SUPPORT MATERIAL

SUBJECT: MATHEMATICS
CLASS - IX

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REGIONAL OFFICE PATNA

YEAR : 2014 - 15

SA-I

How to use this study material?

Dear Students,


Shri Niwas Ramanujan
(1887 - 1920)

This study material contains gist of the topic/units along with the assignments for self assessment. Here are some tips to use this study material while revision during SA-I and SA-II examination.

- Go through the syllabus given in the beginning. Identify the units carrying more weight age.
- Suggestive blue print and design of question paper is a guideline for you to have clear picture about the form of the question paper.
- Revise each of the topic/unit. and consult the problem with your teacher.
- After revision of all the units, solve the sample paper and do self assessment with the value points.
- Must study the marking scheme / solution for CBSE previous year paper which will enable you to know the coverage of content under different questions.
- Underline or highlight key ideas to have bird eye view of all the units at the time of examination.
- Write down your own notes and make summaries with the help of this study material.
- Turn the theoretical information into outlines and mind maps.
- Make a separate revision notebook for diagrams and numerical.
- Discuss your 'Doubts' with your teacher or classmates.

Important

(i) Slow learners may revise the knowledge part first.

(ii) Bright students may emphasize the application part of the question paper.

INDEX

PART - I

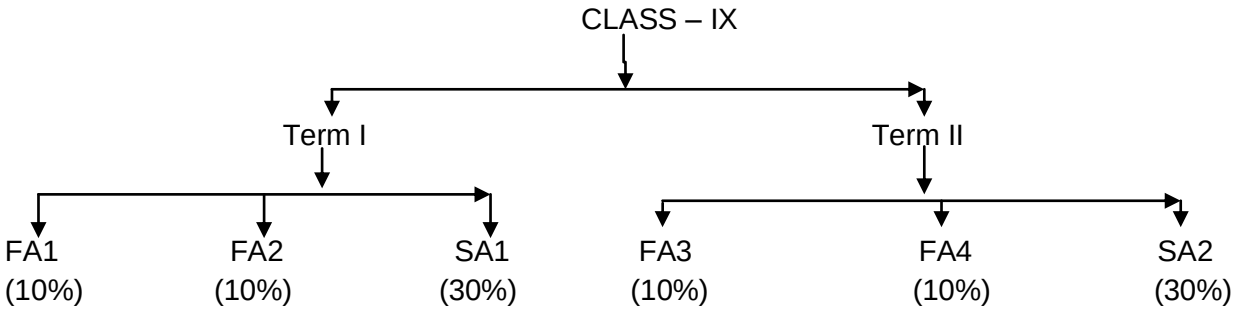
SA - 1

PART - II

COURSE STRUCTURE

CLASS – IX

As per CCE guidelines, the syllabus of Mathematics for class IX has been divided term-wise.
The units specified for each term shall be assessed through both formative and summative assessment.



Suggested activities and projects will necessarily be assessed through formative assessment.

SA - I

First Term	**Marks - 90**
Units	**Marks**
Unit I - Number system (Real Numbers)	17
Unit II - Algebra (Polynomials)	25
Unit III - Geometry (Introduction of Euclid Geometry lines and angles, triangle	37
Unit IV - Coordinate Geometry	06
Unit V - Mensuration Area of Triangles - Heron's Formula	05
TOTAL	**90**

NCERT MATHEMATICS BOOK

Topic wise analysis of examples and questions

Sl. No	Chapter No.	Name of chapter	No. of solved problems	No. of questions in exercises	Total
SA 1					
1	1	Number system	21	27	48
2	2	Polynomials	25	33	58
3	3	Coordinate geometry	04	06	10
4	5	Euclid's geometry	03	09	12
5	6	Lines and angles	08	18	26
6	7	Triangles	09	27	26
7	12	Heron's formula	06	15	11
		Total	76	135	211
SA 2					
1	4	Linear equations in two variables	09	16	25
2	8	Quadrilateral	08	19	27
3	9	Area of parallelogram and triangles	04	23	27
4	10	Circles	06	23	29
5	11	Construction	01	10	11
6	13	Surface area and volumes	19	72	91
7	14	Statistics	15	26	41
8	15	Probability	10	13	23
Total			72	202	274

DETAILS OF THE CONCEPTS TO BE MASTERED BY EVERY CHILD OF CLASS IX WITH EXERCISE AND EXAMPLES OF NCERT TEXT BOOKS.

SA - I

Symbols used

* Important Questions

** Very Important Questions

*** Very Very Important Questions

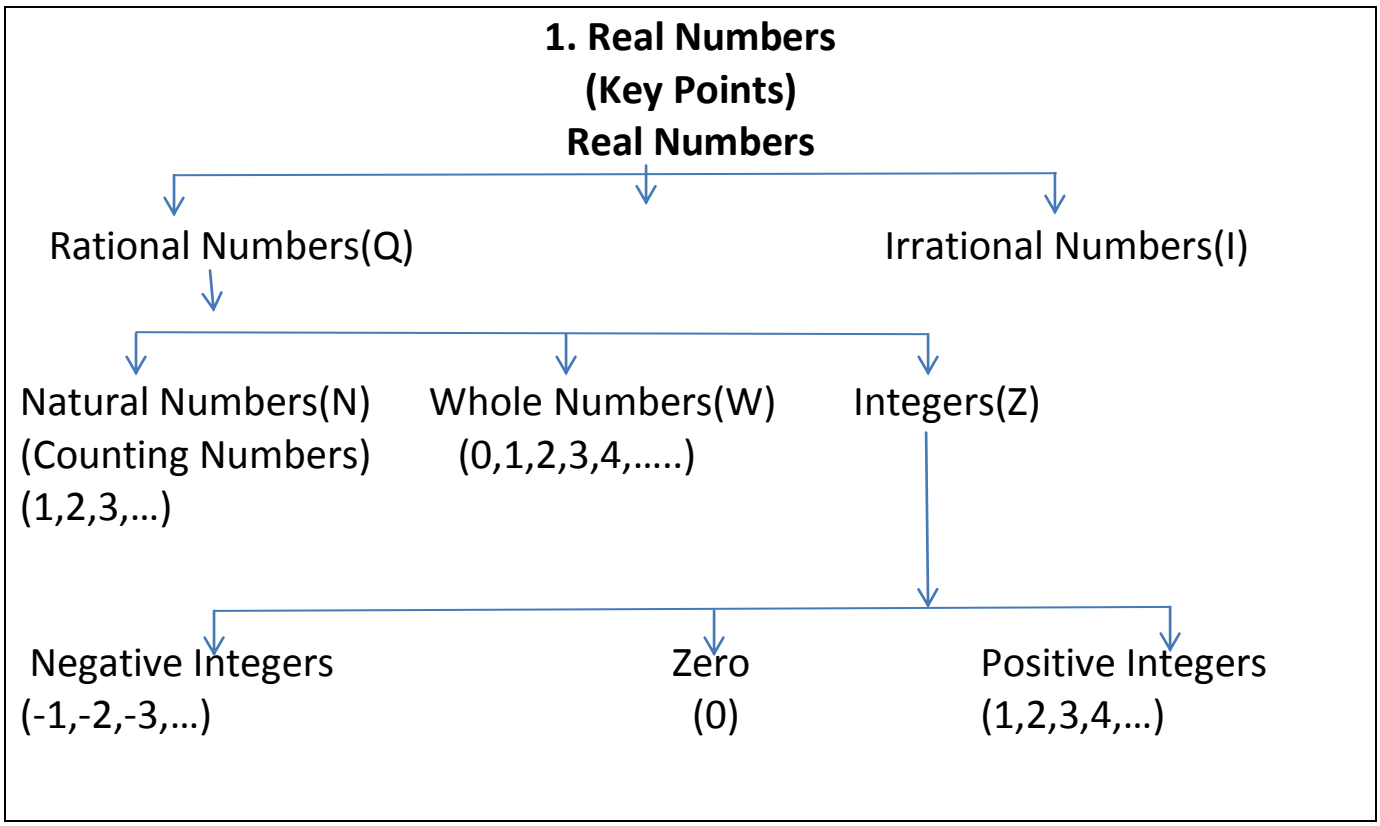
S. No.	Topic	Concept	Degree of Importance	NCERT Book
1.	Number System	Rational Numbers	**	Example – 2 Ex. 1.1 Q: 2, 3
		Irrational Numbers	**	Example 3, 4 Ex. 1.2 Q 3
		Real Numbers and their decimal expansion and number line	***	Example 7, 8, 9, 11 Ex. 1.3 Q 3, 7, 8 Ex. 1.4 Q 1, 2
		Operations on Real Numbers	***	Example 18, 19, 20 Ex. 1.5 Q: 4, 5
		Laws of Exponents for Real Numbers	*	Example 21 Q: 2, 3
2.	Polynomials	Polynomials in one variable and zeroes of a polynomial	*	Ex. 2.1 Q 5 Example 2, 4, 5 Ex. 2.2 Q 2, 4
		Remainder Theorem	***	Example 6, 7, 9 Q: 1, 2
		Factorization of Polynomial	***	Example 12, 13, 14, 15 Ex. 2.4 Q 1, 2, 4, 5
		Algebraic Identities	***	Example 17, 18, 20, 21, 22, 23, 24 Ex. 2.5 Q2, 4, 5, 6, 9, 11, 12, 13, 14
3.	Coordinate Geometry	Cartesian System	**	Example 2 Ex. 3.2 Q: 2
		Plotting a Point in the Plane	***	Example 3 Ex. 3.3 Q 1, 2
4.	Introduction to Euclid's Geometry	Axioms and Postulates	*	Example 1 Ex. 5.1 Q: 2, 4, 6 Ex. 5.2 Q: 2
5.	Lines and Angles	Basic Terms and Definition	**	Example 1, 3 Ex. 6.1 Q: 3, 5
		Parallel Lines and a transversal	**	Example 4, 6 Ex. 6.2 Q: 3, 4, 5
		Angle Sum Property of a triangle	***	Example 7, 8 Ex.: 7.1 Q: 1, 3, 5, 7, 8
		Properties of congruency of triangles	**	Example 4, 5, 6 Ex. 7.2 Q: 2, 4, 5, 6 Ex. 7.3 Q: 2, 4
		Inequalities in a triangle	*	Example 9 Ex. 7.4 Q: 2, 3, 5
7.	Heron's Formula	Area of triangle by Heron's Formula	*	Example 1, 3 Ex. 12.1Q: 4, 5, 6
		Application of Heron's Formula	***	Example 6 Ex. 12.2 Q: 1, 2, 5, 9

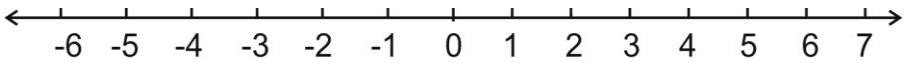
Chapter - 1(Term-I)

(Number System)

Key Concepts

1. Real Numbers
(Key Points)





* Natural numbers are 1, 2, 3, …….. denoted by N.
* Whole numbers are 0, 1, 2, 3, …… denoted by W.
* Integers ……. -3, -2, -1, 0, 1, 2, 3, …… denoted by Z.
  Positive integers :- 1,2,3,4----------
  Negative Integers :- -1,-2,-3,-4----------
  Zero ie. 0.
* Rational numbers - All the numbers which can be written in the form p/q, $q \neq 0$ are called rational numbers where p and q are integers. Example $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{3}$, $\frac{0}{5}$,0.1 etc
  The decimal expansion of a rational number is either terminating or non terminating recurring. Thus we say that a number whose decimal expansion is either terminating or non terminating recurring is a rational number.
* Irrational numbers - A number is called irrational, if it cannot be written in the form p/q where p and q are integers and $q \neq 0$.
* The decimal expansion of a irrational number is non terminating & non recurring. Example:- $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, $\sqrt{7}$,π , 0.0414114111…….. , 0.0424224222…….
* All the rational numbers and irrational numbers taken together. Make a collection of real number.
* A real number is either rational or irrational.
* If r is rational and s is irrational then r+s, r-s, r.s are always irrational numbers but r/s may be rational or irrational.

* Every irrational number can be represented on a number line using Pythagoras theorem.
* Rationalization of denominator means to remove square root from the denominator.

To rationalize $\frac{3+\sqrt{5}}{\sqrt{2}}$, we will multiply both numerator and denominator by $\sqrt{2}$.

For $\frac{1}{a \pm \sqrt{b}}$ Its rationalization factor $a \mp \sqrt{b}$

- Every integer is a rational number
- A rational number may or may not be an integer
- Between two given rational number a & b , there are infinitely many rational numbers.

Section - A

Q.1 Every Irrational number is
(a) non real number (b) An integer (C) a real number (d) a whole number

Q.2 Decimal representation of a rational number cannot be
(a) terminating (b) non terminating (c) non-terminating repeating (d) non-terminating non-repeating

Q.3 The value of 0.999……. in the form p/q , where p and q are integers and q ≠0 is
(a) 1/9 (b) 2/9 (c) 9/10 (d) non of these

Q.4 $8\sqrt{15} \div 2\sqrt{3}$ =

(a) $4\sqrt{15}$ (b) $4\sqrt{5}$ (c) $2\sqrt{5}$ (d) $none\ of\ these$

Q. 5 Value of $(343)^{-2/3}$ is
(a) 1/7 (b) 2/7 (c) 1/49 (d) non of these

Q. 6 Which of the following is irrational ?
(a) $\frac{\sqrt{4}}{\sqrt{9}}$ (b) $\frac{\sqrt{12}}{\sqrt{3}}$ (c) $\sqrt{7}$ (d) $\sqrt{81}$

Section - B

Q.7 Find the decimal expansion of $\frac{10}{3}$, $\frac{7}{8}$ and $\frac{1}{7}$? What kind of decimal expansion each has.

Q.8 Show that 1.272727 = $1.\overline{27}$ can be expressed in the form p/q, where p and q are integers and $q \neq 0$.

Q.9 Write three numbers whose decimal expressions are non-terminating &non recurring?

Q.10 Find three different rational between -2 and - 4/5.

Q.11 Classify the following numbers as rational or irrational.
(a) $\sqrt{23}$ (b) $\sqrt{225}$ (c) 0.6796
(d) 1.101001000100001….

Q.12 locate $\sqrt{5}$ on the number line .

Section - C

Q.13 Visualize 4.237 on the number line using successive magnification.

Q.14 Visualize $2.\overline{72}$ on the number line upto 4 decimal places.

Q.15 Simplifies the following expressions.
(i) $(5+\sqrt{7})(2+\sqrt{5})$
(ii) $(5+\sqrt{5})(5-\sqrt{5})$

(iii) $\left(\sqrt{3}+\sqrt{7}\right)^2$

(iv)$\left(\sqrt{11}-\sqrt{7}\right)\ \left(\sqrt{11}+\sqrt{7}\right)$

Q.16 Rationalize the denominator of $\frac{2\sqrt{3}}{\sqrt{3}-\sqrt{2}}$.

Q. 17 If $a=2+\sqrt{3}$, then find a^2+1/a^2

Q.18 Express 2.0 $\overline{13}$ in the form of p/q , where p and q are integers and q ≠ 0

Section - D

Q.19 Represent $\sqrt{7.4}$ on number line.

Q.20 Simplify

(i) $3^{3/4}.3^{1/4}$

(ii) $\left(\frac{1}{3^3}\right)^5$

(iii) $(32)^{6/5}$

(iv)$7^{1/2}8^{1/2}$

Q. 21 Simplify $\frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$ + $\frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}}$ - $\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}$

Q. 22 If $x=\frac{1}{2-\sqrt{3}}$, then evaluate x^2-4x+9

Q.23 Finds three different irrational numbers between 1/7 and 3/13.

Self Evaluation

Q.1 Write the value of

$$\left(\frac{x^a}{x^b}\right)^{a+b} \times \left(\frac{x^b}{x^c}\right)^{b+c} \times \left(\frac{x^c}{x^a}\right)^{c+a}$$

Q.2 Evaluate:- $\left\{5\left(8^{\frac{1}{3}}+27^{\frac{1}{3}}\right)^3\right\}^{\frac{1}{4}}$

Q.3 If a & b are rational number, find the value of a & b in each of the following equalities.

(a) $\frac{\sqrt{3}-1}{\sqrt{3}+1}=a+b\sqrt{3}$ (ii) $\frac{3+\sqrt{7}}{3-\sqrt{7}}=a+b\sqrt{7}$

Q.4 Prove that $3\sqrt{2}$ is an irrational number

Q.5 Prove that $\sqrt{2}+\sqrt{3}$ is an irrational number.

Answer

(1) c (2) d (3) d (4) b (5) c (6) c (10) - 19/10 , -18/10 , -17/10 (16) 6+ $2\sqrt{2}$
(17) 14 (21) 0 (22) 8

Self evaluation Answer

(1) 1 (2) 5 (3)(a) a=2 and b= -1 (b) a= 8 and b=3

Chapter - 2
(Polynomials)

Key Concepts

Constants : A symbol having a fixed numerical value is called a constant.

Example : 7, 3, -2, 3/7, etc. are all constants.

Variables : A symbol which may be assigned different numerical values is known as variable.

Example :$C = 2\pi r$ C - circumference of circle

r - radius of circle

Where 2 &π are constants. while C and r are variable

Algebraic expressions : A combination of constants and variables connected by some or all of the operations +, -, X and ÷ is known as algebraic expression.

Example :$4 + 9x - 5x^2y + \frac{3}{8}xy$ etc.

Terms : The several parts of an algebraic expression separated by '+' or '-' operations are called the terms of the expression.

Example :$x^3 + 2x^2y + 4xy^2 + y^3 + 7$ is an algebraic expression containing 5 terms $x^3, 2x^3y,\ -4xy^2,\ y^3 \& 7$

Polynomials : An algebraic expression in which the variables involved have only non-negative integral powers is called a polynomial.

(i) $5x^3 - 4x^2 - 6x - 3$ is a polynomial in variable x.

(ii) $5 + 8x^{3/2} + 4x^{-2}$ is an expression but not a polynomial.

Polynomials are denoted by $p(x),\ q(x) and\ r(x) etc.$

Coefficients : In the polynomial $x^3 + 3x^2 + 3x + 1$, coefficient of $x^3, x^2, x\ are\ 1, 3, 3$ respectively and we also say that +1 is the constant term in it.

Degree of a polynomial in one variable : In case of a polynomial in one variable the highest power of the variable is called the degree of the polynomial.

Classification of polynomials on the basis of degree.

	degree	Polynomial	Example
(a)	1	Linear	$x + 1,\ 2x + 3\ etc.$
(b)	2	Quadratic	$ax^2 + bx + c$ etc.
(c)	3	Cubic	$x^3 - 3x^2 + 1$ etc.
(d)	4	Biquadratic	$x^4 - 1$

Classification of polynomials on the basis of no. of terms

No. of terms		**Polynomial**	**Examples.**
(i)	1	Monomial	- $5, 3x, \frac{1}{3}y$ etc.
(ii)	2	Binomial	- $(3 + 6x),\ (x - 5y)$ etc.
(iii)	3	Trinomial	- $2x^2 + 4x + 2$ etc.

Constant polynomial: A polynomial containing one term only, consisting a constant term is called a constant polynomial. The degree of non-zero constant polynomial is zero.

Zero polynomial: A polynomial consisting of one term, namely zero only is called a zero polynomial.

The degree of zero polynomial is not defined.

Zeroes of a polynomial: Let $p(x)$ be a polynomial. If $p(\alpha) = 0,$ then we say that α is a zero of the polynomial p(x).

Remark: Finding the zeroes of polynomial p(x) means solving the equation p(x)=0.

Remainder Theorem: Let $f(x)$ be a polynomial of degree $n \geq 1$ and let a be any real number. When $f(x)$ is divided by $(x - a)$ then the remainder is $f(a)$

Factor Theorem: Let $f(x)$ be a polynomial of degree $n > 1$ and let a be any real number.

(i) If $f(a) = 0\ then\ (x - a) is\ factor\ of\ f(x)$

(ii) $If\ (x - a) is\ a\ factor\ of\ f(x)\ then\ f(a) = 0$

Factor: A polynomial $p(x)$ is called factor of $q(x),\ if\ p(x)$ divides $q(x)$ exactly.

Factorization: To express a given polynomial as the product of polynomials each of degree less than that of the given polynomial such that no such a factor has a factor of lower degree, is called factorization.

Example:$x^2 - 16 = (x + 4)(x - 4)$

Methods of Factorization:

Factorization by taking out the common factor

e.g.

$$36a^3b - 60a^2bc = 12a^2b\,(3a - 5c)$$

Factorizing by grouping

$$\begin{aligned} ab + bc + ax + cx &= (ab + bc) + (ax + cx) \\ &= b\,(a + c) + x\,(a + c) \\ &= (a + c)(b + x) \end{aligned}$$

Factorization of quadratic trinomials by middle term splitting method.

$$\begin{aligned} x^2 + bc + c &= x^2 + (p + q)x + pq \\ &= (x + p)(x + q) \end{aligned}$$

Identity: Identity is an equation (trigonometric, algebraic) which is true for every value of variable.

Some algebraic identities useful in factorization:

(i) $(x + y)^2 = x^2 + 2xy + y^2$

(ii) $(x - y)^2 = x^2 - 2xy + y^2$

(iii) $x^2 - y^2 = (x - y)(x + y)$

(iv) $(x + a)(x + b) = x^2 + (a + b)x + ab$

(v) $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

(vi) $(x + y)^3 = x^3 + y^3 + 3xy\,(x + y)$

(vii) $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$

(viii) $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

(ix) $x^3 + y^3 + z^3 = 3xyz \quad if\ x + y + z = 0$

Section - A

Q.1 Which of the following expressions is polynomial?

(i) $x^5 - 2x^3 + x + 7$ (ii) $y^3 - \sqrt{3}y$

(iii) $5\sqrt{z} - 6$ (iv) $x - \frac{1}{x}$ (v) $x^{108} - 1$

(vi) $\sqrt[3]{x} - 27$ (vii) $x^{-2} + 2x^{-1} + 3$

Q.2 Write the degree of each of the following polynomial.

(i) $2x - \sqrt{5}$ (ii) $3 - x + x^2 - 6x^3$ (iii) 9

(iv) $8x^4 - 36x + 5x^7$ (v) $x^9 - x^5 + 3x^{10} + 8$ (vi) $2 - 3x^2$

Q.3 (i) Give an example of a binomial of degree 27.

(ii) Give an example of a monomial of degree 16.

(iii) Give an example of trinomial of degree 3.

Section -B

Q.4 If $p(x) = 5 - 4x + 2x^2$ $find\ (i)\ p(0)\ (ii)\ p(3)(iii)\ p(-2)$

Q.5 Find the zeros of the polynomials given below :

(i) $p(x) = x - 5$ (ii) $q(x) = x + 4$ (iii) $h(x) = 6x - 1$

(iv) $p(x) = ax + b$ (v) $r(x) = x^2 + 3x$ (vi) $l(x) = x^2 + 2x + 1$

Q.6 Find the remainder when $f(x) = 12x^3 - 13x^2 - 5x + 7$ is divided by $(3x + 2)$

Q.7 Show that $(x + 5)$ is a factor of the polynomial

$f(x) = x^3 + x^2 + 3x + 115$

Q.8 Find the value of a for which $(x - a)$ is a factor of the polynomial.

$f(x) = x^5 - a^2x^3 + 2x + a - 3$

Section - C

Q.9 Factorize the following expressions.

(i) $5x^2 - 20xy$

(ii) $5a\ (b + c) - 7b\ (b + c)$

(iii) $x(x - y)^2 + 3x^2y\ (x - y)$

(iv) $6ab - b^2 + 12ac - 2bc$

(v) $x^2 + \frac{1}{x^2} + 2 - 2x - \frac{2}{x}$

Q.10 Factorize :

(i) $9x^2 - 16y^2$ (ii) $x^3 - x$

Q.11 Factorize:

$a(a - 1) - b\ (b - 1)$

Q.12 Factorize following expressions.

(i) $x^2 + 9x + 18$

(ii) $x^2 - 4x - 21$

(iii) $x^2 - 9x + 18$

(iv) $x^2 - 19x + 78$

Q.13 Calculate $(997)^2$ using algebraic identities.

Q.14 If x+y=5 and xy =6 then find x^3+y^3.

Q.15 Expand $(2a + 3b + 4c)^2$.

Q.16 Factorize $9x^2 + 4y^2 + 16z^2 + 12xy - 16yz - 24xz$.

Q.17 Expand (i) $(4a + 5b)^3$ (ii) $(5x - 3y)^3$

Q.18 Evaluate (i) $(95)^3$ (ii) $(106)^3$

Q.19 Factorize (i) $x^3 + 64$ (ii) $27x^3 + 125y^3$

(iii) $8a^3 - 27b^3$ (iv) $1 - 64a^3$.

(v) $4x^3 + 8x^2 - 25x - 50$ (use factor theorem)

Section - D

Q.20 Factorize

$a^3 + 27b^3 + 8c^3 - 18abc$

Q.21 Factorize

$(p - q)^3 + (q - r)^3 + (r - p)^3$

Q.22 Find the product
$(3x-5y-4)(9x^2+25y^2+15xy+12x-20y+16)$

Q.23 If $x+y+z=9\ and\ xy+yz+zx=23$ then find the value of
$(x^3+y^3+z^3-3xyz)$

Self Evaluation

Q.24 Which of the following expression is a polynomial?
(a) $\sqrt{x}-1$ (b) $\frac{x-1}{x+1}$ (c)$x^2-\frac{2}{x^2}+5$(d) $x^2+\frac{2x^{3/2}}{\sqrt{x}}+6$

Q.25 Degree of zero polynomial is
(a) 1 (b) 0 (c) not defined (d) none of these

Q.26 For what value of k is the polynomial $p(x)=2x^3-kx^2+3x+10$ exactly divisible by $(x+2)$?
(a) $\frac{-1}{3}$ (b) $\frac{1}{3}$ (c) 3 (d) -3

Q.27 The zeroes of the polynomial $p(x)=\ 3x^2-1\ are$
(a) $\frac{1}{3}$ (b) $\frac{1}{\sqrt{3}}$ (c)$\frac{-1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{3}}\ and\ \frac{-1}{\sqrt{3}}$

Q.28 If $\frac{x}{y}+\frac{y}{x}=-1$ where $x\neq 0,\ y\neq 0\ \ then\ find\ the\ value\ of\ x^3-y^3.$

Q.29 If $(x+2)and\ (x-1)are\ factors\ of\ (x^3+10x^2+m\,x+n)$ then find value of m & n?

Q.30 Find the value of $(369)^2-(368)^2$

Q.31 Find value of 104 X 96

Q.32 If $a+b+c=0$ find value of $\left(\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}\right)$

Answers

Q.1 (i), (ii), (v)

Q.2 (i) 1 (ii) 3 (iii) 0 (iv) 4 (v) 9 (vi) 2

Q.4 (i) p (0) = 5 (ii) p(3) = 11 (iv) 21

Q.5 (i) $x=5$ (ii) $x=-4$ (iii) x= 1/6 (iv)$x=-b/a$
(v) $x=0, x=-3$ (vi) $x=-1,-1$

Q.6 remainder = 1

Q.8 a = 1

Q.9 (i) $5x(x-4y)$
(ii) $(b+c)(5a-7b)$
(iii) $x(x-y)[(x-y)+3xy]$
(iv)$(b+2c)(6a-b)$
(v) $\left(x+\frac{1}{x}\right)\left(x+\frac{1}{x}-2\right)$

Q.10 (i) $(3x+4y)(3x-4y)$ (ii) $x(x+1)(x-1)$

Q.11 (a-b) (a+b-1)

Q.12 (i) $(x+6)(x+3)$
(ii) $(x-7)(x+3)$
(iii) $(x-6)(x-3)$
(iv)$(x-6)(x-13)$

Q.13 994009

Q.14 $x^3+y^3=35$

Q.15 $4a^2 + 9b^2 + 16c^2 + 12ab + 24bc + 16ac$

Q.16 $(3x+2y-4z)^2$

Q.17 (i) $64a^3 + 125b^3 + 240a^2b + 300ab^2$

(ii) $125x^3 - 27y^3 - 225x^2y + 135xy^2$

Q.18 (i) 857375 (ii) 1191016

Q.19 (i) $(x + 4)(x^2 - 4x + 16)$

(ii) $(3x+5y)(9x^2-15xy+25y^2$

(iii) $(2a - 3b)(4a^2 + 6ab + 9b^2)$

(iv)$(1 - 4a)(1 + 4a + 16a^2)$

(v) (2x -5) (2x + 5) (x + 2)

Q.20 $(a + 3b + 2c)(a^2 + 9b^2 + 4c^2 - 3ab - 6bc - 2ac)$

Q.21 $3(p - q)(q - r)(r - p)$

Q.22 $27x^3 - 125y^3 - 64 - 180xy.$

Q.23 108

Q.24 $(d)x^2 + \frac{2x^{\frac{3}{2}}}{x^{\frac{1}{2}}} + 6$

Q.25 (c) not defined

Q.26 (d) -3

Q.27 (d) $\frac{1}{\sqrt{3}} \& \frac{-1}{\sqrt{3}}$

Q.28 0

Q.29 m = 7, n = -18

Q.30 737

Q.31 9984

Q.32 3

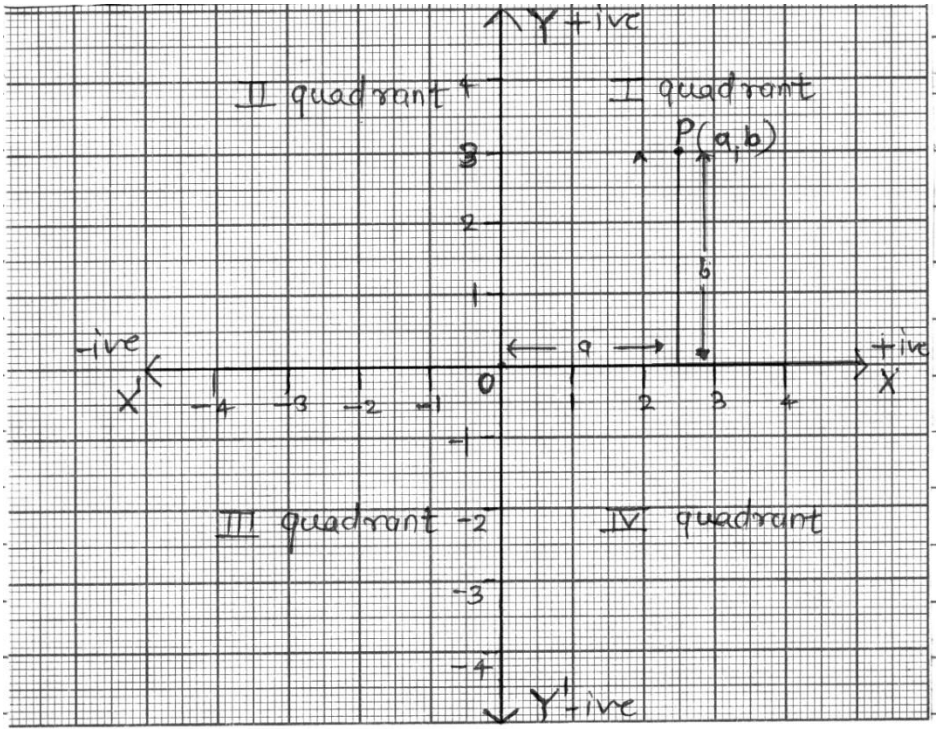
Chapter - 3
(Coordinate Geometry)

Key concepts

Coordinate Geometry : The branch of mathematics in which geometric problems are solved through algebra by using the coordinate system is known as coordinate geometry.

Coordinate System

Coordinate axes: The position of a point in a plane is determined with reference to two fixed mutually perpendicular lines, called the coordinate axes.



In this system, position of a point is described by ordered pair of two numbers.

Ordered pair : A pair of numbers a and b listed in a specific order with 'a' at the first place and 'b' at the second place is called an ordered pair (a,b)

Note that

$$(a, b) \neq (b, a)$$

Thus (2,3) is one ordered pair and (3,2) is another ordered pair.

In given figure O is called origin.

The horizontal line X^1OX is called the X-axis.

The vertical line YOY' is called the Y-axis.

P(a,b) be any point in the plane. 'a' the first number denotes the distance of point from Y-axis and 'b' the second number denotes the distance of point from X-axis.

a -X - coordinate | abscissa of P.

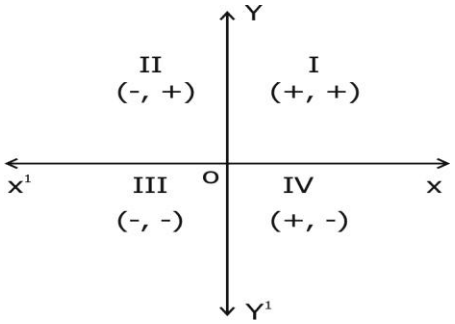
b -Y - coordinate | ordinate of P.

The coordinates of origin are (0,0)

Every point on the x-axis is at a distance o unit from the X-axis. So its ordinate is 0.

Every point on the y-axis is at a distance 0 unit from the Y-axis. So, its abscissa is 0.

Quadrants



Note :1. Any point lying on $X - axis$ or Y-axis does not lie in any quadrant.

2. Every point lies on the x-axis whose y coordinate is 0 and every point lies on the y-axis whose x coordinate is 0.

Section - A

Q.1 On which axes do the given points lie?
(i) (7, 0) (ii) (0, -3) (iii) (0, 6) (iv) (-5, 0)

Q.2 In which quadrants do the given points lie?
(i) (4, -2) (ii) (-3, 7) (iii) (-1, -2) (iv) (3, 6)

Q.3 Is P (3, 2) &Q(2, 3) represent the same point?

Q.4 In which quadrant points P(3,0), Q(6,0) , R (-7.0), S (0,-6), lie?

Q.5 If a<0 and b<0, then the point P(a,b) lies in
(a) quadrant IV (b) quadrant II (c) quadrant III (d) quadrant I

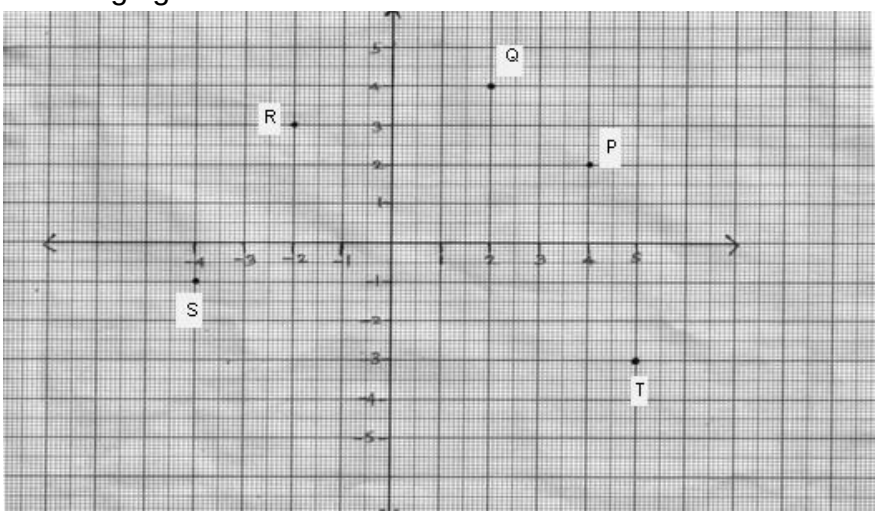
Q.6 The points (other than the origin) for which the abscissa is equal to the ordinate lie in
(a) Quadrant I only (b) Quadrant I and II
(c) Quadrant I & III (d) Quadrant II only.

Q.7 The perpendicular distance of the point P(4,3) from the y axis is
(a) 3 Units (b) 4 Units (c) 5 Units (d) 7 Units

Q.8 The area of triangle OAB with 0(0,0), A(4,0) & B(0,6) is
(a) 8 sq. unit (b) 12 sq. units (c) 16 sq. units (d) 24 sq. units

Section - B

Q.9 Write down the coordinates of each of the points P,Q, R, S and T as shown in the following figure?

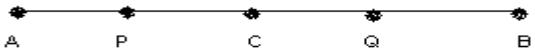


Q.10 Draw the lines X'OX and YOY[1] as the axes on the plane of a paper and plot the given points.
(i) A(5,3) (ii) B (-3, 2) (iii) C(-5, -4) (iv) D(2,-6)

Section - C

Q.11 Find the mirror images of the following point using x-axis & y-axis as mirror.
(i) A(2,3)
(ii) B(2,-3)
(iii) C(-2,3)
(iv) D(-2,-3)

Q.12 In figure C is mid-point of the segment AB. P and Q are mid-point of the segments AC and BC respectively.
Prove that AP=BQ=1/4 AB



Q.13 Draw a triangle with vertices 0(0,0) A(3,0) B(3,4). Classify the triangle and also find its area.

Q.14 Draw a quadrilateral with vertices A(2,2) B(2,-2) C(-2,-2), D(-2,2). Classify the quadrilateral and also find its area.

Q.15 Plot the points (x,y) given by the following table

x	2	4	-3	-2	3	0	-2
y	4	2	0	5	-3	1.25	-3

Answers

Q.1 (i) (7,0) X-axis (ii) (0, -3) Y-axis (iii) (0,6) Y-axis (iv) (-5,0) X-axis

Q.2 (i) (4,-2) IV quadrant (ii) (-3,7) II quadrant (iii) (-1,-2) III quadrant
(iv) (3,6) I quadrant.

Q.3 P(3,2) and Q(2,3) do not represent same point.

Q.4 These points do not lie in any quadrant. These points lie on the axes.

Q.5 (c) quadrant III Q.6 (c) quadrant I & III

Q.7 (b) 4 units Q.8 (b) 12 sq. units.

Q.11 $A^1(2,-3), B^1(2,3), C^1(-2,-3), D^1(-2,3)$

Q.13 right angle triangle area - 6 square units.

Q.14 quadrilateral is square area -16 square units.

Q.15 Every point on Y-axis satisfy this condition.

Chapter - 5

(Introduction to Euclid's Geometry)

The Greeks developed geometry in a systematic manner. Euclid (300 B.C.) a Greek mathematician, father of geometry, introduced the method of proving mathematical results by using deductive logical reasoning and the previously proved result. The Geometry of plane figure is known as "Euclidean Geometry".

Axioms:

The basic facts which are taken for granted without proof are called axioms, Some Euclid's axioms are

(i) Things which are equal to the same thing are equal to one another. i.e.

$a = b, \quad b = c \implies a = c$

(ii) If equals are added to equals, the wholes are equal i.e. $a = b \implies a + c = b + c$

(iii) If equals are subtracted from equals, the remainders are equal i.e.

$a = b \implies a - c = b - c$

(iv) Things which coincide with one another are equal to one another.

(v) The whole is greater than the part.

Axiom , Postulates and Theorems :-

(1) **Axioms** are the general statements, postulates are the axioms relating to a particular field.

(2) **Statements** : A sentence which is either true or false but not both, is called a statement.

eg. (i) 4+9=6 it is a false sentence, so it is a statement.

(ii) Sanjay is tall. This is not a statement because he may be tall for certain persons and may not be taller for others.

(3**) Theorems**: A statement that requires a proof is called a theorem.

eg. (i) The sum of the angles of triangle is 180^0.

(ii) The angles opposite to equal sides of a triangles are equal.

Corollary - Result deduced from a theorem is called its corollary.

(4) **Postulates :-** The basic assumptions in geometry which are universal true and are accepted without proof are called Postulates.

(5**) Euclid's five postulates** are.

(i) A straight line may be drawn from any one point to any other point.

(ii) A terminated line can be produced indefinitely.

(iii) A circle can be drawn with any centre and any radius.

(iv) All right angles are equal to one another.

(v) If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely meet on that side on which the angles are less than two right angles.

Section - A

(1) Euclid stated that if equals are subtracted from equals, the remainders are equals in the forms of

(a) an axiom (b) a postulate

(c) a definition (d) a proof Ans.(a)

(2) Euclid stated that all right angles are equals to each other in the form of

(a) an axiom (b) a definition(c) a postulate(d) a proof Ans.(c)

(3) Which of the following needs a proof:
(a) Theorem (b) Axiom(c) Definition (d) Postulate Ans.(a)

(4) The number of dimensions, a solid has
(a) 1 (b) 2 (c) 3 (d) 0 Ans.(c)

(5) The number of dimensions a surface has :
(a) 1 (b) 2 (c) 3 (d) 0 Ans.(b)

(6) The number of dimensions, a point has
(a) 0 (b) 1 (c) 2 (d) 3 Ans.(a)

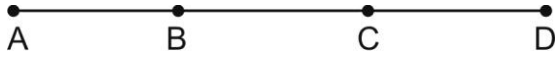
(7) Which one of the following statement is true?
(a) Only one line can pass through a single point.
(b) There are infinite number of lines which pass through two distinct points.
(c) Two distinct lines cannot have more than one point in common.
(d) If two circles are equal, then their radii are not equal. Ans.(c)

(8) Euclid divided his famous treatise "The Element" into
(a) 13 chapters (b) 12 Chapters
(c) 11 Chapters (d) 9 Chapters Ans.(a)

(9) Thales belongs to the country.
(a) Babylonia (b) Egypt (c) Greece (d) Rome Ans.(c)

Section - B

(10) If AB=CD can you say that AC=BD?
Give reasons for your answer.



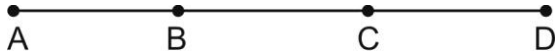
(11) In how many points two distinct lines can intersect.

(12) In how many lines two distinct planes can intersect.

Section - C

(13) If a point C lies between two points A and B such that AC=CB then prove that $AC = \frac{1}{2}\ AB$. Explain by drawing the figure.

(14) In the figure, AC=BD prove that AB=CD.



(15) If C is called a mid point of line segment AB. Prove that every line segment has one and only one mid point.

(16) Define the following terms :
(i) Parallel lines (ii) Concurrent lines (iii) Intersecting lines
(iv) Perpendicular lines.

(17) State Euclid's any three postulates.

(18) State Euclid's any three axioms.

(19) What do understand by axioms and postulates ?

Answers (MCQ)

1. (a) 2. (c) 3. (a) 4. (c) 5. (b) 6. (a) 7. (c)
8. (a) 9. (c)

Chapter - 6

(Lines and Angles)

Key Concepts

(1) Point - We often represent a point by a fine dot made with a fine sharpened pencil on a piece of paper.

(2) Line - A line is completely known if we are given any two distinct points. Line AB is represented by as $\overleftrightarrow{AB}$. A line or a straight line extends indefinitely in both the directions.

(3) Line segment - A part (or portion) of a line with two end points is called a line segment.

(4) Ray - A part of line with one end point is called a ray.

(5) Collinear points - If three or more points lie on the same line, they are called collinear points otherwise they are called non-collinear points.

(6) Angle :- An angle is the union of two non collinear rays with a common initial point.

Types of Angles -

(1) **Acute angle -** An acute angle measure between 0^0 and 90^0.

(2) **Right angle -** A right angle is exactly equal to 90^0.

(3) **Obtuse angle -** An angle greater than 90^0 but less than 180^0.

(4) **Straight angle -** A straight angle is equal to 180^0.

(5) **Reflex angle -** An angle which is greater than 180^0 but less than 360^0 is called a reflex angle.

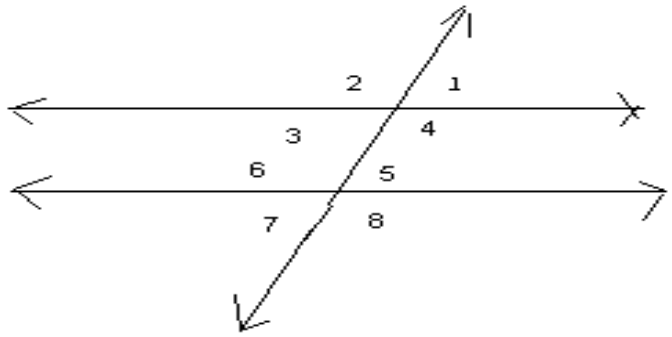
(6) **Complementary angles -** Two angles whose sum is 90^0 are called complementary angles.

(7) **Supplementary angle -** Two angles whose sum is 180^0 are called supplementary angles.

(8) **Adjacent angles -** Two angles are adjacent, if they have a common vertex, a common arm and their non common arms are on different sides of common arm.

(9) **Linear pair -** Two angles form a linear pair, if their non-common arms form a line (a straight angle).

(10) Vertically opposite angles - Vertically opposite angles are formed when two lines intersect each other at a point.

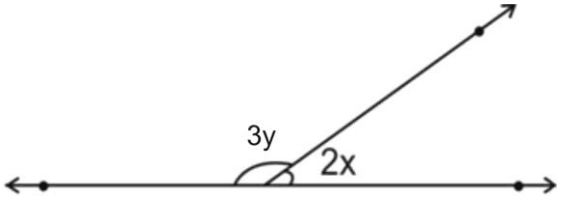


(a) Corresponding angles ($\angle 1$ & $\angle 5$), ($\angle 4$, $\angle 8$) , ($\angle 2$, $\angle 6$), ($\angle 3$, $\angle 7$)
(b) Alternate interior angles ($\angle 3$,$\angle 5$) , ($\angle 4$, $\angle 6$)
(c) Alternate exterior angles($\angle 1$,$\angle 7$) , ($\angle 2$, $\angle 8$)
(d) Interior angles on the same side of the transversal ($\angle 4$, $\angle 5$) ($\angle 3$,$\angle 6$)

* If a transversal intersects two parallel lines, then
  (i) Each pair of corresponding angles are equal.
  (ii) Each pair of alternate interior angles are equal.
  (iii) Each pair of interior angle on the same side of the transversal are supplementary.
* If a transversal Intersects two lines such that, either
  (i) Any one pair of corresponding angles are equal, or
  (ii) Any one pair of alternate interior angles are equal or
  (iii) Any one pair of interior angles on the same side of the transversal are supplementary then the lines are parallel.
* Lines which are parallel to a given line are parallel to each other.
* The sum of the three angles of a triangle is 180^0.
* If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

Section - A

Q.1 In the given figure, $x = 30^0$
The value of y is
(a) 10^0 (b) 40^0 (c) 36^0 (d) 45^0



Q.2 An exterior angle of a triangle is 75^0 and its two interior opposite angles are equal. Each of these equal angles is
(a) 105^0 (b) 50.5^0 (c) 52^0 (d) 37.5^0

Q.3 The complement of an angle 'm' is:
(a) m (b) 90^0+m (c) 90^0-m (d) m X 90^0

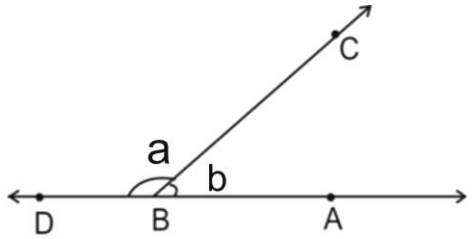
Q.4 If one angle of a triangle is equal to the sum of the other two equal angles, then the triangle is
(a) an isosceles triangle (b) an obtuse triangle

(c) an equilateral triangle (d) a right triangle

Q.5 In the given figure $\angle a \ and \ \angle b$ form a linear pair if a-b = 100^0 then a and b are

(a) 120^0, 20^0 (b) 40^0, 140^0

(c) 50^0, 150^0 (d) 140^0, 40^0

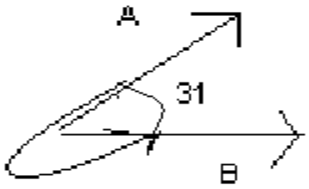


Q.6 Angle of a triangle are in the ratio 2 : 4 : 3. The smallest angle of the triangle is

(a) 60^0 (b) 40^0 (c) 80^0 (d) 20^0

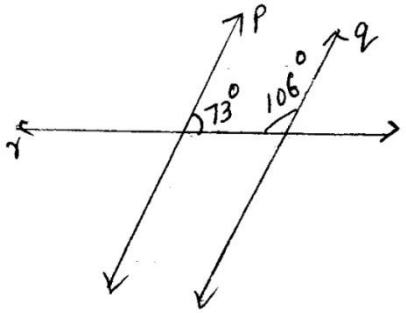
Section - B

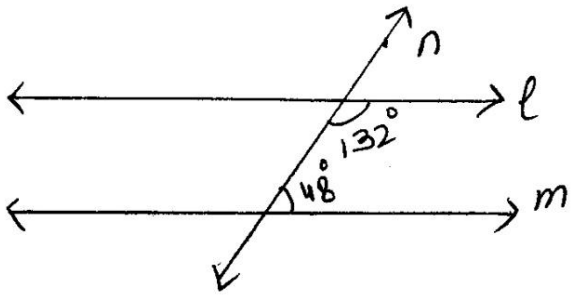
Q.7 $\angle AOB$ =31° find the reflex angle. $\angle AOB$



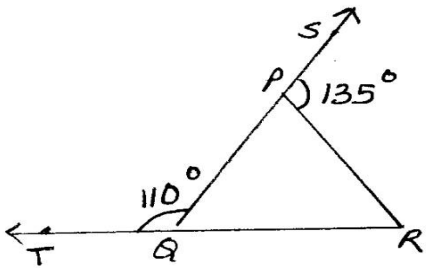
Q.8 In the following figures which of the two lines are parallel and why?

(i) (ii)

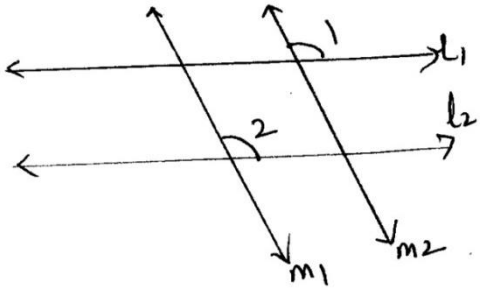




Q.9 In the given fig. sides QP and RQ of ΔPQR are produced to point S and T respectively. If $\angle PQT = 110^0$ and $\angle SPR = 135^0$ find $\angle PRQ$

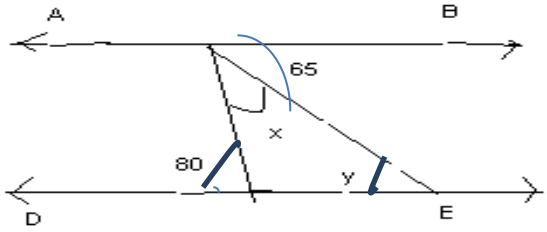


Q.10 In the fig. $l_1 \parallel l_2 \ and \ m_1 \parallel m_2 \ if \ \angle 1 = 151^0 \ find \ \angle 2$



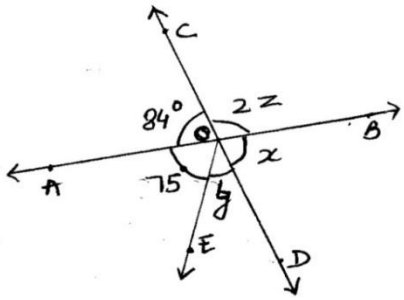
Q.11 Sum of two angles of a triangle is 90^0 and their difference is 50^0. Find all the angles of the triangle.

Q.12 In the adjoining figure, $AB \parallel DE$, find the value of $x \& y$.



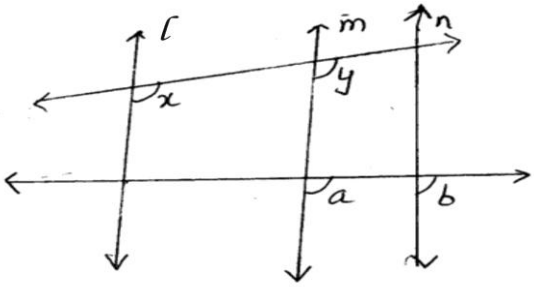
Section - C

Q.13 In the given figure AB and CD intersect each other at O. If $\angle AOE = 75^0$ and $\angle AOC = 84^0$ find the value of $x, y \; and \; z$.

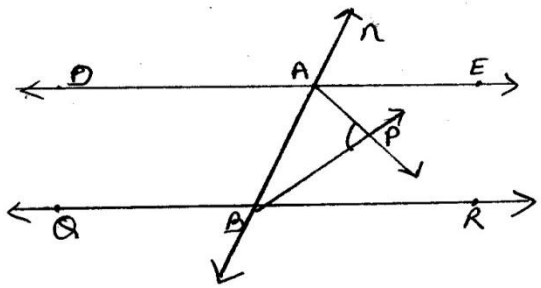


Q.14 Prove that vertically opposite angle are equal.

Q.15 In the given figure $x = y \; and \; a = b$ prove that $l \parallel n$



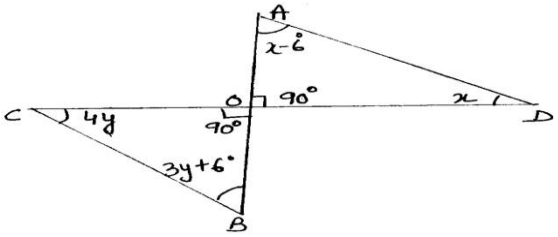
Q.16 In the given figure $DE \parallel QR$ and AP and BP are bisectors of $\angle EAB \; and \; \angle RBA$ respectively find $\angle APB$



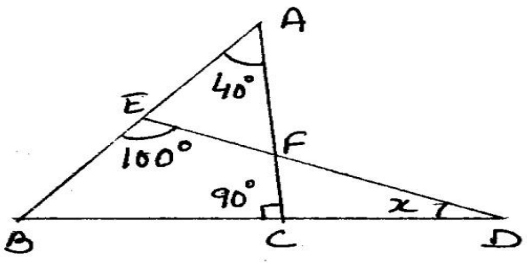
Q.17 The angles of a triangle are in the ratio 3:5: 7 find the angles of the triangle.

Which type of triangle is this on the basis of angle ?

Q.18 Find x and y in the following figure.



Q.19 In figure find x.



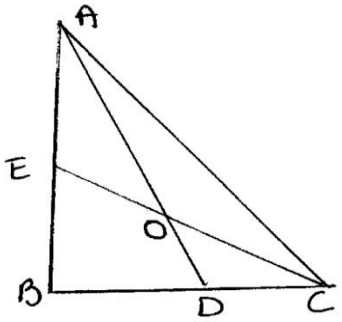
Section - D

Q.20 Prove that sum of the angles of triangle is 180^0.

Q.21 Prove that sum of the angles of a hexagon is 720^0.

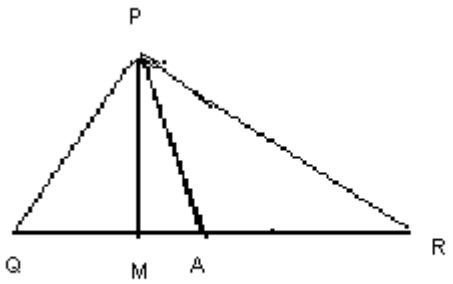
Q.22 The angles of a triangle are $(x - 40^0)$, $(x - 20^0)$ and $\left(\frac{1}{2}x - 10\right)^0$. Find the value of x.

Q.23 In the given figure, AD and CE are the angle bisectors of $\angle A$ and $\angle C$ respectively
If $\angle ABC = 90^0$ $then$ $find$ $\angle AOC$



Q.24 A transversal intersects two parallel lines. Prove that the bisectors of any pair of corresponding angle so formed are parallel.

Q. 25 $\angle Q$ >$\angle R$. PA is the bisector of $\angle QPR$ and PM $\perp$ QR.
Prove that $\angle APM = \frac{1}{2}\ \angle Q - \angle R$



Hot Questions

26. Prove that the two lines that are respectively perpendiculars to two parallel lines are parallel to each other.

27. In ΔABC, side BC is produced to D and bisector of $\angle A$ meets BC at L. Prove that $\angle ABC + \angle ACD = 2\angle ALC$

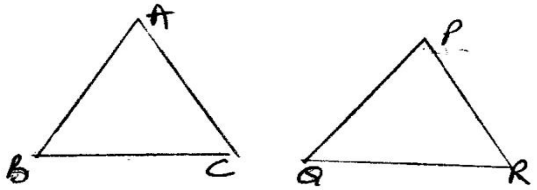
Answer :

(1) b (2) d (3) c (4) a,d (5) d (6) b
(9) 65^0 (10) 151^0 (11) $20^0, 70^0, 90^0$ (12) 95^0 (13) $84^0, 21^0, 48^0$ (16) 90^0
(17) $36^0, 60^0, 84^0$ (18) $48^0, 12^0$ (19) 30^0 (22) 100^0 (23) 135^0

Chapter - 7

(Triangles)

- Triangle - A closed figure formed by three intersecting lines is called a triangle. A triangle has three sides, three angles and three vertices.
- Congruent figures - Congruent means equal in all respects or figures whose shapes and sizes are both the same. For example, two circles of the same radii are congruent. Also two squares of the same sides are congruent.
- Congruent Triangles - Two triangles are congruent if and only if one of them can be made to superpose on the other, so as to cover it exactly.
- If two triangles ABC and PQR are congruent under the correspondence $A \leftrightarrow P, B \leftrightarrow Q$ and $C \leftrightarrow R$ then symbolically, it is expressed as $\Delta ABC \cong \Delta PQR$



- In congruent triangles corresponding parts are equal and we write 'CPCT' for corresponding parts of congruent triangles.
- SAS congruency rule - Two triangles are congruent if two sides and the included angle of one triangle are equal to the two sides and the included angle of the other triangle. For example $\Delta ABC \text{ and } \Delta PQR$ as shown in the figure satisfy SAS congruent criterion.
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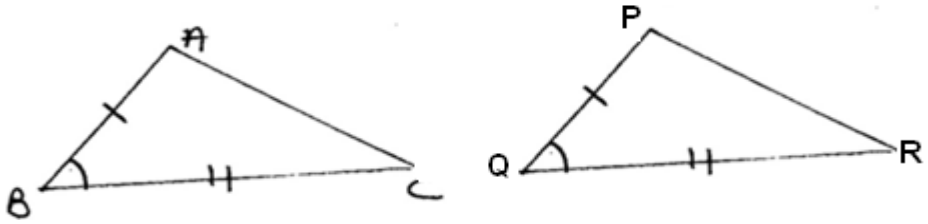
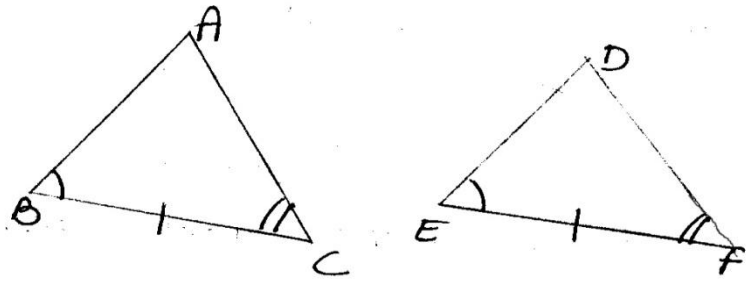
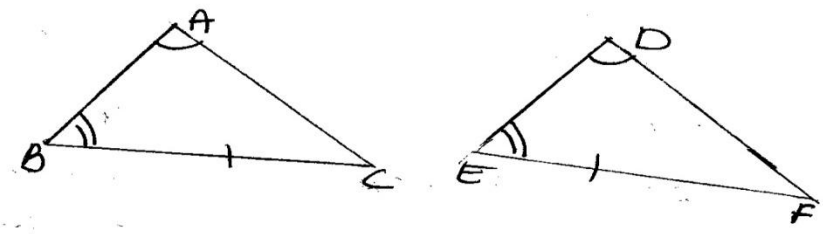


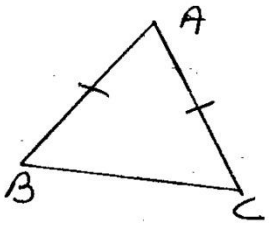
- ASA Congruence Rule - Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of other triangle. For examples $\Delta ABC \text{ and } \Delta DEF$ shown below satisfy ASA congruence criterion.



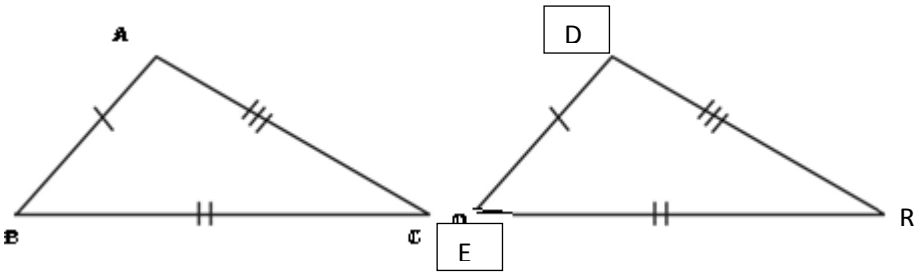
- AAS Congruence Rule - Two triangles are congruent if any two pairs of angles and one pair of corresponding sides are equal for example $\Delta ABC \text{ and } \Delta DEF$ shown below satisfy AAS congruence criterion.



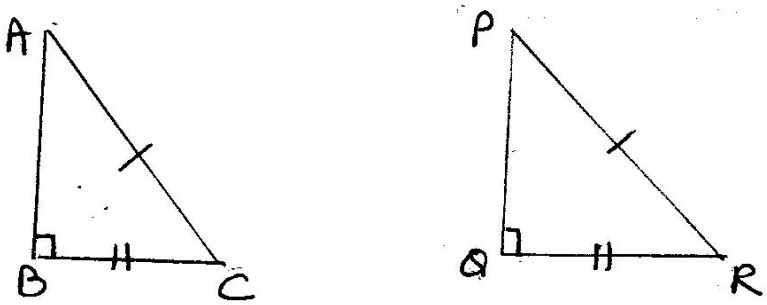
- AAS criterion for congruence of triangles is a particular case of ASA criterion.
- Isosceles Triangle - A triangle in which two sides are equal is called an isosceles triangle. For example ΔABC shown below is an isosceles triangle with AB=AC.



- Angle opposite to equal sides of a triangle are equal.
- Sides opposite to equal angles of a triangle are equal.
- Each angle of an equilateral triangle is 60^0.
- SSS congruence Rule - If three sides of one triangle are equal to the corresponding three sides of another triangle then the two triangles are congruent for example $\Delta ABC \; and \; \Delta DEF$ as shown in the figure satisfy SSS congruence criterion.



- RHS Congruence Rule - If in two right triangles the hypotenuse and one side of one triangle are equal to the hypotenuse and one side of the other triangle then the two triangle are congruent. For example $\Delta ABC \; and \; \Delta PQR$ shown below satisfy RHS congruence criterion.



RHS stands for right angle - Hypotenuse side.

- A point equidistant from two given points lies on the perpendicular bisector of the line segment joining the two points and its converse.
- A point equidistant from two intersecting lines lies on the bisectors of the angles formed by the two lines.
- In a triangle, angle opposite to the longer side is larger (greater)
- In a triangle, side opposite to the larger (greater) angle is longer.
- Sum of any two sides of a triangle is greater than the third side.

Section - A

Q.1 Which of the following is not a criterion for congruence of triangles?

(a) SAS (b) SSA (c) ASA (d) SSS

Q.2 If AB=QR, BC=RP and CA=PQ then

(a) $\Delta ABC \cong \Delta PQR$ (b) $\Delta CBA \cong \Delta PRQ$

(c) $\Delta BAC \cong \Delta RPQ$ (d) $\Delta PQR \cong \Delta BCA$

Q.3 InΔ PQR, if $\angle R > \angle Q$ then

(a) $QR > PR$ (b) $PQ > PR$ (c)$PQ < PR$ (d) $QR < PR$

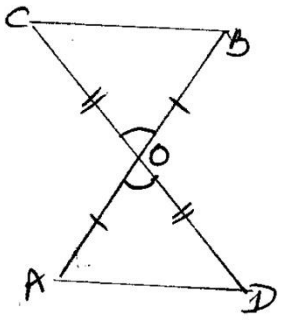
Q.4 $\Delta ABC \cong \Delta DEF \; and \; if \; AB = 3 = DE$ and BC = EF = 4 then necessary condition is

(a) $\angle A = \angle D$ (b) $\angle B = \angle E$ (c)$\angle C = \angle F$ (d) $CA = FD$

Q.5 In the given figure, if OA=OB, OD=OC then $\Delta AOD \cong \Delta BOC$ by congruence rule.

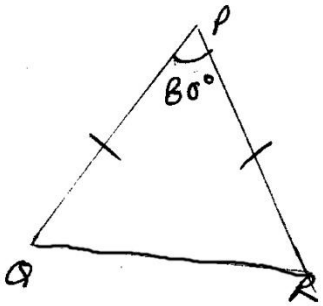
(a) SSS (b) ASA

(c) SAS (d) RHS



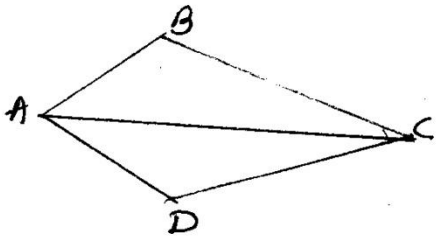
Q.6 In the figure if PQ=PR and $\angle P = 80^0$, then measure of Q is

(a) 100^0 (b) 50^0 (c) 80^0 (d) 40^0



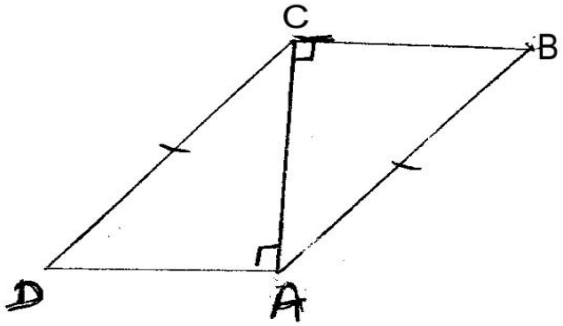
Q.7 In the figure$\Delta ABC \cong \Delta ADC, if \angle ACB = 25^0 \; and \; \angle B = 125^0, then \; \angle CAD \; is$

(a) 25^0 (b) 65^0 (c) 30^0 (d) 75^0



Q.8 In the figure, if $\Delta ABC \cong \Delta CDA$, the property of congruence is

(a) SSS (b) SAS (c) RHS (d) ASA



Q.9 It is not possible to construct a triangle when its sides are

(a) 8.3cm, 3.4cm, 6.1cm (b) 5.4cm, 2.3cm, 3.1cm

(c) 6cm, 7cm, 10cm (d) 3cm, 5cm, 5cm

Q.10 In a $\Delta\, ABC$, if AB=AC and BC is produced to D such that $\angle ACD = 100^0$ then $\angle A$

(a) 20^0 (b) 40^0 (c) 60^0 (d) 80^0

Q.11 If$\Delta PQR \cong \Delta EFD, then\ \angle E =$?

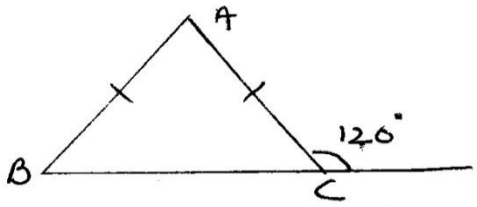
(a) $\angle P$ (b) $\angle Q$ (c)$\angle R$ (d) None of these

Q.12 If $\Delta PQR \cong \Delta EFD, then\ ED =$

(a) PQ (b) QR (c) PR (d) None of these

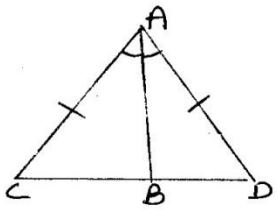
Section - B

Q.13 In the figure AB=AC and $\angle ACD = 120^0\ find\ \angle A$



Q.14 In a $\Delta ABC\ if\ \angle A = 45^0\ and \angle B = 70^0$determine the shortest and largest sides of the triangle.

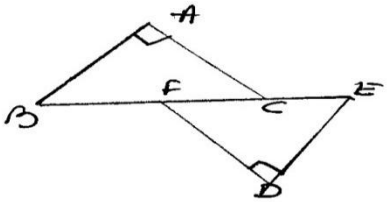
Q.15 In the given figure AB is bisector of $\angle A$ and AC=AD Prove that BC=BD and $\angle C = \angle D$



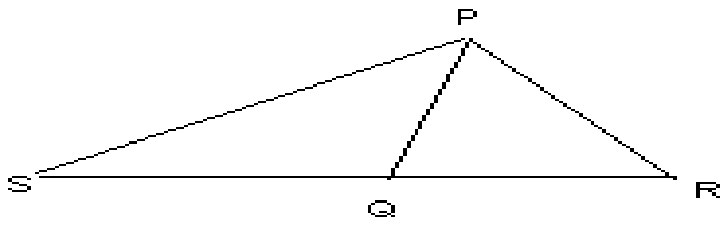
Q.16 AD is an altitude of an isosceles triangle ABC is which AB=AC. Prove that $\angle BAD = \angle DAC$

Q.17 In an acute angled ΔABC, S is any point on BC. Prove that AB+BC+CA > 2AS

Q.18 In the given figure $BA \perp AC, DE \perp DF$ such that BA=DE and BF=EC show that $\Delta ABC \cong \Delta DEF$

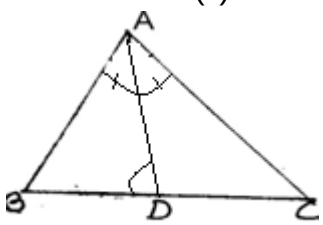


Q.19 Q is a point on the side SR of A ΔPSR such that PQ=PR. Prove that PS>PQ

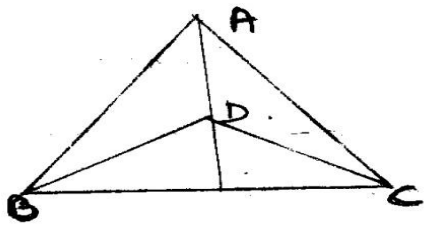


Section - C

Q.20 In the given figure if AD is the bisector of $\angle A$ show that
(i) AB>BD (ii) AC>CD

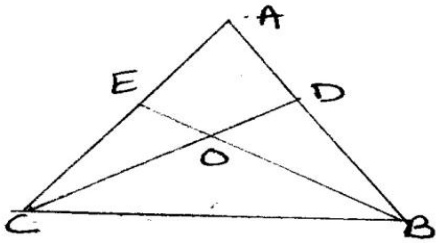


Q.21 In the given figure AB=AC, D is the point is the interior of ΔABC such that $\angle DBC = \angle DCB$ Prove that AD bisects $\angle BAC \ of \ \Delta ABC$



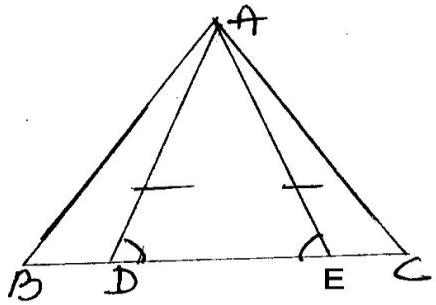
Q.22 Prove that if two angles of a triangle are equal then sides opposite to them are also equal.

Q.23 In the figure, it is given that AE=AD and BD=CE. Prove that $\Delta AEB \cong \Delta ADC$



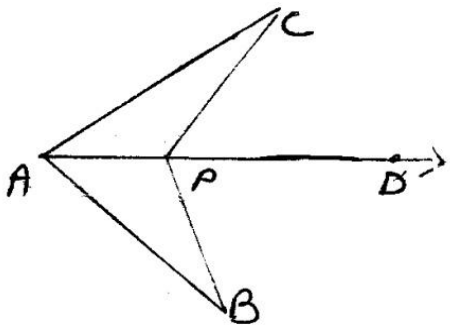
Q.24 Prove that angles opposite to two equal sides of a triangle are equal.

Q.25 In the figure AD=AE and D and E are points on BC such that BD=EC Prove that AB=AC



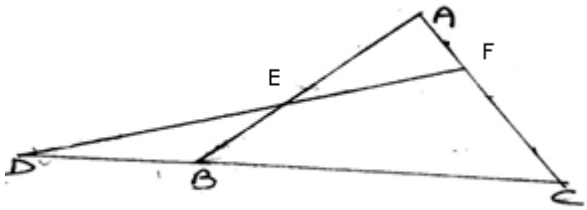
Q.26 Prove that medians of an equilateral triangle are equal.

Q.27 In the given figure $\angle CPD = \angle BPD$ and AD is the bisector of $\angle BAC$. Prove that $\Delta BAP \cong \Delta CAP$ and hence BP=CP

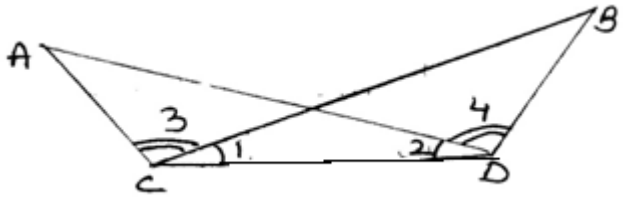


Section - D

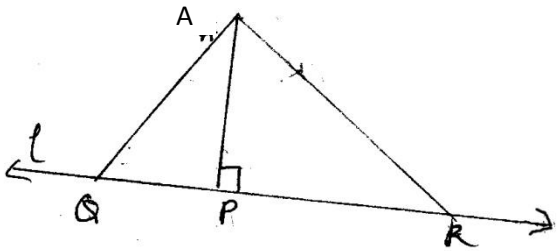
Q.28 In the figure $\angle B = \angle C$ show that AE > AF



Q.29 In the figure $\angle BCD = \angle ADC$and $\angle ACB = \angle BDA$. Prove that AD=BC and $\angle A = \angle B$

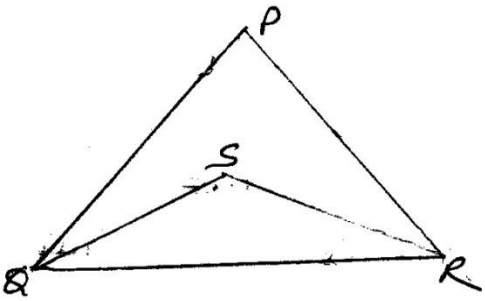


Q.30 In the given figure $AP \perp l$ and PR > PQ. Show that AR > AQ



Q.31 Prove that if in two triangles two angles and the included side of one triangle are equal to two angles and the included side of the other triangle, then the two triangles are congruent.

Q.32 In the given figure PQR is a triangle and S is any point in its interior, show that SQ + SR < PQ + PR



Answers :

(1) b	(2) b	(3) b	(4) b	(5) c	(6) b
(7) c	(8) c	(9) b	(10) a	(11) a	(12) c
(13) 60^0	(14) BC, AC				

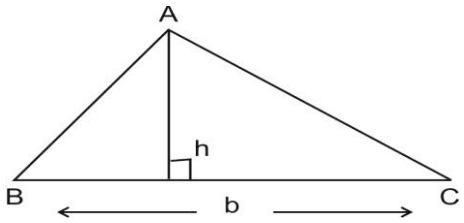
Chapter - 12

(Heron's Formula)

Key Concept

* Triangle with base 'b' and altitude 'h' is

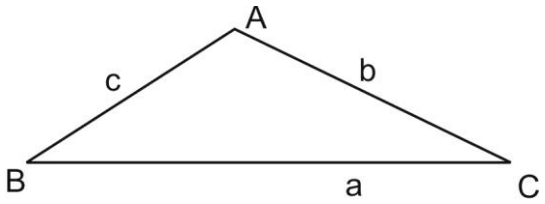
  Area = $\frac{1}{2} \times (b \times h)$



* Triangle with sides a, b and c

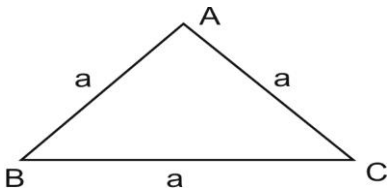
  (i) Semi perimeter of triangle s = $\frac{a+b+c}{2}$

  (ii) Area = $\sqrt{s(s-a)(s-b)(s-c)}$ square units.



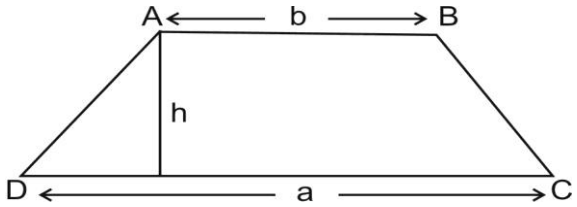
* Equilateral triangle with side 'a'

  Area = $\frac{\sqrt{3}}{4}a^2$ square units



* Trapezium with parallel sides 'a' and 'b' and the distance between two parallel sides as 'h'.

  Area = $\frac{1}{2}(a+b)\,h$ square units



Section - A

(1) An isosceles right triangle has an area 8cm^2. The length of its hypotenuse is

(a) $\sqrt{16}\ cm$ (b) $\sqrt{48}\ cm$ (c) $\sqrt{32}\ cm$ (d) $\sqrt{24}\ cm$

(2) The sides of a triangle are 35cm, 54cm, and 61cm, respectively. The length of its longest altitude is

(a) $26\sqrt{5}\ cm$ (b) 28 cm (c) $10\sqrt{5}\ cm$ (d) $24\sqrt{5}\ cm$

Q.3 The sides of a triangle are 56cm, 60cm. and 52cm. long. The area of the triangle is.

(a) 4311 cm^2 (b) 4322 cm^2 (c) 2392 cm^2 (d) None of these

Q.4 The area of an equilateral triangle is $16\sqrt{3}$ m^2. Its perimeter is

(a) 24m (b) 12m (c) 306 m (d) 48m

Q.5 The perimeter of a triangle is 30cm. Its sides are in the ratio 1 : 3 : 2, then its smallest side is.

(a) 15cm (b) 5cm (c) 1 cm (d) 10cm.

Section - B

Q.6 Find the area of a triangular garden whose sides are 40m., 90m and 70m.

(use$\sqrt{5}$ = 2.24)

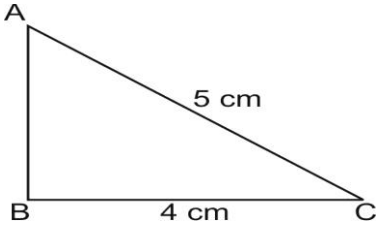
Q.7 Find the cost of leveling a ground in the form of a triangle with sides 16m, 12m and 20m at Rs. 4 per sq. meter.

Q.8 Find the area of a triangle, two sides of which are 8cm and 11cm and the perimeter is 32 cm.

Q.9 The area of an isosceles triangle is 12cm^2. If one of its equal side is 5cm. Find its base.

Q.10 Find the area of a right triangle whose sides containing the right angle are 5cm and 6cm.

Q.11 Find the area of the adjoining figure if $AB \perp BC$



Section - C

Q.12 The diagonals of a rhombus are 24cm and 10cm. Find its area and perimeter.

Q.13 Two side of a parallelogram are 10cm and 7cm. One of its diagonals is 13cm. Find the area.

Q.14 A rhombus shaped sheet with perimeter 40 cm and one diagonal 12cm, is painted on both sides at the rate of Rs. 5 per m^2. Find the cost of painting.

Q.15 The sides of a quadrilateral ABCD are 6cm, 8cm, 12cm and 14cm (taken in order) respectively, and the angle between the first two sides is a right angle. Find its area.

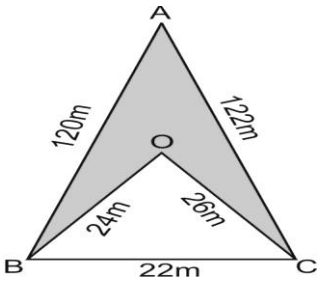
Q.16 The perimeter of an isosceles triangle is 32cm. The ratio of the equal side to its base is 3 : 2. Find the area of the triangle.

Q.17 The sides of a triangular field are 41m, 40m and 9m. Find the number of flower beds that can be prepared in the field, if each flower bed needs 900cm^{2}space.

Q.18 The perimeter of a triangular ground is 420m and its sides are in the ratio 6 : 7 : 8. Find the area of the triangular ground.

Section - D

Q.19 Calculate the area of the shaded region.



Q.20 If each sides of a triangle is double, then find the ratio of area of the new triangle thus formed and the given triangle.

Q.21 A field is in the shape of a trapezium whose parallel sides are 25m and 10m. If its non-parallel sides are 14m and 13m, find its area.

Q.22 An umbrella is made by stitching 10 triangular pieces of cloth of 5 different colour each piece measuring 20cm, 50cm and 50cm. How much cloth of each colour is required for one umbrella? $(\sqrt{6} = 2.45)$

Q.23 A triangle and a parallelogram have the same base and same area. If the sides of the triangle are 26cm, 28cm and 30cm and the parallelogram stands on the base 28cm, find the height of the parallelogram.

Value Based Question

Q.24. Mr. Ramesh has a triangular field ABC such that AB = 140m, BC = 160m and AC = 100m. He wants to divide this field into two parts, one for each of his two sons. He marks the mid point D of side BC and allots ΔABD to one son and ΔADC to other son.

(i) Find areas of ΔABD & ΔADC.

(ii) Comment on the behavior of Mr.Ramesh as a father.

Answer

Q. 1 (c) $\sqrt{32}\ cm$

Q. 2 (d) $24\sqrt{5}\ cm$

Q. 3 (d) None of these

Q. 4 (a) 24 m.

Q. 5 (b) 5 cm.

Q. 6 1344 sq. m.

Q. 7 ` 384

Q. 8 $8\sqrt{30}\ cm^2$

Q. 9 6cm.

Q. 10 15cm^2

Q. 11 6cm^2

Q. 12 120 sqcm., 52 cm.

Q. 13 $40\sqrt{3}\ cm^2$

Q. 14 ` 960

Q.15 $24(\sqrt{6}+1)$ cm^2

Q.16 $32\sqrt{2}\ cm^2$

Q.17 2000

Q. 18 $2100\sqrt{15}m^2$

Q.19 1074m^2

Q. 21 196 sq. m.

Q.22 980 cm^2 each.

Q. 23 12cm.

Q.24 (i) area of ΔABD = area of ΔADC = $400\sqrt{3}$m^2

(ii) Mr. Ramesh is an intelligent and wise father believing in equality and justice. He treats his sons alike.

(A median of a triangle divides it into two parts of equal area.)

Activities / Projects Term - I

(1) Construct a square root spiral.

(2) Represent irrational number √2 on the number line.

(3) Verify the Identity.

$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

(4) Verify the Identity.

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

(5) verify experimentally that if two lines intersect, then

(i) The sum of all the four interior angles is 360^0.

(ii) The sum of two adjacent angles is 180^0.

(6) Verify that the sum of the angles of a triangle is 180^0.

(7) Verify that the exterior angle is equal to sum of interior opposite angle.

(8) Verify experimentally the different criteria for congruency of triangles using different triangular cut out shapes.

(9) Verify experimentally that in a triangle, the longer side has the greater angle opposite to it.

(10) Design a crossword puzzles using mathematical terms/words.

(11) Search of various historical aspects of the number π.

(12) Collection of various objects or congruent shapes.

Design of Sample Question Paper
Mathematics Class IX

Class IX

MATHEMATICS-SA-1(2014-15)

BLUE PRINT

Unit/Topic	VSA 1 marks	SA type I 2 marks	SA type II 3 marks	LA 4 marks	Total
Number system	1(1)	2(1)	6(2)	8(2)	17(6)
Polynomials	-	6(3)	3(1)	16(4)	25(8)
Euclid's Geometry	1(1)	2(1)	18(6)	16(4)	37(12)
Coordinate Geometry	2(2)	-	-	4(1)	6(3)
Mensuration	-	2(1)	3(1)	-	5(2)
Total	4(4)	12(6)	30(10)	44(11)	90(31)

Summative Assessment-I , 2014

Mathematics

Class IX

Time allowed: 3 hours **Maximum marks:90**

General Instruction:

(i) All questions are compulsory.

(ii) The question paper consists of 31 questions divided into four sections-A,B,C and D. Section A comprises of four questions of 01 mark each, section B comprises of six questions of 02 marks each, section C comprises 0f ten questions of 03 marks each and Section D comprise of eleven question of 04 marks each.

(iii) Use of calculators is not permitted. However you may ask for mathematical tables.

Section A

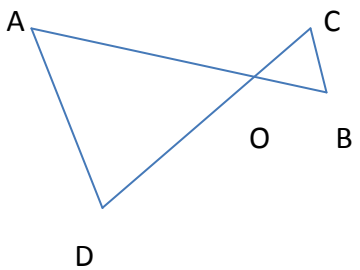
Question Numbers 1 to 4 carry 1 mark each.

1. What type of decimal representation of a number gives us an irrational number.
2. Write the coordinates of one point in 2^{nd} quadrant and one in 3^{rd} quadrant.
3. Find the distance of the point (-1,4) from y-axis.
4. Angles A and B are complement of each other. If A=4B. Then find A.

Section B

Question Numbers 5 to 10 carry 2 mark each.

5. Simplify $(\frac{81}{16})^{-3/4} \times (\frac{25}{9})^{-3/2}$
6. In the adjoining figure , if line segment AB intersects CD at O such that $\angle$OAD=80°, $\angle$ODA=50° And $\angle$OCB=40° ,then find $\angle$OBC.

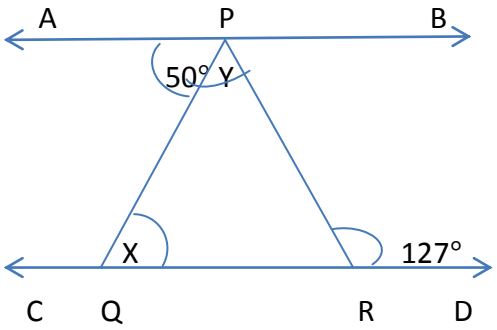


7. Two sides of a triangle are 8 cm and 11 cm and its perimeter is 32cm. Find the area of the triangle.
8. Find the remainder when y^4-3y^2+2y+6 is divided by Y+1.
9. Expand the following:
   (i) $(x-2y-3z)^2$
   (ii) $(y-\sqrt{3})^2$
10. Simplify:
   $(x-\frac{2}{3}y)^3 - (x+\frac{2}{3}y)^3$

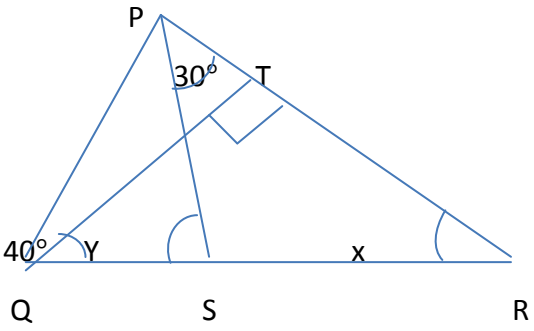
Section C

Question Numbers 11 to 20 carry 3 mark each.

11. If $x=2+\sqrt{3}$, find the value of $x^2+\frac{1}{x^2}$.
12. In the adjoining figure, if ABIICD, then find the value of x and y.



13. Lines PQ and RS intersects each other at point O. If ∠POR: ∠ ROQ=5:7, find all the remaining angles.
14. Represent $\sqrt{2}$ on the number line.
15. Factorise $x^2+\frac{1}{x^2}+2-2x-\frac{2}{x}$
16. E and F are respectively the mid point of equal sides AB and AC of ΔABC.Show that BF=CE.
17. The sides of a triangular field are 52m, 56m and 60m. Find the cost of leveling the field at Rs. 5 per Sq. m.
18. In ΔABC, The bisector AD of ∠A is perpendicular to side BC. Show that ΔABC is an isosceles triangle.
19. Show that the sum of any two sides of a triangle is greater than twice of the median drawn to the third side.
20. In the adjoining figure, if QT ⊥ PR, ∠TQR=40° and ∠SPR=30°, find the values of x and y.



Section D

21. Plot the points A(3,0),B(3,3) and C(0,3) in a Cartesian plane. Join OA, AB,BC and CO. Name the figure so formed and write its one property.
22. Prove that the sum of the angles of a triangle is 180°.
23. Factorise $x^3-6x^2+11x-6$.
24. D is a point on side BC of ΔABC .Such that AD=AC. Show that AB>AD.
25. Without actual division, prove that $2x^4-6x^3+3x^2+3x-2$ is exactly divisible by x^2-3x+2.
26. If a+b =12 and ab=27,find the value of a^3+b^3 .
27. Express $2.4\overline{178}$ in the form of $\frac{a}{b}$.
28. Find four rational numbers between $\frac{3}{7}$ and $\frac{5}{7}$.
29. In ΔABC, O is a point in its interior. Show that AB+AC>OB+OC.
30. Determine whether (3x-2) is a factor of $3x^3+x^2-20x+12$
31. Mr. Balwant singh has a triangular field ABC. He has three sons. He wants to divide the field into four equal and identical parts so that he may give three parts to his three sons and retain the fourth with him.
    (i) Is it possible to divide the field into four parts which are equal and identical?
    (ii) If yes, explain the method of division.
    (iii) By doing so, which value is depicted by Mr. Balwant Singh.

Part II

Term - I

(1) Number system

QUIZ

Q.1 What is a rational number?

Q.2 What is an irrational number?

Q.3 What type of decimal representation do rational numbers have?

Q.4 Why do we calculate the approximate value of an irrational number?

Q.5 State whether $\sqrt{4}$ is an irrational or a rational number?

ORAL

Q.1 All rational and irrational number is _____?

Q.2 Is 3.1010010001……a rational number?

Q.3 Is $-2+\sqrt{5}$ negative or positive?

Q.4 The smallest composite number is ……..?

Q.5 The decimal expansion of $\sqrt{7}$ is non-terminatingnon recurring or non-terminating recurring.

(2) POLYNOMIALS

QUIZ

Q.1 What is the degree of a quadratic polynomial?

Q.2 How can you decide that $x-a$ is a factor of a polynomial$f(x)$?

Q.3 How many variables can be there in a polynomial?

Q.4 What is a linear polynomial?

Q.5 A cubic polynomial has how many zeroes?

ORAL

Q.1 A polynomial / expression with two terms is called ……..?

Q.2 An example of a monomial of degree 7 is.

Q.3 If a + b + c = 0, then what is the value of $a^3+b^3+c^3$ is equal to _____?

Q.4 Complete this identity = $(a+b)^3 = \cdots$ ... ...

Q.5 The zeroes of polynomial $P(x)=x(x+2)(x-3)$ are ……?

(3) COORDINATE GEOMETRY

QUIZ

Q.1 In which quadrant does the point (-4,-5) lie?

Q.2 What are the coordinates of origin?

Q.3 What is the abscissa of all the point on the y-axis?

Q.4 What is the ordinate of all point on the x-axis?

Q.5 Point (2,0) lies on which axis.

ORAL

Q.1 The perpendicular distance of the point (5,3) from the x-axis is ……..

Q.2 Point (-4,3) lies in the ……..quadrant.

Q.3 The points in which abscissa and ordinate have same signs will lie in ……..
Q.4 Is the point (5,-2) is same as the point (-2,5) or not.
Q.5 The ordinate of the point (1,9) is ……..

(4) INTRODUCTION TO EUCLID'S GEOMETRY

QUIZ

Q.1 Name the part of a line which has only one end point.
Q.2 What was the name of the famous book of Euclid?
Q.3 How many lines can pass through a given point?
Q.4 How many common points can two distinct lines have?
Q.5 How many dimensions, a point has?

ORAL

Q.1 The side faced of a pyramid are ……..
Q.2 Part of the line with two end points is called …….
Q.3 To which country does Euclid belong?
Q.4 Axioms are assumed to be …….
Q.5 The things which are double of the same thing are ……..

(5) LINES AND ANGLES

QUIZ

Q.1 What is the sum of the angles of triangle.
Q.2 What is the sum of two opposite angles of cyclic quadrilateral?
Q.3 Define Reflex angle.
Q.4 What is the complement of 45^0?
Q.5 What is the difference between a line and line segment?

ORAL

Q.1 40^0 and 50^0 are example of compliment angles or not?
Q.2 In a triangle with a right angle, the other two angles are …….
Q.3 A line with two end points is called …….
Q.4 Through a point infinite number of ……..can be drawn.
Q.5 An angle of measure greater than 90^0 but less than 180^0 is called …….

(6) TRIANGLES

QUIZ

Q.1 In right angled triangle which side is the longest side?
Q.2 What do you mean by congruence of two figures?
Q.3 What are the various parts of a triangle?
Q.4 Classify triangles on the basis of their sides?
Q.5 Classify triangles on the basis of their angles.

ORAL

Q.1 Angle opposite to greater side of a triangle is ……..
Q.2 The sum of any two sides of a triangle is greater than ……
Q.3 Each angle of an …….triangle is 60^0.
Q.4 If all angles of a triangle are equal, then all of its ……. are also equal.
Q.5 Can a triangle have two right angles?

(7) HERON'S FORMULAE

QUIZ

Q.1 What is semi perimeter of a triangle?

Q.2 What does the letter 's' used in Heron's formula denotes?
Q.3 Who gave the famous formula for calculating the area of a triangle in terms of its three sides?
Q.4 Triangle with no two side equal is called?
Q.5 What is the area of an equilateral triangle with side x units?

ORAL

Q.1 The area of a rhombus can be obtained by the measure of its two ……
Q.2 What is the formula to find area of a triangle?
Q.3 In a triangle, side opposite to the ……. angle is longer.
Q.4 the sum of any two sides of a triangle is greater than ……
Q.5 Name all the criterions for congruency of triangles.

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