CONTENTS

Syllabus

TERM I

April – May

Sets:

Sets and their representations, Empty set, finite & infinite sets, equal sets. Subsets-Subsets of the set of real numbers especially intervals (with notations), Power set, Universal set, Venn diagrams, Union, Intersection, Difference and Complement of a set.

Linear Inequalities:

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables- graphically.

Linear Programming:

Introduction, definition of related terminology such as constraints ,objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Principle of Mathematical Induction:

Processes of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of Mathematical induction and simple applications.

July

Relations & Functions:

Ordered pairs, Cartesian product of sets. Number of elements in the cartesian product of two finite sets. Cartesian product of the set of real numbers with itself (upto $R \times R \times R$).Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation ofa function, domain, co-domain & range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum , difference, product and quotients of functions.

Activity: ***Exploring graphs of functions using Sketch Pad – Discovering domain & range.***

Trigonometric Functions:

Positive and negative angles. Measuring angles in radians & in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unitcircle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x. Signs of trigonometric functions and sketch of their graphs. Expressing $\sin(x+y)$ and $\cos(x+y)$ in terms of $\sin x, \sin y, \cos x, \cos y$.

August

Trigonometric Functions(Continued) : Deducing the identities like following:

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

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

$$\sin x + \sin y = 2\sin\frac{x+y}{2}\cos\frac{x-y}{2}$$

$$\sin x - \sin y = 2\cos\frac{x+y}{2}\sin\frac{x-y}{2}$$

$$\cos x + \cos y = 2\cos\frac{x+y}{2}\cos\frac{x-y}{2}$$

$$\cos x - \cos y = -2\sin\frac{x+y}{2}\sin\frac{x-y}{2}$$

Identities related to sin2x, cos2x, tan2x, sin3x, cos3x, tan3x. General solution of trigonometric equations of the type $\sin\theta = \sin\alpha, \cos\theta = \cos\alpha, \tan\theta = \tan\alpha$.

Introducing trigonometric curves using Sketch Pad – a Presentation.

Permutations & Combinations:

Fundamental principle of counting. Factorial n. Permutations and combinations,derivation of formulae and their connections, simple applications.

September: First Term Examination

TERM II

October- November

Binomial Theorem:

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, general and middle term in binomial expansion, simple applications.

Sequences and Series:

Sequence and Series. Arithmetic progression (A. P.), arithmetic mean (A.M.). Geometric progression (G.P.), general term of a G. P., sum of n terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to infinity of a G.P. Sum to n terms of the special series: $\sum n, \sum n^2, \sum n^3$

Straight Lines:

Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two -point form, intercepts form and normal form.

December

Straight Lines (Continued) :

General equation of a line.Distance of a point from a line.

Conic Sections:

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations andsimple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

Visualising Conic Sections as locus of a point- using Sketch Pad

Introduction to Three -dimensional Geometry:

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point.Distance between two points and section formula.

January

Limits and Derivatives:

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions. Some important Limits:

$$(i)\lim_{x\to 0}\frac{1}{x},(ii)\lim_{x\to\infty}\frac{1}{x},(iii)\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x},(iv)\lim_{x\to 0}(1+x)^{\frac{1}{x}},(v)\lim_{x\to 0}\frac{\log(1+x)}{x},(vi)\lim_{x\to 0}\frac{e^{x}-1}{x},(vii)\lim_{x\to 0}\frac{a^{x}-1}{x},a>0$$

Online tutorials, YouTube Videos,PowerPoint presentation

February

Probability:

Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

Complex Numbers and Quadratic Equations:

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system. Square root of a complex number

Mathematics Project Work

Prepare a project on any of the following topics. You may work in groups of not more than four students. Each selected topic must be investigated thoroughly. Relevant information must be collected and understood. Group will be required to make a presentation (not necessarily power point show, handmade charts or simple displays will also be appreciated).

The assessment will be done at in the second term. The marks will be included in the second term assessment.

The project will be assessed on the basis of mathematical content, depth and clarity of understanding, explanation, neatness and organization, group presentation, coordination, creativity and completion. The final presentation should not exceed ten minutes of time. Please refer to the do's and don'ts of making a PowerPoint presentation on page 49.

Topics:

1. **Encryption :** Encryption has been playing a very important role in our lives. From secret messages passed in the ancient wars to the safety of our gmail account it has been used extensively. Understand the theory behind these systems, how and why of it. Try creating something you can call your own.
2. **Mathematics in Forensics :**Put on your gloves, take out your magnifying glasses and get ready to become a crime scene investigator.They Apply deductive reasoning skills to make sense of the relationships between events, suspects, motives, evidences and ultimately solve this "Who did it"
3. **Queuing Theory:** How is the time and frequency of the metro trains decided? How come the traffic light at one crossing stays red precisely for 3 minutes, while another stays red for merely 40 seconds? Delve into the Queuing theory and find answers to these and other related observations.

4. **Prisoner's Dilemma:** investigate prisoner' Dilemma and explore its use in marketing strategies.
5. **Mathematical Biology:** What distinguishes us from the others? The answer lies in our genes. Is there anything common between your DNA structure and say, Ramanujan's? Investigate
6. **Konigsberg Bridge Problem:** Understand the problem, its known solution and the theory behind the solution. Can you think of another solution for this problem and its application, for example, in deciding evacuation routes of a hotel or school?
7. **Fractals:** What are Fractals? What are a Sierpinski Triangle and Koch Curve? Discover how to construct the Koch or "Snowflake" Curve and Sierpinski. Learn how to make Fractal Cards – make at least two Fractal Cards.

Suggested reading and weblinks:

1. http://www.sunysb.edu/philosophy/faculty/pgrim/SPATIALP.HTM
2. http://ptril.tipod.com
3. http://www.cut-the-knot.org/selfreference/Russell.shtml
4. http://mathforum.org/issac/problems/bridges l .html
5. http://math.youngzones.org/Konigsberg.html

Assignment No. 1

Sets

Q. No. 1 - 10 are very short answer type questions:

1. Write the set $\left\{\frac{1}{2}, \frac{2}{9}, \frac{3}{28}, \frac{4}{65}, \frac{5}{126}, \frac{6}{217}\right\}$ in set builder form.

2. Write the set $\left\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11}, \frac{11}{13}, \right\}$ in set builder form.

3. Write the set A = $\{x : x \in Z, x^2 < 30\}$ in roster form.

4. Describe the set $A = \{x : x$ is a two digit number such that the sum of its digits is $8\}$ in roster form .

5. Find the pairs of equal sets and equivalent sets from the following : A = $\{1\}$,

   $B = \{x : x \in R, x > 10 \text{ and } x < 6\}$, $C = \{x : x \in R, x - 1 = 0\}$ $D = \{x : x \in R, x^2 = 36\}$,

   $E = \{x : x \text{ is an integral root of } x^2 + 8x + 12 = 0\}$

6. If $A = \{1,3,5,7,9,11,13\}$, $B = \{2,4,6,8,......14\}$ and N is the universal set , find $A' \cup ((A \cup B) \cap B')$.

7. Write whether the set is empty, finite or infinite?

   (a) $\{x \in N : x < 200\}$ (b) $\{x \in R, 0 < x < 1\}$ (c) $\{x : 4 < x < 5, x \in N\}$

   (d) $\{x : x \in \text{Z and } x^2 \text{ is even}\}$ (e) $\{x : x^2 - 5 = 0 \text{ and } x \text{ is rational}\}$

   (f) {Set of circles passing through three given non – collinear points}

8. If $A = \{x : x = 5n \ , n \in Z\}$ and $B = \{x : x = 3n \ , n \in Z\}$, find $A \cap B$.

9. If $A = \{1, \ 2 \ , \ \{3,4\}\}$, find $P(A)$.

10. Draw Venn diagrams to represent : (a) $A' \cap (C - B)$ (b) $(B - C) \cup (C - B)$

    (c) $A - (B \cap C)$ (d) $B' - A'$

11. Let $A = \{a, b, \{c, d\}, e\}$. Which of the following statements are false and why?

(i) $\{c,d\} \subset A$ (ii) $\{a,b,c\} \subset A$ (iii) $\phi \in A$ (iv) $\{\{c,d\}\} \subset A$ (v) $\phi \subset A$ (vi) $\{a,b,e\} \in A$ (vii) $b \in A$ (viii) $\{\phi\} \subset A$

12. Let $A=\{1,2,3,4\}$, $B=\{1,2,3\}$ and $C=\{2,4\}$, find all subsets X such that

    (a) $X \subset B$ and $X \subset C$ (b) $X \subset A$ and $X \not\subset B$ (c) $X \subset A$, $X \subset B$ and $X \subset C$

13. If $U=\{a,b,c,d,e,f,g\}$, $A=\{b,e,f\}$ and $B=\{a,g\}$,show that

    $B-A=B\cap A'$.

14. If $U=\{1,2,3,4,5,6,7,8,9\}$, $A=\{2,4,6,8\}$, $B=\{3,5,7\}$ and $C=\{1,2,4,5,7\}$ find

(i) $A\cap(B\cup C)'$ (ii) $A'\cup(B\cap C')$ (iii) $(A\cup B)'-(A\cup C)'$ (iv) $(B-A)\cup(A-C)$

15. In a group of 50 people, 30 like cricket, 25 like football and 32 like hockey. Assume that each one likes at least one of the three games. If 15 people like both cricket and football , 11 like football and hockey and 18 like cricket and hockey, then find how many like (i) all three games? (ii) Only football?(iii) only hockey?

16. In a survey of 100 students, the number of students studying various languages is as follows: English only 18, 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 are studying Hindi? (ii) how many students are studying Hindi and English?

17. In an university, out of 100 students 15 offered Mathematics only; 12 offered statistics only; 8 offered only Physics; 40 offered Physics and Mathematics; 20 offered Physics and Statistics; 10 offered Mathematics and Statistics, 65 offered Physics. Find the number of students who (i) offered Mathematics (ii) offered Statistics (iii) did not offer any of the above three subjects.

18. In a survey 18 people liked Channel A; 23 liked Channel B and 24 liked Channel C. Of these, 13 liked both Channel B and C; 12 Liked Channel A and B; 11 liked Channel C and A and 6 liked all the three Channels. Find:

    a. how many people were surveyed?

    b. how many people liked Channel C but not B?

    c. how many people liked exactly one of the three channels?

19. Let $X = \{1, 2, 3, ..., 10\}$, $A = \{1, 2, 4, 5\}$, $B = \{2, 4, 6, 8, 10\}$ and $C = \{2, 3, 4, 5, 6, 7\}$

Verify the following results:

(i) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (ii) $(A \cap B)' = A' \cup B'$

Web Resources:

- Need to revise concepts of sets visit

  http://goo.gl/IHgu7y

- Enjoyed working with Sets and the various operations? Here is an activity for you to show your expertise (try Level 1 to 3):

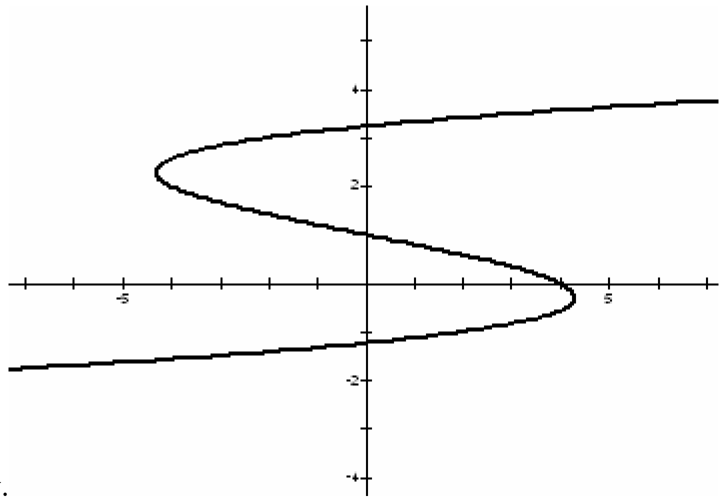
  http://goo.gl/n13yk0

Assignment No. 2

Relations and Functions

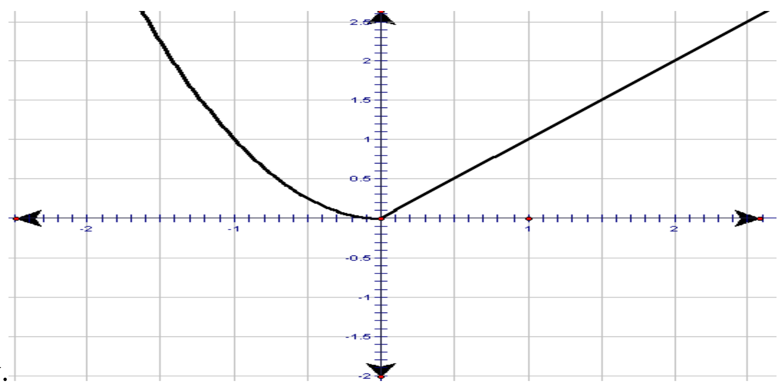
Q. No. 1 - 13 are very short answer type questions:

1. If $A=\{2,3\}, B=\{4,5\}$ and C = $\{5,6\}$, find $A\times(B\cap C)$
2. Is the following graph, the graph of a function of x?



Justify.

3. Is the following graph, the graph of a function of x ?



Justify.

4. Let $A=\{2,3\}, B=\{4,5\}$.Find the total number of relations from A to B.
5. Determine the domain and range of the relation R defined by

$R=\{(a,b):b=|a-1|, a\in Z$ and $|a|\leq 3\}$

6. Determine the domain and range of the relation R defined by

   $R = \{(x+1, x-1) : x \in \{1,2,3,4,5,6\}\}$

7. If f is a relation from $A = \{1,2,3,4\}$ to itself defined by $f = \{(x, y) : x + y > 4, x, y \in A\}$, determine whether it is a function from A to A? Justify.

8. Draw the graph of the function $y = |x-3|$.

9. Find the range of the function $f(x) = \dfrac{3-x}{x-3}$.

10. Let $f : R \to R$, be defined as $f(x) = x^2 + 1$, then find the pre-image of 17.

11. If $f(x) = x^2 - 3x + 1$ and $f(2\alpha) = 2f(\alpha)$, then find the value of α.

12. Let $A = \{2,3,4,5,6\}$.Let R be the relation on A defined by the rule "$(x, y) \in R$ iff x divides y". Find R as a subset of $A \times A$.

13. Let $f : R \to R$ and $g : N \to N$ be two functions defined as

    $f(x) = x^2$ and $g(x) = x^2$. Are they equal functions?

14. Find the domain and range of the following functions:

    (i) $1-|x-3|$ (ii) $\dfrac{3}{2-x^2}$ (iii) $\sqrt{9-x^2}$ (iv) $\dfrac{1}{\sqrt{x-3}}$

15. If f is the identity function and g is the modulus function , find $f+g, f-g, f.g, \dfrac{f}{g}$

16. Let f, g be two real functions defined by $f(x) = 4(x-1)^2$ and $g(x) = 4x^2$. Then describe each of the following functions:

    (i) $g - f$ (ii) $\dfrac{f}{g}$ (iii) $2f - \sqrt{g}$ (iv) $\dfrac{4}{g}$

17. If f, g, h are three real functions defined as

$f(x)=\sqrt{x-1},\ g(x)=\dfrac{1}{x},\ h(x)=2x^2+3$, find the value of $2f+g-h$ at $x=1$.

18. Draw the graph of the following function:

$$f(x)=\begin{cases} -x-1 \, if \ x<-2 \\ x+1 \ if \ -2\le x\le 1 \\ 3 \, if \ x>1 \end{cases}$$

19. Draw the graph of the following function and find the range using the graph:

$$f(x)=\begin{cases} 1, \text{ if } x\ge 1 \\ x, \text{ if } -1<x<1 \\ \text{-1, if } x\le -1 \end{cases}$$

20. Draw the graph of the following function and find the range using the graph:

$$f(x)=\begin{cases} 1, \text{ if } x\ge 1 \\ 1-x, \text{ if } x<1 \end{cases}$$

Web Resources

- For a simple explanation of Domain and Range of Functions visit the web page http://goo.gl/TjtojD

- Take a short Quiz on Relations and Functions, visit the webpage: http://goo.gl/dsflf9

Assignment No. 3

Trigonometric Functions

<u>Q. No. 1 - 8 are very short answer type questions:</u>

1. Find the degree measure of an angle through which a pendulum swings if its length is 50 cm and the tip describes an arc of length 16 cm $\left(\text{Take } \pi = \frac{22}{7}\right)$.
2. Find the value of $\operatorname{cosec}\left(\frac{-19\pi}{3}\right)$.
3. Prove that $\cos\theta - \sin\theta = \sqrt{2}\cos\left(\theta + \frac{\pi}{4}\right)$
4. Find the general solution to the equation $\cos\theta = -\frac{1}{2}$.
5. Find the principal solution to the equation $\cot\theta = -\sqrt{3}$.
6. Prove that $\tan\frac{A}{2} = \frac{1-\cos A}{\sin A}$.
7. Find the value of $\cot\left(\frac{37\pi}{12}\right)$.
8. Prove the following:

$(i)\ \frac{\sin 11A \sin A + \sin 7A \sin 3A}{\cos 11A \sin A + \cos 7A \sin 3A} = \tan 8A$

$(ii)\ \cos\theta + \cos\left(\theta + \frac{2\pi}{3}\right) + \cos\left(\theta + \frac{4\pi}{3}\right) = 0$

$(iii)\ \frac{\sin A + \sin 3A + \sin 5A + \sin 7A}{\cos A + \cos 3A + \cos 5A + \cos 7A} = \tan 4A$

(iv) $\tan 11\theta - \tan 7\theta - \tan 4\theta = \tan 11\theta \tan 7\theta \tan 4\theta$

(v) $\frac{\cos 2A \cos 3A - \cos 2A \cos 7A + \cos A \cos 10A}{\sin 4A \sin 3A - \sin 2A \sin 5A + \sin 4A \sin 7A} = \cot 6A \cot 5A$

9. If $\cos A = \frac{-24}{25}$ and $\sin B = \frac{-4}{5}$, where π<A<$\frac{3\pi}{2}$ and $\frac{3\pi}{2} < B < 2\pi$, find the following:

(i) $\sin(A+B)$ (ii) $\tan(A-B)$

10. Prove that: $\cos 10° \cos 50° \cos 60° \cos 70° = \frac{\sqrt{3}}{16}$

11. Find the general solution for each of the following equations :

$(i) \sin 2x + \sin 4x + \sin 6x = 0$

$(ii) \sqrt{2}\sec\theta + \tan\theta = 1$

$(iii) \cot^2\theta + \frac{3}{\sin\theta} + 3 = 0$

$(iv) \sin 3\theta + \cos 2\theta = 0$

12. Prove the following:

$(i) \cos^2 A + \cos^2\left(A+120^\circ\right) + \cos^2\left(A-120^\circ\right) = \frac{3}{2}$

$(ii) \frac{\tan\left(\frac{\pi}{4}+\theta\right) + \tan\left(\frac{\pi}{4}-\theta\right)}{\tan\left(\frac{\pi}{4}+\theta\right) - \tan\left(\frac{\pi}{4}-\theta\right)} = \cos ec 2\theta$

$(iii) \frac{\sec 8\theta - 1}{\sec 4\theta - 1} = \frac{\tan 8\theta}{\tan 2\theta}$

$(iv) \cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{5\pi}{8} + \cos^2\frac{7\pi}{8} = 2$

13. If $\tan x = \frac{4}{3}$ and $\pi < \text{x} < \frac{3\pi}{2}$, find the values of $\sin\frac{\text{x}}{2}, \cos\frac{x}{2}, \tan\frac{x}{2}$

14. If $\tan(A+B) = m$ and $\tan(A-B) = n$, show that $\tan 2B = \frac{m-n}{1+mn}$.

Web Resources

1. Baffled with Unit Circle and the value of trigonometric functions?!

Check out the Tutorial: Unit Circle &Trig Function http://goo.gl/XFbYkx

and make sure you attempt the Unit Circle Quizzes and self-assess yourself.

2. Did you know that you can use Google Search to plot the graphs?!

Master the Graphs of Trigonometric functions by taking this quiz:

http://goo.gl/9T8Ot4

Assignment No. 4

Linear Inequalities

Each part of Q. No 1 and Q. No. 2- 4 are very short answer type questions:

1. If a, b, c are real numbers such that $a \leq b, c > 0$, then

   (i) $ac \leq bc$ (ii) ac < bc (iii)ac > bc (iv) $ac \geq bc$. Choose the correct option.

2. Solve for x: $3x + 9 \geq -x + 19$
3. Solve : $3x - 4 < 7$,when $x \in Z$
4. Solve the following system of inequalities : $2x - 3 < 7, 2x > -4$
5. How many litres of a 30% acid solution must be added to 500 litres of a

   12% solution so that acid content in the resulting mixture will be more than 14%

   but less than 20%.

6. Solve $6x + 2 < 4x + 7$, when (i) x is a natural number

   (ii) x is an integer (iii) x is a real number

   and represent solution for each part on the number line

7. Find all pairs of consecutive even positive integers, both of which are larger than 7, such that their sum is less than 30.
8. The water acidity in a pool is considered normal when the average pH reading of three daily measurements is between 7.2 and 7.8. If the first two pH readings are 7.48 and 7.85, find the range of pH value for the third reading that will result in the acidity level being normal.
9. Solve the following linear inequalities and show the graph of solution in each case on the number line :($x \in R$)

   (i) $\frac{2x+3}{4} - 3 < \frac{x-4}{3} - 2$ (ii) $|3x - 7| > 4$

   (iii) $\frac{5x+8}{4-x} < 2$ (iv) $\left|\frac{3x-4}{2}\right| \leq \frac{5}{12}$ (v) $3x - 2 > x + \frac{4-x}{3} > 3$

10. Solve the following system of inequalities :

(i) $5x - 7 < 3(x+3)$, $1 - \frac{3x}{2} \geq x - 4$

(ii) $\frac{5x}{4} + \frac{3x}{8} > \frac{39}{8}$, $\frac{2x-1}{12} - \frac{x-11}{3} < \frac{3x+1}{4}$

11. Solve the following system of inequalities graphically:

(i) $3x + 4y \geq 12,\ 4x + 7y \leq 28,\ y \geq 1,\ x \geq 0,\ y \geq 0$

(ii) $x + 2y \leq 10,\ x + y \geq 1,\ x - y \leq 0,\ x \geq 0,\ y \geq 0$

(iii) $x + 2y \leq 40, 3x + y \geq 30, 4x + 3y > 60, x \geq 0, y \geq 0$

Web Resources:

- For a quick revision of "Solving System of Linear Inequalities " visit the webpage http://goo.gl/QgGI8n
- Although we cannot accept printouts of graphs in HW and tests why not use Desmos Calculator (https://www.abettercalculator.com/c), free online Graphing calculators to self check the graphs of Q11.

Assignment No. 5

Complex Numbers and Quadratic Equations

Q. No. 1 - 5 are very short answer type questions:

1. Find the value of x and y $(x, y \in R)$ if : $2y+(3x-y)i=5-2i$
2. Express $3i^3+6i^{16}-7i^{29}+4i^{27}$ in the form $x+iy$ where $x, y \in R$.
3. Evaluate : $\left(i^{41}+\frac{1}{i^{257}}\right)^9$
4. If $Z_1=1-i, Z_2=-2+4i,$ find $\text{Im}\left(\frac{Z_1 Z_2}{\overline{Z_1}}\right)$.
5. Find the conjugate of the complex number: $\frac{1}{2-3i}$
6. Write the following complex numbers in the polar form:

   (i) $-2-2i$ (ii) $\frac{1}{1+i}$

7. Find the complex conjugate of $\frac{(8-3i)(6-i)}{2-2i}$.
8. Find the multiplicative inverse of $\left(\frac{3+4i}{4-5i}\right)$
9. Find the modulus and argument of $\frac{1+2i}{1-3i}$
10. If $(a+ib)^2=(x+iy)$, prove that $\left(a^2+b^2\right)^2=\left(x^2+y^2\right)$
11. Find x and y if $\frac{(1+i)x-2i}{3+i}+\frac{(2-3i)y+i}{3-i}=i$
12. For what values of x and y are the numbers $-3+ix^2y$ and x^2+y+4i complex conjugates? (x, y are real numbers.)

13. Solve the following quadratic equations:

(i) $6x^2 - 17ix - 12 = 0$ (ii) $3x^2 + 7ix + 6 = 0$

$(iii) x^2 - (7-i)x + 18 - i = 0$

$(iv) x^2 - \left(3\sqrt{2} - 2i\right)x - 6\sqrt{2}i = 0$

$(v) 2x^2 - (3+7ix)x + 9i - 3 = 0$

14. Find the square root of: $(i) -8-6i, (ii) -5+12i, (iii) -i$

Web Resources

- Visit http://rossroessler.tripod.com/ for a short and interesting note put together by a student on the History of i
- For a more detailed information on History of Complex numbers read http://goo.gl/3qzaBY

http://goo.gl/8t2JUf

Assignment No. 6

Permutations and Combinations

Q. No. 1- 5 are very short answer type questions:

1. If ${}^{n}C_{10} = {}^{n}C_{12}$, find ${}^{23}C_{n}$.
2. If ${}^{16}C_{r} = {}^{16}C_{r+2}$, find ${}^{r}C_{4}$.
3. If ${}^{11}P_{r} = {}^{12}P_{r-1}$, find r.
4. In an examination, a student is to answer 4 questions out of 5. Question 1 and 2 are, however compulsory. Determine the number of ways in which the student can make the choice.
5. How many three-digit numbers are there, with distinct digits, with each digit odd?
6. In how many ways can the 6 boys and 5 girls be arranged for a group photograph if the girls are to sit on chairs in a row and the boys are to stand in a row behind them?
7. How many numbers between 400 and 1000 can be formed with the digits 0, 2, 3, 5, 6, 7 if no digit is repeated in the same number?
8. Find the number of ways in which 5 boys and 5 girls be seated in a row so that :
   (i) no two girls may sit together.
   (ii) all the girls sit together and all the boys sit together.
9. How many permutations can be formed by the letters of the VOWELS, when
   (i) there is no restriction on letters?
   (ii) each word starts with O and ends with L?
   (iii) all vowels come together?
   (iv) all vowels never come together?
10. Out of 5 boys and 3 girls, a committee of 5 is to be formed. In how many ways can it be done if the committee contains
    (i) exactly two girls?
    (ii) at least two girls?

(iii) at most two girls?

11. How many words can be formed with the letters of the word UNIVERSITY, the vowels remaining together?
12. How many numbers greater than a million can be formed with the digits 2, 3, 0, 7, 7, 3, 7?
13. In an examination a candidate has to pass in each of the four subjects. In how many ways can he fail?
14. If the letters of the word SACHIN are arranged in all possible ways and these words are written out as in a dictionary. Prove that the word SACHIN appears at serial number 601.
15. How many numbers can be formed with the digits1, 2, 3, 4, 3, 2, 1 so that the odd digits always occupy the odd places?

Web Resources:

- To revisit the concept of permutation and combination

  http://goo.gl/Yc166n
- Take a quick online quiz at

  http://goo.gl/luDjHo

Assignment No. 7

Binomial Theorem

Each part of Q. No. 1 & 2 and Q. No. 3- 8 are very short answer type questions:

1. Find the number of terms in the expansion of the following:

$(i)\left(x^2-y\right)^{16}, (ii)\left(2x+3y-4z\right)^n, (iii)\left[\left(3x+y\right)^8-\left(3x-y\right)^8\right]$

2. Write down the general term in the expansion of

$(i)\left(1-x^3\right)^{11}, (ii)\left(x^2-\dfrac{1}{x}\right)^{12}.$

3. Find the 6th term in the expansion of $\left(\dfrac{4x}{5}-\dfrac{5}{2x}\right)^9$.

4. Find the 5th term from the end in the expansion of $\left(\dfrac{x}{2}+\dfrac{2}{x}\right)^{10}$.

5. Find the 13th term in the expansion of $\left(9x-\dfrac{1}{3\sqrt{x}}\right)^{18}$.

6. In the expansion of $(1+x)^{2n}$ the coefficients of $(p+1)th$ and $(p+3)th$ terms are equal, prove that $p=n-1$.

7. For what value of m, the coefficients of the $(2+m)th$ and $(4m+5)th$ terms in the expansion of $(1+x)^{10}$ are equal.

8. Find the coefficient of:

(i) x^{-3} in the expansion of $\left(2x^2+\dfrac{1}{x}\right)^{12}$

(ii) x^2 in the expansion of $\left(3x-\frac{1}{x}\right)^6$.

9. Find the term independent of x in the expansion of:

(i) $\left(2x-\frac{1}{x}\right)^{10}$ (ii) $\left(3x-\frac{1}{x}\right)^6$

10. Show that the ratio of the coefficients of x^{10} in the expansion of $\left(1-x^2\right)^{10}$

and the absolute term in the expansion $\left(x-\frac{2}{x}\right)^{10}$ is 1:32.

11. If the coefficients of the three successive terms in the expansion of $\left(1+x\right)^n$

are 462, 330 and 165, find n.

12. Using Binomial Theorem, show that $3^{2n+2}-8n-9$ is divisible by 64 for all

natural numbers n.

13. If the coefficients of 2nd, 3rd and 4th terms in the expansion of $(1+x)^{2n}$ are in A.P., show that $2n^2-9n+7=0$.

14. Prove that there is no term involving x^{-1} in the expansion of $\left(\frac{x^2}{2}+\frac{1}{x}\right)^{12}$.

15. Find the coefficient of x^5 in the expansion of $(1+x)^3(1-x)^6$.

Web Resources:

- For step by step construction of Pascal's Triangle http://goo.gl/qkNoiJ

Assignment No. 8

Sequences and Series

Q. No 1- 7 are very short answer type questions:

1. Write the value of the 10th term of the sequence: $1(1)+2(1+2)+3(1+2+3)+.....$

2. The 4th term of a G.P. is x, the 10th term is y and the 16th term is z. Write the relation between x, y and z.

3. Insert three numbers between 2 and 32 so that the resulting sequence is a G. P.

4. Which term of the series : $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+.....$ is $\frac{1}{512}$?

5. The third term of a G. P. is 4, find the product of first 5 terms.

6. Evaluate: $\sum_{1}^{20}\left(2^{n}+5^{n-1}\right)$.

7. Insert two numbers between 2 and 3 so that the resulting sequence is an A. P.

8. (i) If a^2, b^2, c^2 are in A.P., then show that $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are also in A.P.

   (ii) $\frac{b+c-a}{a}, \frac{c+a-b}{b}, \frac{a+b-c}{c}$ are in A.P., then prove that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

9. The ratio of the sum of n terms two A.P.'s is $(3n+4):(5n+6)$, , find the ratio of their 5th terms.

10. There are n A.M.'s between 3 and 17. The ratio of the last mean to the first mean is 3:1. Find the value of n.

11. The product of three numbers in a G.P. is 216 and the sum of the product of the numbers taken in pairs is 156. Find the numbers.

12. Three numbers are in A.P. and their sum is 15. If 1, 3, 9 be added to them respectively, they form a G.P. Find the numbers.

13. Find the sum to n terms of the series:

$(i) 2+5+10+17+26+.....$
$(ii) 2+5+11+23+47+.....$

14. Find the sum to n terms of the series:

$$(i)\frac{1^3}{1}+\frac{1^3+2^3}{2}+\frac{1^3+2^3+3^3}{3}+.....$$

$$(ii) 1.2^2+3.3^2+5.4^2+7.5^2+.....$$

15. The first term of a G.P. is 2 and sum to infinity is 6. Find the common ratio.
16. The sum of an infinite G.P. is 15 and the sum of their squares is 45. Find the G.P.
17. The first term of G.P. exceeds the 2nd term by 2 and the sum to infinity is 50. Find the G.P.

Web Resources:

- www.mathcentre.ac.uk/types/**video**/geometric/

  This unit introduces **sequences and series**, and gives some simple examples of each.

Assignment No. 9

Straight Lines

<u>Q. No. 1 - 7 are very short answer type questions</u>:

1. Reduce $x+\sqrt{3}y+12=0$ to the normal form and hence find the distance of the line from the origin.
2. Find the distance between the parallel lines $2x-3y+9=0$ and $4x-6y+1=0$.
3. A line passes through the points $(4,-6)$ and $(-2,-5)$. Does it make an acute angle with the positive direction of x-axis?
4. Determine x so that the inclination of the line containing the points $(x,-3)$ and $(2,5)$ is $135°$.
5. Find the equation of the line with slope -1 and whose perpendicular distance from the origin is equal to 5.
6. Find the equation of the line passing through the point $(-4,3)$ and parallel to y-axis.
7. At what point must the origin be shifted, if the coordinates of a point (-4,2) becomes (3,-2)?
8. A line passes through (7, 9) and the portion of it intercepted between the axes is divided by this point in the ratio 3 : 1. Find the equation of the line.
9. Find the equation of the line which passes through the point (-3, -2) and cuts off intercepts on x and y axes which are in the ratio 4:3
10. If $A(1,4), B(2,-3), C(-1,-2)$ are the vertices of ΔABC, find the equation of: (i) the median through A. (ii) the altitude through A. (iii) right bisector of BC.
11. Find the angles of a triangle whose sides are x + 2y – 8 = 0; 3x + y – 1 = 0 and x – 3y + 7 = 0.
12. Find the equation of the line such that the area of the triangle formed by the line and the coordinate axes in the first quadrant is 30 and length of the hypotenuse is 13.
13. Prove that line 5x – 2y – 1 = 0 is mid parallel to the lines 5x – 2y – 9 = 0 and 5x – 2y + 7 – 0.
14. Find the circumcentre of the triangle whose vertices are $(3,0)$, $(-1,-6)$ and $(4,-1)$
15. Find the equations of straight lines which are perpendicular to the line 3x + 4y – 7 = 0 and are at a distance of 3 units from (2, 3)

16. Find the equations of the lines which pass through $(4,5)$ and make an angle of $45°$ with the line $2x + y + 1 = 0$.
17. Find the coordinates of the foot of the perpendicular from the point $(2,3)$ on the line $x = 3y + 4$.
18. Find the image of the point (4, -13) in the line mirror 5x + y +6 = 0 .
19. If the image of the point $(2,1)$ in a line is (4, 3), then find the equation of the line.
20. Find the equation of the line passing through the intersection of the lines $3x + y - 9 = 0$ and $4x + 3y - 7 = 0$ and perpendicular to the line $5x - 4y + 1 = 0$.
21. If the origin is shifted to the point $(3,-1)$, find the new equation of the straight line $2x - 3y + 5 = 0$.
22. The line 2x – 3y = 4 is the perpendicular bisector of the line segment AB. If coordinates of A are (-3, 1), find the coordinates of B.

Web Resources:

Create GeoGebra worksheet to demonstrate 'slope' of a line
(the video available here: http://goo.gl/9rguCr may be used as reference)

Video by MyWhyU (http://goo.gl/mo3uCk) starting at 2:00 min to introduce idea of slope

Assignment No.10

Conic Sections

Q. No. 1- 5 are very short answer type questions:

1. Find the equation of the parabola with vertex $(0,0)$ and focus at $(-4,0)$.
2. Find the length of the latus rectum of the hyperbola $16y^2 - 4x^2 = 16$.
3. Find the equation of the ellipse whose end points of major axis are $(0,\pm\sqrt{5})$ and of minor axis are $(\pm 1,0)$.
4. Find the equation of the circle with centre $(-3,2)$ and radius 4.
5. Find the radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$.
6. Find the equation of a circle concentric with the circle $2x^2 + 2y^2 - 6x + 8y + 1 = 0$ and of double its area.
7. Show that the points $A(1,0), B(2,-7), C(8,1)$ and $D(9,-6)$ all lie on the same circle. Find the equation of this circle, its centre and radius.
8. Find the equation of the circle circumscribing the triangle formed by the lines $x + y = 6, 2x + y = 4, x + 2y = 5$
9. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum:

   (i) $y^2 = -6x$ (ii) $x^2 = 8y$

10. Find the equation of the parabola that satisfies the given conditions:

    (i) Focus is $(0,-4)$; directrix is $y = 4$

    (ii)Vertex is $(0,0)$ and it passes through the point $(3,2)$ and is symmetric with respect to x-axis.

11. Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latus rectum of the ellipse:

    (i) $16x^2 + 25y^2 = 400$ (ii) $16x^2 + 9y^2 = 144$

12. Find the equation for the ellipse that satisfies the given conditions:

    (i) $e = \frac{1}{2}$ and foci are $(\pm 2, 0)$.

    (ii) $e = \frac{2}{3}$ and length of latus rectum = 5.

13. Find the coordinates of the foci, the vertices , the eccentricity and the length of the latus rectum of the hyperbolas:

    (i) $25x^2 - 36y^2 = 225$ (ii) $16y^2 - 4x^2 = 1$

14. Find the equation for the hyperbola that satisfies the given conditions:

    (i) distance between whose foci is 32 and whose eccentricity is $2\sqrt{2}$.

    (ii) $e = 3$ and length of latus rectum is 4 units.

Web Resources:

Check out following resources for visualizing and learning more on Conic Sections:

- http://goo.gl/BE1YpH
- http://goo.gl/qRHCBL
- http://goo.gl/tDu04p
- http://goo.gl/Z5ap4L
- http://goo.gl/fBY4DX

Assignment No. 11

Three Dimensional Geometry

<u>Q. No. 1- 5 are very short answer type questions</u>:

1. The points $(4,7,8),(2,3,4)$ and $(-1,-2,1)$ are the three vertices of a parallelogram. The fourth vertex of the parallelogram is : (a) $(1,2,-5)$ (b) $(1,2,5)$ (c) $(1,-2,5)$ (d) $(-1,2,5)$
2. Find the points on the y-axis which are at a distance of 3 units from the point $(2,3,-1)$.
3. Find the coordinates of the point which divides the join of $(1,-2,3)$ and $(3,4,-5)$ in the ratio 2 : 3 externally.
4. Show that the points $(1,3,2)$, $(3,0,8)$ and $(9,-2,5)$ are the vertices of an isosceles right angled triangle.
5. Show that the points $A(-2,3,5)$, $B(1,2,3)$ and $C(7,0,-1)$ are collinear. Find the ratio in which C divides AB.
6. Find the ratio in which the YZ-plane divides the segment joining the points $(1,2,4)$ and $(3,8,6)$. Also find the coordinates of the point of intersection.
7. Two vertices of a triangle are $(4,-6,3)$ and $(2,-2,1)$ and its centroid is $\left(\frac{8}{3},-1,2\right)$. Find the third vertex.
8. Show that the points $A(2,3,-2)$, $B(6,9,-4)$, $C(7,0,-1)$ and $D(3,-6,1)$ taken in order are the vertices of a parallelogram. Also, show that the segments AP and BD trisect each other, P being the mid-point of BC.
9. A point C with z-coordinate 8 lies on the line segment joining the points $A(2,-3,4)$ and $B(8,0,10)$. Find its coordinates.
10. Find the point on the z-axis which is equidistant from the points $(3,2,1)$ and $(5,2,5)$.

Web Resources:

A Video to introduce Three Dimensional Geometry: http://goo.gl/GZHOSs

Assignment No. 12

Limits and Derivatives

Each part of Q. No.1 & 2 and Q. No. 3- 4 are very short answer type questions:

1. Evaluate the following

$$:(i)\lim_{x\to -2}\left(\frac{1}{x+2}\right)\left(\frac{1}{x}+\frac{1}{2}\right),(ii)\lim_{x\to -1}\left(\frac{x^3+1}{x+1}\right),(iii)\lim_{x\to 2}\left(\frac{1}{x-2}-\frac{4}{x^3-2x^2}\right),(iv)\lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1-x}}{x}$$

$$(v)\lim_{x\to 0}\frac{(8+x)^{\frac{1}{3}}-2}{x}\quad (vi)\lim_{x\to 7}\frac{4-\sqrt{9+x}}{1-\sqrt{8-x}}$$

2. If $f(x)=x^2-x+1$, find $f'(4)$.

3. Differentiate, w. r. to x, the following functions:

$$(i)\left(x-a\right)\left(x^2-b\right),(ii)x^3\tan x,(iii)\frac{x+3}{x^2+1}.$$

4. If for the function f, given by $f(x)=kx^2+7-4,\ f'(5)=97$, find k.

5. Evaluate the following limits:

$$(i)\lim_{x\to 2}\frac{x^3+3x^2-9x-2}{x^3-x-6},(ii)\lim_{x\to 0}\frac{x\cos x+\sin x}{x^2+\tan x},(iii)\lim_{x\to 0}\frac{\tan 2x-\sin 2x}{x^3},$$

$$(iv)\lim_{x\to 0}\frac{1-\cos 4x}{1-\cos 6x},(v)\lim_{x\to\pi}\frac{\sin 3x-3\sin x}{(\pi-x)^3}.$$

$$(vi)\lim_{x\to\frac{\pi}{4}}\frac{\sqrt{2}-\cos x-\sin x}{(4x-\pi)^2}$$

6. Differentiate the following functions w. r. to x from the first principles: $(i)\,x-\frac{1}{x}$, $(ii)\,x^2+\frac{1}{x^2}$, $(iii)\,sec\left(x+1\right)$, $(iv)\,\frac{\sin x}{x}$, $(v)\,x\cos x$.

7. Differentiate, w. r. to x, the following functions:

$$(i)\frac{\sec x-1}{\sec x+1},(ii)\frac{x\sin x}{1+\cos x},(iii)\left(x-\frac{1}{x}\right)\left(x^2-\frac{1}{x^2}\right),(vi)\frac{2}{x+1}-\frac{x^2}{3x-1}.$$

8. Evaluate the following limits, if they exist**:**

$$(i)\lim_{x\to 0} f\left(x\right) \text{ where } f\left(x\right)=\begin{cases}\dfrac{3x}{|x|+2x}, x\neq 0\\ 0, x=0\end{cases},$$

$$(ii)\lim_{x\to\frac{1}{2}} f\left(x\right) \text{ where } f\left(x\right)=\begin{cases}x, 0\le x<\dfrac{1}{2}\\ \dfrac{1}{2}, x=\dfrac{1}{2}\\ 1-x, \dfrac{1}{2}<x\le 1\end{cases},$$

$$(iii)\lim_{x\to 2} f\left(x\right) \text{ where } f\left(x\right)=\begin{cases}x-[x], x<2\\ 4, x=2\\ 3x-5, x>2\end{cases}.$$

9. Let $f\left(x\right)=\begin{cases}ax-4, x<1\\ 1, x=1\\ 4x^2+bx, x>1\end{cases}$ and if $\lim_{x\to 1} f\left(x\right)=f\left(1\right)$, what are the possible values of a and b?

10. Evaluate the following limits:

$$(i)\lim_{x\to 0}\frac{e^{2x}-2e^x+1}{x},(ii)\lim_{x\to 0}\frac{e^{5x}-e^{3x}}{x},(iii)\lim_{x\to 0}\frac{\log(1+5x)}{\sin x},(iv)\lim_{x\to 0}\frac{6^x-2^x-3^x+1}{x^2}$$

Web Resources:

Need to refresh the concepts of “Limits and Derivatives”?

- Visit http://www.calculus-help.com/tutorials and get your concepts cleared up once again.
- See the explanation and Sample examples at http://goo.gl/CUqF6V and also try the applet to evaluate limits.

Assignment No. 13

Probability

Each part of Q. No 1 - 4 and Q. No. 5 are very short answer type questions:

1. A coin is tossed. If the result is a tail, the coin is tossed again. Otherwise a die is rolled. Describe the following events as a set:

   (i) Getting at least one tail

   (ii) Getting a head

   (iii) Getting a head and an even number

2. An experiment involves rolling a pair of dice and recording the numbers that come up. Consider the following events:

   A = The sum is even

   B = The sum is a multiple of 3

   C = The sum is less than 4

   D = The sum is greater than 11

   Prove that

   (i) A and B are not mutually exclusive.

   (ii) A and C are not mutually exclusive.

   (iii) A and D are not mutually exclusive.

   (iv) B and C are not mutually exclusive.

   (v) B and D are not mutually exclusive.

   (vi) C and D are mutually exclusive.

3. In a single throw of two dice, what is the probability of getting (i) a doublet? (ii) a total of more than 10? (iii) an odd number on one and a multiple of 3 on the other?

4. An urn contains 9 red, 7 white and 4 black balls. If two balls are drawn at random, find the probability that (i) both the balls are red. (ii) one ball is white. (iii) one is white and the other is red.

5. Find the probability that in a random arrangement of the letters of the word REPUBLIC, the vowels do not come together.

6. 4 cards are drawn at random from a pack of 52 cards. Find the probability of getting (i) all the four cards of the same suit. (ii) all the four cards of the same number. (iii) one card from each suit. (iv) two red cards and two black cards. (v) all cards of the same colour. (vi) all face cards.

7. An urn contains 9 red, 7 white and and 4 black balls. If two balls are drawn at random, find the probability that the balls are of the same colour.

8. The probability that a person visiting a dentist will have his teeth cleaned is 0.44, the probability that he will have a cavity filled is 0.24. The probability that he will have his teeth cleaned or a cavity filled is 0.60. What is the probability that a person visiting the dentist will have his teeth cleaned and cavity filled?

9. In a single throw of two dice, find the probability that neither a doublet nor a total of 9 will appear.

10. Of the students attending a lecture, 50% could not see what was written on the board and 40% could not hear what the lecture was saying. Most unfortunate 30% fell into both of these categories. What is the probability that a student picked at random was able to see and hear satisfactorily?

11. In a class of 100 students, 60 drink tea, 50 drink coffee and 30 drink both. A student from this class is selected at random. Find the probability that the student takes (i) at least one of two drinks. (ii) only one of two drinks.

12. A basket contains 20 apples and 10 oranges out of which 5 apples and 3 oranges are defective. If a person takes out 2 at random, what is the probability that either both are apples or both are good?

13. A class contains 10 boys and 8 girls. Three students are selected at random. What is the probability that the selected group has (i) all boys? (ii) all girls?

14. Two dice are thrown together. What is the probability that the sum of the numbers on the two faces is (i) divisible by 3 or 4? (ii) neither divisible by 3 nor 4? (iii) either a multiple of 3 or 2?

15. A card is drawn from a deck of 52 cards. Find the probability of getting a king or a heart or a red card.

16. Six boys and six girls sit in a row at random. Find the probability that (i) the six girls sit together. (ii) the boys and girls sit alternately.

Web Resources:

https://youtu.be/AY3O_qsSnbE

https://youtu.be/wqt2RVgBSmQ

QUESTION BANK

<u>Q. No. 1- 42 are very short answer type questions:</u>

1.Write the set $\left\{\frac{2}{2},\frac{4}{3},\frac{6}{4},\frac{8}{5},\frac{10}{6},\frac{12}{7},\frac{14}{8}\right\}$ in set builder form.

2.Find the domain of the real valued function $f(x)=\frac{1}{x^2-3x+2}$

3.Let $n(A)=2$ & $n(B)=3$, then find the number of relations from A to B.

4.Write the relation $R=\left\{\left(x,x^3\right): x \text{ is a prime number less than } 6\right\}$ in roster form.

5.Find the domain and the range of the relation $\left\{\left(x,y\right):\ x\in N, x+y=5\right\}$

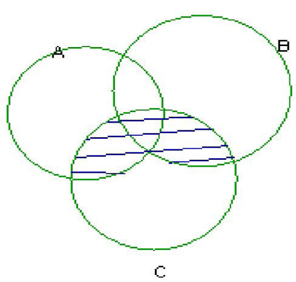
6. If $A=\{1,2,3\}$ & $B=\{4,5,6\}$, is $R=\{(4,2),(1,4),(1,6)\}$ a relation from A to B. Justify.

7.Write the value of $2\cos^2 15^\circ-1$.

8.Prove that $\frac{1-\cos A}{1+\cos A}=\tan^2\frac{A}{2}$

9.Solve $5x-3<3x+1$ when (i) x is an integer (ii) x is a real number

10.What does the shaded portion in the figure represent?



11.If the ordered pairs $(a,-1)$ and $(5,b)$ belong to $\left\{(x,y): y=2x-3\right\}$. Find the values of a and b.

12.Find the real values of x and y if : $\frac{x-1}{3+i}+\frac{y-1}{3-i}=i$

13.Express complex number $\frac{i^2+i^4+i^6+i^7}{1+i^2+i^3}$ in the form $a+ib$

14.Find the mirror image of point $(-7,2,-1)$ in the ZX -plane.

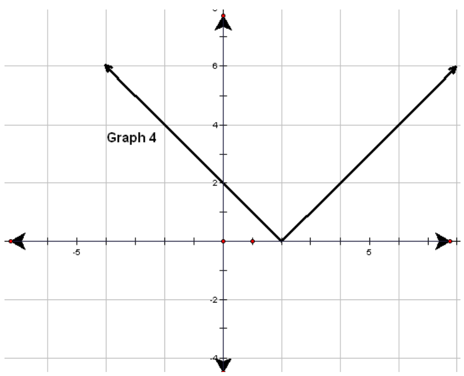
15.Find y if the slope of the line joining $(-8,11),(2,y)$ is $\frac{-4}{3}$.

16.Find the distance of the point $P(-1,1)$, from the line $12(x+6)=5(y-2)$.

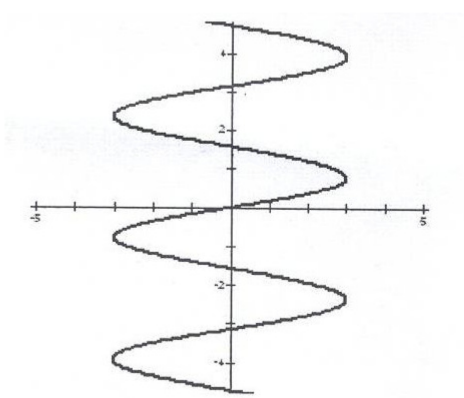
17.For the parabola $x^2=-9y$,find the length of the latus rectum

18.Find the centre and radius of the circle $x^2+y^2-4x-8y-45=0$

19.Is the following graph, the graph of a function of x? Justify



20.Is the following graph, the graph of a function of x? Justify



21.Find the 7th term in the expansion of $\left(x^2+\frac{2}{x}\right)^9$.

22.Write down the general term in the expansion of $\left(\frac{1}{x}-x^3\right)^{10}$.

23.Find the coefficient of a^5 in the expansion of $(a+5)^6$.

24.Find the 4th term from the end in the expansion of $\left(\frac{x^3}{2}-\frac{2}{x^2}\right)^9$.

25.Find the sum of all numbers with two digits.

26.If A is the A. M. between a and b, prove that $(A-a)^2+(A-b)^2=\frac{1}{2}(a-b)^2$.

27.If G is the G. M. between two distinct positive numbers a and b, then show that $\frac{1}{G-a}+\frac{1}{G-b}=\frac{1}{G}$.

28.Evaluate $\sum_{1}^{10}(2^n-1)$.

29.Find the nth term of the series: $1^2+(1^2+2^2)+(1^2+2^2+3^2)+....$

30.Find the sum: $5^3+6^3+7^3+....+10^8$.

31.If $(n+1)!=12(n-1)!$, find n.

32.Prove that $n!+(n+1)!=(n+2)n!$

33.How many different numbers of three digits can be formed without using the digits 0, 2, 3, 4, 5 and 6?

34.Two cards are drawn from a deck of 52 cards one by one with replacement. Find the number of ways in which it can be done.

35. There are 12 doors in a hall. In how many ways can a person enter the hall through a door and leave it by a different door?

36.Evaluate: $\lim_{x\to-1^+}\sqrt{x+1}$. What can you say about $\lim_{x\to-1^-}\sqrt{x+1}$?

37.Evaluate the following limit: $\lim_{x\to1}\left(\frac{1}{x-1}-\frac{2}{x^2-1}\right)$

38. If $f(x)=2x^2+1$, find $f'(0)$.

39.Differentiate, w. r. to x, the following function: $2\sin x + 5x^2 \cot x$.

40.If A and B are two mutually exclusive events.

If $P(A)=\frac{1}{4}, P(B)=\frac{2}{5}$ and $P(A \cup B)=\frac{1}{2}$. Find the value of $P\left(A \cap \overline{B}\right)$.

41.The probabilities that at least one of the events A and B occurs is 0.6. If A and B occur simultaneously with probability 0.2, find $P\left(\overline{A}\right)+P\left(\overline{B}\right)$.

42. If $f(x)=x^3-\frac{1}{x^3}$, then find the value of $f(x)+f\left(\frac{1}{x}\right)$

43. Let $U=\{1,2,3,4,.........10\}$, $A=\{1,2,3,4,5\}$, $B=\{1,2,3,4,6,8,10\}$

$C=\{1,3,5,7,9\}$, find (a) $(A\cap B)'$ (b) $(B-C)'$ (c) $(A\cup B)'-(A\cup C)'$

44.Prove the following:

$(i)\ \frac{\cos 5x+\cos 3x}{\sin 5x-\sin 3x}=\cot x.$

$(ii)\ \cos^2 x+\cos^2\left(x+\frac{\pi}{3}\right)+\cos^2\left(x-\frac{\pi}{3}\right)=\frac{3}{2}$

(iii) $\frac{\sin 8x\cos x-\sin 6x\cos 3x}{\cos 2x\cos x-\sin 3x\sin 4x}=\tan 2x$

45. $\tan A=\frac{3}{4}, \cos B=\frac{9}{11}$, where $\pi<A<\frac{3\pi}{2}$ and $0<B<\frac{\pi}{2}$, then find the value of $\tan(A+B)$.

46.Find the equations of the lines which passes through the point $(3,4)$ and the sum of its intercepts on the axes is 14

47.If origin is the centroid of the triangle PQR with vertices $P(2a,2,6)$,$Q(-4,3b,-10)$ and $R(8,14,2c)$, then find the values of a,b,c

48.Find the equation of the line midway between parallel lines $9x+6y-7=0$ and $3x+2y+6=0$

49.Simplify each of the following:

$$(i)\frac{\sin(180^\circ+\theta)\cos(360^\circ-\theta)\tan(270^\circ-\theta)}{\sec^2(90^\circ+\theta)\tan(-\theta)\sin(270^\circ-\theta)}.$$

$$(ii)\frac{\cos(2\pi+\theta)\operatorname{cosec}(2\pi+\theta)\tan\left(\frac{\pi}{2}+\theta\right)}{\sec\left(\frac{\pi}{2}+\theta\right)\cos\theta\cot(\pi+\theta)}.$$

50.Prove that: $(i)\cos A\cos(60^\circ-A)\cos\left(60^\circ+A\right)=\frac{1}{4}\cos 3A.$

(ii) $1+\cos^2 2x=2\left(\cos^4 x+\sin^4 x\right)$

51.Find the general solution:

(i) $\tan x+\sec x=\sqrt{3}$

(ii) $\cos 3x+\cos x-2\cos 2x=0$

(iii) $4\cos^2 x-4\sin x-1=0$

52.In a town of 10000 families, it was found that 4000 families read newspaper A,2000 families read newspaper B, 1000 families read newspaper C, 500 families read both A and B, 300 families read both B and C and 400 read both A and C. 4000 families read neither A nor B nor C. Find the number of families that read (i) all the three (ii) exactly two newspapers (iii) A and C but not B (iv) do not read A.

53.Solve the following quadratic equations:

(i) $3x^2-4x+\frac{20}{3}=0$ (ii) $\sqrt{5}x^2+x+\sqrt{5}=0$

54. If $Z_1 = 2 - i$ and $Z_2 = -2 + i$, find (i) $\text{Re}\left(\frac{Z_1 Z_2}{\overline{Z_1}}\right)$ (ii) $\text{Im}\left(\frac{1}{Z_1 \overline{Z_1}}\right)$

55.Find the modulus of $\frac{2+i}{4i + (1+i)^2}$

56.Convert the complex number $3\left(\cos\frac{5\pi}{3} - i\sin\frac{\pi}{6}\right)$ into polar form.

57.Find the equation of the circle whose centre is $(2,-3)$ and passes through the intersection of the lines $3x - 2y - 1 = 0$ and $4x + y - 27 = 0$

58.Find the equation of the ellipse with eccentricity $\frac{3}{4}$, foci on y -axis, center at the origin and passing through the point $(6,4)$.

59.Find the coordinates of the foci, the vertices , the eccentricity and the length of the latus rectum of the hyperbola: $5y^2 - 9x^2 = 36$

60.Find the equation of the line on which the perpendicular from origin makes an angle of $30°$ with the x-axis and which forms a triangle of area $\frac{50}{\sqrt{3}}$ square units with the axes

61.One diagonal of a square lies along the line $x - 2y + 2 = 0$ and one vertex of the square is $(1,4)$. Find the equations of all the sides and the other diagonal of the square.

62.If the image of the point $(2,1)$ in a line is $(4,3)$, find the equation of the line.

63.A ray of light is sent along the line $x - 2y - 3 = 0$. Upon reaching the line $3x - 2y - 5 = 0$ the ray is reflected from it. Find the equation of the line containing the reflected ray.

64.If the points $P(0,-11,4), Q(4,p,-2)$ and $R(2,-3,1)$ are collinear, find the value of p .

65.Find the domain and range of $f(x) = \frac{1}{\sqrt{4 - x^2}}$.

66.Find the equation of the circle that passes through $(2,-2),(3,4)$ and has centre on the line $2x + 2y = 7$ .Find the centre and radius.

67.Find the equation of the line passing through the intersection of the lines $3x+y-9=0$ and $4x+3y-7=0$ and perpendicular to the line $5x-4y+1=0$

68.Solve the following system of linear inequalities, and represent the solution(if it exists) on the number line:

$$2(2x+3)-10<6(x-2), \frac{2x-3}{4}+6\geq 4+\frac{4x}{3}$$

69.Solve the following system of linear inequalities graphically:

$$3y-2x\leq 4, x+3y>3, x+y\geq 5, y<4$$

$$x+y<5, 4x+y\geq 4, x+5y\geq 5, x\leq 4, y\leq 3$$

70.Write the following complex numbers in polar form:

(i) $\frac{5-i}{2-3i}$ (ii) $\frac{2+6\sqrt{3}i}{5+\sqrt{3}i}$

71. If $\sin x = -\frac{\sqrt{5}}{3}$, x lies in the third quadrant,then find thevalue of $\sin\frac{x}{2}, \cos\frac{x}{2}, \tan\frac{x}{2}$.

72. Find the coefficient of x^{-2} in the expansion of $\left(x+\frac{1}{x^3}\right)^{11}$.

73.Find the term independent of x in the expansion of: $\left(x^2-\frac{2}{x^3}\right)^5$.

74.Find the coefficient of x^7 in $\left(ax^2+\frac{1}{bx}\right)^{11}$ and that of x^{-7} in $\left(ax-\frac{1}{bx^2}\right)^{11}$ and then find the relation between a and b so that these coefficients are equal.

75.Find the middle terms in the expansion of $\left(3x-\frac{x^3}{6}\right)^7$.

76.If the coefficients of the three successive terms in the expansion of $\left(1+x\right)^n$ are in the ratio 1: 7: 42, find n.

77.If in the expansion of $\left(1-x\right)^{2n-1}$,the coefficient of x^r is denoted by a_r, then prove that $a_{r-1}+a_{2n-r}=0.$

78.If the 3rd, 4th, 5th and 6th terms in the expansion of $\left(x+a\right)^n$ respectively are a,b,c and d. Prove that $\frac{b^2-ac}{c^2-bd}=\frac{5a}{3c}$.

79.Prove that the term independent of x in the expansion of $\left(1+x^m\right)\left(1+\frac{1}{x}\right)^n$ is ${}^{m+n}C_n$.

80.If a,b,c are in A. P., prove that $a\left(\frac{1}{b}+\frac{1}{c}\right),b\left(\frac{1}{c}+\frac{1}{a}\right),c\left(\frac{1}{a}+\frac{1}{b}\right)$ are also in A. P.

81.If S_1,S_2,S_3 be the sums of n terms, $2n$ terms and $3n$ terms respectively of a G.P., then prove that $S_1^{\,2}+S_2^{\,2}=S_1\left(S_2+S_3\right)$.

82.If $\left(b-c\right)^2,\left(c-a\right)^2,\left(a-b\right)^2$ are in A. P., prove that $\frac{1}{b-c},\frac{1}{c-b},\frac{1}{a-b}$ are also in A. P.

83.Find four numbers in G. P. whose sum is 85 and the product is 4096.

84.If $\frac{1}{a+b},\frac{1}{2b},\frac{1}{b+c}$ are three consecutive terms of an A. P., prove that a,b,c are three consecutive terms of a G. P.

85.If a,b,c,d are in G. P., show that a + b, b + c, c + d are also in G. P.

86.How many 7 digit numbers can be formed using the digits 1, 2, 2, 0, 4, 2, 4?

87.If the letters of the word SACHIN are arranged in all possible ways and these words are written out as in dictionary, prove that the word SACHIN appears at serial number 601.

88.A hockey team of 11 players is to be selected from two groups of 6 and 10 respectively. In how many ways can the selection be made if the group of 6 shall contribute at least 4 players?

89.Evaluate the following limit, if it exists: $\lim\limits_{x\to 0} f\left(x\right)$ where $f\left(x\right)=\begin{cases}\dfrac{x}{|x|+x^2}, x\neq 0\\ 0, x=0\end{cases}$.

90.Evaluate the following limit, if it exists: $\lim\limits_{x\to 5} f(x)$, where $f(x)=[x+3]-\dfrac{2|x-5|}{x-5}+4x^2$.

91.Differentiate w. r. to x, the following functions: $(i)\dfrac{x\cos x+\cot x}{3x+5}, (ii)\left(x-\dfrac{1}{x+1}\right)\left(3x^2\right)$

92.Evaluate the following limit (if it exists): $\lim\limits_{x\to 0} f(x)$, where $f(x)=\begin{cases}2x-1, x<o\\ o, x=0\\ x^2+1, x>0\end{cases}$

93.Evaluate the following limit (if it exists): $\lim\limits_{x\to 0} f(x)$, where $f(x)=\begin{cases}[x], x>o\\ o, x=0\\ x^2, x<0\end{cases}$

94.Evaluate the following limit: $\lim\limits_{y\to 0}\dfrac{(x+y)\sec(x+y)-x\sec x}{y.}$

95.There are three red and three black balls in a bag. 3 balls are taken out at random from the bag. Find the probability of getting 2 red and 1 black balls or 1 red and 2 black balls.

96. Find the probability of 4 turning up for at least once in two tosses of a fair die.

97.A drawer contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted. If one of them are chosen at random, what is the probability that it is rusted or a bolt?

98.A box contains 100 bolts and 50 nuts. It is given that 50% bolts and 50% nuts are rusted. Two objects are selected from the box at random. Find the probability that both are bolts or both are rusted.

99. The probability that a patient visiting a dentist will have a tooth extracted is 0.06, the probability that he will have a cavity filled is 0.2 and the probability that he will have a tooth extracted as well as cavity filled is 0.03. What is the probability that a patient has either a tooth extracted or a cavity filled?

100.A card is drawn from a well shuffled pack of 52 cards. Find the probability that the card is either a jack or a king or a queen.

Value Based Questions

1. An Eco Club in a school consists of 4 girls and 7 boys. A team of 5 members is to be selected to represent Club in an Interschool Competition. Teacher A recommends that the team should have (i) at least two boys and two girls?How many such teams will be there? Teacher B says the team should have (ii) no girls. How many such teams will be there? Which teacher do you support and why? What value is exhibited by the choice made?
2. A survey of 500 people produced the following information: 285 are honest, 195 are punctual, 115 are responsible, 45 are both honest and responsible, 70 are both honest and punctual, 50 are both punctual and responsible, and 50 people have none of these values. Represent the information by a venn diagram. Find how many (i) have all the three values (ii) have exactly one of the three values (iii) Which value(s) do you prefer and why?
3. Ram is a kind hearted man whose age is x years. He made his will in which he gavetwo times the square of his age to his daughter (in lakhs), 5 times his age to his son (in lakhs) and 7 lakhs to his servant who is working for him for the past 20 years. Express his will as a function of his age (in years) and find the domain and range of the function thus obtained. Which value is exhibited by Ram in his will?
4. A clever student used a biased coin so that head is 3 times as likely to occur as tail. If the coin is tossed once, find the probability of getting head. In any game, if occurrence of head or tail decides the winner, what value do you think is attached with keeping an unbiased coin?
5. In a school 4100 students are classified on the basis of Honesty, Co-operation & Well-Mannerism. Out of these, 600 students are of first kind only i.e. Honest only, 480 are of second kind only i.e. Co-operative only, 320 are of third kind only i.e. well-mannered only, 1600 students are of first & second kind (Honest & well-mannered), 800 students are of second & third Kind (Co-operative & well-mannered), 400 students are of first & third Kind (Honest & Co-operative) & 40 students got the best students award who are honest, co-operative & well-mannered. Find how many students are either Honest or Co-operative or well- mannered. Which trait (Value) according to you is most important in life & why?
6. There is a group of 50 people who are patriotic. Out of which 20 believe in non violence. Two persons are selected at random out of them. What is the probability that (i) both believe in non violence? (ii) one believes in violence and the other in non violence?

Explain the importance of non violence in patriotism.

7. A Discipline Committee of 4 students is selected at random from a group consisting of 8 boys and 4 girls. Find the probability that there are at least 2 girls in the committee. A committee consisting of both boys and girls must be promoted. Why?

Do's and Don'ts for making a PowerPoint Presentation

When used effectively, PowerPoint is a powerful tool which can help you create professional presentations. However, it is worth reminding ourselves of some basic dos and don'ts when designing slides.

Get to the point

Try not to put too much of your presentation script in your PowerPoint slide show. It's not a good idea to use lots of text over too many lines; this makes your slides look cramped, as well as being difficult to follow. If you do have too much text on a slide, there is the danger that you'll be tempted to start reading from the screen rather than communicate with your audience. This makes it difficult to engage or interact with them.

Do not make your audience read the slide rather than listen to what you are saying. The slides should support what you're saying - not say it all for you. The text on the slides should be used as prompts or to back up your messages. Try not to let one point run for more than two lines. A good guide is if a point has lots of punctuation, you are probably trying to say too much. Do make sure that there's lots of white space on your slide, so that text doesn't look cramped or cluttered.

Special effects

Do not confuse your audience by having text and images appearing from the left, right, top, bottom and diagonally on a slide. When used selectively, PowerPoint's animation features can be very effective. Do use the odd animated effect, but consider if your presentation really needs it. Keep to a simple style to present your text and retain the same effect throughout your presentation.

Colour codes

Your slides will be very difficult to read if you use too much colour, and they'll also look less professional. Do choose a background colour that's easy on the eye, and make sure your text colour is a suitable contrast. Dark colours on a light background work well. PowerPoint 2007 has tools to ensure that you always pick complementary colour schemes to create a professional look and feel.

Text size

Do make sure the size of your slide headings doesn't dominate the rest of your text. Don't use large text (eg 72 points) with much smaller body text (eg 20 point), as it will look mismatched. At the same time, you need to make sure your text is large enough to read on screen - think of the people viewing from the back of the room. A point size of 20 or above is a good size to ensure your audience can comfortably read the text, with headings set in a larger size.

Don’t use fonts with serifs(thin lines) like Times New Roman. Fonts without serifs, like Arial, are easier to read. Don’t mix fonts within your presentation - a lack of consistency looks un-professional. Use left justification - it is easier to read than centered, right or fully justified text

(both edges). Words/paragraphs in capital letters, italics or underlined are harder to read.

Best use of images

If you are going to use images, make sure they're appropriate to the points you're trying to make and don't place images on the slide so that they overshadow everything else.

Transition slides

Don't make your audience feel uncomfortable by selecting one of the more outlandish transition styles to move from slide to slide - especially if you opt for a different style each time. For a standard presentation, do use a transition effect that is unobtrusive and subtle. The effect transition slides should only be used if you are trying to make a point.

Is your layout clear?

Do chose one layout style for every slide, such as a main heading with bullet points underneath - it's easy to read and follow. Take advantage of the Themes and Quick Styles available in PowerPoint 2007 to ensure a professional looking layout that has continuity with colour and type face.

Don't be caught out - preview your slide show to ensure you know the final content of each slide.

Charts, graphs and diagrams

Do use the PowerPoint tool to add charts, graphs and diagrams into your presentations, but keep these straightforward and to the point. The SmartArt tool can be used to help present complex information in a simple, easy to understand way. It's a good idea to ensure that these elements are properly labelled with a reference so that people can understand their relevance.

Sample Paper I

First Term

Time : 3 hrs. **Max Mks : 100**

General Instructions:

- All questions are compulsory.
- The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of 4 marks each and section C comprises of 7 questions of six mark each.
- All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- Internal choice has been provided in some questions. You have to attempt only one of the choices in such questions.
- Use of calculators is not permitted. You may ask for logarithmic tables, if required.

Section A

1. Solve: $-12x > 30$ where $x \in N$

2. Write the following set in the roster form

   A = $\{x : x^3 = x, x \in R\}$

3. Evaluate: $\frac{\sin(-\theta)\sec(180°-\theta)\tan(90°-\theta)}{cosec(90°-\theta)\sin(180°+\theta)\cot(360°-\theta)}$

4. Find r if $P(n,r)$= 720 and $C(n,r)$ = 120

5. If A = $\{a,b\}$, B = $\{c,d\}$, then find $B \times (A \cap \emptyset)$

6. Find the principal solution of the equation $cotx = -\sqrt{3}$

Section B

7. Find the domain and range of the function

$f(x) = \frac{x^2}{x^2+1}$

8. Solve : $\frac{-1}{5} \leq \frac{3x}{10} + 1 < \frac{2}{5}$ where $x \in R$. Represent the solution on the number line.

9. If $\sin x + \sin y = a, \cos x + \cos y = b,$ find the value of $\tan\frac{x+y}{2}$

10. Prove the following using principle of mathematical induction that

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots \ldots\ldots\ldots\ldots + \frac{1}{2^n} = 1 - \frac{1}{2^n} \forall\, n \in N.$

11. Verify that

$(A \cap B)' = A' \cup B'$ using Venn diagram

12. Find the general solution of

$4\sin^2\theta - 8\cos\theta + 1 = 0$

OR

$\sqrt{3}\sin x - \cos x = 2$

13. Find the number of arrangements of the letters of the word **INDEPENDENCE.** In how many of these arrangements

(i) do the words start with P?

(ii) do all the vowels occur together?

What is the importance of celebrating Independence day?

14. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has

(i) at least one boy and one girl (ii) at least 3 girls

OR

The letters of the word MOTHER are written in all possible orders and these words are written out as in a dictionary. Find out the rank of the word MOTHER

15. Prove that if $x+y=\frac{\pi}{4}$, then $(cotx-1)(coty-1)=2$

OR

Prove that : $sec2x+tan2x=tan\left(\frac{\pi}{4}+x\right)$

16. Prove that

$$\frac{sin7x+sin5x+sin9x+sin3x}{cos7x+cos5x+cos9x+cos3x}=tan\ 6x$$

17. To receive Grade A in a course, a student must obtain90 marks or more in 5 examinations (each of 100 marks).If Anju's marks in the first four examinations are 87, 92, 94 and 95 ,find the minimum marks Anju must obtain in fifth examination to get grade A in that course. What life skills should she acquire in order to get grade A in the course?

18. (i) Draw the graph of the function defined by $f(x)=[x]$ and find its range.

(ii) Let A =$\{9,10,11,12,13\}$ and let f : A $\rightarrow$ N be defined by f(x) = the highest prime factor of n.

Find the range of f.

19. Prove that : $\frac{\sin 8x\cos x-\sin 6x\cos 3x}{\cos 2x\cos x-\sin 4x\sin 3x}=\tan 2x$

Section C

20. Solve the following system of inequalities graphically: $x + 2y \leq 10$, $x + y < 6$, $x \leq 4$, $x \geq 0$, $y \geq 0$

21. In a survey of 100 car owners it was found that 67 owned car A, 46 owned carB and 40 owned car C. 28 owned both A and B, 8 owned both B and C, 26 owned both A and C and 2 owned all the three cars. Find the number of people who owned

(i) car A but not B and C

(ii) only two of the cars

(iii) none of the cars

22. Prove that:

(i) $cos^2 A + cos^2\left(A + \frac{2\pi}{3}\right) + cos^2\left(A - \frac{2\pi}{3}\right) = \frac{3}{2}$

(ii) $\frac{cos9° + sin9°}{cos9° - sin9°} = tan54°$

OR

(i) $cos^2\frac{\pi}{8} + cos^2\frac{3\pi}{8} + cos^2\frac{5\pi}{8} + cos^2\frac{7\pi}{8} = 2$

(ii) $tan70° = tan20° + 2tan50°$

23. Prove the following by using the principle of mathematical induction for all $n \in N$ $7^n - 3^n$ is divisible by 4.

OR

Prove the following by using the principle of mathematical induction for all $n \in N$

$\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \cdots \ldots\ldots\ldots\ldots\ldots\ldots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{(6n+4)}$

24. (i)If $secx = -3$ and x lies in third quadrant then, find the value of

(a) $sin\frac{x}{2}$ (b) $cos\frac{x}{2}$

(ii) If $cosA = \frac{4}{5}$, $cosB = \frac{12}{13}$, $\frac{3\pi}{2} < A, B < 2\pi$, find the value of $sin(A - B)$

25. (i) Prove that: $sin10°sin30°sin50°sin70° = \frac{1}{16}$

(ii)How many words with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word DAUGHTER

26. There are 8 candidates appearing in a test. 3 of them have to appear in Mathematics and the remaining in 5 different subjects. How many seating arrangements are possible if they are to sit in a row and no two Mathematics student sit together? Which value would students violate if they resort to unfair means? Will such an act hamper their character development in coming years?

Sample Paper II

Second Term

Time : 3 hrs. Max Mks : 100

General Instructions:

- All questions are compulsory.
- The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of 4 marks each and section C comprises of 7 questions of six mark each.
- All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- Internal choice has been provided in some questions. You have to attempt only one of the choices in such questions.
- Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION A

1. Line through the points $(-2, 6)$ and $(4, 8)$ is parallel to the line through the points $(8, 12)$ and $(x, 24)$. Find the value of x.
2. Find the eccentricity of the hyperbola $9y^2 - 4x^2 = 36$.
3. Find the value of $\lim_{x\to 1} \frac{x^{1/3}-1}{x^{1/6}-1}$.
4. The centroid of a ΔABC is at point (1 , 1 , 1). If the coordinates of A and B are (3 , -5 , 7) and (-1 , 7 , -6) respectively. Find the coordinates of the point C.
5. Find the value of $sin\left(\frac{\pi}{4}-x\right)\ cos\left(\frac{\pi}{4}-y\right)+cos\left(\frac{\pi}{4}-x\right)\ sin\left(\frac{\pi}{4}-y\right)$
6. If P(A) = $\frac{1}{2}$, P(B) = p and P(A$\cup B) = \frac{3}{5}$ then find "p", if A and B are mutually exclusive.

SECTION B

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

   (i) internally (ii) externally

8. Express in the polar form : $-2-2\sqrt{3}\,i$

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

10. Find the image of the point $(1,2)$ with respect to the line $x-3y+4=0$, assuming the line to be a plane mirror.

OR

Find the distance of the line $4x+7y+5=0$ from the point $(1,2)$ along the line $2x-y=0$.

11. Find the equation of the parabola with vertex at $(0,0)$, passing through $(2,-3)$ and symmetric with respect to y axis.

12. Solve the following system of inequalities and represent the solution graphically on number line.

$3x-7<5+x$, $11-5x\le 1$

13. Four cards are drawn from a pack of 52 cards. Find the probability of getting
    (i) two red and two black cards
    (ii) one card from each suit.

OR

From a class of 12 boys and 4 girls, 8 students had to be chosen for a competition. Principal decided to send 6 boys and 2 girls for the same. What was the number of ways of doing so? Which value was exhibited with the representation of both boys and girls for the competition?

14. Using Binomial theorem, show that 6^n-5n always leaves the remainder 1 when divided by 25.

OR

Find the term independent of x in the expansion of $\left(\frac{3}{2}x^2-\frac{1}{3x}\right)^6$

15. Let f be a function defined by $f(x)=\begin{Bmatrix}4x-5, if\ x\le 2\\ x-k, if\ x>2\end{Bmatrix}$

Find k, if $\lim_{x\to 2}f(x)$ exists.

16. Find the sum of the sequence 8 , 88 , 888 , 8888 ,……….to n terms.

OR

The sum of three numbers in G.P. is 56. If we subtract 1 , 7 , 21 from these numbers in that order, we obtain an A.P. Find the numbers.

17. In how many ways can the letters of the word PERMUTATIONS be arranged if
    (i) Vowels are all together
    (ii) There are always 4 letters between P and S?

18. Find the general solution of the equation
    $sec^2 2x = 1 - tan2x$.

19. Differentiate the following function w.r.t. x
    $f(x) = \dfrac{x \sin x}{1 + \cos x}$

SECTION C

20. Solve the following system of inequalities graphically:

$x + 2y \leq 10$, $x + y \geq 1$, $x - y \leq 0$, $x \geq 0$, $y \geq 0$

21. Find the equation of the circle which circumscribes the triangle formed by the lines $x + y + 3 = 0$, $x - y + 1 = 0$ and $x = 3$.

22. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6} : 1$

OR

State and prove the Binomial Theorem for a positive integral index n.

23. (i) Evaluate: $\lim_{x \to 0} \frac{tanx - sinx}{sin^3 x}$ OR $\lim_{x \to 0} \frac{3\sin 2x + 2x}{3x + 2\tan 3x}$

(ii)Find the derivative of $\frac{sinx + cosx}{sinx - cosx}$ with respect to x

24. (i)If $(x+iy)^3 = u+iv$, then show that $\frac{u}{x}+\frac{v}{y} = 4(x^2-y^2)$

(ii)Prove that: $\frac{sec8\theta-1}{sec4\theta-1} = \frac{tan8\theta}{tan2\theta}$

25. (i) Find the derivative of $cotx$ with respect to x from first principle.

(ii) Evaluate $\lim_{x\to4}\frac{x^2-16}{\sqrt{x^2+9}-5}$

OR

(i) Find the derivative of $f(x) = x-\frac{1}{x}$ with respect to x from first principle.

(ii) Differentiate $(x+secx)(x-tanx)$ with respect to x.

26. In a class of 60 students, 30 opted for NCC (National Cadet Corps), 32 opted for NSS (National Service Scheme) and 24 opted for both NCC and NSS. If one of the 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.

Sample Paper III

Second Term

Time : 3 hrs. **Max Mks : 100**

General Instructions:

- All questions are compulsory.
- The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of 4 marks each and section C comprises of 7 questions of six mark each.
- All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- Internal choice has been provided in some questions. You have to attempt only one of the choices in such questions.
- Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION – A

1) If f is the identity function and g is the greatest integer function, find the value of $\frac{f}{g}(2.5)$

2) Find the value of $\sin\left(\frac{\pi}{4}-x\right)\cos\left(\frac{\pi}{4}+x\right)-\cos\left(\frac{\pi}{4}-x\right)\sin\left(\frac{\pi}{4}+x\right)$

3) Find the equation of the directrix of the parabola $y^2=-6x$.

4) Find thevalue of n if $(n+1)!=56(n-1)!$

5)Find the ratio in which the YZ planedivides the line segment joining the points (1,2,4) and(3,8,6).

6) Evaluate $\lim_{x\to 0}\frac{e^x-\sin x-1}{x}$

SECTION B

7) Find the value of 'n' and 'x' in the expansion of $(1+x)^n$ if the fifth term equals four times the fourth term and the fourth term is equal to six times the third term.

8) Find the domain and range of $f(x)=\dfrac{3}{2-x^2}$

9) Prove that $\dfrac{\sin A+\sin 3A+\sin 5A+\sin 7A}{\cos A+\cos 3A+\cos 5A+\cos 7A}=\tan 4A$

OR

$$\frac{\sin 11A\sin A+\sin 7A\sin 3A}{\cos 11A\sin A+\cos 7A\sin 3A}=\tan 8A$$

10) Prove that $sinA(1+tanA)+cosA(1+cotA)=secA+cosecA$

11) How many different numbers can be formed from the digits 1,2,3,4 and 5 assuming that the digits cannot be repeated? How many of these will be even?

12) Differentiate $x\cos x$ w.r.t x from first principles.

13) Find the value of 'k' if the term independent of x in the expansion of $\left(\sqrt{\dfrac{x}{3}}+\dfrac{\sqrt{3}}{kx^2}\right)^{10}$ is $\dfrac{5}{12}$.

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

15) The sum of an infinite number of terms of a GP is 23 and the sum of their squares is 69.Determine the first term and the common ratio.

16) Find the equations of the lines passing through point (4,5)and making an angle of 45° with the line

$2x - y + 7 = 0$.

OR

Find the equation of the straight line passing through the intersection of $5x + y - 1 = 0$ and $3x - 4y + 1 = 0$ and cuts off equal intercepts on the axes.

17) Find the eccentricity, coordinates of foci, vertices and the length of latus rectum for the ellipse

$16x^2 + 9y^2 = 1$.

18) Find the equation of the circle which is concentric with the circle $2x^2 + 2y^2 - 8x - 12y - 9 = 0$ and

passes through the center of the circle $x^2 + y^2 + 8x + 10y - 9 = 0$.

19) Evaluate $\lim\limits_{x \to a} \dfrac{\sqrt{a + 2x} - \sqrt{3x}}{\sqrt{3a + x} - 2\sqrt{x}}$ **OR** $\lim\limits_{x \to 0} \dfrac{\tan x - \sin x}{\sin^3 x}$

SECTION C

20)(i) Find the general solution of $4\cos^2 x - 4\sin x - 1 = 0$

(ii) Prove that $\dfrac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}} = \cot \dfrac{x}{2}$

21) (i) A committee of 4 Principals has to be selected from 4 male Principals and 5 female Principals . What is the probability that males out number the females in this committee. Do you think this type of selection is a fair selection? Why or why not?

(ii) The letters of the word DISCIPLINE are placed at random in a row to form a word with or without meaning. What is the probability that (a) all the vowels come together (b) the word starts with D and ends with I. What is the importance of discipline in the life of a student?

22) Find the sum of the series $1^3 + \frac{1^3+2^3}{2} + \frac{1^3+2^3+3^3}{3} + \ldots\ldots\ldots\ldots$ to n terms.

23) Show that the points (5,5), (6,4), (-2,4) and (7,1) are concyclic. Also find the equation, centre and radius of the circle.

24) Solve the system of inequalities graphically: $3x+2y \le 24$, $x+2y \le 16$, $x+y \le 10$, $x, y \ge 0$.

25) Find the equations of the straight lines passing through the intersection of $x-y+1=0$ and $2x-3y+5=0$,and at a distance of $\frac{7}{5}$ from the point (3,2).

OR

Two vertices of a triangle are A(4 ,- 3) and B(-2 , 5) . If the orthocenter of the triangle is at P(1, 2) , find the coordinates of the third vertex. Also find the distance from the point P to the side BC.

26) (i) Evaluate $\lim_{x \to 0} f(x)$, if it exists, where $f(x) = \begin{cases} \frac{x}{|x|+x^2} & , x \ne 0 \\ 0 & , x = 0 \end{cases}$

OR

Let $f(x) = \begin{cases} a+bx & , x < 1 \\ 4 & , x = 1 \\ b-ax & , x > 1 \end{cases}$ If $\lim_{x \to 1} f(x) = f(1)$, what are the possible values of 'a' and 'b' .

(ii) Differentiate $\frac{\sin x - x\cos x}{x\sin x + \cos x}$ w.r.t x.

ANSWERS OF THE ASSIGNMENTS

ASSIGNMENT NO. 1

(SETS)

1. $\left\{x: x = \frac{n}{n^2+1}, n \leq 6, n\epsilon N\right\}$
2. $\left\{x: x = \frac{n}{n+2}, nisanoddnaturalnumber \leq 11\right\}$
3. $\{0, \pm 1, \pm 2, \pm 3, \pm 4, \pm 5\}$
4. $\{17, 26, 35, 44, 53, 62, 71, 80\}$
5. $A = C$; $AandC$, $DandEareequivalent$
6. N
7. (a) finite (b) infinite (c) empty (d) infinite (e) empty (f) finite
8. $A \cap B = \{x : x = 15n, n\epsilon Z\}$
9. $P(A) = \{\emptyset, \{1\}, \{2\}, \{\{3,4\}\}, \{1,2\}, \{1, \{3,4\}\}, \{2, \{3,4\}\}, A\}$

11. False (i) , (ii) ,(iii) , (vi) , (viii) True (iv) , (v) , (vii)
12. (a) $\emptyset$, $\{2\}$ (b) $\{4\},\{1,4\},\{2,4\},\{3,4\},\{1,2,4\},\{1,3,4\},\{2,3,4\},\{1,2,3,4\}$

    (c) $\emptyset$, $\{2\}$

14. (i) $\{6,8\}$ (ii) $\{1,3,5,7,9\}$ (iii) $\{1\}$ (iv) $\{3,5,6,7,8\}$
15. (i) 7 (ii) 6 (iii) 10
16. (i) 18 (ii) 3
17. (i) 62 (ii) 39 (iii) 1
18. (i) 35 (ii) 11 (iii) 11

ASSIGNMENT NO. 2

(RELATIONS AND FUNCTIONS)

1. $\{(2,5), (3,5)\}$
2. Not a function
3. Yes it's a function
4. 2^4
5. $Domain = \{-3, -2, -1, 0, 1, 2, 3\}$, Range = $\{0, 1, 2, 3, 4\}$
6. D = $\{2, 3, 4, 5, 6, 7\}$ $R = \{0, 1, 2, 3, 4, 5\}$
7. Not a function

9. $R = \{-1\}$
10. ± 4

11. $\pm\frac{1}{\sqrt{2}}$
12. $R = \{(2,2),(2,4),(2,6),(3,3),(3,6),(4,4),(5,5),(6,6)\}$
13. Not equal because their domains are not equal
14. (i) $D_f = R\ ,R_f = (-\infty,1]$ (ii) $D_f = R - \{\pm\sqrt{2}\}$, $R_f = (-\infty,0] \cup \left[\frac{3}{2},\infty\right)$
(iii) $D_f = [-3,3]$, $R_f = [0,3]$ (iv) $D_f = (3,\infty)$, $R_f = (0,\infty)$
15. $(f+g)(x) = \begin{cases} 2x, x \geq 0 \\ 0, x < 0 \end{cases}, (f-g)(x) = \begin{cases} 0, x \geq 0 \\ 2x, x < 0 \end{cases}$,
$(fg)(x) = \begin{cases} x^2, x \geq 0 \\ -x^2, x < 0 \end{cases}, \left(\frac{f}{g}\right)(x) = \begin{cases} 1, x > 0 \\ -1, x < 0 \end{cases}$
16. $(i)(g-f)(x) = -4+8x, D_{g-f} = R$ $(ii)\frac{f}{g}(x) = \left(\frac{x-1}{x}\right)^2, D_{\frac{f}{g}} = R - \{0\}$ (iii)
$(iv)\ \frac{4}{g}(x) = \frac{1}{x^2}, D_{\frac{4}{g}} = R - \{0\}$
17. -4

ASSIGNMENT NO. 3

(TRIGONOMETRIC FUNCTIONS)

(1). $18^\circ 19' 38''$ (2) $-\frac{2\sqrt{3}}{3}$ (4) $\theta = 2n\pi \pm \frac{2\pi}{3}; n \in Z$

(5) $\frac{5\pi}{6}, \frac{11\pi}{6}$ $(7) 2+\sqrt{3}$ (9) $\frac{3}{5}$, $\frac{117}{44}$ (11)(i) $\frac{n\pi}{4}$ or $n\pi \pm \frac{\pi}{3}; n \in Z$

(ii) $2n\pi - \frac{\pi}{4}; n \in Z$ or $n\pi + (-1)^n\left(-\frac{\pi}{2}\right) + \frac{\pi}{4};\ n \in Z$

$(iii) n\pi + (-1)^{n+1}\frac{\pi}{6}$ or $m\pi + (-1)^{m+1}\frac{\pi}{2}, m, n \in Z$

$(iv)\ \frac{2n\pi}{5} - \frac{\pi}{10}$ or $2m\pi - \frac{\pi}{2}, m, n \in Z$ (13) $\frac{2\sqrt{5}}{5}$, $-\frac{\sqrt{5}}{5}$, -2

ASSIGNMENT NO. 4

(LINEAR INEQUALITIES)

1. (i)
2. $x \geq \frac{5}{2}$
3. $\{\ldots\ldots,-2,-1,0,1,2,3\}$

4. $(-2,5)$
5. $62.5 < x < 400$
6. (i) $\{1,2\}$ (ii) $\{......,0,1,2\}$
7. 8 and 10; 10 and 12; 12 and 14;
8. $6.27 < x < 8.07$
9. (i) $x < -\frac{13}{2}$ (ii) $x < 1$ or $x > 11/3$ (iii) (iv) $\frac{19}{18} \le x \le \frac{29}{18}$ (v) $x > \frac{5}{2}$
10. (i) $x \le 2$ (ii) $x > \frac{40}{11}$ (iii) $[-7,11]$

ASSIGNMENT No. 5

(COMPLEX NUMBERS AND QUADRATIC EQUATIONS)

1. $x = 1/6$, $y = 5/2$
2. $6 - 4i$
3. 0
4. 2
5. $\frac{2}{13} - \frac{3}{13}i$
6. (i) $2\sqrt{2}\left[cos\left(-\frac{3\pi}{4}\right) + isin\left(-\frac{3\pi}{4}\right)\right]$ (ii) $\frac{1}{\sqrt{2}}\left[cos\left(-\frac{\pi}{4}\right) + isin\left(-\frac{\pi}{4}\right)\right]$
7. $\frac{71}{4} - \frac{19}{4}i$
8. $-\frac{8}{25} - \frac{31}{25}i$
9. $\frac{1}{\sqrt{2}}, \frac{3\pi}{4}$
10.
11. $x = 3$, $y = -1$
12. $x = 1$, $y = -4$ or $x = -1$, $y = -4$
13. (i) $\frac{3}{2}i$, $\frac{4}{3}i$ (ii) $-3i, \frac{2}{3}i$

$$(iii) 4-3i, 3+2i, (iv) \sqrt{2}i, -2i (v) \frac{3+i}{2}, 3i$$

$$14. (i) \pm(1-3i), (ii) \pm(2+3i), (iii) \pm\left(\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}i\right)$$

ASSIGNMENT No. 6

(PERMUTATIONS AND COMBINATIONS)

1) 23 2) 35 3) 9 4) 3 5) 60 6) 86400 7) 60 8)(i) 86400 (ii) 28800

9) (i) 720 (ii) 24 (iii) 240 (iv) 480 10) (i) 30 (ii) 40 (iii) 46

11) 60480 12) 360 15) 18

ASSIGNMENT No. 7
(BINOMIAL THEOREM)

1. (i) 17 (ii) $\frac{(n+1)(n+2)}{2}$ (iii) 4 2) (i) $(-1)^r \frac{11!}{r!\times(11-r)!}x^{3r}$ (ii) $(-1)^r \frac{12!}{r!\times(12-r)!}x^{24-3r}$ 3) $-\frac{5040}{x}$
4) $\frac{840}{x^2}$ 5) 18564 7) m = 1 8) (i) 1760 (ii) 1215 9) (i) -8064 (ii) -540 11) n = 11 , r = 6 15) -6

ASSIGNMENT NO. 8

(SEQUENCES AND SERIES)

1) 550 2) $y^2 = xz$ 3) 4 , 8 , 16; -4, 8, -16 4) 10th term 5) 1024 6) $2\left(2^{20}-1\right)+\frac{5^{20}-1}{4}$

7) $2,\frac{7}{3},\frac{8}{3},3$ 9) 31 : 51 10) $n = 6$ 11) 2, 6,18 or 18, 6, 2

12) 3, 5, 7 or 15, 5, -5 13) (i) $\frac{n(2n^2+3n+7)}{6}$ (ii)$3\left(2^n-1\right)-n$

14) (i) $\frac{n(n+1)(n+2)(3n+5)}{48}$ (ii) $\frac{n(n+1)\left(n^2+3n+1\right)-2n}{2}$

15.$\frac{2}{3}$

16.$5,\frac{10}{3},\frac{20}{9},\frac{40}{27},\ldots.$

17.$10,8,\frac{32}{5},\ldots.$

ASSIGNMENT NO. 9

(STRAIGHT LINES)

1) $x\cos\frac{4\pi}{3} + y\sin\frac{4\pi}{3} = 6$, distance = 6 2) $\frac{17}{2\sqrt{13}}$ units 3) no 4) $x = 10$

5) $x + y = \pm 5\sqrt{2}$ 6) $x = -4$ 7) (-7, 4) 8) $3x + 7y = 84$ 9) 3X + 4Y +17 = 0

10) (i) $13x - y + 9 = 0$ (ii) $3x - y + 1 = 0$ (iii) $3x - y - 4 = 0$

11) $45^\circ, 45^\circ, 90^\circ$ 12) $12x + 5y = 60$, $5x + 12y = 60$ 14) $(1, -3)$

15) 4x – 3y + 16 = 0, 4x – 3y – 14 = 0

16) $x + 3y - 19 = 0$, $3x - y - 7 = 0$ 17) $\left(\frac{31}{10}, \frac{-3}{10}\right)$ 18) (-1, -14)

19) x + y -5 = 0 20) $4x + 5y - 1 = 0$ $(21) 2x - 3y + 14 = 0, (22) (1, -5)$

ASSIGNMENT NO. 10

(CONIC SECTIONS)

1) $y^2 = -16x$ 2) LR = 8 3) $5x^2 + y^2 = 5$ 4) $x^2 + y^2 + 6x - 4y - 3 = 0$

5) 7 units 6) $4x^2 + 4y^2 - 12x + 16y - 21 = 0$ 7) $x^2 + y^2 - 10x + 6y + 9 = 0$, Centre $(5, -3)$ and radius $r = 5$ 8) $x^2 + y^2 - 17x - 19y + 50 = 0$

9) (i) F $\left(-\frac{3}{2}, 0\right)$; axis y = 0; directrix x = $\frac{3}{2}$; LR = 6

(ii) F $(0, 2)$; axis x = 0; directrix y = -2 ; LR = 8 10) (i) $x^2 = -16y$ (ii) $3y^2 = 4x$

11) (i) F$(\pm 3,0)$, V$(\pm 5,0)$, length of major axis = 10, length of minor axis = 8 , $e=\frac{3}{5}$ and length of LR = $\frac{32}{5}$.

(ii) F$\left(0,\pm\sqrt{7}\right)$, V$(0,\pm 4)$, length of major axis = 8, length of minor axis = 6 , $e=\frac{\sqrt{7}}{4}$ and length of LR = $\frac{9}{2}$. 12)

(i) $3x^2+4y^2=48$ (ii) $\frac{4x^2}{81}+\frac{4y^2}{45}=1$ or $\frac{4x^2}{45}+\frac{4y^2}{81}=1$ 13) (i) F $\left(\pm\frac{\sqrt{61}}{2},0\right)$, $V(\pm 3,0)$, $e=\frac{\sqrt{61}}{6}$, $LR=\frac{25}{6}$

(ii) F$\left(0,\pm\frac{\sqrt{5}}{4}\right)$,V$\left(0,\pm\frac{1}{4}\right)$, $e=\sqrt{5}$, LR = 2 14) (i) $\frac{x^2}{32}-\frac{y^2}{224}=1$ or $-\frac{x^2}{224}+\frac{y^2}{32}=1$

(ii) $16x^2-2y^2=1$ or $16y^2-2x^2=1$

ASSIGNMENT NO. 11

(THREE DIMENSIONAL GEOMETRY)

1)(b) 2) $(0,1,0)$ and $(0,5,0)$ 3) $(-3,-14,19)$5) 3:2 externally 6) 1:3 externally $(0,-1,3)$7) $(2,5,2)$ 9) $(6,-1,8)$ 10) $(0,0,5)$

ASSIGNMENT NO. 12

(LIMITS AND DERIVATIVES)

1) (i)$\frac{-1}{4}$ (ii) 3 (iii) 1 (iv) 1 (v)$\frac{1}{12}$(vi) $\frac{-1}{4}$2) 7 3) (i) $3x^2-2ax-b$ (ii)$x^3\sec^2 x+3x^2\tan x$ (iii) $\frac{-x^2-6x+1}{\left(x^2+1\right)^2}$ 4) 9 5) (i) $\frac{15}{11}$ (ii) 2 (iii) 4(iv) $\frac{4}{9}$ (v) -4 (vi)$\frac{1}{16\sqrt{2}}$ 6) (i) $1+\frac{1}{x^2}$ (ii) $2x-2x^{-3}$ (iii) $\sec(x+1)\tan(x+1)$(iv) $\frac{x\cos x-\sin x}{x^2}$ (v) $-x\sin x+\cos x$ 7) (i) $\frac{2\sin x}{(1+\cos x)^2}$ (ii) $\frac{x+\sin x}{1+\cos x}$

(iii) $3x^2+\frac{1}{x^2}-1-\frac{3}{x^4}$ (iv) $-\frac{2}{(x+1)^2}-\frac{3x^2-2x}{(3x-1)^2}$ 8) (i) limit does not exist

(ii) $\frac{1}{2}$ (iii) 1 9) $a=5$ and $b=-3$

10) (i) 0 (ii) 2 (iii) 5 (iv) (log2)(log3)

ASSIGNMENT NO. 13

(PROBABILITY)

1) $(i)\{TT, TH\}, (ii)\{TH, H1, H2, H3, H4, H5, H6\}, (iii)\{H2, H4, H6\}$ 3) (i) 1/6 (ii) 1/12 (iii) 11/36 4) (i) 18/95 (ii) 91/190 (iii) 63/190 5) $\frac{25}{28}$ 6) (i) 44/4165 (ii) 1/20825 (iii) 2197/20825 (iv) $\frac{325}{833}$ (v) $\frac{92}{833}$ (vi) 99/54145 7) 63/190 8) 0.08 9) $\frac{13}{18}$ 10) 40% or 0.4 11) (i) 4/5 or 0.8 (ii) ½ 12) 316/435 13) (i) 5/34 (ii) 7/102 14) (i) 5/9 (ii) 4/9 (iii) 2/3 15) 7/13 $(16)(i)\frac{1}{132}, (ii)\frac{1}{462}$