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**Term I - April-May****Unit 1: NUMBER SYSTEMS****1. REAL NUMBERS**

Review of representation of natural numbers, integers, rational numbers on the number line. Representation of terminating/non-terminating recurring decimals, on the number line through successive magnification. Rational numbers as recurring/terminating decimals.

Examples of nonrecurring/non terminating decimals such as  $\sqrt{2}, \sqrt{3}, \sqrt{5}$  etc. Existence of non-rational numbers (irrational numbers) such as  $\sqrt{2}, \sqrt{3}$ , and their representation on the number line. Explaining that every real number is represented by a unique point on the number line, and conversely, every point on the number line represents a unique real number.

Existence of  $\sqrt{x}$  for a given positive real number  $x$  (visual proof to be emphasized). Definition of  $n$ th root of a real number.

Recall of laws of exponents with integral powers. Rational exponents with positive real bases (to be done by particular cases, allowing learner to arrive at the general laws). Rationalization (with precise meaning) of real numbers of the type (and their combination)

$\frac{1}{a + b\sqrt{x}}$  and  $\frac{1}{\sqrt{x} + \sqrt{y}}$  where  $x$  and  $y$  are natural numbers and  $a, b$  are integers.

**UNIT II: ALGEBRA****1. POLYNOMIALS**

Recall of algebraic expressions, terms, factorization, etc. Definition of a polynomial, its coefficients, with examples and counter examples. Zero polynomial. Degree of a polynomial with examples. Constant, linear, quadratic, cubic polynomials. Monomials, binomials, trinomials. Factors and multiples. Recall algebraic identities. Further identities of the type

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx, (x \pm y)^3 = x^3 \pm y^3 \pm 3xy(x \pm y),$$

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

and their use in factorization of polynomials. Simple expressions reducible to these polynomials. Polynomials in one variable: zero/roots of a polynomial/ equation. State and motivate the Remainder Theorem with examples and analogy to integers. Statement and proof of the Factor Theorem. Factorization of  $ax^2 + bx + c, a \neq 0$  where  $a, b, c$  are real numbers, and of cubic polynomials using the Factor Theorem.  $a^3 + b^3 + c^3 - 3abc$  may be included.

July**UNIT IV: Coordinate Geometry****1. Coordinate Geometry**

The Cartesian plane, coordinates of a point, names and terms associated with the coordinate plane, notation, plotting points in the plane, graph of linear equations as examples; focus on linear equations of the type  $ax+by+c = 0$  by writing it as  $y = mx+c$  and linking with the chapter on linear equations in two variables.

**UNIT III: GEOMETRY****1. Introduction to Euclid's Geometry**

History- Euclid and geometry in India. Euclid's method of formalizing observed phenomenon into rigorous mathematics with definitions, common/obvious notation, axioms/postulates, and theorems. The five postulates of Euclid. Equivalent versions of the fifth postulate, showing the relationship between axiom and theorem.

1. Given two distinct points, there exists one and only line through them.
2. (Prove) Two distinct lines cannot have more than one point in common.

**2.Lines And Angles**

1. If a ray stands on a line, then the sum of the two adjacent angles so formed is  $180^\circ$  and its converse.
2. (Prove) If two lines intersect, the vertically opposite angles are equal.
3. (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
4. (Motivate) Lines, which are parallel to a given line, are parallel.
5. (Prove) The sum of the angles of a triangle is  $180^\circ$
6. (Motivate) If a side of triangle is produced, the exterior angle so formed is equal to the sum of two interior opposite angles.

August**3. Triangles**

1. (Motivate) Two triangles are congruent if any two sides and the included angle of the one triangle are equal to any two sides and the included angle of the other triangle (SAS Congruence)
2. (Prove) Two triangles are congruent if any two angles and the included side of one triangle are equal to any two angles and the included side of the other triangle (ASA Congruence)
3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to the three sides of the other triangle.
4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are respectively equal to the hypotenuse and a side of the other triangle.
5. (Prove) The angles opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.
7. (Motivate) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

**UNIT V: MENSURATION****1. Heron's Formula.**

Area of triangle using Heron's formula (without proof) and its application in finding the area of a quadrilateral.

Term II-October**UNIT II: ALGEBRA (cont.)****1. Linear Equations in Two Variables**

Recall of linear equations in one variable. Introduction to the equation in two variables. Prove that a linear equation in two variables has infinitely many solutions, and justify their being written as ordered pairs of real numbers, plotting them and showing that they seem to lie on a line. Examples, problems from real life, including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

**UNIT III:GEOMETRY (cont.)****3. Quadrilaterals**

1. (Prove) The diagonal divides a parallelogram into two congruent triangles.
2. (Motivate) In a parallelogram opposite side are equal, and conversely.
3. (Motivate) In a parallelogram opposite angles are equal and conversely.
4. (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.
5. (Motivate) In a parallelogram, diagonals bisect each other and conversely.
6. (Motivate) In a triangle, the line segment joining the midpoints of any two sides is parallel to the third side and (Motivate) its converse.

**November/December****UNIT VI: STATISTICS AND PROBABILITY****1. Statistics:**

Introduction to statistics: Collection of data, presentation of data- tabular form, ungrouped/grouped , bar graphs, histograms(with varying base lengths), frequency polygons, qualitative analysis of data to choose the correct form of presentation for the collected data. Mean, median, mode of ungrouped data.

**2. Probability**

History of Probability. Repeated experiments and observed frequency approach to probability. Revision for the final term

**5. Area**

Review concept of area, recall area of a rectangle.

1. (Prove) Parallelograms on the same base and between the same parallels have the same area.
2. (Motivate) Triangles on the same base and between the same parallels are equal in area and its converse.

**6. Circles**

Through examples, arrive at definitions of circle related concepts, radius, circumference, diameter, chord, arc, subtended angle.

1. (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse.
2. (Motivate) The perpendicular from the centre of a circle to a chord bisects the chord and conversely, the line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.
3. (Motivate) There is one and only one circle passing through three given non-collinear points.
4. (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the centre(s) and conversely.
5. (Prove) The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.
6. (Motivate) Angles in the same segment of a circle are equal.
7. (Motivate) If a line segment joining two points subtends equal angle at two other points lying on the same side of the line containing the segment, the four points lie on a circle.
8. (Motivate) The sum of the either pair of the opposite angles of a cyclic quadrilateral is 180 and its converse.

**January/February****7. Constructions**

1. Construction of bisectors of line segments and angles,  $60^\circ, 90^\circ, 45^\circ$  angles etc, equilateral triangles
2. Construction of a triangle given its base, sum/ difference of the other two sides and one base angle.
3. Construction of a triangle of given perimeter and base angles.

**UNIT V : MENSURATION(cont.)****2. Surface Areas and Volumes**

Surface areas and Volumes of cubes, cuboids, spheres(including hemisphere) and right circular cylinders/cones.

### **Investigative Project Work (10 Marks)**

Prepare a project on any one of the following topics. You may work in groups not more than four students. Each selected topic must be investigated thoroughly. Relevant information must be collected and understood. Group will be required to make a presentation ( not necessarily PowerPoint or any other digital presentation, handmade charts or simple displays will also be appreciated) of 10 minutes duration.

**The assessment will be done in the Second Term (November end). It is compulsory for each student to work on the project as it is one of the essential activities for Formative Assessment.**

**Please refer to the Do's and don'ts of making PowerPoint presentation on page 83!**

#### **Topics for Project:**

1. **Four colour problem** : What is the fewest number of colours needed to colour any map if the rule is that no two countries with a common border can have the same colour. Who discovered this? Why is the proof interesting? What if Mars is also divided into areas so that these areas are owned by different countries on Earth? They too are coloured by the same rule but the areas there must be coloured by the colour of the country they belong to. How many colours are now needed?
2. **Geometric Shapes in Architecture**: Geometry can exist without architecture, but architecture cannot exist without geometry. Prove this statement with your investigations. Research the role of geometric shapes and properties in architecture and construction.
3. **Optical Illusions**: Study what conditions are necessary for illusions to work.
4. **Patterns in numbers**: Numbers can have interesting patterns. Some are Fibonacci Numbers, palindromes, Pascal's Triangle.
5. **Maths in Nature** : Nature uses maths like in human body, shells, pine cones, vegetables, fruits, arrangement of seeds and so on.....
6. **Number systems**: Every civilization has different culture and life styles. Like that every civilization has its own number system. Investigate different ancient number system(eg: Roman number system, Mongolian number system etc )

7. **Applications of Mathematics in other subjects/areas:** ( e.g. Maths in sports, maths in music, maths in sciences, commercial maths etc.)

**References:**

1. [www.ritsumei.ac.jp/~akitaoka/saishin-e.html](http://www.ritsumei.ac.jp/~akitaoka/saishin-e.html)
2. [www.optical-illusion.org/](http://www.optical-illusion.org/)
3. [www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html)
4. [mathworld.wolfram.com/GoldenRatio.html](http://mathworld.wolfram.com/GoldenRatio.html)
5. [www.math.nus.edu.sg/aslaksen/teaching/math-art-arch.shtml](http://www.math.nus.edu.sg/aslaksen/teaching/math-art-arch.shtml)
6. [www. Math.youngzones.org](http://www.Math.youngzones.org)

**ASSESSMENT CRITERIA FOR THE PROJECT**

**Project will be assessed on the basis of the following criteria**

- **Organization**
- **Content**
- **Presentation**
- **Mechanics**
- **Attractiveness**
- **Bibliography**
- **Team effort.**

Category	Exemplary 4	Accomplished 3	Developing 2	Beginning 1	Points
<b>Organization</b>	Content is well organized using headings or bulleted lists to group related material.	Uses headings or bulleted lists to organize, but the overall organization of topics appears flawed.	Content is logically organized for the most part.	There was no clear or logical organizational structure, just lots of facts.	
<b>Content</b>	Covers topic in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1-2 factual errors.	Content is minimal OR there are several factual errors.	
<b>Presentation</b>	All Presenters were familiar with the material and did not read from slides or rely on notes. It is evident that the presentation was rehearsed	All Presenters were familiar with the material and did not read from slides or rely on notes. One of the team members was not present.	Presenters were familiar with the material but some did read from slides or rely on notes.	Presenters were familiar with the material but all did read from slides or rely on notes.	
<b>Mechanics and Attractiveness</b>	No misspellings or grammatical errors. Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.	Three or fewer misspellings and/or mechanical errors. Makes good use of font, color, graphics, effects, etc. to enhance to presentation.	Four misspellings and/or grammatical errors. Makes use of font, color, graphics, effects, etc. but occasionally these detract from the presentation content.	More than 4 errors in spelling or grammar. Use of font, color, graphics, effects etc. but these often distract from the presentation content.	
<b>Bibliography/ Acknowledgements</b>	All resources including images have been listed with sources	Some resources have been listed with the credits to the source	Images have not been given the credits, but some web resources have been listed.	Very few resources have been listed.	

**Rubric for Peer Assessment**

<b>Category</b>	<b>Excellent 4</b>	<b>Very Good 3</b>	<b>Good 2</b>	<b>Poor 1</b>	<b>Score</b>
Peer participation	Participated in the making and presentation of the project. Took a lot of initiative and showed leadership skill	Participated in the making and presentation. Needed reminders from peer.	Participated, but with a lot of reminders. Did not come prepared for presentation.	Participation in the making or presentation of the project was negligible.	

## Assignment 1(A)- Number Systems

1. A rational number  $\frac{p}{q}$  is a terminating decimal when q is a prime factor of
  - a) 2 and/or 3
  - b) 2 only
  - c) 2 and /or 5
  - d) 5 only
2.  $0.\overline{55}$  is equal to
  - a)  $\frac{5}{9}$
  - b)  $\frac{5}{11}$
  - c)  $\frac{1}{2}$
  - d)  $\frac{1}{20}$
3. If the radius of a circle is a rational number, its area is given by a number which is
  - a) Always rational
  - b) sometimes rational and sometimes irrational
  - c) Always irrational
  - d) none of the above
4. If m and (n ≠ 1) are two natural numbers such that  $m^n = 25$ , then  $n^m$  is equal to
  - a) 4
  - b) 10
  - c) 32
  - d) 16
5. Classify the following as rational and irrational numbers.
  - (i)  $2.\overline{613}$
  - (ii)  $0.121523\dots$
  - (iii)  $4 + \sqrt{2}$
  - (iv)  $7\pi$
  - (v)  $\sqrt{9} + 6$
  - (vi)  $3.141141141\dots$
6. Represent (i)  $\sqrt{6.4}$  (ii)  $\sqrt{7}$  geometrically.
7. Multiply: (i)  $\sqrt{162}$  by  $\sqrt{2}$  (ii)  $5\sqrt{2}$  by  $\sqrt{17}$
8. Divide (i)  $21\sqrt{384}$  by  $8\sqrt{96}$  (ii)  $4\sqrt{28}$  by  $3\sqrt{7}$
9. Simplify:
  - (i)  $2\sqrt{50} \times 3\sqrt{32} \times 4\sqrt{18}$
  - (ii)  $8\sqrt{45} - 8\sqrt{20} + \sqrt{245} - 3\sqrt{125}$
10. Express the following recurring decimal expansions in the form  $\frac{p}{q}$ , where p and q are integer and q ≠ 0.
  - (i)  $3.1\overline{25}$
  - (ii)  $0.\overline{87} + 0.\overline{6}$
11. Find the product:
  - i)  $(3\sqrt{18} + 2\sqrt{12}) \times (\sqrt{50} - \sqrt{27})$
  - ii)  $(4\sqrt{3} + 3\sqrt{2}) \times (2\sqrt{5} - 5\sqrt{3})$

**Additional Information:**

<http://tinyurl.com/irrationalnos>

<http://tinyurl.com/irrationalnosactivity>

### Fun With Maths -Palindrome Numbers

Numbers that read the same whether read forwards or backwards are 'Palindrome numbers'.

The numbers 1441, 121, 67076, 145787541 are palindromes.

- ◆ Find out all palindrome numbers less than 100. Are these all multiples of any one particular number?
- ◆ Find any five palindrome numbers which, when divided by 11, yield a quotient that is also a palindrome.(e.g. when 24662 is divided by 11 the quotient is 22422, which is a palindrome)
- ◆ Are the squares of 33, 333, 3333 etc. palindromes?

#### **Interesting facts about 'Palindrome'**

- Palindrome is a Greek word meaning 'running back again'
- Some interesting palindromic words are 'Top Spot', 'Malayalam' and 'Never odd or Even'
- The largest non-hyphenated palindrome word is saippukauppia, a Finnish word for a soap dealer.
- An interesting word- palindrome by J. A. Lindon is: " You can cage a swallow , can't you, but, you can't swallow a cage, can you"

#### **A Speedy Palindrome**

Sarah checks out the odometer on her car. It reads 14,941 miles. She notices that it reads the same backward as forward.

"I wonder how long it will be before that happens again?" Sarah thought to herself. To her surprise, in 2 hours the odometer showed a new palindrome number. What was the number, and what was the average speed of the car in those 2 hours.

## Assignment 1(B) -Number Systems

1. A rational number between  $\sqrt{2}$  and  $\sqrt{3}$  is

(a)  $\frac{\sqrt{2}+\sqrt{3}}{2}$  (b)  $\frac{\sqrt{2}\times\sqrt{3}}{2}$  (c) 1.5 (d) 1.8

2. If  $\sqrt{2^n} = 32$  then  $\frac{n-1}{n}$  is equal to

(a) 9 (b) 0.9 (c) 10 (d)  $1.\bar{1}$

3. The number of rational numbers between  $\sqrt{3}$  and  $\sqrt{5}$

(a) one (b) 3 (c) none (d) infinitely many

4. If m and n are two natural numbers and  $m^n = 32$  then  $n^{mn}$  is

(a)  $5^2$  (b)  $5^3$  (c)  $5^{10}$  (d)  $5^{12}$

5. The product of  $4\sqrt{6}$  and  $3\sqrt{24}$  is

(a) 144 (b) 72 (c) 124 (d) 154

6. If  $x = \frac{\sqrt{7}}{5}$  and  $\frac{5}{x} = p\sqrt{7}$ , find the value of p.

7. Simplify the following by rationalizing the denominator.

(i)  $\frac{2\sqrt{6} + \sqrt{5}}{3\sqrt{5} - 2\sqrt{6}}$  (ii)  $\frac{7 + 3\sqrt{5}}{7 - 3\sqrt{5}}$

8. Find the value of a and b in the following:

(i)  $\frac{3 + \sqrt{6}}{\sqrt{3} + \sqrt{2}} = a + b\sqrt{3}$  (ii)  $\frac{2 + 5\sqrt{7}}{2 - 5\sqrt{7}} = a + \sqrt{7}b$

9. If  $x = 5 - 2\sqrt{6}$  find the value of  $\sqrt{x} + \frac{1}{\sqrt{x}}$ .

10. Taking  $\sqrt{2} = 1.414$ ,  $\sqrt{3} = 1.732$ ,  $\sqrt{5} = 2.236$  and  $\pi = 3.141$ , evaluate the following:

(i)  $\frac{2}{\sqrt{5} - \sqrt{3}}$  (ii)  $\pi + \frac{1}{2\sqrt{5} + 3\sqrt{2}}$

11. Simplify:

$$(i) \frac{(25)^{\frac{5}{2}} \times (729)^{\frac{1}{2}}}{(125)^{\frac{2}{3}} \times (27)^{\frac{2}{3}} \times (8)^{\frac{4}{3}}} \quad (ii) \left(\frac{81}{16}\right)^{\frac{-3}{4}} \times \left\{ \left(\frac{25}{9}\right)^{\frac{-3}{2}} \div \left(\frac{5}{2}\right)^{-3} \right\}$$

12. Evaluate:  $\frac{\sqrt[3]{0.125} \times \sqrt[5]{(0.00032)^{-2}}}{\sqrt[5]{(0.00243)^{-3}} \times (27)^{\frac{2}{3}}}$

13. Evaluate  $(x^{a-b})^{\frac{1}{ab}} \times (x^{b-c})^{\frac{1}{bc}} \times (x^{c-a})^{\frac{1}{ca}}$ .

14. If  $5^{2x-1} - (25)^{x-1} = 2500$ , find the value of x.

15. If  $5^{x-3} 3^{2x-8} = 225$  Find the value of x.

### Optional Enrichment

1. If  $x = \frac{\sqrt{a+2b} + \sqrt{a-2b}}{\sqrt{a+2b} - \sqrt{a-2b}}$  show that  $bx^2 - ax + b = 0$ .

2. If  $x = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$  and  $y = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$  find  $x^3 + y^3$ .

3. Evaluate  $\frac{40}{2\sqrt{10} + \sqrt{20} + \sqrt{40} - 2\sqrt{5} - \sqrt{80}}$  when it is given that

$$\sqrt{5} \cdot 2.236 \text{ and } \sqrt{10} = 3.162$$

4. If  $\frac{9^{n+1} \times \left(3^{\frac{-n}{2}}\right)^{-2} - (27)^n}{(3^m \times 2)^3} = \frac{1}{729}$ , prove that  $m-n = 2$ .

5. If  $abc = 1$ , show that  $\left(1 + a + \frac{1}{b}\right)^{-1} + \left(1 + b + \frac{1}{c}\right)^{-1} + \left(1 + c + \frac{1}{a}\right)^{-1} = 1$

Fun With Maths

A **mnemonic** is an aid to memory. The approximate values of  $\sqrt{2}$ ,  $\sqrt{3}$ ,  $\sqrt{5}$ ,  $\sqrt{6}$  and  $\sqrt{7}$  are often required in calculation work that one hates to calculate. You may learn the following mnemonics to recall their values upto three decimal places.

$$\sqrt{2} \approx \text{I have a mind} (1.414)$$

$$\sqrt{3} \approx \text{I believe you so} (1.732)$$

$$\sqrt{5} \approx \text{Go to the market} (2.236)$$

$$\sqrt{6} \approx \text{Go Puja play badminton} (2.449)$$

$$\sqrt{7} \approx \text{Go sister meet mother} (2.646)$$

Can you guess and appreciate how the above mnemonics work? How about the following verse for recalling the value of  $\pi$  upto 13 places of decimal?

“ How I wish I could recollect

Of circle round

The exact relation

Arch’medes surround” !

## Assignment 2(A) -Polynomials

1. If  $a^2 + b^2 + c^2 = 250, ab + bc + ca = 3$  then  $a + b + c =$ -----  
 a) 10    b) 16    c) 14    d) 18
2.  $a^2 + a - 90 =$ -----  
 a)  $(a + 10)(a - 9)$     b)  $(a - 10)(a + 9)$     c)  $(a - 10)(a - 9)$     d)  $(a + 10)(a + 9)$
3. If  $x - \frac{1}{x} = \frac{1}{5}$  then  $\frac{x}{x^2 - 1}$  is  
 a)  $\frac{1}{5}$     b) 5    c) 0    d)  $\frac{4}{5}$
4.  $285 \times 285 + 2 \times 285 \times 15 + 15 \times 15$  is  
 a) 900    b) 9000    c) 90000    d) 9000000
5.  $\frac{x^6 - y^6}{x^3 - y^3}$  ( $x \neq y$ ) is equal to  
 a)  $x^2 + y^2$     b)  $x^2 - y^2$     c)  $x^3 + y^3$     d)  $x^3 - y^3$
6. Check whether the polynomial  $q(t) = 4t^3 + 4t^2 - t - 1$  is a multiple of  $2t + 1$ .
7. If the polynomials  $ax^3 + 4x^2 + 3x - 4$  and  $x^3 - 4x + a$  leave the same remainder when divided by  $x - 3$ . Find the value of a.
8. Show that if both  $(x - 2)$  and  $\left(x - \frac{1}{2}\right)$  are factors of  $ax^2 + 5x + b$ , then  $a = b$ .
9. If  $(x - 1)$  is a factor of  $p^2x^2 - 3px + (3p - 1)$ , find the value of p.  
 Also write the given expression in factored form.
12. Find the value of a when  $ay^2 - 9y + 4a$  divided by  $2y - 1$  gives a remainder  $\frac{5}{6}$ .
13. For what value of m is  $x^2 - (m + 2)x + 6$  divisible by  $x - m$ ?
14. Factorise:  $6x^3 - 7x^2 - 8x + 5$  using factor theorem

**Optional Enrichment**

- Using factor theorem, prove that  $x + p$  is a factor of  $x^n + p^n$  for all odd positive values of  $n$ .
- Prove that  $(x^2 + x - 2)(x^2 - 4x + 3)(x^2 - x - 6)$  is a perfect square.
- If  $x = 2y + 6$ , prove that the value of  $x^3 - 8y^3 - 36xy - 212$  is equal to 4.
- Find the value of  $(x - a)^3 + (x - b)^3 + (x - c)^3 - 3(x - a)(x - b)(x - c)$  when  $a + b + c = 3x$ .
- Factorise:  $a^3 - \frac{1}{a^3} + 4$

**Fun With Maths**

$$(x + y)^0 = 1$$

$$(x + y)^1 = 1.x + 1.y$$

$$(x + y)^2 = 1.x^2 + 2xy + 1.y^2$$

$$(x + y)^3 = 1.x^3 + 3x^2y + 3xy^2 + 1.y^3.$$

Can you complete the following?

$$(x + y)^4 = \text{-----}$$

$$(x + y)^5 = \text{-----}$$

Note that the numerical coefficients in the expression of  $(x + y)^n$  for  $n = 0, 1, 2, 3, \dots$  are given by the Pascal's Triangle shown below:

			1				
			1		1		
		1		2		1	
	1		3		3	1	
	1	4		6		4	1
1	5	10		10	5		1

- ✓ Do you also note that for any whole number  $n$ , the sum of the numerical coefficients of  $(x + y)^n$  is  $2^n$  ?
- ✓ Find more patterns in Pascal's Triangle

**Assignment 2(B) - Polynomials**

1.  $(a+b)^2 + (a-b)^2$  is equal to  
 a)  $2a^2 - 2b^2$     b)  $2a^2 + 2b^2$     c)  $4ab$     d)  $-4ab$
2.  $\frac{-1+27a^3}{3a-1}$  is equal to  
 a)  $3a-1$     b)  $3a+1$     c)  $9a^2 + 3a + 1$     d)  $9a^2 - 3a + 1$
3.  $(-12)^3 + (7)^3 + (5)^3$  is equal to  
 a)  $-1260$     b)  $1260$     c)  $-470$     d)  $-576$
4. If  $x=0$  and  $x=2$  are the roots of the polynomial  $p(x) = 2x^3 - 5x^2 + \alpha x + \beta$  then the value of  $\alpha$  and  $\beta$  are  
 a)  $\alpha = 2, \beta = 2$     b)  $\alpha = 0, \beta = 2$     c)  $\alpha = 0, \beta = 0$     d)  $\alpha = 2, \beta = 0$
5. The degree of  $(x^2 + 1)^4 (x^3 + 1)^3$  is  
 a) 17    b) 7    c) 12    d) 5
6. Factorise the following quadratic polynomials:
  - (i)  $5\sqrt{5}x^2 + 30x + 8\sqrt{5}$
  - (ii)  $x^2 + 9\sqrt{3}x + 42$
  - (iii)  $40 + 3x - x^2$
  - (iv)  $3p^3 - p^2 - 10p$
  - (v)  $5x^6 - 7x^3 - 6$
7. If  $x + \frac{1}{x} = 4$ , then find  $x^3 + \frac{1}{x^3}$ .
8. If  $3x - 2y = 8$  and  $xy = 8$ , then evaluate  $27x^3 - 8y^3$ .
9. Prove that  $(x + y + z)\{(x - y)^2 + (y - z)^2 + (z - x)^2\} = 2\{x^3 + y^3 + z^3 - 3xyz\}$
10. Factorise:
  - (i)  $(x + 2)^3 + (x - 2)^3$  (ii)  $x^6 - 729y^6$
  - (iii)  $2\sqrt{2}a^3 + 8b^3 - 27c^3 + 18\sqrt{2}abc$  (iv)  $216(x + y)^3 - (x + 5y)^3 - (5x + y)^3$
11. By using the suitable identity, find the product of  $(\sqrt{2}a + \sqrt{3}b + \sqrt{4}c)(2a^2 + 3b^2 + 4c^2 - \sqrt{6}ab - \sqrt{12}bc - \sqrt{8}ca)$

12. If  $x^2 + \frac{1}{x^2} = 51$ , then find  $x^3 - \frac{1}{x^3}$ .

13. Simplify:

$$\frac{(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3}{(a - b)^3 + (b - c)^3 + (c - a)^3}$$

14. Factorise:

(i)  $8x^4y + \frac{1}{125}xy^4$  (ii)  $x^3 - 8y^3 - 1 - 6xy$  (iii)  $64(x + xy)^3 + 729(y^2 + y)^3$

### Optional Enrichment

1. Factorise:  $a^4 + 2a^3b + 3a^2b^2 + 2ab^2 + b^4$

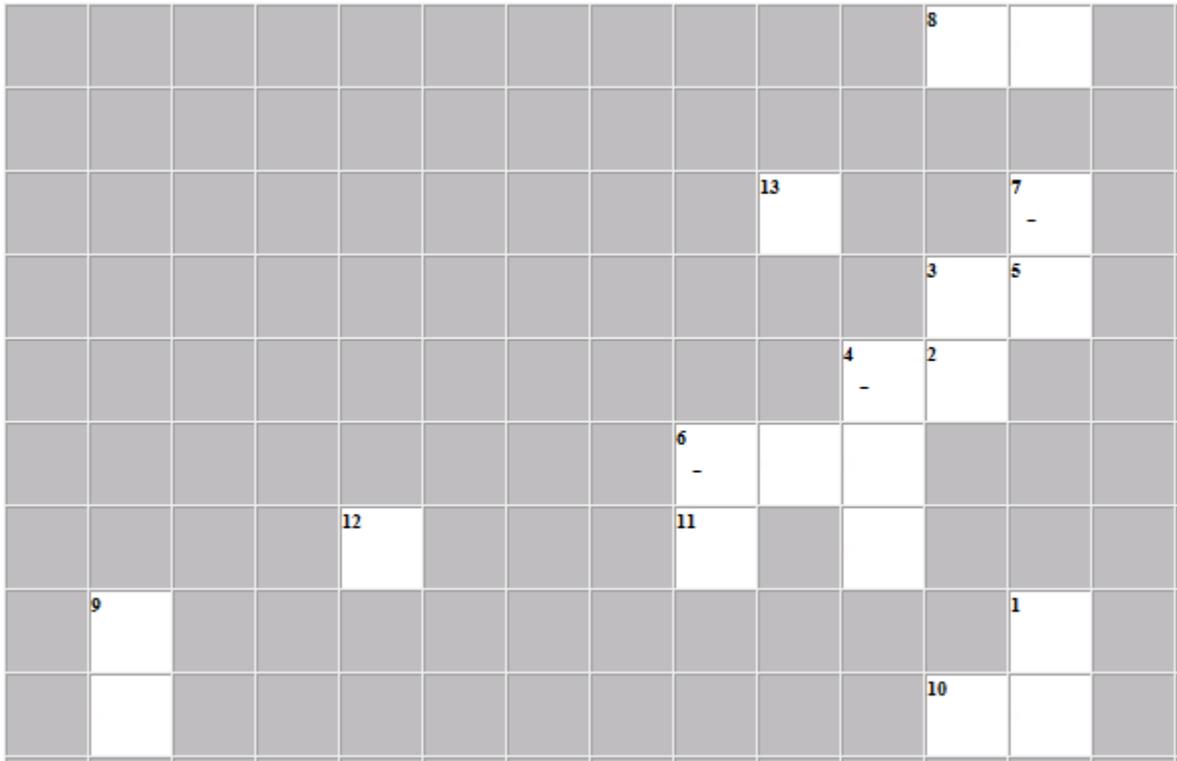
2. Express  $(7x + 3a)(7x + 5a)(7x + 9a)(7x + 11a) + 61a^4$  as the sum of two squares.

3. If  $x^4 + \frac{1}{x^4} = 527$ , find  $x^3 + \frac{1}{x^3}$ .

4. If  $x = a^2 - bc, y = b^2 - ca, z = c^2 - ab$ , prove that  $x^3 + y^3 + z^3 - 3xyz = (a^3 + b^3 + c^3 - 3abc)^2$

5. If  $a + b + c = 0$ , prove that:  $(bc + ca + ab)^2 = b^2c^2 + c^2a^2 + a^2b^2 = \frac{1}{4}(a^2 + b^2 + c^2)^2$

## Solve by Factorising



<u>Down</u>		<u>Across</u>	
1.	$49x^2 - 4 = 0$	3	$x^2 - 144 = 0$
2.	$25x^2 - 36 = 0$	4	$81x^2 + 180x + 100 = 0$
3.	$x^2 - 6x - 55 = 0$	6	$x^2 - 121 = 0$
4.	$x^2 + 10x - 24 = 0$	8	$64x^2 + 16x + 1 = 0$
5.	$9x^2 - 42x + 49 = 0$	10	$81x^2 - 100 = 0$
6.	$x^2 + 11x + 30 = 0$	11	$x^2 + 12x + 36 = 0$
7.	$25x^2 - 144 = 0$	12	$x^2 + 8x + 16 = 0$
8.	$x^2 - 9x + 8 = 0$	13	$x^2 - 6x + 9 = 0$
9.	$x^2 - 12x + 20 = 0$		

## Assignment 3 - Coordinate Geometry

1. The points  $(-2,-4)$  and  $(2,-3)$  lie in which quadrants  
(a) 2<sup>nd</sup> and 3<sup>rd</sup> (b) 3<sup>rd</sup> and 4<sup>th</sup> (c) 4<sup>th</sup> and 3<sup>rd</sup> (d) 2<sup>nd</sup> and 4<sup>th</sup>
2. Which of the following points lies on the y axis:  
(a)  $(0,-6)$  (b)  $(-6,0)$  (c)  $(8,0)$  (d)  $(-1,03)$
3. In which quadrant will all points  $(a, b)$  lie when  $a < 0, b > 0$ ?  
(a) 1<sup>st</sup> quadrant (b) 2<sup>nd</sup> quadrant (c) 3<sup>rd</sup> quadrant (d) 4<sup>th</sup> quadrant.
4. Where can we find all points with ordinate 0?  
(a) x axis (b) y axis (c) origin only (d) fourth quadrant
5. How far is the point  $(5,-8)$  from the x axis?  
(a) 5 units (b) 8 units (c) 3 units (d) cannot say
6. Fill in the blanks:  
(i) If the ordinate of a point is 3 and its abscissa is -5, then its coordinates are \_\_\_\_\_  
(ii) The distance of a point from the x-axis is called its \_\_\_\_\_ and the distance of the point from the y-axis is called its \_\_\_\_\_.
7. Plot the points  $A(1,2)$ ,  $B(-4,2)$ ,  $C(-4,-1)$  and  $D(1,-1)$ . What kind of a quadrilateral is formed ?
8. Write the coordinates of the vertices of a rectangle which is 6 units long and 4 units wide. The rectangle is in the first quadrant, its longer side lies on the x-axis and one vertex is at the origin.
9. Three vertices of a rectangle ABCD are  $A(1,3)$ ,  $B(1,-1)$  and  $C(7,-1)$ . Plot these points on a graph paper and hence find the coordinates of the fourth vertex, D. Also, find the area of this rectangle.
10. In which quadrant or axis do these points lie?  $P(5,0)$ ,  $Q(0,5)$ ,  $R(-4,-6)$ ,  $S(-6,-4)$ ?  
Do R and S represent the same point? Why or why not? Give reasons.

**Assignment 4 -Introduction to Euclid's Geometry**

1. Through four distinct points of which three points are collinear, the number of lines that can be drawn is  
(a) 6      (b) 4      (c) 1      (d) 3
2. A statement whose truth can be easily derived from a theorem is called  
(a) axiom      (b) corollary      (c) postulate      (d) none of these
3. A pair of lines drawn in the a plane which have no common point are called  
(a) coincident lines      (b) parallel lines  
(c) perpendicular lines      (d) concurrent lines
4. The number of lines passing through three distinct collinear points is  
(a) 0      bi) 1      (c) 3      (d) infinitely many
5. The number of planes containing two intersecting lines is  
(a) 1      (b) 2      (c) 3      (d) infinitely many

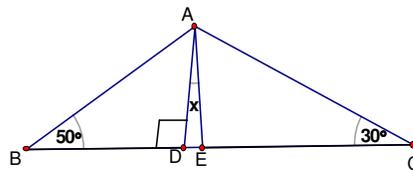
Fill in the blanks:

6. The statements which are "obvious universal truths" are called \_\_\_\_\_ or \_\_\_\_\_.
7. Things that are halves of the same thing are \_\_\_\_\_ to each other.
8. The number of lines that can pass through two distinct points is \_\_\_\_\_.
9. If A, B, C and D are points where  $AB = CD$  and  $CD = EF$ , then  $AB$  \_\_\_\_\_  $EF$ .
10. Two distinct intersecting lines cannot be \_\_\_\_\_ to the same line.

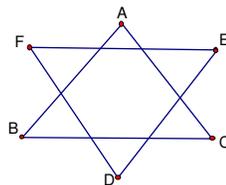
Watch the video to revise :<http://tinyurl.com/euclidspostulates>

## Assignment5 - Lines and Angles

- Four ninth of a right angle is
  - $40^\circ$
  - $50^\circ$
  - $60^\circ$
  - $80^\circ$
- The angle measure between the hour and minute hands of a clock at 3'o clock is
  - $90^\circ$
  - $60^\circ$
  - $180^\circ$
  - $0^\circ$
- If two interior angles on the same side of a transversal intersecting two parallel lines are in the ratio 2 : 3, then the measure of the larger angle is
  - $54^\circ$
  - $120^\circ$
  - $108^\circ$
  - $136^\circ$
- An angle is  $10^\circ$  more than one-thirds of its complement. The angle is
  - $40^\circ$
  - $30^\circ$
  - $60^\circ$
  - $20^\circ$
- The measures of angles of a triangle are in the ratio 4 : 5 : 9. The triangle is
  - An acute angled triangle
  - a right angled triangle
  - an obtuse angled triangle
  - any one of the above
- In the given figure , find the value of x, if AE is bisector of angle A in the triangle ABC.

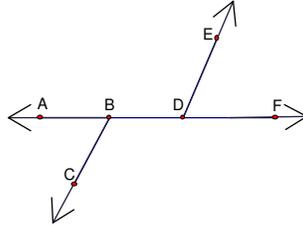


- If the bisectors of angle B and C, of a triangle ABC meets at O, then prove that
 
$$\angle BOC = 90^\circ + \frac{1}{2} \angle A$$
- Sum of two angles of a triangle is  $90^\circ$  and their difference is  $50^\circ$  . Find all the angles Of the triangle.
- In the given figure, prove that  $\angle A + \angle B + \angle C + \angle D + \angle E + \angle F = 360^\circ$

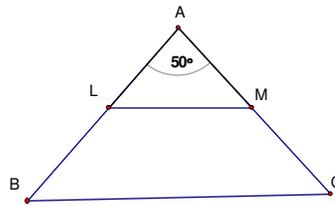


10. In the given figure

$\angle ABC = 30^\circ$ ,  $\angle EDF = (40 - x)^\circ$  and  $\angle ADE = (13x + 20)^\circ$ . Show that  $BC \parallel DE$ .

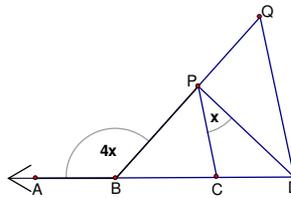


11. ABC is an isosceles triangle in which  $AB = AC$  and  $LM \parallel BC$ . If  $\angle A = 50^\circ$ , find  $\angle LMC$ .



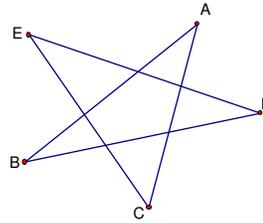
### Optional Enrichment

1. In the given figure, ABCD and BPQ are lines.  $BP = BC$  and  $DQ \parallel CP$ . Prove that (i)  $CP = CD$  (ii) DP bisects  $\angle CDQ$



2. Three friends walk away from a point in three different directions such that the path of each is equally inclined to those of the other two. Find the angles their path make with another.

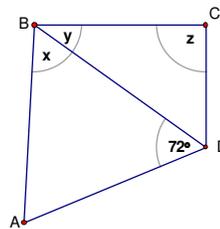
3. Prove that in the given figure  $\angle A + \angle B + \angle C + \angle D + \angle E = 180^\circ$



4. ABCD is a square and ABE is an equilateral triangle outside the square. Prove that

$$\angle ACE = \frac{1}{2} \angle ABE$$

5. In the given figure  $AB \parallel DC$ . If  $x = \frac{4}{3}y$  and  $y = \frac{3}{8}z$ , find  $\angle BCD$ ,  $\angle ABC$  and  $\angle BAD$



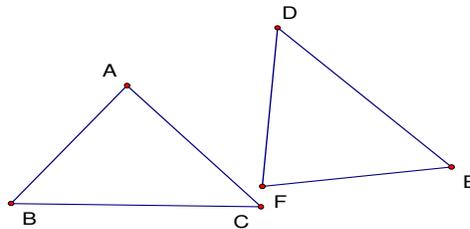
**Fun With Maths**



Arrange the eight dominoes shown above to form a four-by-four square in which the number of dots in each row and column is the same.

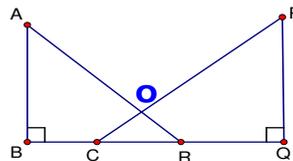
### Assignment 6 - Triangles

- If the altitude from one vertex of a triangle bisects the opposite side then the triangle is
  - Right triangle
  - an isosceles triangle
  - acute triangle
  - any one of the above
- The centroid of a triangle divides each median in the ratio
  - 3:1
  - 1:1
  - 2:1
  - 1:2
- In  $\triangle ABC$ ,  $\angle C > \angle B$  then
  - $AB > AC$
  - $AC > BC$
  - $AB < AC$
  - $BC < AB$
- In figure  $AB = EF$ ,  $BC = DE$ ,  $\angle B = \angle E$  then

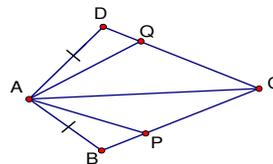


- (a)  $\triangle ABC \cong \triangle DEF$  (b)  $\triangle ABC \cong \triangle EFD$  (c)  $\triangle BAC \cong \triangle DEF$  (d)  $\triangle ABC \cong \triangle FED$

- The lengths of two sides of a triangle are 7cm and 10cm. Which of the following length can be the length of the third side?
  - 19cm
  - 17cm
  - 13cm
  - 3 cm
- In the given figure  $AB = PQ$ ,  $BC = RQ$ ,  $AB \perp BQ$  and  $PQ \perp BQ$ . Prove that  $\triangle ABR \cong \triangle PQC$ .



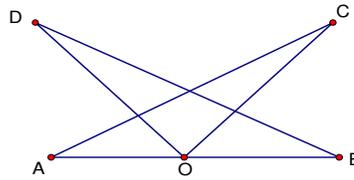
- In the given figure  $AB = AD$ ,  $\angle BAP = \angle QAD$  and  $\angle PAC = \angle CAQ$ . Prove  $AP = AQ$ .



- $AD$  is median of  $\triangle ABC$  and  $PL$  is median of  $\triangle PQR$ . If  $AB = PQ$ ,  $BC = QR$  and

$AD = PM$ . Prove that  $\triangle ABC \cong \triangle PQR$ .

9. In the given figure O is midpoint of AB.  $\angle CAB = \angle ABD$  and  $\angle DOA = \angle COB$ .

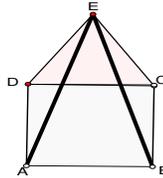


Prove that (i)  $\triangle COA \cong \triangle DOB$  (ii)  $AC = BD$ .

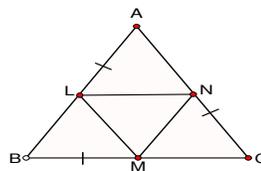
10. Show that the sum of the three altitudes of a triangle is less than the sum of the three sides of the triangle.

### Optional Enrichment

- ABCD is a square and EF is parallel to BD. R is mid point of EF. Prove that
  - $BE = DF$
  - AR bisects  $\angle BAD$
- In the given figure ABCD is a square and  $\triangle DEC$  is an equilateral triangle. Prove that (i)  $\triangle ADE \cong \triangle BCE$  (ii)  $AE = BE$  (iii)  $\angle DAE = 15^\circ$



- If P is a point in the interior of  $\triangle ABC$ , prove that  $PA + PB + PC > \frac{1}{2} (AB + BC + CA)$
- ABCD is a quadrilateral in which diagonals AC and BD intersect at O. Prove that (i)  $AB + BC + CD + DA < 2(BD + AC)$  (ii)  $AB + BC + CD + DA > AC + BD$
- In the given figure  $\triangle ABC$  is an equilateral triangle. Points L, M, N are taken on the sides AB, BC and CA respectively such that  $AL = BM = CN$ . Prove that  $\triangle LMN$  is an equilateral triangle.



Fun With Maths**A Fallacy**

The following is the proof of the theorem that every triangle is isosceles.

**Given:**  $\triangle ABC$

**To Prove:**  $AB = AC$ .

**Proof:** Let D be the midpoint of BC such that  $DB = DC$  and  $AD \perp BC$ .

Now  $DB = DC$ ,  $AD = AD$  and  $\angle ADB = \angle ADC$

Hence  $\triangle ADB \cong \triangle ACD$  (SAS)

Therefore,  $AB = AC$  (c.p.c.t)

Can you find the fallacy?

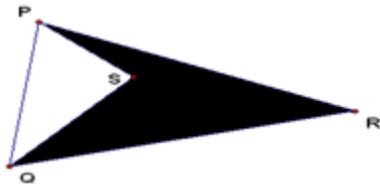
## Did you know that...

- $\pi = 3.14159\ 26535\ 89793\ 23846\ 26433\ 83279\ 50288\ 41971\ 69399\ 37510\ 58209\ 74944\ 59230\ 78164\ 06286\ 20899\ 86280\ 34825\ 34211\ 70679\ 82148\ 08651\ 32823\ \dots$
- There are just [five regular polyhedra](#)
- In a [group of 23 people](#), at least two have the same birthday with the probability greater than  $1/2$
- Everything you can do with a ruler and a compass you can do with the [compass alone](#)
- Among all shapes with the same perimeter a [circle has the largest area](#).
- There are curves that [fill a plane without holes](#)
- Much as with people, there are [irrational, perfect, complex](#) numbers
- As in philosophy, there are [transcendental](#) numbers
- As in the art, there are [imaginary and surreal](#) numbers
- One can [cut a pie](#) into 8 pieces with three movements
- [You are wrong if you think Mathematics is not fun](#)
- Mathematics studies [neighborhoods](#), [groups](#) and [free groups](#), [rings](#), [ideals](#), [holes](#), [poles](#) and [removable poles](#), [trees](#), [growth](#) ...
- Mathematics also studies [models](#), [shapes](#), [curves](#), [cardinals](#), [similarity](#), [consistency](#), [completeness](#), [space](#) ...
- Among objects of mathematical study are [heredity](#), [continuity](#), [jumps](#), [infinity](#), [infinitesimals](#), [paradoxes](#)...
- Last but not the least, Mathematics studies [stability](#), [projections](#) and [values](#), values are often [absolute](#) but may also be [extreme](#), local or global.

Source: [http://www.cut-the-knot.org/do\\_you\\_know/](http://www.cut-the-knot.org/do_you_know/)

## Assignment 7 - Heron's Formula

- The diagonals of a rhombus are 8cm and 10cm. The area of this rhombus is  
 (a)  $100\text{cm}^2$       (b)  $80\text{cm}^2$       (c)  $64\text{cm}^2$       (d)  $40\text{cm}^2$
- If a side of an equilateral triangle is 8cm, then its area is  
 (a)  $16\sqrt{3}\text{cm}^2$  (b)  $12\sqrt{3}\text{cm}^2$       (c)  $8\sqrt{3}\text{cm}^2$       (d)  $64\text{cm}^2$
- The area of an equilateral triangle is  $25\sqrt{3}\text{m}^2$ . The length of each of its sides is  
 (a) 5m      (b) 10 m      (c) 20 m      (d) 10cm
- If the base of an isosceles triangle is 12 cm and its perimeter is 32 cm, then its Area is  
 (a)  $12\text{cm}^2$       (b)  $24\text{cm}^2$       (c)  $36\text{cm}^2$       (d)  $48\text{cm}^2$
- Two adjacent sides of a parallelogram are 5cm and 3.5 cm and one of its diagonals is 6.5cm. Find the area of the parallelogram.
- The parallel sides of a trapezium are 6cm and 12 cm., while its non- parallel sides are 5 cm each. Find its area.
- If the perimeter of a rhombus is 100 m and one of its diagonals is 40 m, Find the length of the other diagonal. Also find its area.
- An isosceles right triangle has area 200 sq.cm. What is the length of its hypotenuse?
- Calculate the area of the shaded portion of the given triangle, given that PR = 52cm, RQ = 48cm, PS = 12cm, QS = 16cm,  $PS \perp QS$ .



- The sides of a triangular plate are 8cm, 15cm, and 17cm. If its weight is 96gm, find the weight of the plate square cm.
- Find the area of the quadrilateral ABCD in which AD = 24cm,  $\angle BAD = 90^\circ$  and BCD forms an equilateral triangle whose each side is equal to 26 cm.

**Additional Information:** <http://tinyurl.com/heronformula>

### Optional Enrichment

1. The perimeter of the right triangle is 12 cm and its hypotenuse is of length 5cm. Find the other two sides and calculate its area. Verify the result using Heron's formula.
2. A trapezium with parallel sides in the ratio 7 : 3 is cut from a rectangle ( 30 cm by 40 cm) so as to have an area equal to one third of the later. Find the lengths of the parallel sides if the distance between them is equal to the shorter side of the rectangle.
3. The area of a trapezium shaped field is 1400 sq.m. Its altitude is 50 m. Find the two bases , if the number of meters in each base is an integer divisible by 8 . Give all possible dimensions.

### Fun Corner - Do you know your birthday?

You could hardly be expected to remember the day itself, although you know the your date of birth. Here is an easy method for you to calculate

1. Let **Y** be the year you were born
2. Let **D** be the day of the year you were born
3. Calculate  $X = (Y-1)/4$  and ignore the remainder
4. Find  $S = Y + D + X$
5. Divide **S** by 7 and note the remainder

The day on which you were born can now be deduced by using the table below to see which day corresponds to the remainder

Remainder	0	1	2	3	4	5	6
Birthday	Fri	Sat	Sun	Mon	Tue	Wed	Thur

**For example :** Suppose the date of birth is 2<sup>nd</sup> March 2008

1.  $Y = 2008$
2. January = 31 days, February = 29 days (2008 is a leap year), March = 2days, so  $D = 62$
3.  $X = (2008 - 1)/4 = 501$  ignoring the remainder
4.  $S = 2008 + 62 + 501 = 2571$
5.  $2571 \div 7$  gives the remainder 2, Using the table, a remainder 2 indicates the birth day is Sunday.

**Assignment 8 - Linear Equations in Two Variables**

1. The number of solutions  $y = 13x + 8$  has is
    - (a) two
    - (b) none
    - (c) infinite
    - (d) four
  2.  $y = 0$  is the equation of which line?
    - (a) y axis
    - (b) line parallel to the x axis
    - (c) x axis
    - (d) line parallel to the y axis
  3. For the equation,  $2x - 5y = 0$ , one solution is
    - (a) (-5,2)
    - (b) (5,2)
    - (c) (-5,0)
    - (d) (2,0)
  4. Any point on the line  $y = x$ , is of the form
    - (a) (m,0)
    - (b) (0,m)
    - (c) (-m,m)
    - (d) (m,m)
  5. The graph of the linear equation  $3x + 5y = 15$  cuts the x-axis at the point
    - (a) (0,5)
    - (b) (0,3)
    - (c) (5,0)
    - (d) (3,0)
  6. Find three solutions of each of the following equations:
    - (i)  $\frac{1}{2}x + 2y = 8$
    - (ii)  $2x = 7y$
    - (iii)  $2x + 3y = 6$
  7. Find the value of k so that the given values of x and y is a solution of the given equation.
    - (i)  $5x - 4y = k$ ,  $x = -4$ ,  $y = -5$
    - (ii)  $3x + 4y = k$ ,  $x = 4$ ,  $y = -3$
  8. Find whether the given ordered pair is a solution of the given line or equation
    - (i)  $4x - 2y = 10$ ; (3,-1)
    - (ii)  $2x - 4y = 32$ ; (8, -4)
  9. Draw the graph of  $\frac{x}{2} + \frac{y}{3} = 1$ . Also find the points where the line meets the two axes
  10. Draw the graph of the equation  $3x + 2y = 12$ . From the graph find
    - a. If  $x = -4$ ,  $y = -2$  is a solution of the equation
    - b. If (-2, 9) lies on the graph of the equation
    - c. The value of y when  $x = 8$ .
-

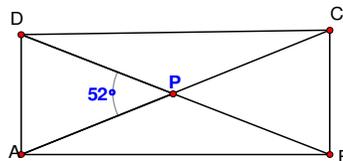
- d. The value of  $x$  when  $y = 12$ .
- e. The point where the line intersects the  $x$  and  $y$  axes.
11. Write the linear equation in two variables to represent the following statement:  
“ Cost of five trousers exceed the cost of eight shirts by Rs 150”  
If the cost of one shirt is Rs 240, find the cost of one trouser.
12. Mahesh is driving his Maruti car with uniform speed of 90 km per hour. Draw the time distance graph. From your graph, find the distance traveled by him in  
(i)  $\frac{1}{2}$  hour (ii)  $2\frac{1}{2}$  hours.
13. On the same graph sheet draw graph of lines  $x - 3y + 1 = 0$  and  $2x - 3y - 4 = 0$ . Also find the point of intersection of the two lines on the graph.

### Fun With Maths - A Few Facts About Prime Numbers

1. Prime numbers of the form  $n - 1$  and  $n + 1$  i.e. with difference 2 are called twin primes e.g. 3 and 5; 11 and 13; 17 and 19; 101 and 103. The world's largest known pair of twin primes is :  $190116 \times 3003 \times 10^{5120} - 1$  and  $190116 \times 3003 \times 10^{5120} + 1$
2. It has been proved that the number of prime numbers is limitless. The search for finding greater and still greater prime number continues. It is hard as trying to break the 100 m world. At present the highest prime is a number  $2^{756839} - 1$ , a number with 227832 digits. It was found in Feb. 1992 with the help of a supercomputer.

### Assignment 9 - Quadrilaterals

- The bisectors of the angles of parallelogram enclose  
(a) parallelogram (b) rhombus (c) rectangle (d) square
- Which of the following quadrilateral is a rhombus  
(a) Diagonals bisect each other (b) All four sides are equal (c) Diagonals bisect opposite angles (d) One angle between the diagonals is  $60^\circ$
- Consecutive angles of parallelogram are:  
(a) Equal (b) Supplementary (c) Complementary (d) none of these
- In parallelogram ABCD, bisectors of angles A and B intersect at O. The value of  $\angle AOB$  is (a)  $30^\circ$  (b)  $60^\circ$  (c)  $90^\circ$  (d)  $120^\circ$
- In a quadrilateral ABCD,  $AB = BC$  and  $CD = DA$  then the quadrilateral is a :  
(a) parallelogram (b) rhombus (c) kite (iv) trapezium
- In the given figure ABCD is a rectangle, diagonals AC and BD intersect each other at P. If  $\angle APD = 52^\circ$ , find  $\angle ACB$  and  $\angle ABD$



- In a quadrilateral ABCD. AO and BO are bisectors of angle A and angle B respectively. Prove that  $\angle AOB = \frac{1}{2} \{\angle C + \angle D\}$
- If an angle of a parallelogram is two third of its adjacent angle, find the angle of the parallelogram.
- In a parallelogram ABCD,  $AB = 8\text{cm}$ ,  $BC = 5\text{cm}$ ,  $\angle ABC = 110^\circ$ . Find:  
(i) CD (ii) AD (iii) angle A (iv) angle D

10. ABCD is a rhombus with one  $\angle BAD = 50^\circ$  find  $\angle DBC$  and  $\angle DCA$ .
11. Prove that the opposite angles of an isosceles trapezium are supplementary.
12. In a triangle ABC, AD is the median through A and E is mid- point of AD. BE produced meets AC in F. Prove that  $AF = \frac{AC}{3}$ .
13. A class teacher gave students colored papers in the shape of quadrilateral. She asked them to make parallelogram from it using paper folding.
- (a) How can a parallelogram be formed by using paper folding?
- (b) Prove that it is a parallelogram.

<http://goo.gl/8yqmfq>

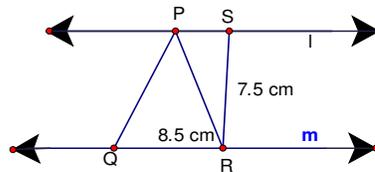
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**Let us Revise Properties :Complete the grid given below:**

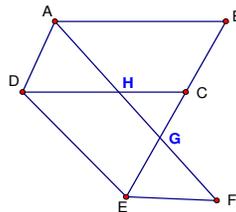
<u>Properties</u>	<u>Square</u>	<u>Rhombus</u>	<u>Rectangle</u>	<u>Trapezium</u>	<u>Prallelogram</u>
Opposite sides are equal	Yes	Yes	Yes	No	No
Opposite sides are parallel					
Adjacent sides are equal					
All angles are 90					
Diagonals bisect each other					
Diagonals bisect at 90					
Opposite angles are equal					
Diagonals divide it into two congruent triangles					
Diagonals are equal in length					

**Assignment 10 - Areas of Parallelograms and Triangles**

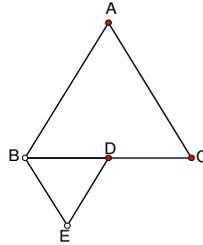
- Given figure A and figure B such that  $\text{ar}(A) = 20$  sq.units and  $\text{ar}(B) = 20$  sq. units.
  - Fig. A and B are congruent
  - Fig. A and B are not congruent
  - Fig. A and B may or may not be congruent
- Given  $\text{ar}(\Delta ABC) = 32 \text{sq.cm}$ . AD is median of  $\Delta ABC$ , and BE is median of  $\Delta ABD$ . If BO is median of  $\Delta ABE$ , then  $\text{ar}(\Delta BOE)$  is :
  - 16 sq.cm.
  - 4 sq.cm
  - 2 sq.cm.
  - 1 sq.cm.
- AD is the median of a triangle ABC. Area of triangle ADC = 15 sq.cm, then,  $\text{ar}(\Delta ABC)$ . is:
  - 15 sq.cm
  - 22.5 sq.cm
  - 30 sq.cm.
  - 37.5 sq.cm.
- If a triangle and a parallelogram are on the same base and between same parallels, then ratio of the area of the triangle to the area of parallelogram is:
  - 1 : 3
  - 1 : 2
  - 3 : 1
  - 1 ; 4
- ABCD is a quadrilateral whose diagonal AC divides it into two parts, equal in area, then ABCD :
  - is a rectangle
  - is always a rhombus
  - is a parallelogram
  - need not be any of (a) , (b) , or (c)
- In the given figure  $l \parallel m$  and RS is perpendicular to l, find area of triangle PQR



- In triangle ABC,  $AB = 7.2$  cm,  $BC = 4.8$  cm  $AM \perp BC$  and  $CL \perp AB$ . If  $CL = 4$  cm. Find AM.
- In the given figure,  $AB \parallel DC \parallel EF$ ,  $AD \parallel BE$  and  $DE \parallel AF$ . Prove that the area of DEFH is equal to the area of ABCD.



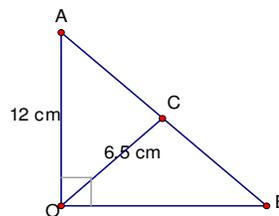
9. In the given figure triangle ABC and triangle BDE are equilateral triangles where D is midpoint of BC. Prove that  $\text{area}(\Delta BDE) = \frac{1}{2} \text{area}(\Delta ABC)$



10. In a parallelogram ABCD, diagonals AC and BD intersect each other at O. Through O a line is drawn to intersect AB at P and CD at Q. Prove that  $\text{area}(\text{quad. APQD}) = \text{area}(\text{quad. BPQC})$

### Optional Enrichment

1. Prove that the parallelogram formed by joining the midpoints of the adjacent sides of a quadrilateral is half of the latter.
2. In triangle ABC, AD divides BC in the ratio  $m : n$ . Show that  $\frac{\text{Area}(\Delta ABD)}{\text{Area}(\Delta ADC)} = \frac{m}{n}$
3. If P, Q, R and S are respectively the mid points of the sides AB, BC, CD and DA of a parallelogram ABCD, prove that  
 (i)  $\text{area}(ABCD) = 2 \times \text{area}(PQRS)$  (ii)  $\text{area}(\Delta PQR) = \frac{1}{4} \text{area}(ABCD)$
4. In the given figure  $\angle AOB = 90^\circ$ ,  $AC = BC$ ,  $OA = 12$  cm and  $OC = 6.5$  cm. Find the area of triangle AOB.



5. If G is the centroid of triangle ABC, show that

$$ar(\triangle AGB) = ar(\triangle AGC) = ar(\triangle BGC) = \frac{1}{3} ar(\triangle ABC)$$

### Fun With Maths - Tower Of Brahma

' Tower of Brahma ' in a temple in the Indian city of Banaras. This tower, the description reads, consists of 64 disks of gold, now in the process of being transferred by the temple priests. Before they complete their task, it was said, the temple will crumble into dust and the world will vanish in a clap of thunder. The disappearance of the world may be questioned, but there is little doubt about the crumbling of the temple. The formula  $2^{64} - 1$  , yields the 20-digit number 18,446,744,073,709,551,615. Assuming that the priests worked night and day, moving one disk every second, it would take them many thousands of millions of years to finish the job.



If we consider a tower of three disks only, then the number of moves will be  $2^3 - 1 = 7$  .

So it can be solved by moving the disks in the following order:

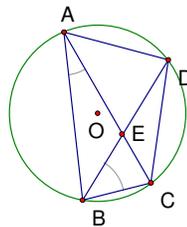
ABACABA

If we consider a tower of four disks then the number of moves will be  $2^4 - 1 = 15$  i.e.

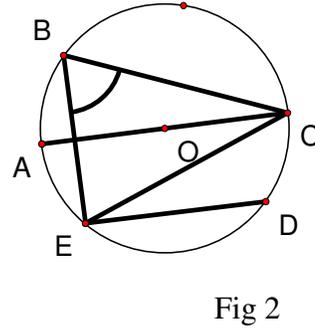
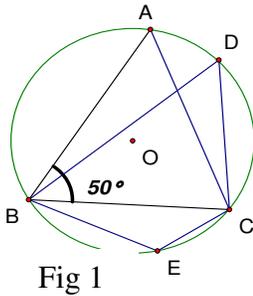
ABACABADABACABA

## Assignment 11 - Circles

- Distance of chord AB from the center is 12 cm and length of chord is 10 cm. Then diameter of the circle is :  
(a) 26 cm (b) 13 cm (c)  $\sqrt{244}$  cm (d) 20 cm.
- If diagonals of a cyclic quadrilateral are the diameters of a circle through the vertices of a quadrilateral, then quadrilateral is a :  
(a) parallelogram (b) square (c) rectangle (d) trapezium.
- The region between a chord and either of the arcs is called :  
(a) an arc (b) a sector (c) a segment (d) a semicircle
- Given three non collinear points, then the number of circles which can be drawn through these three points are :  
(a) one (b) zero (c) two (d) infinite.
- In a circle with centre O. AB and CD are two diameters perpendicular to each other. The length of chord AC is :  
(a) 2 AB (b)  $\sqrt{2}$  AB (c)  $\frac{1}{2}$  AB (d)  $\frac{1}{\sqrt{2}}$  AB.
- Equal chords AB and CD of a circle with centre O, cut at right angles at E. If M and N are the midpoints of AB and CD respectively, prove that OMEN is a square.
- ABC is a triangle inscribed in a circle with centre O. If  $\angle AOC = 130^\circ$  and  $\angle BOC = 150^\circ$ , find  $\angle ACB$ .
- In the given figure A,B,C and D are four points on a circle. AC and BD intersect at the point E. If  $\angle DBC = 30^\circ$ ,  $\angle BAC = 70^\circ$ , find  $\angle BCD$ . Further if  $AB = AC$  find  $\angle ECD$ .



9. ABCD is a cyclic trapezium with  $AD \parallel BC$ . If  $\angle B = 70^\circ$ , determine other three angles of the trapezium
10. AB is the chord of a circle with centre O and AB is produced to C such that  $BO = BC$ . CO produced meets the circle at D. If  $\angle ACD = y$  and  $\angle AOD = x$  prove that  $x = 3y$ .
11. In the given figure 1,  $\Delta ABC$  is an isosceles triangle with  $AB = AC$  and  $\angle ABC = 50^\circ$ . Find  $\angle BDC$  and  $\angle BEC$



12. In the given figure 2, the chord ED is parallel to the diameter AC. Perpendicular from E on AC meets the circle at B. If  $\angle CBE = 50^\circ$  determine  $\angle CED$ .

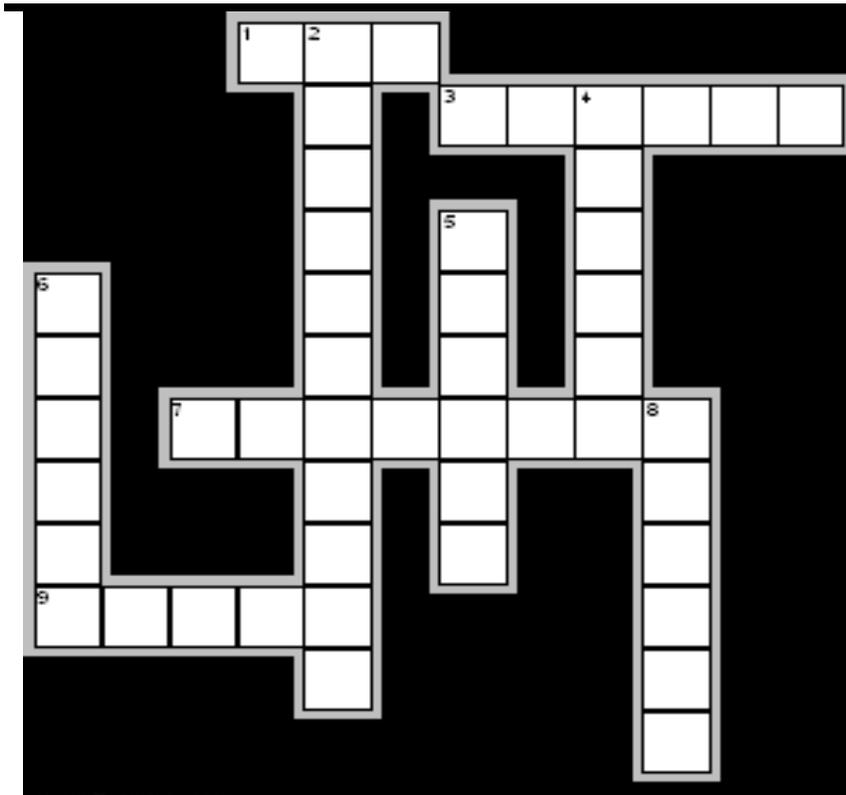
<http://goo.gl/c0R0mc>

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**Optional Enrichment**

- Two circles intersect at C and D. AB is their line of centres and M is the middle point of AB. Through C a straight line PCQ is drawn perpendicular MC, to meet the circles at P and Q. Prove that CP = CQ.
- $\triangle ABC$  and  $\triangle ADC$  are two right triangles with common hypotenuse AC. Prove that  $\angle CAD = \angle CBD$
- Prove that if the bisector of any angle of a triangle and perpendicular bisector of its opposite side intersect, they will intersect on the circumcircle of the triangle.
- ABCDE is regular pentagon. Prove that the points A, B, C and E are concyclic.
- Prove that the altitudes of a triangle are concurrent.

**Crossword Puzzle Sheet****Across**

- Part of a circle
- Sum of pair of opposite angles of ----quadrilateral is 180 degrees

7. Longest chord
9. Equal chords subtend -----angles at the center

**Down**

- 
2. Angle in semi circle
  4. Collection of points in a plane equidistant from a fixed point
  5. Perpendicular from centre of a circle to a chord ----- the chord
  6. Angle subtended by an arc at centre of a circle is ----the angle subtended by it in remaining part of circle
  8. Half of the diameter

**Assignment 12 - Constructions**

1. Construct a perpendicular bisector of a given line segment of length 7.1
2. Construct an angle of  $60^\circ$  and bisect it. Justify your construction.
3. Construct an angle of  $105^\circ$  at the end point A of the line segment AB.
4. Take a straight line  $AB = 3.6$  cm long . At A construct an angle of  $150^\circ$  . Then construct its supplement at B.
5. Construct an equilateral triangle of side 5.2 cm. Give justification for the construction.
6. Construct a right triangle when one side is 4 cm and the sum of other side and the hypotenuse is 8 cm.
7. Construct a triangle PQR in which  $QR = 5.6$  cm,  $\angle Q = 30^\circ$  and  $PQ - PR = 2.8$  cm.
8. Construct a triangle ABC with perimeter 10 cm and each base angle is  $45^\circ$  .
9. Construct a triangle whose perimeter is 10 cm and base angles are  $60^\circ, 30^\circ$
10. Construct a triangle in which one side is 3.5 cm, a base angle is  $45^\circ$  and sum of the other side and hypotenuse is 5.5 cm

**Visit the following pages to learn step by step basic constructions**

**<http://goo.gl/IfQYib>**

**<http://goo.gl/14dLIF>**

**Fun With Maths - The Three Jesters**

Among the prime numbers the three consecutive prime numbers 7,11,13 seem to possess some quite amusing properties. Hence they are named as The three jesters.

ii) Addition of these numbers gives primes

iii) They can bring back to your original number

Take any three digit number, say 123. Now let us write the same number to its right side to have a six digit number. Then this case we will have 123123. Now any such six digit number when divided by 7,11 and 13 will give you back your original three digit number.

iv) Relation with clock and calendar

a.  $11+13 = 24 =$  Number of hours which make a day

b.  $7 =$  no. of days which make a week

c.  $7 + 11 + 13 = 31$  no. of days which make a month

d. Average of 11 and 13 =  $12 =$  no. of months which make a year.

**Assignment 13 - Surfaces and Volumes**

- If the dimensions of a cuboid are 3 cm, 4 cm and 10 cm, then its surface area is  
(a) 82 sq.cm. (b) 123 sq.cm.(c) 164 sq.cm.(d) 216 sq.cm.
- The radius of a spherical balloon increases from 7 cm to 14 cm when air is pumped into it. The ratio of the surface area of original balloon to inflated one is.  
(a) 1 : 2 (b) 1 : 3 (c) 1 : 4 (d) 4 : 3
- The curved surface area of a cylinder of height 14 cm is 88 sq.cm. The diameter of cylinder is  
(a) 0.5 cm (b) 1.0 cm (c) 1.5 cm (d) 2.0 cm.
- The diameter of a sphere whose surface area is 346.5 sq.cm. is:  
(a) 5.25 cm (b) 5.75 cm (c) 11.5 cm (d) 10.5 cm
- The ratio between the curved surface area and the total surface area of a right circular cylinder is 1:2 Find the ratio between the height and the radius of the cylinder.
- A tank 15m long, 10 m wide and 6 m deep is to be made. It is open at the top. Determine the cost of iron sheet, at the rate of Rs. 12.50 per meter, if the sheet is 4 m wide.
- The volume of a sphere is 4851 cu.cm. How much should its radius be reduced so that its volume becomes  $\frac{4312}{3}$  cu.cm.
- A hemispherical bowl of internal diameter 36cm contains some liquid. This, liquid is to be filled in a cylindricalbottle of radius 3cm and height 6 cm. How many bottles are required to empty the bowl?
- The curved surface area of a cylindrical pillar is 132 sq.m and its volume is 99 cu.m. Find the diameter and the height of the pillar.
- A hollow sphere of external and internal diameters 8cm and 4cm respectively is melted into a cone of base diameter 8cm. Find the height of the cone.

**Optional Enrichment**

1. The barrel of a fountain pen, cylindrical in shape, is 7 cm long and 5mm in diameter. A full barrel of ink in the pen will be used up when writing 310 words on an average. How many words would use up a bottle of ink containing one fifth of a litre? Answer correct to the nearest 100 words.
2. A rectangular tank measuring 5m X 4.5 m X 2.1 m is dug in the centre of the field measuring 13.5 m X 2.5 m . The earth dug out is spread evenly over the remaining portion of the field. How much is the level of the field raised?
3. A solid cylinder has total surface area of 462 sq.cm. Its curved surface area is one third of its total surface area. Find the volume of the cylinder  $(\pi = \frac{22}{7})$
4. A metal pipe is 77 cm long. The inner diameter of cross section is 4 cm, The outer diameter being 4.4 cm find its total surface area.

For online Quiz:

<http://goo.gl/sMHVBR>

**Fun Corner - Which Is For Real?**

Suppose you have 5 stacks with 20 supposedly gold coins in each stack. Each authentic gold coin weighs 10 grams, but two of the stacks are composed of only counterfeit coins weighing 11 grams each. You are given a scale that weighs in grams. Figure out a way to determine the counterfeit stacks in one weighing using this scale.

## Assignment14(A) - Statistics

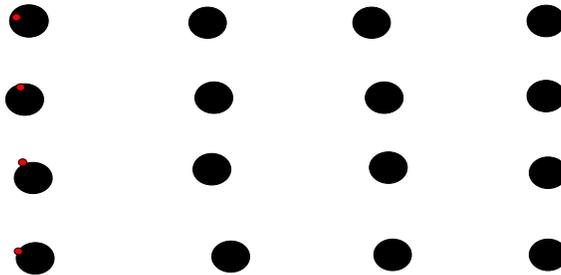
1. The range of the data 14, 27, 29, 61, 45, 15, 9, 18 is :  
(a) 61    (b) 52    (c) 47    (d) 53
2. The class mark of a class is 10 and its class width is 6. The lower limit of the class is:  
(a) 5    (b) 7    (c) 8    (d) 10
3. The mean for first five prime numbers is :  
(a) 5    (b) 4.5    (c) 5.6    (d) 6.5
4. The mean of  $x+3$ ,  $x-2$ ,  $x+5$ ,  $x+7$  and  $x+2$  is:  
(a)  $x+5$     (b)  $x+2$     (c)  $x+3$     (d)  $x+7$
5. If the mode of 12, 16, 19, 16,  $x$ , 12, 16, 19, 12 is 16 then the value of  $x$  is :  
(a) 12    (b) 16    (c) 19    (d) 18
6. The mean of first 10 numbers is 16 and the average of first 25 numbers is 22. Find the average of the remaining 15 numbers.
7. The median of the following observations, arranged in ascending order is 24, find  $x$ :  
11, 12, 14, 18,  $x+2$ ,  $x+4$ , 30, 32, 35, 41
8. Find the median of : 17, 26, 60, 45, 33, 32, 29, 34, 56. If 26 is replaced by 62, what will be the new median?
9. The mean of 1, 7, 5, 3, 4 and 4 is  $m$ . The numbers 3, 2, 4, 2, 3, 3 and  $p$  have mean  $m-1$  and median  $q$ . Find  $p$  and  $q$ .
10. 5, 7, 10, 12,  $2x-8$ ,  $2x+10$ , 35, 41, 42, 50 are arranged in ascending order. If their median is 25, find  $x$ .
11. The mean mark is for 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean.
12. At a shooting competition, the scores of a competitor were as follows:  
11, 13, 9, 10, 11, 12, 13, 11, 10, 12
  - i) What was his modal score?    ii) What was his median score?
  - iii) What was his total score?    iv) What was his mean score?
13. Determine the median of 24, 23,  $a$ ,  $a-1$ , 12, 16 where  $a$  is the mean of 12, 16, 23, 24, 28, 29.

Optional Enrichment

1. The average marks of boys in an examination of a school are 60 and that of the girls is 75. The average score of the school in that examination is 66. Find the ratio of the number of boys to the number of girls appeared in the examination.
2. The average score of girls in class IX examination of our school is 67 and that of boys is 63. The average score for the whole class is 64.5, find the percentage of girls and boys in the class.
3. The sum of deviations of set of values  $x_1, x_2, x_3, \dots, x_n$  measured from 50 is -10. and the sum of deviations of the values measured from 46 is 70. Find the value of n and the mean.

**Puzzle corner**

**Connect the dots: Without lifting your pencil, connect 16 dots using 6 straight line segments**



**Answer: Which is for real? Base two to the rescue.**

Place on the scale 1 coin from the 1<sup>st</sup> stack 2 from the 2<sup>nd</sup> stack, 4 from the 3<sup>rd</sup> stack, 8 from the 4<sup>th</sup> stack and 16 from the 5<sup>th</sup> stack. We know if all stack are real the weight should be 31 grams. So suppose the weight is 49 grams, for example. Writing the amount over 31, that is 18 grams, in base two we get 10010. So this means the counterfeit coins came from the stacks from which you took 16 coins and 2 coins.

## Assignment 14(B)-Statistics

1. For the following data of monthly wages(in Rupees) received by 30 workers in a factory, construct a grouped frequency distribution taking class-intervals of equal width 20 in such a way that mid-value of the first class interval is 220;

236, 258, 215, 307, 307, 316, 280, 240, 210, 220, 268, 258, 242, 210, 268, 272, 242, 210, 268, 272, 242, 311, 290, 300, 320, 319, 304, 250, 254, 274

2. Draw a histogram for the following frequency distribution:

Class interval	1-10	11 - 20	21 - 30	31 -40	41- 50	51 -60
Frequency	3	7	10	5	2	6

3. Draw a histogram to represent the following data:

Marks	0 - 30	30 - 50	50 - 60	60 - 100
Number of students	3	6	5	16

4. The following are the scores of two groups of students in a test of reading ability.

Scores	Group A	Group B
50 - 53	4	2
46 - 49	10	3
42 - 45	15	4
38 - 41	18	8
34 - 37	20	12
30 -- 33	12	17
26 - 29	13	22
Total	92	68

Construct a frequency polygon of each of these groups on the same axes.

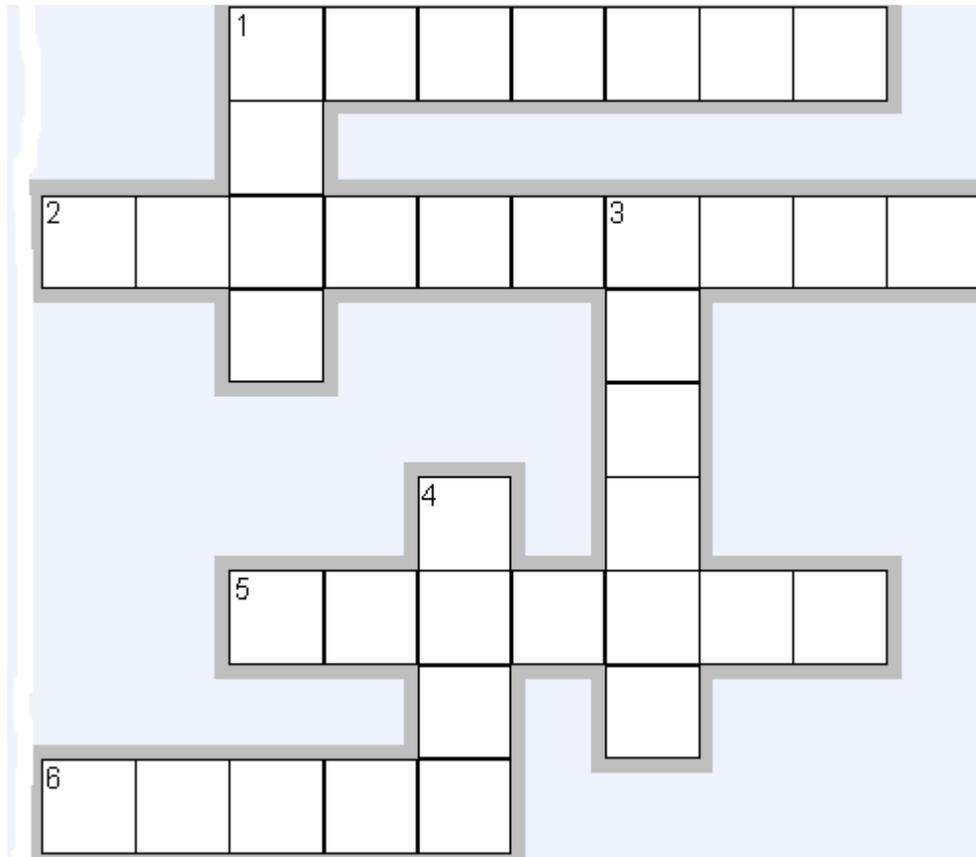
5. The mean of the following distribution is 50:

x	10	30	50	70	90
f	17	$5a+3$	32	$7a-11$	19

Find the value of a and hence the frequencies of 30 and 70.

6. Calculate the mean for the following:

X	5.5	15.5	25.5	35.5	45.5	55.5
F	3	16	26	31	16	8

Crossword**Across**

1. The mode of a group of observations is that value of the variable which has ----- frequency
2. The mid point of a class is called-----
5. Data collected by the experimenter himself is called -----data
6. The difference between maximum and minimum observations in the data is called-----

**Down**

1. The sum total of all the observations divided by their number is called -----of the data
3. The ----- is the middle most observation in the data, when they are arranged in increasing or decreasing order.
4. The median of first 9 natural numbers is -----

### Assignment 15 - Probability

1. In a bag, there are 100 bulbs out of which 30 are bad ones. A bulb is taken out of the bag at random. The probability of the selected bulb to be good is :

- (a) 0.50      (b) 0.70      (c) 0.30      (d) none of these.

2. An experiment is conducted. Probabilities of an event are calculated by some students. Which of the following is the correct answer?

- (a)  $\frac{5}{4}$       (b)  $\frac{1}{3}$       (c)  $\frac{-2}{3}$       (d) 1.3

2. A coin is tossed 1000 times and 560 times head occurs. The empirical probability of occurrence of head in this case is:

- (a) 0.50      (b) 0.56      (c) 0.44      (d) 0.056

3. The probabilities of a student getting grade A, B, C and D are 0.2, 0.3, 0.15 and 0.35 respectively. Then the probability that a student gets at least C grade is :

- (a) 0.65      (b) 0.25      (c) 0.50      (d) 0.35

4. The probability of selecting a boy in a class is 0.6 and there are 45 students in a class, find the number of girls in the class.

5. The percentage of marks obtained by a student in the monthly unit tests are given

Unit Test	I	II	III	IV	V
% of marks obtained	69	71	80	75	92

Based on this data, find the probability that the student gets more than 75% in a unit test.

6. The distance ( in km) of 20 students from their residence to their school were found as follows

5 3 7 12 25 10 2 7 8 10 7 2 3.5 10 34 20 22 11 12.5 15

What is the empirical probability that a student lives:

- a) Less than 3 km radius from his school?  
 b) More than or equal to 7 km from his school?  
 c) Within 1 km from his school?

7. Eleven bags of sugar, each marked 5 kg, actually contained the following weights of sugar (in kg): 4.97, 5.01, 5.08, 5.03, 5.00, 4.8, 5.04, 5.08, 5.00, 5.06, 5.12. Find the probability that any of these bags chosen at random contains less than 5 kg of sugar.

8. A die is thrown 400 times, the frequency of the outcomes of the events 1, 2, 3, 4, 5, 6 are noted in the frequency distribution table given below:

Outcome	1	2	3	4	5	6
frequency	75	60	65	70	68	62

Find the probability of occurrence of (i) an odd number (ii) a prime number

9. The record of weather station shows that out of the past 200 consecutive days, its weather forecasts were correct 176 days. What is the probability that on a given day it was not correct?

10. On one page of a telephone directory, there were 200 telephone numbers. The frequency distribution of their unit's place digit is given in the following table:

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	22	26	22	22	20	10	14	28	16	20

Without looking at the page, a number is chosen at random. What is the probability that the digit in the unit's place is (i) 0 (ii) 6 (iii) less than 5 (iv) more than 7

11. Frequency distribution of marks obtained by 30 students is given below:

Marks obtained	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students	2	3	4	0	8	3	4	6

Find the probability that the mark obtained by a student is (i) less than 30 (ii) more than 30 and less than 40 (iii) less than 80.

FOR ONLINE QUIZ:

<http://goo.gl/TknqHc>

<http://goo.gl/Txf3wl>

<http://goo.gl/l7FFLF>

### Math Magic Trick

Here's a really cool **Math Magic Trick** that kids can use to impress family and friends and build basic math skills too! You'll find lots of other math tricks here as well so have fun and learn some math along the way.

**Materials:** 5 dice

#### **Performing the Trick:**

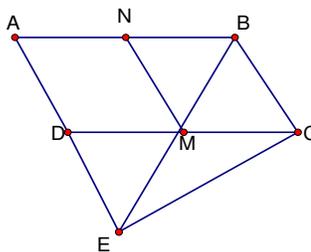
1. Tell the spectator that you can see *through the dice* all the way to the bottom numbers.
2. Roll all 5 dice on table.
3. Pretend that you are looking through the dice to see the bottom numbers. (What you are actually doing is *adding up the top numbers* of all 5 dice.)
4. Then you will announce the sum of the bottom numbers. (All you have to do is subtract the sum of the numbers you added in your mind from the top from 35.)
5. Then turn over the 5 dice and have the spectator add the numbers of top numbers. They will be amazed at how you did it!



**Can you Figure out the trick?**

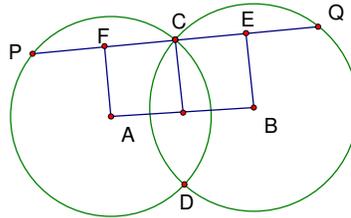
## Question Bank

- Simplify : i)  $\frac{7+3\sqrt{5}}{7-3\sqrt{5}}$  ii)  $3\sqrt{48} - \frac{5}{2}\sqrt{3} + 4\sqrt{3}$  iii)  $(3\sqrt{3} - 2\sqrt{2}) \times (\sqrt{2} - 2\sqrt{3})$
- Express the following recurring decimal expansions in the form  $\frac{p}{q}$ , where p and q are integers and  $q \neq 0$ .  
 (ii)  $0.\overline{135}$  (iii)  $2.\overline{23}$  (vi)  $0.39\overline{285714} \times 0.15\overline{90}$  ii)  $11.45\overline{65} \div 2.\overline{67}$
- Find the value of m and n if  $(x-1)$  and  $(x+2)$  are factors of the polynomial  $2x^3 + mx^2 + nx - 14$ .
- Find the value of a so that  $x+3$  is a factor of  $x^3 + ax^2 + (2a-1)x + 6$ .
- Find the value of a when  $ay^2 - 9y + 4a$  divided by  $2y - 1$  gives a remainder  $\frac{5}{6}$ .
- S is mid point of the side QR of the triangle PQR, and T is the mid point of QS. If O is the mid point of PT, prove that the area of triangle QOT is one-eighth of the area of triangle PQR.
- In parallelogram ABCD, P is a point on side AB and Q is a point on side BC. Prove that (i) triangles CPD and AQP are equal in area  
 (ii)  $Area(\Delta AQP) = Area(\Delta CPD) + Area(\Delta CPB)$
- In the given figure, M and N are the midpoints of the sides DC and AB of the parallelogram ABCD and the area of the parallelogram ABCD is 36 sq.cm  
 (i) Find the area of the triangle BEC  
 (ii) Find the parallelogram which is equal in area to the triangle BEC.



- Take a line segment  $AB = 3.8$  cm. At B construct  $135^\circ$
- Construct a triangle ABC in which base  $BC = 7$  cm,  $\angle B = 75^\circ$  and  $AB + AC = 13$  cm
- Construct a right angled isosceles triangle whose hypotenuse is 7 cm long

12. Find the volume and total surface area of hemisphere of radius 3.5cm.
13. Two circles intersect at C and D. AB is their line of centres and M is the middle point of AB. Through E a straight line PCQ is drawn perpendicular to MC to meet the circles at P and Q. Prove that  $CP = CQ$



14. A solid sphere of radius 21 cm is melted to stretch into a wire of length 63 cm. Find the radius of the wire
15. How many spherical lead shots each 4.2 cm in diameter can be obtained from a rectangular solid of lead dimensions 66 cm, 42 cm and 21 cm
16. If the radius of the base of a right circular cylinder is halved, keeping the height same, find the ratio of the volumes of the reduced cylinder to that of original one.
17. The area of three adjacent faces of a cuboid are  $x$ ,  $y$  and  $z$ . If the volume is  $V$ , find the relationship between  $V$ ,  $x$ ,  $y$  and  $z$ .
18. Following are the ages of 400 persons in a small village: Draw a histogram for the following data:

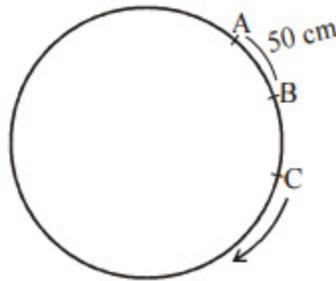
<u>Ages (in years)</u>	<u>Number of Persons</u>
0 - 10	70
10 - 20	80
20 - 30	60
30 - 40	80
40 - 50	50
50 - 60	40
60 - 70	20

19. Find the median of 11, 8, 4, 9, 7, 5, 2, 4, 10
20. The mean of 1, 7, 5, 3, 4 and 4 is  $m$ . The numbers 3, 2, 4, 2, 3, 3 and  $p$  have mean  $m$  and median  $q$ . Find  $p$  and  $q$ .

**Value Based Questions**

1. A student studying in a university covers his expenditure on daily needs and tuition fee by driving a taxi on rent in the city. The taxi fare in the city is as follows: For the first kilometer the fare is Rs40 and for the subsequent distance it is Rs 20 per km.
    - (i) Write a linear equation for the given information.
    - (ii) Which value is depicted by the student by driving a taxi.
  2. Mr. Murthy is sitting on a chair in the corner of a huge park. He asked his son "Draw a straight line passing through my feet and the centre of the park in 2 minutes." His son did so.
    - (i) Find the coordinates of the feet of Mr Murthy if the x-coordinate of the feet is 20.5 , and the equation of the line is  $x=y$ .
    - (ii) ) Find the coordinates of the feet of Mr Murthy if the y-coordinate of the feet is - 19.5 , and the equation of the line is  $x+y=0$ .
    - (iii) Which value is shown by his son?
  3. Hari Ram distributed toffees among his four sons. The number of toffees received by the sons are in the ratio 6:5:4:3 from eldest to the youngest son.
    - (i) Find the number of toffees received by each son, provided the degrees of the total number of toffees form the sum of all interior angles of a trapezium.
    - (ii) What was the ratio of the number of toffees received by the youngest son to the eldest son?
    - (iii) By distributing toffees which value was exhibited by Hari Ram?
  4. Roja, Renu and Reena are three friends . They decided to sweep a circular park near their homes. They divided the park into three parts by two equal chords AB and AC for convenience.
    - (i) Prove that the centre of the park lies on the bisector of angle BAC.
    - (ii) By deciding to sweep which value is depicted by the three friends.
  5. A well for common people is dug out by a farmer Ramu in his village. How many cubic metres of earth must be dug out to sink a well 22.5m deep and of 7m diameter. Also find the cost of plastering the inner curved surface at Rs 3/sqm. Write a value depicted by farmer Ramu.
-

6. A residential colony has a population of 5400 and 60 litres of water is required per person per day. For the effective utilization of rain water, a group of people decided to do WATER HARVESTING. They constructed a water reservoir measuring  $48\text{m} \times 27\text{m} \times 25\text{m}$  to collect the rain water. (a) For how many days the water of this tank is sufficient if during rain the height of water level is 5m. (b) Which value is shown by the group of people ?
7. A group of 66 students went for a picnic. They halted at a park for their lunch. They made a big circle and each child was 50 cm away from the other child along the circle. They shared the food they bought with each other and left the park clean.



- (a) Find the radius of the circle they formed. (b) What value of the girls is depicted here?
8. A survey on 100 children of a village was conducted regarding their education and it was found that 23 children are studying beyond primary level, 48 have discontinued their education after class V, and the remaining have never gone to school. Find the probability that a child, chosen at random, has never been to school. How is education important for each child? What steps can be taken to educate each child?
9. The number of literate females in the age group (10 – 57) in a village are given below:

Age (in yrs)	10 -17	18 -25	26- 33	34 - 41	42 - 49	50 - 57
No.of females	300	980	740	580	260	140

Draw a histogram to represent the above data. How will you relate female literacy with social development? What can be done to literate females in villages?

## Revision Assignment - First Term

1. Represent  $\sqrt{8.6}$  on the number line.
2. Rationalize  $\frac{1}{\sqrt{3} + \sqrt{2}}$  and subtract it from  $\sqrt{3} - 2$
3. If  $x = 3 - 2\sqrt{2}$ , find  $x^2 + \frac{1}{x^2}$
4. If  $x = 7 + 4\sqrt{3}$ , find the value of  $\sqrt{x} + \frac{1}{\sqrt{x}}$
5. Write  $0.\overline{235}$  in the form p/q.
6. Write two rational and two irrational numbers between  $2\sqrt{2}$  and 3.
7. If  $\frac{4 + 3\sqrt{5}}{4 - 3\sqrt{5}} = a + b\sqrt{5}$ , find a and b.
8. Factorize:
  - (a)  $18a^3b - 33a^2b^2 - 30ab^3$
  - (b)  $6(x + y)^2 - 5(x + y) - 6$
  - (c)  $a^4 - 13a^2 + 36$
  - (d)  $9a^2 - 4ab - 13b^2$
9. If  $(x - a)$  is a factor of  $x^6 - ax^5 + x^4 - ax^3 + 3x - a + 2$ , find the remainder when  $2x^4 - 6x^3 + 2x^2 + ax + 2$  is divided by  $(x + 2)$ .
10. Using Factor theorem, factorize completely:  $x^3 - 10x^2 - 53x - 42$
11. The polynomial  $ax^3 + bx^2 + x - 6$  has  $(x + 2)$  as a factor and leaves a remainder 4 when divided by  $(x - 2)$ . Find a and b.
12. If two parallel lines are intersected by a transversal, then prove that the bisectors of the interior angles form a rectangle.
13. Without actual division show that  $x^3 - 3x^2 - 10x + 24$  is exactly divisible by  $x^2 - x - 12$ .
14. Let R1 and R2 be the remainders when the polynomials  $x^3 + 2x^2 - 5ax - 7$  and  $x^3 + ax^2 - 12x + 6$  are divided by  $x + 1$  and  $x - 2$  respectively. If  $2R1 + R2 = 6$  find a

15. Factorize:

(i)  $8(x + y)^3 - 27(x - y)^3$

(ii)  $a^2b^2 - a^2 - b^2 + 1$

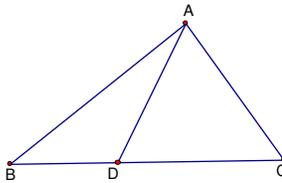
(iii)  $3\sqrt{3}a^3 - b^3 - 5\sqrt{5}c^3 - 3\sqrt{15}abc$

16. Simplify: 
$$\frac{(x^2 - y^2)^3 + (y^2 - z^2)^3 + (z^2 - x^2)^3}{(x - y)^3 + (y - z)^3 + (z - x)^3}$$

17. The bisector of  $\angle ABC$  and  $\angle BCA$  of triangle ABC intersect each other at O.

Prove that  $\angle BOC = 90 + \frac{1}{2}\angle A$ .

18. D is a point on side BC of triangle ABC such that  $AD = AC$ . Show that  $AB > AD$ .



19. Factorize completely:

(i)  $3x^2 + 2y^2 + z^2 + 2\sqrt{6}xy - 2\sqrt{2}yz - 2\sqrt{3}xz$

(ii)  $32a^4b - 108ab^4$

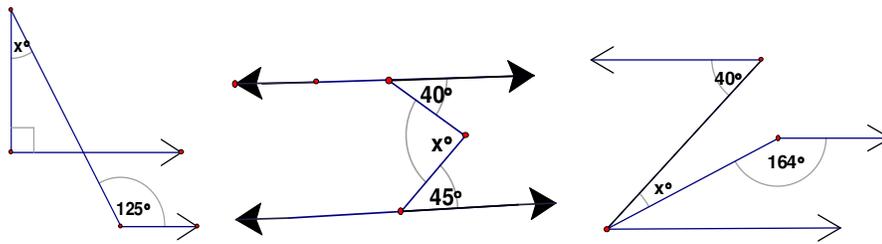
20. Ray OS stands on a line POQ. Ray OR and ray OT are angle bisectors of  $\angle POS$  and  $\angle SOQ$  respectively. If  $\angle POS = x$ , find  $\angle ROT$ .

21. In right triangle ABC, right angled at C, M is the mid point of hypotenuse AB. C is joined to M and produced to a point D such that  $DM = CM$ . Point D is joined to point

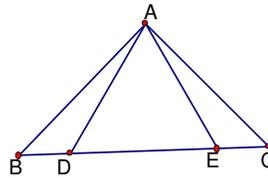
B. Show that  $CM = \frac{1}{2}AB$

22. Triangle ABC is an isosceles triangle in which  $AB = AC$ . D, E and F are the mid points of the sides BC, AC and AB respectively. Prove that  $DE = DF$ .

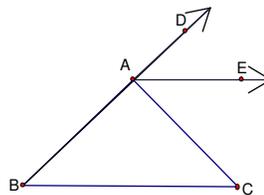
23. In the following figures, find the value of  $x$ .



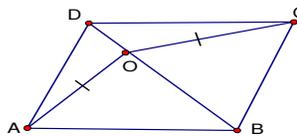
24. In the given figure D and E are points on the base BC of triangle ABC such that  $BD = CE$  and  $AD = AE$ . Prove that  $\triangle ABE \cong \triangle ACD$



25. In the given figure, AE bisects  $\angle CAD$  and  $\angle B = \angle C$ . Prove that  $AE \parallel BC$ .



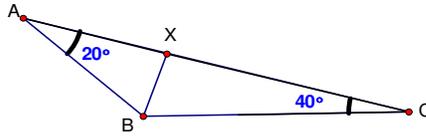
26. In the given figure, ABCD is a rhombus in which O is a point interior to it such that  $OA = OC$ . Prove that DOB is a straight line.



27. From the vertices B and C of  $\triangle ABC$ . Perpendiculars BE and CF are drawn to the opposite sides AC and AB respectively. If  $BE = CF$ . Prove that  $\triangle ABC$  is isosceles.

28. In  $\triangle ABC$ ,  $\angle A = 20^\circ$ ,  $\angle C = 40^\circ$ . The bisector of the angle B meets AC at X.

Prove that (i)  $AX > BX$  (ii)  $CX > BX$  (iii)  $BC > XC$

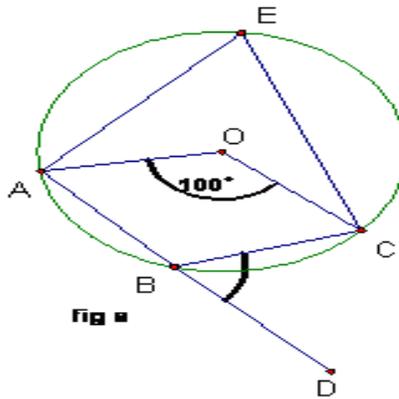


29. AP and DP are the bisectors of two adjacent angles A and D of a quadrilateral ABCD. Prove that  $2\angle APD = \angle B + \angle C$

ABCD. Prove that  $2\angle APD = \angle B + \angle C$

## Revision Assignment - Second Term

- In a parallelogram ABCD, bisectors of angles A and B intersect each other at O. what is the measurement of  $\angle AOB$ .
- The numbers 2, 3, 4, 4,  $2x+1$ , 5, 5, 6, 7 are written in ascending order. If their median is 5, find the value of x. Hence find mode
- Find the length of a chord which is at a distance of 4cm from the centre of a circle whose radius is 5 cm.
- In a cricket match, a batsman hits a boundary 6 times out of 24 balls he plays. Find the probability that he did not hit the boundary.
- A rectangular sheet of paper 44cm X 18 cm is rolled along its length and a cylinder is formed. Find the volume of the cylinder.
- In the given figure (a), O is the centre of the circle. Find  $\angle CBD$



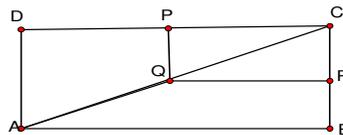
- ABCD is a quadrilateral in which P, Q, R and S are midpoints of sides AB, BC, CD and DA. Prove that PQRS is a parallelogram.
- ABCD is a trapezium in which  $AB \parallel CD$ . E is the midpoint of AD. A line through E parallel to AB intersects BC at F. Prove that F is the midpoint of BC.
- A rhombus sheet, whose perimeter is 32 m and whose one diagonal is 10 m long, is painted on both sides at the rate of Rs. 5 persq.m. Find the cost of painting.
- There are two cones. The curved surface area of one is twice that of the other. The slant height of the latter is twice that of the former. Find the ratio of their radii.
- Construct a triangle whose perimeter is 12 cm and base angles are of  $45^\circ$  and  $60^\circ$ .

12. Total surface area of a solid sphere is 1386 sq.m then what will be the total surface area of the solid hemisphere of same radius.
13. Determine the median of 24, 23, a, a-1, 12, 16 where a is the mean of 10, 20, 30, 40, 50
14. The class marks of distribution are 6, 10, 14, 18, 22, 26, 30 Find the class size and the class intervals
15. A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 26 cm, 28 cm and 30 cm, and the parallelogram stands on the base 28 cm, find the height of the parallelogram.
16. A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm the outer diameter being 4.4 cm Find (a) inner surface area (b) outer surface area (c) total surface area.
17. Construct the frequency polygon for the following data.

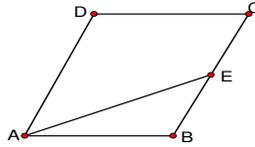
Age in Years	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35
Frequency	7	10	14	20	16	8	2

18. Prove that "The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle".
- A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the major arc.
- 19 In the given figure ABCD and PQRC are rectangles where Q is the mid point of AC. Prove that

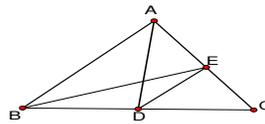
(i)  $DP = PC$  (ii)  $QR = \frac{1}{2} AB$



20. In the given figure, ABCD is a parallelogram. If E is mid point of BC and AE be bisector of angle A, prove that  $AB = \frac{1}{2} AD$ .

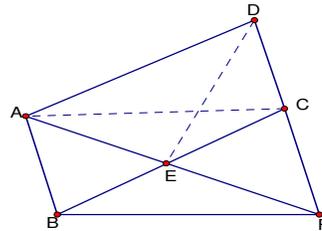


21. In the given figure, ABC is a triangle with AD as median and  $DE \parallel AB$ . Prove that BE is a median.



22. A point E is taken on the side of a parallelogram ABCD; AE and DC are produced to meet at F. Prove that

$$(i) \text{ar}(\triangle DEC) = \text{ar}(\triangle BEF) \quad (ii) \text{ar}(\triangle ADF) = \text{ar}(\text{quad}ABFC)$$



23. S is mid point of the side QR of the triangle PQR, and T is the mid point of QS. If O is the mid point of PT, prove that the area of triangle QOT is one-eighth of the area of triangle PQR.

24. A quadrilateral ABCD is inscribed in a circle so that AB is the diameter of the circle.

If  $\angle ADC = 115^\circ$ , find  $\angle BAC$ .

25. Two congruent circles intersect each other at the points P and Q. A line through P meets the circles in A and B. Prove that  $QA = QB$ .

26. Diameters of a circle intersect each other at right angles. Prove that the quadrilateral formed by joining their end points is a square.

**Sample Paper 1**  
**First Term Examination**  
**Subject: Mathematics**

**Time: 3 Hrs.**

**M.M:90**

**General Instructions**

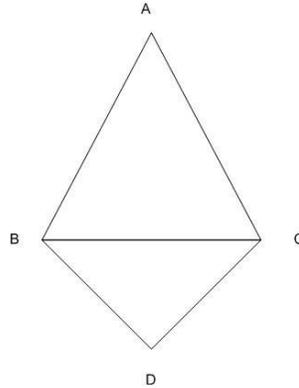
1. All questions are compulsory.
2. The question paper consists of 31 questions divided into four sections A, B, C and D.
3. Section A contains 4 questions of 1 mark each. Section B contains 6 questions of 2 marks each. Section C contains 10 questions of 3 marks each. Section D contains 11 questions of 4 marks each.
4. This paper has 5 printed sides.

**Section A**

- Q1. What is the perpendicular distance of the point (3, -8) from the x-axis?
- Q2. Is the product of two different irrational numbers always irrational? Justify with an example.
- Q3. Evaluate  $8\sqrt{15} \div 2\sqrt{3}$
- Q4. What is the difference between postulate and axiom?

**Section B**

- Q5. The sum of two angles of a triangle is  $90^\circ$ , and their difference is  $50^\circ$ . Find all the angles of the triangle.
- Q6. The area of an equilateral triangle is  $16\sqrt{3} m^2$ . Find its perimeter.
- Q7.  $\triangle ABC$  and  $\triangle DBC$  are two isosceles triangles on the same base BC. Show that:  
 $\angle ABD = \angle ACD$ .



Q8. Factorize :  $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$

Q9. An angle is equal to one-third its complement. Find its measure.

Q10. The polynomial  $2x^3 - kx^2 + 7x - 1$ , when divided by  $x - 1$  leaves the remainder 3. Find the value of  $k$ .

### Section C

Q11. In the figure,  $\angle ABC = 30^\circ$ ,  $\angle EDF = (40 - x)^\circ$  and  $\angle ADE = (13x + 20)^\circ$ . Show that  $BC \parallel DE$ .

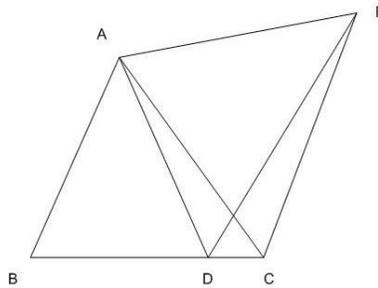


Q12. Plot A (1, 2), B(-4, 2), C(-4, -1) and D(1, -1). Join them in order. Determine the area of the figure obtained.

Q13. Express  $0.35\bar{7}$  in  $\frac{p}{q}$  form, where  $p$  and  $q$  are integers,  $q \neq 0$ .

Q14. Simplify:  $\left(\frac{3^{-1} \times 5^2}{3^2 \times 5^{-4}}\right)^{\frac{1}{3}} \times \left(\frac{3^{-1} \times 5^{-1}}{3^3 \times 5^{-5}}\right)^{-\frac{1}{2}}$ .

Q15. In the figure below,  $AC = AE$ ,  $AB = AD$ ,  $\angle BAD = \angle EAC$ . Show that  $BC = DE$ .



Q16. Show that the bisectors of the angles of a linear pair form a right angle.

Q17. Factorize:  $r^3(s - t)^3 + s^3(t - r)^3 + t^3(r - s)^3$ .

Q18. Evaluate, after rationalizing the denominator:

$$\left(\frac{20}{\sqrt{40}-\sqrt{20}}\right), \sqrt{5} = 2.236, \sqrt{10} = 3.162.$$

**OR**

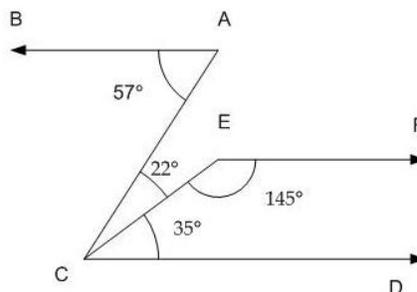
If  $x = 5 - 2\sqrt{6}$ , find the value of  $\sqrt{x} + \frac{1}{\sqrt{x}}$ .

Q19. Prove that the perimeter of a triangle is greater than the sum of its altitudes.

Q20. If a transversal intersects two lines such that the bisectors of a pair of alternate interior angles are parallel, then prove that the lines are parallel.

**OR**

In the figure below, show that  $AB \parallel EF$ .

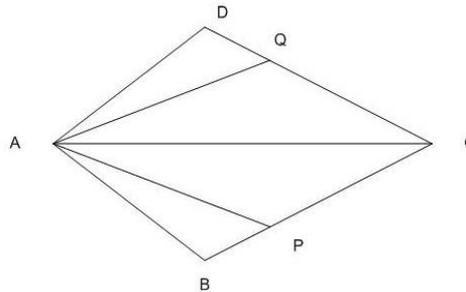


**Section D**

Q21.  $ABC$  is an isosceles triangle in which  $AB = AC$ . Side  $BA$  is produced to  $D$  such that  $AD = AB$ . Show that  $\angle BCD$  is a right angle.

Q22. Factorize using Factor theorem:  $x^3 + 6x^2 + 11x + 6$ .

Q23. In the given figure,  $AB = AD$ ,  $\angle BAP = \angle QAD$  and  $\angle PAC = \angle CAQ$ . Prove that  $AP = AQ$ .

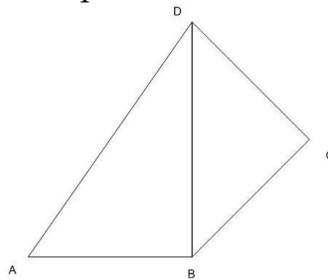


Q24. If both  $(x - 2)$  and  $(x - \frac{1}{2})$  are factors of  $px^2 + 5x + r$ , show that  $p = r$ .

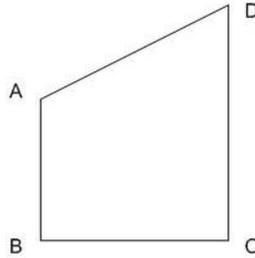
Q25. As shown in the figure below, a chocolate is in the form of a quadrilateral  $ABCD$  with sides  $AB = 6\text{cm}$ ,  $AD = 10\text{cm}$ ,  $BC = 5\text{cm}$ ,  $CD = 5\text{cm}$ .  $\angle ABD = 90^\circ$ . It is cut into two parts along one of its diagonals by Anshu. Part I ( $\triangle BCD$ ) is given to her maid and Part II ( $\triangle ABD$ ) is equally divided among her two children.

(i) Is the distribution fair? Justify it.

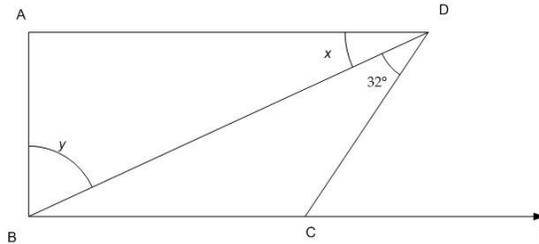
(ii) What quality of Anshu is depicted here?



Q26. In the figure below,  $AB$  and  $CD$  are respectively the shortest and longest sides of a quadrilateral  $ABCD$ . Show that  $\angle A > \angle C$ .



Q27. In the figure below,  $AD \perp AB$ ,  $AD \parallel BC$ . If  $\angle BDC = 32^\circ$  and  $x : y = 11 : 19$ , Find  $\angle DCE$ .



Q28. Do as directed:

(i) If  $3x - 2y = 8$ ,  $xy = 8$ , evaluate  $27x^3 - 8y^3$ .

(ii) Factorize (**any one**):

(a)  $2\sqrt{2}a^3 + 8b^3 - 27c^3 + 18\sqrt{2}abc$ .

(b)  $5x^6 - 7x^3 - 6$

Q29. Two sides AB and BC and the median AM of a  $\Delta ABC$  are respectively equal to sides PQ, QR and median PN of  $\Delta PQR$ . Show that  $\Delta ABC \cong \Delta PQR$ .

Q30. Prove that:  $\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2} \times \left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2} \times \left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2} = 1$ .

OR

Find a and b, if  $\frac{2+\sqrt{3}}{2-\sqrt{3}} - \frac{2-\sqrt{3}}{2+\sqrt{3}} = a - b\sqrt{3}$ .

Q31. Prove that the sum of the angles of a triangle is  $180^\circ$ .

**Sample Paper 2**  
**First Term Examination.**  
**Subject: Mathematics**

**Time : 3hrs**

**MM : 90**

**General Instructions:**

- All questions are compulsory.
- The question paper consists of 31 questions divided into 4 sections A, B, C and D.  
Section A: 4 questions of 1 mark each.  
Section B: 6 questions of 2 marks each.  
Section C: 10 questions of 3 marks each.  
Section D: 11 questions of 4 marks each.
- In questions with internal choice, only one of the questions has to be attempted.
- An additional 15 minutes has been allotted to read the question paper.
- There are 4 printed sides and 31 questions in all.

**Section A**

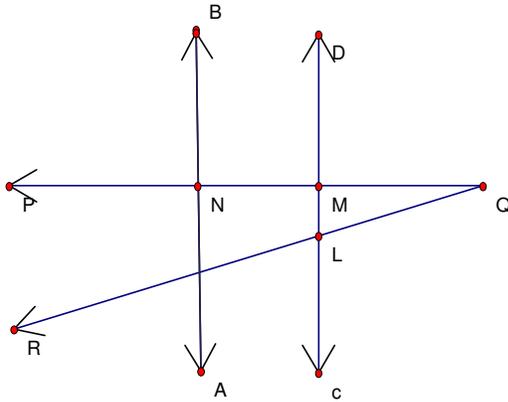
1. The area of an equilateral triangle is  $16\sqrt{3}m^2$ . Find its perimeter.
2. Simplify:  $\left(\frac{64}{125}\right)^{-\frac{2}{3}}$
3. An angle is equal to five times its complement. Find the measure of the angle.
4. Find the value of the polynomial  $p(x) = 2x^3 + x^2 + x$  at  $x = -1$ .

**Section B**

5. Two sides of a triangle are 70cm and 80cm and its perimeter is 240cm. Find its area.
6. In the given figure  $AC=BD$ , then prove that  $AB=CD$ .



7. In the given figure if  $AB \parallel CD$ ,  $\angle PNA = 88^\circ$ ,  $\angle QLC = 110^\circ$  then find the measure of  $\angle PQR$



8. Find the remainder when the polynomial  $x^4 + x^3 - 2x^2 + x + 1$  is divided by  $x - 1$ .

9. Simplify by rationalizing the denominator:  $\frac{6-4\sqrt{3}}{6+4\sqrt{3}}$ .

OR

If  $x^2 + \frac{1}{x^2} = 38$ , then find the value of  $x^3 - \frac{1}{x^3}$ .

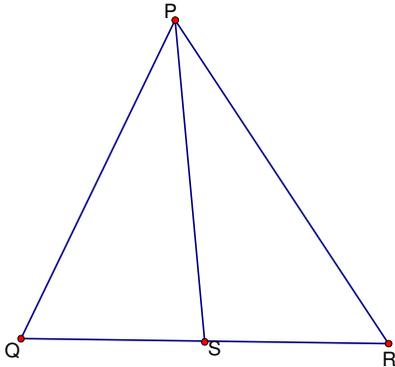
10. In which quadrant or on which axis do each of the points  $(-3,6)$ ,  $(0,5)$ ,  $(4,2)$  and  $(-1,0)$  lie?

### Section C

11. If a transversal intersects two parallel lines, prove that the bisectors of alternate interior angles are parallel.

12. Simplify 
$$\frac{(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$$

13. In  $\Delta PQR$ ,  $PR > PQ$ , and  $PS$  bisects  $\angle QPR$ . Prove that  $\angle PSR > \angle PSQ$ .



14. Represent  $\sqrt{4.5}$  on the number line.

15. If  $\frac{5+\sqrt{11}}{3-2\sqrt{11}} = a + b\sqrt{11}$ . Find  $a$  and  $b$ .

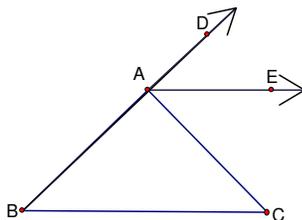
16. Prove that the perimeter of a triangle is greater than the sum of the triangle's three altitudes.

17. Factorize:  $(3x + 2y)^3 - (3x - 2y)^3$

18. ABC is an isosceles triangle in which  $AB = AC$ . Side BA is produced to D such that  $AD = AB$ .

Show that  $\angle BCD$  is a right angle.

19. In the given figure, AE bisects  $\angle CAD$  and  $\angle B = \angle C$ . Prove that  $AE \parallel BC$ .



20. Ram has a piece of land which is in the shape of a rhombus with perimeter 400m. He divides the land into two parts to give his son and daughter by drawing one of the diagonals 160m long. How much area of land will each of his children get? Has Ram done a fair distribution of his land? What can you say about his character?

### Section D

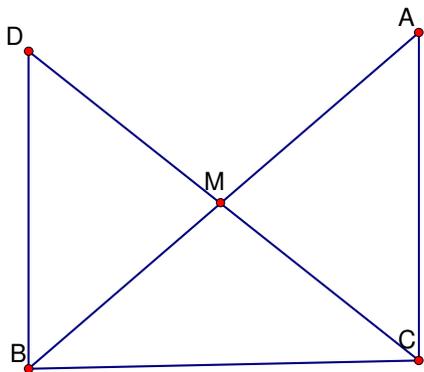
21. Factorise using Factor theorem:  $2x^3 - x^2 - 13x - 6$ .

22. Plot the points A(0,-3), B(-5,-3) and C(-5,0). Find the coordinates of D such that ABCD is a rectangle. Also find the area of this rectangle.

23. State and prove the angle sum property of a triangle.

24. In a right triangle ABC right angled at C, M is the midpoint of the hypotenuse AB. C is joined to M and produced to a point D such that DM=CM. Point D is joined to point B. Show that:

- a)  $\triangle AMC \cong \triangle BMD$       b)  $\angle DBC$  is a right angle



25. The polynomials  $ax^3 - 3x^2 + 4$  and  $2x^3 - 5x + a$  when divided by  $x - 2$  leave the remainder  $p$  and  $q$  respectively. If  $p - 2q = 4$ , find the value of  $a$ .

26. Two sides AB and BC and median AM of one  $\triangle ABC$  are respectively equal to two sides PQ, QR and median PN of  $\triangle PQR$ .

Show that: a)  $\triangle ABM \cong \triangle PQN$ ,      b)  $\triangle ABC \cong \triangle PQR$ .

27. Factorise **any two**: a)  $7\sqrt{2}x^2 - 10x - 4\sqrt{2}$

b)  $x^2 - 2x + \frac{7}{16}$

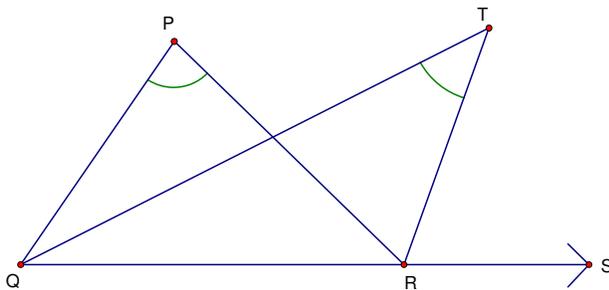
c)  $1 - 27x^3$

28. If the bisectors of  $\angle B$  and  $\angle C$  of  $\triangle ABC$  meet at  $O$  inside the triangle, then show that

$$\angle BOC = 90^\circ + \frac{1}{2} \angle A.$$

OR

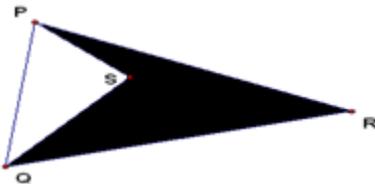
In the given figure side  $QR$  of  $\triangle PQR$  is produced to a point  $S$ . If the bisectors of  $\angle PQR$  and  $\angle PRS$  meet at point  $T$ , then show that  $\angle QTR = \frac{1}{2} \angle QPR$ .



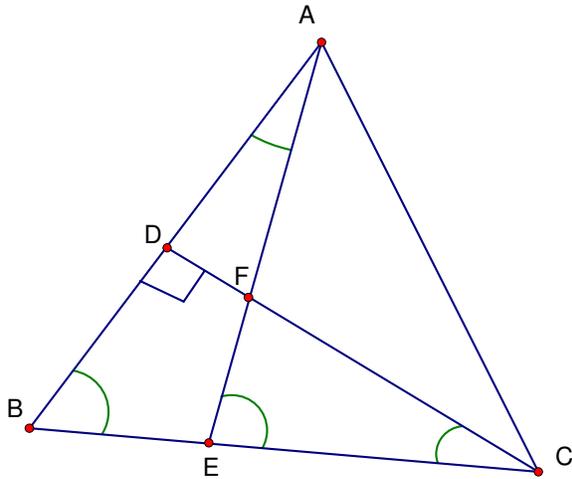
29. Simplify:  $\left(\frac{81}{16}\right)^{-\frac{3}{4}} \times \left[\left(\frac{25}{9}\right)^{-\frac{3}{2}} \div \frac{5^{-3}}{2}\right]$

30. Calculate the area of the shaded portion of the given triangle, given that  $PR = 52\text{cm}$ ,

$RQ = 48\text{cm}$ ,  $PS = 12\text{cm}$ ,  $QS = 16\text{cm}$ ,  $PQ = 20\text{cm}$  and  $PS \perp QS$ .



31. In  $\triangle ABC$   $CD$  is perpendicular to  $AB$ .  $\angle BAE = 20^\circ$ ,  $\angle BCD = 30^\circ$ . Find  $\angle ABC$ ,  $\angle AEC$ ,  $\angle EFC$  and  $\angle AFC$ .



**Second Term examination  
Sample Paper 2  
Mathematics**

**Time allowed: 3 hours    Max Marks : 90**

**General Instructions:**

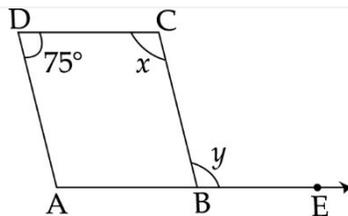
- (i) All questions are **compulsory**.
- (ii) The question paper consists of **32** questions divided into five **sections A, B, C, D and E**. **Section-A** comprises of **4** questions of **1 mark** each, **Section-B** comprises of **6** questions of **2 marks** each, **Section-C** comprises of **10** questions of **3 marks** each and **Section-D** comprises of **11** questions of **4 marks** each.
- (iii) There is no overall choice.
- (iv) Use of calculator is not permitted.

**Section-A**

**Question numbers 1 to 4 carry one mark each**

1. Express  $\frac{x}{4} - 3y = 7$  in the form of  $ax + by + c = 0$ .

2. Two students of class IX donated Rs. 300 in the Relief Fund. Represent this in the form of a linear equation in two variables.



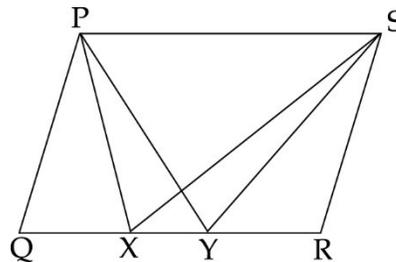
3. ABCD is a parallelogram in which  $\angle ADC = 75^\circ$  and side AB is produced to point E as shown in the figure. Find  $x + y$ .

4. If the radius of a sphere is  $2r$ , then find its volume.

## Section-B

Question numbers 5 to 10 carry two marks each

5. PQRS is a parallelogram and X and Y trisect side QR. Show that ar ( $\Delta PQX$ ) is equal to ar ( $\Delta SRY$ ).



6. Construct a triangle in which the three sides are of length 6 cm, 4 cm and 2.8 cm.
7. If diagonals of a cyclic quadrilateral are diameters of the circle through the opposite vertices of the quadrilateral, prove that the quadrilateral is a rectangle.
8. The radius of a spherical balloon increases from 7cm to 14cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.
9. The mean of 21 numbers is 15. If each number is multiplied by 2, what will be the new mean?
10. The probability of guessing the correct answer to a certain question is  $\frac{x}{2}$ . If probability of not guessing the correct answer is  $\frac{2}{3}$ , then find  $x$ .

## Section-C

Question numbers 11 to 20 carry three marks each.

11. Find the mean of the following distribution :

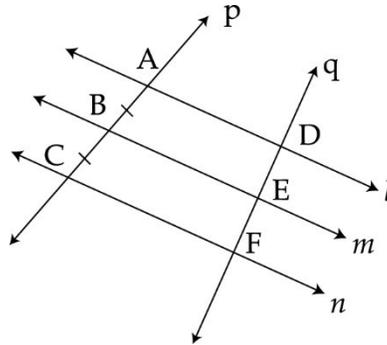
x	5	7	9	11	13	15
f	4	5	8	10	8	5

12. (a) Find the point where line  $2x + 3y = 6$  meets  $x$ -axis.

(b) Find the point where line  $4x - 3y = 9$  meets  $y$ -axis.

(c) Does the point  $(3, -2)$  lie on  $4x + 3y = 11$  ?

13. In the figure,  $l \parallel m \parallel n$  and  $p$  and  $q$  are transversals such that  $AB = BC$ . Show that  $DE = EF$ .



14. Prove that the circle drawn on any one of the equal sides of an isosceles triangle as diameter bisects the third side.

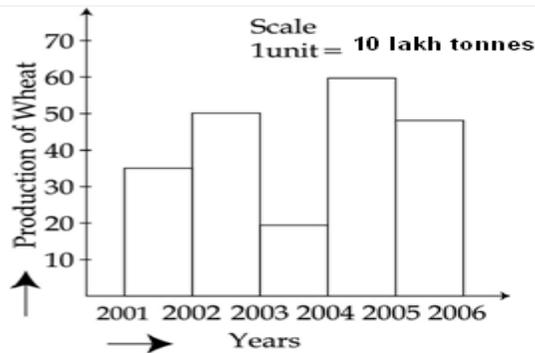
15. Draw lines PQ and RS intersecting at point K. Measure a pair of vertically opposite angles. Bisect them. Are the bisecting rays forming a straight line?

16. Construct  $\triangle MNO$  when  $NO = 3.6$  cm,  $MN + MO = 7.4$  cm and  $\angle N = 75^\circ$ .

17. If two equal chords of a circle intersect within a circle, prove that the segments of a chord are equal to the corresponding segments of the other chord.

18. A godown measures  $40\text{m} \times 25\text{m} \times 10\text{m}$ . Find the maximum number of wooden crates each measuring  $1.6\text{m} \times 1.25\text{m} \times 0.5\text{m}$  that can be stored in the godown.

19. Study the following bar graph and answer the given questions :



- (a) In which year, was the production of wheat maximum and how much?  
 (b) What is the ratio of the maximum production to that of the minimum production

20. In a bottle there are 7 red buttons, 5 green buttons and 8 purple buttons. What is the probability that randomly drawn button from the bottle is a purple button? If one extra green button is put inside the bottle. What will be the probability that randomly drawn button is purple.

#### SECTION-D

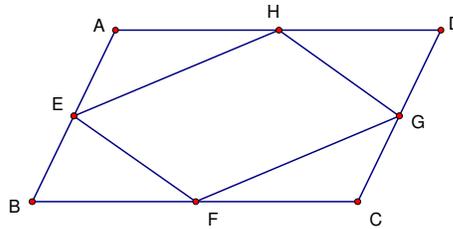
Question numbers 21 to 31 carry four marks each.

21. Half the perimeter of a rectangular garden is 36 m. Write a linear equation which satisfies this data. Draw the graph for the same.

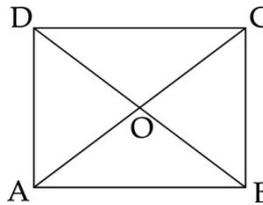
22. Draw the graphs of the following equations on the same graph sheet :

$x = 1$ ,  $y = 1$ ,  $x + y = 4$  Also, write the vertices of the triangle formed between these lines.

23. A farmer had a field ABCD in the form of a parallelogram. He wanted to divide it in two parts to distribute among his son and daughter. He took E, F, G and H as the mid points of the four sides, and joined them to get a quadrilateral EFGH. He gave the quadrilateral EFGH to his daughter and the remaining portion of the field to his son. Is the distribution justified? What values do you think the farmer possesses?



24. ABCD is a square whose diagonals intersect at O. Calculate  $\text{ar}(\text{AOB}) : \text{ar}(\text{ABCD})$ .



25. Draw any acute angle. Divide it into four equal parts using ruler and compass. Measure them using a protractor.

26. Construct a triangle given the perimeter as 12.2 cm and the base angles as  $60^\circ$  and  $90^\circ$ . (Steps of construction is not required)

27. Curved surface of cylindrical reservoir 12 m deep is plastered from inside with concrete mixture at the rate of Rs 15 per  $\text{m}^2$ . If the total payment made is of Rs. 5652, then find the capacity of this reservoir in litres. ( Use  $\pi = 3.14$  )

28. Volume of a right circular cone is  $78848 \text{ cm}^3$ . Its diameter is 56 cm. Find its total surface area. (Use  $\pi = \frac{22}{7}$ )

29. Two spheres have their volumes in the ratio 64 : 27. If the sum of their radii is 7 cm, find the difference in their surface areas. ( Use  $\pi = \frac{22}{7}$  )

30. The following table shows the number of people of different age groups travelling in a metro during a day :

Age Group (in years)	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
No of people (in hundred)	27	33	39	45	27	15

Construct a frequency polygon for the above data

31. A die is tossed 120 times and the outcomes are recorded as follows :

Outcomes	1	even no < 6	odd no > 1	6
Frequency	25	40	35	20

Find the probability of getting :

- (a) An Even Number
- (b) Find an odd number greater than 1.

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

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

### **Get To the Point**

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

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

### **Special Effects**

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

### **Colour Codes**

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

### **Text Size**

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

**Don't Use Fonts With Serifs**(thin lines) like Times New Roman.

Fonts without serifs, like Arial, are easier to read. Don't mix fonts within your presentation - a lack of consistency looks un-professional. Use left justification - it is easier to read than centered, right or fully justified text(both edges). Words/paragraphs in capital letters, italics or underlined are harder to read.

### **Best Use Of Images**

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

### **Transition Slides**

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

### **Is Your Layout Clear?**

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

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

### **Charts, Graphs and Diagrams**

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

AnswersAssignment 1(A) (Number Systems)

1.(c) 2 and /or 5

2.(a)  $\frac{5}{9}$

3.(c)

4.(c)

5.(i),(v),(vi) are rational numbers and (ii),(iii),(iv) are irrational

7. (i) 18 (ii)  $5\sqrt{34}$ 

8.(i)  $\frac{21}{4}$  (ii)  $\frac{8}{3}$

9. (i)  $2880\sqrt{2}$  (ii) 0

10. (i)  $\frac{1547}{495}$  (ii)  $\frac{277}{55}$  (iii)  $\frac{283681}{499950}$  (iv)  $\frac{17}{11}$

11. (i)  $54 - 7\sqrt{6}$  (ii)  $8\sqrt{15} + 6\sqrt{10} - 15\sqrt{6} - 60$

Assignment 1(B)

1. (a)  $\frac{\sqrt{2} + \sqrt{3}}{2}$  2.(b) 0.9

9.  $2\sqrt{3}$

3.(a) infinitely many

10.(i) 3.968 (ii) 3.256

4.(c)  $5^{10}$  5.(a) 144

11.(i)  $\frac{375}{16}$  (ii) 1 12. 0.037

6.  $\frac{25}{7}$  7.(i)  $\frac{8\sqrt{30}+39}{21}$  (ii)  $\frac{47+21\sqrt{5}}{2}$

13. 1

8.(i)  $a=0, b=1$  (ii)  $a=\frac{-179}{171}, b = \frac{-20}{171}$

14.  $x=3$  15.  $x=5$

Assignment 2(A) (Polynomials)

1.(b) 16

7. -1

2.(a)  $(a+10)(a-9)$ 

3.(b) 5

9.  $p=1, -1$  when  $p=1, (x-2)(x-1)$  when  $p=-1, (x+4)(x-1)$ 

4.(c) 90000

5.(c)  $x^3 + y^3$ 

10.  $a = \frac{64}{51}$  11.  $m = 3$  12.  $(x+1)(2x-1)(3x-5)$

6. Yes

**Assignment 2(B)**

1. (b)  $2a^2 + 2b^2$
2. (c)  $9a^2 + 3a + 1$
3. (a) -1260
4. d)  $\alpha = 2, \beta = 0$
5. (a) 17
6. (i)  $(5x + 4\sqrt{5})(\sqrt{5}x + 2)$   
 (ii)  $(x + 2\sqrt{3})(x + 7\sqrt{3})$   
 (iii)  $(x + 5)(8 - x)$   
 (iv)  $p(3p + 5)(p - 2)v(5x^3 + 3)(x^3 - 2)$
7. 52
8. 1664
10. (i)  $2x(x^2 + 12)$   
 (ii)  $(x + 3y)(x - 3y)(x^4 + 81y^4 + 9x^2y^2)$   
 (iii)  $(\sqrt{2}a + 2b - 3c)(2a^2 + 4b^2 + 9c^2 - 2\sqrt{2}ab + 6bc + 3\sqrt{2}ac)$   
 (iv)  $18(x + y)(x + 5y)(5x - y)$
11.  $2\sqrt{2}a^3 + 3\sqrt{3}b^3 + c^3 - 6\sqrt{6}abc$
12. 364
13.  $(a+b)(b+c)(c+a)$
- 14 (i)  $xy\left(2x + \frac{y}{5}\right)\left(4x^2 + \frac{y^2}{25} - \frac{2}{5}xy\right)$   
 (ii).  $(x - 2y - 1)(x^2 + 4y^2 + 1 + 2xy - 2y + x)$   
 (iii).  $(1 + y)^3(4x + 9y)(16x^2 + 81y^2 - 36xy)$

**Assignment 3(Coordinate Geometry)**

- 1.(b) 3<sup>rd</sup> and 4<sup>th</sup>
- 2.(a) (-6,0)
- 3.(b) 2<sup>nd</sup> quadrant
- 4.(a) x axis
- 5.(b) 8 units
- 6.(i) (-5,3)  
 (ii) ordinate, abscissa
7. A rectangle
8. (0,0),(6,0),(6,4),(0,4)
9. (7,3) area=21sq units
10. x axis ,y axis, III quadrant, III quadrant. R and S represent different points.

**Assignment 4(Euclid's geometry)**

1. (b) 4    2. (b) corollary    3. (b) parallel lines    4. (d)    5. (a) 1
6. axioms, postulates    7. equal    8. infinite    9. is equal to    10. Parallel

**Assignment 5(Lines and Angles)**

- 1.(a)  $40^\circ$     2.(a)  $90^\circ$     3.(c)  $108^\circ$     4.(b)  $30^\circ$     5.(b) a right angled triangle  
 6.  $x=10^\circ$     8.  $20^\circ, 70^\circ, 90^\circ$     11.  $115^\circ$

**Assignment 6(Triangles)**

- 1.(b) an isosceles triangle    2.(c) 2: 1    3.(a)  $AB > AC$     4.(d)  $ABC \cong FED$     5.(c)  $3\text{cm}$

**Assignment 7(Heron's Formula)**

- 1.(d)  $40\text{ sq.cm}$     2(a)  $16\sqrt{3}\text{ sq.cm}$     3(b)  $10\text{m}$     4(d)  $48\text{ sq.cm}$     5.  $10\sqrt{3}\text{cm}^2$     6.  $36\text{cm}^2$   
 7.  $30\text{ cm}$ , area =  $600\text{ sq.cm}$     8.  $20\sqrt{2}\text{cm}$     9.  $384\text{ sq.cm}$     10.  $1.6\text{ grams}$     11.  $412.37\text{cm}^2$

**Assignment 8(Linear Equation in One Variable)**

- 1.(c) infinite    8. (i) No (ii) Yes  
 2(c) x axis    10. y axis intersection  $(0, -3)$  and x axis  
 3(b)  $(5, 2)$     intersection  $(6, 0)$   
 4(d)  $(m, m)$     12. (i) No (ii) Yes (iii)  $y = -6$  (iv)  $x = -4$  (v)  
 5(c)  $(5, 0)$     x axis intersection is  $(4, 0)$  and y axis  
 6. (i)  $(0, 4)$ ,  $(4, 3)$ ,  $(16, 0)$  (ii)  $(0, 0)$ ,  $(7, 2)$ ,    intersection is  $(0, 6)$   
 $(14, 4)$  (iii)  $(0, 2)$ ,  $(6, -2)$ ,  $(3, 0)$     13. Rs.414  
 7. (i) 0 (ii) 0    14.(i) 45 km (ii) 225 km  
 15.  $(5, 2)$

**Assignment 9(Quadrilaterals)**

- 1.(c) rectangle    2(b) all four sides are equal    3(b) supplementary    4(c)  $90^\circ$   
 5. (c) kite    6.  $\angle ACB = 64^\circ, \angle ABD = 26^\circ$     8.  $108^\circ$     9.  $CD = 8\text{cm}$ ,  $AD = 5\text{cm}$   
 $\angle A = 70^\circ, \angle D = 110^\circ$     10.  $\angle DBC = 65^\circ, \angle DCA = 25^\circ$

**Assignment 10(Area of Parallelogram and Triangle)**

- 1.(c) Fig A and B may or may not be congruent    2(b) 4 sq cm    3(c) 30 sq.cm  
 4(b) 1: 2    5(d) need not be any of a, b or 3    6. 31.875 sq.cm    7. 6 cm

**Assignment 11(Circles)**

- 1.(a) 26 cm    2. (c) rectangle    3(c) a segment    4(a) one    5(d)  $\frac{1}{\sqrt{2}}AB$     7.  $40^\circ 8'$   
 $\angle BCD = 100^\circ, \angle ECD = 45^\circ$     9.  $70^\circ, 110^\circ, 110^\circ$     11.  $\angle BDC = 80^\circ, \angle BEC = 100^\circ$     12.  
 $\angle CED = 40^\circ$

**Assignment 13(Surface Area and Volume)**

- 1.(c) 164 sq.cm    2(c) 1:4    3(d) 2.0 cm    4(d) 2310 sq.m    5(d) 10.5 cm  
 6. 88 sq.m, Rs 440    7. 1 : 1    8. 17m    9. 1056 sq.cm, 1458.2 sq.cm, 4224 cu.cm  
 10.  $r = 7$  cm, 2772 cu.cm    11. Rs 1406.25    12. 1.232 l    13. 3168 sq.cm    14. 3.5 cm  
 15. 72    16.  $r = 1.5$  m ,  $h = 14$  m

**Assignment 14 (A) (Statistics)**

- 1.(b) 52    2(b) 73(c) 5.6    4(c)  $x+3$  5(b) 166. 26    7. 21    8. 33, 34  
 9.  $p = 4, q = 3$     10. 12    11. 39.7    12. (i) 11 (ii) 11 (iii) 112 (iv) 11.2    13. 21.5

**Assignment 15(Probability)**

1. b) 0.70    2. b)  $\frac{1}{3}$     3. b) 0.56    4. a) 0.65    5. d) 18    6.  $\frac{2}{5}$   
 7. a)    b)    c)    8.  $\frac{2}{11}$     9. i)  $\frac{13}{25}$     ii)  $\frac{193}{400}$     10.  $\frac{3}{25}$     11. i)  $\frac{5}{9}$     ii)  $\frac{4}{9}$   
 12.  $\frac{23}{100}$     13. i)  $\frac{11}{100}$     ii)  $\frac{7}{100}$     iii)  $\frac{14}{25}$     iv)  $\frac{9}{50}$     14. i)  $\frac{3}{10}$     ii) 0    iii) 1