

# PREFACE

In the ACs' conference held in July, 2010 at KVS (HQ), New Delhi, issue of Study Material for Board classes was discussed at length and finally decided to provide it to students. Various Regional Offices were asked to prepare the study material in different subjects while the task of its correction and moderation was assigned to various ZIETs of KVS.

KVS, ZIET, Chandigarh received study material in the subjects of Physics, Chemistry, and Biology & Maths for XII, Maths and Science & Tech. for X class, from various Regional Offices. The study material was got reviewed and suitably modified by organising workshops of experienced and competent subject teachers with the co-operation and guidance of AC, KVS, RO, CHD. Corrected study material was sent to all regional offices for providing it to students and also uploaded on the Website [WWW.zietchandigarh.org](http://WWW.zietchandigarh.org).

Subject teachers, both at the preparation and moderation levels have done a remarkable job by preparing a comprehensive study material of multiple utility. It has been carefully designed and prepared so as to promote better learning and encourage creativity in students through their increased self efforts for solving assignments of different difficulty level. But the teachers and the students must bear in mind that the purpose of the study material is in no way to replace the text-book, but to make it a complete set by supplementing it with this study material so that it may provide requisite and adequate material for use in different ways.

The study material can be effectively used in the following ways:

- ❖ **Practice material** to supplement questions given in the textbook.
- ❖ **Material for Study Camps:** The purpose of conducting study camps is to inculcate study habits amongst students under active supervision of the teachers. These camps can be organised within the normal school hours and days. Day wise target will be ascertained and given to the students and reviewed by the concerned subject teacher. If the target is not achieved by any student, it will be added to the next day's target.
- ❖ **Master Cards:** The teachers can help students prepare master cards by taking the important questions/topics/points/concepts /reactions/terms etc from this study material for the quick revision for the examination.
- ❖ **Crash Revision Courses:** The material can also be used for preparing handouts for conducting Crash Revision Courses under the supervised guidance of the teachers just before or in the gaps between papers during examination.

Effectiveness of the study material will ultimately depend upon its regular and judicious use for the above listed purposes both by teachers and students. While attempting the source material, it would be quite useful to mark every time a question done successfully with a tick out (✓) and a question not done successfully with a dot (•). It can be later used as a source of feedback for error analysis and for effective subsequent revisions/remedial work etc. I am sure that this well prepared study material if used sincerely and judiciously will surely bring cheers to all sections of students.

I, also, take this opportunity to extend my most sincere gratitude to our Hon'ble, Commissioner KVS (HQ), New Delhi, and other higher authorities of KVS for providing this opportunity for making some useful contribution to the study material.

I also extend my thanks to all the Assistant Commissioners of various Regions for their invaluable contribution in preparation of the Study Material in various subjects.

Above all, sincere and dedicated efforts of the subject teachers in preparation of this study material deserve full appreciation. Teacher's observations, suggestions and critical analysis for further improvement of the study material mailed to 'kvszietchd' @[gmail.com](mailto:kvszietchd@gmail.com), will be highly appreciated.

With best wishes to all users of this STUDY MATERIAL.

(HAR GOPAL)  
Director  
KVS ZIET Chd.

# **STUDY MATERIAL**

**SUBJECT: MATHEMATICS**

**CLASS: X**

**KENDRIYA VIDYALAYA  
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YEAR 2010-2011**

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## TOPIC WISE ANALYSIS OF EXAMPLES AND QUESTIONS NCERT TEXT BOOK

CHAPTERS	CONCEPTS	NUMBER of QUESTIONS for REVISION		TOTAL
		QUESTIONS FROM SOLVED EXAMPLES	QUESTIONS FROM EXERCISE	
01	Real numbers	10	33	43
02	Polynomials	4	29	33
03	A pair of linear equations in two variables	8	36	44
04	Quadratic equations	14	36	50
05	Arithmetic progression	12	25	37
06	Triangles	15	45	60
07	Co-ordinate Geometry	8	37	45
08	Introduction to Trigonometry	7	46	53
09	Application of Trigonometry	4	19	23
10	Circles	3	34	37
11	Construction	4	22	26
12	Area Related to Circles	6	27	33
13	Surface Area & Volumes	6	40	46
14	Statistics	5	11	16
15	Probability	9	47	56
	<b>TOTAL</b>	<b>115</b>	<b>487</b>	<b>602</b>

## DETAILS OF THE CONCEPTS TO BE MASTERED BY EVERY CHILD OF CLASS X WITH EXERCISES AND EXAMPLES OF NCERT TEXT BOOK

### SYMBOLS USED

\*: Important Questions, \*\*: Very Important Questions, \*\*\*: Very- Very Important Questions

S.No	TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	References (NCERT BOOK)
01	Real Numbers	Euclid`s division Lemma & Algorithm	* * *	Example1, page5. Example 2,3,4 ;page 6 Ex: 1.1 Q; 1,2,3
		Fundamental Theorem of Arithmetic	***	Example 5; page 9. Example 7,8; page 10 Ex; 1.2; Q; 1,2,4,5
		Revisiting Irrational Numbers	***	Example 9; page;13 Example;10,11,page 14 . Ex; 1.3; Q 1,2,3
		Revisiting Rational Numbers and their decimal expansion	**	Ex; 1.4 Q; 1,2
02	Polynomials	Meaning of the zero of polynomial	*	Ex. 2.1 Q.No.1
		Relationship between zeros and coefficients of a polynomial	**	Ex. 2,3 page 30,Ex 2.2 Q No. 1
		Forming a quadratic polynomial	**	Ex.2.2 Q .No. 2
		Division algorithm for a polynomial	*	Exp 8 page 34 ,Ex. 2.3 Q .No. 1,2
		Finding the zeros of a polynomial	***	Exp .9 page 35, Ex.2.3 Q No.3
03	Linear Equation in two Variables	Graphical and algebraic representation	*	Exp 2&3 Ex 3.1 Q no 2,3
		Consistency of pair of linear equations	**	Ex 3.2 Q No 2,3
		Graphical method of solution	***	Exp 4 &5 Ex 3.2 Q No 4,7
		Algebraic methods of solution	**	

		a) Substitution method b) Elimination method c) Cross multiplication method d) Equation reducible to pair of linear equations in two variables		Exp 10 ,ex 3.3 Q no1,3  Exp 13 Ex 3.4 Q No 2  Exp 14 Ex 3.5QNo 2,4  Exp 19 Ex 3.5 Q No 1(ii),(viii),2(ii),(iii)
04	Quadratic Equation	1. Standard form of quadratic Equation	*	NCERT Text book Example 1,2 Q.1,2Ex 4.1
		2.Solution of quadratic by factorization	***	Example 3,4,5, Q.1,3,4,5,6 Ex.4.2
		3.Solution of quadratic equation by completing the square	**	Example 7,8,9 Q. 1 Ex.4.3
		4. Solution of quadratic equation by quadratic formula	***	Example 10,11,12,13,14 Q.2 Ex. 4.3
		5.Nature of roots	***	Example 16 Q. 1,2 Ex. 4.4
05	Arithmetic Progressions	General Form of an A.P.	*	<b>Page 96 NCERT 2007</b> <b>Exp.1, Ex. 5.1</b> <b>QNo.s2(a),3(a)</b>
		nth Term of an A.P.	**	<b>Page 101</b>
			***	<b>Exp. 3,8 Ex.5.2 Q.Nos 1,2,4,7,11,16,</b>
		Sum of first n terms of an A.P.	***	<b>Page 108</b>
			**	<b>Exp 11,13,15</b>
			*	<b>Ex. 5.3 Q.No.1(i,ii)</b>
			**	<b>Q3(i,iii)</b>
***	<b>Q.7,10</b>			
06	TRIANGLES	1)Similarity of Triangles	***	Theo.6.1, Ex.1Pg126, Ex.2,3-pg127, Exer.6.2-2,4,6,10
		2) Criteria for Similarity of Triangles	**	Ex.6,7-Pg.136, Ex.8-Pg137,Exer.6.3-4,5,6,10,13,16
		3) Areas of Similar Triangles	***	Ex.9-Pg143,Theo.6.6, Exer 6.4- 3,4,5,6,7
		4)Pythagoras Theorem	***	Theo.6.8 & 6.9, Ex.10-Pg147,

				Ex.12,13Pg148, Ex.14-Pg149,Exer6.5- 4,5,6,7,13,14,15,16
07	Coordinate Geometry	Distance Formula	* *	Example No. 2, 4 Exercise 7.1 Q.No 1,2,3,4
		Section Formula	* *	Example No. 6,7 Exercise 7.2 Q.No 1,2,4,5
		Mid Point Formula		Example 10 Q.No-9,7
		Area of Triangle	* *	Example 11,12,13 Q.No 1,4
08	Introduction to Trigonometry	1)Trigonometric Ratios 2) Trigonometric Ratios of some specific angles 3) Trigonometric Ratios of complementary angles 4) Trigonometric Identities.	* ** ** ***	Ex 8.1 Q1,2 Page(181) Example 6,Page (185) Ex 8.2 Q 1,3 Example 9,10,11 page(189)Ex 8.3 Q 2,3 Example 14,15 page (192,193) EX 8.4 Q5(V, VII, VIII)
09	<b>Some Application of Trigonometry</b>	Heights and Distances	***	Example 1,2,3,4Pge(198-200) Ex 9.1 Q1,5,10,12,15,16 Pg (204-205)
10	<b>CIRCLES</b>	1.Tangents to a circle 2.Number of tangents from a point to a circle	* ***	Q3 (Ex. 10.1) Pg..209 Q1,Q6,Q7 (Ex 10.2) Pg. 214  Theorem 10.2 Pg.211 Eg.2,3 Pg. 212 Q8,9,10,12,13 (Ex.10.2)
11	Constructions	1 Division of line segment in the given ratio	*	Const 11.1 Page 216 Ex 11.1 Q.no. 1
		2 Construction Of Triangles	*	1 When three sides are given  2When two sides and included angle given  3 When two angles and one side given. 4. Construction of right

				angled triangle.
		3 Construction of triangle similar to given triangle as per given scale.	**	Exp. 1,2 pg 218 Ex. 11.1 Q.no.2-7
		4 Const. Of tangents to a circle	**	Exp. 11.3 Page 220 Ex. 11.2 Q. no. 1- 4
12	Area Related to Circles	I. Circumference of a circle	*	Example 1 page 225 Exercise 12.1 . Q. No. 1,4
		II. Area of a circle	*	Example 5 page 233 Exercise 12.1 Q .No 2,3
		III. Length of an arc of a circle	*	Exercise 12.2 Q. No 5
		IV.Area of sector of a circle	**	Example 2 page 228 Exercise 12.2 Q No 1,2
		V. Area of segment of a circle	**	Example No 3 page 228 Exercise 12.2 Qno4
		VI.Combination of figures	***	EX 12.3,Example 4,5 Pg 233
13	Surface Area and Volumes	I. Surface area of a combination of solids	**	Example 1, Pg 241 Exercise 13.1 Q1,3,6,7
		II. Volume of combination of a solid	**	Example 5, Pg 245 Exercise 13.2 Q 1,2,6
		III. Conversion of solids from one shape to another	***	Example 8 & 10, Pg 249 & 250 Exercise 13.3 Q 1,2,6
		IV. Frustum of a cone	***	Example 12 & 13 Pg 253 & 255 Exercise 13.4 Q1,3
14	STATISTICS	CONCEPT 1 Mean of grouped data		
		1. Direct Method	***	Example 2 page 267, Exercise 14.1 Q.No. 1&3, Pg.270
		2. Assumed Mean Method	*	Exercise 14.1 Q.No. 6, Pg.271
		3. Step Deviation Method	*	Exercise 14.1 Q.No. 9, Pg.272
		CONCEPT 2		
		Mode of grouped data	***	Example 5 page 273. exercise 14.2 Q.No.

				2&5, Pg.275
		CONCEPT 3		
		Median of grouped data	***	Example 7&8 page 283,284.exercise 14.3 Q. No. 5,2&3, Pg.287
		CONCEPT 4		
		Graphical representation of c.f.(ogive)	**	Example 9 page 291 exercise 14.4 Q. No. 1&3, Pg.293

## REAL NUMBERS

### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	References (NCERT BOOK)
Real Numbers	Euclid's division Lemma & Algorithm	* * *	Example1, page5. Example 2,3,4 ;page 6 Ex: 1.1 Q; 1,2,3
	Fundamental Theorem of Arithmetic	***	Example 5; page 9. Example 7,8; page 10 Ex; 1.2; Q; 1,2,4,5
	Revisiting Irrational Numbers	***	Example 9; page;13 Example;10,11,page 14 . Ex; 1.3; Q 1,2,3
	Revisiting Rational Numbers and their decimal expansion	**	Ex; 1.4 Q; 1,2

### LEVEL - I

Q;1 The decimal expansion of  $\frac{147}{120}$  will terminate after how many places of decimals ?

( Ans; 3 )

Q;2 If  $\text{HCF}(105,120) = 15$ , then find LCM of ( 105, 120 )

( Ans 840 )

Q;3 Write 21975 as a product of its prime factors

( Ans  $3 \times 5^2 \times 293$  )

Q;4 The prime factorization of natural number  $n$  is  $2^3 \times 3^2 \times 5^2 \times 7$ . Find the number of consecutive zeroes in  $n!$ .

( Ans 2)

Q;5 Will  $\frac{64}{455}$  have non-terminating repeating decimal expansion ? Why ?

( Ans Yes )

### LEVEL - II

Q;1 Prove that  $\frac{2\sqrt{3}}{5}$  is irrational.

Q;2 Prove that  $(5 - \sqrt{2})$  is irrational.

Q;3 Explain why  $7 \times 11 \times 13 \times 17 + 17$  is a composite number.

Q;4 Prove that in any three consecutive positive integers one and only one is divisible by 3.

### LEVEL - III

Q;1 Prove that  $n^2 - n$  is divisible by 2 for any positive integer  $n$ .

Q;2 If  $d$  is the HCF of 45 and 27, find  $x$  &  $y$  satisfying  $d = 27x + 45y$ .

(Ans  $d=9, x=2, y=-1$ )

Q;3 A book seller purchased 117 books out of which 45 books are of mathematics and the remaining 72 books are of Physics. Each book has same size. Mathematics and Physics books are to be packed in separate bundles and each bundle must contain same number of books. Find the least number of bundles which can be made for these 117 books.

( Ans; 13 bundles)

Q;4 Find the HCF of 117 and 65 and express it as a linear combination of 117 & 65.

( HCF=13,  $65x - 117y = 13$ )

Q;5 Find the largest number that will divide 445, 572 and 699 leaving remainder 4, 5 & 6 respectively.

Q;6  $n^2-1$  is divisible by 8, if  $n$  is an odd positive integer. Prove it.

### SELF – EVALUATION TEST

Q;1 Express 234 as the product of its prime factors.

Q;2 The LCM and HCF of two numbers are 180 and 6 respectively. If one of the numbers is 30, find the other number.

Q;3 Find the greatest number of 6 digits exactly divisible by 24,15 and 36.

Q;4 Prove that  $\sqrt{3}$  is an irrational number.

Q;5 Prove that  $\sqrt{3}+\sqrt{5}$  is an irrational number.

Q; 6 Insert a rational and irrational number between  $a$  and  $b$ . How many rational numbers and irrational numbers can be inserted between  $a$  and  $b$  ?

## POLYNOMIALS

### SCHEMATIC DIAGRAM

S No	Concept	Degree of importance	NCERT questions and examples
1	Meaning of the zero of polynomial	*	Ex. 2.1 Q.No.1
2	Relationship between zeros and coefficients of a polynomial	**	Ex. 2,3 page 30,Ex 2.2 Q No. 1
3	Forming a quadratic polynomial	**	Ex.2.2 Q .No. 2
4	Division algorithm for a polynomial	*	Exp 8 page 34 ,Ex. 2.3 Q .No. 1,2
5	Finding the zeros of a polynomial	***	Exp .9 page 35, Ex.2.3 Q No.3

## LEVEL – I

1. If  $x=1$  is a zero of a polynomial  $f(x) = x^3 - 2x^2 + 4x + k$ . Write the value of  $k$   
(Ans.  $k = -3$ )
2. For what value of  $k$ ,  $-4$  is a zero of the poly.  $x^2 - x - (2k+2)$ ?  
(Ans.  $=9$ )
3. Verify whether  $3$  and  $2$  are the zeros of the poly.  $(x-2)(x-3)$ ?
4. Find the zeros of the polynomial  $f(x) = 4x^2 + 8x$   
(Ans.  $0, -2$ )
5. Find a quadratic polynomial each with the given zeros as sum and the product of its zeros respectively  
(a)  $\frac{1}{4}, -1$       (b)  $\sqrt{2}, \frac{1}{3}$       {Ans. (a)  $4x^2 - x - 4$ , (b)  $3x^2 - 3\sqrt{2}x + 1$ }

## LEVEL – II

1. Using division algorithm, find the quotient and the remainder on dividing  $f(x)$  by  $g(x)$ , where  $f(x) = 6x^3 + 13x^2 + x - 2$  and  $g(x) = 2x + 1$   
[Ans.  $q(x) = 3x^2 + 5x - 2$ ,  $r(x) = 0$ ]
2. If  $\alpha, \beta$  are the zeros of  $2y^2 + 7y + 5$  write the value of  $\alpha + \beta + \alpha\beta$ .      (Ans.  $-1$ )
3. Find the zeros of a quadratic polynomial  $5x^2 - 4 - 8x$  and verify the relationship between the zeros and the coefficients of the polynomial.      (Ans.  $2, \frac{-2}{5}$ )
4. If  $\alpha, \beta$  are the zeros of the poly.  $f(x) = x^2 - px + q$ , find the value of  
(a)  $\alpha^2 + \beta^2$       (b)  $\frac{1}{\alpha} + \frac{1}{\beta}$       (Ans.  $P^2 - 2q, \frac{P}{q}$ )
5. On dividing  $x^3 + 2x^2 - 5x - 6$  by a polynomial  $g(x)$  the quotient and remainder were  $x+1$  and  $-4x-4$  respectively Find the polynomial  $g(x)$   
(Ans.  $x^2 + x - 2$ )
6. If  $(x + a)$  is a factor of  $2x^2 + 2ax + 5x + 10$ . Find  $a$ .      (Ans.  $a = 2$ )

## **Level – III**

1. Find all the zeros of  $2x^4 - 9x^3 + 5x^2 + 3x - 1$ , if two of its zeros are  $2 + \sqrt{3}$  &  $2 - \sqrt{3}$

2. If  $\alpha$  and  $\beta$  are the zeroes of the polynomial  $f(x) = 3x^2 - 4x + 1$ . Find the quadratic polynomial whose zeroes are  $\frac{\alpha^2}{\beta}$  and  $\frac{\beta^2}{\alpha}$

Ans.  $K(x^2 - \frac{28}{9}x + \frac{1}{3})$

3. If sum of squares of zeros of a quadratic polynomial  $f(x) = x^2 - 8x + k$  is 40, find the value of k.

(Ans. 12)

4. What must be subtracted from  $8x^4 + 14x^3 - 2x^2 + 7x - 8$  so that the resulting polynomial is exactly divisible by  $4x^2 + 3x - 2$

(Ans.  $14x - 10$ )

5. Find the value of a and b so that  $x^4 + x^3 + 8x^2 + ax + b$  is divisible by  $x^2 + 1$

(Ans a=1, b=7)

### SELF EVALUATION QUESTIONS

- If the product of the zeros of the polynomial  $ax^2 - 6x - 6$  is 4, find the value of a.
- If  $\alpha, \beta$  are the zeros of a polynomial, such that  $\alpha + \beta = 6$  and  $\alpha\beta = 4$  then write the polynomial.
- Check whether  $g(x)$  is a factor of  $p(x)$  by dividing  $p(x)$  by  $g(x)$ .  
 $p(x) = x^4 + 4x^3 - 2x^2 + x - 2, g(x) = x^2 - 4x + 1$
- If  $\alpha, \beta$  are the zeros of quadratic polynomial  $p(x) = x^2 - x - 4$ ,  
find the value of  $\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$
- If -1 is one of the zeros of the polynomial  $f(x) = 3x^3 - 5x^2 - 11x - 3$ . Find the other two zeroes.
- Obtain all zeros of the polynomial  
 $f(x) = 2x^4 + x^3 - 14x^2 - 19x - 6$ , if two of its zeroes are -2 and -1
- If one zero of the polynomial  $(a^2 + 9)x^2 + 13x + 6a$  is reciprocal of the other. Find the value of a.

### LINEAR EQUATION IN TWO VARIABLES

#### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCES
Linear Equation in two Variables	Graphical and algebraic representation	*	Exp 2&3 Ex 3.1 Q no 2,3
	Consistency of pair of linear equations	**	Ex 3.2 Q No 2,3
	Graphical method of solution	***	Exp 4 &5 Ex 3.2 Q No 4,7
	Algebraic methods of solution e) Substitution method f) Elimination method g) Cross multiplication method h) Equation reducible to pair of linear equations in two variables	**	Exp 10 ,ex 3.3 Q no1,3 Exp 13 Ex 3.4 Q No 2 Exp 14 Ex 3.5QNo 2,4 Exp 19 Ex 3.5 Q No 1(ii),(viii),2(ii),(iii)

### LEVEL - I

**Q NO 1** Ten students of class 10<sup>th</sup> took part in mathematics quiz .If the number of girls is 4 more than the number of boys . Represent this situation algebraically and graphically.

Ans :  $x-y=4$  ,  $x+y=10$

**Q NO 2** Solve graphically the system of equations

$$\begin{aligned}x+2y &= 1 \\ x-2y &= -7\end{aligned}$$

Ans :  $x=-3, y=2$

**Q NO 3** On comparing the ratios  $a_1/a_2, b_1/b_2$  &  $c_1/c_2$ . Find out whether the following pair of linear equations are consistent or not.

$$\begin{aligned}3x-y &= 3 \\ 2x+y &= 5\end{aligned}$$

Ans Consistent

**Q NO 4** Solve by substitution method

$$\begin{aligned}x-2y &= 4 \\ x-y &= 3\end{aligned}$$

Ans  $x=2, y=-1$

Q NO 5 Solve given pair of linear equations by elimination method

$$3x+2y = 12$$

$$5x-2y = 4$$

Ans  $x=2$  ,  $y=3$

### LEVEL 2

Q NO 1 Show graphically that pair of linear equations has no solution

$$2x+3y = 10$$

$$4x+6y = 12$$

Q NO 2 Find the value of K for which pair of linear equations has infinitely many solutions

$$5x+2y = k$$

$$10x+4y = 3$$

Ans  $K = 3/2$

Q NO 3 The sum of a two digit number and the number obtained by reversing the order of the digits is 165. If the digits differ by 3. Find the number.

Ans : 69 or 96

Q NO 4 In a triangle ABC ,  $\angle A = x^\circ$  ,  $\angle B = 3x^\circ$  ,  $\angle C = y^\circ$  . If  $3y^\circ - 5x^\circ = 30^\circ$  Prove that triangle ABC is a right angled triangle.

Ans :  $\angle A = 30^\circ$  ,  $\angle B = 90^\circ$  ,  $\angle C = 60^\circ$

Q NO 5 Solve the pair of linear equations

$$5x+3y = 5xy$$

$$2x+4y = 3xy$$

Ans :  $x = 14/5$  ,  $y = 14/11$

### LEVEL 3

Q NO 1 Solve graphically pair of linear equations

$$4x-3y +4=0$$

$$4x+3y-20=0$$

Find the area bounded by these lines and x-axis

Ans : 12 square units

Q NO 2 Solve by cross multiplication method  $a^2/x - b^2/y = 0$  ,  $a^2b/x + b^2a/y = a+b$  ,  $x,y \neq 0$ .

Ans:  $x=a^2$  ,  $y=b^2$

Q NO 3 X takes 3 hours more than Y to walk 30 km. But if X doubles his pace he is ahead of Y by  $3/2$  hours . Find their speed of walking .

Ans : X' s speed = 10/3km/hr

Y's speed = 5km/hr

Q NO 4 A person invested some amount at the rate of 12% simple interest & some other amount at 10% simple interest . He received yearly interest of Rs. 130 . But if he had interchanged the amount invested he would have received Rs 4 more as interest . How much amount did he invest at different rates .

Ans : Rs. 500 at 12% per year ,Rs 700 at 10% per year.

Q NO 5 A boat cover 32 km upstream & 36 km downstream in 7 hours . Also it covers 40 km upstream & 48 km downstream in 9 hours . Find the speed of boat in still water & speed of stream

Ans : 10 km per hour , 2 km per hour .

### **SELF EVALUATION**

Q NO 1 Solve the pair of linear equations by substitution method ;

$$\begin{aligned}x+y &= a+b \\ax+by &= a^2+b^2\end{aligned}$$

Q NO 2 Find the value of K for which pair of linear equations has infinitely many solutions

$$\begin{aligned}(K-1)x + 3y &= 7 \\(K+1)x + 6y &= 5K-1\end{aligned}$$

Q NO 3 Sum of two numbers is 35 & difference is 13 . Find the numbers .

Q NO 4 Draw the graphs for following equations :

$$\begin{aligned}2x-y -2&=0 \\4x+3y-24&=0 \\y+4&=0\end{aligned}$$

Obtain the vertices of triangle so formed .

Q NO 5 Solve the pair of linear equations by cross multiplication method :

$$\begin{aligned}ax+by &= a-b \\bx -ay &= a+b\end{aligned}$$

Q NO 6 A & B are friends & their ages differ by 2 years . A's father D is twice as old as A. B is twice as old as his sister C . The ages of D & C differ by 40 years .Find the ages of A& B .

Q NO 7 The incomes of X &Y are in ratio 8:7 & their expenditure are in ratio 19:16 .If each saves Rs 1250 find their incomes .

Q NO 8 Places A & B are 100 Km apart on a highway . One car starts from A & another from B at the same time . If the cars travel in same direction at different speeds they meet in 5 hours. If they travel towards each other they meet in 1 hour . What are the speeds of two cars?

### **QUADRATIC EQUATION**

### **SCHEMATIC DIAGRAM**

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCES
Quadratic Equation	1. Standard form of quadratic Equation	*	NCERT Text book Example 1,2 Q.1,2 Ex 4.1
	2. Solution of quadratic by factorization	***	Example 3,4,5, Q.1,3,4,5,6 Ex.4.2
	3. Solution of quadratic equation by completing the square	**	Example 7,8,9 Q. 1 Ex.4.3
	4. Solution of quadratic equation by quadratic formula	***	Example 10,11,12,13,14 Q.2 Ex. 4.3
	5. Nature of roots	***	Example 16 Q. 1,2 Ex. 4.4

### LEVEL – I

- For what value of  $k$ , the quadratic equation  $2x^2 + kx + 8$  has equal roots.  
(Ans.  $K=+8, -8$ )
- Find the roots of quadratic equation  $x^2 - 3x - 10 = 0$ , if they exist  
(Ans.5.-2)
- Find the roots of quadratic equation  $3x^2 - 5x + 2 = 0$  by factorization.  
(Ans.x=1, 2/3)
- Solve  $x - 1/x = 4$   
(Ans.  $x = 2 \pm \sqrt{5}$ )
- If one root of quadratic equation  $x^2 - 5x + k = 0$  is 4 then find the value of  $k$ .  
(Ans.k = 4)
- Find the nature of roots of the quadratic equation  $3x^2 - 5x + 2 = 0$ .  
(Ans.real & distinct roots)

### LEVEL – II

- Find the value of  $\alpha$  such that the quadratic equation  $(\alpha-3)x^2 + 4(\alpha-3)x + 4 = 0$  has equal roots.  
(Ans. $\alpha = 4$ )
- Find the roots of quadratic equation  $9x^2 - 3(a + b)x + ab = 0$   
(Ans.x =  $a/3, b/3$ )

3. Solve by completing the square  $6x^2 - 13x - 5 = 0$

(Ans.  $x=5/2, -1/3$ )

4. The difference of two numbers is 5 and the difference of their reciprocals is  $1/10$ .  
Find the numbers.

(Ans.  $x= 10, 5$  &  $x = -10,-5$ )

5. Solve for x ----

$$\frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3}$$

(Ans.  $x = 5, 5/2$ )

### LEVEL III

1. Solve for x-

$$2\left(\frac{2x-1}{x+3}\right) - 3\left(\frac{x+3}{2x-1}\right) = 5$$

(Ans.  $x = -5, -10$ )

2. If twice the area of a smaller square is subtracted from the area of the larger square the result is  $14\text{cm}^2$ , however if twice the area of larger square is added to 3 times the area of smaller, the result is  $203\text{cm}^2$ . Determine the sides of two squares.

(Ans.  $8\text{cm}, 5\text{cm}$ )

3. Solve for x-

$$x = \sqrt{20 + \sqrt{20 + \sqrt{20 + \sqrt{20}}}}$$

(Ans.  $x = -4, 5$ )

4. The sum of the ages of father and his son is 45 years. Five years ago, the product of their ages was 124 (in years). Find their ages.

(Ans. Father's age = 36 years,  
( Son's age = 9 years )

5. In a flight of 600km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200km/h and the time is increased by 30 minutes. Find the duration of aircraft.

(Ans. 1 hour)

### Self Evaluation

1. Solve the following quadratic equation by factorization  $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

2. Solve the quadratic equation  $9x^2 - 15x + 6 = 0$  by completing the square.

3. Find the nature of roots of quadratic equation  $3x^2 - 15x + 7 = 0$ .

4. Solve the equation  $(a + b)^2 x^2 - 4abx - (a-b)^2 = 0$ .

5. Two pipes running together can fill a cistern in  $3\frac{1}{13}$  minutes . If one pipe takes 3 minutes more than the other to fill it, find the time in which each pipe would fill the cistern.
6. A person on tour has Rs.360 for his daily expenses . If he extends his tour for 4 days , he has to cut down his daily expenses by Rs. 3. Find the original duration of the tour.
7. If the equation  $(1+m^2) x^2 + 2mcx + c^2 - a^2 = 0$  has equal roots, then show that  $c^2 = a^2(1+m^2)$
8. The hypotenuse of a right angled triangle is 1m less than twice the shortest side . If the third side is 1 m more than the shortest side . Find the sides of the triangle .
9. If -5 is a root of the quadratic equation  $2x^2 + px -15 = 0$  and the quadratic equation  $p(x^2+x) + k=0$  has equal roots, find the value of k.

## ARITHMETIC PROGRESSIONS

### SCHEMATIC DIAGRAM

TOPIC	CONCEPT	DEGREE OF IMPORTANCE	REFERENCE
<b>Arithmetic Progressions</b>	<b>General Form of an A.P.</b>	*	<b>Page 96 NCERT 2007 Exp.1, Ex. 5.1 QNo.s2(a),3(a)</b>
	<b>nth Term of an A.P.</b>	**	<b>Page 101</b>
		***	<b>Exp. 3,8 Ex.5.2 Q.Nos 1,2,4,7,11,16,</b>
	<b>Sum of first n terms of an A.P.</b>	***	<b>Page 108</b>
		**	<b>Exp 11,13,15</b>
		*	<b>Ex. 5.3 Q.No.1(i,ii)</b>
		**	<b>Q3(i,iii)</b>
		***	<b>Q.7,10</b>

### LEVEL -1

- Q. No.1. Find the common difference of the A.P. and write the next two terms;  
51,59,67,75..... {Ans. D=8 and 83,91}
- Q. No.2.Determine the A.P. whose third term is 5 and seventh term is 9.  
{Ans. 3,4,5,6...}
- Q. No.3. How many terms are there in the A.P. 5,11,17,.....,299.Also find its 16<sup>th</sup> term.  
{Ans.50, 95 }
- Q. No.4. Find the 20<sup>th</sup> term from the end of the A.P.3,8,13, ..... ,253.  
{Ans.158}
- Q. No.5. Which term of the A.P. 5,8,11,..... is 320 ?  
{Ans. 106}

Q. No.6. If the  $n$ th term of an A.P. is given by  $5n-3$ , find the A.P. {Ans.2,7,12,.....}

### LEVEL -2

Q. No.1. Is 68 a term of the A.P. 7,10,13 ..... {Ans. No}

Q. No.2. Show that  $a-b, a$  and  $a+b$  are the consecutive terms of the A.P.

Q. No.3. Which term of the A.P. 3,10,17,....., will be 84 more than its 13<sup>th</sup> term? {Ans.25<sup>th</sup>}

Q. No.4. In an A.P. the sum of first  $n$  terms is  $\frac{5n^2}{2} + \frac{3n}{2}$ . Find its 20<sup>th</sup> term. {Ans.99}

Q. No.5. If the 8<sup>th</sup> term of an A.P. is 37 and the 15<sup>th</sup> term is 15 more than the 12<sup>th</sup> term, find the A.P. and hence find the Sum of first 15 terms of the A.P. {Ans.  $a=2, d=5, S_{15} = 555$ }

Q. No.6. If  $3n^2 - 4n$  is the sum of  $n$  terms, find the  $n$ th term. {Ans.  $a_n = 6n - 7$ }

### LEVEL -3

Q. No.1. In an A.P.  $S_n = 90$ , find  $n$  and  $a_n$ , given that  $a=2$  and  $d=8$  {Ans.  $n=5, a_n = 34$ }

Q. No.2. How many terms of the A.P. 9,17,25,..... must be taken to give a sum of 636. {Ans.12 terms}

Q. No.3. Find  $K$  if  $3K+2, 4K+3$  and  $6K-1$  are in A.P. { $K=5$ }

Q. No.4. The first and the last term of an A.P. are 17 and 350 respectively. If the common difference is 9, how many terms are there in the A.P.? What is their Sum. {Ans.  $n=38, S_n = 6973$ }

Q. No.5. Find the middle term of the A.P. 10,7,4,.....,-62. {Ans.  $n=25, \text{middle term}=13\text{th}, T_{13} = -26$ }

### Self Evaluation Questions

Q.No.1. Find the Common difference and write the next two terms of the A.P. 8,3,-2,-7 .....

Q. No.2. Find the Sum :  $25 + 28+31 + \dots + 100$ .

Q. No.3. If the  $n$ th term of an A.P. is  $(2n+1)$ . Find the Sum of first  $n$  terms of A.P.

Q. No.4. Find the 8<sup>th</sup> term from the end of the A.P. 7, 10,13,.....,184.

Q. No.5. The sum of first n terms of an A.P. is given by  $(n^2 + 3n)$ .  
Find the 20<sup>th</sup> term of the A.P.

Q. No.6. Which term of the A.P. 4,9,14,..... is 89 ?Also find the Sum..

Q.No.7. In an A.P if  $S_{21} = 1250, S_{20} = 1200$ . Find its 21st term.

Q.No.8. Find the sum of all the three digit natural numbers which are multiples of 6.

## TRIANGLES

### SCHEMATIC DIAGRAM

TOPIC	CONCEPT	DEGREE OF IMPORTANCE	NCERT Examples and Questions
TRIANGLES	1) Similarity of Triangles	***	Theo.6.1, Ex.1Pg126, Ex.2,3-pg127, Exer.6.2-2,4,6,10
	2) Criteria for Similarity of Triangles	**	Ex.6,7-Pg.136, Ex.8-Pg137,Exer.6.3-4,5,6,10,13,16
	3) Areas of Similar Triangles	***	Ex.9-Pg143,Theo.6.6, Exer 6.4- 3,4,5,6,7
	4)Pythagoras Theorem	***	Theo.6.8 & 6.9, Ex.10-Pg147, Ex.12,13Pg148, Ex.14-Pg149,Exer6.5-4,5,6,7,13,14,15,16

### ASSIGNMENTS BASED ON CONCEPTS

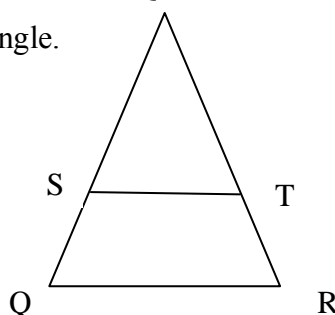
#### LEVEL – 1

1. If  $\Delta ABC \sim \Delta DEF$  and  $2 AB = DE, BC = 8\text{cm}$ . Find EF.

Ans-  $EF = 16\text{cm}$

2. In the given figure,  $\frac{PS}{SQ} = \frac{PT}{TR}$  and  $\angle PST = \angle PRQ$  P

Prove that  $\Delta PQR$  is an isosceles triangle.



3.  $\triangle ADE \sim \triangle ABC$ , if  $DE=4\text{cm}$ ,  $BC=8\text{cm}$  and  $\text{ar}(\triangle ADE)=25\text{sq cm}$ . Find the area of  $\triangle ABC$ .

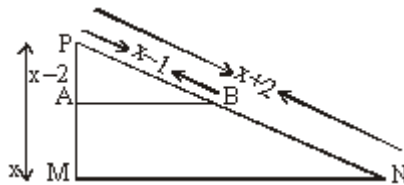
Ans- 100sqcm

4. A ladder 10m long reaches a window 8 m above the ground. Find the distance of the foot of ladder from the base of the wall.

Ans- 6 m

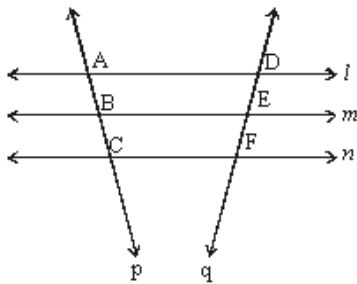
### LEVEL – 2

1. In the given fig.  $AB \parallel MN$ , If  $PA = x - 2$ ,  $PM = x$ ;  $PB = x - 1$  and  $PN = x + 2$ , find the value of 'x'.



Ans-  $x = 4$

2. If three or more parallel lines are intersected by transversals, the intercepts made by them on the transversals are proportional.



3. D and E are points on the sides AB and AC respectively of  $\triangle ABC$  such that DE is parallel to BC and  $AD:DB = 4 : 5$ . CD & BE intersect each other at F. Find the ratio of areas of  $\triangle DEF$  and  $\triangle BCF$

Ans- 16 : 81

4. In  $\triangle ABC$ , AD is perpendicular to BC and  $\frac{BD}{DA} = \frac{DA}{DC}$ . Prove that  $\triangle ABC$  is a right triangle.

### LEVEL – 3

1. State and prove Basic Proportionality Theorem (Thales Theorem)
2. Sides AB, BC and median AD of triangle ABC are respectively proportional to the sides PQ, QR and median PM of  $\triangle PQR$ . Show that  $\triangle ABC \sim \triangle PQR$
3. In  $\triangle ABC$ , DE is parallel to BC and DE divides the triangle in two parts such that  $\text{ar}(\triangle ADE) = \frac{1}{3} \text{ar}(\triangle ABC)$ . Prove that  $\frac{BD}{AB} = \frac{\sqrt{3}-1}{\sqrt{3}}$

4. In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
5. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
6. In a triangle, if the square of one side is equal to the sum of the squares of the other two sides then the angle opposite to the first side is a right angle.

### **SELF – EVALUATION**

1. State and prove Basic proportionality theorem.
2. Triangle ABC & Triangle DBC are two triangles on the same base BC. If AD intersect BC at O, Show that  $\frac{\text{ar}(ABC)}{\text{ar}(DBC)} = \frac{AO}{DO}$
3. State and prove Pythagoras theorem.
4. Prove that the sum of squares of the sides of the rhombus is equal to the sum of the squares of its diagonals.
5. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
6. In triangle ABC, XY is parallel to BC and it divides the triangle ABC in two parts of equal area. Prove that  $\frac{BX}{AB} = \frac{\sqrt{2}-1}{\sqrt{2}}$
7. State and prove converse of Pythagoras theorem.
8. If the areas of two similar triangles are equal then the triangles are congruent.

### **CO - ORDINATE GEOMETRY**

#### **SCHEMATIC DIAGRAM**

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	EXAMPLES & QUESTIONS OF EXERCISE FROM NCERT BOOK
Coordinate Geometry	Distance Formula	* *	Example No. 2, 4      Exercise 7.1 Q.No 1,2,3,4
	Section Formula	* *	Example No. 6,7      Exercise 7.2 Q.No 1,2,4,5
	Mid Point Formula		Example 10

			Q.No-9,7
	Area of Triangle	* *	Example 11,12,13 Q.No 1,4

### LEVEL – I

- Ques 1: Find the distance between P(4,4) and Q(2,-3) Ans:  $\sqrt{53}$   
 Ques 2: Show that points (-2,-1), (2, 1), (4, 2) are collinear.  
 Ques 3: Find the coordinates of the points which divides the join of P(7,-1) and Q(-3,4) in the ratio 2:3. Ans : (3,1)  
 Ques 4: In what ratio does the point (-2,3) divides the line segment joining (-3,5) and (4,-9) Ans: (1:6)  
 Ques 5: Find area of a  $\Delta$  whose vertices are (1, -1), (3, 5), (2,7). Ans: (5 sq. units)

### LEVEL II

- Ques1: Show that the following sets of points are the vertices of an isosceles triangle A(0,5), B(6,3), C(5,10).  
 Ques2: Find the point on X-axis which is equidistant from points (7,6) and (9,4) Ans: (3, 0)  
 Ques 3: Find the ratio in which line segment joining the points (6,4) and (1,-7) is divided by X-axis, also find the coordinates of the point of division. Ans : {7 : 4 and  $(\frac{46}{11}, 0)$ }  
 Ques 4: If A(-2,4), B(0,0) and C(4,2) are the vertices of  $\Delta ABC$  then find the length of median of the triangle through A. Ans : 5 units  
 Ques 5: Find 'k' for which the points (1,1), (3,k), (-1,4) are collinear. Ans: k = - 2  
 Ques 6: Find area of a quad. ABCD whose vertices have coordinates A(-5,7), B(-4,-5), C(-1,-6), D(4,5) Ans: 72 sq.units

### Level III

- Ques 1: Show that following set of points are the vertices of an equilateral triangle are (0,0),  $(5, 5\sqrt{3})$  and  $(-5, 5\sqrt{3})$   
 Ques 2: Check whether the points X(0,-4),  $Y(\frac{3}{2}, -2)$ , Z(3,0) are the vertices of isosceles right triangle. Ans: No  
 Ques 3: Find the centroid of the triangle whose vertices are A(-1,0), B(5,-2) & C(8,2). Ans: - (4,0)

Ques 4: In what ratio does the line  $x - y - 2 = 0$  divides the line segment joining (3,-1) and (8,9)? Also find the coordinates the point of intersection.

Ans: (2:3) ( 5,3)

Ques 5: The vertices of a triangle ABC are A(5,2),B(-9,-3) and C(-3,-5). D,E,F are respectively the mid points of BC,CA and AB.  
Prove that Area of  $\Delta ABC = 4 \times$  Area of  $\Delta DEF$ .

### SELF EVALUATION QUESTIONS

Ques 1: Find the distance between points

- a) A(8,-2)B(3,-6)
- b) A[(a+b),(a-b)] B[(a-b), -(a+b)]

Ques 2: Show that the points (-1,-1), (1,1) and  $(-\sqrt{3},\sqrt{3})$  are the vertices of an equilateral triangle.

Ques 3: If the distance of P(x,y) from A(5,1) and B(-1,5) are equal.Prove that  $3x=2y$ .

Ques 4: Find the coordinates of the points which trisect the line segment joining (1,-2) and (-3,4).

Ques 5: Find the area of a triangle whose vertices are P(3,-2) ,Q(-1,1) and R(-5,4).  
Hence draw the conclusion about position of three points .Are these points collinear.

Ques 6: Prove that the points (4,5) ,(7,6) ,(6,3) and (3,2) are the vertices of a ||gm. Is it a rectangle.?

Ques 7: Find value of 'k' .If points (4,2),(7,k) and (3,8) be collinear.

Ques 8: In what ratio does y-axis divide the line segment joining the points (-4,5) and (3,-7)?

### INTRODUCTION TO TRIGONOMETRY SCHEMATIC DIAGRAM

TOPIC	CONCEPT	DEGREE OF IMPORTANCE	NCERT Examples and Questions
Introduction to Trigonometry	1)Trigonometric Ratios	*	Ex 8.1 Q1,2 Page(181)
	2) Trigonometric Ratios of some specific angles	**	Example 6,Page (185) Ex 8.2 Q 1,3 Example 9,10,11 page(189)Ex 8.3 Q 2,3
	3) Trigonometric Ratios of complementary angles	**	
	4) Trigonometric Identities.	***	Example 14,15 page (192,193) EX 8.4 Q5(V, VII, VIII)

**LEVEL - I**

1. If  $\sin \theta = \frac{12}{13}$  evaluate  $\frac{2}{\sqrt{3}}$  Ans(25)

2. If  $\tan A = \frac{1}{\sqrt{3}}$  find all other t-ratios

3. If  $\sin \theta = \frac{1}{3}$  find the value of  $2 \cot^2 \theta + 2$

Ans(18)

4. Evaluate  $\sin 45^\circ \sin 30^\circ + \cos 45^\circ \cos 30^\circ$

Ans (  $\frac{\sqrt{3}+1}{2\sqrt{2}}$  )

5. Find the value of  $\operatorname{cosec} 30^\circ + \cot 45^\circ$

Ans (3)

6. Evaluate  $2 \sin^2 30^\circ \tan 60^\circ - 3 \cos^2 60^\circ \sec^2 30^\circ$

Ans (  $\frac{\sqrt{3}-2}{2}$  )

7. Evaluate  $\frac{\cos 37^\circ}{\sin 53^\circ}$

Ans (1)

8. Evaluate  $\sin 39^\circ - \cos 51^\circ$

Ans (0)

9. Prove that  $\frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} = \cos^2 \theta - \sin^2 \theta$

10. Prove that  $\cos^4 \theta - \sin^4 \theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1$

11. Prove that  $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$

12. Evaluate  $\cos^2 13^\circ - \sin^2 77^\circ$

Ans(0)

**LEVEL - II**

1. If find the value of  $\frac{(2 + 2 \sin \theta)(1 - \sin \theta)}{(1 + \cos \theta)(2 - 2 \cos \theta)}$

2. If  $\cot \theta = \sqrt{3}$  find the value of  $\frac{\operatorname{cosec}^2 \theta + \cot^2 \theta}{\operatorname{cosec}^2 \theta - \sec^2 \theta}$

Ans (21/8)

3. If  $\operatorname{cosec} \theta = \frac{13}{12}$  find the value of  $\frac{2 \sin \theta - 3 \cos \theta}{4 \sin \theta - 9 \cos \theta}$

Ans(3)

4. Show that  $2(\cos^2 45^\circ + \tan^2 60^\circ) - 6(\sin^2 45^\circ - \tan^2 30^\circ) = 6$

5. Find the value of  $\theta$  if  $2 \sin \theta = \sqrt{3}$

Ans (60)

6. Evaluate  $\frac{\sin 30^\circ - \sin 90^\circ + 2 \cos 0^\circ}{\tan 30^\circ \tan 60^\circ}$

Ans (3/2)

7. Evaluate  $\cos 65^\circ \sin 25^\circ + \cos 25^\circ \sin 65^\circ$

Ans(1)

8. Evaluate  $\frac{\sin^2 63^\circ + \sin^2 27^\circ}{\cos^2 17^\circ + \cos^2 73^\circ}$

Ans(1)

9. Show that  $\tan 10^\circ \tan 15^\circ \tan 75^\circ \tan 80^\circ = 1$

10. Prove that  $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \tan \theta + \cot \theta$

11. Prove that  $(\operatorname{cosec} \theta - \sin \theta)(\sec \theta - \cos \theta) = \frac{1}{\tan \theta + \cot \theta}$

### LEVEL - III

1. If  $\sqrt{3} \tan \theta = 3 \sin \theta$  find the value of  $\sin^2 \theta - \cos^2 \theta$

2. If  $\sin \theta + \cos \theta = \sqrt{2} \sin \theta$  find  $\cot \theta$

Ans ( $\sqrt{2} - 1$ )

3. If  $\sin (A+B) = 1$   $\cos (A-B) = \frac{\sqrt{3}}{2}$ ,  $0^\circ < A+B < 90^\circ$ ,  $A > B$

Find A and B

(Ans A=  $60^\circ$ , B=  $30^\circ$ )

4. If  $\theta$  is an acute angle and  $\tan \theta + \cot \theta = 2$  find the value of  $\tan^2 \theta + \cot^2 \theta$

(Ans 2)

5. If  $\theta = 30^\circ$  Verify  $\cos 2\theta = \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta}$

6. If  $\sin 3\theta = \cos(\theta - 6)$ ,  $3\theta$  and  $(\theta - 6)$  are acute angles, find the value  $\theta$

Ans ( $\theta = 24^\circ$ )

7. Evaluate  $\frac{2}{3} \operatorname{cosec}^2 58^\circ - \frac{2}{3} \cot 58^\circ \tan 32^\circ - \frac{5}{3} \tan 37^\circ \tan 13^\circ \tan 45^\circ \tan 77^\circ \tan 53^\circ$

Ans (-1)

8. Evaluate  $\tan \theta \cot(90^\circ - \theta) - \sec \theta \operatorname{cosec}(90^\circ - \theta) + 3\sqrt{3} \tan 13^\circ \tan 30^\circ \tan 77^\circ$

Ans (2)

9. Prove that  $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1 = 0$

10. Prove that  $(1 + \cot A + \tan A)(\sin A - \cos A) = \sin A \tan A - \cot A \cos A$

11. For an acute angle A, Show that  $(\sin A - \operatorname{cosec} A)(\cos A - \sec A) = \frac{1}{\tan A + \cot A}$

### SELF EVALUATION

Q1  $\sec \theta = x + \frac{1}{4x}$ . Prove that  $\sec \theta + \tan \theta = 2x$  or  $\frac{1}{2x}$

Q2 If  $\tan^2(3A + 15^\circ) - 1 = 0$ . Find the value of A.

Q3. Prove that  $\frac{2}{\cos^2 \theta} - \frac{1}{\cos^4 \theta} - \frac{2}{\sin^2 \theta} + \frac{1}{\sin^4 \theta} = \cot^4 \theta - \tan^4 \theta$ .

Q4. Prove that  $\sqrt{\frac{1 + \sin A}{1 - \sin A}} = \frac{\cos A}{1 - \sin A}$ .

Q5. If  $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$ . Show that  $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$ .

## SOME APPLICATION OF TRIGONOMETRY

### SCHEMATIC DIAGRAM

TOPIC	CONCEPT	DEGREE OF IMPORTANCE	NCERT Examples and Questions
<b>Some Application of Trigonometry</b>	Heights and Distances	***	Example 1,2,3,4Pge(198-200) Ex 9.1 Q1,5,10,12,15,16 Pg (204-205)

### LEVEL - I

Q1 A ladder 15 m long just reaches the top of a vertical wall. If the ladder makes an angle of  $60^\circ$  with the wall, find the height of the wall.

( $7.5\sqrt{3}$ )

Q2 A pole 12 m high casts a shadow  $4\sqrt{3}$  m long on the ground. Find the angle of elevation.

(60°)  
Q 3 The angle of elevation of the top of a tower from a point on the ground is 30° if on walking 30m towards the tower, the angle of elevation becomes 60°. Find the height of the tower.

(15√3)

### LEVEL – II

Q 1 An observer 1.5m tall is 20.5m away from a tower 22m high. Determine the angle of elevation of the top of the tower from the eye of the observer.

(45°)

Q 2 An aero plane when flying at a height of 5000m from the ground passes vertically above another aero plane at an instant when the angles of the elevation of the two planes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the aero planes at the instant.

(2116.5m)

Q 3 At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is  $\frac{5}{12}$ . On walking 192m towards the tower, the tangent of the angle of elevation is  $\frac{3}{4}$ . Find the height of the tower.

(180m)

### LEVEL – III

Q 1 The angle of elevation of the aero plane from a point on the ground is 60°. After 15 seconds flight, the angle of elevation changes to 30°. If the aero plane is flying at a height of  $1500\sqrt{3}$  m. Find the speed of the plane

(200m/s)

Q 2 A man standing on the deck of a ship, which is 16m above the water level, observe the angle of elevation of the top of cliff as 60° and the angle of depression of the base of the cliff as 30°. Calculate the distance of the cliff from the ship and the height of the cliff.

(16√3 m, h=64m)

Q 3 If the angle of elevation of a cloud from a point h meters above a lake is  $\alpha$  and the angle of depression of its reflection in the lake is  $\beta$ . Prove that the distance of the cloud from the point of observation is  $\frac{2h \sec \alpha}{\tan \beta - \tan \alpha}$ .

## SELF EVALUATION

Q 1 A Vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height  $h$ . At a point on the plane the angle of elevation of the bottom of flagstaff is  $\alpha$  and that of the top of the flagstaff is  $\beta$ . Prove that the height of the tower is  $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$ .

Q 2 From a point on the ground the angle of elevation of the bottom and top of a water tank kept at the top of 20m high tower are  $45^\circ$  and  $60^\circ$ . Find the height of the water tank.

Q 3 The horizontal distance between two towers is 140m and the angle of elevation of the top of the first tower when seen from the second tower is  $30^\circ$ . If the height of the second tower is 60m, find the height of the first tower.

Q 4 Upper part of a tree broken over by the wind makes an angle of  $45^\circ$  with the ground, and the horizontal distance from the foot of the tree to the point where the top of the tree touches the ground is 12m. Find the height of the tree before it was broken.

## CIRCLES

### SCHEMATIC DIAGRAM

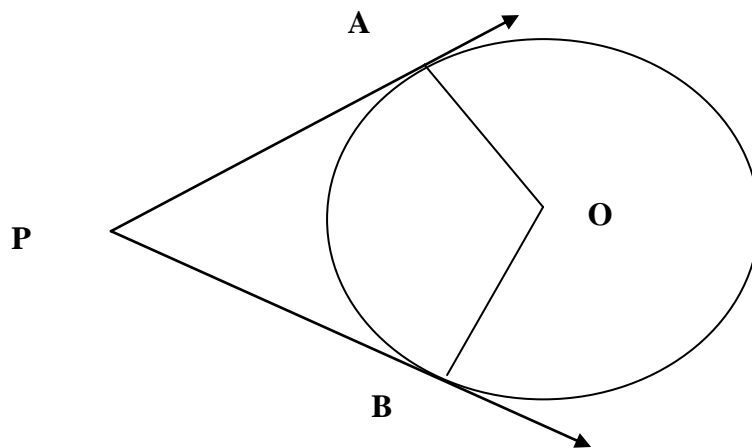
TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCE
<b>CIRCLES</b>	1.Tangents to a circle 2.Number of tangents from a point to a circle	*  ***	Q3 (Ex. 10.1) Pg..209 Q1,Q6,Q7 (Ex 10.2) Pg. 214  Theorem 10.2 Pg.211 Eg.2,3 Pg. 212 Q8,9,10,12,13 (Ex.10.2)

### LEVEL I

1. Prove that the line segment joining the two parallel tangents to a circle is a diameter of the circle.
2. Find the length of the tangent from T which is at a distance of 13cm from the centre of a circle of radius 5cm.

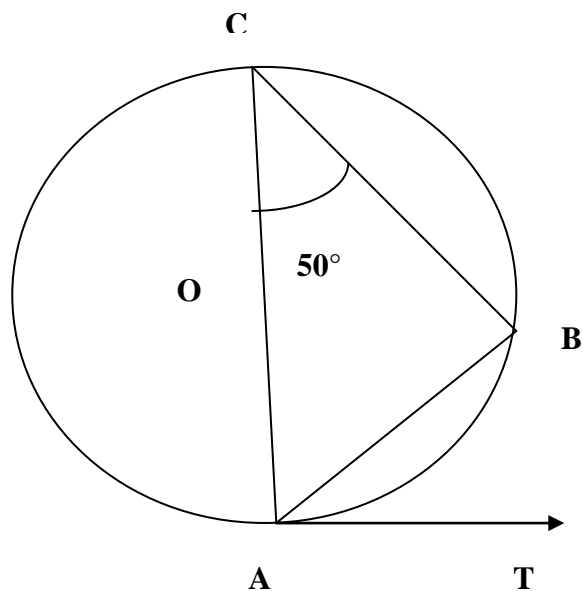
(Answer = 12cm)

3. If the angle between the two radii of a circle is 130, find the angle between the tangents at the ends of the two radii.



(Answer =  $50^\circ$ )

4. AC is a diameter and AB be any chord of the circle such that angle  $ACB=50^\circ$ . If AT is



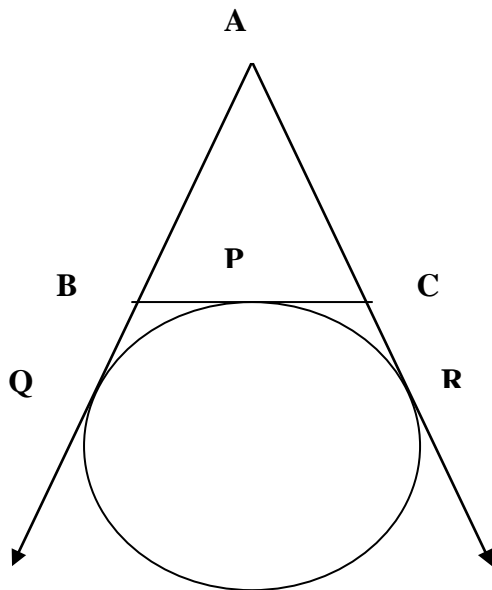
a tangent, find angle BAT.

(Answer =  $50^\circ$ )

5. XP and XQ are the two tangents to a circle with centre O from a point X outside the circle. ARB is a tangent to a circle at R intersecting XP at A and XQ at B. Prove that  $XA + AR = XB + BR$ .

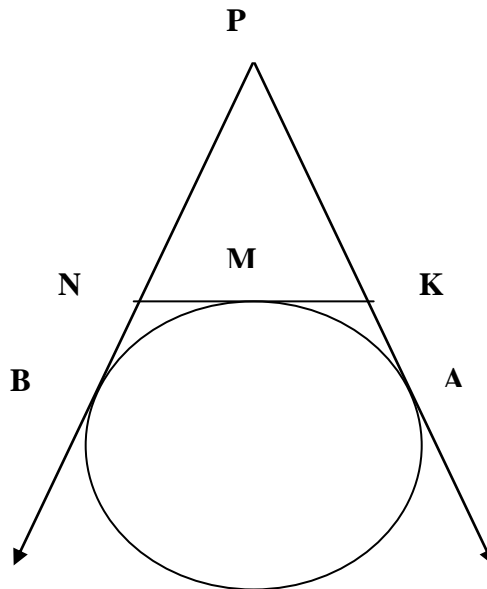
**LEVEL – II**

1. A circle is touching the side BC of triangle ABC at P and touching AB & AC produced at Q and R respectively. Prove  $AQ = \frac{1}{2}(\text{Perimeter of triangle ABC})$ .



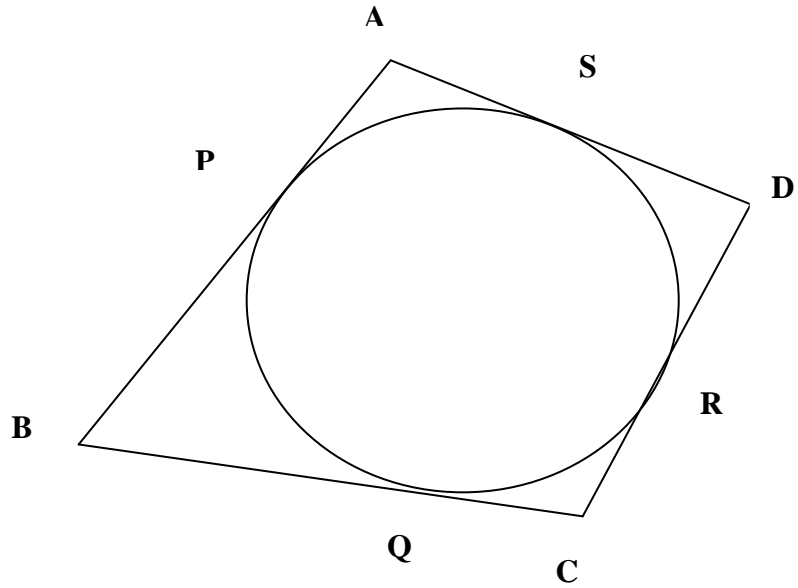
(Hint: The lengths of tangents drawn from an external point to a circle are equal.)

2. PA and PB are tangents from an external point P to the circle with center O. At point M a tangent is drawn cutting PA at K & PB at N.



3. Prove that  $KN = AK + BN$ .

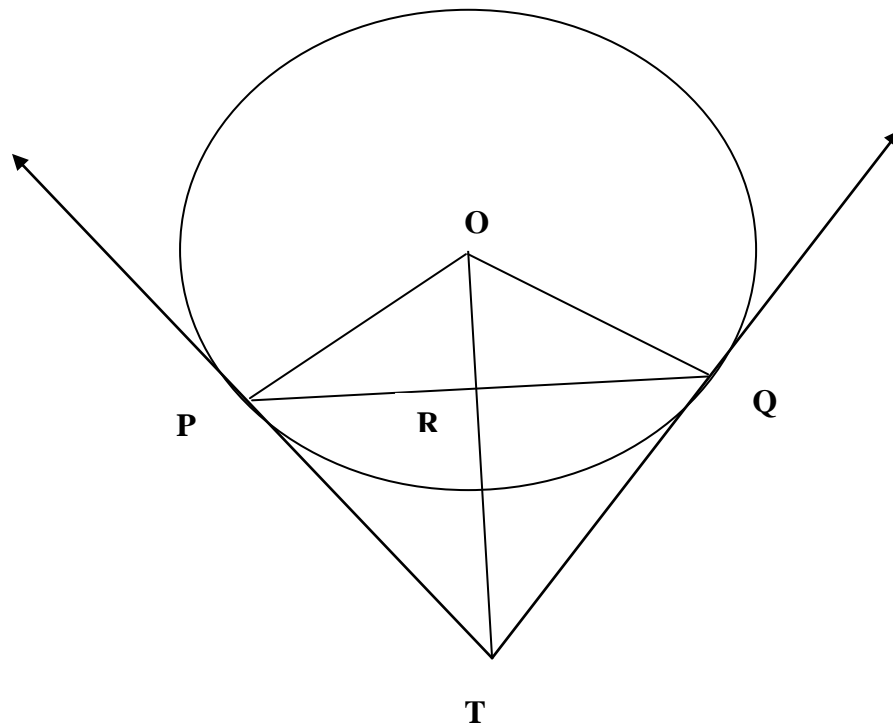
4. A circle touches all the four sides of quadrilateral ABCD with  $AB = 6\text{cm}$ ,  $BC = 7\text{cm}$  &  $CD =$



4cm, find AD.

(Answer = 3cm)  
(Hint:  $AB + CD = AD + BC$ .)

5. PQ is a chord of length 8cm of a circle of radius 5cm. The tangents at P & Q intersect at a point T. Find the length TP.



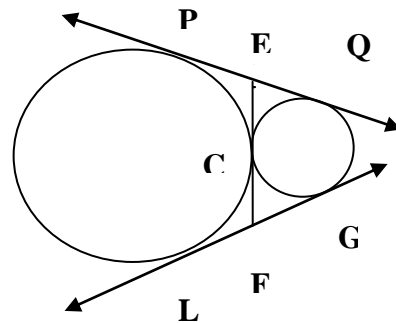
(Answer:  $TP = \frac{20}{3}\text{cm}$ )

6. If PA and PB are two tangents from a point P to a circle with center O touching it at A & B. Prove that OP is perpendicular bisector of AB.

7. A circle is inscribed in triangle ABC touching the sides BC, CA & AB at D, E & F respectively. Show that  $AF + BD + CE = AE + BF + CD$ .

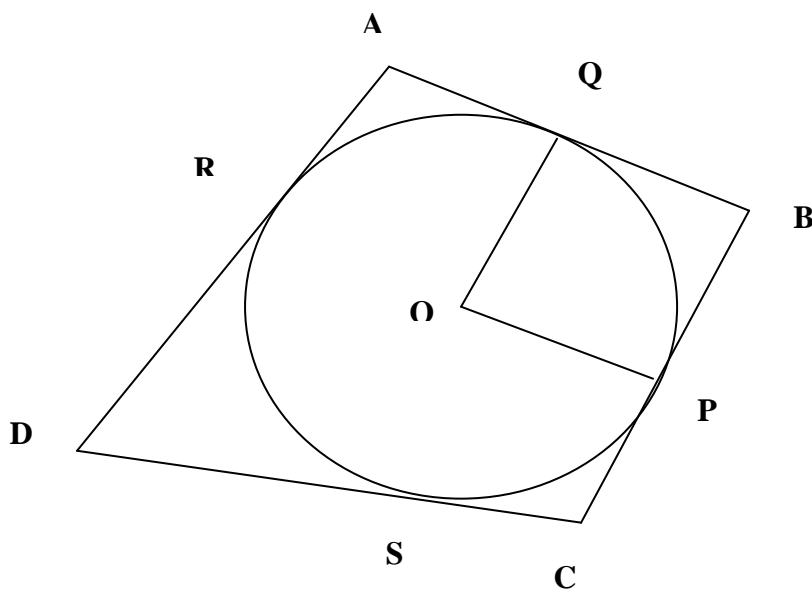
**LEVEL – III**

1. Two circles touch each other externally at C. Prove that the common tangent at C



bisects the other two common tangents.

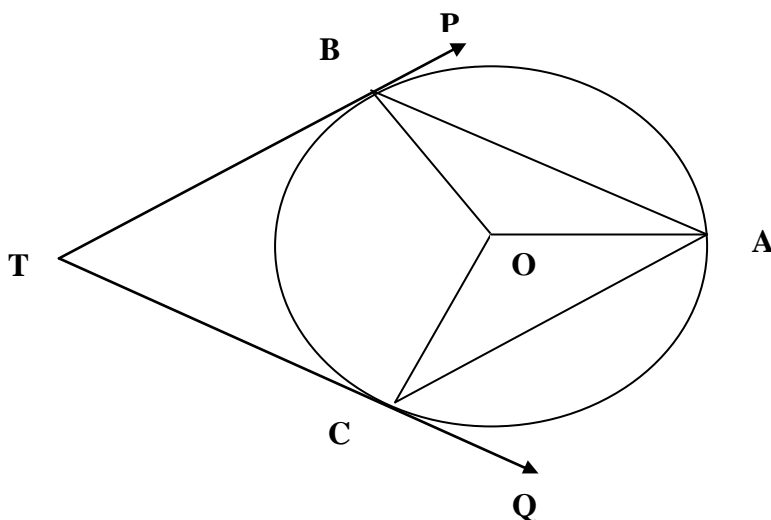
2. A circle is inscribed in a quad. ABCD touching the sides AB, BC, CD and DA at Q, P, S and R respectively. If angle B is  $90^\circ$ , AD = 23cm, AB = 29cm and DS = 5cm, find radius of the circle.



Answer=11cm

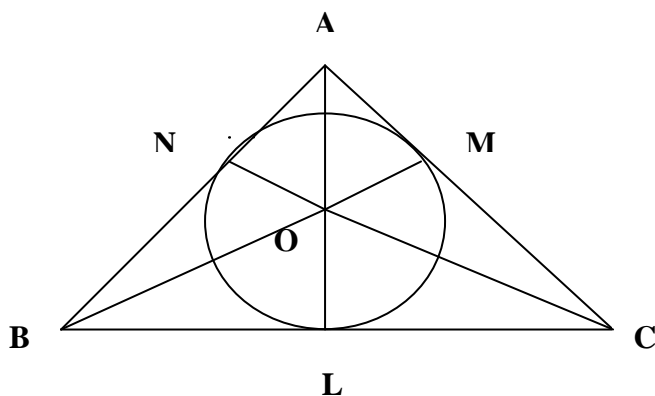
3. TBP and TCQ are the tangents to a circle (with centre O) from the external point T. A is a point on the circle such that angle ABP =  $60^\circ$  and angle ACQ =  $70^\circ$ , find

angle BAC.

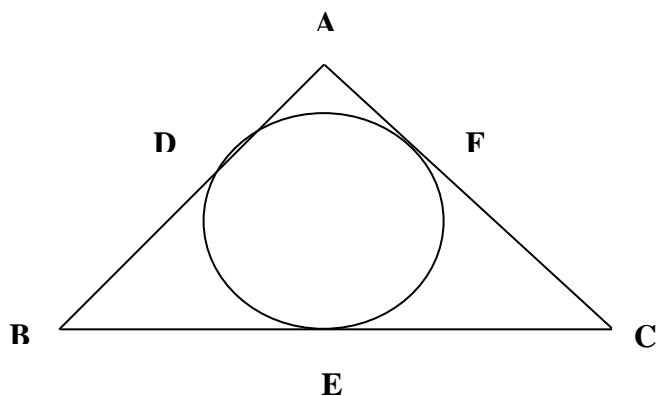


Answer =  $50^\circ$

4. The radius of an incircle of a triangle is 4cm and the segments into which one side is divided by the point of contact are 6cm and 8cm, find the other two sides of the triangle.  
 Answer = 13cm and 15cm

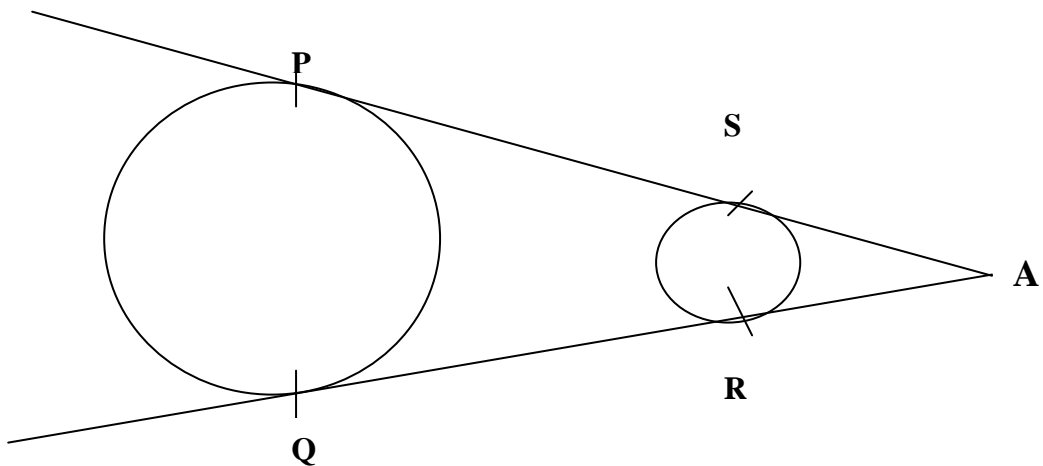


5. A circle touches the three sides AB, BC and CA of a triangle ABC at D, E and F respectively. Prove that  $AF + BD + CE = \frac{1}{2}$  perimeter ( $\Delta ABC$ )



## SELF EVALUATION QUESTIONS

1. AB is a diameter and TB is a tangent to a circle. If Q is a point on TB, then find QA.
2. If radii of two concentric circles are 4cm and 5cm, find the length of a chord of one circle which is tangent to the other circle.
3. If two tangents inclined at an angle 60 degree are drawn to a circle of radius 3cm, find the length of each tangent.
4. ABC is an isosceles triangle in which  $AB=AC$ , circumscribes about a circle. Show that BC is bisected at the point of contact.
5. If PA and PB are tangents to the circle with centre O such that angle  $APB=50^\circ$ , find angle OAB.
6. A circle is inscribed in a triangle ABC touching AB at D, BC at E and CA at F having sides  $BC= 8\text{cm}$ ,  $CA= 10\text{cm}$  and  $AB = 12\text{cm}$ . Find AD, BE and CF.
7. In the given figure, prove that  $PS = QR$



8. From a point P which is at a distance of 13cm from the centre O of a circle of radius 5cm, the pair of tangents PQ and PR to the circles are drawn. Find the area of quad. PQOR.
9. Triangle ABC is a right triangle right angled at B such that  $BC = 6\text{ cm}$  and  $AB = 8\text{ cm}$ , find the radius of its in-circle.

## CONSTRUCTIONS

### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCES NCERT BOOK
Constructions	1 Division of line segment in the given ratio	*	Const 11.1 Page 216 Ex 11.1 Q.no. 1
	3 Construction Of Triangles	*	1 When three sides are given  2 When two sides and included angle given  3 When two angles and one side given. 4. Construction of right angled triangle.
	3 Construction of triangle similar to given triangle as per given scale.	**	Exp. 1,2 pg 218 Ex. 11.1 Q.no.2-7
	4 Const. Of tangents to a circle	**	Exp. 11.3 Page 220 Ex. 11.2 Q. no. 1- 4

#### LEVEL - I

- 1 . Divide a line segment of length 8 cm in the ratio 2 : 3 .
2. Draw a line segment AB = 10 cm and divide it in the ratio 4 : 3
3. Divide a line segment AB = 8cm and locate a point P on it such that  $AP = \frac{3}{5}$  of AB.
4. Draw a circle of radius 4 cm . Take a point P on it . Draw tangent to the given circle at P.
5. Construct an isosceles triangle whose base 7.5 cm and altitude is 4.2 cm.

#### LEVEL - II

- 1 . Construct a triangle of sides 4cm , 5 cm and 6 cm and then a triangle similar to it whose sides are  $\frac{3}{4}$  of corresponding sides of given triangle.

2. Construct a triangle ABC in which  $AB=5\text{ cm}$ ,  $BC=7\text{ cm}$  and  $\angle ABC=50^\circ$ . Construct another triangle, whose each side is  $\frac{5}{7}$  of corresponding side Of  $\triangle ABC$ .
3. Construct a triangle similar to triangle ABC such that each of its side is  $\frac{2}{3}$  of the corresponding sides of triangle ABC. It is given that  $AB =6\text{ cm}$   $\angle B =50^\circ$  and  $\angle C=65^\circ$ .
4. Construct a  $\triangle ABC$  in which  $AB =4\text{ cm}$ ,  $\angle B=120^\circ$  and  $BC = 5\text{ cm}$ . Construct another  $\triangle AB'C'$  similar to triangle ABC such that  $AB' = \frac{5}{4} AB$ .
5. Draw a pair of tangents to a circle of radius  $4.5\text{ cm}$  which are inclined to each other at angle of  $80^\circ$ .
6. Draw a circle of radius  $5\text{ cm}$ . From a point  $8\text{ cm}$  away from its centre, construct a pair of tangents to the circle and measure their lengths.

## AREA RELATED TO CIRCLE

### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	Degree of importance	References NCERT BOOKS
Area Related to Circles	I. Circumference of a circle	*	Example 1 page 225 Exercise 12.1 . Q. No. 1,4
	II. Area of a circle	*	Example 5 page 233 Exercise 12.1 Q .No 2,3
	III. Length of an arc of a circle	*	Exercise 12.2 Q. No 5
	IV. Area of sector of a circle	**	Example 2 page 228 Exercise 12.2 Q No 1,2
	V. Area of segment of a circle	**	Example No 3 page 228 Exercise 12.2 Qno4
	VI. Combination of figures	***	EX 12.3, Example 4,5 Pg 233

### LEVEL – I

1. A sector is cut from a circle of radius  $21\text{ cm}$  and the angle of sector is  $150^\circ$ . Find the length of its arc and area.  
(Ans:  $55\text{ cm}$ )
2. Find area of a circle whose circumference is  $22\text{ cm}$ .

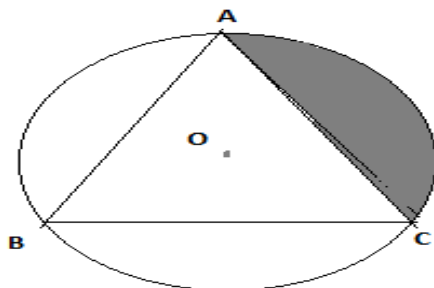
(Ans:38.5 sq cm)

3. Find circumference of a circle whose area is 301.84sq cm.  
(Ans: 61.6cm)
4. A bicycle wheel makes 5000 revolutions in moving 11 km Find the diameter of the wheel.  
(Ans: 70cm)
5. An arc of length  $20\pi$  cm subtends an angle of  $144^\circ$  at the centre of the circle. Find radius of the circle.

(Ans:25cm)

### LEVEL – II

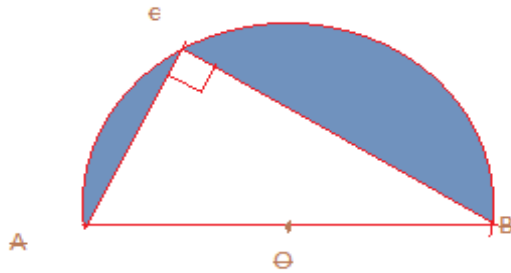
1. The area of a sector of a circle of radius 5cm is  $5\pi$ sqcm . Find the angle contained by the sector.  
( $72^\circ$ )
2. The perimeter of a certain sector of a circle of radius 5.6m is 27.2m. Find the area of sector.  
( $44.8\text{m}^2$ )
3. A chord AB of a circle of radius 14cm makes an angle of  $60^\circ$  at the centre of the circle. Find area of minor and major segment of circle. ( use  $\pi = 22/7$ )  
( $598.10\text{cm}^2$ )
4. A chord of a circle of radius 14cm makes the right angle at the centre. Find the area of minor and major segment of circle.  
( $560\text{cm}^2$ )
5. A chord PQ of length 12 cm subtends an angle of  $120^\circ$  at centre of a circle. Find the area of minor segment cut off by chord PQ.  
( $4(4\pi - 3\sqrt{3}) \text{cm}^2$ )
6. In given fig ABC is an equilateral triangle inscribed in a circle of radius 4cm with centre o. Find area of shaded region



$$4\left(\frac{4}{3}\pi - \sqrt{3}\right) \text{cm}^2$$

**LEVEL – III**

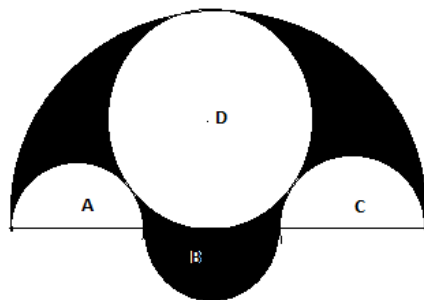
- 1 In the given fig. O is the centre of the circular arc and AOB is a straight line . Find the perimeter and area of shaded region correct to one decimal place. (use  $\pi = 3.14$ )



(61cm<sup>2</sup>)

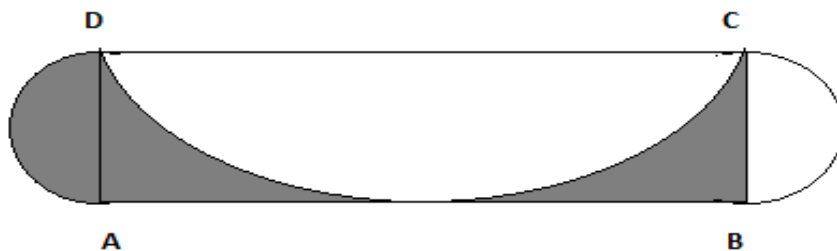
- 2 In the given fig. There are three semicircles A, B and C having diameter 3cm each and another semicircle E having a circle D within it with diameter 4.5cm as shown in the fig. Calculate

- i) Area of shaded region
- ii) The cost of painting shaded region at the rate of 25paise per sq cm.to nearest Rs.



(12.37 cm<sup>2</sup>, Rs. 3(approx.))

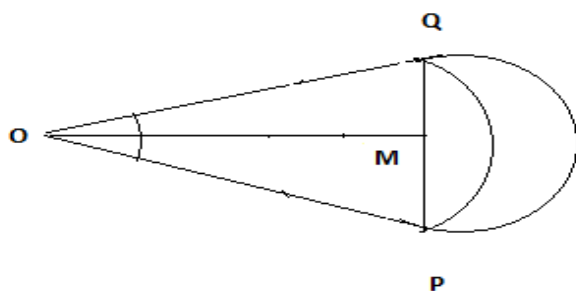
3. In the given fig. ABCD is a rectangle with AB= 14cm and BC= 7cm taking DC, BC and AD as diameter, three semicircles are drawn as shown in the fig. Find the area of the shaded regions



(59.5 cm<sup>2</sup>)

### SELF EVALUATION

1. Two circles touch externally the sum of there areas is  $130\pi$  cm<sup>2</sup> and distance between there centres is 14 cm. Find the radii of circles.
2. Two circles touch internally. The sum of there areas is  $116\pi$ cm<sup>2</sup> and the distance between there centres is 6cm. Find the radii of circles.
3. A pendulum swings through an angle of  $30^\circ$  and describes an arc 8.8cm in length. Find length of pendulum.
4. The side of a square is 10cm. Find the area of circumscribed and inscribed circles.
5. A car has two wipers which do not overlap . Each wiper has a blade of length 25cm sweeping through an angle of  $115^\circ$ . Find the total area cleaned at each sweep of the blades.
6. The given figure shows two arcs A and B .Arc A is a part of a circle with centre O and radius OP. Arc B a part of circle with centre M and radius PM, where M is the mid point of PQ. Show that area enclosed by two arcs is equal to  $25(\sqrt{3} - \pi/6)$ cm<sup>2</sup>.

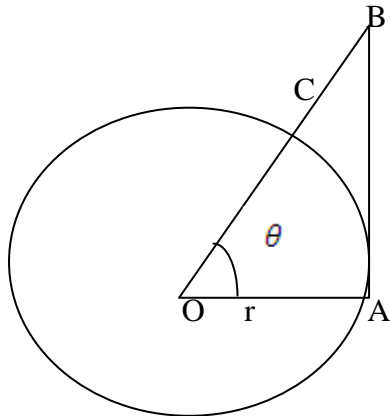


7. In the given fig ,sector of circle with centre O contains an angle  $\theta$

Prove that

i) perimeter of shaded region is  $r(\tan\theta + \sec\theta + \frac{\pi\theta}{180} - 1)$

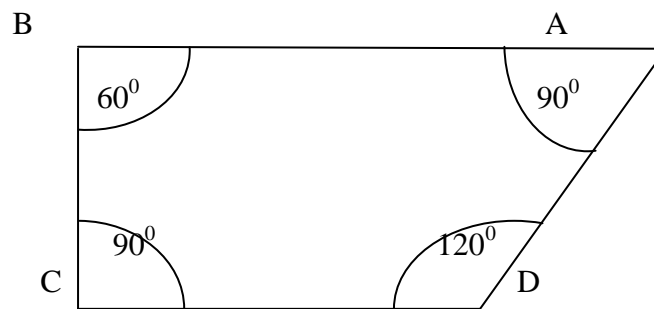
ii) Area of shaded region is  $\frac{r^2}{2}(\tan\theta - \frac{\pi\theta}{180})$



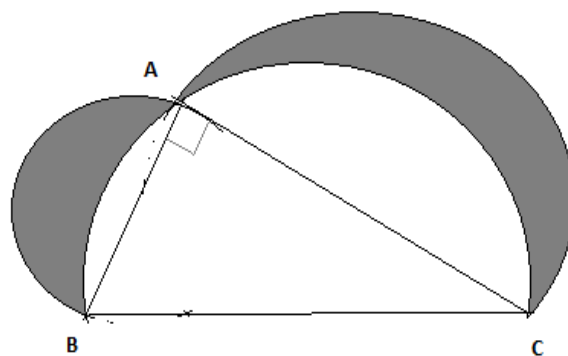
8. ABCD is a field in the shape of trapezium. AB parallel to CD and  $\angle DAB = 60^\circ$ . four sector are formed with centres A,B,C,D. The radius of each sector is 17.5m. Find

i) Total area of four sectors.

ii) Area of remaining portion given that AB=75m and CD=50m



9. ABC is a right angled triangle in which  $\angle A = 90^\circ$  AB=21cm and AC=28cm. Semicircles are described on AB, BC and AC as diameters. Find the area of shaded region.



## SURFACE AREA AND VOLUMES

### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCES (NCERT BOOK)
Surface Area and Volumes	I. Surface area of a combination of solids	**	Example 1, Pg 241 Exercise 13.1 Q1,3,6,7
	II. Volume of combination of a solid	**	Example 5, Pg 245 Exercise 13.2 Q 1,2,6
	III. Conversion of solids from one shape to another	***	Example 8 & 10, Pg 249 & 250 Exercise 13.3 Q 1,2,6
	IV. Frustum of a cone	***	Example 12 & 13 Pg 253 & 255 Exercise 13.4 Q1,3

### LEVEL 1

Q1.If the radii of the circular ends of a conical bucket, which is 16 cm high, are 20 cm and 8 cm, Find the capacity and the total surface area of the bucket.

(10459.43cu.cm, 1961.14 sq. cm)

Q2. Find the volume of right circular cylinder which has a height of 21cm and base radius 5cm.Find also the curved surface area.

(1650 cu cm, 660 sq cm.)

Q3. The base radii of two right circular cones of same height are in the ratio 3:5.Find the ratio of their volumes.

(9:25)

Q4. The circumference of the base of a 16m high solid cone is 3m.Find the volume of cone.

m<sup>3</sup>) (3.818

Q5 A circus tent is cylindrical upto a height of 3m and conical above it. If the diameter of the base is 105 m and the slant height of the conical part is 53 m. Find the total canvas used in making the tent.

(9735 sq m.)

**LEVEL – II**

Q1. A solid consists of a cylinder with a cone on one end and a hemisphere on the other end. If the length of the entire solid is 12.8cm and the diameter and height of the cylinder are 7cm and 6.5cm respectively. Find the total surface area of the solid.

(269.28sq cm)

Q2. A cylindrical container is filled with ice cream, whose radius is 6cm and height 15cm. The whole ice cream is distributed among 10 children in equal cones having hemispherical top .If the height of the conical portion is four times the radius of its base .Find the radius of the base of the cone.

(3cm)

Q3. A solid toy is in the form of a hemisphere surmounted by a right circular cone. Height of the cone is 2cm and the diameter of the base is 4cm.If a right circular cylinder circumscribes the solid, find how much more space it will cover. ( $\pi = \pi$ )

( $8 \pi \text{ cm}^3$ )

Q4. Water in a canal, 6m wide and 1.5m deep is flowing with a speed of 10km/hr.How much area will it irrigate in 30 minutes, if 8cm of standing water is needed.

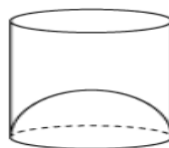
(56.25 hectares).

Q5. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 10cm and its base is of radius 3.5 cm. Find the total surface area of the article.

(374 sq. cm)

**LEVEL – III**

Q1.A juice seller serves his customers using a glass as shown in figure. The inner diameter of the cylindrical glass is 5cm, but the bottom of the glass has a hemispherical portion raised which reduces the capacity of the glass. If the height of the glass is 10cm, find the apparent capacity of the glass and its actual capacity. (Use  $\pi=3.14$ )



(196.25 cu cm, 163.54 cu cm)

Q2. A cylindrical vessel with internal diameter 10cm and height 10.5 cm is full of water. A solid cone of base diameter 7cm and height 6cm is completely immersed in water. Find the volume of

(i) Water displaced out of the cylindrical vessel.

(ii) Water left in the cylindrical vessel.

(77 cu cm, 748 cu cm)

Q3. A hemispherical tank full of water is emptied by a pipe at the rate of  $3\frac{4}{7}$  liters per second.

How much time will it take to empty half the tank, if the tank is 3m in diameter.

(16.5 minutes)

Q4. The height of a cone is 30 cm. A small cone is cut off at the top by the plane parallel to the base. If its volume be  $\frac{1}{27}$  of the volume of the given cone, at what height above the base, the section has been made.

(20 cm)

Q5. A right triangle, whose sides are 15cm and 20 cm, is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed.

(3768 cu cm. 1318.8 sq cm.)

### **SELF EVALUATION QUESTIONS**

- 1 A cylinder, a cone and a hemisphere are of equal base and have the same height. What is ratio of their volume?
- 2 The interior of a building is in the form of a right circular cylinder of radius 7 m and height 6 m surmounted by a right circular cone of a vertical angle is  $60^\circ$ . Find the cost of painting the building from inside at the rate of Rs.30/m<sup>2</sup>?
- 3 An iron pillar has lower part in the form of a right circular cylinder and the upper part is the form of a right circular cone. The radius of the base of each of the cone and a cylinder is 8 cm. The cylindrical part is 240 cm high and conical part is 36 cm high. Find the weight of the pillar if 1 cm<sup>3</sup> of iron weighs 7.8 grams.
- 4 A container (open at the top) made up of a metal sheet is in the form of a frustum of cones of height 16 cm with radii of its lower and upper ends are 8 cm and 20 cm respectively. Find
  - (i) The cost of milk when it is completely filled with milk at the rate of Rs. 15 per litre.
  - (ii) The cost of metal sheet used, if it cost Rs. 5 per 100 cm<sup>2</sup>.
- 5 A solid is composed of a cylinder with hemispherical ends. If the whole length of the solid is 100 cm and the diameter of the hemispherical ends is 28 cm, find the cost of polishing the surface of the solid at the rate of 5 paisa per sq. cm.
- 6 An open container made up of a metal sheet is in the form of a frustum of a cone of height 8 cm with radii of its lower and upper ends as 4 cm and 10 cm respectively.

Find the cost of oil which can completely fill the container at the rate of Rs.50 per liter. Also, find the cost of metal used, if it costs Rs. 5 per 100 cm<sup>2</sup>.(Use  $\pi = 3.14$ )

- 7 A toy is in the form of a cone mounted on a hemisphere of common base radius 7 cm. The total height of the toy is 31cm. Find the total surface are of toy and the volume of the toy.
- 8 If h, c and V respectively are the height, the curved surface area and volume of a cone, prove that
- $$3 \pi V h^3 - c^2 h^2 + 9 V^2 = 0$$
- 9 A toy is in the shape of a right circular cylinder with a hemisphere on one end and a cone on the other. The radius and height of the cylindrical part is 5 cm and 13 cm respectively. The radii of the hemispherical and conical parts are the same as that of the cylindrical part. Find the surface area of the toy if the total height of the toy is 30 cm.
10. A solid cylinder of diameter 12 cm and height 15 cm melted and recast into 12 toys in the shape of right circular cone mounted on a hemisphere. Find the radius of the hemisphere and total height of the toy if height of the cone is 3 times the radius.

## STATISTICS

### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCE
STATISTICS	CONCEPT 1 Mean of grouped data		
	1. Direct Method	***	Example 2 page 267, Exercise 14.1 Q.No. 1&3, Pg.270
	2. Assumed Mean Method	*	Exercise 14.1 Q.No. 6, Pg.271
	3. Step Deviation Method	*	Exercise 14.1 Q.No. 9, Pg.272
	CONCEPT 2		
	Mode of grouped data	***	Example 5 page 273. exercise 14.2 Q.No. 2&5, Pg.275
	CONCEPT 3		
	Median of grouped data	***	Example 7&8 page 283,284.exercise 14.3 Q. No. 5,2&3, Pg.287
	CONCEPT 4		
Graphical	**	Example 9 page 291	

	representation of c.f.(ogive)		exercise 14.4 Q. No. 1&3, Pg.293

**LEVEL - I**

1. Find the mean of the following frequency distribution

C.I.	0-10	10-20	20-30	30-40	40-50
No. of workers	7	10	15	8	10

Ans – 25.8

2. Convert the given frequency distribution into more than type cumulative frequency distribution.

Marks	50-55	55-60	60-65	65-70	70-75
Frequency	2	6	8	14	5

3. Convert the given frequency distribution into less than type cumulative frequency distribution

C.I.	20-30	30-40	40-50	50-60	60-70
Frequency	4	5	6	11	9

4. Write the empirical relation between mean, mode and median. If in a frequency distribution mode is 7.88, mean is 8.32, find the median.

$$\text{Ans- } 3\text{Median} = \text{Mode} + 2\text{ Mean}$$

$$\text{Median} = 8.17$$

**LEVEL II**

1. Find the mode of the following data

C.I.	20-40	40-60	60-80	80-100	100-120
Frequency	5	10	20	12	3

Ans. – 71.11

2. The frequency of class 49-52 is missing. Mean of frequency distribution is 47.2 Find the missing frequency

Weekly wages (in Rs.)	40-43	43-46	46-49	49-52	52-55
N0. of workers	31	58	60	?	27

Ans. – 44

3. Calculate the median.

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	5	6	15	10	5	4	2	2

Ans. - 19.5

4. Find the mode.

Class	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Frequency	2	5	10	23	21	12	3

Ans. – 14.6

### **LEVEL - III**

1. If the median of the distribution below is 28.5. Find the values of x and y

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	Total
frequency	5	x	20	15	y	5	60

Ans-  $x=8, y=7$

2. The mean of the following frequency distribution is 62.8 and the sum of all the frequencies is 50. Compute the missing frequencies  $f_1$  and  $f_2$ .

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	5	$F_1$	10	$F_2$	7	8

Ans-  $f_1=8, f_2=12$

2. Draw the two ogives of the following frequency distribution of weekly wages (less than and greater than) number of workers, determine the median from the curves

Weekly wages	0-20	20-40	40-60	60-80	80-100
No. of workers	40	51	64	38	7

### SELF EVALUATION TEST

1. Find the mean number of plants per house.

No. of plants	0-2	2-4	4-6	6-8	8-10	10-12	12-14
No. of houses	1	2	1	5	6	2	3

2. Find the median height of students.

Height in cms.	160-162	163-165	166-168	169-171	172-174
No. of students	15	118	142	127	18

3. Determine the modal lifetimes of the components

Lifetimes (in hours)	0-20	20-40	40-60	60-80	80-100	100-120
No. of	10	35	52	61	38	29

components						
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4. Draw “less than type” curve.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	2	8	12	18	28	22

5. The mean of the following data is 62.8 Find x

C.I.	0-20	20-40	40-60	60-80	80-100	100-120
f	5	8	X	12	7	8

6. Draw “more than type” ogive and compute the median from the curve.

Weight in gms.	0-10	10-20	20-30	30-40	40-50	50-60
No. of articles	14	17	22	26	23	18

7. If median is 46 Find missing frequencies.

Variables	10-20	20-30	30-40	40-50	50-60	60-70	70-80
frequency	12	30	X	65	y	25	18

Total of frequencies is 230.

8. Calculate the median for the following distribution

No of letters	Less than 4	Less than 7	Less than 10	Less than 13	Less than 16	Less than 19
No of surnames	6	36	76	82	86	90

## PROBABILITY

### SCHEMATIC DIAGRAM

TOPIC	CONCEPTS	DEGREE OF IMPORTANCE	REFERENCE
PROBABILITY	Probability	*	Definition, Types of Probability
	Probability of an Events	***	Eg.1 Page-298
	Elementary Events	*	Eg 2 Page 298,Eg 8 Page 304
	Equally Likelly Events	*	Eg 2 Page 298
	Complementary Events	*	Eg 5 Page 302
	Impossible Events	*	Q (i) Page 300
	Sure Events	*	Q (ii) Page 300
	Experiments	*	Tossing a coin Throwing a die Draw a card
	Events (atleast,either,almost etc)	**	Eg 9 Page 304 Ex 15.1 Q 24 Page 310
	Probability lies between 0& 1	*	Ex 15.1 Q 4 Page 308
Performing Experiments (i) Tossing a coin (ii) Throwing a die (iii) Drawing a card from deck of 52 cards	- ** ** ***	- Eg 1 Page 298 Ex 15.1 Q 13 Page 309 Eg 4 Page 301 Q 14,15 Page 309	

### LEVEL – I

- One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will be King.

Ans 1/13

- Write a sample space of

- a. Tossing a coin.
- b. Throwing a die. Ans { H,T } and { 1,2,3,4,5,6 }
3. If the probability of an event is  $p$  then probability of complementary event will be .....
- Ans  $1-p$**
4. In a throw of a die the probability of getting a prime number is .....
- Ans  $1/2$**
5. A die is thrown once. Find the probability of getting a number less than 9.
- Ans 1**
6. A letter of English alphabet is chosen at random. Determine the probability that the letter chosen is
- a. a vowel
- b. letter so chosen is a consonant.
- Ans  $5/26$  &  $21/26$**
7. Find the probability of getting a red heart.
- Ans  $1/4$**
8. A coin is tossed twice. Find the probability of getting at least one head.
- Ans.  $3/4$**
9. What is the probability of a sure event?
- Ans 1**
10. Define probability (**theoretical probability of an event.**)

### LEVEL – II

1. A die is thrown once. Find the probability of getting a number less than 4.
- Ans  $1/2$**
2. Two coins are tossed simultaneously find the probability of getting
- a. Two tails.
- b. At least one tail.
- c. No tail.
- Ans  $1/4$ ,  $3/4$  &  $1/4$**
3. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting
- a. An ace

b. A face card.

**Ans 1/13 & 3/13**

4. A bag contains 5 red balls, 8 white balls, 4 green balls and 7 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is

a. Black

b. Red

c. not green .

**Ans 7/24 , 5/24 & 5/6**

5. Two coins are tossed once. Find the probability of getting

a. exactly one head

b. Almost one head.

**Ans 1/2 & 3/4**

6. Write the sample space of two dice thrown simultaneously.

Ans-  $\left\{ \begin{array}{l} (1,1), (1,2), \dots, (1,6) \\ (2,1), (2,2), \dots, (2,6) \\ (3,1), (3,2), \dots, (3,6) \\ (4,1), (4,2), \dots, (4,6) \\ (5,1), (5,2), \dots, (5,6) \\ (6,1), (6,2), \dots, (6,6) \end{array} \right\}$

7. 15 cards numbered 1,2,3,...,15 are put in a box and mixed thoroughly. A card is drawn at random from box. Find the probability that the card drawn bears

a. even number

b. number divisible by 2 or 3.

**Ans 7/15 & 2/3**

8. A box contains 5 red balls, 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is

a. white ball

b. neither red nor white.

**Ans 7/16 & 1/4**

9. In a lottery there are 10 prizes & 25 blanks. Find the probability of getting a prize.

**Ans  $\frac{2}{7}$**

10. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought ?

**Ans 480 tickets**

### **LEVEL – III**

1. In a single throw of two die find the probability of getting

- a. a total of 7
- b. a total of 11
- c. doublets
- d. 6 as a product.

**Ans  $\frac{1}{6}$ ,  $\frac{1}{18}$ ,  $\frac{1}{6}$  &  $\frac{1}{9}$**

2. Find the probability of getting 53 Mondays in a leap year, 53 Tuesdays in a non leap year.

**Ans  $\frac{2}{7}$  &  $\frac{1}{7}$**

3. Lataksi and Vinay are friends. What is the probability that both will have

- a. same birthday
- b. different birthday. ( ignoring the leap year)

**Ans  $\frac{1}{365}$  &  $\frac{364}{365}$**

4. If there are 3 children in a family. Find the probability that there

- a. Is girl child in a family.
- b. atleast 2 girl children.
- c. is no girl child.
- d. are 3 girl children.

**Ans  $\frac{7}{8}$ ,  $\frac{1}{2}$ ,  $\frac{1}{8}$  &  $\frac{1}{8}$**

5. Are the following outcomes equally likely or not? A baby is born. "It's a boy or a girl."

**Ans Yes equally likely**

6. A box contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted. If one item is chosen from the box at random. What is the probability that it is rusted or a bolt?

**Ans  $\frac{5}{8}$**

7. All the aces and jacks are removed from a pack of 52 cards and then well shuffled. One card is now drawn at random. Find the probability of getting

- a. a club

b. an ace

**Ans 1/4 & 0**

8. A card is drawn at random from a well shuffled deck of 52 cards, what is the probability of drawing
- king or a spade
  - a non spade
  - either a king or 10 of heart.

**Ans 4/13 , 3/4 & 5/52**

9. Tom was born in February 2000. What is the probability that he was born on 13<sup>th</sup> Feb?

**Ans 1/29**

10. A letter is selected at random from the letters of the word "EXAMINATION". Find the probability that it is 'N'.

**Ans 2/11**

### SELF EVALUATION QUESTIONS

1. A child has a die whose six faces show the letter as given below



If a die is thrown once then find probability of getting A.

2. As the number of trials in an experiment go on increasing we may expect the experimental and theoretical probability to be nearly the same. Comment on it.
3. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting
- A king of red colour
  - A face card
  - A red face card
  - The jack of hearts
  - A spade
  - The queen of diamonds
4. Two dice are thrown at the same time. Find the probability of getting
- Same number on both dice
  - Different numbers on both dice

5. A child's game has 8 triangles of which 3 are blue and rest are red and 10 squares of which 6 are blue and rest are red. One piece is lost at random. Find the probability that it is
- Triangle
  - Square
  - Square of blue colour
  - Triangle of red colour
6. A bag contains 5 white balls, 7 red balls & 2 blue balls. One ball is drawn at random from the bag. What is the probability that ball drawn is
- White or blue
  - Black or red
  - Not white
  - Neither white nor black
7. Cards marked with numbers 5 to 50 are placed in a box & mixed throughout. A card is drawn from the box at random. Find the probability that the number on the taken out card is
- A prime number less than 10
  - A number which is a perfect square
8. Someone is asked to take a number from 1 to 100. Find the probability that it is not a prime number.
9. What is the probability that the number selected from numbers 1,2,3,...,25 is
- A number divisible by 3
  - A number divisible by 3 & 4
  - A number between 12 & 24
10. A carton of 24 bulbs contain 6 defective bulbs, one bulb is drawn at random. What is the probability that the bulb is not defective? If the bulb is defective & is not replaced and a second bulb is selected at random from the rest, what is the probability that the second bulb is defective?

## **BIBLIOGRAPHY**

1. X – INGS BY Rajesh Dhiwan
2. Move Fast with Mathematics by RL Arora
3. Self study in mathematics by JK Kataria
4. Together with mathematics by S.K Batra & Dr. Sanjeev Verma
5. A treatise on trigonometry by S.L Loni