =3/16

74.	$=\frac{\sin(4A-2B)+\sin(4B-2A)}{\cos(4A-2B)+\cos(4A-2B)}$ $=\frac{2\sin^{\frac{(4A-2B+4B-2A)}{2}}\cos^{\frac{(4A-2B-4B+2A)}{2}}}{2\cos^{\frac{(4A-2B+4B-2A)}{2}}\cos^{\frac{(4A-2B-4B+2A)}{2}}}$ $=\frac{2\sin^{\frac{(2A+2B)}{2}}\cos^{\frac{(6A-6B)}{2}}}{2COS^{\frac{(2A+2B)}{2}}\cos^{\frac{(6A-6B)}{2}}}$ $=\frac{2\sin(A+B)}{2\cos(A+B)}$ =tan(A+B)
75.	$=\frac{sinA-sin5A+sin9A-sin13A}{cosA-cos5A-cos9A+cos13A}$ $=\frac{sinA+sin9A-sin5A-sin13A}{cosA-cos9A-cos5A+cos13A}$ $=\frac{2\sin^{\frac{(A+9A)}{2}}\cos^{\frac{(A-9A)}{2}}-2\sin^{\frac{(5A+13A)}{2}}\cos^{\frac{(5A-13A)}{2}}}{-2\sin^{\frac{(A+9A)}{2}}\sin^{\frac{(A-9A)}{2}}-2\sin^{\frac{(13A+9A)}{2}}\sin^{\frac{(13A-A)}{2}}}$ $=\frac{2sin5Acos4A-2sin9Acos4A}{2sin5Asin4A-2sin9Asin4A}$ $=\frac{2cos4A(sin5A-sin9A)}{2sin4A(sin5A-sin9A)}$ =cot4A
76.	$=\sqrt{2+\sqrt{2+\sqrt{2+2cos8A}}}$ $=\sqrt{2+\sqrt{2+\sqrt{2(1+cos8A)}}}$ $=\sqrt{2+\sqrt{2+\sqrt{2(2cos^2 4A)}}}$ $=\sqrt{2+\sqrt{2+\sqrt{4cos^2 4A}}}$ $=\sqrt{2+\sqrt{2+2cos4A}}$ $=\sqrt{2+\sqrt{2(1+cos4A)}}$ $=\sqrt{2+\sqrt{4cos^2 2A}}$ $=\sqrt{2+2cos2A}$ $=\sqrt{2(1+cos2A)}$ $=\sqrt{2.2cos^2 A}$ =2cosA
77.	sin4A=2sin2Acos2A =2(2sinAcosA)(cos^2A-sin^2A) =4sinAcos^3A-4cosAsin^3A
78.	A+B+C=π $\therefore \frac{A}{2}+\frac{B}{2}+\frac{C}{2}=\frac{\pi}{2}$

	$\Rightarrow \frac{A}{2}+\frac{B}{2}=\frac{\pi}{2}-\frac{C}{2}$ $\Rightarrow \tan\left(\frac{A}{2}+\frac{B}{2}\right)=\tan\left(\frac{\pi}{2}-\frac{C}{2}\right)$ $\Rightarrow \frac{\tan\frac{A}{2}+\tan\frac{B}{2}}{1-\tan\frac{A}{2}\tan\frac{B}{2}}=\cot\frac{C}{2}$ $\Rightarrow \frac{\tan\frac{A}{2}+\tan\frac{B}{2}}{1-\tan\frac{A}{2}\tan\frac{B}{2}}=\frac{1}{\tan\frac{C}{2}}$ $.\Rightarrow \tan\frac{A}{2}\tan\frac{C}{2}+\tan\frac{C}{2}\tan\frac{B}{2}=1-\tan\frac{A}{2}\tan\frac{B}{2}$ $.\Rightarrow \tan\frac{A}{2}\tan\frac{C}{2}+\tan\frac{C}{2}\tan\frac{B}{2}+\tan\frac{A}{2}\tan\frac{B}{2}=1$
79.	$=2\,sin^2\beta+4\cos(a+\beta)\sin a\sin\beta+\cos 2(a+\beta)$ $=2\,sin^2\beta+4\,(\cos a\cos\beta-\sin a\sin\beta)\sin a\sin\beta+1-2\sin^2(a+\beta)$ $=2\,sin^2\beta+4\,(\cos a\cos\beta\sin a\sin\beta-\sin^2a\sin^2\beta)+1-2(\sin a\cos\beta+\cos a\sin\beta)^2$ $=2\,sin^2\beta+4\cos a\cos\beta\sin a\sin\beta-4\sin^2a\sin^2\beta+1-2(\sin^2a\cos^2\beta+2\sin a\cos\beta\sin a\cos\beta+\cos^2a\sin^2\beta)$ $=2\,sin^2\beta+4\cos a\cos\beta\sin a\sin\beta-4\sin^2a\sin^2\beta+1-2\sin^2a\cos^2\beta-4\sin a\cos\beta\sin a\cos\beta-2\cos^2a\sin^2\beta$ $=2\,sin^2\beta-4\sin^2a\sin^2\beta+1-2\sin^2a\cos^2\beta-2\cos^2a\sin^2\beta$ $=2\,sin^2\beta-4\sin^2a\sin^2\beta+1-2\sin^2a(1-\sin^2\beta)-2(1-\sin^2a)\sin^2\beta$ $=1-2\sin^2a=\cos 2a=$independent ofβ
80.	Draw appropriate graphs.

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : COMPLEX NUMBERS

	MCQ
Q1	The value of i^{528} (a) 1 (b) -1 (c) i (d) – i
Q2	$[i^{19} + (\frac{1}{i})^{25}]^2$ is equal to (a) 4 (b) -4 (c) i (d) $-i$
Q3	$\frac{i^{592}+ i^{590}+ i^{588}+i^{586}+ i^{584}}{i^{582}+ i^{580}+ i^{578}+i^{576}+ i^{574}}$ is equal to (a) -1 (b)1 (c) $-2i$ (d) i
Q4	$i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is equal to (a)0 (b) 1 (c) -1 (d) 2
Q 5	The conjugate of i^{-35} (a)1 (b) -1 (c)i (d) –i
Q 6	If $z_1 = 3 + 2i$ and $z_1 = 2 - 4i$ and $\|z_1 + z_2\|^2+\|z_1 - z_2\|^2$ is equal (a) 11 (b)22 (c) 55 (d)66

Q 7	The value of $\frac{1^{n+1}-1^{n-1}}{2}$ (a) i (b) 2i (c) -i (d) -2i
Q 8	The real part of $\frac{(1+\mathrm{i})^2}{3-\mathrm{i}}$ is (a) $\frac{1}{3}$ (b) $-\frac{1}{5}$ (c) $\frac{-1}{3}$ (d) None of these
Q 9	The conjugate of the complex number $\frac{2+3\mathrm{i}}{4-3\mathrm{i}}$ (a) $\frac{7-26\mathrm{i}}{25}$ (b) $\frac{7-26\mathrm{i}}{25}$ (c) $\frac{-7-26\mathrm{i}}{25}$ (d) $\frac{7+26\mathrm{i}}{25}$
Q10	If $z(2-\mathrm{i})=(3+\mathrm{i})$, then z^{20} is equal to (a) 2^{10} (b) -2^{10} (c) 2^{20} (d) -2^{20}
Q11	If $4x+\mathrm{i}(3x-y)=3+\mathrm{i}(-6)$ then the values of x and y are (a) x =3, y =4 (b) x=3/4, y= 33/4 (c)x =4. y =3 (d)x =33. Y =4
Q 12	If $\mathrm{i}^{103}=a+\mathrm{i}b$ then a +b is equal to (a) 1 (b) -1 (c) 0 (d) 2
Q13	If $z_1=\sqrt{3}+\mathrm{i}\sqrt{3}$ and $z_2=\sqrt{3}+\mathrm{i}$ then the quadrant in which $\frac{z_1}{z_2}$ lie is (a) I (b) II (c) III (d) IV

Q14	The conjugate of $\frac{z-1}{(1-2i)^2}$ (a) $\frac{-2}{25}+\frac{11}{25}i$ (b) $\frac{2}{25}-\frac{11}{25}i$ (c) $\frac{2}{25}-\frac{11}{25}i$ (d) $\frac{2}{25}-\frac{11}{25}i$
Q15	If $z=-5i^{-15}-6i^{-8}$ then $\bar{z}$ is equal to (a) -6-5i (b) -6 +5i (c) 6 -5i (d) 6 +5i
Q16	$(1+i)^8+(1-i)^8$ equalto (a) 1 (b)2 (c) 8 (d) 32
Q 17	Which of the following options defined 'imaginary number'? (a)Square root of any number (b) Square root of positive number (c) Square root of negative number (d)Cube root of number
Q 18	If $z=\frac{7-i}{3-4i}$ then $\|z\|^{14}$ (a) 2^7 (b) 2^7i (c) -2^7 (d) -2^7i
Q 19	The argument of $\frac{1-i}{1+i}$ is (a) $\frac{\pi}{2}$ (b) $\frac{-\pi}{2}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$
Q 20	If $Z_1=1+i$, $Z_2=2-i$ and $\frac{Z_1}{Z_2}$= a +ib, then a +b is equal to (a) 2 (b) 1 (c) 3 (d) 4

	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	Conjugate of a complex number $z = x + \mathrm{i}y$ is $x - \mathrm{i}y$ and denoted by $\bar{z} = x - \mathrm{i}y$ Based on above information answer the following questions: (a).Find x if $sinx + \mathrm{i}cos2x$ and $cos2x - \mathrm{i}sin2x$ are conjugate each other. (b) Solve the equation $z^2 + z$.
Q 22	An ant is moving around a few food pieces scattered on the floor along the curve $\left\|\frac{z-2}{z-3}\right\| = 2$. (a) What is the shape of the path described by the ant (b) Find the equation of the path described.
Q 23	The conjugate of a complex number z is the complex number z is the complex number, obtained by z.It is denoted by $\bar{z}$. The modulus of a complex number z = a +ib is defined as the non-negative real number $\sqrt{a^2 + b^2}$. It is denoted by $\|z\|$ i. e $\|z\| = \sqrt{a^2 + b^2}$ (a) If $(x - \mathrm{i}y)(3 + 5\mathrm{i})$ is the conjugate of $-6 - 24\mathrm{i}$, the find the value of x + y (b) If $f(z) = \frac{7-z}{1-z^2}$, where z = 1 + 2i then find $\|f(z)\|$.
	ASSERTION REASONING
Q 24	Assertion (A) if $\mathrm{i} = \sqrt{-1}$then $\mathrm{i}^{4k} = 1, \mathrm{i}^{4k+1} = \mathrm{i}$, $\mathrm{i}^{4k+2} = -1\mathrm{i}^{4k+3} = -\mathrm{i}$. Reason (R) $\mathrm{i}^{4k} + \mathrm{i}^{4k+1} + \mathrm{i}^{4k+2} + \mathrm{i}^{4k+3} = 1$ (a) A is true, R is true; R is a correct explanation of A. (b) A is true, R is true; R is not a correct explanation of A. (c) A is true; R is false (d) A is false; R is true.
Q 25	Assertion: For real roots of $ax^2 + bx + c$, $D \geq 0$. Reason:The greatest value of λ for which $(2\lambda - 1)x^2 - 4x + (2\lambda - 1) = 0$ (a) A is true, R is true; R is a correct explanation of A. (b) A is true, R is true; R is not a correct explanation of A. (c) A is true; R is false (d) A is false; R is true.

Q 26	Assertion: If $\|z_1 + z_2\|^2 = \|z_1\|^2 + \|z_2\|^2$, then $\frac{z_1}{z_2}$ is purely imaginary Reason: If z is purely imaginary, then $+\bar{z} = 0$. (a) A is true, R is true; R is a correct explanation of A. (b) A is true, R is true; R is not a correct explanation of A. (c) A is true; R is false (d) A is false; R is true.
Q 27	Assertion: The equation $\mathrm{i}x^2 - 3\mathrm{i}x + 2\mathrm{i} = 0$ has non real roots. Reason: If a, b, c are real and $b^2 - 4ac \geq 0$, then the roots of the equation $ax^2 + bx + c = 0$ are real and if $b^2 - 4ac < 0$, then the roots of the equation $ax^2 + bx + c = 0$ are non-real. (a) A is true, R is true; R is a correct explanation of A. (b) A is true, R is true; R is not a correct explanation of A. (c) A is true; R is false (d) A is false; R is true.
	VERY SHORT
Q 28	Express the following complex number in the form $a + \mathrm{i}b$ $\frac{3 - \sqrt{-16}}{1 - \sqrt{-9}}$
Q 29	Find the modulus and conjugate of $\overline{\frac{(4+5\mathrm{i})^2}{(2+3\mathrm{i})^2}}$.
Q 30	For any complex number prove that $\|z^2\| = \|z\|^2$
Q 31	Evaluate i^{-999}
Q 32	Find the value of $(-\sqrt{-1})^{4n+3}$ where n is any natural number.
Q 33	Evaluate $1 + \mathrm{i}^2 + \mathrm{i}^4 + \mathrm{i}^6 + \cdots + \mathrm{i}^{20}$.
Q 34	Find the multiplicate inverse $z = 3 - 2\mathrm{i}$
Q 35	Check if $z = \left(\frac{3+2\mathrm{i}}{2-3\mathrm{i}}\right) + \left(\frac{3-2\mathrm{i}}{2+3\mathrm{i}}\right)$ is purely real or purely imaginary.
Q 36	If z_1, z_2 are $1 - \mathrm{i}$ and $-2 + 4\mathrm{i}$ respectively find $Im\left(\frac{z_1 z_2}{\bar{z}_1}\right)$
Q 37	Find the real values of x and y if $(1 - \mathrm{i})x + (1 + \mathrm{i})y = 1 - 3\mathrm{i}$
Q 38	If $\left(\frac{1-\mathrm{i}}{1+\mathrm{i}}\right) = a + \mathrm{i}b$ find a and b

Q 39	If a $=cos\theta + isin\theta$, find the value of $\frac{1+a}{1-a}$
Q 40	What is smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$?
Q 41	If z_1, z_2, z_3 are complex numbers such that $\|z_1\| = \|z_2\| = \|z_3\| = \left\|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right\| = 1$, then find the value of $\|z_1 + z_2 + z_3\|$.
Q 42	If $z_1 = 2 - i$ and $z_2 = -2 + i$ find (i)Re$\left(\frac{z_1 z_2}{\bar{z}_1}\right)$(ii) Im$\left(\frac{1}{z_1 \bar{z}_1}\right)$
	SHORT QUESTIONS
Q 43	If $(x+iy)^3 = u + iv$, then showthat $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$
Q 44	If $\left(\frac{1+i}{1-i}\right)^m$=1 then find the least positive integral value of m.
Q 45	Simplify $(1+i)^4(1+\frac{1}{i})^4$
Q 46	Find the value of: $i^{45} + i^{46} + i^{47} + i^{48}$.
Q 47	If z (2-i)=(3+i),then z^{20} is equal to.
Q 48	Evaluate $\sum_{n=1}^{13} (i^n + i^{n+1})$ where $n \in N$.
Q 49	Evaluate $1 + i^2 + i^4 + i^6 + \cdots + i^{2n}$.
Q 50	Find the value of $(1+i)^6 + (1-i)^3$
Q 51	Find the real values of x and y if $\frac{x-1}{3+i} + \frac{y-1}{3-i} = i$.
Q 52	Find all non-zero complex numbers z satisfying $\bar{z} = iz^2$.
Q 53	If $\|1-i\|^x = 2^x$, find non zero integral solution.
Q 54	Solve the equation$\|z+1\| = z + 2(1+i)$
Q 55	Find real θ such that $\frac{3+2isin\theta}{1-2i\,sin\theta}$ is purely real
Q 56	Show that $\left\|\frac{z-2}{z-3}\right\| = 2$ represents a circle. Find centre and radius .
Q 57	Find smallest positive integer n for which $\frac{(1+i)^n}{(1-i)^{n-2}}$ is a real number.
Q 58	Find the modulus and the amplitude of $\frac{1+2i}{1-3i}$
Q 59	If(x+iy)(2-3i)=4+i,then find x and y

Q 60	Find x and y if $\left(\frac{1+i}{1-i}\right)^3 + \left(\frac{1-i}{1+i}\right)^3 = x + iy$
	LONG QUESTIONS
Q 61	If x+iy= $\sqrt{\frac{a+ib}{c+id}}$, then prove that $(x^2 + y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$
Q 62	Find the modulus and argument of the complex number $\frac{1+7i}{(2-i)^2}$.
Q 63	Find the value of *a* such that the sum of the squares of therootsoftheequationx^2-(a-2)x-(a+1)=0isleast.
Q 64	For what values of x and y are the numbers $3 + ix^2 y$ and $x^2 + y + 4i$ are conjugate of each other.
Q 65	If $z = x + iy$ and $w = \frac{|1-iz|}{|z-i|}$and $\|w\| = 1$ then show that z is purely real.
Q 66	Prove that maximum value of $\|z\| + +\|z - 1\|$ is 1
Q 67	If $\|z + 1\| = \sqrt{2}\|z - 1\|$ prove that z describes a circle.
Q 68	If z_1, z_2 are complex numbers such that $\frac{z_1}{3z_2}$ is purely imaginary number the find $\left\|\frac{z1-,z2}{z_1+z_2}\right\|$.
Q 69	$\|z\| = 1$then prove that $\frac{z-1}{z+1}$ is purely imaginary. What can you conclude if z =1.
Q 70	If the real part $\frac{z+2}{\bar{z}-1} = 4$,then show that the locus of the point representing z in the complex plane is a circle.

Answer Key

1. a	2. b	3. a	4. a	5. c	6. c	7. a	8. b	9. c	10. b
11. b	12. b	13. a	14. b	15. a	16. d	17. c	18. a	19. b	20. a
21. No value of n	22 – $(x-\frac{10}{3})^2+(y-0)^2=\frac{4}{9}$			23.i. 0 ii. $\frac{\lvert z\rvert}{2}$		24. c	25.c	26. b	27. d
28. $\frac{3}{2}+\frac{1}{2}$i		29. $\frac{525}{169}-i\frac{92}{169}$		30-	31. i	32. i	33. 1	34-. $\frac{3}{13}+\frac{2}{13}$i	
35. 0	36. 2	37. x=2, y=-1		38. (1,0)		39. i$cot\frac{\theta}{2}$		40. n=2	41. 1
42. $\frac{-2}{5}$, 0		44. 4	45. 16	46. 0	47. -2^{10}	48. $-1+i$	49. 0 if n is odd 1 if n is even		50. $-2-10i$
51. x= -4, y=6	52. $z=0$, i, $\frac{\sqrt{3}}{2}-\frac{1}{2}$i, $\frac{-\sqrt{3}}{2}-\frac{1}{2}$i			53. No	54. $z=\frac{1}{2}-2i$		55. $\theta=n\pi$		
56. r= $r=\frac{2}{3}$ *and cnetre* $(\frac{10}{3},0)$				57.1	58. Modulus = $\frac{1}{\sqrt{2}}$ Amplitude $\theta=\frac{3\pi}{4}$				59. x= 5/13, y= 14/13
60. $x=0, y=0$				62. $\sqrt{2}, \theta=\frac{3\pi}{4}$			63. 70. minimum value of a =1		
63. $x=\pm2, y=-1$				68. 1			69. purely real		

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION

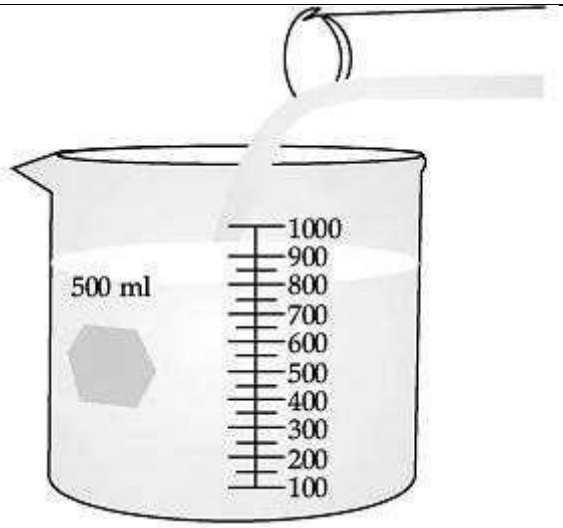
MATHS CONTENT

CLASS-XI

CHAPTER: LINEAR INEQUALITIES

MCQ TYPE	
1	Solve $7x<24$ when $x\in N$ (a){1,2,3,4} (b){0,2,3,4} (c){1,2,3} (d) {0,2,3,4}
2	Solve $3-2x<9$ when $x\in R$. Express the solution in the form of interval. (a) $[-3,\infty)$ (b) $(-3,\infty)$ (c) $[-3,\infty]$ (d) $[-2,\infty)$
3	If$(x-3)/(x-2)>0$ then x belongs (a)$(-\infty,2)\cup(3,\infty)$ (b) $(-\infty,-3)\cup(-5,\infty)$ (c)$(-\infty,2]\cup[5,\infty)$ (d) (2,3)
4	If $x>0$ and $y<0$ then (x,y) lies in (a) I quadrant (b) II quadrant (c) II Iquadrant (d) IV quadrant
5	If $-2<2x-1<2$ then the value of x lies in the interval (a)(1/2,3/2) (b)(-1/2, 3/2) (c) (3/2,1/2) (d)(3/2,1/2)
6	The solution of $\|2/(x-4)\|>1$where $x\neq4$ is (a) (2,6) (b) (2,4) U (4,6) (c) (2,4) U (4,∞) (d) (-∞, 4) U (4, 6)
7	The solution of the $0 < 3(x - 2)/5 < 15$ is (a)$2<x<27$ (b) $27<x<-2$ (c) $-27<x<2$ (d) $-27 < x < -2$

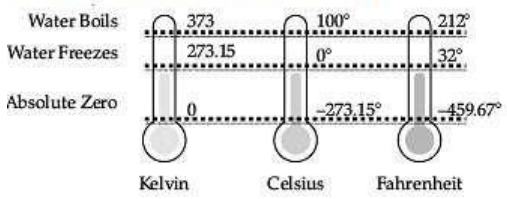
8	Solve: f(x) ={(x −1)×(2−x)}/(x−3)≥0 (a) (-∞,1] ∪ (2,∞) (b) (-∞,1] ∪ [2, 3) (c) (-∞,1] ∪ (3,∞) (d) None of these
9	The solution of the inequality 3(2-x)≥2(1-x) for real x is: (a) x<4 (b) x>4 (c) x≤4 (d) x≥4
10	The solution to |3x−1|+1<3 is (a)2<x<3/4 (b)-1/3<x<1 (c) -1/3 < x < ¼ (d) -3 < x < 3
11	Solve: 3x+5<x−7,when x is are a real number (a)x< −12 (b) x>−6 (c) x<−6 (d) None of these
12	$If\ \|x-3\|<7$ and x is a real number than x belongs to (a) (4,10) (b) (-10,4) (c) (4,-10) (d) None of these
13	The solution set of $-x^2>16$, x is a real number, is.. (a) (-4,4) (b) (0,4) (c) (-4,0) (d) Empty set
14	Set of points in the second quadrant is represented by… (a) X>0 and y<0 (b) X<0 and y <0 (c) X>0 and y> 0 (d) X<0 and y>0
15	The graph of $x<y$ (a) Contains origin (b) Contains (-2,3) (c) Contains (2,2) (d) None of these
16	If $-\frac{1}{x}<\frac{2}{3}$ then (a) x can be 2 (b) x can be -1 (c) x can be 0 (d) None of these

17	$x^2 - 1 \geq 8$ *then* x *belongs to* … (a) R-(-3,3) (b) (-3,3) (c) (0,3) (d) (-3,0)
18	The open upper half plane of x-axis can be expressed as…. (a) X>0 and y<0 (b) X>0 (c) Y>0 (d) X<0
19	The word "linear" stands for… (a) One term (b) One power (c) One degree (d) None of these
20	$\|x - 3\| < 0$Then solution set of x is….. (a) (0,3) (b) (-3,0) (c) (-3,3) (d) None of these
SOURCE BASED / CASE STUDY QUESTIONS	
21	 A beaker contains 640 litres of 8% solution of boric acid. This is to be diluted by adding 2% solution of boric acid to it. Based on this information answer the following questions. 1. If x litres of 2% boric acid solution is added to the beaker, find the quantity of acid in the resulting solution. 2. Find the initial quantity of water in the beaker. 3. Find the initial quantity of Boric acid in the beaker .

22

Kelvin(K), degree Celsius(°C) and degree Fahrenheit(°F) are three units of temperature. The conversion formula for them is as follows:

F = 9 / 5C + 32 and K = C + 273.15



Based on the above information, answer the following questions.

1. To maintain the Celsius temperature of a system at least 5^0c , what minimum Fahrenheit temperature should be maintained?
2. To maintain Kelvin temperature of a system maximum 100 K, what maximum Celsius temperature should be maintained?
3. Find the Celsius temperature (up to 1^{st} place after the decimal) for which Kelvin and Fahrenheit temperatures are equal.

23

In three examinations (each of 100 marks), Amit and Arti scored the following marks.

Name	Test-1	Test-2	Test-3
Amit	60	54	x
Arti	50	84	y

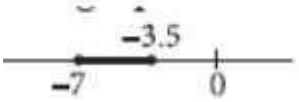
Study the above table and answer the following answers.

1. To attain an average of at least 65 marks, how marks Amit must score in the third test?
2. The average of Amit is greater than the average of Arti , establish relationship between x and y.
3. To get A grade, one must attain an average of at least 80 marks. Find the minimum marks Arti should score to get A grade.

24

	IQ of a person is calculated by the formula **IQ** $= \frac{M}{C} \times 100$ Where M is the mental age and C is the chronological age of a person. Answer the following questions. 1. If IQ of a person of Mental age 30 years is 60 , find the chronological age of the person. 2. A person's Chronological age is 50 years, to have IQ at least70, what minimum Mental age he should have in completed years. 3. Mental age of a person is 30 years. To have IQ between 50 and 60 , what his chronological age should be?
25	Consider the following system of linear inequalities $x - 2y \leq 0, 2x + y \leq 4, y \leq 2, x \geq 0$. Based on the above information, answer the following questions: 1. The graph of $x - 2y \leq 0$ contains the origin? 2. In which quadrants the solution region cannot lie. 3. Show the region $2x + y \leq 4$.
	VERY SHORT ANSWER TYPE QUESTIONS
26	Minimum value of x-3 is 7 , find minimum value of x
27	Maximum value of 2m-3 is 7; find the maximum value of m.
28	If$-3 < m < 7$, find the minimum value of$\|2m + 10\|$.
29	If $\|x + 2\| \leq 9$, find interval of x
30	If $x \geq -3$, find the minimum value $of\ x + 5$
31	If $x^2 \leq 9$, $find\ the\ interval\ of\ x.$
32	If $\|x\| - 3 < 8$, find the interval of x
33	If $-11 < 4x - 3 \leq 13$, find interval of x.
34	Represent solution set of $x - 3 < 6$ on number line.
35	Represent solution set of $\frac{x}{-2} < 3$ on number line.
36	Represent solution set of $x^2 \leq 4$ on number line.
37	How many points are there in the solution set of $x^2 < 0$, xcR
38	How many integral solutions are there for the inequation $-5 < 3x < 6$?
39	Write any one solution of $x - 2y < -6$.
40	Write one solution of $\|x - 3\| < y$
41	Represent first quadrant in terms of inequalities of x and y.
42	Represent the first and fourth quadrants together in terms of inequalities of x and y.

43	Represent third quadrant in terms of inequalities of x and y.
44	Write the interval in which sin^2x lies for any real x.
45	Write the interval in which $\sin x + 3\ lies$. For any real x.
	ASSERTION REASONING TYPE QUESTIONS
46	Assertion: $\|3x - 5\| > 9\ implies\ x \in (-\infty, \frac{4}{3})\ U\ (\frac{14}{3}, \infty)$ Reason: The region containing all the solutions of inequality is called the solution region. (a) Assertion and reason both are correct statements and reason is the correct explanation of the assertion. (b) Assertion and reason both are correct statements and reason is not the correct explanation of the assertion. (c) Assertion is correct statement and reason is wrong statement. (d) reason is correct statement and assertion is wrong statement.
47	Assertion : If $11x - 9 \leq 68$, then $x \in (-\infty, 7)$. Reason : If an inequality consist of signs $\leq$ or $\geq$, then the point on the line are also included in the solution region. (a) Assertion and reason both are correct statements and reason is the correct explanation of the assertion. (b) Assertion and reason both are correct statements and reason is not the correct explanation of the assertion. (c) Assertion is correct statement and reason is wrong statement. (d) Reason is correct statement and assertion is wrong statement.
48	Assertion : If $x \geq -3$, then $x + 5 \geq 2$. Reason : Same number can be added to both sides of the inequality without changing the sign of inequality. (a) Assertion and reason both are correct statements and reason is the correct explanation of the assertion. (b) Assertion and reason both are correct statements and reason is not the correct explanation of the assertion. (c) Assertion is correct statement and reason is wrong statement. (d) Reason is correct statement and assertion is wrong statement.

49	Assertion : If a < b, c < 0, then a/c < b/c . Reason : If both sides are divided by the same negative quantity, then the inequality is reversed. (a) Assertion and reason both are correct statements and reason is the correct explanation of the assertion. (b) Assertion and reason both are correct statements and reason is not the correct explanation of the assertion. (c) Assertion is correct statement and reason is wrong statement. (d) reason is correct statement and assertion is wrong statement.
50	Assertion : If $-5 \leq 2x + 9 \leq 2$, then $x \in [-7, -3.5]$. Reason : The graphical representation of $-5 \leq 2x + 9 \leq 2$ is  (a) Assertion and reason both are correct statements and reason is the correct explanation of the assertion. (b) Assertion and reason both are correct statements and reason is not the correct explanation of the assertion. (c) Assertion is correct statement and reason is wrong statement. (d) Reason is correct statement and assertion is wrong statement.
	SHORT ANSWER TYPE QUESTIONS
51	Solve 2m − 3 < -8 when m is a natural number.
52	Solve: (m-3) (m+2) <0 when m is a real number.
53	Solve: $\|m - 5\| < 6$
54	Solve 4x+3<5x+7 if x is a natural number.
55	Solve: $\frac{x-3}{x+5} < 0$, if x is a realnumber.
56	Solve :x+y<5 graphically. (Not in syllabus).
57	Solve 3x + 2y > 6 graphically. (Not in syllabus).
58	Solve 5x − 3 > 3x − 5, if x is a real number.
59	Solve: $\frac{x-3}{x-5} > 2$, for real x
60	Solve : $0 < -\frac{x}{2} < 3$ for real x
61	Solve: $\|x - 3\| \geq 3$ for real x
62	We know that $sinx \in [-1,1], \forall x \in R$. Find the range of $2sinx - 3$
63	Solve : x+5<3 on number line
64	Represent the solution set of $3x - 5 \geq 7$ on real number line.
65	Represent the solution set of $\|x + 5\| < 6$ on real number line
66	The maximum value of $7x - 5$ is 9. Find the maximum value of 2x+3.
67	The minimum value of $x - 2$ is 12 , find the minimum value of 3x+5
68	Find the solutions of $\|2 - x\| = x - 2$

69	Solve : $1 \leq \|x-2\| \leq 3$ for real x.
70	Solve: $10 \leq -5(x-2) < 20$ for real x
LONG ANSWER TYPE QUESTIONS. (Not in syllabus).	
71	Solve the following system of in equalities graphically $2x+y \leq 24$, $x+y<11$, $2x+5y \leq 40$, $x \geq 0$, $y \geq 0$
72	Solve the following system of inequalities graphically $3x+2y \geq 24$, $3x+y \leq 15$, $x \geq 4$
73	Solve the following system of in equalities graphically $x-2y \leq 3$, $3x+4y>12$, $x \geq 0$, $y \geq 1$
74	Solve the following system of in equalities graphically $3x+4y \leq 60$, $x+3y \leq 30$, $x \geq 0$, $y \geq 0$
75	Solve the following system of in equalities graphically $2x+y \geq 4$, $x+y \leq 3$, $2x-3y \leq 6$
76	Solve the following system of inequalities graphically $4x + 3y \leq 60$, $y \geq 2x$, $x \geq 3$, x, $y \geq 0$
77	Solve the following system of inequalities graphically $3x + 2y \leq 150$, $x + 4y \leq 80$, $x \leq 15$, $y \geq 0, x \geq 0$
78	Solve the following system of inequalities graphically $x+2y \leq 10$, $x+y \geq 1$, $x-y \leq 0$, $x \geq 0$, $y \geq 0$
79	Solve the following system of inequalities graphically $5x + 4y \leq 20$, $x \geq 1$, $y \geq 2$
80	Solve the following system of in equalities graphically $2x+y \geq 8$, $x+2y \geq 10$

ANSWERS/SOLUTIONS

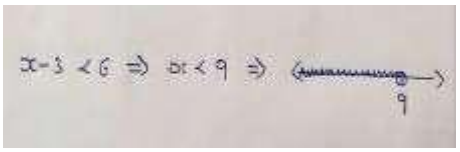
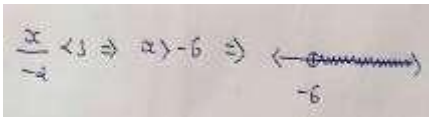
MCQ TYPE

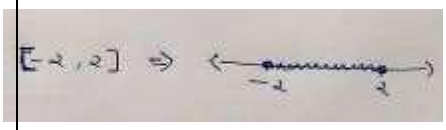
1	c	2	b	3	a	4	d	5	b
6	a	7	a	8	b	9	c	10	b
11	c	12	d	13	d	14	d	15	b
16	a	17	a	18	c	19	c	20	d

SOURCE BASED/CASE STUDY

21	1. (51.2 +x/50) litres 2. 588.8 litres 3. 51.2 litres
22	1. 41 F 2. -173.15 C 3. 301.4 C
23	1. 81 MARKS 2. X-Y >20 3. She cant get grade A
24	1. 50 years 2. 71 years 3.(50,60)
25	1. Yes 2. Second and third quadrants 3. Proper shading

VERY SHORT ANSWER TYPE

26	$x \geq 10$ so minimum value of x is 10
27	$m \leq 5$ so maximum value of m is 5
28	Minimum value of $\|2m + 10\|$ is 4
29	X belongs to [-11,7]
30	Minimum value of x+5 is 2
31	X belongs to [-3,3]
32	X belongs to (-11,11)
33	X belongs to (-2,4)
34	
35	

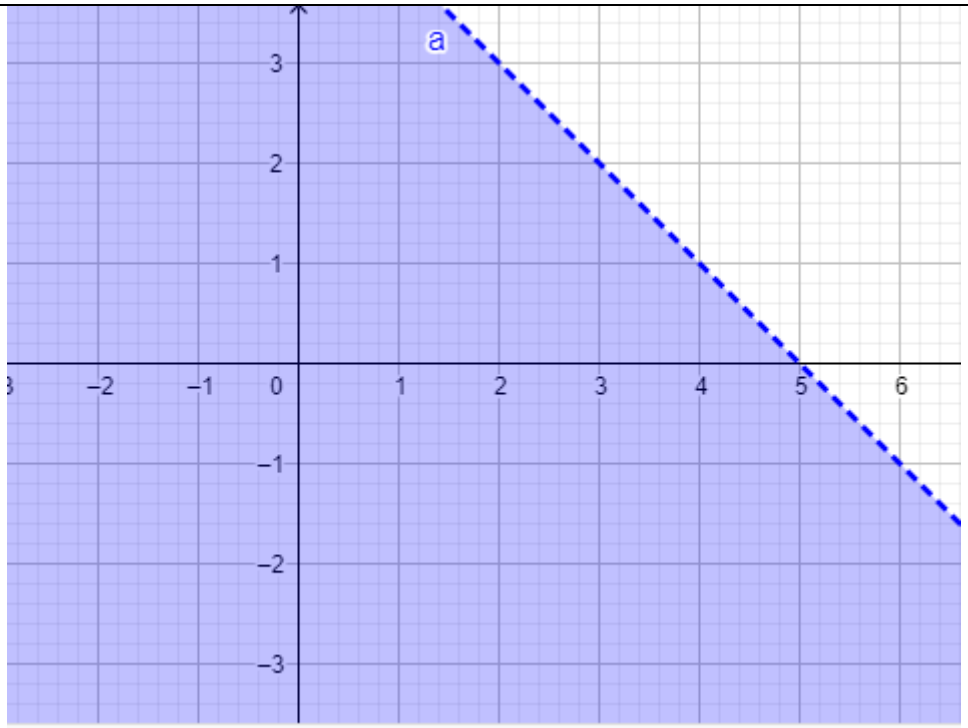
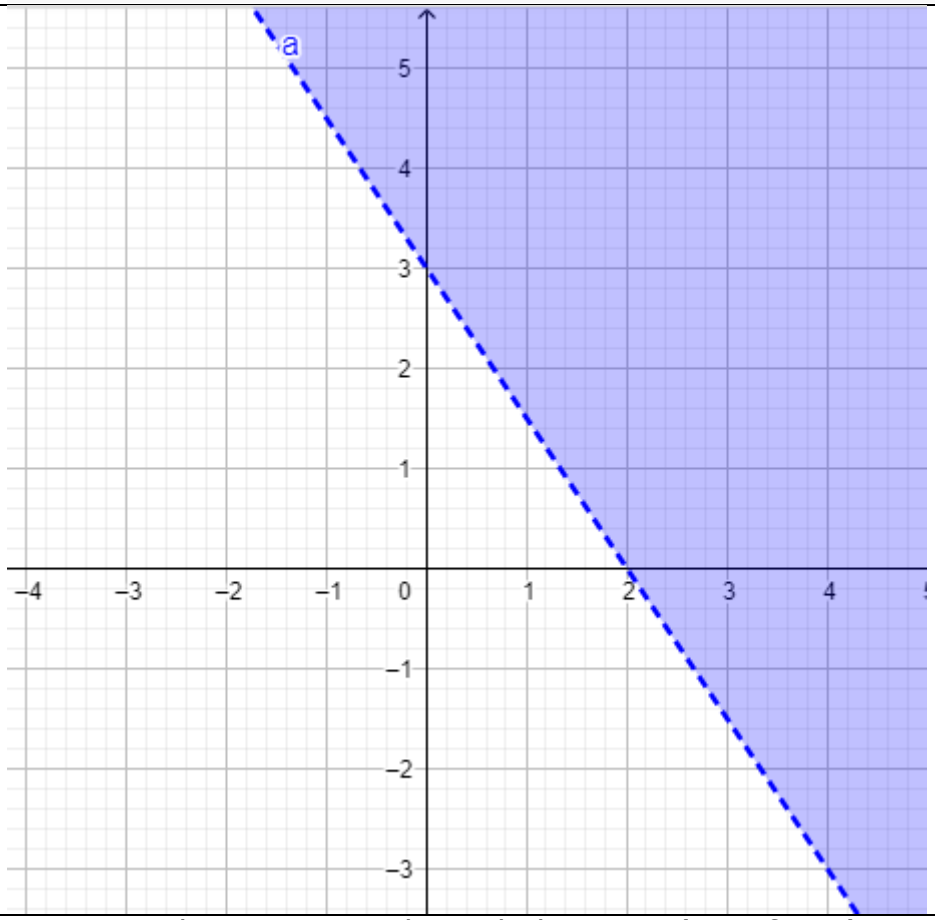
36	
37	No point
38	X belongs to {-1,0,1}
39	(x,y) = (1,4)
40	(x,y) = (1,4)
41	x>0 , y>0
42	x>0
43	X<0 , y<0
44	[0,1]
45	[2,4]

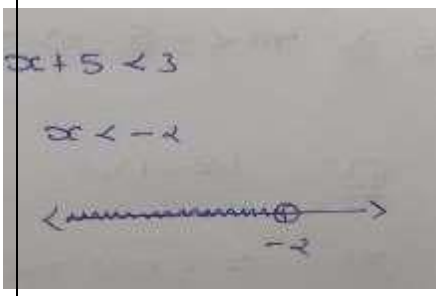
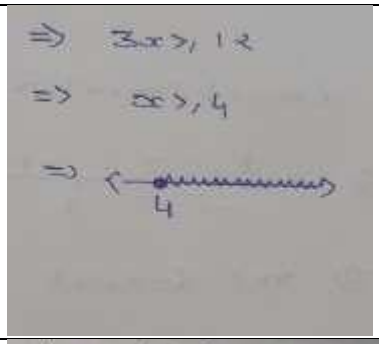
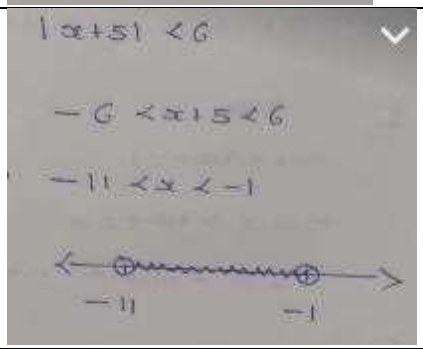
ASSERTION-REASON TYPE

46	b	47	d	48	a	49	d	50	a

SHORT ANSWER TYPE

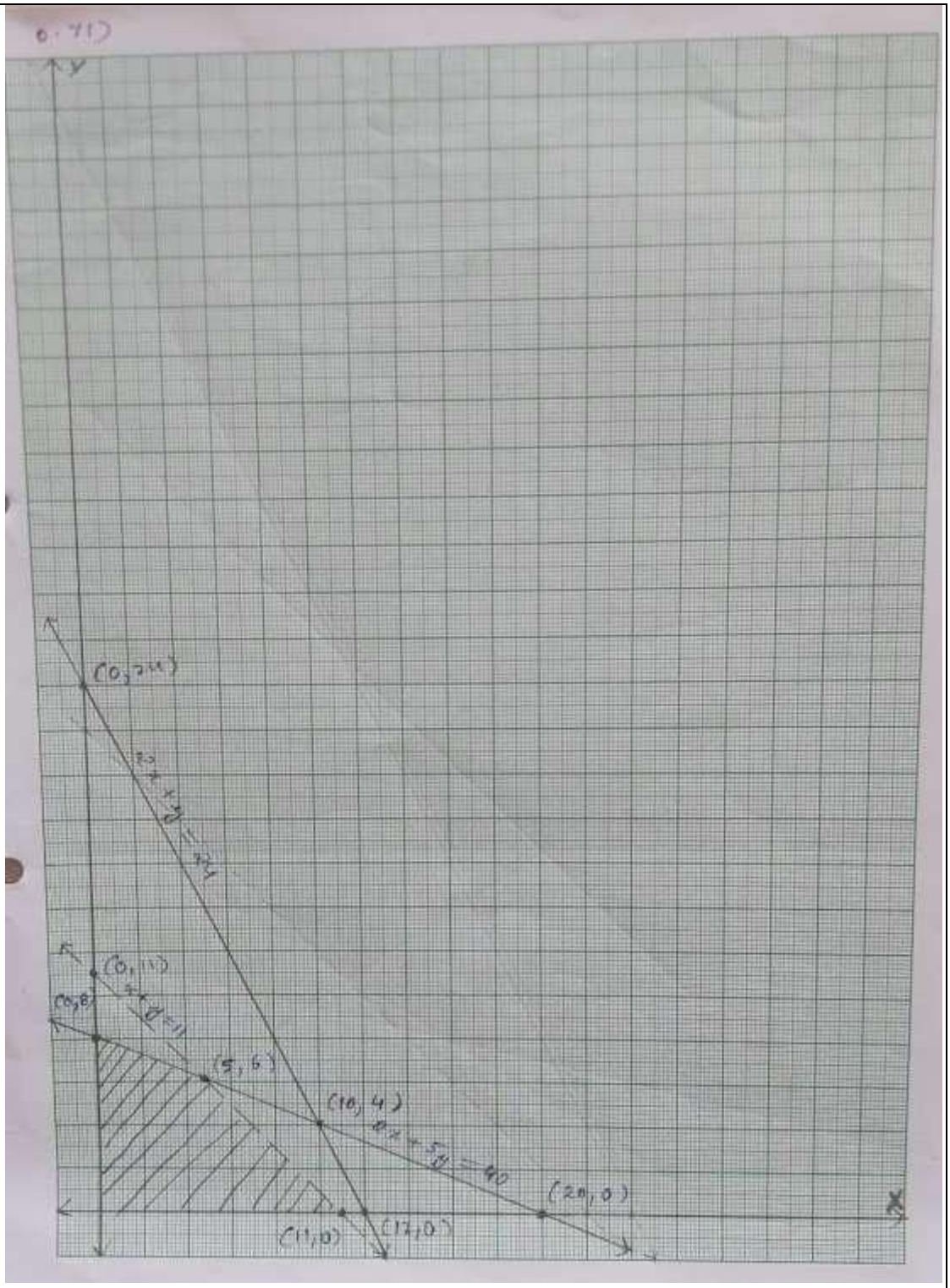
51	2m-3<-8 implies m<-2.5 but x is a natural number so x belongs to { }
52	m belongs to (-2,3)
53	m belongs to (-1,11)
54	x belongs to N
55	x belongs to (-5,3)

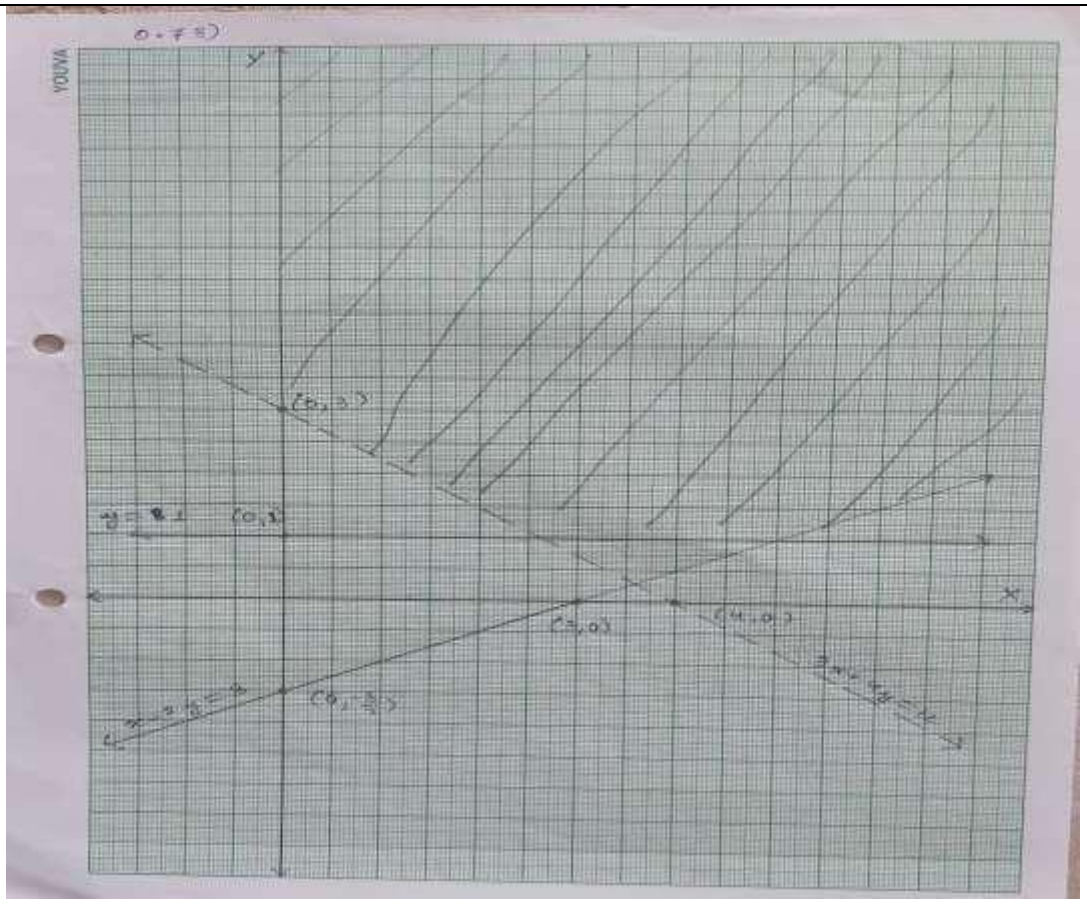
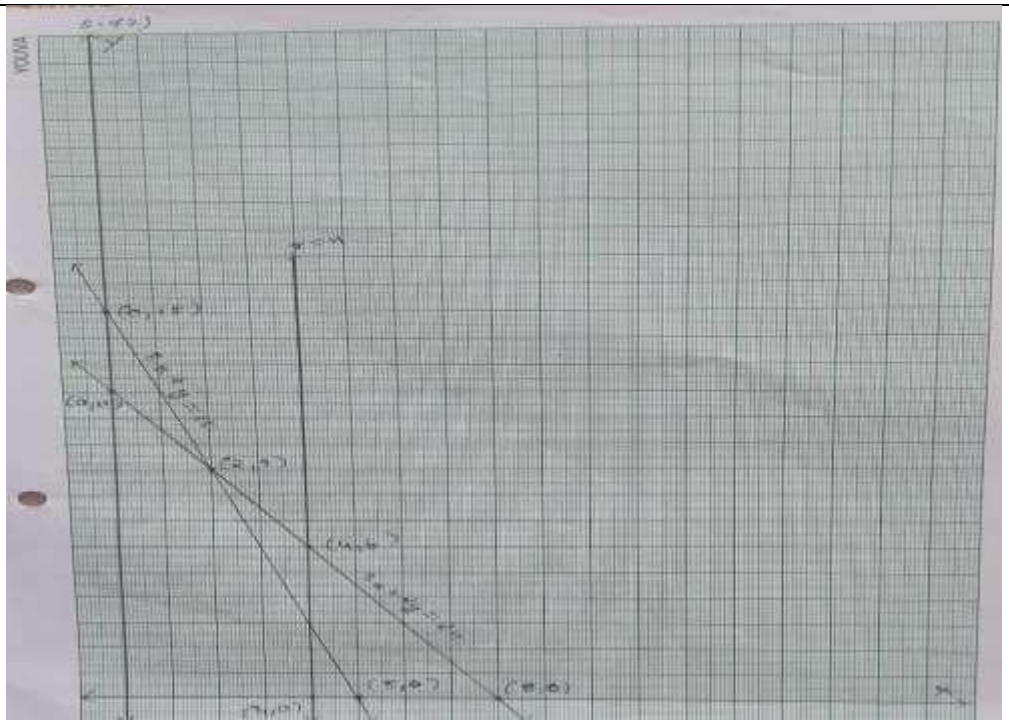
56	
57	
58	2x>-2 implies x >-1 implies x belongs to (-1,infinity)
59	x-3>2x-10 implies x<7 implies x belongs to (-infinity,7)
60	x belongs to (-6,0)
61	X belongs to R-(0,6)
62	2 sinx -3 belongs to [-5,-1]

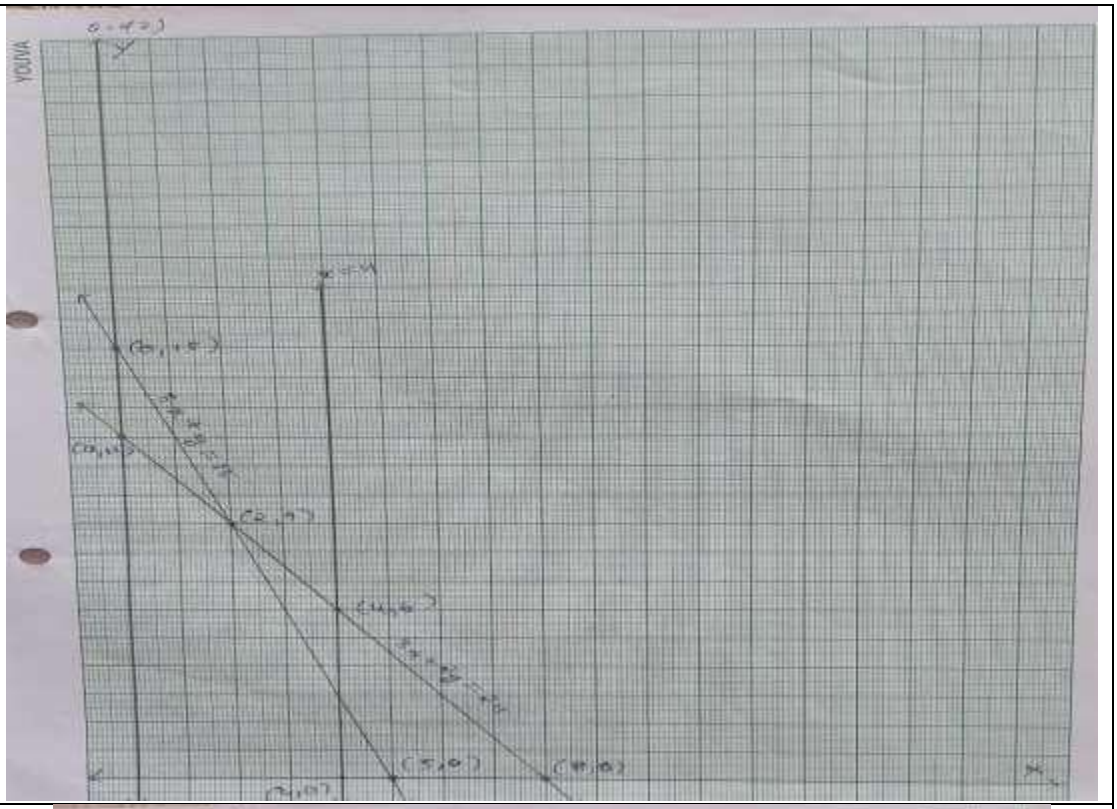
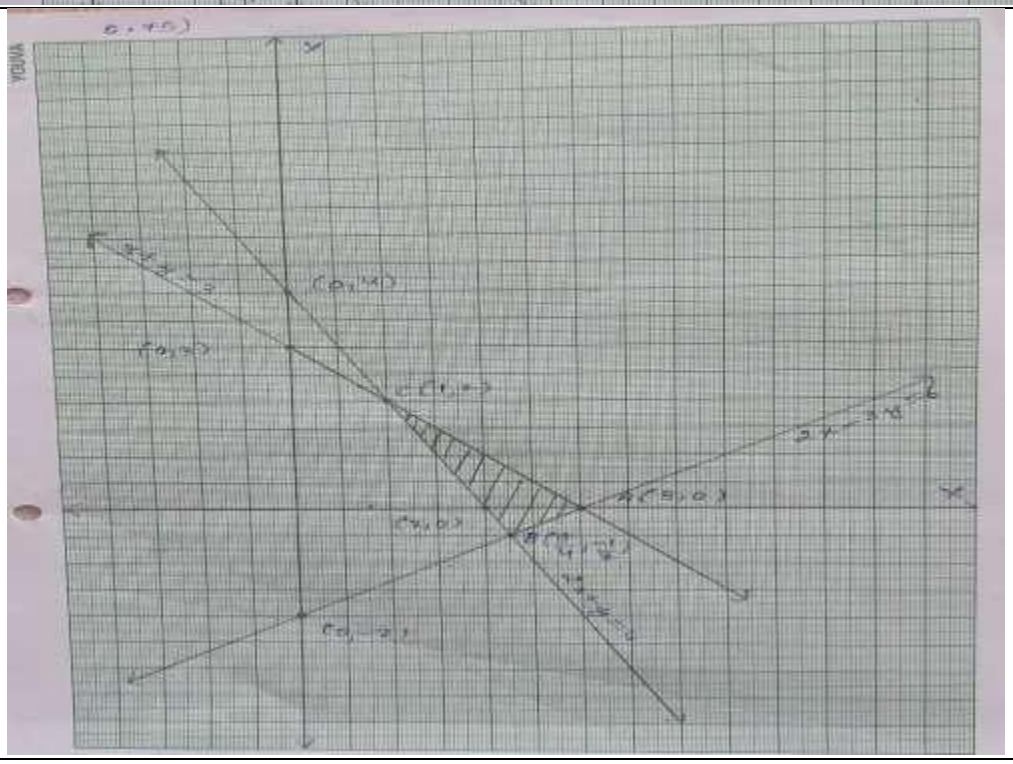
63	
64	
65	
66	$2x + 3 \leq 7$
67	$3x + 5 \geq 47$
68	$x \geq 2$
69	x belongs to [3,5]
70	x belongs to (-2,0]

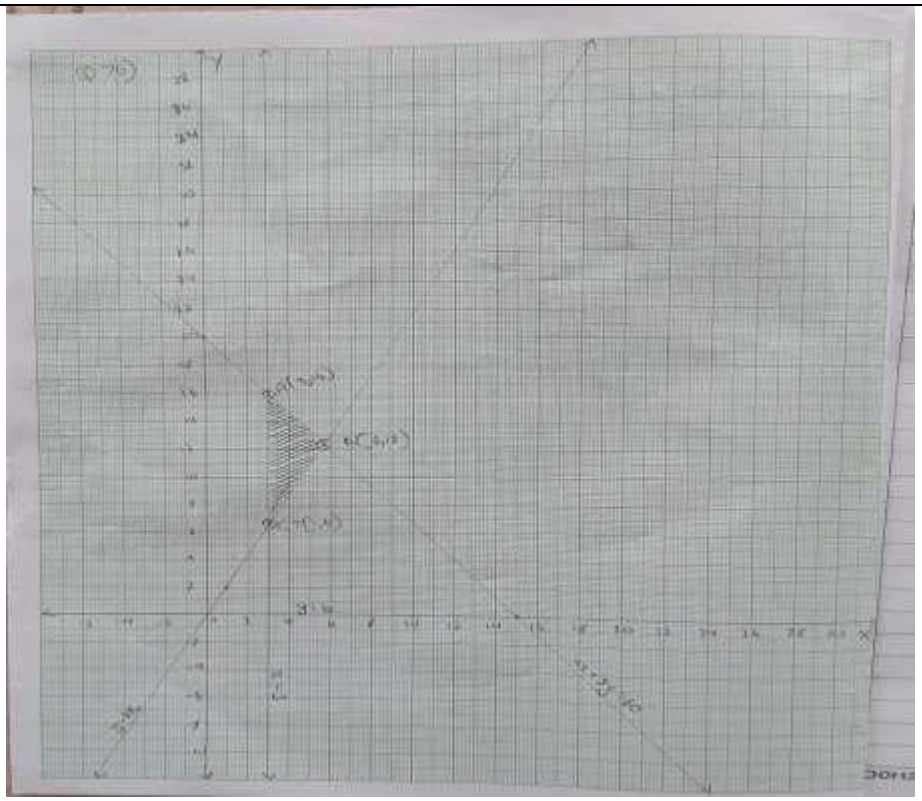
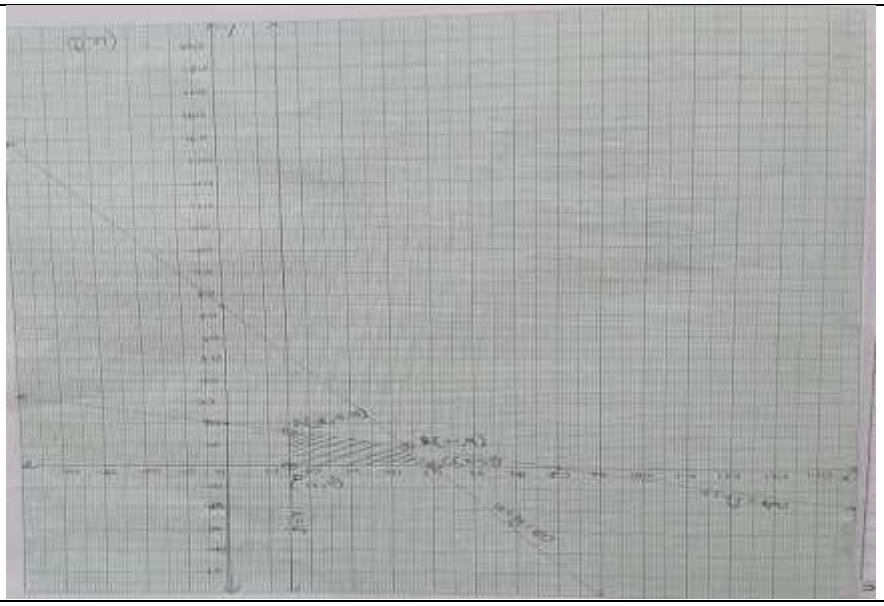
LONG ANSWER TYPE

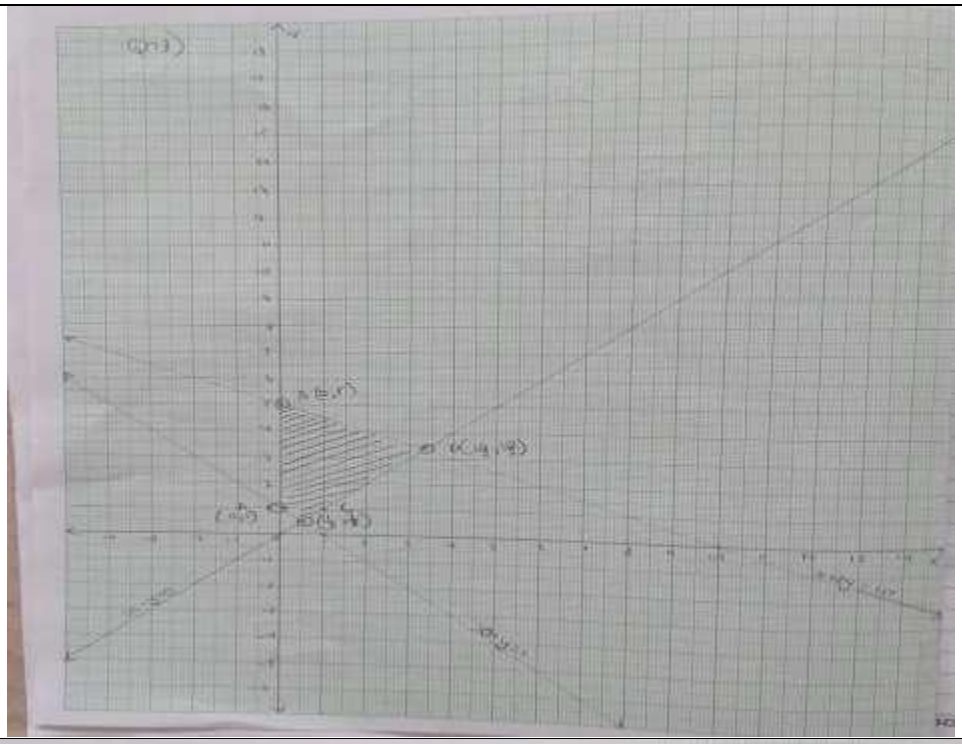
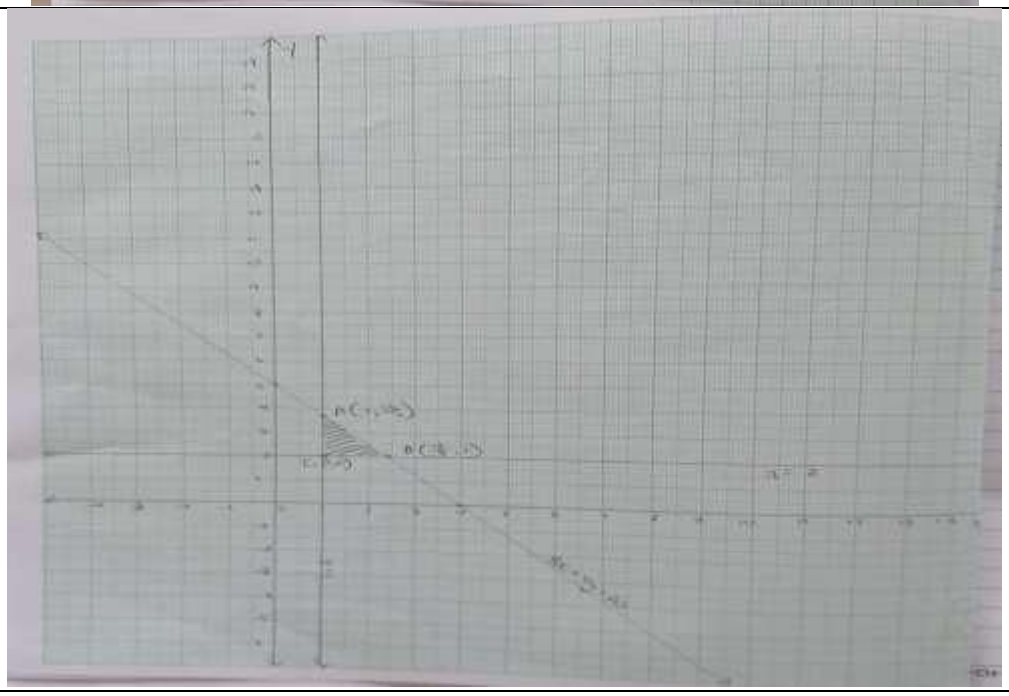
71

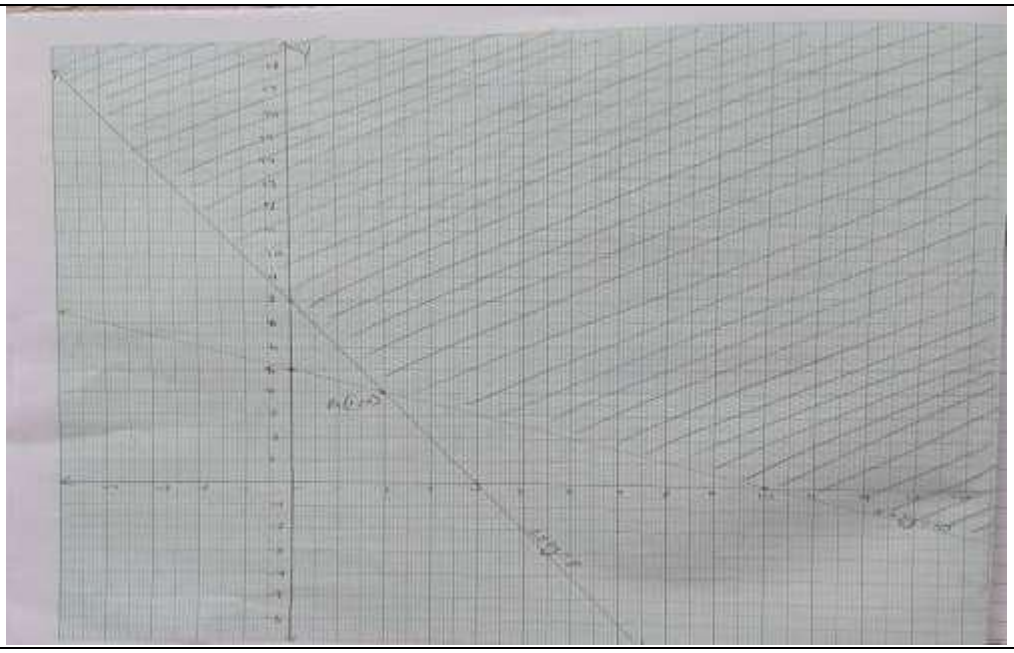


72	
73	

74	
75	

76	
77	

78	
79	

80		

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : PERMUTATION AND COMBINATION

CONCEPTS AND KEY POINTS:

Fundamental principle of counting:

1. **Addition Rule**: Let two events A and B can occur by m and n ways respectively and both cannot be done simultaneously. Then A or B (at least one of them) can be done by $(m+n)$ ways.
2. **Multiplication Rule**: Let two events A and B can occur by m and n ways respectively. Then A and B (both of them) can be done by $(m \times n)$ ways.

PERMUTATION (Arrangement)

1. Number of permutations of n distinct things taken r at a time, $0 \le r \le n$
   $n_{P_r} = n(n-1)(n-2) \dots \dots (n-r+1)$
2. Number of permutations of n distinct things taken all at a time $= n!$
3. Number of permutations (with repetition) of n distinct things taken r at a time $= n^r$
4. Number of permutations of n distinct things taken all at a time such that p things must always together $= (n-p+1)! \times p!$
5. Number of permutations of n distinct things taken all at a time such that $p_1, p_2, \dots \dots, p_r$ things of them are alike and $p_1 + p_2 + \dots \dots + p_r \le n$is $= \frac{n!}{p_1 ! \times p_2 ! \times, \dots\dots \times p_r!}$

COMBINATION (Selection)

1. Number of combinations of n distinct things taken r at a time, $0 \le r \le n$
$$nC_r = \frac{n(n-1)(n-2) \dots \dots (n-r+1)}{r!} = \frac{n!}{(n-r)!\ r!}$$
2. Number of combinations of n distinct things taken r at a time, $0 \le r \le n$such that one thing is always selected is $(n-1)C_{(r-1)}$.
3. Number of combinations of n distinct things taken r at a time, $0 \le r \le n$such that one thing is never selected is $(n-1)C_r$.
4. $nC_r + nC_{(r-1)} = (n+1)C_r$
5. If $nC_p = nC_q$, then either $p = q$ or $p + q = 1$.

NOTE:

1. Number of permutations of n distinct things taken p, where $0 \le p \le n$, at a time such that p things must always occur= $(n-1)C_{(p-1)} \times p!$

2. Number of permutations of n distinct things taken r at a time such that p things must never occur together $= (n-p)C_r \times r!$

3. Number of line segments joining n non – collinear points is $nC2$.

4. Number of line segments joining n points in which p points collinear is $nC_2 - pC_2 + 1$.

Number of diagonals in n sided polygon is$nC_2 - n = \frac{n(n-3)}{2}$.

	MCQ
Q1	A coin is tossed n times. The number of possible outcomes is (a) 2n (b) $^nC_2$ (c) n^2 (d) 2^n
Q2	A convex polygon has 65 diagonals. The number of its sides is equal to: (a) 13 (b) 10 (c) 22 (d) 11
Q3	Number of diagonals of a convex hexagon is (a) 3 (b) 6 (c) 9 (d) 12
Q4	In how many ways can 10 lion and 6 tigers be arranged in arow so that no two tigers are together? (a) $10! \times 11C6$ (b) $10! \times 10C6$ (c) $6! \times 10C6$ (d) $6! \times 10C7$
Q 5	The total number of ways of selecting six coins out of 20one – rupee coins, 10 fifty paise coins and 7 twenty – five paise coin is: (a) $37C_6$ (b) 56 (c) 28 (d) 29
Q 6	Given 4 flags of different colors, how many differentsignals can be generated, if a signal requires the use of2 flags one below the other? (a) 12 (b) 13 (c) 14

	(d) 15
Q 7	In an examination, there are three multiple choice questions and each question has 4 choices. Number of ways in which a student can fail to get all answers correct is: (a) 11 (b) 12 (c) 27 (d) 63
Q 8	There are 10 true-false questions in a examination. Thenthese questions can be answered in: (a) 100 (b) 20 (c) 512 (d) 1024
Q 9	To fill 12 vacancies, there are 25 candidates of which fiveare from scheduled caste. If 3 of the vacancies arereserved for scheduled caste candidates while the rest areopen to all, then the number of ways in which theselection can be made: (a) $5C_3 + 22C_9$ (b) $22C_9 - 5C_3$ (c) $5C_3 + 22C_3$ (d) None
Q10	A father with 8 children takes them 3 at a time to thezoological garden, as often as he can without taking thesame 3 children together more than once. The number oftimes he will go to the garden is: (a) 56 (b) 100 (c) 112 (d) None
Q11	Number of words from the letters of the words ***BHARAT***inwhich B and H will never come together is: (a) 210 (b) 240 (c) 422

	(d) 400
Q 12	If all the words formed by the letters of the word ***HAPPY*** is arranged according to the dictionary, then the place of ***HAPPY***is: (a) 60 (b) 12 (c) 13 (d) 24
Q13	Everybody in a room shakes hands with everybody else. The total number of handshakes is 66.The total number of person is : (a) 11 (b) 12 (c) 13 (d) 14
Q14	A bag contains 3 black, 4 white and 2 red balls, all the balls being different. Number of selections of atmost 6 balls containing balls of all the colors is: (a) 1008 (b) 1080 (c) 1204 (d) 1130
Q15	The total number of words formed by the letters of the word ***MISSISSIPPI*** such that all ***S's*** and all ***I's*** are occur together, is: (a) $5!$ (b) $5! \times 2$ (c) $\frac{11!}{4!}$ (d) None
Q16	The number of words formed by letters of the word ***EQUATIONS*** containing 2 consonants and 3 vowels, is: (a) 72 (b) 120 (c) 7200 (d) 60

Q 17	The number of ways in which a team of eleven players can be selected from 22 players, always including 2 of them and excluding 4 of them, is: (a) $16_{C_{11}}$ (b) 16_{C_5} (c) 16_{C_9} (d) 20_{C_9}
Q 18	The sum of the digits in the unit place of all the numbers formed with the help of 3, 4, 5, 6 taken all at a time is: (a) 432 (b) 108 (c) 36 (d) 18
Q 19	The number of ways in which 5 prizes be distributed among 4 boys, while each boy is capable of having any number of prizes is: (a) 5^4 (b) 4^5 (c) $4! \times 2^4$ (d) $4! \times 5$
Q 20	Total number of n – digit number $(n > 1)$, having the property that no two consecutive digits are same, is: **(a)** 8^n **(b)** 9^n **(c)** $9 \times 10^{n-1}$ **(d)** None
	CASE BASED
Q 21	Sunita and her friends went for a trip to Shimla. They stayed in a hotel. There were 4 vacant rooms A,B,C,D. Out of these 4 vacant rooms, two rooms A and B were double share rooms and two rooms C and D can contain one person each. (i) Find the number of ways in which room A can be filled? (ii) If room A and B are already filled each, then find the number of ways in which room C can be filled. (iii) Find the total number of ways of accommodating Sunita and her friends in these 4 vacant rooms. (iv) If room A is filled with 2 persons, then find the number in which room C and D can be filled.

Q 22	In a certain city all telephone numbers have seven digits. City is divided in to six zones. Each zone is allotted a specific non – zero digit which is to be used as first digit of each telephone number of that zone. ***Based on the above information, answer the following questions*** (i)How many telephone numbers are there in each zone, if digit on first place is not used again? **(a)** 9^6 **(b)** 10^6 **(c)** 10_{P_6} (d) 9_{P_6} (ii) How many telephone numbers are there in the city if there is no restrictions? **(a)** 6×9^6 **(b)** 6×10^6 **(c)** $6 \times 10_{P_6}$ **(d)** $6 \times 9_{P_6}$ (iii) How many telephone numbers are there in the city with all digits distinct? **(a)** 9^6 **(b)** 10^6 **(c)** 10_{P_6} $(d) 9_{P_6}$ (iv) How many different telephone numbers are there in the city if the first two digits of different zones are 12, 23, 34, 45 56 and 67? **(a)** 6×10^5 **(b)** 6×8^5 **(c)** $6 \times 10_{P_5}$ $(d)\ 6 \times 8_{P_5}$
Q 23	The students of class XIwere given a task to arrange all letters of the word ***EQUATIONS*** in all possible ways. ***Based on the above information, answer the following questions:*** **(i)** In how many ways can all letters of the word ***EQUATIONS*** be arranged? **(a)** 9! **(b)** 10!

	(c) 9_{P_7} (d) 10_{P_7} (ii) In how many ways can all letters of the word ***EQUATIONS*** be arranged so that all vowels are occur together? **(a)** $5! \times 5!$ **(b)** $25!$ **(c)** $6!$ (d) $5 \times 6!$ (iii) In how many ways can all letters of the word ***EQUATIONS*** be arranged so that all consonants are occur together? **(a)** $5! \times 5!$ **(b)** $2 \times 4! \times 5!$ **(c)** $6!$ (d) $5! \times 6!$ (iv) In how many ways can all letters of the word ***EQUATIONS*** be arranged so that the positions of vowels and consonants are unaltered? **(a)** $5! \times 5!$ **(b)** $4! \times 5!$ **(c)** $6! \times 4!$ (d) $5! \times 6!$
Q 24	A dentist conducts a team to take surveys of people in his locality about using toothpaste. A survey team has some persons and survey owner makes a team out of total persons available at that time. If he has a group of 5 persons available at that time out of which2 are men and 3 are women (i) If a committee of 3 persons is to be constituted from the available group. In how many ways this can be done?How many of these committees would consist of 1man and 2 women? (ii) If P(2n-1,n):P(2n+1,n-1)=22:7, find n.
Q 25	Two friends Swati and KOMAL are playing cards. Swati asks Komal to choose any four cards from a pack of 52 cards. Based on it answer the following: (i) In how many ways can Komal select 4 cards from same suite and she select all 4 cards from different suites? (ii) In how many ways can she select all face cards?

	ASSERTION REASONING QUESTIONS: In the following questions,a statement of assertion(A) is followed by a statement of reasoning(R). Mark the correct choice: (a) Both A and R are true and R is correct explanation of A. (b) Both A and R are true and R is not correct explanation of A. (c) A is true and R is false (d) A is false and R is true.
Q26	Assertion: The number of ways of distributing 10 identical balls in 4 distinct boxes such that no box is empty is $^{9}C_{3}$. Reason: The number of ways of choosing any 3 places from 9 different places is $^{9}C_{3}$.
Q27	Assertion: The number of rectangles on a chess board is $^{8}C_{2}X\ ^{8}C_{2}$ Reason: To form a rectangle ,we have to select any two of horizontal line and any two of the vertical line.
Q28	Assertion:If n is a positive integer,then $n(n^{2}-1)(n+2)$ is divisible by 24. Reason: Product of r consecutive whole numbers is divisible by r.
Q29	Assertion:The product of five consecutives natural numbers is divisible by 4! Reason:Product of n consecutive natural numbers is divisible by (n+1)!
Q30	Assertion:Number of lines formed by joining n points on a circle is n(n-1)/2 Reason:C(n,3) =n(n-1)/2
	VERY SHORT ANSWER TYPE QUESTIONS
Q 31	Find r ,if $^{n}p_{r}=2880$ and $^{n}C_{r}=120$.
Q 32	If there are 30 students in a group. If all shake hands with one another ,how many hand shake are possible?
Q 33	Find r, if $^{10}C_{2r}=^{10}C_{r+2}$
Q 34	How many words with 2 different vowels and 2 different consonants can be formed from the alphabets?
Q 35	How many committees of five persons with a chairperson can be selected from 12 persons?
Q36	If $^{n}C_{8}=^{n}C_{6}$. Find $^{n}C_{2}$
Q37	How many rectangles can be formed from the chess board of any size?
Q38	Evaluate: 2.5!-3.4!
Q39	Find the number of different four digit numbers that can be formed with digits 2,3,4,7 and using each digit once.
Q40	Evaluate: $\frac{6}{5}.5!-\frac{5}{4}.4!$.
Q41	Evaluate:4!-3!.
Q42	Find the value of P(7,3)
Q43	A college has 6 good badminton players. A team of 4 has to be sent for inter college tournament. In how many ways can the team be selected.
Q44	Six identical coins are arranged in a row. Determine the number of ways in which 3 heads and 3 tails can appear.
Q45	In how many different ways can the letter of word 'HEXAGON' be permuted?

Q46	There are 3 different rings to be born in four fingers with atmost one in each finger. In how many ways can this be done?
Q47	In how many ways 2 different prizes be awarded to 15 students, without giving both to the same student?
Q48	How many words of three distinct English alphabets are there?
Q49	There are 12 buses running between Jammu and Delhi. In how many ways can a man go from Jammu to Delhi and return by the same bus.
Q50	Find r if P(11,r)= P(12,r-1)
	SHORT ANSWER TYPE QUESTIONS
Q 51	Out of 18 points in a plane , no three points are in the same line except five points which are collinear. Find the number of lines that can be formed joining the points.
Q 52	There are two identical red and two identical black and white balls. In how many ways can the balls be placed in the cells such that balls of same color do not occupy any two consecutive cells?
Q 53	Determine n if ${}^{2n}C_3 : {}^{n}C_3 = 11:1$
Q 54	A boy has 4 movie tickets and 9 movies of his interest in the theatre.Of these 9, he does not want to see Marvels part 2 ,unless part 1 is seen. Inhow many ways can he choose 3 movies to be seen?
Q 55	How many 4-letter code can be formed using the first 10 letters of the English alphabet, if no letter can be repeated?
Q 56	Evaluate $\frac{n!}{(n-r)!}$, When (i) n = 6, r = 2 (ii) n = 9, r = 5
Q 57	Find the number of 4-digit numbers that can be formed using the digits 1, 2, 3, 4, 5 if no digit is repeated. How many of these will be even?
Q 58	In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?
Q 59	Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.
Q 60	How many words, with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word DAUGHTER?
Q 61	It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible?
Q 62	In how many ways can the letters of the word ASSASSINATION be arranged so that all the S's are together?
Q 63	We wish to select 6 persons from 8 ,but if the person A is chosen,then B must be chosen. In how many ways can selections be made?
Q 64	If all letters of the word RACHIT are arranged in all possible ways as

	listed in dictionary. Then what is the rank of the word RACHIT?
Q65	How many automobile licence plates can be made if each plate contains two different letters followed by three different digits?
Q66	If ${}^{12}P_{X+1} > 2\ {}^{12}P_X$ then find the set of values of x.
Q67	Find the number of positive integers greater than 6000 and less than 7000 which are divisible by 5, provided that no digit is to be repeated.
Q68	There are 10 persons named P1,P2……P10. Out of 10,5 persons are to be arranged in a line such that
Q 69	A student is allowed to select atleast one piece of fruit from 6 bananas,5 oranges and 4 apples. In how many ways can he make a selection?
Q70	Find the number of ways in which 13 different books can be packed into five parcels if four parcels contain 3 books each and the fifth only one.
	LONG QUESTIONS
Q 71	How many words, with or without meaning can be made from the letters of the word MONDAY, assuming that no letter is repeated, if. (i) 4 letters are used at a time, (ii) All letters are used at a time, (iii) all letters are used but first letter is a vowel?
Q 72	In how many ways can the letters of the word PERMUTATIONS be arranged if the (i) Words start with P and end with S, (ii) Vowels are all together, (iii) There are always 4 letters between P and S?
Q 73	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: (i) Exactly 3 girls? (ii) At least 3 girls? (iii) At most 3 girls?
Q 74	A bag contains six white marbles and five red marbles. Find the number of ways in which four marbles can be drawn from the bag if: (i) They can be of any color (ii) Two must be white and two red (iii) They must be all of same color.
Q 75	From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many ways can the excursion party be chosen?
Q 76	4 cards are chosen from the deck of 52 cards.Find the number of ways to choose **(i)** four cards of same suit **(ii)** two are red and two are black cards

	(iii) four cards belong to four different suits **(iv)** cards are of same color **(v)** are face cards **(vi)** at least two them are red cards?
Q 77	A tea party is arranged for 18 persons among two sides of a long table with 9 chairs on each side. Four guests wish to sit on one particular side and three on the other side. In how many ways can they be seated?
Q 78	If C(n,r-1)=36, C(n, r)=84 and C(n,r+1)=126, then find C(r,2).
Q 79	In a village, there are 87 families of which 52 families have at most 2 children. In a rural development program, 20 families are to be helped chosen for assistance, of which at least 18 families must have at most 2 children. In how many ways can the choice be made?
Q 80	Eight chairs are numbered from 1 to 8. Two women and 3 men wish to occupy one chair each. First the women chose the chairs among st the chairs 1 to 4 and then men select from the remaining chairs. Find the possible arrangement.

ANSWER KEY

PERMUTATIONS AND COMBINATIONS

1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**
d	a	c	a	c	a	d	d	a	a
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
b	c	b	d	a	c	b	b	b	b
21.	**22.**	**23.**	**24.**	**25.**	**26.**	**27.**	**28.**	**29.**	**30.**
(i) 15 (ii) 2 (iii) 18 (iv) 12	(i) a (ii) b (iii) d (iv) a	(i) a (ii) a (iii) d (iv) b	(i)10,6 (ii) n=10	(i)13^4 (ii)495	a	d	a	c	c
31.	**32.**	**33.**	**34.**	**35.**	**36.**	**37.**	**38.**	**39.**	**40.**

r=4	435	r=2	50400	3960	91	1296	168	24	114
41.	**42.**	**43.**	**44.**	**45.**	**46.**	**47.**	**48.**	**49.**	**50.**
18	210	15	20	5040	24	210	15600	132	9

51	Number of points=18 Number of collinear points=5 Required number of lines=$^{18}C_2$-$^{5}C_2$+1=144
52	CASE 1: 2 balls of same colour and 2 balls of different colour are arranged TWO balls of same colour and 2 of different colours can be arranged together in which two balls of same colour are adjacent=4!/(2!X2!)=6 Total number of arrangement=6X3=18 Case 2: Two colours out of 3 can be selected in 3 ways 2 balls of each colour can be arranged alternatively in 2 ways 4 balls can be arranged =3X2 ways Hence total ways of arrangement=18+6=24
53	Dividing and solving equation,we get8n-4=11n-22 n=6
54	Case 1: Marvel part 2 is seen Number of ways of selecting 2 movies out of 7=$^{7}C_2$=21 CASE 2: MARVEL part 2 is not seen Number of ways of selecting 4 out of 8=$^{8}C_4$=70 Hence required number of ways=21+70=91
55	Let the 4 digit code be 1234. At the first place, the number of letters possible is 10. Let's suppose any 1 of the ten occupies place 1. Now, as the repetition is not allowed, the number of letters possible at place 2 is 9. Now at 1 and 2, any 2 of the 10 alphabets have been taken. The number of alphabets left for place 3 is 8 and similarly the number of alphabets possible at 4 is 7. Therefore the total number of 4 letter codes=10 × 9 × 8 × 7=5040.

56	(i) Given n = 6 and r = 2 Putting the value of n and r we get $\frac{6!}{(6-2)!}$ $\Rightarrow \frac{6!}{4!} = \frac{6 \times 5 \times 4!}{4!} = 6 \times 5 = 30.$ (ii) Given n = 9 and r = 5 Putting the value of n and r we get $\frac{9!}{(9-5)!}$ $\Rightarrow \frac{9!}{4!} = \frac{9 \times 8 \times 7 \times 6 \times 5 \times 4!}{4!} = 9 \times 8 \times 7 \times 6 \times 5 = 15120.$
57	Total number of digits possible for choosing = 5 Number of places for which a digit has to be taken = 4 As there is no repetition allowed, ⇒ Number of permutations = ${}^{5}_{4}P = \frac{5!}{(5-4)!} = \frac{5!}{1!} = 120.$ The number will be even when 2 and 4 are at one's place. The possibility of (2, 4) at one's place = 2/5 = 0.4 Total number of even number = 120 × 0.4 = 48.
58	Given 5 boys and 4 girls are in total We can select 3 boys from 5 boys in ${}^{5}C_3$ ways Similarly, we can select 3 boys from 54 girls in ${}^{4}C_3$ ways ∴ Number of ways a team of 3 boys and 3 girls can be selected is ${}^{5}C_3 \times {}^{4}C_3$ ⇒ ${}^{5}C_3 \times {}^{4}C_3$ = $\frac{5!}{3!(5-3)!} \times \frac{4!}{3!(4-3)!} = \frac{5!}{3! \times 2!} \times \frac{4!}{3! \times 1!}$ ⇒ ${}^{5}C_3 \times {}^{4}C_3 = 10 \times 4 = 40$ ∴ Number of ways a team of 3 boys and 3 girls can be selected is ${}^{5}C_3 \times {}^{4}C_3 = 40$ ways
59	Given a deck of 52 cards There are 4 Ace cards in a deck of 52 cards. According to question, we need to select 1 Ace card out the 4 Ace cards

	∴ Number of ways to select 1 Ace from 4 Ace cards is ${}^4C_1$ ⇒ More 4 cards are to be selected now from 48 cards (52 cards – 4 Ace cards) ∴ Number of ways to select 4 cards from 48 cards is ${}^{48}C_4$ $\Rightarrow {}^4C_1 \times {}^{48}C_4 = \frac{4!}{1!(4-1)!} \times \frac{48!}{4!(48-4)!} = \frac{4!}{1!\times 3!} \times \frac{48!}{4!\times 44!}$ $\Rightarrow {}^4C_1 \times {}^{48}C_4 = \frac{4\times 3!}{1!\times 3!} \times \frac{48\times 47\times 46\times 45\times 44!}{4!\times 44!} = \frac{4}{1} \times \frac{4669920}{24} = 4 \times 194580 = 778320$ ∴ Number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination 778320.
60	The word DAUGHTER has 3 vowels A, E, U and 5 consonants D, G, H, T and R. The three vowels can be chosen in ${}^3C_2$ as only two vowels are to be chosen. Similarly, the five consonants can be chosen in ${}^5C_3$ ways. ∴ Number of choosing 2 vowels and 5 consonants would be ${}^3C_2 \times {}^5C_3$ $= \frac{3!}{2!\,(3-2)!} \times \frac{5!}{3!\,(5-3)!} = \frac{3!}{2!1!} \times \frac{5!}{3!2!}$ = 30 ∴ Total number of ways of is 30 Each of these 5 letters can be arranged in 5 ways to form different words = ${}^5P_5$ $\Rightarrow \frac{5!}{(5-5)!} = \frac{5!}{0!} = \frac{5!}{1} = 5 \times 4 \times 3 \times 2 \times 1 = 120$ Total number of words formed would be = 30 × 120 = 3600
61	Given there are total 9 people Women occupies even places that means they will be sitting on 2nd, 4th, 6th and 8th place where as men will be sitting on 1st, 3rd, 5th,7th and 9th place. 4 women can sit in four places and ways they can be seated= ${}^4P_4$ $= \frac{4!}{(4-4)!} = \frac{4\times 3\times 2\times 1}{0!} = 24$ 5 men can occupy 5 seats in 5 ways The numbers of ways in which these can be seated = ${}^5P_5$ $= \frac{5!}{(5-5)!} = \frac{5\times 4\times 3\times 2\times 1}{1} = 120$ The total numbers of sitting arrangements possible are 24 × 120 = 2880

62	In the given word ASSASSINATION, there are 4 'S'. Since all the 4 'S' have to be arranged together so let as take them as one unit. The remaining letters are= 3 'A', 2 'I', 2 'N', T The number of letters to be arranged are 9 (including 4 'S') Using the formula $\frac{n!}{p_1!p_2!p_3!}$ where n is number of terms and p_1, p_2 p_3 are the number of times the repeating letters repeat themselves. Here p_1= 3, p_2= 2, p_3 = 2 Putting the values in formula we get $\frac{10!}{3!\,2!\,2!} = \frac{10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3!}{3! \times 2 \times 2 \times 1 \times 1} = 151200$
63	Case 1: If both selected=1X1X $^6C4$=15 CASE 2: IF NEITHER selected=$^6C_6$=1 CASE 3: if B is selected but A is not=1X $^6C_5$=6 REQUIRED WAYS=15+1+6=22
64	Number of words that can start with A= 5! Number of words that can start with C= 5! Number of words that can start with H= 5! Number of words that can start with I= 5! TOTAL=480 Number of words that can start with R= 1 Total words=481
65	Number of letters in automobile licence plate=2 Number of ways of arranging alphabets=26X25=650 NUMBER OF DIGITS=3 Number of ways of arranging digits= 10X9X8=720 Total number of automobile licence plates=720X650=468000
66	$^{12}P_{X+1}$>2 $^{12}P_X$ $\frac{12!}{(11-x)!} = 2\frac{12!}{(12-x)!}$ Simplifying 12-x>2 X<10 X=10,9,8,7,6,5
67	Thouands place can be with 6 only Number of ways=1 Unit place can be filled by 2 ways

	Hundred place can be filled by 8 ways Tens place can be filled by 7 ways Required number will be =1X8X7X2=112
68	Number of ways in which P1 can be arranged=5!=120 Number of ways in which other ca be arranged, $^{7}C_{4}$=35 Required number of arrangement=35X120=4200
69	None,one or more bananas out of 6 can be selected in 7 ways None,one or more oranges out of 5 can be selected in 6ways None,one or more apple out of 4 can be selected in 5 ways None,one or more piece of fruit can be selected in 7X6X5=210 ways REQUIRED NUMBER OF WAYS=210-1=209.
70	In this case four parcels containing 3 books each are interchangeable, therefore required number of ways=$^{13}C_{3}X^{10}C_{3}X^{7}C_{3}X^{4}C_{3}X^{1}C_{1}$/ 4!= 200200
71	.i) Number of letters to be used =4 ⇒ Number of permutations = $^{6}_{4}P = \frac{6!}{(6-4)!} = \frac{6!}{2!} = 360.$ (ii) Number of letters to be used = 6 ⇒ Number of permutations = $^{6}_{6}P = \frac{6!}{(6-6)!} = \frac{6!}{0!} = 720.$ (iii) Number of vowels in MONDAY = 2 (O and A) ⇒ Number of permutations in vowel = $^{2}_{1}P = 2$ Now, remaining places = 5 Remaining letters to be used =5 ⇒ Number of permutations = $^{5}_{5}P = \frac{5!}{(5-5)!} = \frac{5!}{0!} = 120.$ Therefore, total number of permutations = 2 × 120 =240.
72	.(i) Total number of letters in PERMUTATIONS =12 Only repeated letter is T; 2times First and last letter of the word are fixed as P and S respectively. Number of letters remaining =12 – 2 = 10 ⇒ Number of permutations = $\frac{^{10}_{10}P}{2!} = \frac{10!}{2(10-10)!} = \frac{10!}{2} = 1814400$ (ii) Number of vowels in PERMUTATIONS = 5 (E, U, A, I, O)

	Now, we consider all the vowels together as one. Number of permutations of vowels = 120 Now total number of letters = 12 – 5 + 1= 8 ⇒ Number of permutations = $\frac{{}^{8}_{8}P}{2!} = \frac{8!}{2(8-8)!} = \frac{8!}{2} = 20160.$ Therefore, total number of permutations = 120 × 20160 = 2419200 (iii) Number of places are as 1 2 3 4 5 6 7 8 9 10 11 12 There should always be 4 letters between P and S. Possible places of P and S are 1 and 6, 2and 7, 3 and 8, 4 and 9, 5 and 10, 6 and 11, 7 and 12 Possible ways =7, Also, P and S can be interchanged, No. of permutations =2 × 7 =14 Remaining 10 places can be filled with 10 remaining letters, ∴ No. of permutations = $\frac{{}^{10}_{10}P}{2!} = \frac{10!}{2(10-10)!} = \frac{10!}{2} = 1814400$ Therefore, total number of permutations = 14 × 1814400 =25401600.
73	.(i) Given exactly 3 girls Total numbers of girls are 4 Out of which 3 are to be chosen ∴ Number of ways in which choice would be made = ${}^{4}C_{3}$ Numbers of boys are 9 out of which 4 are to be chosen which is given by ${}^{9}C_{4}$ Total ways of forming the committee with exactly three girls = ${}^{4}C_{3} \times {}^{9}C_{4}$ $= \frac{4!}{3!(4-3)!} \times \frac{9!}{4!(9-4)!} = \frac{4!}{3!1!} \times \frac{9!}{4!5!} = \frac{9\times8\times7\times6\times5\times4\times3\times2\times1}{3\times2\times1\times5\times4\times3\times2\times1} = 504$ (ii) Given at least 3 girls There are two possibilities of making committee choosing at least 3 girls There are 3 girls and 4 boys or there are 4 girls and 3 boys Choosing three girls we have done in (i) Choosing four girls and 3 boys would be done in ${}^{4}C_{4}$ ways And choosing 3 boys would be done in ${}^{9}C_{3}$ Total ways = ${}^{4}C_{4} \times {}^{9}C_{3}$ $= \frac{4!}{4!\,(4-4)!} \times \frac{9!}{3!\,(9-3)!} = \frac{4!}{4!\,0!} \times \frac{9!}{3!\,6!} = \frac{9\times8\times7\times6!}{3\times2\times1\times6!} = 84$

	Total numbers of ways of making the committee are 504 + 84 = 588 (iii) Given at most 3 girls In this case the numbers of possibilities are 0 girl and 7 boys 1 girl and 6 boys 2 girls and 5 boys 3 girls and 4 boys Number of ways to choose 0 girl and 7 boys = $^4C_0 \times {}^9C_7$ $= \frac{4!}{0!\,(4-0)!} \times \frac{9!}{7!\,2!} = \frac{4!}{4!} \times \frac{9 \times 8 \times 7!}{7! \times 2 \times 1} = \frac{72}{2} = 36$ Number of ways of choosing 1 girl and 6 boys = $^4C_1 \times {}^9C_6$ $\frac{4!}{1!\,3!} \times \frac{9!}{6!\,3!} = \frac{4 \times 3!}{3!} \times \frac{9 \times 8 \times 7 \times 6!}{6! \times 3 \times 2 \times 1} = 336$ Number of ways of choosing 2 girls and 5 boys = $^4C_2 \times {}^9C_5$ $\frac{4!}{2!\,2!} \times \frac{9!}{5!\,4!} = \frac{4!}{2 \times 1 \times 2 \times 1} \times \frac{9 \times 7 \times 8 \times 6 \times 5!}{5!\,4!} = 756$ Number of choosing 3 girls and 4 boys has been done in (1) = 504 Total number of ways in which committee can have at most 3 girls are = 36 + 336 + 756 + 504 = 1632
74	Total number of marbles=11 (i) if they are of any color,required number of ways= $^{11}C_4$ (ii) number of ways of choosing two white and two red marbles=$^6C_2$X $^5C_2$ (iii) Required no. of ways=$^6C_4$ +$^5C_4$
75	In this question we get 2 options that is (i) Either all 3 will go Then remaining students in class are: 25 – 3 = 22 Number of students remained to be chosen for party = 7 Number of ways choosing the remaining 22 students = $^{22}C_7$ = $\frac{22!}{7!15!} = 170544$ (ii) None of them will go The students going will be 10 Remaining students eligible for going = 22 Number of ways in which these 10 students can be selected are $^{22}C_{10}$ $= \frac{22!}{10!\,12!} = 646646$

	Total numbers of ways in which students can be chosen are = 170544 + 646646 = 817190
76	(i) $4 \times 13_{C_4}$ (ii) $(26_{C_2})^2$ (iii) $(13)^4$ (iv) $2 \times 26_{C_4}$ (v) 12_{C_4} (vi) $52_{C_4} - 26_{C_1} \times 26_{C_3}$
77	Since 4 guests are to be seated on one side and 3 on other side, so the remaining guests are 11. As the guests are to be divided equally on both sides of table , we have to select 5 for one side where 4 particular guests are to be seated, this can be done in $^{11}C_5$ Ways Further 9 guests on each side of the table can be arranged among themselves in 9!ways Therefore required no. of ways=$^{11}C_5$X9!X9!=462.(9!)^2
78	We have C(n,r-1)=36, ... (1) C(n, r)=84..... (2) and C(n,r+1)=126,..... (3) dividing 2 and 3 we get 2n-3=5r using 1 and 2 we get 3n+3=10r solving both eq we get n=9,r=3 now $^rC_2$=3
79	There are 35 families which have more than 2 children. We may select 2 or 1 or no family out of those 35 and correspondingly we have to select 18,19,or 20 families out of 52 having atmost two children. Required number of ways=$^{52}C_{18}$ X $^{35}C_2$+$^{52}C_{19}$ X $^{35}C_{1+}$ $^{52}C_{20}$ X $^{35}C_0$
80	W1 can occupy chair marked 1 to 4 in 4 different ways W2 can occupy chair marked 1 to 4 in 3 different ways Total no. of ways in which women can occupy chairs=$^4P_2$=12 M1 can occupy any of 6 different chairs in 6 different ways M2 can occupy any of 5 different chairs in 5 different ways M3 can occupy any of 4 different chairs in 4 different ways Total no. of ways in which men can occupy chairs=$^6P_3$=120 Hence total number of ways in which men and women can be seated=120x12=1440

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION

MATHS CONTENT: 2022 – 23

CLASS: XI

CHAPTER: BINOMIAL THEOREM

	MULTIPLE CHOICE QUESTIONS
Q. 1	The number of terms in the expansion of $(x^2 - 2xy + y^2)^{10}$ is: **(a)** 11 **(b)** 15 **(c)** 20 **(d)** 21
Q. 2	The total number of terms in the expansion of $(x + a)^{51} - (x - a)^{51}$after simplification is: **(a)** 102 **(b)** 25 **(c)** 26 **(d)** None of these
Q. 3	The term independent of x in the expansion of$(2x + \frac{1}{3x^2})^9$ is: **(a)** 2nd **(b)** 3rd **(c)** 4th **(d)** 5th
Q. 4	In the expansion of $(\sqrt[3]{\frac{x}{3}} - \sqrt[3]{\frac{3}{x}})^{10}$, $x > 0$, the constant term is: **(a)** – 70 **(b)** 70 **(c)** 210 **(d)** – 210 **(e)**
Q. 5	The coefficient of x^{-12} in the expansion of $(x + \frac{y}{x^3})^{20}$ is:

	(a) C_8^{20} **(b)** $C_8^{20}y^8$ **(c)** C_{12}^{20} **(d)** $C_{12}^{20}y^8$
Q. 6	In the binomial expansion of $(a-b)^n, n \geq 5$ the sum of the 5th and 6th terms is zero. Then a/b equals: **(a)** $\frac{n-5}{4}$ **(b)** $\frac{n-4}{5}$ **(c)** $\frac{n-5}{6}$ **(d)** $\frac{n-6}{4}$
Q. 7	If the coefficient of $(2r+3)^{th}$ and $(r-1)^{th}$in $(1+x)^{15}$ are equal, then n is: **(a)** 6 **(b)** 5 **(c)** 4 **(d)** 3
Q. 8	In the expansion of $(1+x)^{15}$, the middle term is: **(a)** 308 **(b)** 462 **(c)** 924 **(d)** 1848
Q. 9	The coefficient of x^6 in the expansion of $(x^3+\frac{1}{x})^8$ is: **(a)** – 252 **(b)** 252 **(c)** 63 **(d)** – 63
Q. 10	If the coefficient of x^2 and x^3in the expansion of $(3+m\,x)^9$ are equal, then the value of m is:

	(a) $-\frac{9}{7}$ **(b)** $-\frac{7}{9}$ **(c)** $\frac{9}{7}$ **(d)** $\frac{7}{9}$
Q. 11	The constant term in $(\sqrt{x}-\frac{k}{x^2})^{10}$ is 405, then $\|k\| = \ldots\ldots$ **(a)** 9 **(b)** 1 **(c)** 3 **(d)** 2
Q. 12	Remainder when $(27)^{999}$is divided by 7 is: **(a)** 4 **(b)** 5 **(c)** 3 **(d)** 6
Q. 13	$(\sqrt{5}+2)^4+(\sqrt{5}-2)^4=\cdots\ldots$ **(a)** 212 **(b)** 322 **(c)** 218 **(d)** 328
Q. 14	$2^{2n}-3n-1$ is divisible by: **(a)** 3 **(b)** 9 **(c)** 4 **(d)** 16
Q. 15	$(r+1)^{th}$ from the end in the expansion of $(x+a)^n$is: **(a)** $\binom{n}{r}x^{n-r}a^r$

	(b) $\binom{n}{r} x^{r} a^{n-r}$ **(c)** $\binom{n}{r} x^{r} a^{r}$ **(d)** $\binom{n}{r} x^{n-r} a^{n-r}$
	ASSERTION REASONING QUESTIONS
Q. 16	**Assertion** (S_1): T_9 is the middle term in the expansion of $\left(2x + \frac{1}{2x}\right)^{8}$. **Reason** (S_2): The number of terms in the expansion of $(x+a)^n$ is $n+1$. **(a)** $S_1$is true, $S_2$is true and $S_2$is correct explanation of S_1. **(b)** $S_1$is true, $S_2$is true but $S_2$is not correct explanation of S_1. **(c)** $S_1$is true, $S_2$is false. **(d)** $S_1$is false, $S_2$is true.
Q. 17	**Assertion** (S_1): The coefficients ofx^3 in the expansion of $(1+x)^n$is 20, then $n = 6$. **Reason** (S_2): $\binom{n}{3} = 20 \Rightarrow n = 6$ **(a)** $S_1$is true, $S_2$is true and $S_2$is correct explanation of S_1. **(b)** $S_1$is true, $S_2$is true but $S_2$is not correct explanation of S_1. **(c)** $S_1$is true, $S_2$is false. **(d)** $S_1$is false, $S_2$is true.
Q. 18	**Assertion** (S_1): The coefficients of terms equidistant from beginning and end in the expansion of $(x+a)^n$ are equal. **Reason** (S_2): $\binom{n}{r} = \binom{n}{n-r}$ **(a)** $S_1$is true, $S_2$is true and $S_2$is correct explanation of S_1. **(b)** $S_1$is true, $S_2$is true but $S_2$is not correct explanation of S_1. **(c)** $S_1$is true, $S_2$is false. **(d)** $S_1$is false, $S_2$is true.
Q. 19	**Assertion** (S_1): The number of terms in the expansion of $(3x+y)^8 - (3x-y)^8$ is 4.

	Reason (S_2): If n is even, then $(x+a)^n-(x-a)^n$ has $\frac{n}{2}$ terms. **(a)** $S_1$is true, $S_2$is true and $S_2$is correct explanation of S_1. **(b)** $S_1$is true, $S_2$is true but $S_2$is not correct explanation of S_1. **(c)** $S_1$is true, $S_2$is false. **(d)** $S_1$is false, $S_2$is true.
Q. 20	**Assertion** (S_1): The r^{th} term from the end in the expansion of $(x+a)^n$is $\binom{n}{n-r+1}x^{r-1}a^{n-r+1}$ **Reason** (S_2): The r^{th} term from the end in the expansion of $(x+a)^n$ is $(n-r+2)^{th}$ term. **(a)** $S_1$is true, $S_2$is true and $S_2$is correct explanation of S_1. **(b)** $S_1$is true, $S_2$is true but $S_2$is not correct explanation of S_1. **(c)** $S_1$is true, $S_2$is false. **(d)** $S_1$is false, $S_2$is true.
	<u>VERY SHORT ANSWER QUESTIONS</u>
Q.21	If the coefficients of 2nd, 3rd and the 4th terms in the expansion of $(1+x)^n$ are in A.P. then find the value of n.
Q.22	Prove that: $\sum_{r=0}^{n} {}_nC_r\, 4^r = 5^n$
Q.23	Find a, if the 17th and 18th term of the expansion $(2+a)^{50}$ are equal.
Q.24	The coefficients of three consecutive terms in the expansion of $(1+x)^n$ are in the ratio $1:7:42$. Find n.
Q.25	Expand: $(x^2+1-2x)^3$
Q.26	Using binomial theorem, evaluate: $(0.99)^5$
Q.27	Find the coefficient of x^5 in the expansion of $\left(3x^2+\frac{1}{3x}\right)^{10}$.
Q.28	Write general term in the expansion of $\left(3z^2-\frac{3}{3z^2}\right)^{35}$
Q. 29	Using binomial theorem, show that 3 is a factor of 7^n-4^n, where $n \in N$.

Q. 30	Show that sum of powers of a and b of each term in the expansion of $(x+a)^n$ is always n.
	SHORT ANSWER QUESTIONS
Q.31	If the coefficient of x^7 and x^8in the expansion of $(2+\frac{x}{3})^n$ are equal, then find n.
Q.32	Find the term independent of x in the expansion of $(\sqrt[3]{x}+\frac{1}{2\sqrt[3]{x}})^{18}, x>0$.
Q. 33	If the coefficient of $(r-5)^{th}\ and\ (2r-1)^{th}$terms in the expansion of $(1+x)^{34}$ are equal, find r.
Q. 34	Find the coefficient of a^4 in the product $(1+2a)^4(2-a)^5$ using binomial theorem.
Q. 35	The sum of the coefficients of the first three terms in the expansion of $(x-\frac{3}{x^2})^m, x \neq 0$. m being a natural number, is 559. Find the term of the expansion containing x^3.
Q. 36	Show that the coefficient of the middle term in the expansion of $(1+x)^{2n}$ is equal to the sum of the coefficients of two middle terms in the expansion of $(1+x)^{2n-1}$.
Q. 37	If p is a real number and the middle term in the expansion of $(\frac{p}{2}+2)^8$ is 1120, then find the value of p.
Q. 38	Find the coefficient of x^4 in the expansion of $(1+x+x^2+x^3)^{11}$.
Q.39	If the coefficient of 2nd, 3rd and 4th terms in the expansion of $(1+x)^{2n}$ are in A.P., show that $2n^2-9n+7=0$.
Q. 40	Find the 6th term of the expansion $(y^{\frac{1}{2}}+x^{\frac{1}{3}})^n$, if the coefficient of 3rd term from end is 45.
	LONG ANSWER QUESTIONS
Q.41	Find the term independent of x in the expansion of$(1+x+$

	$2\,x^3)\,(\frac{3}{2}x^2 - \frac{1}{3x})$.
Q.42	Find n, if ratio of the 7th term from beginning and 7th term from end in the expansion of $(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}})^n$, is $\frac{1}{6}$.
Q. 43	The 2nd, 3rd and 4th terms in the expansion of $(x+a)^n$ are 240, 720 and 1080 respectively. Find x, a and n.

Middle Term not in syllabus

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(a)	(c)	(c)	(c)	(b)	(b)	(b)	(c)	(a)	(c)
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
(c)	(d)	(b)	(b)	(b)	(b)	(a)	(a)	(a)	(a)

21. 7 **23.** 1 **24.** 55

25. $1 - 6x + 15\,x^2 - 20\,x^3 + 15\,x^4 - 6\,x^5 + x^6$

26. 0.951 **27.** 0.252 **28.** $(-1)^r C_r^{35} 3^r z^{70\,-\,4r}$ **31.** 55

32. $C_9^{18}\,\frac{1}{29}$ **33.** $r = 14$ **34.** - 438 **35.** $-5940\,x^3$

37. $p = \pm 2$ **38.** 990 **40.** $252\,x^{\frac{5}{3}}y^{\frac{5}{2}}$ **41.** 17/54

42. 9 **43.** $x = 2\,,\, a = 3\,,\, n = 5$

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : SEQUENCES AND SERIES

Important Points:

- A sequence refers to an arrangement of numbers in a definite order according to some rule.
- If a_1, a_2, a_3, a_4, …..is a sequence then $a_1+a_2+a_3+a_4+$ ….. is called series.
- An arithmetic progression (A.P.) is a sequence in which terms increase or decrease regularly by the same constant. This constant is called common difference (denoted by *d*) of the A.P. The first term and the last term of an A.P are denoted by *a* and$l$ respectively.
- The general term of an A.P. is given by a_n = a+ (n-1)d
- The sum of the first n terms of an A.P is given by $S_n = \frac{n}{2}[2a + (n-1)d]$
- The sum of all terms of a finite A.P whose first term is a and the last term is l is given by S = $\frac{n}{2}(a + l)$
- The arithmetic mean of two numbers a and b is given by A.M = $\frac{(a+b)}{2}$

  The sequence a, A.M, b form an A.P.
- A sequence is called a geometric progression (G.P.) if the ratio of any term to its preceding term is same throughout. This constant ratio is called the common ratio (denoted by *r*).
- The general term of a G.P. is given by $a_n = ar^{n-1}$, where a is the first term and r is the common ratio of the G.P.
- The sum of the first n terms of a G.P is given by Sn = $\frac{a(r^n-1)}{r-1}$ or $\frac{a(1-r^n)}{1-r}$, if r G 1.
- The sum of terms in an infinite G.P. is given by $S_\infty = \frac{a}{(1-r)}, r$ G 1.
- The geometric mean (G.M) of any two positive numbers a and b is given by $\sqrt{ab}$.

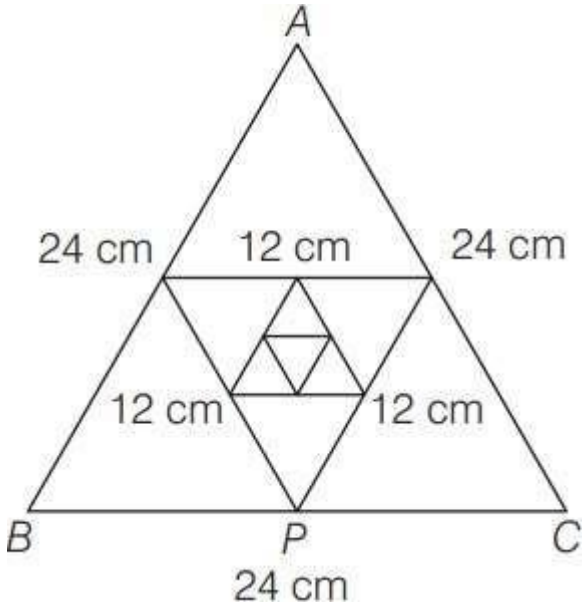
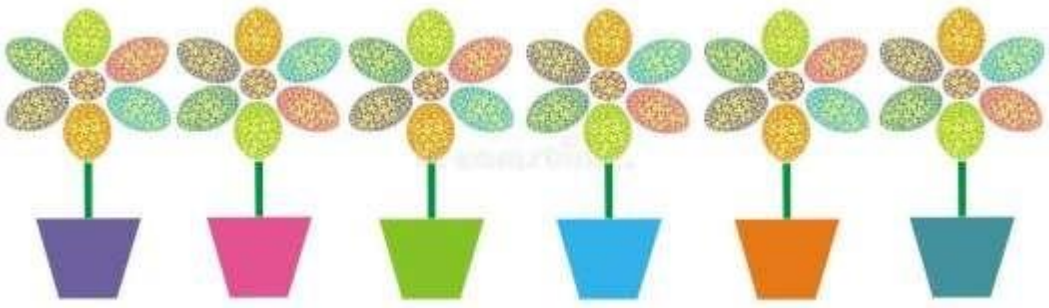
  The sequence a, G.M, b form a G.P.

	MCQs	
Q1	If the nth term of an AP is 3n - 4, the 10th term of AP is (a) 12 (b) 22 (c) 26 (d) 30	

Q2	If 2/3, k, 5/8 are in AP then the value of k is (a) 31/24 (b) 31/48 (c) 24/31 (d) 48/31
Q3	If the third term of an A.P. is 7 and its 7th term is 2 more than three times of its third term, then the sum of its first 20 terms is (a) 228 (b) 74 (c) 740 (d) 1090
Q4	For a G.P. the ratio of the 7th and the third terms is 16. What is the common ratio? (a) 2 (b) ±2 (c) 4 (d) ±4
Q 5	If the sum of the first 2n terms of the A.P. 2, 5, 8, ….., is equal to the sum of the first n terms of the A.P. 57, 59, 61, ….., then n equals (a) 10 (b) 12 (c) 11 (d) 13
Q 6	How many terms of G.P. 3, 32 , 33 , ... are needed to give the sum 120? (a) 3 (b) 4 (c) 5 (d) 6
Q 7	Next term of the sequence 0.02, 0.006, 0.0018,… is (a) 0.000054 (b) 0.0054

	(c) 0.00054 (d) 0.00036
Q 8	A man saves Rs 135/- in the first year, Rs 150/- in the second year and in this way he increases his savings by Rs 15/- every year. In what time will his total savings be Rs 5550/-? (a) 20 years (b) 25 years (c) 30 years (d) 35 years
Q 9	The fourth, seventh and tenth terms of a G.P. are p, q, r respectively, then : (a) $p^2 = q^2 + r^2$ (b) $q^2 = pr$ (c) $p^2 = qr$ (d) $pqr + pq + 1 = 0$
Q10	4th term from the end of the G.P. 3, 6, 12, 24., ..., 3072 is (a) 348 (b) 843 (c) 438 (d) 384
	CASE BASED/SOURCE BASED / PASSAGE BASED QUESTIONS
Q 11	150 workers were engaged to finish a job in a certain number of days. 4 workers dropped out on second day, 4 more workers dropped out on third day and so on. It took 8 more days to finish the work.

	 (i) Find the A.P. representing the above situation. (ii) In how many days was the work completed?
Q 12	A company produces 500 computers inthe third year and 600 computers in theseventh year. Assuming that theproduction increases uniformly by aconstant number every year, answer the following questions.  (i) How many computers were produced in the first year? (ii) By what number does the production increase every year? (iii) How many computers will be produced in the 21st year? (iv) Find the total production in 10 years.
Q 13	Each side of an equilateral triangle is 24 cm. The mid-point of its sides are joined to form another triangle. This process is going on continuously.

	 Based on the above information, answer the following questions. (i) What is the length of the side of the fifth triangle? (ii) What is the sum of the perimeters of the first six triangles?
Q 14	Rahul being a plant lover decides toopen a nursery and he bought fewplants with pots. He wants to place potsin such a way that number of pots infirst row is 2, in second row is 4 and in third row is 8 and so on. Answer the following questions based on the above information.  (i) Find the number of pots in the 8^{th} row. (ii) Find the total number of pots in 10 rows. (iii) If Rahul wants to place 510 pots in all, how many rows will be formed?
Q 15	Asif buys a scooter for Rs 22000. He pays Rs 4000 in cash and agrees to pay the balance in annual installments of Rs 1000 plus 10% interest on the unpaid amount.

	Based on the above information, answer the following questions.  (i) What will be the first installment? (ii) In how many installments will he be able to repay the loan? (iii) Find the total amount paid as installments.
	VERY SHORT QUESTIONS
Q 16	If $S_n = 3n^2 + 2n$, then write a_2.
Q 17	If sum of first n terms of an A.P is $2n^2 + 7n$, write its nth term.
Q 18	If in a G.P., $a_3 + a_5 = 90$ and if $r = 2$ find the first term of the G.P.
Q 19	If the product of 3 consecutive terms of G.P. is 27, find the middle term.
Q 20	In an A.P, 8, 11, 14, ... find $S_n - S_{n-1}$
Q 21	The first term of a G.P. is 2 and sum to infinity is 6, find common ratio.
Q 22	The A.M. of two numbers is 34 and G.M. is 16, the numbers are _____and _____
Q 23	The sum of first 10terms of G.P. is equal to 244 times the sum of first five terms. Then the common ratio is_____.
Q 24	The third term of a geometric progression is 4. Find the product of the first five terms.
Q 25	The first term of a GP is 1. The sum of the third term and fifth term is 90. The common ratio of GP is_____.
	ASSERTION REASON QUESTIONS
	In questions 26 to 30, each question contains A (Assertion) and R (Reason). Each of these questions has the following four choices, out of which only one is correct.

	(a) Both A and R are true. R is a correct explanation for A. (b) Both A and R are true. R is not a correct explanation for A. (c) A is true but R is false. (d) A is false but R is true.
Q 26	A: If $a_1, a_2, a_3, \ldots\ldots, a_n, \ldots$ is an A.P such that $a_1 + a_4 + a_7 + \ldots\ldots a_{16} = 147$, then $a_1 + a_6 + a_{11} + a_{16} = 98$ R: In an A.P, the sum of the terms equidistant from the beginning and the end is always same and is equal to the sum of first and last term.
Q 27	A: If nth term of a sequence is $a_n = \frac{n}{2^n}$ then its 7th term is $\frac{49}{128}$ R: If nth term of a sequence is $a_n = \frac{n(n-2)}{n+3}$ then its 20th term is $\frac{323}{22}$
Q 28	A: If the numbers $\frac{-2}{7}, k, \frac{-7}{2}$ are in G.P. then k = ± 1 R: If a, b, c are in G.P. then ac = b^2
Q 29	Let $a_1, a_2, a_3, \ldots\ldots, a_{n-1}, a_n$ be an A.P A: $a_1 + a_2 + a_3 + \ldots\ldots a_n = \frac{n}{2}(a_1 + a_n)$ R: $a_k + a_{n-k+1} = a_1 + a_n$ for $k = 1, 2, 3, \ldots\ldots\ldots, n$
Q 30	A: The sum of the first 22 terms of the A.P. 16, 11, 6, …… is – 803. R: The sum of the first 22 terms of the A.P. x+y, x-y, x-3y,…..is 22[x-20y].
	SHORT QUESTIONS
Q 31	Write the first negative term of the sequence 20, $19\frac{1}{4}$, $18\frac{1}{2}$, $17\frac{3}{4}$, …..
Q 32	How many numbers are there between 200 and 500, which leave remainder 7 when divided by 9?
Q 33	In an A.P. sum of first 4 terms is 56 and the sum of last 4 terms is 112. If the first term is 11 then find the number of terms.
Q 34	The product of first three terms of a G.P. is 1000. If 6 is added to its second term and 7 is added to its third term, the terms become in A.P. Find the G.P.
Q 35	Insert 5 numbers between 7 and 55 , so that resulting series is A.P.
Q 36	The sum of first three terms of a G.P. is 15 and sum of next three

	terms is 120. Find the sum of first n terms.
Q 37	Find the sum of all the natural numbers between 1 and 200 which are neither divisible by 2 nor by 5.
Q 38	If in an A.P. $\frac{a_7}{a_{10}} = \frac{5}{7}$, find $\frac{a_4}{a_7}$
Q 39	Using G.P. prove that $0.03111..... = \frac{7}{225}$ [Hint : 0.03111…… = 0.03 + 0.001 + 0.0001 + ... Now use infinite G.P.]
Q 40	Solve : 1 + 6 + 11 + 16 + ... + x = 148
	LONG QUESTIONS
Q 41	A square is drawn by joining the mid points of the sides of a square. A third square is drawn inside the second square in the same way and the process is continued indefinitely. If the side of the first square is 15 cm, then find the sum of the areas of all the squares so formed.
Q 42	If a is arithmetic mean of b and c and c, G1 , G2 , b are in G.P. then prove that $G_1^3 + G_2^3 = 2abc$
Q 43	If pth, qth and rth terms of an A.P and G.P both are a, b and c, respectively, then show that $a^{b-c} b^{c-a} c^{a-b} = 1$.
Q 44	Prove that the sum of n numbers between a and b such that the resulting series becomes A.P. is $\frac{n(a+b)}{2}$
Q 45	If a, b, c are in G.P., then prove that $$\frac{1}{a^2 - b^2} = \frac{1}{b^2 - c^2} - \frac{1}{b^2}$$ [Hint : Put b = ar, c = ar^2]
Q 46	1f the sum of p terms of an A.P is q and the sum of q terms is p, then show that the sum of p + q terms is —(p + q). Also, find the sum of first p — q terms (where p > q).
Q 47	If A is the arithmetic mean and G1 , G2 are two geometric means between any two numbers, then prove that $2A = \frac{G_2}{G_1} + \frac{G_1}{G_2}$
Q 48	Show that the sum of $(m + n)^{th}$ and $(m – n)^{th}$ terms of an A.P. is equal to twice the m^{th} term.
Q 49	The sums of n terms of two arithmetic progressions are in the ratio

	5n+4: 9n+6. Find the ratio of their 18th terms.
Q 50	Find two positive numbers whose difference is 12 and whose arithmetic mean exceeds the geometric mean by 2.

AP not in syllabus

ANSWERS

MCQs

Q 1- c	Q 2- b	Q 3- c	Q 4- b	Q 5- c
Q 6- b	Q 7- c	Q 8- a	Q 9- b	Q 10- d

CASE BASED QUESTIONS

Q 11 (i) 150, 146, 142, ……

(ii) 25 days

Q 12 (i) 450

(ii) 25

(iii) 950

(iv) 5625

Q 13 (i) 1.5 cm

(ii) 567/4 cm

Q 14 (i) 256

(ii) 2046

(iii) 8

Q 15 (i) Rs 2800

(ii) 18

(iii) Rs 35100

VERY SHORT QUESTIONS

Q 16: 11	Q 17: 4n+5	Q 18: 9/2	Q 19: 3	Q 20: 3n+5
Q 21: 2/3	Q 22: 64 & 4	Q 23: 3	Q 24: 4^5	Q 25: 3

ASSERTION REASON QUESTIONS

Q 26: a	Q 27: c	Q 28: a	Q 29: a	Q 30: b

SHORT QUESTIONS

Q31: -1/4	Q32: 33	Q33: 11
Q34: 5,10,20,…. Or 20,10,5,….	Q35: 15, 23, 31, 39, 47	Q36: $\frac{15}{7}(2^n - 1)$
Q37: 7999	Q38: 3/5	Q40: 36

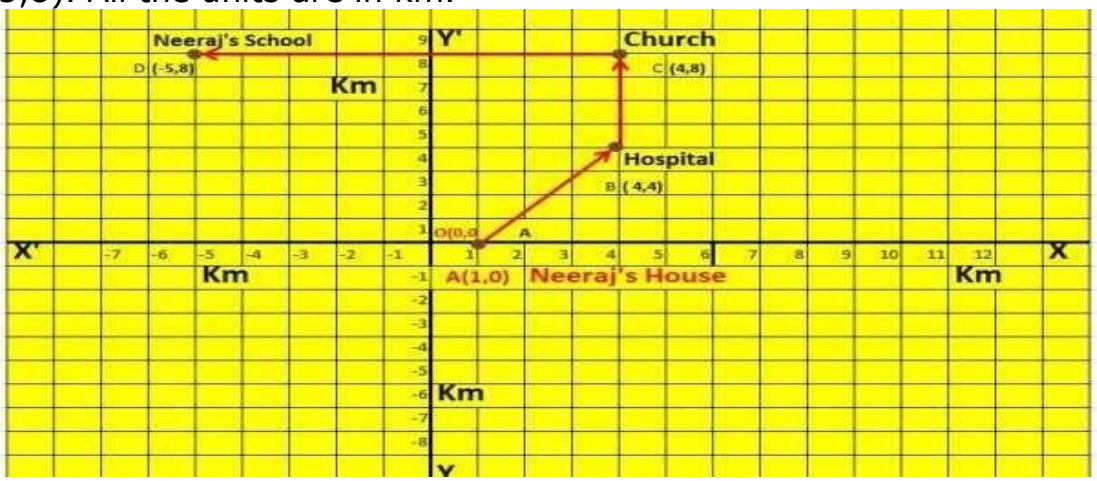
LONG QUESTIONS

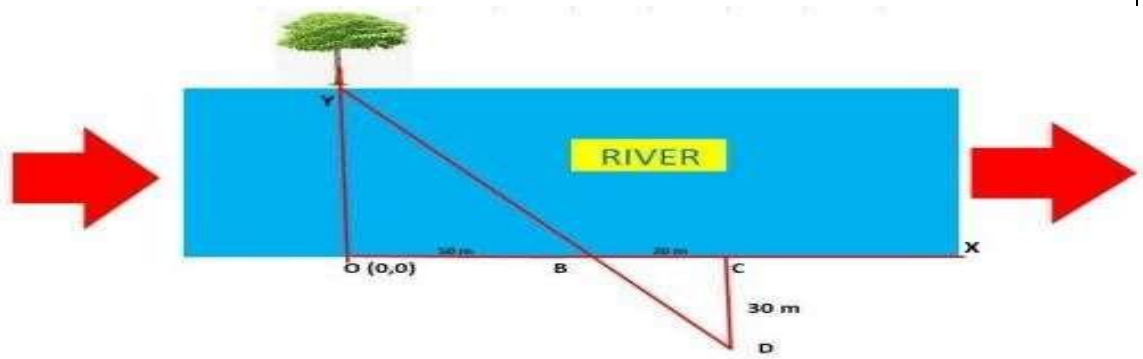
Q41: 450 cm^2	Q46: $(p-q)^{\frac{(p+2q)}{p}}$	Q49: 179:321	Q50: 16,4

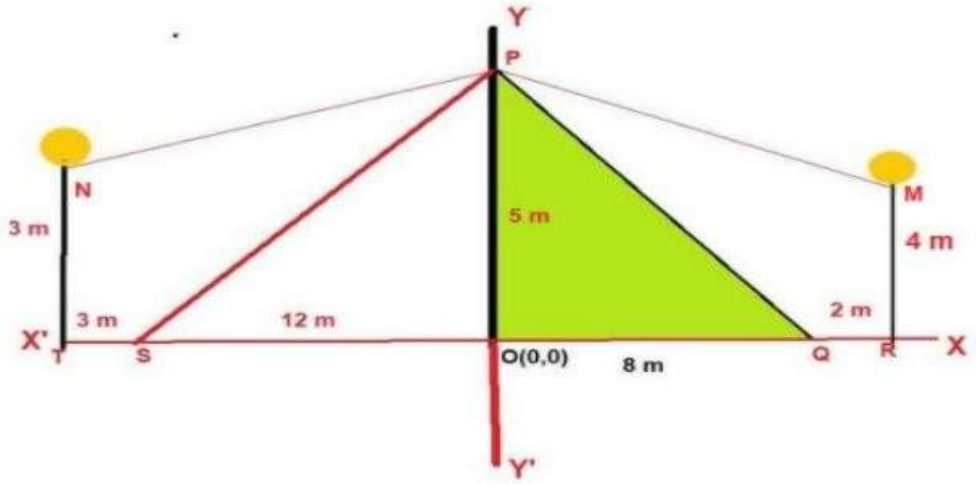
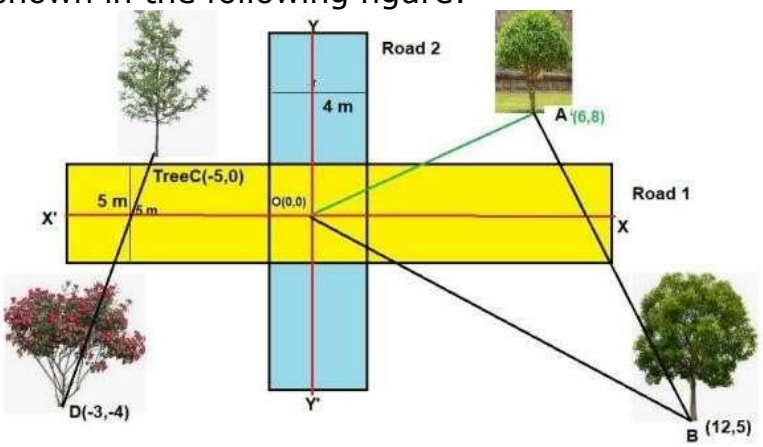
KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : Straight Lines

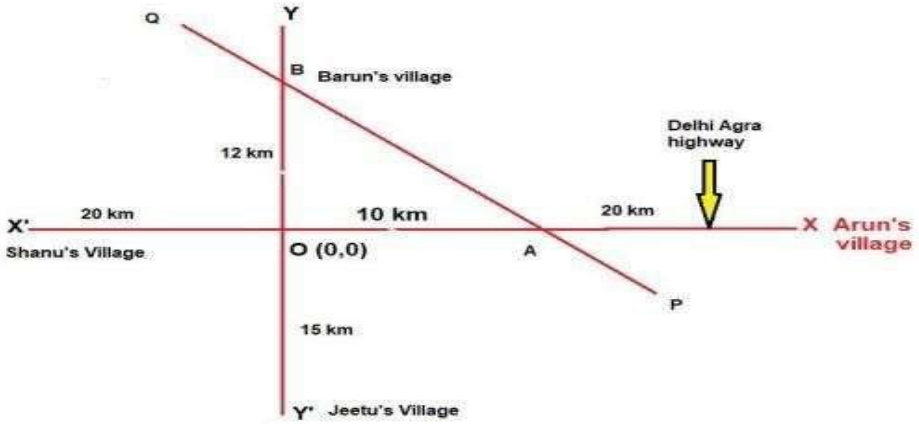
	MCQ
Q1	The inclination of the line $x - y + 3 = 0$ with the positive direction of x-axis is (A) 45° (B) 135° (C) – 45° (D) –135°
Q2	The two lines $ax + by = c$ and $a'x + b'y = c'$ are perpendicular if (A) $aa' + bb' = 0$ (B) $ab' = ba'$ (C) $ab + a'b' = 0$ (D) $ab' + ba'$
Q3	The equation of the line passing through (1, 2) and perpendicular to $x + y + 7 = 0$ is (A) $y - x + 1 = 0$ (B) $y - x - 1 = 0$ (C) $y - x + 2 = 0$ (D) $y - x - 2 = 0$
Q4	The distance of the point P (1, – 3) from the line $2y - 3x = 4$ is (A) 13 (B) $7\sqrt{13}/13$ (C) $\sqrt{13}$ (D) None of these
Q 5	The coordinates of the foot of the perpendicular from the point (2, 3) on the line $x + y - 11 = 0$ are (A) (–6, 5) (B) (5, 6) (C) (–5, 6) (D) (6, 5)
Q 6	The intercept cut off by a line from y-axis is twice than that from x-axis, and the line passes through the point (1, 2). The equation of the line is (A) $2x + y = 4$ (B) $2x + y + 4 = 0$ (C) $2x - y = 4$ (D) $2x - y + 4 = 0$
Q 7	A line cutting off intercept -3 from the y-axis and the tangent of angle to the x-axis is 3/5, its equation is (a) 5y-3x+15=0(b) 3x-5y+15=0 (c) 5y-3x-15=0 (d) None of these
Q 8	Slope of a line which cuts off intercepts of equal lengths on the axes is (a) -1 (b) 0 (c) 2 (d) $\sqrt{3}$
Q 9	The equation of the straight line passing through the point (3, 2) and perpendicular to the line $y = x$ is (a) x-y = 5 (b) x+y = 5 (c)x+y=l (d)x-y=1

Q10	The equation of the line passing through the point (1,2) and perpendicular to the line x +y + 1 = 0 is (a) y-x +1=0 (b) y — x—1=0 (c) y-x + 2 = 0 (d) y — x — 2=0
Q11	If the line $\frac{x}{a}+\frac{y}{b}=1$ passes through the points (2, -3) and (4, -5), then (a, b) a b is (a) (1,1) (b) (-1,1) (c) (1,-1) (d) (-1,-1)
Q 12	If the coordinates of the middle point of the portion of a line intercepted between the coordinate axes is (3, 2), then the equation of the line will be (a) 2x + 3y = 12 (b) 3x + 2y=l2 (c) 4x-3y = 6 (d) 5x- 2y=10
Q13	Equation of the line passing through (1,2) and parallel to the line y = 3x – 1 is (a)y + 2=x+l (b) y + 2 = 3(x + 1) (c) y -2 = 3(x — 1) (d) y-2=x-l
Q14	The point (4, 1) undergoes the following two successive transformations: (i) Reflection about the line y = x (ii) Translation through a distance 2 units along the positive x-axis Then the final coordinates of the point are (a) (4,3) (b) (3,4) (c) (1,4) (d) (7/2,7/2)
Q15	A point equidistant from the lines 4x + 3y+ 10 = 0, 5x – 12y + 26 = 0 and lx + 24y – 50 = 0 is (a) (1,-1) (b) (1, 1) (c) (0,0) (d) (0, 1)
Q16	A line passes through (2, 2) and is perpendicular to the line 3x + y = 3. Its y-intercept is (a) 1/3 (b) 2/3 (c) 1 (d) 4/3
Q 17	The ratio in which the line 3x + 4y + 2 = 0 divides the distance between the lines 3x + 4y + 5 = 0 and 3x + 4y – 5 = 0 is (a) 1:2 (b) 3:7 (c) 2:3 (d) 2:5
Q 18	One vertex of the equilateral triangle with centroid at the origin and one side asx + y- 2 = 0is (a) (-1,-1) (b) (2,2) (c) (-2,-2) (d) (2,-2)
Q 19	Equations of diagonals of the square formed by the lines x = 0, y = 0, x = 1 and y = 1 are (A). y = x, y + x = 1 (B). y = x, x + y = 2 (C). 2y = x, y + x = 1/3 (D). y = 2x, y + 2x = 1
Q 20	For specifying a straight line, how many geometrical parameters should be known? (A). 1 (B). 2 (C). 4 (D). 3
	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	Read the Case study given below : Neeraj's house is 1 km in the east of origin(0,0), While going to the school first he takes auto till hospital at B(4,4). From the

	hospital(4,4) to church (4,8) he travels by city bus. From Church C(4,8) he rides in a metro train and he reaches the school at D(-5,8). All the units are in km.  Now answer the following questions: i. What is the slope of Neeraj's journey from home to Hospital? a) 3/4 b) 4/3 c) 4/5 d)5/4 ii. What is the distance of School from Hospital? a). √ 97 km b). 10 km c). √145 km d). 12 km iii. What is the equation of the straight line joining the points A and D? a). 4x - 3y = 4 km b). 5x + 4y = 10 c). 4x + 3y = 4 d). 6x + 7y = -15 iv. What is the equation of the straight line joining church and hospital? a). y = 4 km b). 5x + 4y = 10 c). x = -4 d). x = 4 v. What is the equation of the straight line joining the points A (House) and C (church)? a). 4x - 3y = 4 km b). 8x - 3y = 8 c). 4x + 3y = 4 d). 6x + 7y = -15

Q 22	Read the Case study given below and attempt any 4 sub parts: A surveyor was measuring the width of a river. For this, he selected a tree at Y on the other side of the river. He is standing at Point O(0,0). From O he walks 50 m in the right direction, at point B he fixes a stick. From B in the right side at distance 20 m at C fixes a stick. Now from C, he walks perpendicular to line OC. Further, he fixes a stick D so the stick D, B and the tree are in the same straight line approximately. He finds that CD = 30m. We assume that OC is the x-axis and OY is the y-axis  Now answer the following questions: What are the coordinates of point D? a). (50, 30) b). (70, -30) c). (50, 20) d). (70, 30) ii. What are the coordinates of point C? a). (0, 500) b). (0, -70) c). (0, 70) [4] 1 21 / 24 d). (70, 30) iv. What are the coordinates of point Y? a). (0, 100) b). (0 ,-70) c). (75, 0) d). (0, 75) v. What is the equation of straight line BD? a). 3x + 2y = 150 b). 3x + 2y = 100 c). 5x + 2y = 150 d). 5x - 3y = 150
Q 23	Read the Case study given below and attempt any 4 subparts: In a colony, as shown in the following picture, an electric pole has been installed. The pole has been tied by strong wire PQ to support this pole, some electricians were working on the staircase PS.

	 In the left and right side of the pole, two street lights are fixed at a height of 3m and 4m respectively. These lights are given supply by wires PM and PN. The height OP=5 m and O is the origin. Now answer the following questions: i. What are the coordinates of point P? a. (5, 0) b. (0, 5) c. (0, -5) d. (0, 10) ii. What is the length of the staircase? a. 12 m b. 15 m c. 13m d. 20 m iii. What is the area of the ΔOPQ? a. 12 m² b. 15 m² c. 13m² d. 20 m² iv. What is the equation of line PN? a. x + 15y = -75 b. 15x - 2y + 6 = 0 c. x + 5y = 50 d. x - 5y = 20 v. What is the length of wire PM?' a. √101 b. √26 m c. 26 m d. 25 m
Q 24	Read the Case study given below and attempt any 4 sub parts: In a park Road 1 and road 2 of width 5 m and 4 m are crossing at centre point O(0, 0). As shown in the following figure: 

	For trees A, B, C and D are situated in four quadrants of the Cartesian system of coordinate. The coordinates of the trees A, B, C and D are (6, 8), (12, 5), (-5, 0) and (-3, 4) respectively. Now answer the following questions: i. What is the distance of Tree C from the Origin? a. 5 m b. 10 m c. 15 m d. 25 m ii. What is the equation of line AB? a. 2x + y = 22 b. x - 2y = -6 c. x + 2y - 22 = 0 d. x + 2y = 6 iii. What is the slope of line CD? a. 2/1 b. 1/2 c. -1/2 d. 3/2 iv. What is the slope of line OA? a. 3/4 b. 1 c. 4/3 d. 6/8 v. What is the distance of point B from the origin? a. 13 m b. 15 m c. 12 m d. 5 m
Q 25	Read the Case study given below and attempt any 4 sub parts: villages of Shanu and Arun's are 50km apart and are situated on Delhi Agra highway as shown in the following picture. Another highway YY' crosses Agra Delhi highway at O(0,0). A small local road PQ crosses both the highways at pints A and B such that OA=10 km and OB =12 km. Also, the villages of Barun and Jeetu are on the smaller high way YY'. Barun's village B is 12km from O and that of Jeetu is 15 km from O.  Now answer the following questions: i. What are the coordinates of A? a. (10, 0) b. (10, 12) c. (0,10) d. (0,15) ii. What is the equation of line AB? a. 5x + 6y = 60 b. 6x + 5y = 60 c. x = 10 d. y = 12

	iii. What is the distance of AB from O(0, 0)? a. 60 km b. 60/√61 km c. √61 km d. 60 km iv. What is the slope of line AB? a. 6/5 b. 5/6 c. -6/5 d. 10/12 v. What is the length of line AB? a. √61 km b. 12 km c. 10 km d. 2√ 61 km
	ASSERTION REASONING Directions Each of these questions contains two statements : Assertion(A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below. (a) A is true, R is true; R is a correct explanation for A. (b) A is true, R is true; R is not a correct explanation for A. (c) A is true; R is false. (d) A is false; R is true.
Q 26	Assertion (A) The point (3, 0) is at 3 units distance from the*Y* -axis measured along the positive *X* -axis and has zero distance from the *X* -axis. Reason (R) The point (3, 0) is at 3 units distance from the *X* -axis measured along the positive*Y* -axis and has zero distance from the*Y* -axis. c
Q 27	Assertion (A) If x cosq + y sin q = 2 is perpendicular to the line $x - y = 3$, then one of the value of q is p/4. Reason (R) If two lines $y = m_1 x + c_1$ and$y = m_2 x + c_2$ are perpendicular then $m_1 = m_2$.
Q 28	Assertion (A) Slope of *X* -axis is zero and slope of*Y* -axis is not defined. Reason (R) Slope of *X* -axis is not defined and slope of*Y* -axis is zero.
Q 29	Assertion (A) The slope of the line $x + 7y = 0$ is1/7 and y-intercept is 0. Reason (R) The slope of the line $6x + 3y - 5 = 0$ is - 2 and y-intercept is 5/3
Q 30	If *A* (- 2, - 1), *B* (4, 0),*C* (3, 3) and*D* (-3, 2) are the vertices of aparallelogram, then Assertion (A) Slope of *AB* = Slope of *BC* and Slope of*CD* = Slope of *AD*. Reason (R) Mid-point of *AC* =Mid-point of *BD*.
	VERY SHORT
Q 31	<u>Match the questions given under Column C1 with their appropriate answers given under the Column C2.</u> Column C_1 Column C_2

	a) The coordinates of the points P and Q on the line x+5y=13 which are at a distance of 2 units from the line 12x-5y+26=0 are i) (3,1), (-7,11) b) The coordinates of the points on the line x+y=4 which are at a unit distance from the line 4x-3y+10=0 areiii) 1, 12/5,-3,16/5 ii) -1/3, 11/3, 4/3, 7/3 c) The coordinates of the points on the line joining A (-2,5) and B(3,1) such that AP=+Q=QB are
Q 32	The value of the λ, if the lines (2x + 3y + 4) + λ (6x – y + 12) = 0 are Column C_1 Column C_2 a) parallel to y-axis is i) λ=-3/4 b) perpendicular to 7x+y-4=0 ii) λ=-1/3 c) Passes through (1,2) is iii) λ=-17/41 d) parallel to x-axis is iv) λ=3
Q 33	The equation of the line through the intersection of the lines 2x – 3y = 0 and 4x – 5y = 2 and Column C_1 Column C_2 a) through the point (2,1) is i) 2x-y =4 b)perpendicular to the line x+2y+1=0 is ii)x+y-5=0 c)parallel to the line 3x+4y+5=0 is iii)x-y-1=0 d) equally inclined to the axes is iv) 3x-4y-1=0
Q 34	Find the equation of the straight line which passes through the point (1, -2)
Q 35	Find the equation of the line passing through the point (5,2) and perpendicular to the line joining the points (2, 3) and (3, -1)
Q 36	Find the angle between the lines y = (2 -√3) (x + 5) and y = (2 + -√3) {x – 7)
Q 37	Find the equation of the lines which passes through the point (3, 4) and cuts off intercepts from the coordinate axes such that their sum is 14.
Q 38	Find the points on the line x+y = 4 which lie at a unit distance from the line 4x + 3y= 10

Q 39	Find the equation of lines passing through (1,2) and making angle 30° with y axis
Q 40	Find the equation of the line passing through the point of intersection of 2x + y = 5 and x + 3 y +8 = 0 and parallel to the line 3x + 4y=1.
Q 41	For what values of a and b the intercepts cut off on the coordinate axes by the line ax + by + 8 = 0 are equal in length but opposite in signs to those cut off by the line 2x − 3y + 6 = 0 on the axes
Q 42	If the intercept of a line between the coordinate axes is divided by the point (-5,4) in the ratio 1 : 2, then find the equation of the line.
Q 43	Find the equation of a straight line on which length of perpendicular from the origin is four units and the line makes an angle of 120° with the positive direction of x-axis
Q 44	Find the equation of one of the sides of an isosceles right angled triangle whose hypotenuse is given by 3x + Ay = 4 and the opposite vertex of the hypotenuse is (2, 2).
Q 45	If the equation of the base of an equilateral triangle is x + y − 2 and the vertex is (2, -1), then find the length of the side of the triangle
Q 46	A straight line moves so that the sum of the reciprocals of its intercepts made on axes is constant. Show that the line passes through a fixed point.
Q 47	Find the equation of the line which passes through the point (-4, 3) and the portion of the line intercepted between the axes is divided internally in the ratio 5 : 3 by this point.
Q 48	If the sum of the distances of a moving point in a plane from the axes is 1, then find the locus of the point
Q 49	Find the equation of a line which passes through the point (2, 3) and makes an angle of 30° with the positive direction of x-axis.
Q 50	The distance between the lines $3x + 4y = 9$ and $6x + 8y = 15$ is
	SHORT QUESTIONS
Q 51	Find the equation of the line where length of the perpendicular segment from the origin to the line is 4 and the inclination of the perpendicular segment with the positive direction of x-axis is 30°.
Q 52	Find the equation of the straight line passing through (1, 2) and perpendicular to the line x + y + 7 = 0
Q 53	Find the distance between the lines 3x + 4y = 9 and 6x + 8y = 15.
Q 54	If the slope of a line passing through the point A(3, 2) is 3 /4
Q 55	Find the equation to the straight line passing through(1,1) and perpendicular to the line 3x− 5y+ 11 = 0.
Q 56	A ray of light coming from the point (1, 2) is reflected at a point A on the x-axis and then passes through the point (5, 3). Find the coordinates of the point A.
Q 57	If one diagonal of a square is along the line 8x − 15y = 0 and one of its vertex is at (1, 2), then find the equation of sides of the square passing through this vertex.
Q 58	Find the angle between the x-axis and the line joining the points (3,−1) and (4,−2).

Q 59	The vertices of Δ PQR are P (2, 1), Q (–2, 3) and R (4, 5). Find equation of the median through the vertex R.
Q 60	Point R (h, k) divides a line segment between the axes in the ratio 1: 2. Find equation of the line.
Q 61	Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$
Q 62	Find the distance of the point (–1, 1) from the line $12(x + 6) = 5(y - 2)$
Q 63	Two lines passing through the point (2, 3) intersects each other at an angle of 60^o . If slope of one line is 2, find equation of the other line.
Q 64	Find the equations of the lines, which cut-off intercepts on the axes whose sum and product are 1 and – 6, respectively.
Q 65	Find the value of p so that the three lines $3x + y - 2 = 0$, $px + 2y - 3 = 0$ and $2x - y - 3 = 0$ may intersect at one point
Q 66	Find the equation of the line passing through the point of intersection of the lines $4x + 7y - 3 = 0$ and $2x - 3y + 1 = 0$ that has equal intercepts on the axes
Q 67	If the lines $y = 3x + 1$ and $2y = x + 3$ are equally inclined to the line $y = mx + 4$, find the value of m
Q 68	Find equation of the line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$.
Q 69	The hypotenuse of a right angled triangle has its ends at the points (1, 3) and (– 4, 1). Find an equation of the legs (perpendicular sides) of the triangle
Q 70	Find the equation of the lines through the point (3, 2) which make an angle of 45^o with the line $x - 2y = 3$
	LONG QUESTIONS
Q 71	A variable line passes through a fixed point P. The algebraic sum of the perpendiculars drawn from the points (2, 0), (0, 2) and (1, 1) on the line is zero. Find the coordinates of the point P
Q 72	In what direction should a line be drawn through the point (1, 2) so that its point of intersection with the line $x+y = 4$ is at a distance $\sqrt{6}/3$ from the given point.
Q 73	Find the equations of the lines through the point of intersection of the lines $x-y+ 1=0$ and $2x - 3y + 5 = 0$ and whose distance from the point (3, 2) is 7/5
Q 74	The point (4, 1) undergoes the following two successive transformations: (i) Reflection about the line $y = x$ (ii) Translation through a distance 2 units along the positive x-axis

	Then the final coordinates of the point
Q 75	One vertex of the equilateral triangle with centroid at the origin and one side asx + y- 2 = 0isLocus of the mid-points of the portion of the line x sin θ + y cos θ = p intercepted between the axes.
Q 76	If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that$\frac{1}{p2} = \frac{1}{a2} + \frac{1}{b2}$
Q 77	Show that the path of a moving point such that its distances from two lines 3x – 2y = 5 and 3x + 2y = 5 are equal is a straight line.
Q 78	Find the area of the triangle formed by the lines y – x = 0, x + y = 0 and x – k = 0
Q 79	If p and q are the lengths of perpendiculars from the origin to the lines xcosθ −y sin θ = k cos2 θ and x sec θ + y cosec θ = k, respectively, prove that $p^2 + 4q^2 = k^2$
Q 80	Find the distance of the line 4x + 7y + 5 = 0 from the point (1, 2) along the line 2x – y = 0

ANSWERS

Q1 (A), Q2 (A), Q3 (B) , Q4(C), Q5 (B), Q6 (A), Q7 (A), Q8 (A), Q9 (B), Q10 (B), Q11 (B), Q12 (A), Q13 (C), Q14(B), Q15 (C), Q16 (D), Q17 (B), Q18 (C), Q19 (A), Q20 (B), Q21 i.(b) ii.(a) iii.(c) iv.(d) v (b), Q22 i.(b) ii.(c) iii.(a) iv.(d) v.(a), Q23 i.(b) ii.(c) iii.(d) iv.(b) v.(a), Q 24 i.(a) ii.(c) iii.(b) iv.(c) v.(a), Q25 i.(a) ii.(b) iii.(b) iv.(c) v.(d), Q26 (C), Q27 (C), Q28 (C), Q29 (D), Q30 (D), Q31 a.(iii) b(i) c(ii) Q32 a.(iv) b(iii) c(i) d(ii) Q33 a.(iii) b(i) c(iv) d(ii) Q 34x+y+1=0, Q35x-4y+3=0, Q 36$\theta=60^0$, Q 37 x+y=7,Q 38 (3,1) and (-7,11),Q 39√3X-Y-√3+2, Q 40 3X+2Y+3=0, Q 41 A=-8/3 ,B=4, Q 42 8x-5y+60=0, Q 43 √3X+Y=8,Q 44x-7y+12=0 and 7x+y=16,Q 45 √2/3, Q 46PROOF, Q 479X-20Y+96=0,Q 48 locus of the point P which is a square ,Q 49 x-√3y+3√3-2=0,Q 50 3/10 Q 51√3x+y=8,Q 52 x – y – 1 = 0, Q 53 3/10 Q 54 4y – 3x + 1 = 0, Q 555x + 3y + 8 = 0, Q 56 (13/5,0), Q 57 7x + 23y – 53 = 0.,Q 58135°,Q 59 3x – 4y + 8 = 0,Q 60 2kx + hy = 3kh,Q 61 30^0, 150^0, Q 62 5 units,Q 63(√3-2)x+(1+2√3)y=-1+8√3,Q 64 2x-3y=6,-3x+2y=6,Q65 5 units, Q 66 13x + 13y = 6 Q 67 (1+5√2)/7 Q 68 18x + 12y + 11 = 0 Q 69 x = 1, y = 1 Q 703x – y = 7, x + 3y = 9 Q 71 (1,1),Q 72 $\theta=105^0$,Q 73 4x-3y+1=0 and 3x-4y+6=0,Q 74 (-2,-2) ,Q 75 $4x^2y^2=p^2(x^2+y^2)$,Q 78 k^2 square units, Q 80 (23√5)18 units

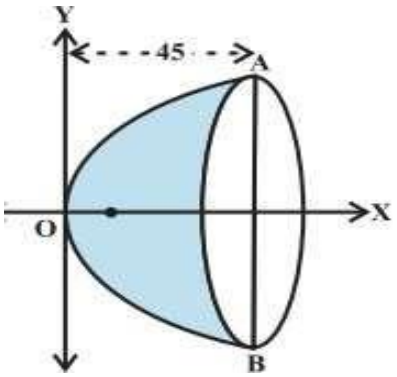
KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: 11th
CHAPTER : Conic Section

	MCQs
Q1	The equation of circle of radius 5 units touches the coordinates axes in the second quadrant is: (a) $x^2 + y^2 + 10x - 10y + 25 = 0$ (b) $x^2 + y^2 - 10x - 10y + 25 = 0$ (c) $x^2 + y^2 + 10x + 10y + 25 = 0$ (d) $x^2 + y^2 - 10x - 10y - 25 = 0$
Q2	Equation of the circle through the origin and cutting intercepts 2 and 4 on the coordinate axes is : (a) $x^2 + y^2 - 2x - 4y = 0$ (b) $x^2 + y^2 + 2x + 4y = 0$ (c) $x^2 + y^2 + 4x + 8y = 0$ (d) $x^2 + y^2 - 4x - 8y = 0$
Q3	Equation $(4m - 3)x^2 + my^2 + 10x - 8y + 16 = 0$ represent a circle for m = (a) 3 (b) 3/4 (c) 1 (d) -1
Q4	The radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$ (a) 8 (b) 10 (c) 9 (d) 7
Q 5	The centre of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$ (a) (– 4, –5) (b) (4, 5) (c) (– 8, –10) (d) (8, 10)

Q 6	Find the equation of the circle with centre (−3, 2) and radius 4. (a) $(x - 3)^2 + (y - 2)^2 = 16$ (b) $(x + 3)^2 + (y + 2)^2 = 16$ (c) $(x - 3)^2 + (y + 2)^2 = 16$ (d) $(x + 3)^2 + (y - 2)^2 = 16$
Q 7	Eccentricity of circle is: (a) 0 (b) 1 (c) 1.5 (d) 0.5
Q 8	Eccentricity of parabola is: (a) 0 (b) 1 (c) 1.5 (d) 0.5
Q 9	Find the equation of the parabola with vertex at (0, 0) and focus at (0, 2). (a) $x^2 = 8y$ (b) $x^2 = - 8y$ (c) $y^2 = 8x$ (d) $y^2 = - 8x$
Q10	The directrix of parabola $y^2=48x$ is: (a) $x = -12$ (b) $x = 12$ (c) $x = 24$ (d) $x = -24$
Q11	What point of the parabola $x^2 = 9y$ is the abscissa three times that of ordinate. (a) (1, 1) (b) (3, 1) (c) (-3, -1) (d) (-3, -3)

Q 12	The point where the axis meets the parabola is called: (a) Latus rectum (b) Tangent (c) Chord (d) Vertex
Q13	The vertex of the parabola $(y + a)^2 = 8a (x - a)$ is (a) (-a, -a) (b) (a, a) (c) (-a, a) (d) (a, -a)
Q14	The length of latus rectum of parabola $y^2=16x$ is: (a) -16 (b) -4 (c) 16 (d) 4
Q15	The focus of parabola $x^2=16y$ is: (a) (-4, 0) (b) (4, 0) (c) (0, 4) (d) (0, -4)
Q16	In an ellipse, the distance between its foci is 6 and its minor axis is 8 then its eccentricity is (a) 4/5 (b) 1/√52 (c) 3/5 (d)½
Q 17	The difference between the length of the major axis and latus rectum of an ellipse is (a) $2ae^2$ (b) ae^2 (c) 2ae (d) ae
Q 18	The eccentricity of ellipse , if the minor axis is equal to the distance between the foci,is

	(a) $\sqrt{3}/2$ (b) $2/\sqrt{3}$ (c) $\sqrt{2}/3$ (d) $1/\sqrt{2}$
Q 19	The eccentricity of ellipse , $5x^2 + 9y^2 = 1$,is (a) 3/4 (b) 4/5 (c) 2/3 (d) ½
Q 20	The eccentricity of rectangular hyperbola ,is (a) 1 (b)$\sqrt{2}$ (c) $\sqrt{\ }$ (d) 2
	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	"C: $x^2+ y^2$ -2x -2ay -8= 0, a is variable." Gaurang is analyzing the equation of the given curve and the dependency of curve with 'a' then on the basis of the given equation of the curve solve the following questions: i) The equation represent the family of circles having center in first quadrant , if 'a' is: a) Any Real number b) 0 c) Always a negative real number d) Always a positive real number II) If a = 0, then center of C is: a) (1,0) b) (0,1) c) (8,0) d) (0,8) III) If a = 0, then radius of C is: a) 1 b) 3

	c) 2 d) 4 IV) Curve C Passing through2 fixed points whose coordinates are: a) (-2,0),(4,0) b) (2,0),(4,0) c) (-4,0),(4,0) d) (2,0),(-4,0) V) Eccentricity of the Curve C is Passing through2 fixed points whose coordinates are: a) Depend on the value of a b) Always 0 c) Always 1 d) Always less than 1
Q 22	CASE STUDY : The focus of a parabolic mirror as shown in Fig is at a distance of 5 cm from its vertex and the mirror is 45 cm deep  Based on the above information answer the following: I)What is the equation of the above parabolic section: a) $y^2 = -5x$ b) $y^2 = 45x$ c) $y^2 = 5x$ d) $y^2 = 20x$ II) What is the length of distance AB? a) 5 cm b) 45 cm c) 30 cm d) 20 cm III)What is the coordinate of focus point of the parabolic mirror? a) (5,0) b) (20,0)

	c) (45,30) d) (45,15) IV) What is the coordinate of point A of the parabolic mirror? a) (5,0) b) (45,5) c) (45,20) d) (45,15) V)What is the equation of axis of the parabolic mirror? a) x=0 b) y=0 c) x=45 d) y=45
Q 23	The standard form of the equation of an ellipse with center $(h,\ k)$ and **major axis** parallel to the *x*-axis is $$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$ where • $a>b$ • the length of the major axis is $2a$ • the coordinates of the vertices are $(h\pm a,k)$ • the length of the minor axis is $2b$ • the coordinates of the co-vertices are $(h,k\pm b)$ • the coordinates of the foci are $(h\pm c,k)$, where $c^2=a^2-b^2$. The standard form of the equation of an ellipse with center (h,k) and major axis parallel to the *y*-axis is $$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$$ where • $a>b$ • the length of the major axis is $2a$ • the coordinates of the vertices are $(h,k\pm a)$ • the length of the minor axis is $2b$ • the coordinates of the co-vertices are $(h\pm b,k)$ • the coordinates of the foci are $(h,k\pm c)$, where $c^2=a^2-b^2$.

	Based on the above information answer the following: I) If equation of ellipse is $(x-2)^2 + 9(y-1)^2 = 9$ then length of major axis of the ellipse is : a) 3 b) 6 c) 9 d) 18 II) If equation of ellipse is $(x-2)^2 + 9(y-1)^2 = 9$ then centre of the ellipse is : a) (2,1) b) (3,1) c) (-2,1) d) (1,9) III) If equation of ellipse is $9(x-2)^2 + (y-1)^2 = 9$ then major axis is parallel to the line : a) $x + y = 0$ b) $y = 0$ c) $x + y = 0$ d) $x = 0$ IV) If equation of ellipse is $(x-2)^2 + 25(y-1)^2 = 25$ then coordinate of vertices are : a) $(2 \pm 5, 1)$ b) $(2, 1 \pm 1)$ c) $(2 \pm 5, 0)$ d) $(\pm 5, 0)$ V) If equation of ellipse is $(x-2)^2 + 9(y-1)^2 = 9$ then foci of the ellipse are : a) $(2 \pm 2\sqrt{2}, 1)$ b) $(2, 1 \pm 2\sqrt{2})$ c) (2,1) d) $(\pm 2\sqrt{2}, 0)$
	ASSERTION REASONING In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A.

	(c) A is true but R is false. (d) A is false but R is true.
Q 26	Assertion (A): The Conic section having the equation: $2x^2 - 2y^2 - 5 = 0$ is a circle. Reason (R): The Conic section having general equation: $Ax^2 + Cy^2 + Dx + Ey + F = 0$ is a circle, If A = C.
Q 27	Assertion (A): The point (1.5, 2) is inside the circle $S: x^2 + y^2 - 5x - 4y = 0$ Reason (R): The point (x_1, y_1) is inside, on or outside the circle $S_1 = x_1^2 + y_1^2 + 2gx_1 + 2fy_1 + c$, According as $S_1 < 0$; or $=0$; or > 0
Q 28	Assertion (A): The parabola $x^2 + 6y = 0$ opens upwards along y axis. Reason (R): When the axis of symmetry is along the X-axis the parabola opens upwards.
Q 29	Assertion (A): The major axis of the ellipse $5x^2 + 9y^2 = 1$, is along x axis. Reason (R): The major axis is along the x-axis if the coefficient of x^2 has the larger denominator and it is along the y-axis if the coefficient of y^2 has the larger denominator in its standard equation i.e. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
Q 30	Assertion (A):Eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is always less than 1. Reason (R): For the hyperbola, $a^2 = c^2 - b^2$, and Eccentricity = c/a. so the eccentricity is always less than one The major axis is along the x-axis if the coefficient of x^2 has the larger denominator and it is along the y-axis if the coefficient of

	y^2 has the larger denominator.
	VERY SHORT
Q 31	Find equation of circle with centre (-a,-a) and radius$\sqrt{2}$ a.
Q 32	Find equation of circle whose end points of diameter are (a,0) and (0,b)
Q 33	Find radius and centre of circle: $3x^2 + 3y^2 + 9x - 6y + 1 = 0$
Q 34	Find equation of circle with centre (1,5) and pass through the point (7,-1)
Q 35	Does point (7,-5) lie inside ,outside or on the circle $x^2 + y^2 - 6x + 8y + 9 = 0$
Q 36	For what value of k, does the equation $9x^2 + y^2 = k (x^2 – y^2 – 2x)$ represent the equation of a circle?
Q 37	Find equation of the parabola with vertex at origin and directix y – 2 = 0
Q 38	Find equation of the parabola with vertex at origin , axis along x axis and passing through the point (3,2).
Q 39	Find equation of the parabola with focus (3,-4) and directrix x +1 = 0
Q 40	Find focus , vertex, and directrix of the parabola $y^2 = x$
Q 41	Determine the equation of the ellipse whose foci are (4,0) and (-4,0), eccentricity = ⅓.
Q 42	If the distance between the foci of a hyperbola is 16 and eccentricity is $\sqrt{2}$, then obtain its equation.
Q 43	In an ellipse, the distance between its foci is 10 and its minor axis is 8 then its eccentricity
Q 44	Find the equation of diameter of a circle : $x^2 + y^2 + 2x - 4y = 4$, that is parallel to 3x+5y =4.
Q 45	Find equation of a parabola whose vertex is at origin and which is symmetric about the x-axis and passes through the point(-2,-3).
Q 46	If the eccentricity of an ellipse is 4/9 and the distance between its foci is 8 units, then find the length of the latus rectum of the ellipse.
Q 47	Find The focus of hyperbola , $9x^2 - 16y^2 = 144$.

Q 48	Find the eccentricity of hyperbola , $3x^2 - 2y^2 = 1$.
Q 49	Find The equation of hyperbola whose vertices are (±3, 0) and foci are (±5, 0).
Q 50	Find The latus rectum of hyperbola , $16x^2 - 9y^2 = 144$.
	SHORT QUESTIONS
Q 51	Find length of latus rectum of the parabola $x^2 - 4x - 8y + 12 = 0$ is
Q 52	Find the length of axis, foci, vertices, eccentricity of hyperbola , $2x^2 - 3y^2 = 6$
Q 53	Find equation of hyperbola whose foci are $(\pm 3\sqrt{5}, 0)$ and length of the latus rectum is 8.
Q 54	For the ellipse $3x^2 + 2y^2 = 6$, find the lengths of major and minor axis, eccentricity, foci, vertices and the latus rectum.
Q 55	If the line $y = mx + 1$ is tangent to the parabola $y^2 = 4x$ then find the value of m.
Q 56	Find the equation of ellipse whose eccentricity is 2/3, latus rectum is 5 and the centre is (0, 0).
Q 57	Show that the set of all points such that the difference of their distances from (4, 0)and (-4, 0) is always equal to 2 represent a hyperbola.
Q 58	The equation of 2 diameters of a circle are x+y=6 and x+2y = 4, and radius is 10 unit, find the equation of the circle.
Q 59	Find the equation of the circle which passes through the origin and cuts off intercept 4 and 6 on the axises.
Q 60	If the length of the latus rectum of an ellipse with major axis along x axis and centre at origin is 20 units, distance between foci is equal to length of minor axis, then find equation of the ellipse.
Q 61	Find equation of the ellipse whose foci are (2,3) and (-2,3) and whose semi minor axis is $\sqrt{5}$.
Q 62	If eccentricity of a hyperbola is $\sqrt{3}$, then Find eccentricity of conjugate hyperbola.
Q 63	Find vertex and focus of the parabola$2y^2 + 3y - 4x - 3 = 0$.

Q 64	Find radius of a circle passing through foci of $9x^2+ 16y^2 = 144$,and having centre (0,3).
	LONG QUESTIONS
Q 65	Find equation of circle pass through the points (-1,2) & (3,-2) and has its centre on the line x -2y = 0
Q 66	Prove that the points (1,0) , (2,-7), (8,1) and(9,-6) are concyclic.
Q 67	Find equation of circle drawn on the diagonal of a rectangle as diameter whose sides are x=4, x=-2, y= -3, y = 2.
Q 68	Find equation of circle which touch the y axis at the point (0,4) and make intercept of 6 on the x axis.
Q 69	Find equation of circle which pass through the points (0,2) , (3,0) and(3,2)
Q 70	Find equation of circle which pass through the centre of the circle $x^2 + y^2 + 8x + 10y - 7 = 0$ to concentric with the circle $2x^2 + 2y^2 - 8x -12y - 9 = 0$
Q 71	An equilateral triangle is inscribed in the parabola $y^2 = 4ax$, whose one vertex is at the vertex of the parabola. Find length of the side of the triangle.
Q 72	A rod of length 12 cm move with its ends always touching the coordinate axes. determine the locus of the point P on the rod, which is 3 cm from the end in contact with x axis.
Q 73	If the lines 2x – 3y = 5 and 3x-4y = 7 are the diameters of a circle of area 154 square units, then obtain the equation of the circle.
Q 74	Find the equation of the set of all points the sum of whose distances from the points (3, 0) and (9, 0) is 12

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION

MATHS CONTENT

CLASS: XI

CHAPTER : INTRODUCATION TO 3D GEOMETRY

IMPORTANT POINTS

Coordinate axes: In three dimensions the coordinate axes of a rectangular Cartesian coordinate system are three mutually perpendicular lines. The axes are called the x-axis, y-axis and z axis.

- Planes: The three planes determined by the pair of axis are the coordinate planes, called xy, yz and zx planes.
  xy – plane i. e, z=0
  yz – plane i. e, x=0
  zx – plane i. e, y=0
- Octants: The three coordinate planes divide the space into eight parts known as octants.
- Points in 3D: Any point an XY plane (x,y,o)
  Any point an YZ plane (o,y,z)
  Any point an ZX plane (x,o,z)
- Distance formula between two points:
  P(x_1, y_1, z_1) and Q (x_2, y_2, z_2)
  PQ = square root of $\{(x_2- x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2\}$

Centroid:

$$\left(\frac{x1+x2+x3,}{3} \quad \frac{y1+y2+y3,}{3} \quad \frac{z1+z2+z3}{3}\right)$$

MCQ

Q-1.The ratio in which the line joining (2,4,5) and (3,5-9) is divide by the yz Plane is

(a) 2:3 (b) 3:2 (c) 2:3 (d) 4:-3

Q-2.The ratio in which the line joining the points (a,b,c) and (-a,-c,-b) is divided by the xy –plane is

(a) a:b (b) b:c (c) c:a (d) c:b

Q-3.If P(0,1,2),Q(4,-2,1)and O(0,0,0) are three points, then angle POQ=

(a) $\pi/6$ (b) $\pi/4$ (c) $\pi/3$ (d)$\pi/2$

Q-4. If the extremities of the diagonal of a square are (1,-2,3) and (2,-3,5) then the length of the side is

(a) $\sqrt{6}$ (b) $\sqrt{3}$ (c) $\sqrt{5}$ (d) $\sqrt{7}$

Q-5.The Points (5,-4,2),(4,-3,1),(7,6,4) and (8,-7,5) are the vertices of

(a) A rectangle (b) a square
(c) a parallelogram (d) none of these

Q-6. In a three dimensional space the equation x^2-5x+6=0 represents

(a) Points (b) Planes
(c) curves (d) Pair of Straight lines

Q-7.Let (3,4,-1) and (-1,2,3) be the end points of a diameter of a sphere then, the radius of the sphere is equal to

(a) 2 (b) 3 (c) 6 (d) 7

Q-8.XOZ-Plane divides the join of (2,3,1) and (6,7,1) in the ratio

(a) 3:7 (b) 2:7 (c) -3:7 (d) -2:7

Q-9. What is the locus of a point for which y=0,z=0?

(a) x axis (b) y axis (c) z axis (d) yz-plane

Q-10.The Coordinates of the foot of the perpendicular drawn from the point P(3,4,5) on the yz-plane are

(a) (3,4,0) (b) (0,4,5) (c) (3,0,5) (d) (3,0,0)

Q-11. The Coordinates of the foot of the perpendicular from a point P(6,7,8) on x-axis are

(a) (6,0,0) (b) (0,7,0) (c) (0,0,8) (d) (0,7,8)

Q-12. The perpendicular distance of the point P(6,7,8) from xy plane is

(a) 8 (b) 7 (c) 6 (d) 10

Q-13. The length of the perpendicular drawn from the P(3,4,5) from on y axis is

(a) 10 (b) $\sqrt{34}$ (c)$\sqrt{113}$ (d)$5\sqrt{2}$

Q-14. The perpendicular distance of the point P(3,3,4) from the x-axis is

(a) $3\sqrt{2}$ (b) 5 (c) 3 (d) 4

Q-15 The length of the perpendicular drawn from the point P(a,b,c) from z axis is

(a) $\sqrt{a^2+b^2}$ (b) $\sqrt{b^2+c^2}$ (c) $\sqrt{a^2+c^2}$ (d) $\sqrt{a^2+b^2}+c2$

Q-16. A plane is parallel to the yz –plane so it is perpendicular to the

(a) x-axis (b) y-axis (c) z-axis (d) none of these

Q-17.The Point (-2,-3,-4) lies in the

(a) first octant (b) seventh octant

(c) Second octant (d) eighth octant

Q-18.If the distance between the points (a,0,1) and (0,1,2) Is $\sqrt{27}$,then the value of a is

(a) 5 (b) ±5 (c) -5 (d) none of these

Q-19. x-axis is the intersection of the Planes

(a) xy and xz (b)yz and zx

(c) xy and yz (d) none of these

Q-20. Equation of y-axis is considered as

(a) x=0,y=0 (b) y=0,z=0

(c) z=0,x=0 (d) none of these

Case based/Source Based Questions

Q-21. A three dimensional cartesian coordinate system is formed by a point called the origin (denoted by 0) and a basis& consisting of three mutually perpendicular vectors. These vectors define the three coordinate axes x,y and z axes. They are also known as abscissa, ordinate and applicate axis, respectively. The coordinate of any point in the space is determined by known as coordinate planes divides the space into OCTANTS.

1. In which octant does the point (3,-2,-5) lies?
   (a) II (b) VI (c)VII (d) IV

2.If a point lies on Z axis then the coordinates of the point are
   (a) (x,y,z) (b)(x,y,0) (c)(0,y,0) (d)(0,0,z)

3.The locus of a point for which x=0 is
   (a) xy plane (b) yz plane (c) zx plane (d) none of these

4. A Plane is parallel to yz plane so it perpendicular to
   (a) x-axis (b) y-axis (c) z-axis (d) none of these

Q-22. The coordinates of a point P in the space are (a,b,c) based on the above information, answer the following questions.

1. Distance of point P from xy plane is
   (a) $|a|$ (b)$|b|$ (c)$|c|$ (d) $\sqrt{a^2+b^2}$

2. The coordinates of foot of perpendicular drawn from point P to yz-plane are

(a) (0,a,b) (b) (0,a,c) (c) (0,b,a) (d) (0,a,b)

3. The Coordinates of foot of perpendicular drawn from point P to z axis are

(a)$(0,0,\sqrt{b^2+c^2})$ (b) (0,0,c)

(c)$(0,0,\sqrt{a^2+b^2})$ (d) $(0,0,\sqrt{c^2+a^2})$

4. Distance between point P and its image in zx-Plane is

(a) $2|b|$ (b)$2\ |a|$ (c)$2|c|$ (d) $2|a+c|$

Very short Answer Questions.

Q-23. Write the distance of the point P(2,3,5) from the xy-Plane

Q-24. Write the distance of the point P(3,4,5) from z-axis

Q-25. If the distance between the points P(a,2,1) and Q(1,-1-L) is 5 units, find the value of a.

Q-26.The Coordinates of the mid points of sides AB,BC and CA of ABC are D(1,2,-3), E(3,0,1) and F(-1,1,-4) respectively. Write the coordinates of its centroid.

Q-27.Write the cordinates of third vertex of a triangle having centroid at the origin and two vertices are (3,-5,7) and (3,0,1)

Q-28. What is the locus of a point (x,y,z) for y=0,z=0 ?

Q-29. Find the point on y-axis which is at a distance of $\sqrt{10}$ units from the point(1,2,3).

Q-30.If the origin is the centroid of a triangle ABC having vertices A(a,1,3),B(-2,b,-5) and C(4,7,c). Find the values of a,b,c.

Q-31. Find the distance of the point (a,b,c) from zx-plane.

Q-32. If Land M are the feet of the perpendiculars from P(3,4,5) on xy and yz-planes then find LM.

Q-33. Find the value of β,so that distance between the points (7,1,-3)and (4,5, β) is 13.

Q-34. Are the points A(3,6,9),B(10,20,30) and C(25,-41,5) vertices of a right angled triangle? Justify your answer.

Q-35.Find the mid point of (1,4,6) and (5,8,10).

Q-36. Find the distance between the points A(3,4,5) and origin(0,0,0)

Q-37. A Point is on x-axis what are its y coordinate and z-coordinate?

Q-38. A Point is in the xz plane what can you say about its y-coordinate?

Q-39. Name the octant in which Point (7,-1,5) lie.

Q-40.Find the coordinates of a point on the y-axis which is at a distance of 5 $\sqrt{2}$ from the point P(3,-2,5)

Q-41.Write the Plane containing the x-axis and y-axis.

Q-42. Find the distance of the point P(3,4,5) from yz Plane.

Short Answer type Questions

Q-43. Show that the points (a,b,c),(b,c,a) and (c,a,b) are vertices of an equilateral triangle.

Q-44. Using distance formula prove that point A(4,-3,-1),B(5,-7,6) And C(3,1,-8) are collinear.

Q-45. Find the point on y-axis which is equidistant from the points (3,1,2) and (5,5,2)

Q-46. Find the point on z-axis which are at a distance $\sqrt{21}$ from the point(1,2,3)

Q-47.Show that the points (0,7,10),(-1,6,6) and (-4,9,6) are the vertices of an isosceles right angled triangle.

Q-48.Three vertices of a parallelogram ABCD are A(3,-1,2),B(1,2,-4) and C(-1,1,2).Find the coordinates of the fourth vertex.

Q-49. Find the equation of the set of the points p such that its distance from the points A(3,4,-5) and B(-2,1,4) are equal.

Q-50.Using section formula, prove that the three points (-4,6,10),(2,4,6) and (14,0,-2) are collinear.

Q-51. Find the coordinates of the point which divides the line segment joining the point (1,-2,3)and (3,4,-5) in the ratio 2:3 internally.

Q-52. Given that P(3,2,-4),Q(5,4,-6) and R(9,8,-10) are collinear. Find the ratio in which Q divides PR.

Q-53. Find the ratio in which yz-Plane divides the line segment formed by joining the points (-2,4,7)and (3,-5,8)

Q-54. Find the coordinates of the points which trisect the line segment joining the point P(4,2,-6) and Q(10,-16,6).

Q-55.Verify that (-1,2,1),(1,-2,5),(4,-7,8) and (2,-3,4)are the vertices of a parallelogram.

Q-56. Given the points A(1,2,-3),B(3,-2,1),find the locus of P if $AP^2-BP^2=18$.

Q-57. Find the locus of a point which is equidistant from the points(3,2,1) and (1,2,3). What surface does it represent?

Q-58. Find the point on the Z-axis which is equidistant from the points(1,5,7) and (5,1,-4).

Q-59. Show that the points (0,7,-10),(1,6,-6)and (4,9,-6) are the vertices of an Isosceles Triangle.

Q-60.Find the image of

(1)(-2,3,4) in the yz-Plane

(2)(-5,4,-3) in the xz-Plane

(3) (5,2,-7) in the xy-Plane

Q-61.Name the octants in which following Points lie:

(1) (5,2,3) (2) (-5,4,3) (3) (4,-3,5) (4) (7,4,-3)

Q-62.Show that the Points A(3,3,3),B(0,6,3),C(1,7,7) and D(4,4,7) are vertices of a square.

Long Answer Questions

Q-63.Find the Ratio in which the joining the point A(2,1,5) and B(3,4,3)is divided by the Plane 2x+2y-2z=1 also find the coordinates of the point of division.

Q-64.The mid Points of the sides of a triangle are(1,5,-1),(0,4,-2) and (2,3,4).Find its vertices.

Q-65.Find the Length of the medians of the triangle with vertices A(0,0,6),B(0,4,0) and C(6,0,0).

Q-66.Write the coordinates of the Point P which is five –sixth of the way from A(-2,0,6)to B(10,-6,-12).

Q-67.Find the Equation of the set of point's p, the sum of whose distances from A(4,0,0)and B(-4,0,0)is equal to 10.

Q-68. Show that the three Points A(2,3,4),B(-1,2,-3)and C(-4,1,-10) are collinear and find the ratio in which C divides AB.

Section Formula not in syllabus

Answer key

MCQ

1-c 2-d 3-d 4-b 5-a 6-b 7-c 8-c 9-a 10-b 11-a 12-a 13-b 14- b15-a 16-a 17-b 18-b 19-a 20-c

Case study

Q-21. 1-c 2-d 3-b 4-a

Q-22. 1-c 2-a 3-b 4-a

Very Short Answer Questions

23. 5 24. 5 25.5,-3 26.(1,1,-2)
27.(-6,5,-8) 28.x axis 29.(0,2,0) 30.a=-2,b=-8,c=2 31.b 32. $\sqrt{34}$ 33.-15 or 9
34. 35.(3,6,8) 36.$\sqrt{50}$ 37.(0,0)
38.0 and (0,2,0) 39.OXY'Z or IV 40.(0,-6,0) 41.xy-plane 42. 3 units

Short Answer Questions

43. Proof 44.Proof 45.(0,5,0) 46.(0,0,7)(0,0,-1) 47.Proof 48. (1,2,-8) 49. 10x+6y-18z-29=0
50.Proof 51. (9/5, 2/5,-1/5)
52.1:2 53.2:3 54. (6,-4,-2) (8,-10,2)
55.Proof
56.2x-4y+4z-9=0 57.x-z=0 58.(0,0,3/2)
59. Proof 60.(i) (2,3,4)
(ii) (-5,-4,-3) (iii) (5,2,7)
61. (1) I (2)II (3)III (4) V
62.Proof

Long Anser Questions

63. 5:7 ; (29/12,9/4,25/6) 64.A(1,2,3) ; B(3,4,5) and C(-1,6,-7) 65. 7, $\sqrt{34}$,7
66.(8,-5,-9) 67.$9x^2+25y^2+25z^2-225=0$ 68. C divides AB in the ratio 2:1 Externally

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION

MATHS CONTENT

CLASS: XI

CHAPTER : LIMITS AND DERIVATIVES

KEY POINTS :

Limit

Let y = f(x) be a function of x. If at x = a, f(x) takes indeterminate form, then we consider the values of the function which is very near to a. If these value tend to a definite unique number as x tends to a, then the unique number so obtained is called the limit of f(x) at x = a and we write it as $\lim_{x\to a} f(x)$.

Left Hand and Right-Hand Limits

If values of the function at the point which are very near to a on the left tends to a definite unique number as x tends to a, then the unique number so obtained is called the left-hand limit of f(x) at x = a, we write it as

$$f(a-0)=\lim_{x\to a^-} f(x)=\lim_{h\to 0} f(a-h)$$

Similarly, right hand limit is

$$f(a+0)=\lim_{x\to a^+} f(x)=\lim_{h\to 0} f(a+h)$$

Existence of Limit

$\lim_{x\to a} f(x)$ exists, if

(i) $\lim_{x\to a^-} f(x)$ and $\lim_{x\to a^+} f(x)$ both exists

(ii) $\lim_{x\to a^-} f(x)=\lim_{x\to a^+} f(x)$

Some Properties of Limits

Let f and g be two functions such that both $\lim_{x\to a} f(x)$and $\lim_{x\to a} g(x)$ exists, then

(i) $\lim_{x\to a}[f(x)\pm g(x)]=\lim_{x\to a} f(x)\pm\lim_{x\to a} g(x)$

(ii) $\lim_{x\to a} kf(x)=k\lim_{x\to a} f(x)$

(iii) $\lim_{x\to a} f(x)\cdot g(x)=\lim_{x\to a} f(x)\times\lim_{x\to a} g(x)$

(iv) $\lim_{x\to a}\frac{f(x)}{g(x)}=\frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$, where $g(x)\neq 0$

Some Standard Limits

(i) $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$

(ii) $\lim_{x \to 0} \frac{\sin x}{x} = 1$

(iii) $\lim_{x \to 0} \frac{\tan x}{x} = 1$

(iv) $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$

(v) $\lim_{x \to 0} \frac{e^x - 1}{x} = 1$

(vi) $\lim_{x \to 0} \frac{\log (1 + x)}{x} = 1$

Derivatives

Suppose f is a real-valued function, then

$f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$ is called the derivative of f at x

iff $\lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$ exists finitely.

Fundamental Derivative Rules of Function

Let f and g be two functions such that their derivatives are defined in a common domain, then

(i) $\frac{d}{dx}[f(x) + g(x)] = \frac{d}{dx}[f(x)] + \frac{d}{dx}[g(x)]$

(ii) $\frac{d}{dx}[(f(x) - g(x)] = \frac{d}{dx}[f(x)] - \frac{d}{dx}[g(x)]$

(iii) $\frac{d}{dx}[f(x) . g(x)] = \left[\frac{d}{dx} f(x)\right] . g(x) + f(x) . \left[\frac{d}{dx} g(x)\right]$

(iv) $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{\left[\frac{d}{dx} f(x)\right] \cdot g(x) - f(x) . \left[\frac{d}{dx} g(x)\right]}{[g(x)]^2}$

Some Standard Derivatives

(i) $\frac{d}{dx}(x^n) = nx^{n-1}$

(ii) $\frac{d}{dx}(\sin x) = \cos x$

(iii) $\frac{d}{dx}(\cos x) = -\sin x$

(iv) $\frac{d}{dx}(\tan x) = \sec^2 x$

(v) $\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$

(vi) $\frac{d}{dx}(\sec x) = \sec x \tan x$

(vii) $\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$

(viii) $\frac{d}{dx}(a^x) = a^x \log_e a$

(ix) $\frac{d}{dx}(e^x) = e^x$

(x) $\frac{d}{dx}(\log_e x) = \frac{1}{x}$

	MCQs
Q1	$\lim_{x\to\pi} \frac{\sin x}{x-\pi}$ is equal to: (a) 1 (b) 2 (c) -1 (d) -2
Q2	$\lim_{x\to 0} \frac{x\cos x}{1-\cos x}$ is equal to: (a) 2 (b) $\frac{2}{3}$ (c) $-\frac{3}{2}$ (d) 1
Q3	$\lim_{x\to 0} \frac{(1+x)^n - 1}{x}$ is equal to: (a) n (b) 1 (c) -n (d) 0
Q4	$\lim_{x\to 1} \frac{x^m - 1}{x^n - 1}$ is equal to: (a) 1 (b) $\frac{m}{n}$ (c) $-\frac{m}{n}$ (d) $\frac{m^2}{n^2}$
Q5	$\lim_{\theta\to 0} \frac{1-\cos 4\theta}{1-\cos 6\theta}$ is equal to: (a) $\frac{4}{9}$ (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) -1

Q6	$\lim_{x\to 0}$ ~~$\frac{\cos ecx - \cot x}{x}$~~ is equal to: (a) $-\frac{1}{2}$ (b) 1 (c) $\frac{1}{2}$ (d) 1
Q7	$\lim_{x\to 0}$ ~~$\frac{\sin x}{\sqrt{x+1}-\sqrt{1-x}}$~~ is equal to: (a) 2 (b) 0 (c) 1 (d) -1
Q8	$\lim_{x\to \frac{\pi}{4}}$ ~~$\frac{\cos x - \sin x}{\tan x - 1}$~~ is equal to: (a) 3 (b) 1 (c) 0 (d) 2
Q9	$\lim_{x\to 1}$ ~~$\frac{(\sqrt{x}-1)(2x-3)}{2x^2+x-3}$~~ is equal to: (a) $\frac{1}{10}$ (b) $-\frac{1}{10}$ (c) 1 (d) None of these
Q10	If f(x) = $\begin{cases} \frac{\sin[x]}{[x]} & , \quad [x] \neq 0 \\ 0 & , \quad [x] = 0 \end{cases}$,where [ ] denotes the greatest integer function , then $\lim_{x\to 0} f(x)$ is equal to: (a) 1 (b) 0 (c) -1 (d) Doesn't exist
Q11	Let f(x) = x-[x] , x∈ R then $f'\left(\frac{1}{2}\right)$ is equal to: (a) $\frac{3}{2}$ (b) 1 (c) 0 (d) -1
Q12	If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, then $\frac{dy}{dx}$ at x=1is equal to: (a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) 0
Q13	If $f(x) = \frac{2\sqrt{x}}{4}$ then f'(1) is equal to: (a) $\frac{5}{4}$ (b) $\frac{5}{5}$ c) 1 (d) 0
Q14	If $y = \frac{1+\frac{1}{x^2}}{1-\frac{1}{x^2}}$, then $\frac{dy}{dx}$ is equal to: (a) $\frac{-4x}{(x^2-1)^2}$ (b) $\frac{-4x}{x^2-1}$ (c) $\frac{1-x^2}{4x}$ (d) $\frac{4x}{x^2-1}$
Q15	If $y = \frac{\sin x+\cos x}{\sin x-\cos x}$, then $\frac{dy}{dx}$ at x=0 is equal to: (a) -2 (b) 0 (c) $\lim_{x\to\pi} f(x)$ (d) Does not exist
Q16	If $f(x) = 1 + x + \frac{x^2}{2} + \cdots + \frac{x^{100}}{100}$, then f'(1) is equal to: (a) $\frac{1}{100}$ (b) 100 (c) 0 (d) Does not exist
Q17	If $f(x) = \frac{x^n - a^n}{x-a}$ for some constant a , then f'(a) is equal to: (a) 1 (b) 0 (c) $\frac{1}{2}$ (d) Does not exist

Q18	If $f(x) = x^{100} + x^{99} + \cdots + x + 1$, then f'(1) is equal to : (a) 5050 (b) 5049 (c) 5051 (d) 50051
Q19	If $y = \frac{\sin(x+9)}{\cos x}$, then $\frac{dy}{dx}$ at x=0 is equal to: (a) Cos9 (b) sin9 (c) 0 (d) 1
Q20	If $f(x) = 1 - x + x^2 - x^3 + \cdots + x^{99} + x^{100}$, then f'(1) is equal to : (a) 150 (b) -50 (c) -150 (d) 50
	CASE BASED/SOURCE BASED / PASSAGE BASED QUESTIONS
Q21	Indeterminate forms of limits. On direct evaluation, if a limit takes the form $\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty, \ldots$, we use standard results for evaluating the limits. The below figure shows a few indeterminate forms. $\frac{0}{0}, \infty^0, \frac{\infty}{\infty}, 0^0, 1^0, 0 \times \infty, \infty - \infty$ Based on the above data, answer any four of the following questions (i) $\lim_{x\to 1} \frac{x^6-64}{x-2} =$ (a) 0 (b) 80 (c) 192 (d) ∞ (ii) $\lim_{x\to 1} \frac{x^{15}-1}{x^{10}-1} =$ (b) 0 (b) $\frac{3}{2}$ (c) ∞ (d) 15 (iii) $\lim_{x\to 0} \frac{\sqrt{1+3x} - \sqrt{1-3x}}{x} =$ (c) 0 (b)1 (c) 3 (d) 6 (iv) $\lim_{x\to 0} \frac{8^x - 2^x}{x} =$ (d) 0 (b) log2 (c) log4 (d) log8 (v) $\lim_{x\to 0} \frac{\cos 5x - \cos x}{x^2} =$ (e) 0 (b)-12 (c) 1 (d) 12
Q22	The derivative of y with respect to x is the change in y with respect to a change in x. The derivative of f(x) at x_0 is given by $f'(x_0) = \lim_{\Delta x\to 0} \frac{\Delta y}{\Delta x} = \frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x}$ Based on the above information , answer any four of the following questions (i) Derivative of sinx with respect to x is : (a) sinx (b) cosx (c) –sinx (d) –cosx (ii) Derivative of cosx with respect to x is :

(a) sinx (b) cosx (c) –sinx (d) –cosx

(iii) Derivative of tanx with respect to x is :

(a) sec^2x (b)$-sec^2x$ (c) $cosec^2x$ (d) $-cosec^2x$

(iv) If $f(x) = x^{100} - x^{80}$, $f'(x)$ is…….

(a) 0 (b) 50 (c) 51 (d) 101

(v) $y = \frac{x}{tanx}$, $then\ \frac{dy}{dx} =$……..

(a) cos^2x (b) sec^2x (c) $\frac{tanx-secx}{tan^2x}$ (d) $\frac{tanx-xsec^2x}{tan^2x}$

Q23

Let $f: R \to [0, \infty)$ be a function defined as $f(x) = |x|$ and $g(x) = f(x+1) + f(x-1), \forall\ x \in R$.

Based on the above information, answer the following questions:

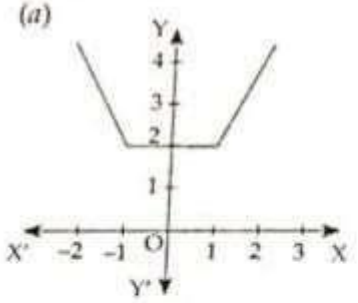
(i) The value of g(x) is

(a) $g(x) = \begin{cases} -2x & , \quad x < -1 \\ 2 & , \quad -1 \le x < 1 \\ 2x & , \quad x \ge 1 \end{cases}$ (b) $g(x) = \begin{cases} -2x+1 & , \quad x < -1 \\ -2x & , \quad -1 \le x < 1 \\ 2x-1 & , \quad x \ge 1 \end{cases}$

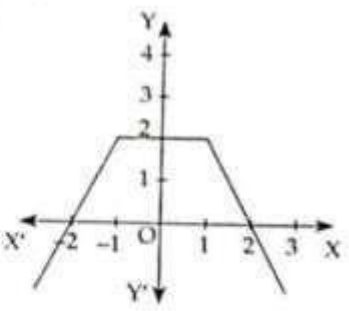
(c) $g(x) = \begin{cases} 2x & , \quad x < -1 \\ -2 & , \quad -1 \le x < 1 \\ -2x & , \quad x \ge 1 \end{cases}$ (d) $g(x) = \begin{cases} 2x-1 & , \quad x < -1 \\ -2x & , \quad -1 \le x < 1 \\ -2x+1 & , \quad x \ge 1 \end{cases}$

(ii) The graph of g(x) is

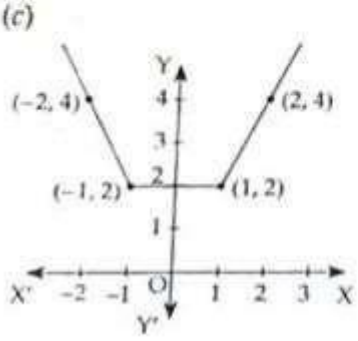
(a)



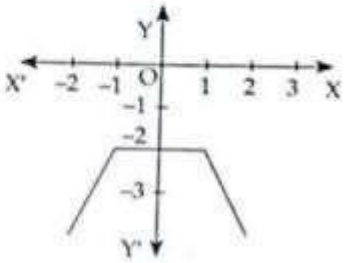
(b)



(c)



(d)



(iii) If $\lim_{x \to -1} g(x) = a$, then the value of a is

(a) 0 (b) -2 (c) 2 (d) does not exist

(iv) The value of $\lim_{x \to 1^+} g(x)$ is

(a) 0 (b) 2 (c) -2 (d) does not exist

(v) The value of $\lim_{x \to 1^-} g(x)$ is

(a) 0 (b) 2 (c) -2 (d) does not exist

Q24 Let f(x) be a real function defined as

$$f(x) = \begin{cases} \dfrac{\log(1+ax) - \log(1-bx)}{x}, & x < 0 \\ 5, & x = 0 \\ \dfrac{\sqrt{1+bx} - 1}{x}, & x > 0 \end{cases}$$

Based on the above information, answer the following questions:

(i) $\lim_{x\to 0^-} f(x)$ is

(a) a+b (b) a-b (c) b-a (d) –a-b

(ii) $\lim_{x\to 0^+} f(x)$ is

(a) b (b) $\frac{b}{2}$ (c) $\frac{b}{3}$ (d) $\frac{b}{4}$

(iii) $\lim_{x\to 0^-} f(x) = \lim_{x\to 0^+} f(x)$, then a relation between a and b is

(a) a+2b=0 (b) 2a-b=0 (c) 2a+b=0 (d) 3a+2b=0

(iv) The value of b , if $\lim_{x\to 0^+} f(x) = f(0)$ is

(a) 5 (b) 15 (c) 20 (d) 10

(v) The values of a and b if $\lim_{x\to 0^-} f(x) = f(0) = \lim_{x\to 0^+} f(x)$ are

(a) -5,5 (b) -5,10 (c) 5,10 (d) 10,15

Q25 If $\lim_{x\to c} f(x)g(x)$ is of the form 1^∞ , then

$$\lim_{x\to c} f(x)g(x) = \lim_{e^{x\to c}} g(x)[f(x) - 1]$$

For example:

$$\lim_{x\to 0}(1+ax)^{\frac{1}{x}}$$

$= \lim_{e^{x\to 0}} \frac{1}{x}(1 + ax - 1)$

$= \lim_{e^{x\to 0}} \frac{1}{x}.ax = \lim_{e^{x\to 0}} a = e^a$

Based on the above information , answer the following questions:

(i) The value of $\lim_{x\to\infty} \left(\frac{x-3}{x+2}\right)^x$ is

(a) e (b) e^{-1} (c) e^{-5} (d) e^5

(ii) The value of $\lim_{x\to 0} \{tan(\frac{\pi}{4} + x)\}^{\frac{1}{x}}$ is

(a) e^2 (b) e^3 (c) e^{-2} (d) 1

(iii) The value of $\lim_{x\to \frac{\pi}{2}} (sinx)^{tan^2 x}$ is

(a) e^2 (b) $e^{\frac{1}{2}}$ (c) e^1 (d) $e^{-\frac{1}{2}}$

	(iv) The value of $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x}{3}\right)^{\frac{1}{x}}$ is (a) $(abc)^{\frac{1}{3}}$ (b) $\frac{1}{3}(abc)$ (c) $log(abc)^{\frac{1}{3}}$ (d) 1 (v) The value of $\lim_{x\to 0}\left(\frac{1+tanx}{1+sinx}\right)^{cosecx}$ is (a) e (b) $\frac{1}{e}$ (c) 1 (d) 0
	ASSERTION REASONING QUESTIONS
Q26	Statement: $f(x) = sin^2x - \frac{1}{2}cos2x + cot\alpha$, $then\ f'(x) = 0$ Reason: Derivative of a constant function is always zero. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is NOT the correct explanation of A. (c) A is true but R is false (d) A is false but R is true (e) Both A and R are false
Q27	Statement: The derivative of $y = 2x - \frac{3}{4}$ is 2. Reason: The derivative of y=cx is c. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is NOT the correct explanation of A. (c) A is true but R is false (d) A is false but R is true (e) Both A and R are false
Q28	Statement: The derivative of $(x) = x^3$ is x^2 . Reason: The derivative of $(x) = x^n$ is nx^{n-1}. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is NOT the correct explanation of A. (c) A is true but R is false (d) A is false but R is true (e) Both A and R are false
Q29	Statement: $\lim_{x\to 0}\frac{sinax}{bx}$ is $equal\ to\ \frac{a}{b}$ Reason: $\lim_{x\to 0}\frac{\frac{sinx}{x}}{} = 1$ (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is NOT the correct explanation of A. (c) A is true but R is false (d) A is false but R is true (e) Both A and R are false
Q30	Statement: $\lim_{x\to 0}\frac{cos2x-1}{cosx-1}$ is $equal\ to\ 4$ Reason: $\lim_{x\to 0}\frac{\frac{tanx}{x}}{} = 1$ (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is NOT the correct explanation of A. (c) A is true but R is false (d) A is false but R is true (e) Both A and R are false

	VERY SHORT ANSWER QUESTIONS
Q31	Find $\lim_{x\to a} \frac{\sqrt{x}+\sqrt{a}}{x+a}$
Q32	Find the value of $\lim_{x\to 0} \frac{e^{-1}}{x}$
Q33	Evaluate $\lim_{x\to 0} \frac{\sin x}{x}$
Q34	Evaluate $\lim_{x\to 3} \frac{\sqrt{2x+3}}{x+3}$
Q35	Evaluate $\lim_{x\to 1} \frac{\sqrt{1+x}-\sqrt{1-x}}{1+x}$
Q36	Evaluate $\lim_{n\to\infty} \frac{1+2+3+\cdots+n}{n^2}$
Q37	Find n, if $\lim_{x\to 2} \frac{x^{-2}}{x-2} = 80, n \in N$
Q38	Find $\lim_{x\to 0} \frac{e^{-x-1}}{x}$
Q39	Evaluate $\lim_{x\to 5} \frac{e^x-e^5}{x-5}$
Q40	Evaluate $\lim_{x\to 0} \frac{e^{-e^{-2}}}{x^2}$
Q41	Find the derivative of the function $y = 1 + x + x^2 + \cdots + x^{50}$ at x=1
Q42	Find the derivative of $2x^4 + x$
Q43	Find f'(x) , if $f(x) = (x-2)^2(2x-3)$
Q44	Find the derivative of 5secx+4cosx
Q45	Find the derivative of cosecx . cotx
Q46	Find the derivative of (secx-1)(secx+1)
Q47	Find the derivative of sin(x+a)
Q48	Find the derivative of $\frac{1}{x^{11}}$
Q49	Find the derivative of $(x^2+1)cosx$
Q50	Find the derivative of $cot^3 x$
	SHORT ANSWER QUESTIONS
Q51	Evaluate $\lim_{x\to 1} \frac{x^{15}-1}{x^{10}-1}$
Q52	Evaluate $\lim_{x\to 0} \frac{sinax+bx}{ax+sinbx}$, $a, b, a+b$ G 0
Q53	Find $\lim_{z\to 1} \frac{z^{\frac{1}{3}}-1}{z^{\frac{1}{6}}-1}$

Q54	Evaluate the left hand and right hand limits of the following functions at x=2. Does $\lim_{x\to 2} f(x)$ exists? $f(x) = \begin{cases} 2x+3 & , \text{ if } x \le 2 \\ x+5 & , \text{ if } x > 2 \end{cases}$
Q55	Show that $\lim_{x\to 4} \frac{\sqrt{x}-2}{x-4}$ does not exist.
Q56	Evaluate $\lim_{x\to 1} \frac{(2x^2+3)(\sqrt{x}-1)}{2x^2+x-3}$
Q57	Evaluate $\lim_{x\to 1} \frac{x^n-1}{x^n-1}$
Q58	Evaluate $\lim_{x\to 0} \frac{tan2x-sin2x}{x^3}$
Q59	Evaluate $\lim_{x\to \frac{\pi}{6}} \frac{\sqrt{3}\,sinx-cosx}{x-\frac{\pi}{6}}$
Q60	Evaluate $\lim_{x\to 0} \frac{log(6+x)-log(6-x)}{x}$
Q61	Find the derivative of cosx by first principle.
Q62	Find the derivative of sin2x by first principle.
Q63	Find the derivative of f(x) = x cosx.
Q64	Differentiate $3^x + x^3 + 4x - 5$ with respect to x
Q65	Differentiate $e^x sinx + x^n$ with respect to x
Q66	Differentiate $\frac{x}{sinx}$ with respect to x.
Q67	Differentiate $\frac{x^4+x^3+x^2+1}{x}$ with respect to x.
Q68	Differentiate $\left(x+\frac{1}{x}\right)^3$ with respect to x.
Q69	Differentiate (3x+5)(1+tanx) with respect to x.
Q70	Differentiate $\frac{x^2 cos\frac{\pi}{4}}{sinx}$ with respect to x.
	LONG ANSWER QUESTIONS
Q71	Find $\lim_{x\to 1} f(x)$, where $f(x) = \begin{cases} x^2-1 & , \quad x \le 1 \\ -x^2-1 & , \quad x > 1 \end{cases}$
Q72	Find the value of 'k' if $\lim_{x\to 1} \frac{x^4-1}{x-1} = \lim_{x\to k} \frac{x^3-k^3}{x^2-k^2}$
Q73	Find the values of 'a' and 'b' if $\lim_{x\to 2} f(x)$ *and* $\lim_{x\to 4} f(x)$ exists, where $f(x) = \begin{cases} x^2+ax+b & , \quad 0 \le x < 2 \\ 3x+2 & , \quad 2 \le x \le 4 \\ 2ax+5b & , \quad 4 < x \le 8 \end{cases}$

Q74	Find $\lim_{x\to 0}\left(\frac{\sqrt{1+x^2}-\sqrt{1+x}}{\sqrt{1+x^3}-\sqrt{1+x}}\right)$
Q75	Evaluate $\lim_{x\to 0}\frac{sec4x-sec2x}{sec3x-secx}$
Q76	Find the derivative of the following function. $f(x)=\frac{sinx+cosx}{sinx-cosx}$
Q77	Differentiate $f(x)=x^5e^x+x^3logx-2^x$ with respect to x.
Q78	If $y=\sqrt{x}+\frac{1}{\sqrt{x}}$, $prove\ that\ 2x.\frac{dy}{dx}+y=2\sqrt{x}$
Q79	Differentiate $\sqrt{\frac{1-cos2x}{1+cos2x}}$ with respect to x
Q80	If $y=\sqrt{\frac{x}{a}}+\sqrt{\frac{a}{x}}$ prove that $(2xy)\frac{dy}{dx}=\frac{x}{a}-\frac{a}{x}$

ANSWER KEY AND SOLUTIONS

MCQs

1(c)	2(a)	3(a)	4(b)	5(a)	6(c)	7(c)	8(d)	9(b)	10(d)
11(b)	12(d)	13(a)	14(a)	15(a)	16(b)	17(d)	18(a)	19(a)	20(d)

CASE BASED QUESTIONS

Q21	(i)(c)	(ii)(b)	(iii)(c)	(iv)(c)	(v)(b)
Q22	(i)(b)	(ii)(c)	(iii)(a)	(iv)(b)	(v)(d)
Q23	(i)(a)	(ii)(a)	(iii)(c)	(iv)(b)	(v)(b)
Q24	(i)(a)	(ii)(b)	(iii)(c)	(iv)(d)	(v)(b)
Q25	(i)(c)	(ii)(a)	(iii)(d)	(iv)(a)	(v)(c)

ASSERTION REASONING QUESTIONS

Q26	(b)	Both A and R are true but R is NOT the correct explanation of A.
Q27	(a)	Both A and R are true and R is the correct explanation of A
Q28	(d)	A is false but R is true
Q29	(a)	Both A and R are true and R is the correct explanation of A
Q30	(b)	Both A and R are true but R is NOT the correct explanation of A

VERY SHORT ANSWER QUESTIONS

Q31	$\frac{1}{\sqrt{a}}$	Q32	1	Q33	n	Q34	$\frac{1}{2}$	Q35	$\frac{1}{\sqrt{2}}$

Q36	$\frac{1}{2}$	Q37	5	Q38	0	Q39	e^5	Q40	1
Q41	1275				Q42	$8x^3+1$			
Q43	$6x^2-22x+20$				Q44	5secx tanx-4sinx			
Q45	$-cosecx(cot^2x+cosec^2x)$				Q46	$2tanx.sec^2x$			
Q47	cos(x+a)				Q48	$-\frac{11}{x^{12}}$			
Q49	$2xcosx-x^2sinx-sinx$				Q50	$-3cot^2x.cosec^2x$			

SHORT ANSWER QUESTIONS

Q51

$$\lim_{x\to1}\frac{x^{15}-1}{x^{10}-1}$$
$$=\lim_{x\to1}\frac{(x^5)^3-1^3}{(x^5)^2-1^2}$$
$$=\lim_{x\to1}\frac{(x^5-1)(x^{10}+x^5+1)}{(x^5-1)(x^5+1)} \quad \{\therefore a^3-b^3=(a-b)(a^2+b^2+ab)\}$$
$$=\lim_{x\to1}\frac{(x^{10}+x^5+1)}{(x^5+1)}$$
$$=\lim_{x\to1}\frac{(1^{10}+1^5+1)}{(1^5+1)}$$
$$=\frac{3}{2}$$

Q52

$$\lim_{x\to0}\frac{sinax+bx}{ax+sinbx}$$
$$\lim_{x\to0}\frac{\frac{sinax}{ax}\cdot ax+bx}{ax+\frac{sinbx}{bx}\cdot bx}$$
$$\lim_{x\to0}\frac{\frac{sinax}{ax}\cdot a+b}{a+\frac{sinbx}{bx}\cdot b}$$
$$=\frac{1\cdot a+b}{a+1\cdot b}$$
$$=\frac{a+b}{a+b}$$
$$=1$$

Q53

$$\lim_{z\to1}\frac{z^{\frac{1}{3}}-1}{z^{\frac{1}{6}}-1}=\lim_{z\to1}\left(\frac{z^{\frac{1}{3}}-1}{z-1}\div\frac{z^{\frac{1}{6}}-1}{z-1}\right)$$

	$= \lim_{z\to 1}\left(\frac{z^{\frac{1}{3}}-1}{z-1}\right) \div \lim_{zt\to 1}\left(\frac{z^{\frac{1}{6}}-1}{z-1}\right)$ $= \frac{1}{3}\cdot 1^{\frac{1}{3}-1} \div \frac{1}{6}\cdot 1^{\frac{1}{6}-1}$ $= \frac{1}{3}\times 6$ $= 2$
Q54	L.H.L $= \lim_{x\to 2^-} f(x) = \lim_{x\to 2^-}(2x+3) = 2+5 = 7$ and R.H.L $= \lim_{x\to 2^+} f(x) = \lim_{x\to 2^+}(x+5) = 2+5 = 7$ $since \lim_{x\to 2^-} f(x) = \lim_{x\to 2^+} f(x)$ $\therefore \lim_{x\to 2} f(x)\ exists\ and\ is\ equal\ to\ 7$
Q55	$\lim_{x\to 4}\frac{\lvert x-4\rvert}{x-4}$ $\lim_{x\to 4}\begin{cases}\frac{(x-4)}{x-4}, & x\geq 4\\ \frac{-(x-4)}{x-4}, & x<4\end{cases}$ L.H.L $= \lim_{x\to 4^-} f(x) = \lim_{x\to 4^-}\left(\frac{(x-4)}{x-4}\right) = 1$ and L.H.L $= \lim_{x\to 4^+} f(x) = \lim_{x\to 4^+}\left(\frac{-(x-4)}{x-4}\right) = -1$ $since \lim_{x\to 4^-} f(x)\ \mathrm{G}\ \lim_{x\to 4^+} f(x)$ $\therefore \lim_{x\to 4} f(x)\ does\ not\ exist$
Q56	$\lim_{x\to 1}\frac{(2x-3)(\sqrt{x}-1)}{2x^2+x-3}$ $= \lim_{x\to 1}\frac{(2x-3)(\sqrt{x}-1)}{(2x+3)(x-1)}$ $= \lim_{x\to 1}\frac{(2x-3)(\sqrt{x}-1)(\sqrt{x}+1)}{(2x+3)(x-1)(\sqrt{x}+1)}$ $= \lim_{x\to 1}\frac{(2x-3)(x-1)}{(2x+3)(x-1)(\sqrt{x}+1)}$ $= \lim_{x\to 1}\frac{(2x-3)}{(2x+3)(\sqrt{x}+1)}$ $= \frac{-1}{5.2}$ $= -\frac{1}{10}$

Q57	$\lim_{x\to 1}\frac{x^m-1}{x^n-1}=\lim_{x\to 1}\frac{x^m-1}{x-1}\times\frac{x-1}{x^n-1}$ $=\frac{m\cdot 1^{m-1}}{n\cdot 1^{n-1}}\left[\therefore \lim_{x\to a}\frac{x^n-a^n}{x-a}=na^{n-1}\right]$ $=\frac{m\cdot 1}{n\cdot 1}$ $=\frac{m}{n}$
Q58	$\lim_{x\to 0}\frac{tan2x-sin2x}{x^3}$ $=\lim_{x\to 0}\frac{\frac{sin2x}{cos2x}-sin2x}{x^3}$ $=\lim_{x\to 0}\frac{sin2x-sin2x\cdot cos2x}{x^3cos2x}$ $=\lim_{x\to 0}\frac{sin2x-sin2x\cdot cos2x}{x^3cos2x}$ $=\lim_{x\to 0}\frac{tan2x}{x}\cdot\lim_{x\to 0}\frac{2sin^2x}{x^2}$ $=2\lim_{x\to 0}\frac{tan2x}{2x}\cdots\cdots\cdots 2\lim_{x\to 0}\left(\frac{sinx}{x}\right)^2$ $=2\cdot 1\times 2\cdot(1)^2=4$
Q59	$\lim_{x\to\frac{\pi}{6}}\frac{\sqrt{3}\,sinx-cosx}{x-\frac{\pi}{6}}=\lim_{x\to\frac{\pi}{6}}\frac{2\left[\frac{\sqrt{3}}{2}sinx-\frac{1}{2}cosx\right]}{\left(x-\frac{\pi}{6}\right)}$ $=\lim_{x\to\frac{\pi}{6}}\frac{2\left[sinx\,cos\frac{\pi}{6}-cosx\,sin\frac{\pi}{6}\right]}{\left(x-\frac{\pi}{6}\right)}$ $=\lim_{x\to\frac{\pi}{6}}\frac{2sin\left(x-\frac{\pi}{6}\right)}{\left(x-\frac{\pi}{6}\right)}$ $=2\cdot 1=2$
Q60	$\lim_{x\to 0}\frac{log(6+x)-log(6-x)}{x}$ $=\lim_{x\to 0}\frac{log6\left(1+\frac{x}{6}\right)-log6\left(1-\frac{x}{6}\right)}{x}$ $=\lim_{x\to 0}\frac{[log6+log\left(1+\frac{x}{6}\right)]-[log6+log\left(1-\frac{x}{6}\right)]}{x}$

$$= \lim_{x\to 0} \frac{log\,(1+\frac{x}{6}) - log\,(1-\frac{x}{6})}{x}$$

$$= \lim_{x\to 0} \frac{log\,(1+\frac{x}{6})}{x} + \lim_{x\to 0} \frac{log\,(1-\frac{x}{6})}{-x}$$

$$= \lim_{x\to 0} \frac{1}{6} \frac{log\,(1+\frac{x}{6})}{\frac{x}{6}} + \lim_{x\to 0} \frac{1}{6} \frac{log\,(1-\frac{x}{6})}{-\frac{x}{6}}$$

$$= \frac{1}{6}\cdot 1 + \frac{1}{6}\cdot 1 \qquad [\because \lim_{x\to 0} \frac{\log(1+x)}{x} = \lim_{x\to 0} \frac{\log(1-x)}{-x} = 1]$$

$$= \frac{1}{3}$$

Q61 Let f(x) = cosx

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h\to 0} \frac{cos(x+h) - cosx}{h}$$

$$= \lim_{h\to 0} \frac{-2sin\,\frac{(x+h)+x}{2} \cdot sin\,\frac{(x+h)-x}{2}}{h}$$

$$= \lim_{h\to 0} \frac{-2\sin\,(\frac{h}{2}+x) \cdot sin\,\frac{h}{2}}{h}$$

$$= -\lim_{h\to 0} \sin\,(\frac{h}{2}+x) \cdot \lim_{h\to 0} \frac{sin\,\frac{h}{2}}{\frac{h}{2}}$$

$$= -sinx \cdot 1$$

$$= -sinx$$

Q62 Let f(x) = sin2x

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h\to 0} \frac{sin2(x+h) - sin2x}{h}$$

$$= \lim_{h\to 0} \frac{2cos\,\frac{2(x+h)+2x}{2} \cdot sin\,\frac{2(x+h)-2x}{2}}{h}$$

$$= \lim_{h\to 0} \frac{2\cos\,(h+2x) \cdot sinh}{h}$$

$$= 2\lim_{h\to 0} \cos\,(h+2x) \cdot \lim_{h\to 0} \frac{sinh}{h}$$

$$= 2 \cdot cos2x \cdot 1$$

$$= 2cos2x$$

Q63 f(x) = x cosx

	$f'(x) = \frac{d}{dx}(x\,cosx)$ $= x\frac{d}{dx}cosx + cosx\frac{d}{dx}x$ $= x(-sinx) + cosx(1)$ $= -xsinx + cosx$
Q64	$Let\ f(x) = 3^x + x^3 + 4x - 5$ $f'(x) = \frac{d}{dx}(3^x) + \frac{d}{dx}(x^3) + \frac{d}{dx}(4x) - \frac{d}{dx}(5)$ $= 3^x \log_e 3 + 3x^2 + 4 \cdot 1 - 0$ $= 3^x \log_e 3 + 3x^2 + 4 \cdot 1$
Q65	$Let\quad f(x) = e^x sinx + x^n cosx$ $f'(x) = \frac{d}{dx}(e^x sinx) + \frac{d}{dx}(x^n cosx)$ $= e^x\frac{d}{dx}(sinx) + sinx\frac{d}{dx}(e^x) + x^n\frac{d}{dx}(cosx) + cosx\frac{d}{dx}(x^n)$ $= e^x(cosx) + sinx(e^x) + x^n\frac{d}{dx}(-sinx) + cosx \cdot n(x^{n-1})$ $= e^x(cosx + sinx) + x^{n-1}(ncosx - xsinx)$
Q66	$Let\ f(x) = \frac{x}{sinx}$ $f'(x) = \frac{d}{dx}(\frac{x}{sinx})$ $= \frac{sinx\frac{d}{dx}x - x\frac{d}{dx}sinx}{(sinx)^2}$ $= \frac{sinx \cdot 1 - x \cdot cosx}{(sinx)^2}$ $= cosecx - xcotx\ cosecx$ $= cosecx(1 - xcotx)$
Q67	$\frac{d}{dx}(\frac{x^4 + x^3 + x^2 + 1}{x})$ $= \frac{d}{dx}(x^3 + x^2 + x + \frac{1}{x})$ $= \frac{d}{dx}(x^3) + \frac{d}{dx}(x^2) + \frac{d}{dx}(x) + \frac{d}{dx}(\frac{1}{x})$ $= 3x^2 + 2x + 1 + (-\frac{1}{x^2})$
Q68	$Let\ \ y = (x + \frac{1}{x})^3$

	$\frac{dy}{dx} = \frac{d}{dx}(x + \frac{1}{x})^3 = 3(x + \frac{1}{x})^{3-1} \frac{d}{dx}(x + \frac{1}{x})$ $= 3(x + \frac{1}{x})^2 (x - \frac{1}{x^2})$ $= 3x^2 - \frac{3}{x^2} - \frac{3}{x^4} + 3$
Q69	Let y =(3x+5)(1+tanx) $\therefore \frac{dy}{dx} = \frac{d}{dx}[(3x + 5)(1 + \tan x)]$ $= (3x + 5)\frac{d}{dx}(1 + \tan x) + (1 + \tan x)\frac{d}{dx}(3x + 5)$ $= (3x + 5)(sec^2 x) + (1 + \tan x)(3)$ $= 3x sec^2 x + 5sec^2 x + 3\tan x + 3$
Q70	$Let \quad y = \frac{x^2 cos\frac{\pi}{4}}{sinx} = \frac{\frac{x^2}{\sqrt{2}}}{sinx}$ $= \frac{1}{\sqrt{2}} \cdot \frac{x^2}{sinx}$ $\therefore \frac{dy}{dx} = \frac{1}{\sqrt{2}}[\frac{sinx\frac{d}{dx}(x^2) - x^2\frac{d}{dx}(sinx)}{sin^2 x}]$ $\frac{dy}{dx} = \frac{1}{\sqrt{2}} \cdot [\frac{sinx(2x) - x^2(cosx)}{sin^2 x}]$ $\frac{dy}{dx} = \frac{1}{\sqrt{2}} \cdot [\frac{2x \cdot sinx - x^2(cosx)}{sin^2 x}]$ $\frac{dy}{dx} = \frac{x}{\sqrt{2}} \cdot [2cosecx - xcotx\ cosecx]$

LONG ANSWER QUESTIONS

Q71	L.H.L $= \lim_{x\to 1^-} f(x) = \lim_{x\to 1^-}(x^2 - 1)$ $= (1)^2 - 1 = 1 - 1 = 0$ and R.H.L= $\lim_{x\to 1^+} f(x) = \lim_{x\to 1^+}(-x^2 - 1)$ $= -(1)^2 - 1 = -1 - 1 = -2$ $since \lim_{x\to 1^-} f(x)$ G $\lim_{x\to 1^+} f(x)$ So $\lim_{x\to 1} f(x)$ does not exist
Q72	It is given that $\lim_{x\to 1}\frac{x^4-1}{x-1} = \lim_{x\to k}\frac{x^5-k^5}{x^2-k^2}$

	$\lim_{x\to 1}\frac{(x^2-1)(x^2+1)}{(x-1)} = \lim_{x\to k}\frac{(x-k)(x^2+xk+k^2}{(x-k)(x+k)}$ $\lim_{x\to 1}(x+1)(x^2+1) = \frac{k^2+k^2+k^2}{k+k}$ $(1+1)(1^2+1) = \frac{3k^2}{2k} \Rightarrow k = \frac{8}{3}$
Q73	To find $\lim_{x\to 2} f(x)$ L.H.L$= \lim_{x\to 2^-} f(x) = \lim_{x\to 2^-} x^2+ax+b = 2a+b+4$ and R.H.L$= \lim_{x\to 2^+} f(x) = \lim_{x\to 2^+}(3x+2) = (3)(2)+2 = 8$ $since \quad \lim_{x\to 2} f(x)\ exists\ therefore \lim_{x\to 2^-} f(x) = \lim_{x\to 2^+} f(x)$ $so, 2a+b+4 = 8 \Rightarrow 2a+b = 4$.....(1) To find $\lim_{x\to 4} f(x)$ L.H.L$= \lim_{x\to 4^-} f(x) = \lim_{x\to 4^-}(3x+2) = (3)(4)+2 = 14$ and R.H.L$= \lim_{x\to 4^+} f(x) = \lim_{x\to 4^+}(2ax+5b) = (2a)(4)+5b = 8a+5b$ $since \quad \lim_{x\to 4} f(x)\ exists\ therefore \lim_{x\to 4^-} f(x) = \lim_{x\to 4^+} f(x)$ $so, 8a+5b = 14$.....(2) From (1)and (2) a= 3 and b=-2
Q74	$\lim_{x\to 0}\left(\frac{\sqrt{1+x^2}-\sqrt{1+x}}{\sqrt{1+x^3}-\sqrt{1+x}}\right)$ $\lim_{x\to 0}\left(\frac{\sqrt{1+x^2}-\sqrt{1+x}}{\sqrt{1+x^3}-\sqrt{1+x}}\right)\times\left(\frac{\sqrt{1+x^2}+\sqrt{1+x}}{\sqrt{1+x^2}+\sqrt{1+x}}\right)\times\left(\frac{\sqrt{1+x^3}+\sqrt{1+x}}{\sqrt{1+x^3}+\sqrt{1+x}}\right)$ $\lim_{x\to 0}\left\{\frac{(1+x^2)-(1+x)}{(1+x^3)-(1+x)}\times\frac{\sqrt{1+x^3}+\sqrt{1+x}}{\sqrt{1+x^2}+\sqrt{1+x}}\right\}$ $\lim_{x\to 0}\left\{\frac{x(x-1)}{x(x^2-1)}\times\frac{\sqrt{1+x^3}+\sqrt{1+x}}{\sqrt{1+x^2}+\sqrt{1+x}}\right\}$ $\lim_{x\to 0}\left\{\frac{1}{(x+1)}\times\frac{\sqrt{1+x^3}+\sqrt{1+x}}{\sqrt{1+x^2}+\sqrt{1+x}}\right\}$ $\left(\frac{1}{(0+1)}\times\frac{\sqrt{1+0^3}+\sqrt{1+0}}{\sqrt{1+0^2}+\sqrt{1+0}}\right) \Rightarrow \frac{2}{2} = 1$
Q75	$\lim_{x\to 0}\frac{sec4x-sec2x}{sec3x-secx}$

	$\lim_{x\to 0}\frac{\frac{1}{\cos 4x}-\frac{1}{\cos 2x}}{\frac{1}{\cos 3x}-\frac{1}{\cos x}} \Rightarrow \lim_{x\to 0}\frac{\frac{\cos 2x-\cos 4x}{\cos 4x\cos 2x}}{\frac{\cos x-\cos 3x}{\cos 3x\cos x}}$ $\lim_{x\to 0}\left(\frac{cos2x-cos4x}{cosx-cos3x}\times\frac{cos3xcosx}{cos4xcos2x}\right)$ $\lim_{x\to 0}\left(\frac{2sin3xsinx}{2sin2xsinx}\times\frac{cos3xcosx}{cos4xcos2x}\right)$ $\lim_{x\to 0}\left(\frac{sin3x}{sin2x}\right)\times\lim_{x\to 0}\left(\frac{cos3xcosx}{cos4xcos2x}\right)$ $\frac{3\lim_{x\to 0}\frac{sin3x}{3x}}{2\lim_{x\to 0}\frac{sin2x}{2x}} \Rightarrow \frac{3}{2}\times\frac{1}{1}=\frac{3}{2}$
Q76	$f(x)=\frac{sinx+cosx}{sinx-cosx}$ By quotient rule $f'(x)=\frac{(sinx-cosx)\frac{d}{dx}(sinx+cosx)-(sinx+cosx)\frac{d}{dx}(sinx-cosx)}{(sinx-cosx)^2}$ $=\frac{-(sinx-cosx)^2-(sinx+cosx)^2}{(sinx-cosx)^2}$ $=\frac{-2(sin^2x+cos^2x)}{(sinx-cosx)^2}$ $=\frac{-2}{(sinx-cosx)^2}$
Q77	$f(x)=x^5e^x+x^3logx-2^x$ $f'(x)=\frac{d}{dx}(x^5e^x+x^3logx-2^x)$ $f'(x)=\frac{d}{dx}(x^5e^x)+\frac{d}{dx}(x^3logx)-\frac{d}{dx}(2^x)$ $=e^x\cdot 5x^4+x^5\cdot e^x+logx\cdot 3x^2+x^3\cdot\frac{1}{x}-2^x\log_e 2$ $(5x^4+x^5)e^x+(3logx+1)x^2-2x\log_e 2$
Q78	Given that : $y=\sqrt{x}+\frac{1}{\sqrt{x}}$ $\frac{dy}{dx}=\frac{d}{dx}(\sqrt{x}+\frac{1}{\sqrt{x}})$

	$= \frac{1}{2} \cdot \frac{1}{\sqrt{x}} - \frac{1}{2x\sqrt{x}}$ Now, consider L.H.S = $2x.\frac{dy}{dx} + y$ $= 2x\left(\frac{1}{2\sqrt{x}} - \frac{1}{2x\sqrt{x}}\right) + \sqrt{x} + \frac{1}{\sqrt{x}}$ $= \sqrt{x} - \frac{1}{\sqrt{x}} + \sqrt{x} + \frac{1}{\sqrt{x}}$ $= 2\sqrt{x} = R.H.S$
Q79	$Let\, f(x) = \sqrt{\frac{1-cos2x}{1+cos2x}}$ $= \sqrt{\frac{2sin^2x}{2cos^2x}}$ $= tanx$ So, $f'(x) = \frac{d}{dx}(tanx) = sec^2x$
Q80	$y = \sqrt{\frac{x}{a}} + \sqrt{\frac{a}{x}}$ $y^2 = \left(\sqrt{\frac{x}{a}} + \sqrt{\frac{a}{x}}\right)^2 = \frac{x}{a} + \frac{a}{x} + 2$ $\frac{d}{dx}(y^2) = \frac{d}{dx}\left(\frac{x}{a}\right) + \frac{d}{dx}\left(\frac{a}{x}\right) + \frac{d}{dx}(2)$ $2y\frac{dy}{dx} = \frac{1}{a} - \frac{a}{x^2}$ $2xy\frac{dy}{dx} = \frac{x}{a} - \frac{a}{x}$ Hence proved.

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : STATISTICS

	MCQ
Q1	Standard deviation of first 10 natural numbers is (a) 5.5 (b)3.87 (c) 2.97 (d)2.87
Q2	If $\bar{x}$ is the mean of n observations x_1, x_2, x_3, …, x_n, then $\frac{1}{n}\sum_{i=1}^{n} \lvert x_i - \bar{x}\rvert =$ (a) M.D. about mean (b) S.D. (c) 0 (d) None of these
Q3	S.D. of 15 items is 6 and if each item decreased by 1, then S.D. will be (a) 5 (b) 7 (c) $\frac{1}{15}$ (d) 6
Q4	The range of the data 35,50,48,62,27,39,43,72,56,68 is (a) 25 (b) 45 (c) 35 (d) 15
Q 5	A set of n values $x_1, x_2 x_3,\ldots,x_n$has S.D. $= \sigma$.Then the S.D. of the values $x_1+k, x_2+k\, x_3+k,\ldots, x_n+k$will be (a) σ (b) $\sigma + k$ (c) σ-k (d) $k\sigma$
Q 6	If $y_i = ax_i + b(aG\ 0)$ for each$i=1,2,3,\ldots,n$, then (a) $\bar{y}=\bar{x}$ (b) $\sigma_x = \sigma_y$ (c) $\sigma_x = \lvert a\rvert\, \sigma_y$

	(d) $\sigma_x = a\,\sigma_y$
Q 7	If the variance of the numbers 2,4,5,6,8,17 is 23.33, then the variance of 4,8,10,12,16,34 will be (a) 23.33 (b) 46.66 (c) 93.32 (d) none of these
Q 8	When tested, the lives (in hours) of 5 bulbs, were noted as follows: 1357,1090,1666,1494,1623 The mean deviation (in hours) from the mean is (a) 179 (b) 178 (c) 220 (d) 356
Q 9	Which of the following is one of the measures of dispersion? (a) Mean (b)Range (c) Median (d) Mode
Q10	The mean deviation about the mean for the data: 6,7,10,12,13,4,8,12 is (a) 1.75 (b)2.5 (c) 2.05 (d)2.75
Q11	Following are the marks obtained by 9 students in a Mathematics test: 50,69,20,33,53,39,40,65,59 Mean deviation from the median is (a) 9 (b)10.5 (c) 12.67 (d)14.76
Q 12	The following information relates to a sample of size 60; $\sum x^2 = 18000, \sum x = 960$ The variance of the data is (a) 6.63 (b)16 (c) 22 (d)44
Q13	The mean deviation about the mean for the following data:

x_i	10	30	50	70	90	
f_i	4	24	28	16	8	

(a) 16
(b)17
(c) 18
(d)19

Q14 The possible value of x if standard deviation of the numbers 2,3,2x and 11 is 3.5 is

(a) 2
(b)3
(c) 4
(d)5

Q15 The mean deviation from the median for the following series is:

1,2,3,4,4,5,6,7

(a) 3.4
(b)4.3
(c) 4.4
(d)3.3

Q16 The variance of the data is 121, then the standard deviation of the data is

(a) 11
(b)12
(c) 13
(d)1331

Q 17 The mean deviation about the mean of first n natural numbers when n is an even number is

(a) $\frac{n^2}{4}$
(b)$\frac{n}{4}$
(c)$\frac{n^2}{2}$
(d)$\frac{n^2-1}{4}$

Q 18 The mean and standard deviation of 100 items are 50 and 4 respectively. The sum of squares of the items is

(a) 251600
(b) 215600
(c) 216500

	(d) 215060
Q 19	The standard deviation of the data 6,5,9,13,12,8,10 is (a) $\sqrt{\frac{52}{7}}$ (b) $\frac{52}{7}$ (c) 6 (d) 5
Q 20	The standard deviation of some temperature data in degree Celsius is 5. If the data were converted into Fahrenheit , the variance would be (a) 81 (b)57 (c) 36 (d)25
	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	The scores of 10 students in a test with maximum marks 50 were as follows: 28,36,34,28,48,22,35,27,19,41 (1) Find the variance of marks (2)If 2 grace marks are awarded to each student, find the new variance
Q 22	The mean and standard deviation of some data for the time taken to complete a test are calculated with the following results: Number of observations =25, mean =18.2 seconds, S.D. = 3.25 seconds. Further, another set of 15 observations x_1, x_2, x_3,…,x_{15}also in seconds is now available and we have $\sum_{i=1}^{15} x_i = 279$ and $\sum_{i=1}^{15} x_i^2$= 5524 (1) Find the mean of all 40 observations. (2) Find the standard deviation of all 40 observations.
Q 23	Let x_1, x_2, x_3, …,$x_n$be n observations. If each observation is increased, decreased, multiplied or divided by a non-zero constant a, then the mean is also increased,decreased ,multiplied or divided by the same non-zero constant a. In case of variance, if each

<table>
<tr><td></td><td>observation is increasedor decreased by the same constant a, then the variance remains unchanged. But on multiplying or dividing each observation by same non- zero constant a, the variance σ^2 becomes $a^2\sigma^2$ or$\frac{\sigma^2}{a^2}$ respectively.So, we can say that variance is independent of change of origin but not of the scale.

Based on the above information answer the following questions:

(1) The mean of 10 observations is 18. If each observation is increased by 2, then find the new mean

(2) The mean of 7 observations is 25. If 3 is subtracted from each observation, then find the new mean.</td></tr>
<tr><td>Q 24</td><td>Consider the data:
<table><tr><td>Class</td><td>Frequency</td></tr><tr><td>0-10</td><td>5</td></tr><tr><td>10-20</td><td>7</td></tr><tr><td>20-30</td><td>15</td></tr><tr><td>30-40</td><td>16</td></tr><tr><td>40-50</td><td>4</td></tr><tr><td>50-60</td><td>2</td></tr></table>
Based on above information answer the following questions.

(1) What is the Median of the given data.

(2) Find the Mean deviation about median.</td></tr>
<tr><td>Q 25</td><td>You are given some observations as 34, 66, 30, 38, 44, 50, 40, 60, 42, 51. Based on these observations, answer the following questions.

(1) Find the mean deviation about the mean.

(2) Find the mean deviation about the median.</td></tr>
<tr><td></td><td>ASSERTION REASONING

Assertion-Reasoning MCQs Directions (Q. Nos. 26-30) Each of these questions contains two statements Assertion (A) and Reason (R). Each of the questions has four alternative choices, any one is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) A is true, R is true; R is a correct explanation of A.

(b) A is true, R is true; R is not a correct explanation of A.

(c) A is true; R is false

(d) A is false; R is true.</td></tr>
</table>

Q 26	**Assertion (A)** The mean deviation about the mean for the data 4, 7, 8, 9, 10, 12, 13, 17 is 3. **Reason (R)** The mean deviation about the mean for the data 38, 70, 48, 40, 42, 55, 63, 46, 54, 44 is 8.5.
Q 27	**Assertion (A)** The mean deviation about the mean to find measure of dispersion has certain limitations. **Reason (R)** The sum of deviations from the mean is more than the sum of deviations from median. Therefore, the mean deviation about the mean is not very scientific, where degree of variability is very high.
Q 28	**Assertion (A)** In order to find the dispersion of values of x from mean $\bar{x}$, we take absolute measure of dispersion. **Reason (R)** Sum of the deviations from mean ($\bar{x}$) is zero.
Q 29	**Assertion (A)** The variance of first n even natural numbers is $\frac{n^2-1}{4}$. **Reason (R)** The sum of first n natural numbers is $\frac{n\ (n+1)}{2}$ and the sum of squares of first n natural numbers is $\frac{n\ (n+1)(2n+1)}{6}$.
Q 30	**Assertion (A)** If each of the observations x_1 , x_2 , …, x_n is increased by a, where a is a negative or positive number, then the variance remains unchanged. **Reason (R)** Adding or subtracting a positive or negative number to (or from) each observation of a group does not affect the variance.
	VERY SHORT
Q 31	If for a distribution $\sum(x-5)=3$,$\sum(x-5)^2=43$ and the total number of items is 18, Find the S.D.
Q 32	Find the Variance of first n natural numbers.
Q 33	The mean and standard deviation of 6 observations are 8 and 4 respectively. If each observation is multiplied by 3, find the new S.D.
Q 34	The mean and standard deviation of 100 observations are 40 and 5.1 respectively. If the observation 50 is replaced by 40, find the new S.D.
Q 35	Let x_1,x_2,x_3,x_4,x_5 be the observations with mean m and standard deviation s. Find the standard deviation of observations kx_1,kx_2,kx_3,kx_4,kx_5 .
Q 36	Find the mean deviation from the mean for the set of observations -1,0,4

Q 37	Find the variance of the following data: 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
Q 38	Find the mean deviation about the mean for the data : 38, 70, 48, 40, 42, 55, 63, 46, 54, 44
Q 39	Find the mean deviation about the median of the following data: 3,6,11,12,18
Q 40	Find the variance of first five natural numbers
Q 41	The variance of 10 observations is 4. If each observation is multiplied by 3, find the variance of the new data.
Q 42	Find the standard deviation of 2,4,5,6,8,17.
Q 43	Find the mean deviation of the data 2, 9, 9, 3, 6, 9, 4 from the mean.
Q 44	Variance of the data 2, 4, 5, 6, 8, 17 is 23.33. What will be the variance of 6, 12, 15, 18, 24, 51?
Q 45	The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations
Q 46	Let a, b, c, d, e be the observations with mean m and standard deviation s. Find the standard deviation of the observations a + k, b + k, c + k, d + k, e + k
Q 47	Consider the first 10 positive integers. If we multiply each number by −1 and then add 1 to each number,Find the variance of the numbers so obtained.
Q 48	The standard deviation of some temperature data in °C is 10. If the data were converted into ºF,find the variance.
Q 49	If the variance of a data is 144, then the standard deviation of the data is_____.
Q 50	Find the variance and standard deviation for the following data: 57, 64, 43, 67, 49, 59, 44, 47, 61, 59
	SHORT QUESTIONS
Q 51	Find the mean and variance for the data 6, 7, 10, 12, 13, 4, 8, 12.
Q 52	If mean and standard deviation of 100 items are 50 and 4 respectively, then find the sum of all the item and the sum of the squares of item
Q 53	The standard deviation for the data 6, 7, 10, 12, 13, 4, 8, 12 is ……
Q 54	Following are the marks obtained by 9 students in a mathematics test 50, 69, 20, 33, 53, 39, 40, 65, 59 Find the mean deviation from the median.

Q 55 Find the mean deviation about the mean for the following data:

12, 3, 18, 17, 4, 9, 17, 19, 20, 15, 8, 17, 2, 3, 16, 11, 3, 1, 0, 5.

Q 56 Find mean deviation about the mean for the following data:

x_i : 2 5 6 8 10 12

f_i : 2 8 10 7 8 5

Q 57 Find the mean and variance of first 10 multiples of 3

Q 58 Find the mean and variance for the following frequency distribution

Classes	0-10	10-20	20-30	30-40	40-50
Frequencies	5	8	15	16	6

Q 59 Find the mean deviation about the median for the following data:

x_i	3	6	9	12	13	15	21	22
f_i	3	4	5	2	4	5	4	3

Q 60 Find the mean deviation about the mean for the following data.

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of students	2	3	8	14	8	3	2

Q 61 The AM and SD OF 9 variates are 43 and 5 respectively. If a variate 63 is added to the variates,find the mean and standard deviation of the 10 variates.

Q 62 Find the mean and variance of the frequency distribution given below:

x	$1 \le x < 3$	$3 \le x < 5$	$5 \le x < 7$	$7 \le x < 10$
f	6	4	5	1

Q 63 For the frequency distribution:

x	2	3	4	5	6	7
f	4	9	16	14	11	6

Find the standard distribution

Q 64 The frequency distribution:

x	A	2A	3A	4A	5A	6A
f	2	1	1	1	1	1

where A is a positive integer, has a variance of 160. Determine the value of A

Q 65 Find the mean deviation about the mean of the distribution:

Size	20	21	22	23	24
Frequency	6	4	5	1	4

Q 66 Find the mean deviation about the median of the following distribution:

Marks obtained	10	11	12	14	15
No. of students	2	3	8	3	4

Q 67 There are 60 students in a class. The following is the frequency distribution of the marks obtained by the students in a test:

Marks	0	1	2	3	4	5
Frequency	x-2	x	X^2	$(x+1)^2$	2x	X+1

where x is a positive integer. Determine the mean and standard deviation of the marks

Q 68 Calculate the mean deviation about the mean for the following frequency distribution:

Class Interval	0-4	4-8	8-12	12-16	16-20
Frequency	4	6	8	5	2

Q 69 The scores of a batsman in 10 innings are 48, 80, 58, 44, 52, 65, 73, 56, 64, 54, then find the mean deviation from the median.

Q 70 The mean deviation of the data 3, 10, 10, 4, 7, 10, 5 from the mean is ……

LONG QUESTIONS

Q 71 Calculate the mean deviation about median for the following data

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	7	15	16	4	2

Q 72 The mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6,find the other two observations.

Q 73 The mean and standard deviation of 100 observations were calculated as 40 and 5.1, respectively by a student who took by mistake 50 instead of 40 for one observation. What are the correct mean and standard deviation?

Q 74 The mean and standard deviation of six observations are 8 and 4, respectively. If each observation is multiplied by 3, find the new mean and new standard deviation of the resulting observations.

Q 75 The mean and standard deviation of a group of 100 observations were found to be 20 and 3, respectively. Later on, it was found that

	three observations were incorrect, which were recorded as 21, 21 and 18. Find the mean and standard deviation if the incorrect observations are omitted.
Q 76	Calculate mean, variance and standard deviation for the following distribution.

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

Q 77 Calculate the mean deviation about median for the following data :

Age (in years)	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Number of persons	5	6	12	14	26	12	16	9

Q 78 The diameters of circles (in mm) drawn in a design are given below:

Diameters	33-36	37-40	41-44	45-48	49-52
No. of circles	15	17	21	22	25

Calculate the standard deviation and mean diameter of the circles

Q 79	The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation If it is replaced by 12.
Q 80	Determine mean and standard deviation of first n terms of an A.P. whose first term is a and common difference is d.

MCQ

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d	A	d	b	a	c	c	b	b	d	c	d	a	b	c
16	17	18	19	20										
a	A	a	a	a										

CASE BASED/SOURCE BASED / PASSAGE BASED

21: (1)69.16 (2) 69.16

22: (1) 18.35 (2) 3.87

23: (1)29 (2) 22

24: (1) 28 (2) 10.16

25: (1) 9 (2) 8.7

ASSERTION REASONING

26	27	28	29	30
C	a	a	d	a

VERY SHORT QUESTIONS

31	32	33	34	35	36	37	38	39	40
1.54	$\frac{n^2-1}{12}$	12	6	ks	2	33	8.4	4.2	2
41	42	43	44	45	46	47	48	49	50
36	4.83	2.57	209.97	20	s	8.25	324	12	8.13

SHORT QUESTIONS

51	52	53	54	55	56	57	58	59	60
9, 9.25	5000, 251600	$\sqrt{9.25}$	12.67	6.2	2.3	16.5, 74.25	27, 132	4.97	10
61	62	63	64	65	66	67	68	69	70
45, 7.65	4.16,4.04	1.38	7	1.25	1.25	2.8, 1.122	3.84	8.6	2.57

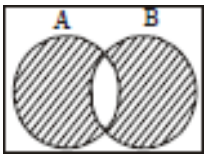
LONG QUESTIONS

71	72	73	74	75	76	77	78	79
10.16	4, 9	39.9, 5	24, 12	20, 3.036	62,201, 14.18	7.35	5.55, 43.5	1.98

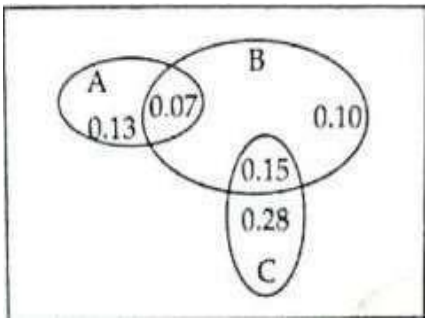
80
a + $\frac{n-1}{2}$ d, d$\sqrt{\frac{n^2-1}{12}}$

KENDRIYA VIDYALAYA SANGATHAN AHMEDABAD REGION
MATHS CONTENT
CLASS: XI
CHAPTER : PROBABILITY

MCQ	
Q1	If $\frac{1+4P}{4}$, $\frac{1-P}{2}$ and $\frac{1-2P}{2}$ are the probabilities of threemutually exclusive events, then value of p is (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{2}{3}$
Q2	Which of the following cannot be the probability of an event? (a) 2/3 (b) – 1/5 (c) 15% (d) 0.7
Q3	Probability of an event can be (a) – 0.7 (b) $\frac{11}{9}$ (c) 1.001 (d) 0.6
Q4	In an experiment, the sum of probabilities of different events is (a) 1 (b) 0.5 (c) – 2 (d) 0
Q 5	In rolling a dice, the probability of getting number 8 is (a) 0 (b) 1 (c) –1 (d) $\frac{1}{2}$
Q 6	In a simultaneous throw of 2 coins, the probability of having 2 heads is: (a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{1}{8}$ (d) $\frac{1}{6}$
Q 7	The probability of getting sum more than 7 when a pair of dice are thrown is: (a) $\frac{7}{36}$ (b) $\frac{5}{12}$ (c) $\frac{7}{12}$ (d) None of these
Q 8	The probability of raining on day 1 is 0.2 and on day 2 is 0.3. The probability of raining on both the days is (a) 0.2 (b) 0.1 (c) 0.06 (d) 0.25
Q 9	If A and B are two events, such that P(A∪ B) =3 , P(A ∩B) =1 ,P(A') = 2 where A' stands for the complementary event of A, then P(B) is given by: (a) $\frac{1}{9}$ (b) $\frac{2}{3}$ (c) $\frac{1}{9}$ (d) $\frac{2}{9}$

Q10	In the following Venn diagram circles A and B represent twoevents:  The probability of the union of shaded region will be (a) P(A) + P(B) – 2P(A ∩B) (b) P(A) + P(B) – P(A ∩B) (c) P(A) + P(B) (d) 2P(A) +2 P(B) – P(A ∩B)
Q11	A single letter is selected at random from the word "PROBABILITY". The probability that the selected letter is a vowel is (a) $\frac{1}{11}$ (b) $\frac{3}{11}$ (c) $\frac{4}{11}$ (d) 0
Q 12	A bag contains 10 balls, out of which 4 balls are whiteand the others are non-white. The probability of getting anon-white ball is (a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$
Q13	The dice are thrown together. The probability of getting thesum of digits as a multiple of 4 is: (a) $\frac{1}{9}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{5}{9}$
Q14	If the probabilities for *A* to fail in an examination is 0.2 andthat for *B* is 0.3, then the probability that either *A* or *B* failsas (a) > 0. 5 (b) 0.5 (c) ≤ 0.5 (d) 0
Q15	If $\frac{2}{11}$ is the probability of an event, then the probability of the event 'not A', is (a) $\frac{9}{11}$ (b) $\frac{11}{2}$ (c) $\frac{11}{9}$ (d) $\frac{2}{11}$
Q16	An experiment is called random experiment, if it (a) has more than one possible outcome (b) is not possible to predict the outcome in advance (c) Both (a) and (b) (d) None of the above
Q 17	An event can be classified into various types on the basis of the (a) experiment (b) sample space (c) elements (d) None of the above
Q 18	An event which has only ..... sample point of a sample space, is called simple event. (a) two (b) three (c) one (d) zero

Q 19	If an event has more than one sample point, then it is called a/an (a) simple event (b) elementary event (c) compound event (d) None of these
Q20	A die is rolled. Let E be the event "die shows 4" and F be the event "die shows even number", Then, E and F are (a) mutually exclusive (b) exhaustive (c) mutually exclusive and exhaustive (d) None of the above
CASE BASED/SOURCE BASED / PASSAGE BASED	
Q 21	If three coins are tossed, all possible outcomes are {HHH, HHT, HTH, THH, TTH, HTT, THT, TTT}, if E1 , E2 , ..., En are n events of a sample space S and if E1 UE2 UE3….. U En = S, then E1 , E2 , ..., En are called exhaustive events. Further, if Ei∩Ej = φ for i ≠j i.e. events Ei and Ej are pairwise disjoint and UEi=S , then events E1 , E2 , ... , Enare called mutually exclusive and exhaustive events, now answers the following (i) Two events which are mutually exclusive. (ii) Three events which are mutually exclusive and exhaustive. (iii) Two events, which are not mutually exclusive. (iv) Two events which are mutually exclusive but not exhaustive. (v) Three events which are mutually exclusive but not exhaustive.
Q 22	Grandmother of Reena, Simi and Aryan has a bag, which contain 9 discs of different beautiful colors, of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. Children asked grandmother to give them discs and grandmother draws a disc at random from the bag. Calculate the probability that it will be (i) red, (ii) yellow, (iii) blue, (iv) not blue, (v) either red or yellow.
Q 23	An urn contain twenty white slips of paper numbered from 1 through 20, ten red slips of paper numbered from 1 through 10, forty yellow slips of paper numbered from 1 through 40 and ten blue slips of paper numbered from 1 through 10. These 80 slips of paper are thoroughly shuffled so that each slip has the equal chance of begin drawn. A slip is drawn random from the urn. Based on the above information , answer the following questions: (i) What is the probability that slip drawn is blue or white? (ii) What is the probability that slip drawn is numbered 1,2,3,4 or 5? (iii)What is the probability that slip drawn is red or yellow and numbered 1,2,3 or 4? (iv) What is the probability that slip drawn is numbered 5,15,25 or 35? (v) What is the probability that slip drawn is white and number higher than 12 or yellow and numbered higher than 26?

Q 24	The given Venn diagram shows three events A, B and C and also the probabilities of the various intersections (for P(A∩B) = 0.07) Based on the above information , answer the following questions: (i) The value of P(B∩C') is (ii) The value of P(A ∩ B) is (iii) The value of P(A∩B') is (iv) The value of P(B∩C) is (v) The probability of occurrence of exactly one of the events A, B or C is 
Q 25	The letter of the word 'ASSASSINATION' are arranged at random. Based on the above information , answer the following questions: (i) The probability that four S's come consecutively in the word is (ii) The probability that two I's and two N's come together is (iii) The probability that all A's are not coming together is (iv) The probability that no two A's are coming together is (v) The probability that all vowels are coming together is
ASSERTION REASONING TYPE QUESTIONS	
	Directions (FOR Q- 26 TO 30): Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion. (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion (c) Assertion is correct, reason is incorrect (d) Assertion is incorrect, reason is correct.
Q 26	**Assertion :** Probability of getting a head in a toss of anunbiased coin is $\frac{1}{2}$ **Reason :** In a simultaneous toss of two coins, the probabilityof getting 'no tails' is $\frac{1}{4}$
Q 27	**Assertion :**In tossing a coin, the exhaustive number of cases is 2. **Reason :**If a pair of dice is thrown, then the exhaustive number of cases is 6 X6 = 36.
Q 28	**Assertion :**A letter is chosen at random from the word NAGATATION. Then, the total number of outcomes is 10. **Reason :**A letter is chosen at random from the word 'ASSASSINATION' Then, the total number of outcomes is 13.
Q 29	Consider a single throw of die and two events. A = the number is even = {2, 4, 6}

	B = the number is a multiple of 3 = {3, 6} **Assertion :** $P(A \cup B) = \frac{4}{6} = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$ **Reason :** $P(A' \cap B') = P(A \cup B)' = 1 - \frac{2}{3} = \frac{1}{3}$
Q 30	**Assertion :**Two dice are thrown simultaneously. There are 11 possible outcomes and each of them has a probability 1/11**.** **Reason :** Probability of an event (E) is defined as $P(E) = \frac{\text{Number of favourable outcome}}{\text{Total number of outcome}}$
	VERY SHORT
Q 31	The numbers 1, 2, 3 and 4 are written separately on four slips of paper. The slips are put in a box and mixed thoroughly. A person draws two slips from the box, one after the other, without replacement. Describe the sample space for the experiment.
Q 32	An experiment consists of rolling a die and then tossing a coin once if the number on the die is even. If the number on the die is odd, the coin is tossed twice. Write the sample space for this experiment
Q 33	A box contains 1 red and 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for this experiment.
Q 34	If 3/4 is the probability of an event, what is the probability of the event "not A"?
Q 35	There are four men and six women on the city council. If one council member is selected for a committee at random, how likely is it that it is a woman?
Q 36	If two cards are drawn from a well shuffled pack, what is the probability that at least one of the two is heart?
Q 37	What is the probability that a leap year will have 53 Sundays?
Q 38	What is the probability of getting a total of 10 in a single throw of two dice?
Q 39	Two dice are rolled simultaneously. What is the probability that the numbers on them are different
Q 40	At random all the letters of the word "ARTICLE" are arranged in all possible ways. What is the probability that the arrangement begins with vowel and ends with a consonant?

SHORT QUESTIONS	
Q 41	A letter is chosen at random from the word „ASSASSINATION“. Find the probability that letter is (i) a vowel (ii) a consonant (iii) Letter S
Q 42	A and B are events such that P(A) = 0.42, P(B) = 0.48 and P(A and B) = 0.16. Determine (i) P(not A), (ii) P(not B) and (iii) P(A or B)
Q 43	In Class XI of a school 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology
Q 44	A die has two faces each with number „1“, three faces each with number „2“ and one face with number „3“. If die is rolled once, determine (i) P(2) (ii) P(1 or 3) (iii) P(not 3)
Q 45	In a certain lottery 10,000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy (a) one ticket (b) two tickets (c) 10 tickets.
Q 46	A five digit number without repetition is formed by the digits 1, 2, 3, 4, 5, 6, 7, 8. What is the probability that the number has even digits at both ends?
Q 47	4 cards are drawn from a well – shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?
Q 48	A and B are events such that P(A) = 0.42, P(B) = 0.48 and P(A and B) = 0.16.Determine (i) P(not A), (ii) P(not B) and (iii) P(A or B)
Q 49	In Class XI of a school 40% of the students study Mathematics and 30% studyBiology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology.
Q 50	A fair coin is tossed four times, and a person win Re 1 for each head and loseRs 1.50 for each tail that turns up. From the sample space calculate how many different amounts of money you can have after four tosses and the probability of having each of these amounts.
LONG QUESTIONS	
Q 51	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 these students is selected at random, find the probability that (i) The student opted for NCC or NSS.

	(ii) The student has opted neither NCC nor NSS. (iii) The student has opted NSS but not NCC.
Q 52	Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that (a) you both enter the same section? (b) you both enter the different sections?
Q 53	Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope.
Q 54	One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be (i) a diamond (ii) not an ace (iii) a black card (i.e., a club or, a spade) (iv) not a diamond(v) not a black card.
Q 55	A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag.Calculate the probability that it will be (i) red, (ii) yellow, (iii) blue, (iv) not blue,(v) either red or blue.
Q 56	Two students Anil and Ashima appeared in an examination. The probabilitythat Anil will qualify the examination is 0.05 and that Ashima will qualify the examinationis 0.10. The probability that both will qualify the examination is 0.02. Find theprobability that (a) Both Anil and Ashima will not qualify the examination. (b) Atleast one of them will not qualify the examination and (c) Only one of them will qualify the examination.
Q 57	A committee of two persons is selected from two men and two women. What is the probability that the committee will have (a) no man? (b) one man? (c) two men?
Q 58	The number lock of a suitcase has 4 wheels, each labelled with ten digits i.e.,from 0 to 9. The lock opens with a sequence of four digits with no repeats. What is the probability of a person getting the right sequence to open the suitcase?
Q 59	If 4-digit numbers greater than 5,000 are randomly formed from the digits 0, 1, 3, 5, and 7, what is the probability of forming a number divisible by 5 when, (i) the digits are repeated? (ii) the repetition of digits is not allowed?
Q 60	Three letters are dictated to three persons and an evelope is addressed to each ofthem, the letters are inserted into the envelopes at random so that each envelopecontains exactly one letter. Find the probability that at least one letter is in its proper envelope.

ANSWERS:

	MCQ
Q1	(a) $p = \frac{1}{2}$
Q2	(b)
Q3	(d) Probability of an event always lies between 0 and 1. (both inclusive)
Q4	(a)
Q 5	(a) Number 8 does not represent on dice.
Q 6	(a)
Q 7	(b)
Q 8	(d)
Q 9	(b)
Q10	(b)
Q11	(c)
Q 12	(b)
Q13	(c)
Q14	(c)
Q15	(a)
Q16	(c)
Q 17	(c)
Q 18	(c)
Q 19	(c)
Q 20	(d)
	CASE BASED/SOURCE BASED / PASSAGE BASED
Q 21	(i) "Getting at least two heads", and "getting at least two tails" (ii) "Getting no heads", "getting exactly one head" and "getting at least twoheads" (iii) "Getting at most two tails", and "getting exactly two tails" (iv) "Getting exactly one head" and "getting exactly two heads" (v) "Getting exactly one tail", "getting exactly two tails", and getting exactly three tails" Note There may be other events also as answer to the above question.
Q 22	(i) 4/9 (ii) 2/ 9 (iii) 1 /3 (iv) 2/3 (v) 2/3
Q 23	(i) 1/5 (ii) ½ (iii) 2/5 (iv) ½ (v) 2/5
Q 24	(i) 0.17 (ii) 0.45 (iii) 0.13 (iv) 0.15 (v) 0.31
Q 25	(i) 2/143 (ii) 2/143 (iii) 25/26 (iv) 15/26 (v) 2/429
	ASSERTION REASONING
Q 26	(b)
Q 27	(b) Both Assertion and Reason is correct.
Q 28	(b) Both Assertion and Reason are correct.
Q 29	(b) Both Assertion and Reason are correct but Reason is not the correct explanation.
Q 30	(d)

VERY SHORT	
Q 31	{(1,2), (1,3), (1,4), (2,1), (2,3), (2,4), (3,1), (3,2), (3,4), (4,1), (4,2), (4,3)}
Q 32	{1HH, 1HT, 1TH, 1TT, 2H, 2T, 3HH, 3HT, 3TH, 3TT, 4H, 4T, 5HH, 5HT,5TH, 5TT, 6H, 6T}
Q 33	{RW, WR, WW}
Q 34	¼
Q 35	3/5
Q 36	¼
Q 37	2/7
Q 38	1/12
Q 39	25/36
Q 40	2/7
SHORT QUESTIONS	
Q 41	(i) 6/13 (ii) 7/13 (iii) 4/13
Q 42	(i) 0.58 (ii) 0.52 (iii) 0.74
Q 43	0.6
Q 44	(i)1/2 (ii)1/2 (iii) 5/6
Q 45	(a) 999/ 1000 (b) $9990C_2$ /$10000\ C_2$ (c) $9990C_{10}$ /$10000\ C_{10}$
Q 46	3/14
Q 47	$\frac{13_{C_3}\ 13_{C_1}.}{52_{C_4}.}$
Q 48	(i) 0.58 (ii) 0.52 (iii) 0.74
Q 49	0.6
Q 50	Rs 4.00 gain, Rs 1.50 gain, Re 1.00 loss, Rs 3.50 loss, Rs 6.00 loss. P (Winning Rs 4.00) = 1/16 , P(Winning Rs 1.50) = 1/4 , P (Losing Re. 1.00) = 3/8 P (Losing Rs 3.50) = 1/4 , P (Losing Rs 6.00) = 1/16 .
LONG QUESTIONS	
Q 51	(i) 19/30 (ii) 11/30 (iii) 2/15
Q 52	(a) 17/33 (b) 16/33
Q 53	2/3
Q 54	(i) ¼ (ii) 12/13 (iii) ½ (iv) ¾ (v) ½
Q 55	(i) 4/9 (ii) 2/9 (iii) 1/3 (iv) 2/3 (v) 7/9
Q 56	(a) 0.87 (b) 0.98 (c) 0.11

Q 57	(a) 1/6	(b) 2/3	(c) 1/6
Q 58	1/5040		
Q 59	(i)2/5	(ii) 3/8	
Q 60	2/3		

Note: Some deleted portion has been included in material which is required for class XII.