BLOW UP SYLLABUS : MATHEMATICS

CLASS: I PUC

UNIT I: SETS AND FUNCTIONS

1. . Sets

Sets and their representations:
Definitions, examples, Methods of Representation in roster and rule form, examples

Types of sets: Empty set. Finite and Infinite sets. Equal sets. Subsets.
Subsets of the set of real numbers especially intervals (with notations).
Power set. Universal set. examples

Operation on sets: Union and intersection of sets. Difference of sets. Complement of a set,
Properties of Complement sets. Simple practical problems on union and intersection of two sets.

Venn diagrams: simple problems on Venn diagram representation of operation on sets

2. Relations and Functions

Cartesian product of sets: Ordered pairs, Cartesian product of sets.
Number of elements in the Cartesian product of two finite sets. Cartesian product of the reals with itself (upto $R \times R \times R$).

Relation: Definition of relation, pictorial diagrams, domain, co-domain and range of a relation and examples

Function : Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain and range of a function. Real valued function of the real variable, domain and range of constant, identity, polynomial rational, modulus, signum and greatest integer functions with their graphs.

Algebra of real valued functions:
Sum, difference, product and quotients of functions with examples.

3. Trigonometric Functions

Angle: Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another.

Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x.

Signs of trigonometric functions and sketch of their graphs.

Trigonometric functions of sum and difference of two angles:

Deducing the formula for cos(x+y) using unit circle .

Expressing sin (x+ y) and cos (x + y) in terms of sin x, sin y, cos x and cos y .

Deducing the identities like following: $\tan(x \pm y) = \frac{tanx \pm tany}{1 \mp tanx \times tany}$,

$\cot(x \pm y) = \frac{cotx\, coty \mp 1}{coty \pm cotx}$

Definition of allied angles and obtaining their trigonometric ratios using compound angle formulae.

Trigonometric ratios of multiple angles:

Identities related to sin2*x*, cos2*x*, tan2*x*, sin3*x*, cos3*x* and tan3*x*

Deducing results of

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

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

and problems.

Trigonometric Equations:

General solution of trigonometric equations of the type

$\sin\theta = \sin\alpha$, $\cos\theta = \cos\alpha$ and $\tan\theta = \tan\alpha$. and problems.

Proofs and simple applications of sine and cosine rule.

UNIT II : ALGEBRA

1. Principle of Mathematical Induction

Process 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 problems based on summation only.

2. 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 and problems

Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system,

Square-root of a Complex number given in supplement and problems.

3. Linear Inequalities

Linear inequalities,Algebraic solutions of linear inequalities in one variable and their representation on the number line and examples.

Graphical solution of linear inequalities in two variables and examples

Solution of system of linear inequalities in two variables -graphically and examples

4. Permutations and Combinations

Fundamental principle of counting.

Factorial *n*

Permutations : Definition, examples , derivation of formulae ^nP_r,

Permutation when all the objects are not distinct , problems.

Combinations: Definition, examples

Proving $^nC_r = {}^nP_r\ r!$, $^nC_r = {}^nC_{n-r}$; $^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

Problems based on above formulae.

5. Binomial Theorem

History, statement and proof of the binomial theorem for positive integral indices.
Pascal's triangle, general and middle term in binomial expansion,
Problems based on expansion, finding any term, term independent of x, middle term, coefficient of x^r .

6. Sequence and Series:

Sequence and Series: Definitions
Arithmetic Progression (A.P.):Definition, examples, general term of AP, nth term of AP, sum to n term of AP, problems.
Arithmetic Mean (A.M.) and problems
Geometric Progression (G.P.): general term of a G.P., n th term of GP, sum of *n* terms of a G.P. , and problems.
Infinite G.P and its sum, geometric mean (G.M.).
Relation between A.M. and G.M. and problems.
Sum to *n* terms of the special series : $\sum n$, $\sum n^2$ and $\sum n^3$

UNIT III : COORDINATE GEOMETRY

1. Straight Lines

Brief recall of 2-D from earlier classes: mentioning formulae .
Slope of a line : Slope of line joining two points , problems
Angle between two lines: slopes of parallel and perpendicular lines, collinearity of three points and problems.
Various forms of equations of a line:
Derivation of equation of lines parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form and problems.
General equation of a line. Reducing ax+by+c=0 into other forms of equation of straight lines.
Equation of family of lines passing through the point of intersection of two lines and Problems.
Distance of a point from a line , distance between two parallel lines and problems.

2. Conic Section

Sections of a cone: Definition of a conic and definitions of Circle, parabola, ellipse, hyperbola as a conic .
Derivation of Standard equations of circle , parabola, ellipse and hyperbola and problems based on standard forms only.

3. Introduction to Three-dimensional Geometry

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

UNIT IV : CALCULUS

Limits and Derivatives

Limits: Indeterminate forms, existence of functional value, Meaning of $x \to a$, idea of limit, Left hand limit , Right hand limit, Existence of limit, definition of limit, Algebra of limits , Proof of $\lim_{x \to a} \frac{x^n - a^n}{x - a}$ for positive integers only, and $\lim_{x \to 0} \frac{sinx}{x}$ and problems
Derivative: Definition and geometrical meaning of derivative,
Mentioning of Rules of differentiation , problems
Derivative of x^n , sinx, cosx, tanx, constant functions from first principles . problems
Mentioning of standard limits $\lim_{x \to 0} \frac{\log(1+x)}{x}$, $\lim_{x \to 0} \frac{e^x - 1}{x}$

UNIT V: MATHEMATICAL REASONING:

Definition of proposition and problems, Logical connectives, compound proposition, problems, Quantifiers, negation, consequences of implication-contrapositive and converse ,problems , proving a statement by the method of contradiction by giving counter example.

UNIT VI : STATISTICS AND PROBABILITY

1. Statistics

Measure of dispersion, range, mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. 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.

Note: **Unsolved miscellaneous problems given in the prescribed text book need not be considered**

DESIGN OF THE QUESTION PAPER
MATHEMATICS (35)

CLASS : I PUC

Time: 3 hours 15 minute; Max. Mark: 100

(*of which 15 minute for reading the question paper*).

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

I. Weightage to Objectives

Objective	Weightage	Marks
Knowledge	40%	60/150
Understanding	30%	45/150
Application	20%	30/150
HOTS	10%	15/150

II. Weightage to level of difficulty

Level	Weightage	Marks
Easy	35%	53/150
Average	55%	82/150
Difficult	10%	15/150

III. Weightage to content

CHAPTER NO	CONTENT	No. of teaching Hours	Marks
1	SETS	8	8
2	RELATIONS AND FUNCTIONS	10	11
3	TRIGONOMETRIC FUNCTIONS	18	19
4	PRINCIPLE OF MATHEMATICAL INDUCTION	4	5
5	COMPLEX NUMBERS AND QUADRATIC EQUATIONS	8	9
6	LINEAR INEQUALITIES	8	7
7	PERMUTATION AND COMBINATION	9	9
8	BINOMIAL THEOREM	7	8
9	SEQUENCE AND SERIES	9	11
10	STRAIGHT LINES	10	10

11	CONIC SECTIONS	9	9
12	INTRODUCTION TO 3D GEOMETRY	5	7
13	LIMITS AND DERIVATIVES	14	15
14	MATHEMATICAL REASONING	6	6
15	STATISTICS	7	7
16	PROBABILITY	8	9
	TOTAL	**140**	**150**

IV. Pattern of the Question Paper

PART	Type of questions	Number of questions to be set	Number of questions to be answered	Remarks
A	1 mark questions	10	10	Compulsory part
B	2 mark questions	14	10	---
C	3 mark questions	14	10	---
D	5 mark questions	10	6	Questions must be asked from specific set of topics as mentioned below, under section V
E	10 mark questions (Each question with two sub divisions namely (a) 6 mark and (b) 4 mark).	2	1	

V. Instructions:

Content area to select questions for PART D and PART E

(a) In PART D

1. **Relations and functions:** Problems on drawing graph of a function and writing its domain and range.
2. **Trigonometric functions:** Problems on Transformation formulae.
3. **Principle of Mathematical Induction**: Problems.
4. **Permutation and Combination:** Problems on combinations only.
5. **Binomial theorem**: Derivation/problems on Binomial theorem.
6. **Straight lines**: Derivations.

7. **Introduction to 3D geometry**: Derivations.
8. **Limits and Derivatives**: Derivation / problems.
9. **Statistics**: Problems on finding mean deviation about mean or median.
10. **Linear inequalities:** Problems on solution of system of linear inequalities in two variables.

(b) In PART E

6 mark questions must be taken from the following content areas only.

- **(i)** Derivations on trigonometric functions.
- **(ii)** Definitions and derivations on conic sections.

4 mark questions must be taken from the following content areas only.

- **(i)** Problems on algebra of derivatives.
- **(ii)** Problems on summation of finite series.

SAMPLE BLUE PRINT

I PUC: MATHEMATICS (35)

Time: 3 hours 15 minute   Max. Mark: 100

	CONTENT	TEACHING HOURS	PART A	PART B	PART C	PART D	PART E		TOTAL MARKS
			1 mark	**2** mark	**3** mark	**5** mark	**6** mark	**4** mark	
1	SETS	8	1	2	1				8
2	RELATIONS AND FUNCTIONS	10	1	1	1	1			11
3	TRIGONOMETRIC FUNCTIONS	18	1	2	1	1	1		19
4	PRINCIPLE OF MATHEMATICAL INDUCTION	4				1			5
5	COMPLEX NUMBERS AND QUADRATIC EQUATIONS	8	1	1	2				9
6	LINEAR INEQUALITIES	8		1		1			7
7	PERMUTATION AND COMBINATION	9	1		1	1			9
8	BINOMIAL THEOREM	7			1	1			8
9	SEQUENCE AND SERIES	9	1		2			1	11
10	STRAIGHT LINES	10	1	2		1			10
11	CONIC SECTIONS	9			1		1		9
12	INTRODUCTION TO 3D GEOMETRY	5		1		1			7
13	LIMITS AND DERIVATIVES	14	1	1	1	1		1	15
14	MATHEMATICAL REASONING	6	1	1	1				6
15	STATISTICS	7		1		1			7
16	PROBABILITY	8	1	1	2				9
	TOTAL	**140**	**10**	**14**	**14**	**10**	**2**	**2**	**150**

GUIDELINES TO THE QUESTION PAPER SETTER

1. The question paper must be prepared based on the individual blue print without changing the weightage of marks fixed for each chapter.

2. The question paper pattern provided should be adhered to.

Part A : 10 compulsory questions each carrying 1 mark;

Part B : 10 questions to be answered out of 14 questions each carrying 2 mark ;

Part C : 10 questions to be answered out of 14 questions each carrying 3 mark;

Part D: 6 questions to be answered out of 10 questions each carrying 5 mark;

Part E : 1 question to be answered out of 2 questions each carrying 10 mark with subdivisions (a) and (b) of 6 mark and 4 mark respectively.

(The questions for PART D and PART E should be taken from the content areas as explained under section V in the design of the question paper)

3. There is nothing like a single blue print for all the question papers to be set. The paper setter should prepare a blue print of his own and set the paper accordingly without changing the weightage of marks given for each chapter.

4. Position of the questions from a particular topic is immaterial.

5. In case of the problems, only the problems based on the concepts and exercises discussed in the text book (prescribed by the Department of Pre-university education) can be asked. Concepts and exercises different from text book given in Exemplar text book should not be taken. Question paper must be within the frame work of prescribed text book and should be adhered to weightage to different topics and guidelines.

6. No question should be asked from the historical notes and appendices given in the text book.

7. Supplementary material given in the text book is also a part of the syllabus.

8. Questions should not be split into subdivisions. No provision for internal choice question in any part of the question paper.

9. Questions should be clear, unambiguous and free from grammatical errors. All unwanted data in the questions should be avoided.

10. Instruction to use the graph sheet for the question on LINEAR INEQUALITIES in PART D should be given in the question paper.

11. Repetition of the same concept, law, fact etc., which generate the same answer in different parts of the question paper should be avoided.

Model Question Paper

I P.U.C MATHEMATICS (35)

Time : 3 hours 15 minute **Max. Mark: 100**

Instructions:

(i) The question paper has five parts namely A, B, C, D and E. Answer all the parts.
(ii) **Use the graph sheet for the question on Linear inequalities in PART D.**

PART A

Answer ALL the questions **$10 \times 1 = 10$**

1. Given that the number of subsets of a set A is 16. Find the number of elements in A.
2. If $\tan x = \frac{3}{4}$ and x lies in the third quadrant, find $\sin x$.
3. Find the modulus of $\frac{1+i}{1-i}$.
4. Find 'n' if ${}^{n}C_{7} = {}^{n}C_{6}$.
5. Find the 20^{th} term of the G.P., $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \ldots$
6. Find the distance between $3x + 4y + 5 = 0$ and $6x + 8y + 2 = 0$.
7. Given $f(x) = \begin{cases} \frac{x}{|x|} &, x \neq 0 \\ 2 &, x = 0 \end{cases}$, find $\lim_{x \to 0^{+}} f(x)$.
8. Write the negation of 'For all $a, b \in I$, $a - b \in I$'.
9. A letter is chosen at random from the word " ASSASINATION". Find the probability that letter is vowel.
10. Let $A = \{2, 3, 4\}$ and R be a relation on A defined by
    $R = \{(x, y) \mid x, y \in A,\ x \text{ divides } y\}$, find 'R'.

PART – B

Answer any TEN questions **$10 \times 2 = 20$**

11. If A and B are two disjoint sets and n(A) = 15 and n(B) = 10 find $n(A \cup B)$, $n(A \cap B)$.

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

13. If $f : Z \to Z$ is a linear function, defined by $f = \{(1,1), (0,-1), (2,3)\}$, find $f(x)$.

14. The minute hand of a clock is 2.1 cm long. How far does its tip move in 20 minute? $\left(\text{use } \pi = \frac{22}{7}\right)$.

15. Find the general solution of $2\cos^2 x - 3\sin x = 0$.

16. Evaluate: $\lim_{x \to 3} \frac{(x-3)}{(x^2 - 5x + 6)}$

17. Coefficient of variation of distribution are 60 and the standard deviation is 21, what is the arithmetic mean of the distribution?

18. Write the converse and contrapositive of 'If a parallelogram is a square, then it is a rhombus'.

19. In a certain lottery 10,000 tickets are sold and 10 equal prizes are awarded. What is the probability of not getting a prize if you buy one ticket.

20. In a triangle ABC with vertices A (2, 3), B (4, -1) and C (1, 2). Find the length of altitude from the vertex A.

21. Represent the complex number $z = 1 + i$ in polar form.

22. Obtain all pairs of consecutive odd natural numbers such that in each pair both are more than 50 and their sum is less than 120.

23. A line cuts off equal intercepts on the coordinate axes. Find the angle made by the line with the positive x-axis.

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

PART – C

Answer any TEN questions **$10 \times 3 = 30$**

25. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis? How many like tennis only and not cricket?.

26. Let $R : Z \to Z$ be a relation defined by $R = \{(a,b) \mid a, b, \in Z,\ a - b \in Z\}$. Show that
    i) $\forall\, a \in Z,\ (a,a) \in R$
    ii) $(a,b) \in R \Rightarrow (b,a) \in R$
    iii) $(a,b) \in R,\ (b,c) \in R \Rightarrow (a,c) \in R$.

27. Prove that $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4\cos^2\left(\frac{x+y}{2}\right)$.

28. Solve the equation $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$.

29. How many words with or without meaning can be made from the letters of the word MONDAY, assuming that no letter is repeated if
    i) 4 letters are used at a time ,
    ii) All letters are used at a time,
    iii) All letters are used but first letter is a vowel.

30. If $x + iy = \frac{2+i}{2-i}$ prove that $x^2 + y^2 = 1$.

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

32. Insert 3 arithmetic means between 8 and 24.

33. A committee of two persons is selected from 2 men and 2 women. What is the probability that the committee will have (i) at least one man, (ii) at most one man.

34. Find the derivative of the function 'cos x' with respect to 'x' from first principle.

35. A parabola with vertex at origin has its focus at the centre of $x^2 + y^2 - 10x + 9 = 0$. Find its directrix and latus rectum.

36. In an A.P. if m^{th} term is 'n' and the n^{th} term is 'm', where $m \neq n$, find the p^{th} term.

37. Verify by the method of contradiction that $\sqrt{2}$ is irrational.

38. Two students Anil and Sunil appear in an examination. The probability that Anil will qualify in the examination is 0.05 and that Sunil will qualify is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that Anil and Sunil will not qualify in the examination.

PART D

Answer any SIX questions **$6 \times 5 = 30$**

39. Define greatest integer function. Draw the graph of greatest integer function, Write the domain and range of the function.

40. Prove that $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$ (θ being in radians) and hence show that $\lim_{\theta \to 0} \frac{\tan\theta}{\theta} = 1$.

41. Prove by mathematical induction that $1^3 + 2^3 + 3^3 + \ldots + n^3 = \frac{n^2(n+1)^2}{4} . \forall n \in N$.

42. A group consists of 7 boys and 5 girls. Find the number of ways in which a team of 5 members can be selected so as to have at least one boy and one girl.

43. For all real numbers a, b and positive integer 'n' prove that,

$$(a+b)^n = {}^nC_0 a^n + {}^nC_1 a^{n-1}b + {}^nC_2 a^{n-2}b^2 + \ldots + {}^nC_{n-1} ab^{n-1} + {}^nC_n b^n .$$

44. Derive an expression for the coordinates of a point that divides the line joining the points $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$ internally in the ratio m:n . Hence, find the coordinates of the midpoint of AB where $A \equiv (1,2,3)$ and $B \equiv (5,6,7)$.

45. Derive a formula for the angle between two lines with slopes m_1 and m_2. Hence find the slopes of the lines which make an angle $\frac{\pi}{4}$ with the line $x-2y+5=0$.

46. Prove that $\dfrac{\sin 9x+\sin 7x+\sin 3x+\sin 5x}{\cos 9x+\cos 7x+\cos 3x+\cos 5x} = \tan 6x$

47. Solve the following system of inequalities graphically,

$$2x + y \ge 4, \quad x + y \le 3, \quad 2x - 3y \le 6.$$

48. Find the mean deviation about the mean for the following data

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

PART–E

Answer any ONE question **$1 \times 10 = 10$**

49. (a) Prove geometrically that $\cos(A+B) = \cos A \cos B - \sin A \sin B$.

Hence find $cos\ 75°$. 6

(b) Find the sum to n terms of the series $1^2 + (1^2+2^2) + (1^2+2^2+3^2) + \ldots$ 4

50. (a) Define ellipse as a set of points. Derive its equation in the form $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. 6

(b) Find the derivative of $\dfrac{x^5 - \cos x}{\sin x}$ using rules of differentiation. 4

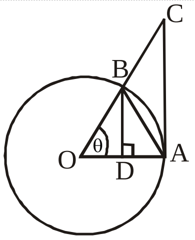
SCHEME OF VALUATION
Model Question Paper

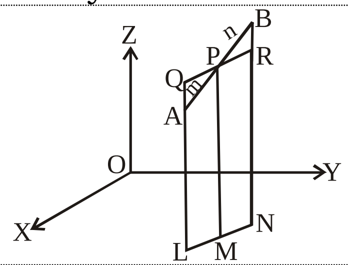
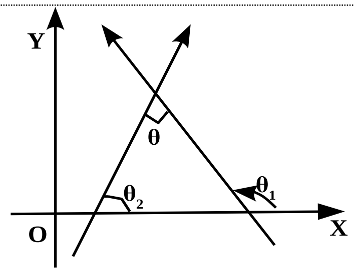
I P.U.C MATHEMATICS (35)

Qn.No.		Marks Allotted
1	Getting $n = 4$.	1
2	Getting $\sin x = \frac{-3}{5}$	1
3	Getting modulus $= 1$.	1
4	Getting $n = 7 + 6 = 13$.	1
5	Getting 20^{th} term $= \frac{5}{2^{10}}$.	1
6	Getting , required distance $= \left\|\frac{5-1}{\sqrt{9+16}}\right\| = \frac{4}{5}$ units .	1
7	Getting $\lim_{x\to 0^+} f(x) = \lim_{x\to 0} \frac{x}{x} = \lim_{x\to 0} 1 = 1$	1
8	Writing the negation.	1
9	Getting the answer $\frac{6}{13}$.	1
10	Writing , R = { (2, 2) , (2, 4) , (3, 3) , (4, 4) }.	1
11	Getting $n(A \cap B) = 0$.	1
	Getting $n(A \cup B) = 25$.	1
12	Writing $A = \{2,3,5,7\}$ **OR** $B = \{2,4,6,8,10\}$	1
	Getting $B' = \{3,5,7,9\}$ and $A \cap B' = \{3,5,7\}$	
13	Stating $f(x) = mx + c$.	1
	Getting $m = 2$ and $c = -1$.	1
14	Writing $r = 2.1$ cm , $\theta = 120^0 = \frac{2\pi}{3}$	1
	Getting $l = 2.1 \times \frac{2\pi}{3} = 4.4\, cm$.	1
15	Getting $\sin x = \frac{1}{2}$ or $\sin x = -2$	1
	Writing $x = n\pi + (-1)^n \frac{\pi}{6}$, $n \in I$	1
16	Writing : $\lim_{x\to 3} \frac{(x-3)}{(x-3)(x-2)}$	1
	and getting answer =1	1

17	Writing the formula $\text{c.v} = \frac{\sigma}{\bar{x}} \times 100$	1
	Writing arithmetic mean = $\bar{x} = 35$	1
18	Writing converse	1
	Writing contrapostive	1
19	Writing probability of getting a prize = $\frac{10}{10000} = \frac{1}{1000}$	1
	Writing p(not getting a prize) = $1 - \frac{1}{1000} = \frac{999}{1000}$	1
20	Getting: equation of BC is $x + y - 3 = 0$	1
	Finding length of altitude from A(2, 3) $= \left\lvert \frac{2+3-3}{\sqrt{2}} \right\rvert = \left\lvert \frac{2}{\sqrt{2}} \right\rvert = \sqrt{2}$	1
21	Getting $r = \sqrt{2}$ **OR** $\theta = \frac{\pi}{4}$	1
	Writing : polar form is $\sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$	1
22	Taking the pair as $x,\ x + 2$ and writing $x > 50,\ 2x + 2 < 120$	1
	Writing the required pair of numbers (51, 53), (53, 55), (55, 57), (57, 59)	1
23	Writing slope = -1	1
	Writing angle made = $135°$.	1
24	Writing $\left(\frac{2a-4+8}{3}, \frac{4+3b+14}{3}, \frac{6-10+2c}{3}\right) = (0, 0)$ **OR** $\frac{2a - 4 + 8}{3} = 0$ **OR** $\frac{4 + 3b + 14}{3} = 0$ **OR** $\frac{6 - 10 + 2c}{3} = 0$	1
	Getting $a = -2,\ b = -6,\ c = 2$	1
25	Knowing the firmula $n(C \cup T)$ $= n(C) + n(T) - n(C \cap T)$ **OR** $n(C \cup T) = 65$, n(C)=40, $n(C \cap T) = 10$.	1
	Getting number of people who like tennis, $n(T) = 35$	1
	Getting number of people who like tennis only= people who like tennis- people who like tennis and cricket =35-10=25	1
26	Stating $\forall a \in Z,\ (a,a) \in R$ since $a - a = 0 \in Z$	1
	Writing $(a,\ b) \in R \Rightarrow (b,\ a) \in R$ with reason	1
	Writing $(a,\ b) \in R,\ (b,\ c) \in R \Rightarrow (c,\ a) \in R$ with reason	1
27	For expanding the LHS. LHS = $\cos^2 x + \cos^2 y + 2\cos x\cos y + \sin^2 x + \sin^2 y - 2\sin x\sin y$	1
	Getting $1 + 1 + 2(\cos x.\cos y - \sin x.\sin y)$	1

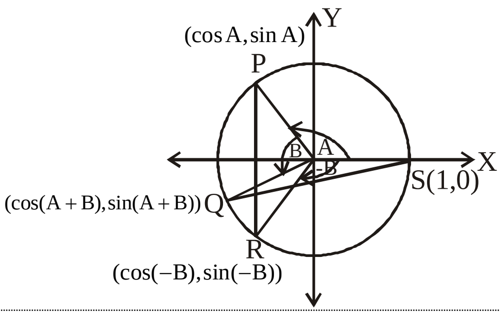
	Getting $= 4\cos^2\left(\frac{x+y}{2}\right)$	1
28	Writing equation $\sqrt{2}x^2 + x + \sqrt{2} = 0$	1
	For using the formula for roots	1
	Getting roots $x = \frac{-1 \pm \sqrt{7}i}{2\sqrt{2}}$.	1
29	Getting number of words with 4 letters = $\frac{6!}{2!}$ =360 ways	1
	Getting number of words containing all the letters of the words = 6! = 720 ways.	1
	Getting the number of words having first letter as vowel is $= 2! \times 5! = 2 \times 120 = 240$.	1
30	Writing the conjugate $= \frac{2-i}{2+i}$.	1
	For using $(x+iy)(x-iy) = x^2 + y^2$ **OR** for simplifying $\frac{2+i}{2-i}$ to $\frac{3+4i}{5}$.	1
	Getting the answer $x^2 + y^2 = 1$.	1
31	Writing $T_{r+1} = {}^6C_r \left(\frac{3}{2}x^2\right)^{6-r}\left(\frac{-1}{3x}\right)^r$	1
	Getting r = 4	1
	Getting answer $= \frac{5}{12}$	1
32	Getting $d = 4$	1
	Finding all the three A.M.s = 12, 16, 20 (any one correct award one mark)	2
33	Knowing number of committees containing at least one man **OR** Knowing number of committees containing at most one man.	1
	Getting the probability that committee contains at least one man	1
	Getting the probability that committee contains at most one man	1
34	Let $f(x) = \cos x$. Writing $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ **OR** $= \lim_{h\to 0}\frac{\cos(x+h)-\cos x}{h}$	1
	For using using formula for $\cos C + \cos D$.	1
	Getting the answer $-\sin x$.	1
35	Writing the centre of the circle ≡ (5, 0)	1
	Getting the equation $y^2 = 20x$	1
	Writing , directrix is $x = -5$, LR = 20	1
36	Writing $a + (m-1)d = n$ and $a + (n-1)d = m$.	1

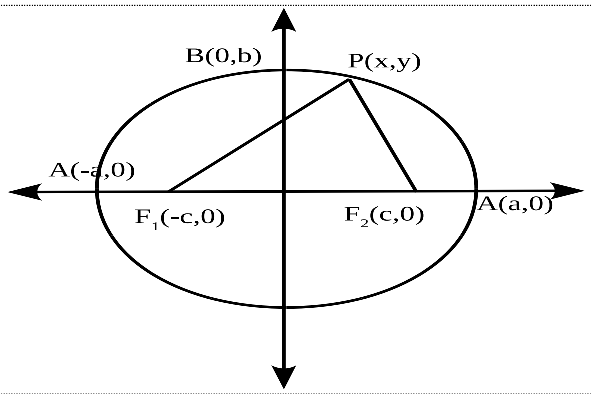
	Solving for d $(= -1)$	1
	Getting p^{th} term $= n + m - p$	1
37	Taking $\sqrt{2} = \frac{p}{q}$ where $p, q \in I$, $q \neq 0$ where p, q have no common factor.	1
	Showing p, q are even.	1
	Concluding , by contradiction.	1
38.	Let A , B denote the events that Anil, Sunil qualify in the exam Writing P (A) = 0.05 , P (B) = 0.1 , $P(A \cap B) = 0.02$	1
	Stating $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.05 + 0.1 - 0.02 = 0.13$	1
	Getting $P(A' \cap B') = 1 - P(A \cup B) = 1 - 0.13 = 0.87$	1
39	Stating any one particular statement of the type $[x] = n$ when $n \leq x < (n+1)$ {for example, $[x] = 1$ when $1 \leq x < 2$}	1
	Drawing any one step (line segment) between two consecutive integers	1
	Drawing three consecutive steps with punches.	1
	Writing R as the domain	1
	Writing Z as the range.	1
40	Figure 	1
	Stating Area of $\Delta OAB <$ area of sector OAB $<$ area of ΔOAC	1
	Getting $\frac{1}{2} r^2 \sin\theta < \frac{1}{2} r^2 \theta < \frac{1}{2} r^2 \tan\theta$	1
	Getting $\underset{\theta \to 0}{\text{Lt}} \frac{\sin\theta}{\theta} = 1$	1
	Getting $\underset{\theta \to 0}{\text{Lt}} \frac{\tan\theta}{\theta} = 1$	1
41	Taking $P(n) = 1^3 + 2^3 + \ldots\ldots + n^3 = \frac{n^2(n+1)^2}{4}$ and showing P (1) is true	1
	Assuming $P(m) : 1^3 + 2^3 + \ldots\ldots + m^3 = \frac{m^2(m+1)^2}{4}$ to be true	1

	Proving $P(m+1) : 1^3+2^3+....+m^3+(m+1)^3 = \frac{(m+1)^2(m+2)^2}{4}$ is true	2
	Concluding that the statement is true by induction	1
42	Writing possible nuber of choices .	1
	Finding number of ways of selecting 1 B and 4 G = $^7C_1 \times {}^5C_4 = 35$, 2 B and 3 G = $^7C_2 \times {}^5C_3 = 210$, 3 B and 2 G = $^7C_3 \times {}^5C_2 = 350$, 4 B and 1 G = $^7C_4 \times {}^5C_1 = 175$ (any one correct award one mark)	3
	Total number of selections = 770	1
43	Taking $P(n) : (a+b)^n + {}^nC_0\, a^n + {}^nC_1\, a^{n-1}b + ...+{}^nC_n\, b^n$ and showing P (1) is true	1
	Assuming P (m) is true	1
	Proving P (m+1) is true	2
	concluding P (n) is true by induction	1
44	Figure 	1
	Showing $\frac{m}{n} = \frac{AP}{PB} = \frac{AQ}{BR}$	1
	Getting $z = \frac{m z_2 + n z_1}{m+n}$	1
	Getting point of division $\equiv \left(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}, \frac{mz_2+nz_1}{m+n}\right)$	1
	Getting , mid point of AB = (3, 4, 5)	1
45	Figure 	1
	Writing $m_1 = \tan\theta_1$, $m_2 = \tan\theta_2$ and writing $\theta_1 = \theta_2 + \theta$	1
	Getting $\tan\theta = \tan(\theta_1 - \theta_2) = \frac{\tan\theta_1 - \tan\theta_2}{1+\tan\theta_1\tan\theta_2} = \frac{m_1-m_2}{1+m_1m_2}$	1

	Let m be the required slope. getting $\left\lvert \dfrac{m-\frac{1}{2}}{1+\frac{m}{2}} \right\rvert = 1$	1
	Finding m.	1
46	Applying formula for $\sin C + \sin D$	1
	Applying formula for $\cos C + \cos D$	1
	Getting LHS = $\dfrac{2\sin 6x.\cos x + 2\sin 6x.\cos 3x}{2\cos 6x\cos x + 2\cos 6x\cos 3x}$	1
	Getting LHS = $\dfrac{2\sin 6x[\cos x + \cos 3x]}{2\cos 6x[\cos x + \cos 3x]}$	1
	Getting LHS = $\tan 6x$	1
47	Drawing the line $2x + y = 4$.	1
	Shading the region $2x + y \geq 4$.	1
	Drawing and shading the region for $x + y \leq 3$	1
	Drawing and shading the region for $2x - 3y \leq 6$	1
	Shading the solution region	1
48	(table below)	

Marks Obtained	Number of students f_i	Midpoints x_i	$f_i\ x_i$	$\lvert x_i - \bar{x}\rvert$	$f_i\lvert x_i - \bar{x}\rvert$
10 – 20	2	15	30	30	60
20 – 30	3	25	75	20	60
30 – 40	8	35	280	10	80
40 – 50	14	45	330	0	0
50 – 60	8	55	440	10	80
60 – 70	3	65	195	20	60
70–80	2	75	150	30	60
	N=40		**1800**		**400**

	For first two columns	1
	For next two columns	1
	For last two columns	1
	Getting $\bar{x} = 45$	1
	Getting M D $(\bar{x}) = 10$	1
49 (a)	Figure 	1

	Showing PR = QS	1
	Using distance formula , getting , $PR^2 = 2 - 2(\cos A \cos B - \sin A \sin B)$ $QS^2 = 2 - 2\cos(A + B)$	1
	Using P R = Q S , getting $\cos(A+B) = \cos A \cos B - \sin A \sin B$	1
	Writing $\cos 75° = \cos(45° + 30°)$	1
	Getting $\cos 75° = \frac{\sqrt{3}-1}{2\sqrt{2}}$	1
(b)	Writing n^{th} term , $T_n = 1^2 + 2^2 + \ldots + n^2$	1
	Getting $T_n = \frac{2n^3 + 3n^2 + n}{6}$	1
	Getting $S_n = \sum T_n = \frac{1}{6}\left[2\sum n^3 + 3\sum n^2 + \sum n\right]$	1
	Writing $S_n = \frac{1}{6}\left[\frac{2n^2(n+1)^2}{4} + \frac{3n(n+1)(2n+1)}{6} + \frac{n(n+1)}{2}\right]$	1
50 (a)	Definition	1
	Figure 	1
	Taking $PF_1 + PF_2 = 2a$	1
	Writing $\sqrt{(x+c)^2 + y^2} + \sqrt{(x-c)^2 + y^2} = 2a$	1
	For simplification	1
	Getting $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	1
(b)	Applying quotient rule for differentiation.	1
	Knowing derivative of x^5, $\cos x$, $\sin x$ (any one correct award one mark)	2
	Getting the answer $\frac{\sin x(5x^4 + \sin x) - (x^5 - \cos x)\cos x}{\sin^2 x}$	1