SACRED HEART COLLEGE (AUTONOMOUS)

Department of Mathematics

BACHELOR OF SCIENCE [MATHEMATICS]

Course plan

Academic Year 2015 – 16

Semester 5

COURSE PLAN
Mathematical Analysis

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COURSE OBJECTIVE

*To study elementary concepts of real analysis

* To equip the students for analysing a problem and solving it.

*To understand both algebraic and geometrical implications of the results in real analysis.

Sessions	Topic	Method	Remarks
1	Introductory Session, Bridge course	Lecture	
2	Introductory Session, Bridge course	Lecture	
3	Intervals, Bounded and unbounded sets-examples	Lecture,group discussion and problem solving	
4	Problem solving		
5	Supremum and infimum-	Lecture,group discussion and problem solving	
6	examples to find supremum and infimum		
7	Order completeness in R, Archimedian property of real numbers	Lecture,group discussion	
8	Dedekinds form of completeness property	Lecture	
9	Dedekinds form of completeness property	Lecture	
10	Revision		
11	Test Paper - 1		
12	Introduction to module 2		
13	Neighbourhood of a point	Lecture,group discussion and problem solving	
14	examples		
15	Interior point of a set-examples		
16	Interior point of a set-examples	Lecture,group discussion and problem solving	
17	Open set-examples	Lecture,group discussion and problem solving	
18	Theorems on open sets - Problems		
19	Limit Point-Derived set-examples	Lecture,group discussion and problem solving	

20	Limit Point-Derived set-examples	Lecture,group discussion and problem solving	
21	Bolzano Weierstras Theorem	Lecture	
22	Closed sets-examples Closure of a set-examples Further theorems	Lecture,group discussion and problem solving	
23	Theorem continues	Lecture	
24	Dense sets-examples	Lecture,group discussion and problem solving	
25	Countable and uncountable sets-examples	Lecture,group discussion and problem solving	
26	Theorems on countable sets	Lecture	
27	Problems on countable sets	Doubt clearing	
28	Test Paper 2		
29	Real sequences, range, bounded sequences	Lecture,group discussion and problem solving	
30	Convergence of sequences	Lecture,group discussion and problem solving	
31	Some theorems		
32	Limit points of a sequence	Lecture,group discussion and problem solving	
33	Examples for limit points of sequences	Lecture,group discussion and problem solving	
34	Bolzano Weierstrass Theorem	Lecture	
35	Bolzano Weierstrass Theorem	Lecture	
36	Bolzano Weierstrass Theorem	Lecture,group discussion and problem solving	
37	Limit inferior and limit superior	Lecture,group discussion and problem solving	
38	Limit inferior and limit superior	Lecture,group discussion and problem solving	
39	Limit inferior and limit superior	Lecture,group discussion and problem solving	
40	Problems	Lecture,group discussion and problem solving	
41	Problems	Lecture,group discussion and problem solving	
42	Convergent Sequences	Lecture,group discussion and problem solving	
43	Convergent Sequences	Lecture,group discussion and problem solving	
44	Convergent Sequences	Lecture,group discussion and problem solving	

45	Convergent Sequences	problem solving	
46	Cauchys general principle of convergence	Lecture,group discussion and problem solving	
47	Cauchys general principle of convergence	Lecture,group discussion and problem solving	
48	Statement of theorem without proof in algebra of sequences	Lecture,group discussion	
49	Statement of theorem without proof in algebra of sequences	group discussion	
50	Some important theorems	Lecture	
51	Examples		
52	Problem solving		
53	Monotonic Sequences	Lecture,group discussion and problem solving	
54	Monotonic Sequences	Lecture,group discussion and problem solving	
55	Monotonic Sequences	Lecture,group discussion and problem solving	
56	Monotonic Sequences	Lecture,group discussion and problem solving	
57	Subsequences	Lecture,group discussion and problem solving	
58	Revision		
59	Test Paper 3		
60	Introduction to complex numbers		
61	Sum and Product	Lecture,group discussion and problem solving	
62	Basic algebraic properties	Lecture,group discussion and problem solving	
63	Further properties		
64	Vector and modulii	Lecture,group discussion and problem solving	
65	Different representations	Lecture,group discussion and problem solving	
66	Exponent forms		
67	Argument of products and quotients	Lecture,group discussion and problem solving	
68	Product and powers in exponential form	Lecture,group discussion and problem solving	
69	Problems		
70	Roots of complex numbers	Lecture,group discussion	
71	Roots of complex numbers	Lecture,group discussion	
72	Examples		

73	Regions in complex plane	Lecture,group discussion and problem solving	
74	Regions in complex plane	Lecture,group discussion and problem solving	
75	Test paper 4		

COURSE PLAN
DIFFERENTIAL EQUATIONS

COURSE OBJECTIVES

Since the time of Isaac Newton differential equation have been of fundamental importance in the application of Mathematics to the Physical Science. Lately differential equation gained increasing importance in the Biological and Social Science. In this course we are studying the ordinary differential equation involving one independent and one or more dependent variables. The integrals of ordinary differential equation are plane curves. Also we should study the differential equation involving one dependent and more than one independent variables, that is, partial differential equation. Such integrals are space curves and surfaces. Partial differential equation can arise in a variety of ways in Geometry, Physics, etc.

Basic Reference

1. Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).
2. Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)

Sessions	Topic	Method
1.	Bridge course – Introduction to differential equations and partial differential equations	Lecture, Group Discussion, Interactions
2.	Module 1 - Exact differential equations	Lecture, Group Discussion, Interactions
3.	Exact differential equations and integrating factors	Lecture, Group Discussion, Interactions
4.	Problems solving	Discussion
5.	Problems	Discussion
6.	Separable equations	Lecture, Group Discussion, Interactions
7.	Separable equations and problems	Lecture, Group Discussion, Interactions
8.	equations reducible to separable equations	Lecture, Group Discussion, Interactions
9.	Problems solving	Lecture, Group Discussion, Interactions

10.	Problems	Lecture, Group Discussion, Interactions
11.	linear equations and its solutions	Lecture, Group Discussion, Interactions
12.	Problems on linear equations	Lecture, Group Discussion, Interactions
13.	Bernoulli equations and its solution	Lecture, Group Discussion, Interactions
14.	Problems on Bernoulli equations	Lecture, Group Discussion, Interactions
15.	special integrating factors and transformations : case 1	Lecture, Group Discussion, Interactions
16.	special integrating factors and transformations : case 2	Lecture, Group Discussion, Interactions
17.	Problems	Lecture, Group Discussion, Interactions
18.	Problems	Lecture, Group Discussion, Interactions
19.	Orthogonal trajectories and its solution	Lecture, Group Discussion, Interactions
20.	Oblique trajectories and its solutions	Lecture, Group Discussion, Interactions
21.	Problems	Lecture, Group Discussion, Interactions
22.	Revision of module 1	Lecture, Group Discussion, Interactions
23.	Test on module 1	
24.	Module 2 – Introduction- Basic theory of linear differential equations	Lecture, Group Discussion, Interactions

25.	Basic Definitions	Lecture, Group Discussion, Interactions
26.	Basic existence theorem	Lecture, Group Discussion, Interactions
27.	Objective type problems based on definitions and theorem	Lecture, Group Discussion, Interactions
28.	Basic theorems on linear homogeneous differential equations	Lecture, Group Discussion, Interactions
29.	Elementary problems on basic theorem	Lecture, Group Discussion, Interactions
30.	Method of reduction of order	Lecture, Group Discussion, Interactions
31.	Problems on reduction of order	Lecture, Group Discussion, Interactions
32.	Non homogeneous equations and theorems	Lecture, Group Discussion, Interactions
33.	Problems on non homogeneous equations	Lecture, Group Discussion, Interactions
34.	Homogeneous linear equations with constant coefficient - Introduction	Lecture, Group Discussion, Interactions
35.	Case I and Case II	Lecture, Group Discussion, Interactions
36.	Case III and Case IV Problems	Lecture, Group Discussion, Interactions
37.	Method of undetermined coefficients - Introduction and method A	Lecture, Group Discussion, Interactions
38.	Method B, definitions of UC functions and sets	Lecture, Group Discussion, Interactions

39.	Examples	Lecture, Group Discussion, Interactions
40.	Problems	Lecture, Group Discussion, Interactions
41.	Variation of Parameters, method	Lecture, Group Discussion, Interactions
42.	Variation of parameters problem	Lecture, Group Discussion, Interactions
43.	Cauchy Euler Equation and the method of solution	Lecture, Group Discussion, Interactions
44.	Problems on CR equations	Lecture, Group Discussion, Interactions
45.	Problems	Lecture, Group Discussion, Interactions
46.	Revision	Lecture, Group Discussion, Interactions
47.	Revision	Lecture, Group Discussion, Interactions
48.	Test on module 2	
49.	Test Paper review	
50.	Introduction to second order linear homogeneous differential equations and examples.	Lecture, Group Discussion, Interactions
51.	Ordinary points of second order linear homogeneous equations and examples.Concept of power series and convergence of power series.	Lecture, Group Discussion, Interactions
52.	Theorem concerning power series solutions& The method of finding power series solutions.	Lecture, Group Discussion, Interactions
53.	Problems related to power series solutions.	Lecture, Group Discussion, Interactions
54.	Problems related to power series solutions.	Seminar by students

55.	Problems related to power series solutions.	Seminar by students
56.	Problems related to power series solutions.	Seminar by students
57.	Singular points of second order linear homogeneous equations. Classification into regular and irregular singular points.	Lecture, Group Discussion, Interactions
58.	Problems related to classification of singular points.	Lecture, Group Discussion, Interactions
59.	Theorems related to existence of Frobenius series solutions about regular singular points of second order linear homogeneous equations.	Lecture, Group Discussion, Interactions
60.	Method of finding Frobenius series solutions about regular singular points.	Seminar by students
61.	Problems related to Frobenius series solutions	Lecture, Group Discussion, Interactions
62.	Problems related to Frobenius series solutions	Lecture, Group Discussion, Interactions
63.	Problems related to Frobenius series solutions	Lecture, Group Discussion, Interactions
64.	Problems related to Frobenius series solutions	Seminar by students
65.	Introducing the Bessel's equation of order zero and order p.	Lecture, Group Discussion, Interactions
66.	Solution of the Bessel's equation of order zero	Lecture, Group Discussion, Interactions
67.	Solution of the Bessel's equation of order zero(Contd.)	Lecture, Group Discussion, Interactions
68.	Solution of the Bessel's equation of order p	Lecture, Group Discussion, Interactions
69.	Solution of the Bessel's equation of order p(Contd.)	Lecture, Group Discussion, Interactions

70.	Bessel Fuctions and properties.	Lecture, Group Discussion, Interactions
71.	CIA – I	1 hr; descriptive answers only
72.	Introduction to systems of first order linear equations.	Lecture, Group Discussion, Interactions
73.	Solving systems of first order linear equations-Elimination Method	Lecture, Group Discussion, Interactions
74.	Solving systems of first order linear equations-Elimination Method(Contd.)	Seminar by students
75.	Solving systems of first order linear equations-Operator Method	Lecture, Group Discussion, Interactions
76.	Solving systems of first order linear equations-Operator Method(Contd.)	Seminar by students
77.	Review of the 3rd Module	
78.	Introduction to Partial Differential equations	Lecture, Group Discussion, Interactions
79.	Origin of Partial Differential Equations	Lecture, Group Discussion, Interactions
80.	. Forming Partial Differential equations by elimination of arbitrary constants	Lecture, Group Discussion, Interactions
81.	Forming Partial Differential equations by elimination of arbitrary constants(Contd.)	Seminar by students
82.	Forming Partial Differential equations by elimination of arbitrary functions.	Lecture, Group Discussion, Interactions
83.	Forming Partial Differential equations by elimination of arbitrary functions.(Contd.)	Seminar by students
84.	Surfaces and Curves in three dimensions.	Lecture, Group Discussion, Interactions
85.	Surfaces and Curves in three dimensions.(Contd.)	Lecture, Group Discussion, Interactions

86.	Method of solution of the differential equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ (Contd.	Seminar by students
87.	Second CIA	2 hrs Descriptive Test
88.	Lagrange's linear first order p.d.e. and solution.	
89.	Problems related to Lagranges equation	
90.	Problems related to Lagranges equation(Contd.)	
91.	Problems related to Lagranges equation(Contd.)	
92.	Review of 4^{th} module	
93.	REVISION.	

COURSE PLAN

ABSTRACT ALGEBRA

COURSE OBJECTIVES

This course aims to introduce the students to abstract algebraic structures such as groups, rings, integral domains, division rings and fields. It also aims to familiarise the students with the concept of isomorphism of algebraic structures, various types and examples of groups, the concept of subgroups and normal subgroups and the concept of characteristic and ideal of a ring.

Text Book

1.A First Course in Abstract Algebra by John B Fraleigh 3rd Edition

Additional references

1) Contemporary Abstract Algebra by Joseph Gallian

2) Topics in Algebra by I.N.Herstein

3) Algebra by Michael Artin

4) Abstract Algebra by David S Dummit and Richard M Foote

Sessions	**Topic**	**Method**	Remarks
1	Bridge Course: Concept of Set and its importance in Mathematics and particularly in algebra	Group Discussion followed by a Lecture session.	
2	Bridge Course : The importance of definitions in mathematics	Interactive session including GD	
3	Bridge Course:Equivalence Relations and Partitions	Lecture session with Examples	
4	Bridge Course:Equivalence Relations and Partitions	Lecture session with Examples	
5 **MODULE 1 BEGINS**	Binary Operations: Introduction of the concept	Lecture session	
6	Examples of operations which are binary operations and counterexamples	Interactive session with the students in which the students are given different	

		operations and are supposed to identify whether they are binary operations or nor.	
7	Representation of Binary Operations using a table	Lecture	
8	Binary operations (Conclusion)	Lecture	
9	Group: Motivating the definition using an example (For example the set of Integers under addition	Lecture	
10	Group (Introduction of the concept continued)	Lecture	
11	Group table of order 4.	Interactive session	
12,13 &14	Selected Exercises on pages 26, 27 and 28 of the text	Assignment and seminar for the students.	
15	Subgroups. The concept of subgroup is explained and examples are given.	Lecture	
16	The subgroups of Z_4 and V are determined.	Lecture	
17	Cyclic Subgroups -Concept is introduced	Lecture	
18,19 &20	Exercises on Page 35,36 and 37 of the text	**Assignment , Seminar and for the students**	
21	Permutations and permutation groups- Introduction of the concept.	Lecture	
22	Permutations continued. The group S_A	Lecture	
23	Group Tables of S_3 and D_4 and their subgroups and subgroup lattice diagrams	Lecture	
24	Cycles and cyclic Notation. Theorem 5.1 of the text and its proof.	Lecture	
25	Transpositions-definition. Corollary on page 52. Theorem 5.2-idea of proof explained	Lecture	
26	Theorem 5.2- Proof Completed.	Lecture	
27	The alternating Group	Lecture	
28	Selected Exercises on page 55,56 and 57	**Seminars and assignments by students**	
29	**FIRST CIA**	Written Test; Descriptive.	
30 **MODULE 2 BEGINS**	Cyclic Groups- Definition , Theorem 6.1, Lemma 6.1 and examples	Lecture	

31	Theorem 6.2 and its Corollary	Lecture	
32	The Classification of Cyclic groups- Infinite Case	Lecture	
33	The Classification of Cyclic groups- Finite Case	Lecture	
34	Subgroups of Finite Cyclic groups. Theorem 6.4	Lecture	
35	Corollary of theorem 6.4 and applications.	Lecture	
36	Selected Exercises on pages 63 64 and 65	**Seminar and assignments for the students**	
37	Isomorphism- Definition , Explanation of the concept and Theorem 7.1	Lecture	
38	How to show that to groups are isomorphic and Theorem 7.2 and Example 7.2	Lecture	
39	How to show that two groups are not isomorphic. Examples 7.5- 7.9 0f the text	Lecture	
40	Cayley's Theorem	Lecture	
41	Cayley's Theorem and proof continued.	Lecture	
42,43 and 44	Exercises on pages 74,75 and 76 of the text	**Seminar Assignment and for the students.**	
45	Groups of Cosets- Introduction to the concept and Theorem 11.1.Definition of left and right cosets.Motivation using example 11.2 and example 11.3.	Lecture	
46	Theorem 11.2 example 11.1 and Theorem 11.3	Lecture	
47	Lagrange's Theorem, its corollary , theorem 11.5, Definition of index and Theorem 11.6.	Lecture	
48	Counterexample for the falsity of the theorem of Lagrange.	Lecture	
49	Selected Exercises on page 111, 112 and 113	**Seminar and assignments for students.**	
50	Lemma 12.1 and Theorem 12.1	Lecture	
51	Definition of automorphism, theorem 12.2 , definition of a normal subgroup ,theorem 12.3,Example 12.1 and definition of conjugate subgroups.	Lecture	

52	Definition of Factor Group, example 12.2, Example 12.3 and example 12.4	Lecture	
53	Examples 12.5, 12.6 and 12.7	Lecture	
54	Definition of simple group, Statement of theorem 12.4 and Theorem 12.5	Lecture	
55	Theorem 12.6	Lecture	
56	Selected Exercises on pages 123, 124,125 and 126	**Seminar and assignments for the students.**	
57 **MODULE 3 BEGINS**	Definition of Homomorphism and Elementary Properties.Example 13.1,Theorem 13.1and Example 13.2	Lecture	
58	Theorem 13.2	Lecture	
59	Theorem 13.3	Lecture	
60	Example 13.3, definition of maximal normal subgroup theorem 13.4 and theorem 13.5.	Lecture	
61,62 and 63	Selected Exercises on pages 133,134 and 135	Lecture	
62	Motivation of the definition of a ring, The Definition and Examples.	Lecture	
63	Examples 23.1 and 23.2	Lecture	
64	Theorem 23.1, Definition of isomorphism and example 23.3	Lecture	
65	Definitions of commutative rings and examples . Definition of Ring with unity and examples, Theorem 23.2, Direct product of rings.	Lecture	
66	Definition of unit, division ring and field and examples.Examplw 23.4	Lecture	
67,68 and 69	Selected Exercises on pages 211,212 and 213.	Lecture	
70	Divisors of Zero, Theorem 24.1 and its corollary	Lecture	
71	Theorem 24.2 and definition of an integral domain and its examples	Lecture	
72	Theorems 24.3 and Theorem 24.4 and its corollary.	Lecture	
73	Selected Exercises on pages 220,221 and 222.	Lecture	
74 **MODULE 4 BEGINS**	Definition of characteristic of a ring and example 24.2 and theorem 24.5	Lecture	

75	Fermat's Theorem (Theorem 24.6,corollary, Example 24.3)	Lecture	
76	Theorem 24.7 and Theorem 24.8(Euler)	Lecture	
77	**SECOND CIA**		
78	**SECOND CIA**		
79	**SECOND CIA**		
80	Theorem 28.2 and lemma 28.1	Lecture	
81	Theorem 28.3	Lecture	
82	Definition of Ideal,proper ideal,improper ideal,trivial ideal et al and examples 28.1-28.4	Lecture	
83	Theorem 28.4 and its corollary	Lecture	
84,85&86	Selected Exercises on Pages 252-253	Lecture	
87	**REVISION**		
88	**REVISION**		
89	**REVISION**		
90	**REVISION**		

COURSE PLAN

Fuzzy Mathematics

(Semester 5– B.Sc Mathematics)

COURSE OBJECTIVES

The course aims

- To introduce and explain the ideas relevant Fuzzy sets and fuzzy logic Theory in detail

Sessions	Topic	Method
1	Module 1 - Preliminaries - Introduction	Lecturing
2	Crisp set an overview	Lecturing
3	Fuzzy sets	Lecturing
4	Basic types of fuzzy sets	Lecturing
5	Basic concepts of fuzzy sets	Lecturing
6	Properties of alpha cuts	Lecturing
7	Theorems on alpha cuts	Lecturing
8	Problems	Lecturing
9	Representation of fuzzy sets	Lecturing
10	first decomposition theorem	Lecturing
11	second decomposition theorem	Lecturing
12	third decomposition theorem	Lecturing
13	Problems	Lecturing
14	Problems	Lecturing
15	Problems	Lecturing
16	Theorems on alpha plus cut of a set	Lecturing
17	Problems	Lecturing
18	Additional theorems on fuzzy sets	Lecturing
19	Problems	Lecturing
20	Problems	Lecturing
21	Revision	Group discussion
22	CIA – I (Module -1)	1 hr; descriptive answers only
23	Module II – Operations on fuzzy sets	Lecturing
24	Types of fuzzy operations	Lecturing
25	Union	Lecturing
26	Intersection	Lecturing
27	Complements	Lecturing
28	Fuzzy complements	Lecturing
29	Problems	Lecturing
30	Theorems	Lecturing
31	Fuzzy t norms	Lecturing
32	Problems	Lecturing
	Problems	Lecturing
33	Theorems	Lecturing
34	Fuzzy t-conorms	Lecturing

35	Problems	Lecturing
36	Problems	Lecturing
37	Theorems	Lecturing
38	De –morgans law	Lecturing
39	Dual triple	Lecturing
40	Theorems on dual triple	Lecturing
41	Theorems on combination of operations	Lecturing
42	Theorems	Lecturing
43	Problems	Lecturing
44	Problems	Group work
45	Problems	Group work
46	Problems	Group work
47	Problems	Group work
48	Problems	Group work
49	Problems	Group work
50	Problems	Group work
51	Revision and test	
52	Module III -Introduction	Lecturing
53	Fuzzy Numbers	Lecturing
54	Arithmetic operations on intervals	Lecturing
55	Addition	Lecturing
56	Subtraction	Lecturing
57	Multiplication	Lecturing
58	Division	Lecturing
59	Arithmetic operations on fuzzy numbers	Lecturing
60	Addition	Lecturing
61	Subtraction	Lecturing
62	Multiplication	Lecturing
63	Division	Lecturing
64	Problems	Lecturing
65	MAX and MIN of fuzzy numbers	Lecturing
66	Max and min of fuzzy numbers	Lecturing
67	Problems	Lecturing
68	Module IV-Fuzzy logic	Lecturing
69	Classical logic an overview	Lecturing
70	Multivalued logics	Lecturing
71	Fuzzy propositions	Lecturing
72	Fuzzy Quantifiers	Lecturing
73	Linguistic hedges	Lecturing
74 - 76	Inference from conditional fuzzy propositions	Lecturing
77 - 80	Problems	

COURSE PLAN
Open Course:APPLICABLE MATHEMATICS

Objectives :

- **Prepare students of all streams, particularly those with arts and commerce back ground for their higher studies.**
- **Prepare students of all streams, particularly those with arts and commerce back ground to approach competitive examinations.**

Text Books:

1 M. Tyra, & K. Kundan- CONCEPTS OF ARITHMETIC.

Sessions	Topic	Method	RemarkS
1	Introduction about the course	Lecture + Interaction	
2	Types of numbers	Lecture + Interaction	
3	Solution of quadratic equations with real roots only	Lecture + Interaction	
4	Different methods of solution	Lecture + Interaction	
5	Logarithms	Lecture + Interaction	
6	Properties + problems	Group work	
7	Problems	Group work	
8	Evaluations of exponents	Lecture + Interaction	
9	Exponents laws	Lecture + Interaction	
10	Permuations	Lecture + Interaction	
11	Rules and explanations	Lecture + Interaction	
12	Problems	Lecture + Interaction	
13	Combinations	Lecture + Interaction	
14	Problems	Lecture + Interaction	
15	Trigonometry	Lecture + Interaction	
16	Simple equations	Group work	
17	- T - Values	Lecture + Interaction	
18	Heights and Distance - problems	Group work	
19	Two dimensional geometry	Lecture + Interaction	
20	Plotting of points	Lecture + Interaction	
21	Drawing graph of a straight line	Lecture + Interaction	
22	Probability	Lecture + Interaction	
23	Sample space	Lecture + Interaction	

24	Examples – events	Lecture + Interaction	
25	Differential calculus	Lecture + Interaction	
26	Formulas	Group work	
27	Simple problems	Group work	
28	Problems	Lecture	
29	Integral calculus	Lecture	
30	Simple problems	Group work	
31	Problems	Group work	
32	Hcf of nos	Lecture	
33	Lcm of nos	Lecture	
34	Fractions	Lecture	
35	Square and roots	Lecture	
36	Test		
37	Cube and cube roots	Lecture	
38	Problems	Lecture	
	Ratio and proportion	Lecture	
39			
	Percentage	Lecture	
40			
41	Profit and loss	Lecture	
42	problems	Group work	
43	Problems	Group work	
44	Simple interest	Lecture	
45	Compound interest	Lecture	
46	Time and work	Lecture	
47	Time and work	Lecture	
48	Work and wage	Lecture	
49	Work and wage	Lecture	
50	Time and distance	Lecture	
51	Elementary menstruation	Lecture	
52	Area and Perimeter	Lecture	
53	Problems on polygons	Lecture	
54	Problems on polygons	Lecture	
55	Test		
56	Problems	Group work	
57	Revision	Group work	
58	Revision	Group work	
59	Revision	Group work	
60	Problems	Group work	