**KENDRIYA** **VIDYALAYA** **SANGATHAN** **RAIPUR** **REGION**



**MODULES**

**for**

**CLASS-XI**

**MATHEMATICS**

**Session -2015-16**

**Class XI MLL’s**

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**Module – 1 SETS**

|  |  |  |
| --- | --- | --- |
| S.No. | Symbol | Meaning |
|  |  | Belongs to |
|  |  | Does not belongs to |
|  |  | There exists |
|  |  | For all |
|  |  | Union |
|  |  | Intersection |
|  |  | Difference |
|  |  | Symmetric difference |
|  |  | Complement |
|  |  | empty set |
|  |  | Subset |
|  |  | Set of natural numbers |
|  |  | Set of whole numbers |
|  |  | Set of integers |
|  |  | Set of all positive integers |
|  |  | Set of all negative integers |
|  |  | Set of rational numbers |
|  |  | Set of real numbers |
|  |  | Set of all positive real numbers |
|  |  | Set of all negative real numbers |
|  |  | Set of irrational numbers |
|  |  | Brackets used to enclose the elements of a set |

Number System

Natural Numbers:

Whole Numbers:

Integers:

Rational Numbers: Collection of numbers which are in the form of and are integers. e.g. etc. are rational numbers.

Irrational Numbers: Collection of numbers which are not in the form of

e.g. i) is irrational number

ii) is irrational number

iii) is not an irrational number

**Real Number:** Collection of all rational numbers or irrational numbers.

**Set:** Collection of well-defined and distinct objects is called as Set. Sets are denoted by capital letters of English alphabets.

Remarks:

1. Here well-defined means, the statement which contains no adjective.
2. Small letter represents the elements or members of a set.

e.g. (i) Collection of best singers in India. It is not a set as it contains adjective best.

(ii) Collection of singers in India. It is a set.

Representation of Set

|  |  |
| --- | --- |
| Set Roster / Tabular Form | Set Builder Form |
| In this representation elements are listed in curly braces separated by comma’s | In this representation common property of elements is defined. |

e.g. is roster form whereas Collection of natural numebrs less than 6

or are set builder form.

Cardinal Number: Number of elements in a set is called as cardinal no. It is denoted by or . e.g.

**Types of Set:**

**Empty Set** : A set containing no element is called as empty set. An empty set is denoted by Greek letter also it is denoted as {}. It is also known as void set or Null set.

Eg: .

**Singleton Set:**  A set containing only one element is called as singleton set.

Eg: A= set of vowels in the word ‘SET’.

A= {E}.

**Subset:** Let A and B be two sets, Set A is said to be subset of set B if all the elements of A are in B. It is denoted by

A= {1, 0, -1}, B = {1, 0 , {-1}}, C = {-1, 0,. 1, 2, 3}

1. A C

**Remark:**

1. Empty set is subset of itself.

2. Every set is subset of itself.

3. If A and , then

4.If A and , then

5. If A and then

6. If A, then B is called as super set of A. It is denoted as

7. If A and Then A is called as proper subset of B.

8. If then total number of subsets of A = and number of proper subsets is -1

**Finite Set:** Set A is said to be finite if it contains countable number of elements

Finite sets are sets that have a finite number of members. If the elements of a finite set are listed one after another, the process will eventually “run out” of elements to list.

Example:

A = {0, 2, 4, 6, 8, …, 100}

C = {x : x is an integer, 1 < x < 10}

**Infinite Set:** Set A is said to be infinite if it contains uncountable number of elements.

Eg: and N={1, 2, 3, …..}

An infinite set is a set which is not finite. It is not possible to explicitly list out all the elements of an infinite set.

Example:

T = {x : x is a triangle}

N is the set of natural numbers

A is the set of fractions

**Equal sets:** Two sets A and B are said to be equal if A and B have the same element .

A = , B =

**Equivalent sets:** Two sets A and B are said to be equivalent if n(A) = n(B)

A={1,2,3} B={a,b,c} clearly n(A) = n(B)=3

**Universal set:** A set which is superset of all sets under consideration is called universal set .It is denoted by U.

A={1,2,3} B={2,3,5} C={1,4,6}

Then U={1,2,3,4,5,6} is universal set for A,B and C.

**Power set:** Let A be any set, then power set of A is denoted by P(A) and defined as set of all possible subsets can be formed from set A.

Ex. A ={1,∅} Then P(A)={ ∅,{1},{1, ∅},{∅} }

Remark:(i)If XϵP(A) ,then X A

(ii) If X P(A)then X

(iii) n[P(A)]=2n(A)

1. . Fill in the blanks by putting appropriate symbols.

i) ii) iii) iv)

2. Write in roster form

i)

ii) The set of letters of the word “PANIC”

3. Write the followings in set builder form.

i)

ii)

4. Represent the following in Roster form

(ii) (iii) (iv) (v)

5. Represent in roster form

1. Set of odd numbers.
2. {xN : x2 < 25}
3. Set of integers -5 to 5
4. {x:x is a natural number less than 6}
5. Classify the following as finite or infinite set.
6. Set of integers greater than 100.
7. Set of concentric circles
8. {x}
9. The set of prime numbers less than 100
10. {x}

7 .State True or False

Let A= {1,2,{3,4},5} state as True or False for the following statements

1. {3,4} A (ii) {1,2,5} A (iii) {} A (iv) 1A (v) {3,4} A

The number of elements in a finite set A is denoted by n(A).

Example:

If A is the set of positive integers less than 12 then

A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11} and n(A) = 11

If C is the set of numbers which are also multiples of 3 then

C = {3, 6, 9, …} and C is an infinite set

If D is the set of integers x defined by –3 < x < 6 then

D = {–2, –1, 0, 1, 2, 3, 4, 5} and n(D) = 8

If Q is the set of letters in the word ‘HELLO’ then

Q = {H, E, L, O } , n(Q) = 4 ← ‘L’ is not repeated.

Interval’s

Q1. write the below interval’s in set builder form.

(i) [ a,b] [ii] [a,b) (iii)[a,b] (iv) (a,b] (v) (-1,3)

(vi) (-1,3) (vii) [3,10] (viii) (-4,0) (ix) [2,9) (x) (-1,3]

Q2. write the below sets in interval form.

(i) {x: 0< x ≪ 10} (ii) ) {x: - 4 < x < 2} (iii){ x: 2≪x≪7}

Q.3.Find the intersection of given two intervals.

(i) [-1,3] and [0,5] (ii) (2,6) and(-1,2] (iii) [1,4) and (2,5)

**Level –I**

Find the cardinal number of the set 

Let A=and B=. Find  and .

In a school there are 20 teachers who teach Mathematics or Physics, of these, `12 teach Mathematics and 4 teach Physics and Mathematics. How many teach Physics?

Let A, B and C be three sets such that  and  Show that B=C

OR

If   

Verify that

1) 

2) 

Draw appropriate Venn diagram for

1)  2) 

**Level-II**

If A= B=, C=, D=, find:

(i) (ii)  (iii)  (iv) 

Draw appropriate Venn diagram for each of the following:

1.  (ii) 

**Level III**

In a survey of 25 students, it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry, 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics , 4 had taken Physics and Chemistry and 3 had taken all the three subjects. Find the number of students that had:

1) Only Chemistry 2) at least one of the three subjects

3) None of the subjects

**Module-2 : Relations and Functions**

**Concepts:**

**Cartesian Product of Sets:** The Cartesian product AB of two non-empty sets A and B is the set of all ordered pairs of elements from A and B i.e.

AB

For example: If A={a,b,c} and B={e,f}, then AB ={(a,e),(a,f),(b,e),(b,f),(c,e),(c,f)}

**Note:** (i) If any of the sets A and B is empty then AB is empty.

(ii) If any of the sets A and B is infinite then AB is infinite.

(iii) If both the sets A and B are finite then AB is finite.

**Relations:** A relation R from a non- empty set A to a non-empty set B is a subset of cartesian product AB in which the first and the second elements of ordered pairs have a relationship between them. For example:

If A={1,2,3,4,5,6}, B={2,3,5,7,9} and R is a relation from A to B such that R={(a,b): aA, bB and a is the multiple of b}, then R={(2,2),(3,3),(4,2),(5,5),(6,2),(6,3)}.

**Domain:** The set of all the first elements of the ordered pairs of R is called domain of R, i.e.

Domain of R = {

**Range:** The set of all the second elements of the ordered pairs of R is called range of R.

Range of R = {

In the above example, domain of R={2,3,4,5,6} and range of R={2,3,5}

**Functions:** A relation from a set A to a set B is called a function from A to B ( denoted by ) if every element of A has one and only one image in B.

Here the set A is called domain of and the set B is called codomain of *f* .

**Range:** The set of all the elements of the codomain of the function which have pre-image in domain under is called the range of .

**Note:** If and , then .

Here *y* is the image of *x* and *x* is the pre-image of *y*.

**Real Valued Function:** A function whose range is the subset of R is called real valued function.

**Real Function:** A function whose domain and range are the subsets of R is called real function.

**Identity Function:** A function is called identity function if , for each .

**Constant Function:** A function is called constant function if , for each , where *c* is a const ant.

**Modulus Function:** A function is called modulus function if , for each , i.e.

For example,

**Signum Function:** A function is called signum function if

**Greatest Integer Function:** A function is called greatest integer function if , which assumes the value of the greatest integer, less than or equal to *x*, for each . For example,

**Note:** (i)If and , then =

(ii)If and , then the number of subsets of AB =

(ii)If and , then the number of relations from A to B =

**Exercises for Practice**

**Level-I**

1. If A= and B=, then find AB and BA.
2. If A= and B=, then find AB and BA.
3. If ), then find and .
4. If A and B=, then find the number of subsets of AB.
5. AB =, then find A and B.
6. Which of the following relations are functions, justify your answer:

(i)

(ii)

(iii)

(iv)

1. If , then find and .
2. If and If , then find If .

**Level-II**

1. If A then find AA A.
2. If are in AB, then find A and B, where and .
3. If A,B and C, then find CAB) and (AB)(AC).
4. Write the relation R = in roster form.
5. If , then find .
6. If then find
7. Find the range of the functions
8. Find the domain of the functions

**Level-III**

1. Find domain of the function .
2. Let be a function from R into R. Determine the range of .
3. Find domain and range of the real valued function .
4. Find domain and range of the real valued function .
5. Find domain and range of the real valued function .
6. Find domain and range of the real valued function .
7. Find domain and range of the real function .
8. If be a function from Z to Z defined by , for some integers , . Determine and .
9. If and , then find and .
10. Let be the subset of Z Z given by . Is a function from Z to Z. Give justification.
11. Let and given by the highest prime factor of . Find the range of .
12. Draw the graph of the function

**Module 3 : Principles of Mathematical Induction**

**Introduction:** The principle of mathematical induction is a technique to verify the validity of a pre-derived formula or statement in terms of natural number n.

**Principles of Mathematical Induction:** Suppose there is a given statement P(n), where n is a natural number, such that

1. P(n) is true for n=1, i.e. P(1) is true, and
2. If P(n) is true for n = k (where k is some positive integer), i.e. if P(k) is true, then P(n) is also true for n= k+1, i.e. the truth of P(k) implies the truth of P(k+1),

then the statement P(n) is true for all nN.

**Exercises for Practice**

**Level-I**

1. Prove the following by using mathematical induction, for all
2. + =

**Level-II**

1. Prove the following by using mathematical induction, for all

**Level-III**

1. Prove the following by using mathematical induction, for all
2. is divisible by .
3. is divisible by 8.
4. is divisible by .
5. is divisible by .
6. where .

**Module -4 (Complex Numbers)**

* + - 1. A complex number z = x + iy, where x, y ar rel numbers and
      2. If is called conjugate of z
      3. Arg pf z = x + iy ,
      4. Polar form of is

where and

**LEVEL 1**

1. Express in combination of real and imaginary number.

2. Express in form, where and are real numbers.

3. Find the value of .

4. Compute :+.

5. Find the conjugate of .

6. Find the multiplicative inverse of .

7. If arg z = and |z|=2, then find z in standard form.

**LEVEL 2**

1. Find the square root of the followings

i) ii) i iii) iv)

2. Convert the following into polar form.

i) ii) iii)

3. If , where is a real number, prove that

4. Solve the following quadratic equations:

i) ii) iii)

iv)

**LEVEL 3**

1. If show that

2. If α and β are the different complex numbers. With | β |=1, then find the value of ||.

3. Find the number of non zero integral solutions of the equation

4. If find the least positive integral value of .

5. Convert the complex number in the polar form.

**Module 5 (Linear Inequalities)**

LINEAR INEQUALITIES

Rules for solving Linear Inequalities

The following rules can be applied to any inequality

* Add or subtract the same n umber or expressions to both the sides.
* Multiply or divide both the sides by same positive number
* The inequality reverses if it is multiplied or divide by a negative number
* a < b ⬄ b > a
* a < b ⬄ 1/a > 1/b
* x2 ≤ a2 ⬄ x ≤ a and x ≥ -a

Points to remember

* x = 0 is y-axis
* y = 0 is x-axis
* x = k is a line parallel to y-axis passing through (k, 0) of x-axis.
* y = k is a line parallel to x-axis passing through (0, k) of y-axis.

Method to find Graphical Solution

1. Draw lines corresponding to each equation treating it as equality.
2. Find the feasible region: intersection of all the inequalities.

LEVEL – I

1. Solve 24x < 100 when x is a natural number.
2. Solve the inequalities and draw the graph of the solution on number line: 3x – 2 < 2x + 1.
3. Solve the following system of inequalities: 2x + y ≥ 8, x + 2y ≥ 10.
4. Solve the following system of inequalities graphically: x ≥ 3, y ≥ 2.
5. Solve the following system of inequalities graphically: x + y ≤ 9, y>x, x≥0.
6. Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that there sum is more than 11.

LEVEL – II

1. Solve the inequalities and draw the graph of the solution on number line:

5(2x – 7) – 3(2x + 3) ≤ 0.

1. Solve the following system of inequalities graphically: x + y ≤ 400, 2x + y ≤ 600.
2. Solve the following system of inequalities graphically: 2x + 19 ≤ 6x + 47.
3. The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side.

LEVEL – III

1. Solve the following system of inequalities: x ≥ 3, y ≥ 2.
2. Solve the following system of inequalities: 2x + y ≥ 3, 3x + 5y ≥ 2.
3. Solve the following system of inequalities: 3x – 7 < 5 + x, 11 -5x ≤ 1.
4. How many litres of water will have to be added to 1125 litres of 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% of acid content?

LEVEL – IV

1. Solve the following system of inequalities: 3( 1 – x) < 2(x + 4)
2. Solve the following system of inequalities: x + y ≥ 1, x ≤ 5, y≤ 4
3. Solve the following system of inequalities: >
4. A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

**Module 6 Binomial Theorem**

Basic concepts:

Factorial : n Factorial is denoted by n!

n! = n (n-1)(n-2) - - - - - -3.2.1

Ex: 5! = 5.4.3.2.1=120

6! = 6.5.4.3.2.1= 720

Binomial expansions: (a + b)0 = 1

(a + b)1  = a + b

(a + b)2  = a2 + 2ab + b2

(a + b)3  = a3 + 3a2 b +3a b2 +b3

(a + b)4 =a4 +4a3 b +6a2 b2  + 4a b3  + b4

Pascal’s Triangle 1 n=0

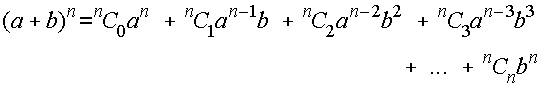
1 1 n=1

` 1 2 1 n=2

1 3 3 1 n=3

1 4 6 4 1 n=4

1 5 10 10 5 1 n=5

The formal expression of the Binomial Theorem is as follows:

Where n is a positive integer.

General term in the expansion of (a + b)n  = nCr an-r br

It is denoted by **T**r+1.

i.e **T**r+1 = nCr an-r br where 0 ≤ r ≤n

and nCr = n! **/** (n – r )! r!

rth term from the end of the binomial expansion : total number of terms for index n-(r-1)



In a expansion of (1 +x)n where n is a positive integer

1. When n is even : the total number of terms in the expansion are n+1



there is only one middle term, that is

(ii) When n is odd : the total number of terms in the expansion are even



there will be two middle terms the average of

**E X E R C I S E for P R A C T I C E**

LEVEL 1

1. Expand (a)
2. Compute using binomial theorem.
3. Find the coefficient of in the expansion of .
4. Write the general term in the expansion of

LEVEL 2

1. Using binomial theorem, indicate which number is larger : or 1000.
2. Find the middle term of the expansion of
3. Find the term independent of x in the expansion of .
4. Find a positive value of m for which the coefficient of in the expansion is 6.

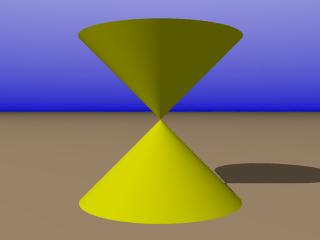
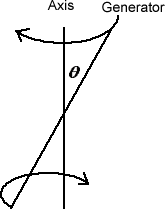
LEVEL 3

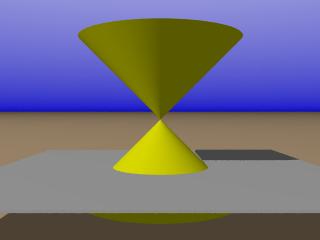
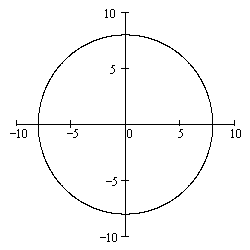
1. Show that the middle term in expansion of is where n is a positive integer.
2. Find a, b and n in the expansion of if the first three terms of the expansion are 729, 7290 and 30375 respectively.
3. Find the coefficient of in the product using binomial theorem.
4. The coefficient of the terms in the expansion of are in the ratio 1:3:5 , find n and r.

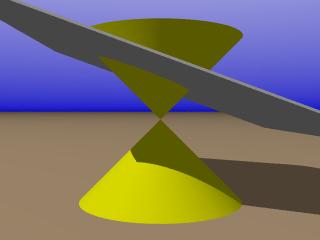
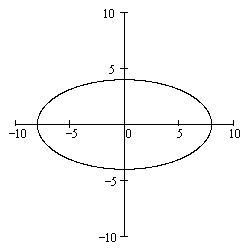
**Module 7 Conic Sections**

**Conic Sections – Introduction**

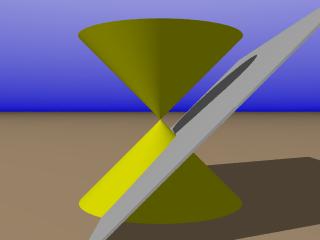
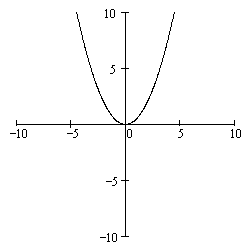
* A conic is a shape generated by intersecting two lines at a point and rotating one line around the other while keeping the angle between the lines constant.



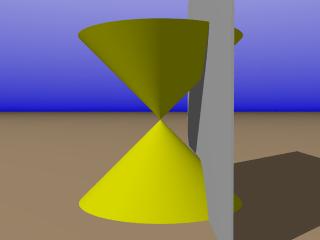
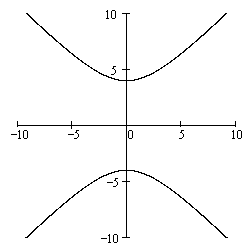
* The resulting collection of points is called a right circular cone. The two parts of the cone intersecting at the vertex are called nappes.
* A “conic” or conic section is the intersection of a plane with the cone.
* The plane can intersect the cone at the vertex resulting in a **point**.
* The plane can intersect the cone perpendicular to the axis resulting in a **circle**.
* 
* The plane can intersect one nappe of the cone at an angle to the axis resulting in an **ellipse**



* The plane can intersect one nappe of the cone at an angle to the axis resulting in a **parabola**.



* The plane can intersect two nappes of the cone resulting in a **hyperbola**.



**FORMULAS RELATED TO CONIC SECTIONS:**

Circle : + = - explaining with above diagrams and examples.

Parabola : standard equations of parabola - explaining with above diagrams and examples.

1. = 4ax 2. = -4ax 3. = 4ay and 4. = -4ay

Ellipse : standard equations of ellipse - explaining with above diagrams and examples.

+ = 1 > …………….. horizontal ellipse

+ = 1 < ……………. Vertical ellipse

Hyperbola : : standard equations of hyperbola - explaining with above diagrams and examples.

- = 1 > …………….. horizontal hyperbola

` - = 1 > ……………. Vertical hyperbola

**E X E R C I S E for P R A C T I C E**

LEVEL 1

1. Find the equation of the circle with centre ( 0, 2 ) and radius 2
2. Find the equation of the circle passing through the point (4,1) and (6,5) and whose centre is on line 4x+ y = 16.
3. Find the coordinates of the focus, axes of the equation of the directrix and lattus rectum of the parabola = 8x
4. Find the equation of the ellipse that satisfy the given condition vertex ( and (.

LEVEL 2

1. Find the equation of the circle which passes through the points ( 2, -2 ) and ( 3, 4 ) and whose centre lies on the line x+y = 2.
2. Find the equation of parabola which is symmetric about the y axis and passes through the point (2,-3).
3. Find the coordinates of the foci, the vertices, the length of major and minor axes and the eccentricity of the ellipse 9+4 =36.
4. Find the equation of hyperbola with foci ( 0,) and vertices 11/2).

LEVEL 3

1. If a parabolic reflector is 20cm in diameter and 5cm in deep, find the focus.
2. An arch is in the form of semi ellipse. It is 8m wide and 2m high at the centre find the height of the arch at a point 1.5m from one end.
3. An equilateral triangle is inscribed in the parabola = 4ax , where one vertex is at the vertex of the parabola. Find the length of the side of the triangle.
4. A rod of length 12cm moves with its ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod which is 3cm from the end in contact with the axes.

**Module 8 Three Dimensional Geometry**

**DISTANCE FORMULA :** Let and are two points in space then

***AB =***  units

**SECTION FORMULA :** Let C divides the join of and in the ratio of m : n ,

(i) If C is internal point on AB then

A C B

, ,

(ii) If C is external point on AB then

A B C

, ,

Level -1

1. 1.A point is on the z-axis, what are the x & y- coordinate.
2. A point is in XY- plane , what is its Z-coordinate?
3. Show that point P(-2,3,5),Q(1,2,3) and R(7,0,-1) are collinear.
4. Verify that (-1,2,1) ,(1,-2,5),(4,-7,8) and (-2,3,4) are the vertices of a parallelogram.
5. Find the coordinate of the points which divides the line segment joining the points(-2,4,7) and (3,-5,8) in ratio 2:3 internally.

Level -2

6.Find the equation of set of points which are equidistant from the points (1,2,3) and (3,2,-1)

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

8.Find the ratio in which the line segment joining the points (4,8,10) and (6,10,-8) is divided by the YZ-plane.

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

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

Level -3.

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

12.Show that the points A(1,2,3), B(-1,-2,-1), C(2,3,2) and D(4,7,6) are the vertices of a parallelogram ABCD, but it is not a rectangle.

13.Find the coordinates of a point on Y-axis which are at a distance of 5 from the point P(-3,2,5).

**Module 9 (Limit And Derivatives)**

LIMITS

Limit of a function at a point is the value of the function at the points just before and after the given point.

Right Hand Limit: The value of a function at a point just immediate after the given point is called the right hand limit of the function at that given point

RHL of f(x) at x = a is given by , here h is positive

Left Hand Limit:The value of a function at a point just immediate before the given point is called the Left hand limit of the function at that given point

LHL of f(x) at x = a is given by , here h is positive

If LHL and RHL of a function at a point are equal then this value of LHL or RHL is called Limit of the function at that point.

Limit of the function f(x) at x = a is given by =

Note: If both limits are not equal then the value of the limit of the function cannot be found at that point.

Derivatives

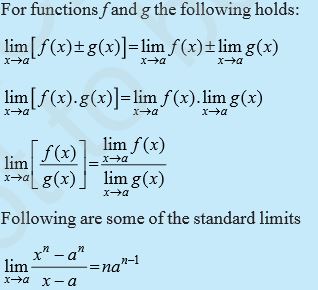
1. Definition: Suppose f is a real valued function and a is a point in its domain of definition. The derivative of f at a is defined by

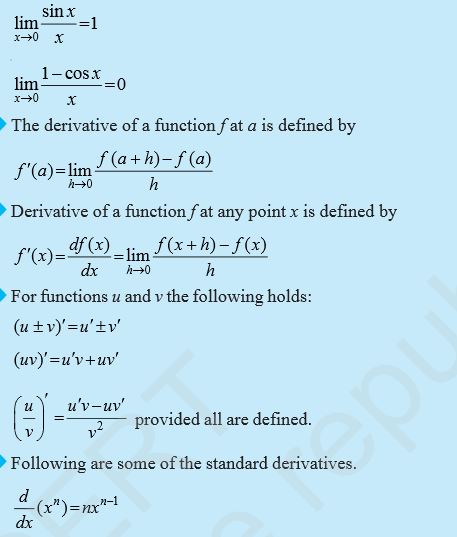
provided this limit exists. Derivative of f(x) at a is denoted by f ‘(a).

2. Definition: Suppose f is a real valued function ,the function defined by

wherever the limit exists is defined to be the derivative of f at x and is denoted by f’(x) . This definition of derivative is also called the first principle of derivative.

Thus, f’(x) =





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**EXERCISE FROM LIMITS**

Level 1

Q.1. Evaluate :

(i) (ii) (iii)

LEVEL 2

Q.1 Evaluate

(i) (ii) (iii) (iv) )

LEVEL 3

Q.1 Evaluate

(i) (ii) (iii) (iv) )

Q.2 Suppose f(x)= and

Q.3 Evaluate , if f(x)=

**EXERCISE FROM DERIVATIVES**

LEVEL 1

Q.1 Find the derivatives of

(i) -27 (ii) 2x - (iii) 52x +4 (iv) (7x-3) (4-2)

LEVEL 2

Q.1 Find the derivatives of (i) (x-a)(x-b) (ii) (iii) x+ (iv) Sin(x+1)

(v) (vi) (px+q) (vii) (viii) (ax+b)n(cx+d)m

LEVEL 3

Q.1 Find the derivatives of (i) (ii) (iii) Sin2x

Q.2. Find the derivatives (i) (x + sec x)(x-tanx) (ii) (iii)

Q.3. Find the derivatives using first principal (i) tanx (ii) sin (x+ 1)

**Module 10 Mathematical Reasoning**

**INTRODUCTION**

Mathematical reasoning is the critical skill that enables a student to make use of all other mathematical skills. With the development of mathematical reasoning, students recognize that mathematics makes sense and can be understood. There two types of mathematical reasoning namely inductive and deductive reasoning.

**STATEMENTS**

A sentence is called a mathematically acceptable statement if it is either true or false but not both. For example Sum of two even numbers is always even. It is always true statements.

**NEGATION OF STATEMENTS**

The denial of a statement is called negation of statements. Negation of p is denoted by

For example p : Delhi is the capital of India.

~p : Delhi is not the capital of India.

**COMPOUND STATEMENTS**

A compound statement is combination of two or more simple statements using a connective. Each statement is called component statements. Some of the connecting words like ‘OR’ and ‘AND ‘etc. are called connectives.

**Compound Statements**

(i) **Conjunction statement**  : When two statements are combined by using connective AND then resulting statement is called as conjunction. Conjunction of p, q is denoted by

For example p: A square is a quadrilateral.

q: A square has all its sides equal.

**Conjunction**: A square is a quadrilateral and its four sides are equal.

(ii) **Disjoint statement**  : When two statements are combined by using connective OR then resulting statement is called as conjunction. Disjunction of p, q is denoted by

For example p: A square is a quadrilateral.

q: A square has all its sides equal.

**Disjunction**: A square is a quadrilateral or its four sides are equal.

(iii) **Conditional statement**  : When two statements are combined by using connective *IF AND THEN*, then resulting statement is called as conditional statement. Conditional statement of p, q is denoted by and read as ***If p then q***

For example p: A square is a quadrilateral.

q: A square has all its sides equal.

**Conditional statement**: *If a square is a quadrilateral then its four sides are equal.*

(iv) **Biconditional statement**  : When two statements are combined by using connective *IF AND ONLY IF*, then resulting statement is called as biconditional statement. Biconditional statement of p, q is denoted by and read as ***p if and only if q***

For example p: A square is a quadrilateral.

q: A square has all its sides equal.

**Biconditional statement**: *A square is a quadrilateral if and only if its four sides are equal.*

**CONTRAPOSITIVE, CONVERSE AND INVERSE OF A STATEMENT** : If is given then

|  |  |
| --- | --- |
| *CONVERSE STATEMENT* |  |
| *INVERSE STATEMENT* |  |
| *CONTRAPOSITIVE STATEMENT* |  |

**VALIDATING A CONDITIONAL STATEMENT**

**BY DIRECT METHOD:** By assuming p is true, prove that q must be true.

**BY CONTRAPOSITIVE METHOD:** By assuming q is false, prove that p must be false

**BY CONTRADICTION :** Here to check whether a statement p is true, we assume that p is not true. Then we arrive at some result which contradicts our assumption. Therefore, we conclude that p is true.

**LEVEL -1**

**(1)** (a) Define statement with example. How it is different from sentence.

(b) What do you mean by negation of statements? Give an example.

(c) Define compound statements with examples.

(d) What are connective and quantifiers? Give a example for each one.

(2) Check whether the following are statements

(a) 8 is less than 6. (b) Mathematics is fun.

(c) The square of a number is always is an even number.

(3) Write the negation of following statements

(a) New Delhi is a city. (b) is an irrational number.

(4) Write the conjunction of following statements

(a)There is something wrong with the bulbs.

(b)There is something wrong with the wiring.

**LEVEL-2**

(1) Find the component statements of following compound statements.

(a) The sky is blue and grass is green.

(b) It is raining or it is cold.

(2) Write the converse of the statement “If a number n is even, then n2 is even.”

(3) For the given statements identify the necessary and sufficient conditions

*If you drive over 80 m per hour, then you will get a fine.*

(4)Write the contrapositive and converse of the following statements

*“If x is a prime number, then x is odd”*

**LEVEL-3**

(1) Prove is an irrational number by contradiction.

(2) For each of the following statements, determine whether an inclusive ‘Or’ or exclusive ‘Or’

is used. Give reason for your answer.

a. To enter a country, you need a passport or a voter registration card.

b. Two lines intersect at a point or are parallel.

**Module : 11 STATISTICS**

Statistics deals with the analysis of data; statistical methods are developed to analyze large volumes of data and their properties.

**Frequency:** In statistics the frequency (or absolute frequency) of an event is the number of times the event occurred in an experiment or study. These frequencies are often graphically represented in histograms

**Mean or Average:** Mean or average, in theory, is the sum of all the elements of a set divided by the number of elements in the set. Mean could be treated as a collaborative property of the whole set of values. You can get a fairly good idea about the whole set of data by calculating its mean.

**Median:** Median is the middle value of a set arranged in increasing or decreasing order. So, if a set consists of odd number of elements, then the middle value is the median of the set, and if the set consists of an even number of sets, then the median is the average of the two middle values.

**Mode:** The mode in a dataset is the value that is most frequent in a dataset. Like mean and median, mode is also used to summarize a set with a single piece of information. For example, the mode of the dataset S = {1,2,3,3,3,3,3,4,4,4,5,5,6,7} is 3 since it occurs the maximum number of times in the set S.

**Variance:** You may want to measure the deviation of a set of data from the mean value. For example, a huge variance of the household income data of a country may be interpreted as an economy with high inequality. Many useful interpretations can be carried out by analyzing the variance in data. The variance is obtained by:

* Finding out the difference between the mean value and all the values in the set.
* Squaring those differences.
* Average of the squared differences obtained above is the variance of the given data.

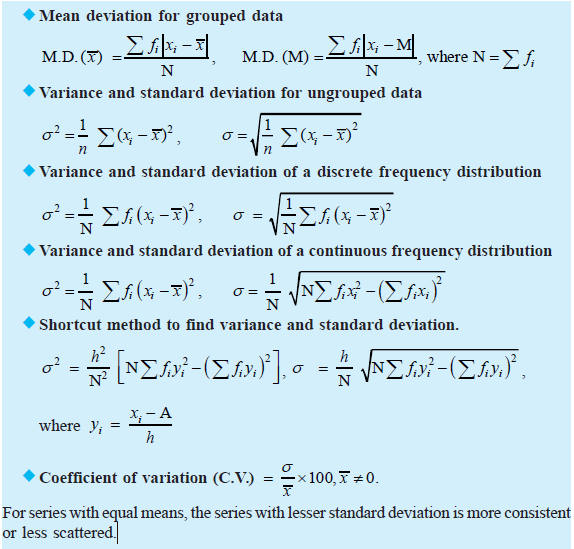
Thus, we can observe that the variance of the particular dataset is always positive.

**Standard Deviation:** The standard deviation is calculated by square rooting the variance of the data. The standard deviation gives a more accurate account of the dispersion of values in a dataset.

**Statistics Formula Sheet used in class XI**

The important statistics formulas are listed in the chart below:

|  |  |  |
| --- | --- | --- |
| Mean | In series Data:  In frequency data: | x = value of observation  n = Total number of observations |
| Median | If n is odd, then  If n is even, then  In Grouped Data: | n = Total number of items  Note: To find median, first we arrange the given data in increasing or decreasing order.  l=lower limit of median class  c=cumulative frequency of the class preceding to the median class  f=frequency of median class  h= class width of median class |
| Mode | The value which occurs most frequently  In Grouped Data: | l = lower limit of modal class (highest frequency class)  f1 = frequency of modal class  f0 = frequency of the class preceding modal class  f2 = frequency of the class next to modal class |
| Mean Deviation about mean | In Series Data:  In Frequency Data: | n = total number of observations in series data |
| Mean Deviation about median | In Series Data:  In Frequency Data: | n = total number of observations in series data  Me = median |
| Standard Deviation | In Series Data:  In Frequency Data: | x = Items given x¯ = Mean n = Total number of items |
| Coefficient of variation | Note : Among two given data , the data having larger value of C.V. is more variable than other. | Where is standard deviation and is arithmetic mean |



**Level – I**

1. Find the Arithmetic Mean of the following series data: 7, 8, 9, 12, 14, 18, 20.
2. Find median of the following data: 24, 12, 7, 10, 19, 20, 26, 28.
3. Find the mode of following data: 22, 22, 21, 18, 19, 21, 18, 19, 10, 10, 20, 15, 15, 16, 17, 18, 20, 18, 17, 11, 14, 18, 19, 21, 22.
4. Find mean deviation about mean for the following data: 6, 9, 7, 9, 10, 12, 13, 8 , 12, 15, 2

**Level - II**

1. Find the mean deviation about median for the following data: 12, 3, 18, 17, 9, 17, 19, 20, 17, 11, 3, 23, 14, 16, 10, 12, 8, 7, 5,6
2. Find standard deviation of the following data: 12, 14, 10, 8, 6, 4, 2, 12, 14, 18, 12, 25, 25
3. Find coefficient of variation of data: 12, 8, 10, 12, 16, 18, 20, 22, 10, 12, 13, 15, 16, 18
4. Find the mean deviation about mean of following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
| f | 12 | 18 | 27 | 20 | 17 | 6 |

1. Find the mean, median and mode of the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
| f | 4 | 12 | 5 | 11 | 8 | 7 |

**Level – III**

1. 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.
2. The means and standard deviation of marks obtained by 50 students of a class in three subjects, Mathematics, Physics and chemistry are given below:

|  |  |  |  |
| --- | --- | --- | --- |
| Subject -> | Mathematics | Physics | Chemistry |
| Mean | 42 | 32 | 40.9 |
| Standard Deviation | 12 | 15 | 20 |

Which of the three subjects shows the highest variability in marks.

1. Find the standard deviation and variance of the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
| f | 8 | 5 | 6 | 4 | 9 | 10 |

1. Find the mean, variance and standard deviation using short-cut method:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Height in cms | **70-75** | **75-80** | **80-85** | **85-90** | **90-95** | **95-100** | **100-105** | **105-110** | **110-115** |
| No. of Children | 3 | 4 | 7 | 7 | 15 | 9 | 6 | 6 | 3 |

**Module 12 Probability**

**Basic concepts:**

Random Experiment: An experiment is called random experiment if it satisfies the following two conditions:

(i) It has more than one possible outcome.

(ii) It is not possible to predict the exact outcome in advance.

SAMPLE SPACE:- The set of all possible outcomes of a random experiment is called sample space of the experiment. ,sample space is denoted by S

Examples: 1. Sample space of tossing two coins S = { HH ,HT ,TH ,TT }

2.Sample space of throwing a die S = { 1 ,2 ,3 ,4 ,5 ,6 }

Types of events:-

**(i)Impossible events:** –An event which will never occur is called impossible event.

eg; on tossing a coin getting even numbers.

is called an impossible event.

1. **Sure event**:- An event which is certain to happen is called sure event.

is called an sure event.

1. **Simple event**:- If an event E has only one sample point of a sample space is called simple event. Example: E = {a}
2. **Compound event** – If an event has more than one sample point , it is called compound event.

Example S = {1 ,2 ,3 ,4 ,5 ,6} E1 = { 2 , 4, 6 } E2= {1 ,3 }

**Algebra of events:-**

(i) **Complementary events** :-For every event **A** there corresponding another event **Ac** is called complementary event to A , It is also called the event **not A**. eg: For tossing a coin

S = { 1 ,2 ,3 ,4 ,5,6 } , The Event of getting even numbers A = { 2, 4 ,6 }, Ac ={1 ,3 ,5 }

**(ii) The event A or B** :- When the sets A and B are two events associated with a sample space, then event A or B = A U B = {}

**(iii) The event A and B** :- When the sets A and B are two events associated with a sample space , then event A and B = A ∩ B= {}

**(iv) The event A but not B** :- A but not B = A∩ B c  = A – B = {}

**E X E R C I S E for P R A C T I C E**

LEVEL 1

1. A coin is tossed if it shows head, we draw a ball from a bag consisting of three blue and four white balls if it shows tail we throw a die .Describe the sample space of this experiment.
2. A die is rolled .Let E be the event “die shows 4 “and F be the event “die shows even number”. Are E and F mutually exclusive ?
3. A fair coin with 1 marked on one face and 6 marked on the other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is (i) 3 (ii) 12
4. A coin is tossed twice .What is the probability that at least one tail occurs.

LEVEL 2

1. A box contains one red and three identical white balls. Two balls are drawn at random in succession without replacement. Write the Sample space for this experiment.
2. Three coins are tossed once. Let A denote the event three heads shows denote the event two heads and one tail shows ,C denote the event three tails shows and D denote the event head shows on the first coin. Which events are (a) mutually exclusive (b) Simple (c) Compound?
3. In a lottery a person choses six different natural numbers at random from 1 to 20 , and these six numbers match with the six numbers already fixed by the lottery committee he wins the prize. What is the probability of winning the prize in the game.?
4. Find the probability that when a hand of 7 cards is a drawn from a well shuffled deck of 52 cards, it contains (i) all kings (ii) three kings (iii) at least three kings?

LEVEL 3

1. A die is thrown repeatedly until a six comes up. What is the sample space for this experiment.?
2. A committee of two persons is selected from two men and two women .What is the probability that the committee will have (i) no man (ii) one man (iii) two men?
3. In a 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?
4. A box contains 10 red marbles ,20 blue marbles and 30 green marbles. 5 marbles are drawn from the box ,What is the probability that (i) All will be blue (ii) At least one will be green ?

**KENDRIYAVIDYALAYA SANGATHAN, RAIPUR REGION**

**Blue - Print Sub: - Mathematics Class XI**

**(Half Yearly Examination)**

**TEMPRORAY ADJUSTIBLE**

**Time: 3 hours Max Marks: 100**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Sl No.** | **Topics** | **Very Short Answer**  **(1 marks)** | **Short Answer**  **(4 marks)** | **Long Answer**  **(6 marks)** | **Total Marks** |
| Unit I | 1. | **Sets** | 1(1) | 4(1) | 6(1)+V | 11(3) |
|  | 2. | **Relations and Functions** | \_ | 4(2)+V | \_ | 8(2) |
|  | 3. | **Trigonometry** | 1(2) | 4(1) | 6(2) | 18(5) |
| Unit II | 4. | **Principle of Mathematical Induction** | \_ | \_ | 6(1) | 6(1) |
|  | 5. | **Complex Numbers and Quadratic Equations** | 1(1) | 4(2) | \_ | 9(3) |
|  | 6. | **Linear Inequalities** | \_ | 4(1)+V | 6(1) | 10(2) |
|  | 7. | **Permutations and Combinations** | \_ | 4(3)+V | \_ | 12(3) |
|  | 8. | **Binomial Theorem** | \_ | 4(1) | 6(1) | 10(2) |
|  | 9. | **Sequences and Series** | 1(2) | 4(2) | 6(1) | 16(5) |
|  | **Total Questions** |  | 1(6) | 4(13) | 6(7) | 100(26) |

**Very easy-30% Easy-40% Difficult-30% Unit I (37 marks), Unit II (63marks)**

**KENDRIYA VIDYALAYA SANGATHAN, RAIPUR REGION**

**BLUE PRINT Sub:- Mathematics**

**CLASS-XI Session Ending Examination**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SL.  NO | NAME OF THE CHAPTER | KNOWLEDGE | | | UNDERSTANDING | | | APPLICATION | | | TOTAL |
| VSA | SA | LA | VSA | SA | LA | VSA | SA | LA |
| 1 | SETS |  |  |  |  | 1(4) |  |  |  | 1(6) | 10 |
| 2 | RELATION AND FUNCTIONS |  | 1(4) |  |  |  |  |  |  |  | 4 |
| 3 | TRIGONOMETRY | 1(1) |  |  |  | 1(4) |  |  | 1(4) | 1(6) | 15 |
| 4 | PMI |  |  |  |  |  |  |  |  | 1(6) | 6 |
| 5 | COMPLEX NUMBERS AND QUARDRATIC EQUATIONS | 1(1) |  |  |  | 1(4) |  |  |  |  | 5 |
| 6 | LINEAR INEQUALITIES |  |  |  |  |  |  |  |  | 1(6) | 6 |
| 7 | PERMUTATIONS AND COMBINATIONS |  | 1(4) |  |  |  |  |  |  | 1(6) | 10 |
| 8 | BINOMIAL THEOREM | 1(1) | 1(4) |  |  |  |  |  |  |  | 5 |
| 9 | SEQUENCE AND SERIES |  |  |  |  |  |  |  |  | 1(6) | 6 |
| 10 | STRAIGHT LINES | 1(1) | 1(4) |  |  |  |  |  |  |  | 5 |
| 11 | CONIC SECTIONS |  |  |  |  | 1(4) |  |  |  |  | 4 |
| 12 | INTRODUCTION TO 3-D |  |  |  |  | 1(4) |  |  |  |  | 4 |
| 13 | LIMIT AND DERIVATIVE |  | 1(4) |  | 1(1) |  |  |  |  |  | 5 |
| 14 | MATHEMATICAL REASONING |  |  |  |  | 1(4) |  |  |  |  | 4 |
| 15 | STATISTICS |  |  |  |  |  |  |  |  | 1(6) | 6 |
| 16 | PROBABILITY | 1(1) |  |  |  | 1(4) |  |  |  |  | 5 |
|  | TOTAL | 5(5) | 5(20) |  | 1(1)\_ | 7(28) |  |  | 1(4) | 7(42) | 26(100) |