OBJECTIVE

It includes detailed information about the scheme of continous and comprehensive evaluation. Continous and comprehensive evaluation associated with he holistic assessment of a lianes which includes with scholastic and cholecystic aspect of leases growth.

Present manual provide detailed guidelines on Methodology of evaluation techniques and tools of evaluation in Mathematics at secondary level.

Information regarding about phasing out of Board Exam at the end of class-Xth, 2 the introduction of grades in place of marks in class-IX and X has been included in this manual. Need of about changes has been explained in this manual.

Problem in school mathematics education and its remedies has also included in this manual.

I hope that teachers of school find this manual is a useful tool which will equip them to cope up with rapid changers in school education system. Teacher will use this manual for the formative 2 summative assessment in mathematics.

Focus on learning outcomes

Developing children's abilities for mathematisation is the main goal of mathematics education. The narrow aim of school mathematics is to develop 'useful' capabilities, particularly those relating to number operation like addition, substraction, division and multiplication, measurement, decimals and percentages. The higher aim is to develop the child's resources to think and reason mathematically, to pursue assumptions to their logical conclusion and to handle abstraction. It includes a way of doing things, and the ability and the attitude to formulate and solve problems.

Aim of curriculum to achieve the higher aim mentioned about, rather than only the narrower aim.

Some Problem is school mathematics education

1. A minority of children have a sense of fear and failure regarding mathematics. Hence, they give up early on and drop out serious mathematical leaning.
2. The curriculum is disappointing hot only to this non participating majority but also to the talented minority by offering them no challenges.
3. Problems, exercises and methods of evaluation are mechanical and repetitive 2 too much emphasis given on composition. Areas of mathematics such as analytical reasoning, logical reasoning not developed in the curriculum.

Teachers have look of confidence, preparations and support. Teacher still uses the old traditional method lock of infrastructure, most of the school do not have a space for opening maths lab.

The twin concern of mathematics curriculum are : What can mathematics education do to engage the mind of very student, and how can it strengthen the student resources?

Mathematics is a compulsory subject at the secondary stage. Most of the skills taught in primary school mathematics are useful. Curriculum at primary level designed to prepare child for secondary education it serve only the 'narrow' aim of education. Reconstruction of curriculum required to achieve 'highes aims' mentioned about will make better use of time that children spend in school in times of the problem solving and analytical skills that it builds, and in preparing children to meet a wide variety of problems in life.

Vision for school mathematics

1. Children leain to enjoy mathematics rather than feas it.
2. Children learn Important mathematics: Mathematics is more than formulas and mechanical procedures.
3. Children see mathematics as something to talk about, to communicate through, to discuss among themselves, to cork together on children pose and solve meaningful problems.
4. Children understand the basic structures, to reason out things, to argue the taught and falsity of statements.
5. Children understand the basic structure of mathematics, Arithmetical, Algebra, Econmetry and trignometry, the absic content areas to school mathematics, all offer a methodology for abstraction, structureation and generalisation.
6. *Teacher engages every child in a class with the conviction that every one can learn mathematics many general tactics of problem sowing can the taught progressively during the different stages of school: abstraction*, quantification, analogy, case analysis, reduction to simple situation are useful in many problem-solving on text.

Simple situation are useful in many problem-solving on text.

More ever when children learn variety of approaches (over time), their tool kit become richer and they also learn which approach is the best, children also need exposure to use of 'heuristics' or rules of thumb rather than believing that mathematics is exact seance. Student should also know about estimation of qualities and appronimating solution is also essential skills.

School curriculum plug major role in developing such useful skills.

Visulisation and representation are skills that mathematics can help to develop. Modelling situation using quantities, shapes and forms are the best use of mathematics. Mathematics concepts can be represented in multiple ways and these representations can serve a variety of purpasision different context. All of this adds to power of mathematics. The representation p/q can be used to denote a fraction part of the whole, but also denote the quotient of two numbers p and q learning this about fractions is as important, it not more, than learning the arithmetic of fractions.

There is also a need to make connections between mathematics and other subject of study. When children able to graph graphs, they should also be encouraged to think to functional relationships in the sciences. In physics according to ohm's law. Voltage is directly proportional to applvel current or in other word there is a linear relationship between theses two quantities. If we dotted graph between these two physical quantities we get straight line. Our children need to appreciate the feat that mathematics is an effective instrument in the study of sciences.

The importance of systematises reasoning in mathematics can not be over emphasised, and is intimately bied to nations of aesthetics and elegance so deal to mathematisations. Proof is important, but in addition to dedicative proof., children should also learn pictures and construction can provide proof., school mathematics should encourage proof as a systematic way of arguementation.

The aim should be develop arguments, evaluate arguments, make and investigate conjectures, and understand that there are various method of reassign.

Mathematics communication is precise and employs unambiguous use of language and regions in formulation, which are important characteristics of mathematical treatment. The use of Jargon in mathematics is deliberate, conscious and stylised. Mathematician discuss what is appropriate notation since good natation is held in high esteem and believed to aid thength. As children grow order, they should be taught of appreciate the significance of such convention and their use. For example setting up of equation should get as much as coverage as solving the

for example $1 + 2 + 3 + 4 + 5 \ldots 10$

can the represented $\sum_{x=1}^{10} x$

Sum of first ten natural numbers can be represented by these two methods. But if the number are large in quantity second method is more convenient.

$1 + 2 + 3 + 4 \ldots 100$

$\sum_{x=1}^{100} x$

'Continous' and 'Comprehensive' Evaluation

This content refuse to a system of school based evaluation of student that covers all aspect of students development. As the nomen culture also suggests, this new pattern in evaluation is not one, two, three times a year but continous one it is a developmental process of assessment which emphasizes on two fold objectives these objectives are continuity in evaluation and assessment of broad based learning and behaviourial out comes on the other. It is a total teaching learning process and spread new the entre span of academic session. It means *Regularity of Assessment, frequency of unit testing, diagnosis of learning gaps, use of corrective measures, restituting* and feed back to evidence to teacher and students for their self evaluation.

Second term comprehensive mean that the scheme attempts to coves both the scholastic and the coscholastic aspects of student growth and development. CCE therefore a paradigm shift in evaluation, shifting the focus from testing to holistic learning. It aims to create good citizens possessing sand health, appropriate skills and desirable qualities ..... academic excellence.

Aims of CCE

1. To help develop cognitive, phychometor and affective skills.
2. To lay emphasis on thought process and de-emphasis memorization.
3. To make evaluation an integral part of teaches learning process.
4. *To use evaluation* for improvement of students achievement and teaching-learning stratgies on the bases of regular diagnosis fallowed by remedial instruction.
5. To use evaluation as a quality control devise of maintan desired standard of performance.
6. To determine social utility, desirability or effectiveness of a programme and take appropriate decisions about the learning, the process of learning and learning environment.
7. To make the process of teaching and learning a leases–centred activity.

NEED OF CCE

Examinations are the important part of education system. It is necessary to determine the effectiveness of teaching learning process. Various commissions and committees have but the need of examination reforms Hunter Commission (1882), Calcutta University Commission on Sadlar Commission (1917-19), Hartog Committee Report 1929, The report of central Advisory Board 1944, Secondary education commission/ Mudalias commission 1952-53 have all made recommendation regarding reducing emphasis on interrenal examination and encouraging internal assessment through continous and comprehensive evaluation.

Also national policy on education 1986 state that "Continuous and comprehensive evaluation that incorporates both scholastic and co-scholastic aspects of evaluation spread ones total span of instructional time.

The Kothari Commission Report 1966 observed, "on the completion of the course, at the end of the loves or higher secondary stage, the student should receive a certificate from the school also giving the record of his internal assessment. As contained in his cumulative record. This certificate may be attached to that given the board in connection with the external examination. It further adds, 'This internal assessment or evaluation conducted by the schools is of greater significance and should be given increasing importance. It should be comprehensive, evaluating all these aspects of student growth that are measured by the external examination and also those personality parts and attitudes which can not be assessed by it.

"Learning without Burden"—A report of the national advisory committee by the ministry of Human resource development, department of education, govt. of india has stated that.

"Board examination, taken at the end of class Xth and XII have remained rigid, bureaucratic, and essentially undeductive.

Accordingly, national curriculum frame work 2005 (NCF 05) proposing examination reform stated "Indeed, boards should consider, as a long term measure, making the class Xth examination optional, this permitting students centering in the same school (and who do not need a board certificate) to take internal school examination instead.

As a sequel to above, the position paper on 'Examination reforms' by NCERT 2006, says.

"Indeed, it is one view that the tenth grade exam to made optional forth with. Tenth grades who intend continuing in the eleventh grad at the same school and do not need the board certificate for any immediate prepare, they should be free to taken a school-conducted exam instead of board exam.

So, evaluation must be continues and goal directed and revets the strength and weakness of learnes more frequently, so that the learnes have better opportunity to understand and improve themselves. It also provides feed back to the teaches for modifying their teacher strategies.

Functions of CCE

In teaching leaning process, the evaluation is expected to take care of scholastic and coscolstic aspects. It a child is weak in some area, diagnostic evaluation and remedial measures should be adopted. Continuous evaluation helps in bringing awareness of the achievement to the child, teachers and parents from time to

time. They can look into probable cause by the fall in achievement if any, and many take remedial measures of instruction in which more emptans is required.

Many times, because of some personal reasons, family problems or adjustment problems, the children start neglecting their studies, resulting in sudden fall in their achievement. If the teacher, child and parents do not come to know about this sudden fall in the achievement and the reflect in students by the child continoues for a longer period than it will result pour achievements and permanent deficiency in learning for the child.

Continues evaluation help in regular assessment. By *continues* evaluation student *can know their strengths* and *weaknesses.* It helps teacher to organize effective teaching strategies. It provides information/ reports on the progress of students in scholastic and co-scholastic areas and thus helps in predicting the future success of the learner.

It provides the child a realistic self assessment of law he/she studies. It can motivate children to develop good study habits, to correct errors and to direct their activities towards the achievement of desired goals. It provides immediate feed back to the teachers. Who can decade whe/his a particular concepts needs reteaching in the whole class or whe this few individuals are in need of remedial instruction. The major emphasis of CCE is on the continuous growth of students ensuring their intellectual, emotional. Physical, cultural and social development and therefore will not be more limited to assessment of learners scholastic attainments. It uses assessment as a means of motivating learners in further programmes to provide information for arranging feed back and fallow up work to improve upon the leaning in the classroom and to present a comprehensive picture of a learner's profile.

There are two type of assessment.

Formative and summative

Formative

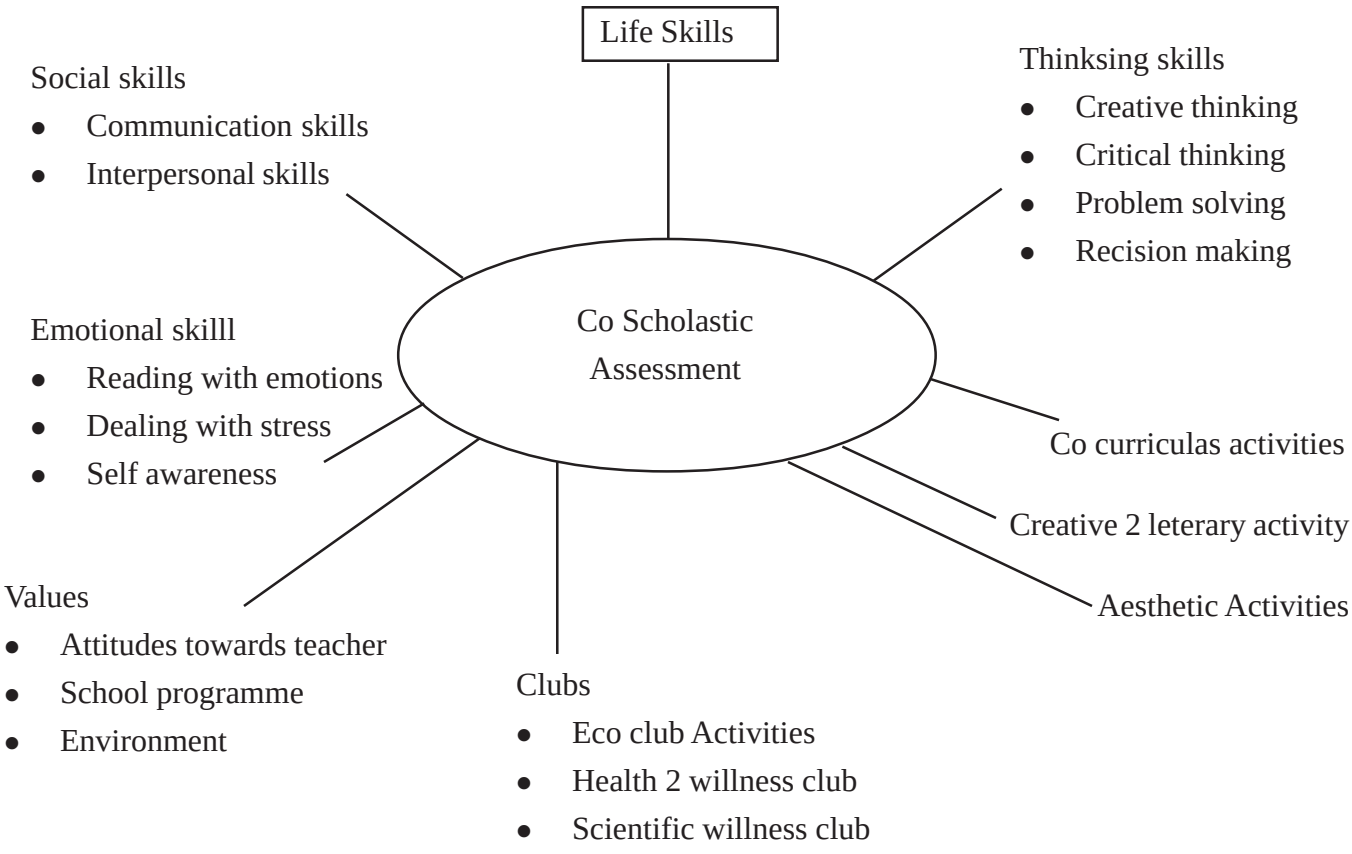
1. '...of ten means no more than that the assessment is carried out frequently and is planned at the same time as teaching. (Black 2 Wiliam 1999).
2. '...provides feedback which leads to students recognizing the (learning) gap and closing it...it is perward looking. (Harlen 1998)
3. '...Includes both feedback and self monitoring'. Sadlu 1989
4. '...is used essentially to feedback into the teaching process.

Summative

'...assessment (that) has increasingly teen used to sump learning. (Black 2 Wileam 1999)

'...looks at past achievement...adds procedures or tests to exesting work...involves only marking and feedback grades to student...is separted from teaching...is carried at intravls when achievement tees to the summarized and reported.

It is a terminal assessment at the end of learning. It is a treatment type form of pen pates test.


Life Skills
Social skills
• Communication skills
• Interpersonal skills
Thinksing skills
• Creative thinking
• Critical thinking
• Problem solving
• Recision making
Emotional skilll
• Reading with emotions
• Dealing with stress
• Self awareness
Co Scholastic Assessment
Co curriculas activities
Creative 2 leterary activity
Aesthetic Activities
Values
• Attitudes towards teacher
• School programme
• Environment
Clubs
• Eco club Activities
• Health 2 willness club
• Scientific willness club

Excellence in diverse Areas should be recognised and rewarded. And it is childrens responsiveness to what is taught rather these just their capacity to retain it that should be the focus of evaluation.

Position paper on Aims of education NCF 2005.

Past Practices

Previously external examination are the dominating part to evaluation. The whole teaching process began to be grated towards the public examination. Process of evaluation was not comprehensive and continous. It was not child centrad and unable to evaluate all round development of child.

Main short coming of traditional external examination are tested below :

1. It is a one shot examinations the end of a year at the terminal stage of scholastic. It mainly evaluates only the scholastic aspects of learning of the student.
2. It does not evaluate all the abilities of the children. On the basis of marks obtained in written examination the student are declared pass or fail and fullness classified into predetermined divisions.
3. Pass and fail system causes frustration and is inhumane because the failed candidates come to free that they are good for nothing.
4. Co scholastic areas of totally ignored have no place in the currently prevalent scheme of education and evaluation.
5. Practice of testing untaught select also reflect poor learning achievement.
6. Only limited techniques of evaluation are used without potential for judging a student.
7. The aim of evaluation is to improve the learner is quality which is not served by external examination.
8. The current practice of awarding marks suffers from many discrepancies due to variety of errors.
9. The varies ranges of obtained scores of students in different subject creak the problem in declaring reliable results.
10. Analysis and interpretation of the results in not done in a scientific way.

New Expeetation

School based evaluation should be *child centred, school centred* and multidimensional. It should encourage all kinds of learning in life both inside the schools as well as outside. It should builds on individual child's abilities, progress and development in achieving already set goals and objecties of educations as an individual and not Just his/her postion in relationship other learners.

New evaluation should be school central also it means no outside agency interfire in the evaluation process. It should be entirely school taxed and done by the teacher the teacher is trusted and given full responsibility to evaluate his student because teacher know best about his student.

School based evaluation should be multidimensional in it should take care of leaner social, emotional physical, intellectual and other areas of development. School based evaluation must be transparent; futuristic and provides more scope for association among learners, teachers and parents.

Modalities of CCE

- Elimination of chance element and subjectivity (as far as possible), de emphasis of melanisation, encouraging comprehensive evaluation incorporating both scholastic and co-scholastic aspects of learners development.
- Continous evaluation spread other the total spass of the instructional time as an integral failt in aspect of the total teaching—learnign process.
- Functional and meaningful decloration of results for effective use by teachers, students, parents and the society.
- Wides uses of test results for purposes not nearly of pupils achievement and projiciencies, but mainly for its improvement, through deagnosis and semedeal programmes.
- Introduction of semester system from the secondary stage on wards.
- The uses of grades in place of marks determining and declaring the level of pupil performance and projiciently.
- Improvement in the mechanics of conducting examination for realizing a number of other allied purposes.
- Introduction of concomitant change in instructional naturales and methodology.
- Reduce stress on children.
- Produce learner with greater skills.
- Provide space for the teacher for creative teaching.

Evaluation of Scholastic Aspect

Schools should conduct their own assessment, school

— Shold not restrict themselves to paer pencil tests. Assessment will be written as will as oral tests, it could also include prpojects/activities/quizzes/assignemnt/class work/Home work. Basis Aim of FA is to disconrage traditional way of testing.

Type of Assessment	***Percentage of Weightage in Academic session***	***Month***	***Term wise weeghtags***
FIRST TERM			
FA 1	10%	April May	FA 1 + 2 = 20%
FA 2	10%	July Aug	
SA 1	10%	September	SA = 20%
SECOND TERM			
FA 3	10%	Oct-Nov	FA 3 + 4 = 20%
FA 4	10%	Jan-Feb.	
SA 2	40%	March	SA – 2 = 40%

Total formative assessments = FA 1 + FA – 2 + FA – 3 + FA – 4 = 40%

Summative assessments = SA – 1 + SA – 2 = 60%

Formative Assessment Scheme in Gen

Focuss on Formative Assessment

↓

Share the learning outcome and assessment expectations with student

↓

Use clearly defined criteria

↓

Use examples and examples

↓

Give specific feeback and feed forward

↓

Which will help

↓

Incorporate student self assessment

↓

Student keep a record of their progress

↓

Teacher keeps seconds of student progress

18 Tools of Formative Assessment in Mathematics

In mathematics formative assessment can be done by using following Method

- Problem solving
- Data Handling and Analysis
- Invertigative projects
- Maths lab activities
- Research project and presentation
- Group projects
- Peer assignemnt
- Presentation Including the use to IT

Flow Chart (How to Apply FA on class)

- Prepare assignemnt on a topic which assesses a variety of skills (Problem solving, graphical analysis, data handling 2 reasoning)
- Which marking assignment Identify the key areas where student need help.

- Explain these to student using examples and showing examples work.
- Give another Assignment to the student which to assessing the identified skills.
- Allow the student the opportunity to improve on work done.

Student begins session in April and it is recommended that FIA begin in April or at the beginning of new session. In mathematics not out fair assessment should be based on maths lab activity.

April to May → Group projects — problem solving—Maths lab Activity.

No-Dec → On line test using IT/Assignment

Jan&Feb → In grent maths lab activity

There could be a number of class test/unit tests with the percentage begin finally reduced to the prescribed norm.

Observation in Maths using a checklist

1. Poes the child have good understanding of the concepts Yes/No
2. Has the child worked with precision, neatness and accuracy Yes/No
3. Can the child interpret word problem into mathematical form Yes/No
4. Can the child think logically and pahonally Yes/No
5. Can the child intapret data Yes/No
6. Can the child able to ..... the problems Yes/No
7. Does child solve problem accurately Yes/No

Projects

These are undertaken over a period of time and generally invalves collection and alalysis of data. Projects are useful in theme based taks to be completed as class work/Homework. Projects cna be both individual or group based. They should be tased on centrents outside the text took and related child environmnet, culture and life style.

Advantage of projects

Provide opportunities to explase and work with one's hand.

Provide opportunity to work in groups and in real life situations.

Help develop a positive attitude towards group work, sharing and learning from each other.

Observe, collect data, analyze, organize and interpret data and draw generalizations.

Concern Regasdign Project

1. The nature and difficulty levle of the projects shoudl be such that students can do it by themselves.
2. Materials to be used for the project available in school, nighbourhood or home setting. There should not be pur financial burden on parents.

Checklist of Projects in Maths

1. Is approach towards the project orginal. Yes/No
2. Is the content and information autherntic and relevant. Yes/No
3. Is the presentation of the project aesthetically. Yes/No

4. Is the projects supported with proper write up. Yes/No
5. Has the result been interpreted approprately. Yes/No
6. Is the contnet of project aceurate. Yes/No
7. Is the project based on experimentation or survey. Yes/No

Questions

An excellent way of finding out what children know, think imagine and full. The learner can be assessed through questions and problem. Even the ability to make a set of questions for gives answers is a valued test of learning.

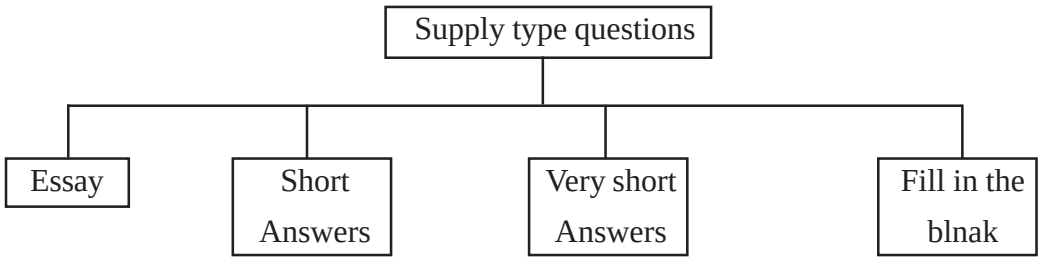
Characteristics of good question

1. **Objective based.** A quations shoudl be based on pre determined objective and shoudl be graned is such a way that is testss the objective effectively.
2. **Content.** The question should test the same area of content which is intends to test.
3. **Difficulty level.** A Question shoudl be written keeping in view the level the students for whom is it meanl. The difficulty of the questions depends upon the ability to be tested, the content area to be tesed and the time avialable to answer it.
4. **Language.** A good question is framed in a clean, precise and unambiguous languages, will with in the comprehension of the students.
5. **Value points.** Marks carried by a questions as a whale and also its sub parts should be clearly mentioned.

Type of Question

Supply type questions

In this type of questions students has to supply the answer. Such type of question also called 'free response' question. Only applicaton of formula is required to answer the question. There are many abilities which amy not be tested through these type of question. Supply type of question may be divided into fair categories—essay type—short answer type very short answer type and fill in the blanks type.



These type of question usually asked interregional board examination system. Marks obtained by student depend on examiners efficiency.

Selection type question

In these type of question students are supposed to answers them by selecting the correct answer among the provided choices. Such question are also known as objective type question. These may be divided into alternative response type, Matching type and multiple choice type questions.

Selection type question are all objective type question. Objective type questions have only one correct answer which the student has to chouse out of given choices. As these questions can be marked objectively they are called objective type question. This means that all the examine will get same marks no mathes who evaluate the question. These method are popular when large number of candidates to be tested.

Alternative response type

In these type of question students have to select one out of two alternative as a correct answer.

(a) True-False/Yes-No questions

In this type of questions a statement is given and candidates is asked whether it is true or false (T/F). T/F questions are easy to construct. They provide a fairly reliable measrue of student understandign particularly in the class rooom testing.

Exp. Write (T) if statement it Ture and (F) if the statement is False.

- $\sqrt{9}$ is irrational number ☐
- is a rational number ☐

Exp. Put bick (√) mark if statement is true and (×) if statement is wrong.

- There are infincte rationa number between 2 and 3. ☐
- $x^2 + 2x + 1$ is a quadratic polynomial ☐

Matching type

In this type two coloums are used. In left coloums stimuli are presented wheats in right colum responses are given. Students are asked to match responses with given stimulti.

	Coloum A	*Coloum B*
A	Integers	1, 2, 3, 45...
B	Natural Number	....–2, – 1, 0, 1, 2, 3...
C	Prime Number	$\sqrt{3}$, , π, ,...
D	Irrational number	2, 3, 5, 7, 11...

Double Matching

In this type of item, one list of stimuli is provided to test two area of knowledge. So three coloums are used on stead of two coloums.

Put *appropriate number and letter in columns I and III*

	Column I		Column II		Column III
1.	Quadratic polynomial	(*a*)	$x^4 - 1$	A	2 2 3 are the of polynomial zeros
2.	Linear polynomial	(*b*)	$x^2 + 5x + 6$	B	2 is one of the zero of polynomial
3.	Cubical polynomial	(*c*)	$x^3 - 8$	C	$x - 4$ is the zero of polynomial
4.	Biquadratic polnomial	(*d*)	$x^2 - 9x + 20$	D	$x = 1$ is the zero of polynomial

Matric Items

These are extensions of double matching type items more than two responses are linked to a stimuli. IN such type of items, stimuli are presented vertically where in responses are presented horizontally. Students are asked to check each cell in which the response across the top is true to each of the stimuli along the side.

$\sqrt{a} + 1$

NumberItem prime Number	*Neither composite Nor Prime*	*Irrahonal Number*	*Rationa Number*	*Integers*
2				
$\sqrt{2} + 1$				
1				
π				
– 8				
0				

Multiple choices

MCQ are most useful of all objective type items. In these questions there is a stem which passes the problem. The stem may be in dueshan form or in the form of then incomeplete statement.

There are four or five choices are given and student have to select correct answers. Multiple choice questions may be of two type.

1. Question from

   What is the HCF of two consecutive integers x and xH

   (*a*) x (*b*) $x + 1$ (*c*) 1 (*d*) 0

2. Incomplete statement form

   A quadratic polynomials has—

   (*a*) at least one zeros (*b*) exactly two zeros

   (*c*) at most two zeros (*d*) exactly one zeros

Unit text/assignment based on these type of question. FA may contain (10 + 15) questions for the duration of one of two period.

— —

Orals tests may be conducted in group/individual to assess the child. If student give quick 2 correct response it means he is good is problem solving. If student taken time is means he knows the concept 2 need some practice give quick answer. Maths quiz is also the pert of oral. It is unique way to involve the whole class in learning process divide the whole class in small group fair and five children and ask four to five dueshan from each group. If one group unable to answer to question pass to another group. Note ... question should be asked from each group.

Assessment of Gaps

Areas of Concern

Corrective Mesures

1. The early monitoring of formative assessment data will ensure that final summative assessments do not come as a surprise to parents. There should not be large gap in result of formative assessment and summative assessment. Every effort should be put into monitoring and moderation of teacher assessment by principal as in appropriate assessment may expose the school to negative scrutiny.
2. No educational scheme can be succeed unless the teachers are adequately prepared by executing it and home a faith in it's worth. Teachers need to be provided orientation about the scheme. For providing ornamentation trained resource persons need to the created. Content of such training programmes, has to incorporate both scholastic and co scholastic areas of learner's growth. In invalues preparation of objective based questions and balanced question papers, scoring of scripts and analysis and declaration of result.

   There course will also need to cones preparation and use of rating scales, inventories, checklists, sheedules and procedures of assessing different area of skills. Training in methods of collecting, recording, compiling and interpreting evidences of learners growth will be the other aspect. Teacher along with heads of their institutes should develop professional learning networks, monitoring and coaching.

(1) Being class about why you are assessing the child.

(2) No labelling children as, slows, poor, intelligent dull on making comparison's between children.

(3) Using a variety of ways to collect information about child learning.

(4) Collect information continuously and recording the same.

(5) Give importance to each child's way of responding and learning.

(6) Not to make any negative statements or use of technical language during assessment or while providing feed back to purents.

(7) Provide feedback in simple and deas language which will bad to positive action and help the child to do better.

REAL NUMBERS

SECTION A

Multiple choice questions :

Choose the correct answer from the given option—

1. How many rational numbers are there between 7 and 13 ?

   (*a*) 5 (*b*) 6 (*c*) 7 (*d*) Infinite

2. A rational number between and is

   (*a*) (*b*) $\frac{\sqrt{2}.\sqrt{3}}{2}$ (*c*) 1.6 (*d*) 1.7

3. cna be rewritten as

   $\frac{\sqrt{3}\sqrt{3}}{\sqrt{}}$

   (*a*) $(4)^7$ (*b*) $(4)^{12}$ (*c*) (*d*)

4. The sum of a rational and an irrational number is

   (*a*) an integer (*b*) a rationa number

   (*c*) irrational number (*d*) none of these

5. When of the following number is rational

   (*a*) (*b*) (*c*) (*d*)

6. is

   (*a*) A rational number (*b*) An irrationa number

   (*c*) Integer (*d*) None of these

7. The square of an irrational number is

   (*a*) Always a natural number

   (*b*) Always an irrationa number

   (*c*) Always a rationa number

   (*d*) Sometime rational, sometime irrational number

8. The product of any two irrational numbers is

(*a*) Always rational (*b*) Always an integer

(*c*) Always an irrational number (*d*) None of these

9. Rationalisation factor of the denominator of the expression $\frac{1}{\sqrt{3}-2}$ is

(*a*) (*b*) $3-\sqrt{2}$ (*c*) $\sqrt{3}+2$ (*d*)

10. $\left[\left\{(625)^{\frac{1}{4}}\right\}^{\frac{1}{2}}\right]^4$

(*a*) 125 (*b*) 25 (*c*) 5 (*d*) 1

11. Decimal representation of a rational number can not be

(*a*) Terminating (*b*) Non terminating non repeating

(*c*) Non terminating repeating (*d*) None of these

12. Every point on number line cna be associated with

(*a*) Matural number (*b*) Rationa number (*c*) Integer (*d*) Real number

13. Zero is

(*a*) Rational (*b*) Irrational (*c*) Positive integer (*d*) Negative Integer

14. Which of the following is an irrational?

(*a*) (*b*) (*c*) (*d*) Π

15. Which of the following is an irrational?

(*a*) (*b*) 3.14 (*c*) (*d*) Π

SECTION B

Fill in the blanks:

1. Every rational number is .....
2. The product of two irrational number is .....
3. is an .....
4. Sum of a rational and an irrational number is .....
5. Every real number is either ..... or .....
6. A number which can not be represented in the form of (where p and q are integers, $q \neq 0$) is called .....

7. Every point on number line corresponds to .....
8. A non terminating, non repeating decimal is called .....
9. Value of is .....
10. Value of is .....

SECTION C

Match the columns

I.

1.	Sum and product of two irrational number may be	(*a*) Whole number
2.	Π is an	(*b*) Irrational number
3.	Sum of rational and irrational number is	(*c*) Irrotational
4.	Each real number corrosponds to a unique point on	(*d*) Real number
5.	Every integer is a	(*e*) Number line

II.

1.	$\sqrt{2}$	(*a*)
2.	0.1 23 123 123....	(*b*)
3.	$\left[\frac{\sqrt[4]{50}\sqrt{7}}{9\sqrt{3^{\frac{1}{3}}}}\right]^{\frac{1}{4}}$	(*c*) Irrational
4.		(*d*) Rational
5.	$0.\overline{4}$	(*e*)

SECTION D

Rapid fire quiz

State whether the following statements are true or false

1. Corresponding to each real number, there is antique poit on the number line.
2. Every whole number is a natural number.
3. There are infinitely many integers between any tow integers.
4. Every rational number is whole number.
5. The decimal expansion of rational is non-terminating non-recurring.
6. Pythagoreans were the first to discover irrational numbers.
7. Between two rational number there is exactly one rational number.
8. Every rational number is integer.

9. The decimal expansion of π is non-terminating non-repeating.
10. Every natural number is a whole number.
11. The product of any two irrational numbers is always an irrational number.
12. The decimal expansion of $\sqrt{7}$ is non terminating non-recording.
13. The sum on difference of a rational number and an irrational is irrational.
14. Every integer is rational number.
15. Every integer is whole number.

SECTION E

Group Discussion:

Diode the class into five groups and ask them to discussand to make a presentation after cempleting the discussion.

* Why do we need rational and irrational number.
* If *a* is a rational number and b is irrational number, is *a* + *b* is necessarily rational.
*

SECTION F

Project work-I

Topic : History of π

Content

1. Reference and information about π is ancient times
2. Works of different mathematiciesn on π
3. Concept of π
4. π and circle
5. Different formulae involving π
6. Problems involving π

Investigation

1. Define π
2. Name the mathematicians who proved that π is irrational
3. What is appromative value of p up to π decimal places.
4. π = gives an impression that π is an irrational number. How to solve it.
5. Contribution of Archimedes, Aryabhatta and chung chi.
6. Anything significant about the project if formal.

Sources and Bibliography.

Project-2

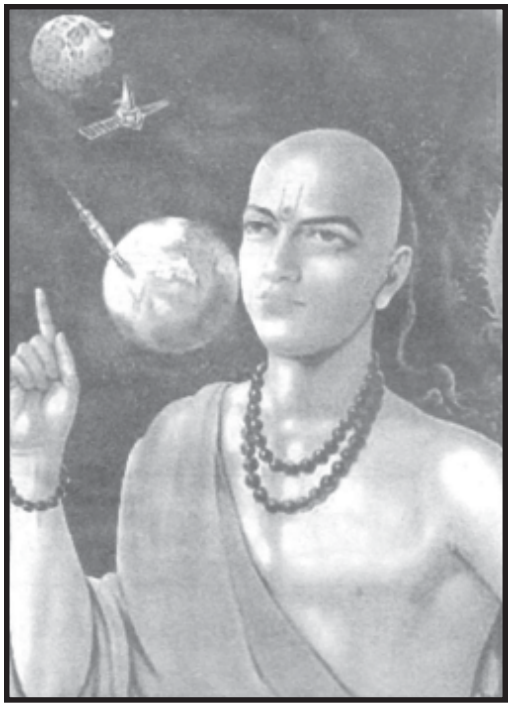
Life and contribution of Aryabhatta.

Content: ***Life History***

Investigation

1. Birth
2. Studies
3. Profession
4. Centribution to mathematics and astronomy
5. Any other interesting investigation

Arlabhatta



Aryabhatta, a renowned mathematician and astronomer of ancient india was born in 476 A.D. in Kerala. For his advanced studies, he Went to *Ksumapura* where he was the head of an institution. He also set up an observatory at the sun temple in Tarengana, Bihar. The famous books written by him are *Aryabhatiya* and *Arya Siddhanta*.

Aryabhatiy-awas written by him in 499 AD, at the age of 23. He wrote it in verse form including the topics like astronomy, plane trigonomety, spherical tri$onometry, arilhmetic and algebra. lt also'inirudes,continued', fiactions, quadratic equations and a table of sines. This book is divided 'into four padas or ctrapters having a total o{ 121 verses. These padas are Gitikapada (13 verses), Ganitapada (33 verses), Kalakriyapada (25 verses) and Golapada (50 verses). This book presented a number of innovations in mathematics and astronomy, which were influential for many centuries. Arya siddhanta is a lost work on astronomical computation which is known through the writings of Aryabhata's contemporary Varahamitira and through later mathematicians and commentators like Brahmagupta and Bhaskara.

Contributions

1. Aryabhatta used zero as a placeholder in his place value system.
2. He calculated the value of p (Pi) and concluded that it is irrational.
3. He gave the formula for calculating the area of a triangle and a circle.
4. He discussed the concept of sine in his book by the name of Ardha-jya.
5. He worked on the solutions of the equation of the form ax + b = cy, known as Diophantine equations. He called the method of solving such problems as, Kuttaka which means breaking into small pieces.
6. He provided elegant results for the summation of series of squares and cubes.

7. He stated and verified pythagoras theorem through examples.
8. Aryabhatta believed that the earth rotates about its own axis.

Project 3

Other mathematicians those who have a rich contribution to number systems.

Project 4

Historical development of number system from prenumber age to real number system.

ENTERTAINMENT

Calendar

Calendar is derived from the Roman word Calendsor Kalends which measn a methods of distributing time into certain periods adapated to the purposes of civil life or hourse, day weeks, months, years etc. Thus Calendar is a table of the days of the year divided into month and weeks, and showing the dates of the religious festivals and observances with scientification life.

A year has 365 days and a fraction, about 365.2422 days or 365 days 5 hours 4 minuts and 46 seconds or approximately days of which is a little more than 365.2422 days.

Since 365 is not divisible by 12, therefore all months are not of the same unber days. At present 7 months are fo 31 days, 4 of 30 days, and one of 28 days. It total 217 + 120 + 28 = 365 days.

Now after every foru years gives one extra day. So after every four years, the year has 366 days (Leap Year). Also is in reality more than 365.2422 by .0078. In 400 years we will have counted 3.12 days more. So the rule was modified, i.e., if a year ends in hundred it will not be a leap years then we will have counted only 3.12-3, i.e., 12 days extra. So in 4000 years we took only 12 days extra. Then in 3323 years we will have taken one day extra. So it has been proposed to correct the Gregorian rule by making the year 4000 and all its multiples common years, i.e., not leap years. Thus the rule becomes :

Every year the number divisible by 4 is a leap year ecept the last year of each centruy, which is a leap year only when the number of the centruey is divisible by 4, but 400 and its sumtiples 8000, 12000 etc. are common years. (Number in 100 is 1, in 200 is 2, in 300 is 3 etc.) preserved. By the last correction and beginning of the year would bot vary more than a day from its present place in 200 centuries.

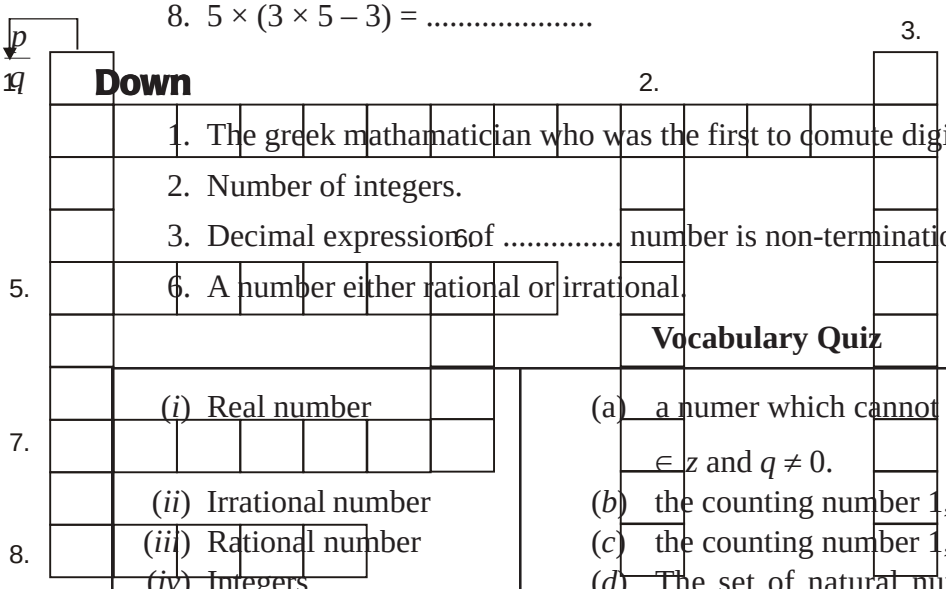
Puzzle

Across

4. A number whose decimal expansion is terminating or non-terminating recurring.
5. The set of natural numbers, year and negative of natural numbers.
7. The number system is which all numbers can be written by using only ten digits 0, 1, 2...9.
8. $5 \times (3 \times 5 - 3)$ = ...

Down

1. The greek mathamatician who was the first to comute digits in decimal expansion of π.
2. Number of integers.
3. Decimal expression of ..... number is non-terminationg non-recurring.
6. A number either rational or irrational.



Vocabulary Quiz

(*i*) Real number	(a) a numer which cannot be written in the form $\frac{p}{q}$, where *p*, *q*, $\in z$ and $q \neq 0$.
(*ii*) Irrational number	(*b*) the counting number 1, 2, 3..... and zero taken together.
(*iii*) Rational number	(*c*) the counting number 1, 2, 3,....
(*iv*) Integers	(*d*) The set of natural numbers, zero and negative of natural numbers.
(*v*) Prime number	(*e*) a number which can be wirtten int he form of , where *p*, *q* $\in z$ and $q \neq 0$.
(*vi*) Whole number	(*f*) the union of rational number and irrational numbers.
(*vii*) Natural number	(*g*) a whole number greater than one that has no factors other than one and itself.

Activating-I

To construct the square root spiral :

— Take a point O on a sheet of paper and draw a line segemnt OP_1 of unit lenght.

— Draw a line segemnt P_1P_2 perpendicular to OP_1 unit length.

— Draw a line segment P_2P_3 perpendicular OP_2 again of unit length.

— Now draw a line segment P_3P_4 perpendicular to OP_3.

— Countinning in this manner, you can get the linesegment $P_{n-1}P_n$ by drawing a lien segment of unit length perpendicular to OP_{n-1}.

— Join than to create a spiral depcting , , , ...

Proof: In ΔOP_1P_2, by pythagoras therm $(OP_2)^2 = (OP_1)^2 + (P_1P_2)^2 = 1^2 + 1^2 = 2$

$\Rightarrow$ OP_2 =

Similary in ΔOP_2P_3

$\therefore$ OP_3 =

Like wise we can show that the line segment OP_4, OP_5,...etc, are of length , , ...etc. respectively.

Suggested Activities

1. Write the history of irrational numbers.
2. Give brief lie sketch of pythagoras.

Oral Questions

1. What is rational numbers?
2. What is an irrational number?
3. What type of decimal representation does rational number have?
4. Why od we calculate the approcimate value of irrational number?
5. State whether is an irrational number.

ACTIVITIES-II

Square root of natural numbers

Aim

To obtain length of the segments corresponding to square roots of natural numbers using a model of graduated wooden sticks.

Before Start You Must Know

- Pythagoras theorem.
- Expressing a givne number as the sum of square of two numbers.

Materials required

Two wooden scales/Cardboard strips, two scales, thread, sketch pen.

How To DO

- Fix the scales on thwo strips of wood or cardboard.
- Place one of the strip horizontal on a table an another strip vertically on it, so that the vertical strip could slide over the horizontal strip as shown in Fig. 1.2.
- Tie a thread at the zero mark of the horizontal strip.

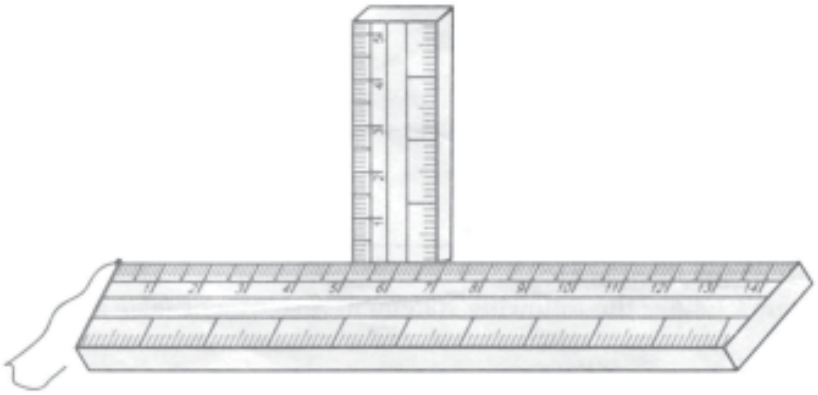


Fig. 1.2

Illustration

To find the $\sqrt{10}$

- Write 10 as sum of two square numbers, i.e., $10 = 3^2 + 1^2$
- Now slide the vertical strip to the point 3 on the horizontal strip.
- STretch the thread and place it upto 1 unit on the vertical scale/strip.

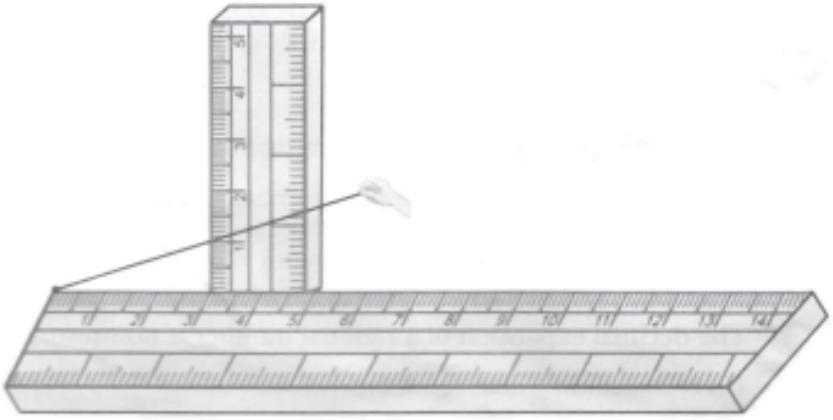


Fig. 1.3

- Mark a point on the thread with a coloured sketch pen where it touches the mark 1 on the vertical strip.
- Now measure the length of this thread on the horizontal strip.

Observation

On measurement the mark on the thread touches the scale at approximately 3.6 cm.

The length of the thread upto the mark =

Thus are that $\sqrt{10} = 3.6$ units (upto one place od decimal)

Precautions

— While preparing the instrument shown in fig (*i*) take care that the zeroses of both the scales/strips must concede.

— While marking the thread at an appropriate point, it must by tightly stretched.

1. Yourself

Find the approximate value of square roots of other natural number by using following facts :

$$5 = 2^2 + 1$$
$$17 = 4^2 + 1$$
$$26 = 5^2 + 1$$

FUN

MAGIC SQUARES

You have already learnt the rule for constructing a magic square of odd order. Now we give a rule for constructing a magic square of order "n", where "n" is a multiple of 4.

1. Write all the numbers in the square in the natural order, filling up the first row from the left, then the second row from the left, and so on.
2. Divide up the square into 4 × 4 squares and in each of these draw the two diagonals.

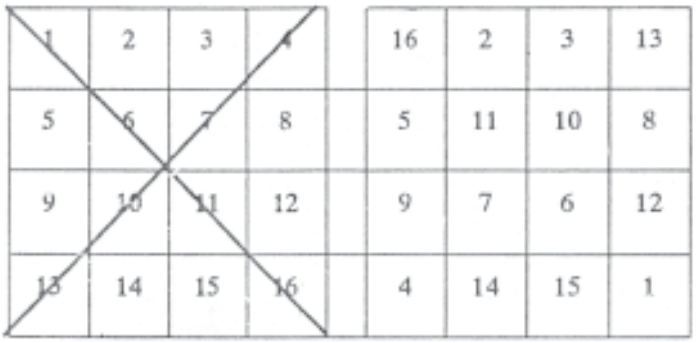


Fig. 13.22

3. Replace any number which is cut by a diagonal by the number in the diametrically opposite square.

(In the case where "n" is graeter than 4, this measns diametrically opposite in the "n" × "n" square, not in the 4 × 4 square). This means that the numebr "r" must be replaced by $n^2 + 1 - r$.

Fig. 13.22 Illustrates the case when n = 4 and Fig. 13.23 illustrates the case when n = 8.

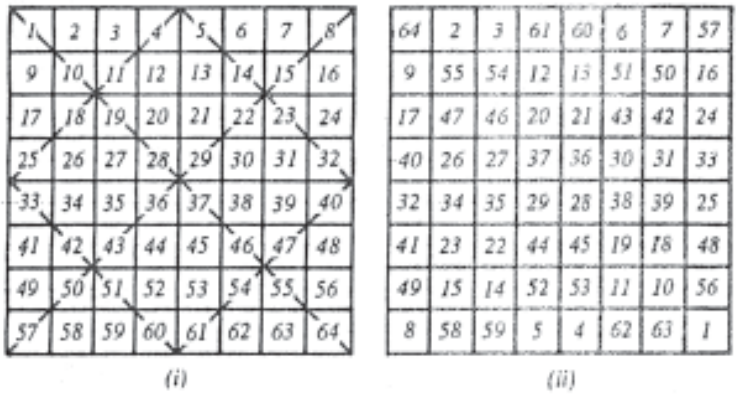


Fig. 13.23

For example 23 is replaced by the $8^2 + 1 - 23 = 42$ or join 23 to the centre of the square and at an equal distance on the other side you find 42.

Among the many legends which history preserves for us is the legend abnout a Maherajah of Inida, who wished to reward one of his subjects for inventing the game of chess. The Maharajash told his subject, "Make your request. Whatever you ask will be granted". The inventor of chess, being a clever man, said, "your Majesty, give me one grain of wheat to cover the first square ofthe chess board, two grains of wheat to cover the second square, four grains to cover the third, and so on. So your Majesty, double the number of grains to put on each succeeding square and give me enough grain to cover all 65 squares of thr chess-board". The Maharajah though the request sounded resonable and agreed.

What the inventor has asked for was

$$1 + 2^1 + 2^2 + ... + 2^{65} + 2^{63} + 2^{64}$$

number of grains of wheat. This totals to 18 446 744 073 709 551 615 grains. If we assume a bushel of grain contains about 5000000 grains, then 4000 billion bushels would be needed. This amounts to the world's wheat production for a 2000 years's period.

Fun with Numbers

In how many different wats can you make 100 from the digits 1, 2, 3, 4, 5, 6, 7, 8 and WITHOUT altering their order. Here are a few suggestions :

$$1 - (2 \times 3) + (4 \times 5) + 6 + 7 + (8 \times 9) = 100$$

$$1 + (2 \times 3) + 4 + (5 \times 6) + (7 \times 8) + \sqrt{9} = 100$$

$$123 - (4 \times 5) - 6\,(7 - 8) - 9 = 100$$

$$(1 + 2) + 3 + 4 + 5 - 6 + 7 + 89 = 100$$

$$(.1 + .2 - .3 - .4)\,5 + .6 + 7 + 89 = 100$$

There must be a lot more ways. Can you find them?

DID YOU KNOW ABOUT ZERO?

1. The *Hindu Arabic numerals.* The modern numerals 1 to 9 go back to a set of numerals found inscribed on cave walls at Nasik near Bomaby. They are almost 2000 years old. They are called Hindu-Arabic numerals after the Hindus—who invented them; and after the Arabs, who later transmitted them.

2. *The Origin of Zero.* The credit for one of the greatest inventions in the history of civilization; that is the symbol for nothing, goes to the Hindu mathematicians. The appearnace of zero on the horizon of mankind liberated it from the columns of abacus and work on methods of written calculation. Originally the sign was a heavy dot that appears in the Bakshali manuscript, whose contents may data back to the third and fourth centruries A.D., and was called "*Sunyabindu*" (the dot marking a blank), which became in Arabic as—sifr or "sifer"and later in Latin "zephirun" and Italian "zero". By introducting place value and by naming powers of ten, the Hindus invented the decimal system.

3. *Zero as a number* had a rather different history. Although Greeks of the sixth, fifth, and fourth centruries B.C. were the chief developers of the study of properties of numbers, they never recognized zero as a number. For them the set of whole numbers began with one, to which their numbers alone assigned such attributes as "male", "reason", "the essence of number", "the origin of all things", "the divine principle". Zero was first recognised as a number by the Hindus and then by Arabs. It cam about in two ways : (1) through attempts to solve certain quadratic equations of the type $AX^2 – Bx = 0$, where one root is zero while the other is some rational number, different from zero and (2) through more and more systematic study of the properties of operation on numbers.

   The Hindu mathematician, *Mahavira,* (about A.D. 850 in Mysore), worte a great book containing this statement : "A number multiplied by zero is zero and that number remains unchanged which is divided by zero." While this statement contains the core of the concept of zero as "the identify number of addition", it also erroneously considers division by zero as having the same effect as addition and subtraction of zero—namely, as haiving no effect on the numbers on which it operates as a divisor. This gross misconception was removed by the great Hindu mathematician Bhaskar who said, "The fractionlike of which the denominator is cipher are termed infinte quantities". Almost all the minor writers of this period recognised zero as the *identify number* of addition and under certain restrictions of subtraction but avoided the problem of dividing by zero or declared the result of such a division to be meaningless.

   In a nutshell, we can say that zero became fully recognised as only form the time of Bhaskara onwards. In modern mathematics zero is both a place holder and a cardinal number, the role it takes depending on whether one talks and thinks about numerations or about number systems.

4. *A Hindu rule for dividing fractions.* The Hindu mathematician *Mahavira* (A.D. 850) gave the rule for dividing one fraction by another, which we still use today. Make the denominator the numerator and then multiply, e.g.,;

   =

CLASS IX (FORMATIVE ASSESSMENT)

Class Assignment/Home Assignment

1. State whether the following statement are true or false

(*a*) Every natural number is rational numbers. (T/F)

(*b*) zero is a rational number (T/F)

(*c*) $\sqrt{16}+z$ is a irrahonal number (T/F)

(*d*) There are finite number of rational numbers between two irration numbers (T/F)

(*e*) value of (is equal to 6 (T/F)

2. Write the correct answer in each of the following

A. $\frac{1}{\sqrt{3}+\sqrt{2}}$ will be equal to

(*a*) $\sqrt{3}+\sqrt{2}$ (*b*) $\sqrt{3}-\sqrt{2}$ (*c*) $\sqrt{3}$ (*d*)

B. Which of the following is irrational number

(*a*) (*b*) (*c*) (*d*)

C. $\sqrt{16}$ value of $a+\frac{1}{a}$ is

(*a*) (*b*) (*c*) 2 (*d*) 4

D. If $3^x+64=2^6+\left(\sqrt{3}\right)^8$ value of *x* is

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 4

E. Value of a and b in the following expression

$$\frac{\sqrt{3}-1}{\sqrt{3}+1}=a+b\sqrt{3}$$

(*a*) $\sqrt{3}$ 2 1 (*b*) 2 2 1 (*c*) 22 – 1 (*d*)

FORMATIVE ASSIGNMENT (FA1)

Class Assignment

1. Simplify

2. Evaluate
   $(64)^{2/3}$
3. Locate on number line
4. Us is rational numbers (T/F)
5. Rationalize

6. On Simplification $\frac{(3+\sqrt{3})(3-\sqrt{3})}{6}$ gives

   (*a*) 1 (*b*) 6 (*c*) 0 (*d*) $2\sqrt{3}$

7. Between two rational numbers
   (*a*) There is one rational number
   (*b*) There is no rational numbers
   (*c*) There are infinite many rational number
   (*d*) There are only finite numbers of rational number

8. Rational number between and

   (*a*) (*b*) $\frac{\sqrt{2}\sqrt{3}}{2}$ (*c*) 1.3 (*d*) 1.81

9. Every rational numbers is
   (*a*) Real numbers (*b*) Integer (*c*) Natural number (*d*) Whole numbers
10. The number 1.3125719...
    (*a*) Natural numbers (*b*) Whole numbers
    (*c*) Rational numbers (*d*) irrational numbers

Project/Group Activity

1. History of π /concept of π
2. Construction of magic square
3. Contribution and life history of Indian
   Mathematician life history should include folliwng pt
   Dat of Birth/Birth Place
   Achievements
   Famous for
   Book Written by him

Topics for Group Discussion/Smarties

1. Properties of rational number/irrational numbers
2. Importance of O and ∞
3. History of π
4. Why do student feel mathematics is dull and fore.
5. Imporantce of mathematics lab/maths practical in teaching of mathematics?

Oral Test

Small question related to the knowledge of formula, clarity of concept may be asked. Some Example are givne below :

(*a*) What is the difference between rational and irrational number.

(*b*) State two properties of irrational number. Whether π is a rational number or irrational number.

(*c*) What is value of $(8)^{1/3}$

(*d*) One rational number between 2 and 3

(*e*) One irrational number number between and

(*f*) Zero is a rational number or irrational numbers.

SECTION—A

1. Which of the following is a quadratic polynomial in one variable?

$\frac{15}{6}x^{\frac{1}{2}} + t^5 - \frac{t^3}{3}$ (*a*) (*b*) $2x^2 + x^{-2}$ (*c*) x^2 (*d*) $2x^2 + y^2$

2. Degree of which of the following polynomial is zero.

(*a*) x (*b*) 1 (*c*) y (*d*)

3. Zero of the polynomial $p(x)$ where $p(x) = ax$, $a \neq 0$ is

(*a*) 1 (*b*) a (*c*) 0 (*d*)

4. What is the reemainder when $x^3 - 2x^2 + x + 1$ is divided by $(x - 1)$?

(*a*) 1 (*b*) – 1 (*c*) 0 (*d*) – 2

5. If 1 is a zero of the polynomial $px^2 + 2x - 2$ than value of p is

(*a*) 1 (*b*) – 1 (*c*) 0 (*d*) –2

6. If $P(x) = (x - a)\, q\,(x) + p\,(a)$ and $(x - a)$ is a factor of $p(x)$ than $p(a)$ is

(*a*) 0 (*b*) 1 (*c*) – 1 (*d*) a

7. If $p(x) =$ then $p(-1)$ is

(*a*) $\frac{15}{6}$ (*b*) (*c*) (*d*)

8. Factor of $12x^2 - 7x + 1$ are

(*a*) $(x - 3)(x + 4)$ (*b*) $(3x - 1)(4x + 1)$ (*c*) $(3x - 1)(4x - 1)$ (*d*) $(3x + 1)(4x - 1)$

9. If $9x^2 + y^2 = 4.1$ and $xy = 3$ then value of $(3x + y)$ is

(*a*) 6 (*b*) 9 (*c*) 7 (*d*) 3

10. If then value of $\left(x - \frac{1}{x}\right)$ is

(*a*) 7 (*b*) 6 (*c*) 2 (*d*) 1

11. Product of $(3x + 2y)(3x - 2y)(9x^2 + 4y^2)$ is

(*a*) $81x^4 + 16y^4$ (*b*) $16x^2 - 81x^4$ (*c*) $81x^4 - 16y^4$ (*d*) $16x^2 + 81x^4$

12. Product of is

(*a*) (*b*) (*c*) (*d*)

13. Factors of $(3x^2 - x - 4)$ are

(*a*) $(x - 1)(3x - 4)$ (*b*) $(x + 1)(3x - 4)$ (*c*) $(x + 1)(3x + 4)$ (*d*) $(x - 1)(3x + 4)$

14. Value of 103×97 is

(*a*) 9991 (*b*) 9919 (*c*) 9191 (*d*) 9911

15. If then value of $x^3 + \frac{1}{x^3}$ is

(a) 720 (*b*) 702 (*c*) 207 (*d*) 772

SECTION—B

Fill in the blanks using the words given box

zero polynomial, coefficients, 6, $-3xyz$
$3xy$, $2xy$, no root, constant , 75

1. The coefficent of y in the expension of $(y + 5)^3$ is .....
2. $(x + y + z)^2 = x^2 + y^2 + z^2 + ...+ 2yz + 2zx$
3. A polynomical of degree zero is called a ..... polynomial
4. $x^3 - y^3 = (n - y)^3 +$ ..... $(x - y)$
5. $x^3 + y^3 + z^3$ ..... $= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zn)$
6. Coefficent of y^3 in $6y^3 + 5y^2 + 3y + 2$ is .....
7. Each term of a polynomial has .....

8. The constant polynomial zero is called .....
9. A non zero constant is called .....
10. Zeroes of $y^2 - 2y$ are ..... and .....

SECTION—C

Match the columns I

Column I	*Column II*
1. Zero of polynomial $p(n)$	(*a*) A polynomial of degree 0
2. Constant polynomial	(*b*) A polynomial of degree 3
3. Monomial	(*c*) A polynomial of degree 2
4. Trinomial	(*d*) A polynomial of two terms
5. Linear polynomial	(*e*) A polynomial of one terms
6. Quadratic polynomial	(*f*) $+...a_1x + a_0, an \neq 0$ and x is a whole number
7. Degree of polynomial	(*g*) Highest power of variable n is a polynomial
8. Benomial	(*h*) A polynomial of degree 3
9. Polynomial	(*i*) A real number a such that $p(a) = 0$
10. Cubic polynomial	(*j*) A polynomial of three terms

$anx^4 + a_{n-1}x^{n-1} + a_{n-2}x^{4-2} + ...$

Match the column II

Column I	*Column II*
1. Coefficient of x2 (2n – 1)3	(*a*) Any real number
2. Degree of zero polynomial	(*b*) 3/2
3. $2^{4/3} \div 2^{1/3}$ is equal to	(*c*) – 12
4. If $y - 1$ is a factor of $ky^2 - 3y + k$ then value of k is	(*d*) Not defined
5. Zero of zero polynomial	(*e*) 2

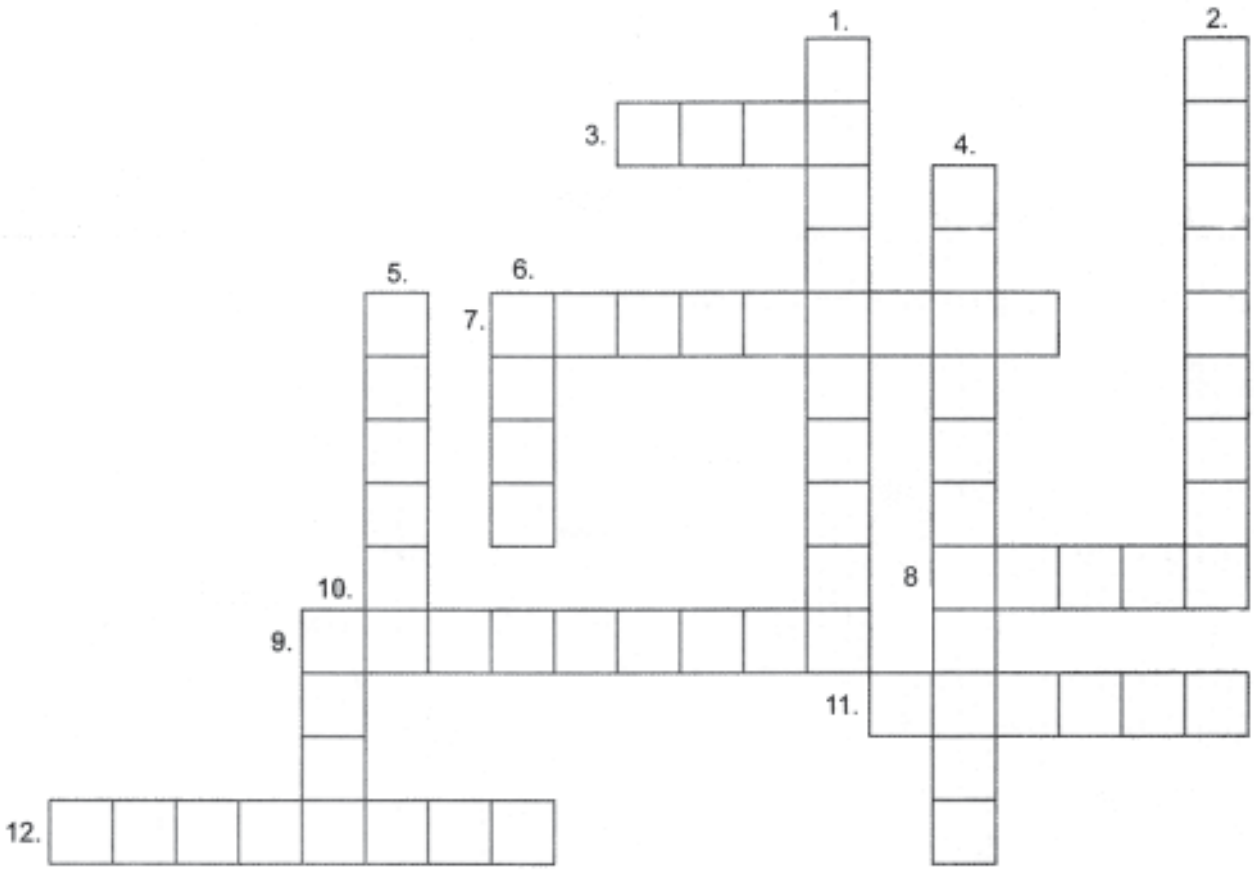
Group Dismission

Divide the class into small groups, ask them to discuss the following and make a presentation

1. Polynomial
2. Degree of polynomial
3. Zeroes of a polynomial
4. Remainder theorem
5. Factor theorem

Puzzle

- Look at the cross world Puzzle and fill in the blanks accordingly.



Across

3. The number which is when substituted in a polynomial makes its value zero.
7. The number or expression that remain when an expression divides another expression.
9. A polynomial/expression with there terms.
11. The highest power of the variable in polynomial.
12. A polynomial/expression with two terms.

Down

1. A expression in single variable x, in which the power of x in each terms is a non-negative integer.
2. A polynomial of degree 2.
4. The constant factor of a term of polynomial.
5. An expression that completely divides a given polynomial.
6. The number which is when substituted in place of the variable in an equatin makes its LHS equal to RHS.
8. A polynomial of degree 3.
10. Parts of a polynomial, which on additin or subtraction form the polynomial.

Project Work-1

Remainder Theorem

$$\text{Dividend} = (\text{Divisor} \times \text{Quotient}) + \text{Remainder}$$

$$p(x) = (x - a)q(x) + r(x),$$

where degree of $p(x)$ > degree of $q(x)$.

Since the degree of $(x - a)$ is 1 and the degree of $r(x)$ is less than the degree of $x - a$, the degree of $r(x) = 0$, i.e., $r(x)$ is a constant say r.

Therefore, $p(x) = (x - a)q(x) + r$

if $x = a$, $p(x) = (a - a)\, q(a) + r = r$

Directions

Research the topic indicated to the right, and answer the questions that follow:

Topic: Remainder Theorem

Representation

- Statement of the theorem.
- Proof of the theorme.
- Application of the theorem.

Project Work-2

Factor Theorem

Let $p(x)$ be a polynomial of degree greater than or equal to 1 and a be a real number such that $p(a) = 0$, then $(x - a)$ is a factor of $p(x)$. Conversely, if $(x - a)$ is a factor of $p(x)$, then $p(a) = 0$:

By remainder theorem, $p(x)$ when divided by $(x - a)$ gives remainder equal to $p(a)$.

$\therefore$ $p(x) = (x - a)\, q(x) + p(a)$

$\Rightarrow$ $p(x) = (x - a)q(x)$ $(\because p(a) = 0)$

$\Rightarrow$ $(x - a)$ is a factor of $p(x)$

Conversely, $(x - a)$ is a factor of $p(x)$

$\Rightarrow p(x)$, when divided by $(x - a)$ gives remainder zero.

$\Rightarrow$ $p(a) = 0$

Directions

Research the topic indicated to the right, and answer the questions that follow:

Topic: Remainder Theorem

Representation

- Statement of the theorem.
- Proof of the theorme.
- Application of the theorem.

Project Work-3: Life and works of Mahaviracharya

Mahaviracharya

Mahavira was the great Jaina Mathematician of 10th centry who wrote "Ganita-Sara-Samgraha" in 850 AD during the reign of the great Rashtrakuta King Amoghvarsha. This book is divided into nine chapters. He separated astrology from Mathematics. His books inspired may mathematicians in Southem India.

Contributions to Mathematics

1. Instead of the operations of addition and subtraction, he included squares and cubes, square roots and cube roots, summation of arithmetic and geometric series, etc. These operations were based on decimal place-value numeration.
2. He mentioned 24 notational places in his work.
3. He asserted that the square root of a negative number did not exist.
4. He gave the sum of a series whose tems are squares of an A.P. The process of summation of a series from which the first few tems are omitted is called by him Vyutkalita.
5. He was the first Indian mathematician to introduce the method of lowest common multiple which he called Niruddha.
6. He discussed techaniques for solving linear, quadratic and higher order equations.
7. He gave empirical rules for area and perimeter of an ellipse.
8. He was the first to give terminology about equilateral, isosceles triangle, rhombus, circle and semi-circle.
9. He gave characteristics of cyclic quadrilateral like that of Bramhagupta. He also gave formula about sides and diagonal of cyclic quadrilateral like the area of a quadrilateral is square root of $[(s-a)(s-b)(s-c)(s-d)]$. If sides of cyclic quadrilateral are a, b , c, d and its diagonals are x and y and

   $x =$ and $y = \sqrt{\frac{ab+cd}{ad+bc}(ac+bd)}$

   Then $xy = ac + bd$.
10. For the volume of a sphere, he gave an approximate rule as $\frac{9}{2}\left(\frac{1}{2} * d\right) ** 3$ and an accurate one as 9/10 * 9/2 * (1/2 * d) ** 3 which makes Pi equal to 3.0375.

Directions

Research the topic indicated to the right, and answer the questions that follow:

The above biography of Mahaviracharya is given as an reference. There may be many more interesting facts about his life and work. See different sources like books, internet, etc and find the correlation with the information given above.

Topic: Mahaviracharya

Highlights

- Birth

- Profession
- Works
- Contributions
- Your findings

Student should mention all the sources they used to collect the information.

Activity

Title: Verification of the Identity

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

Objective: To verify the identity

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

Pre-requiisite knowledge

(*i*) Knowledge about vertices, edges and type of faces of cubes and cuboids

(*ii*) Volume and surface area of a cube and a cuboid

Materials required:

(*i*) acrylic sheets

(*ii*) Wooden board

(*iii*) Sketch pens

(*iv*) Glazed papers

(*v*) Fevicol

(*vi*) Pair of scissors

(*vii*) Eraser

(*viii*) Geometry box

Preparation for the activity:

Take $a = 3$ cm, $b = 1$ cm, making $a + b = 4$ cm

(*i*) Make a cube of side 3 cm fromt he wooden board

(*ii*) Make another cube of side 1 cm from the wooden board

(*iii*) Make three cuboids of dimensions 3 cm × 3 cm × 1 cm and antoerh three cuboids of dimensions 3 cm × 1 cm × 1 cm form the wooden board.

(*iv*) Using acrylic sheet, make a cube of side 4 cm.

Use and Demonstration:

(*i*) The cube of side 4 cm represents $(a + b)^3$ [Fig. 26.3]

(*ii*) The cube of side 3 cm represents a^3 [Fig. 26.1]

(*iii*) The cube of side 1 cm represents b^3 [Fig. 26.2]

(*iv*) A cuboid of dimensions 3 cm × 3 cm × 1 cm represents a^2b. Thus, three such cuboids represent $3a^2b$.

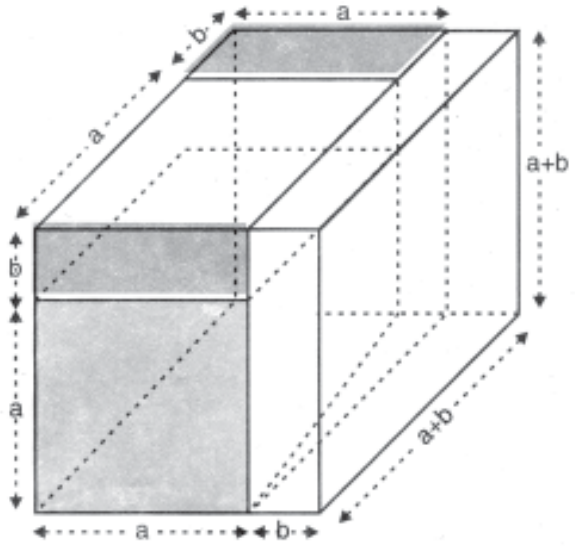
(*v*) A cuboid of dimensions 3 cm × 1 cm × 1cm represent ab^2. Thus, three such cuboids represent $3ab^2$ Place all these cubes and cuboids [as obtained in (*i*)-(*v*)] in the acrylic cube in such a way that these all fill the acrylic cube completely showing thereby that the cube of volume $(a + b)^3$ is equal to the sum of the volumes of cuboids and cubes of volumes a^3m b^3, $3a^2b$ and $3ab^2$ [Fig. 26.4]

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

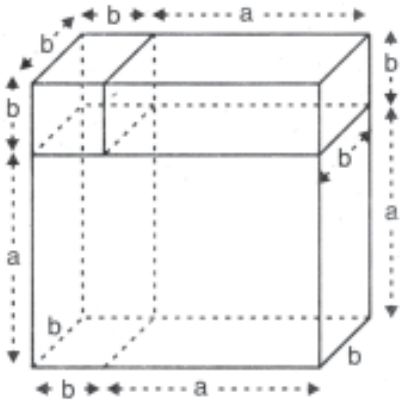
Other Results that cna be verified:

(*i*) The distinction between cubes and cuboids can be made clear to the students.

(*ii*) They can identify similar and different solid figures.

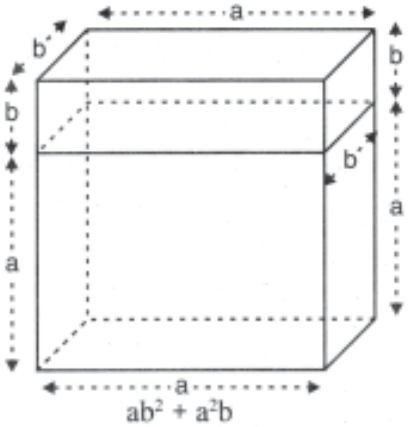


$(a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$

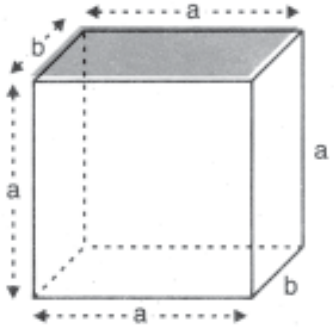


$b^3 + ab^2 + ab^2 + a^2b$

$b^3 + 2ab^2 + a^2b$



$ab^2 + a^2b$



a^2b

Activity

Title: To solve the Quadratic Equation $x^2 + 8x - 33 = 0$

Objective: To solve the above equation experimentally

Pre-requiisite knowledge

(*i*) Special products

(*ii*) Area of squares

(*iii*) Completion of squares

Materials required:

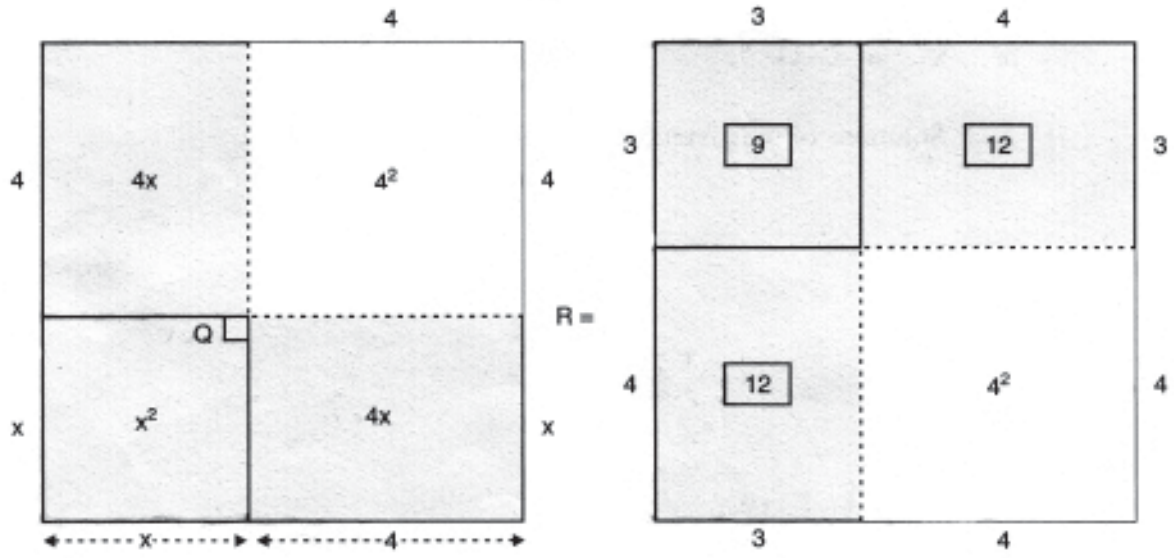
(*i*) Sketch pens

(*ii*) Chart paper

(*iii*) Pencil

(*iv*) Geometry box

(*v*) Fevicol



Demonstration

(*i*) Draw square of side x cm and entend each of it's side by 4 and complete the fig. 1 taking carry out the square PQRS is not a part of its (shown by dotted lines)

(*ii*) Make a square of side 7 cm and shown one it's oen fourth part dotted (not jncluded in figure)

Thus fig 1 peprest $x^2 + 8x = 33$

(*iii*) Add $(4)^2$ to both sides of eqution

(*iv*) L.H.S. = $(x + 4)^2 = x^2 + 8x + 16$

R.H.S. = $(7)^2 = 49$

(*v*) $(x + 4)^2 = (\pm 7)^2$

$x + 4 = \pm 7$

or

$x = 3, -11$

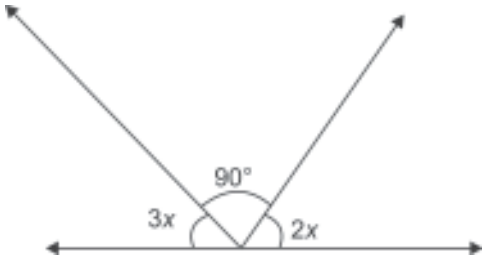
(*vi*) Solutions of the given equation are $3, -11$

SECTION-A LINES AND ANGLES

Multiple choice questions:

Choose the correct answer form the given options:

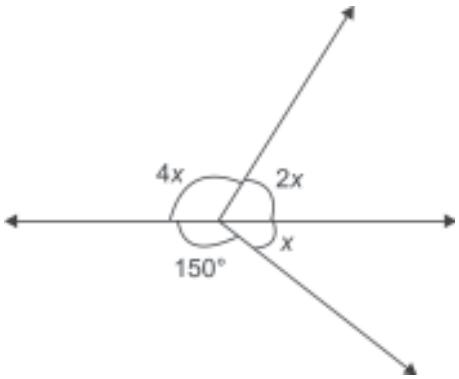
1. In fig the value of x is



(*a*) 16° (*b*) 20°

(*c*) 18° (*d*) 22°

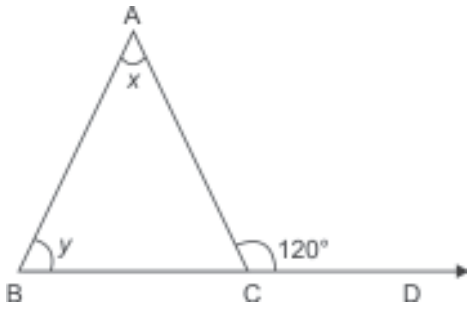
2. In figure value of x is



(*a*) 25° (*b*) 30°

(*c*) 20° (*d*) 40°

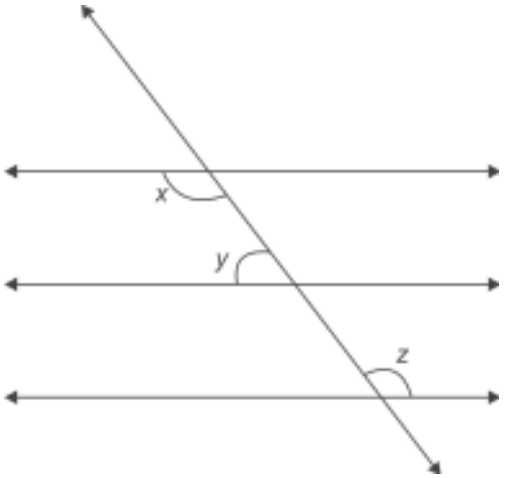
3. In figure ($< x + < y$) is



(*a*) 60° (*b*) 120°

(*c*) 80° (*d*) 70°

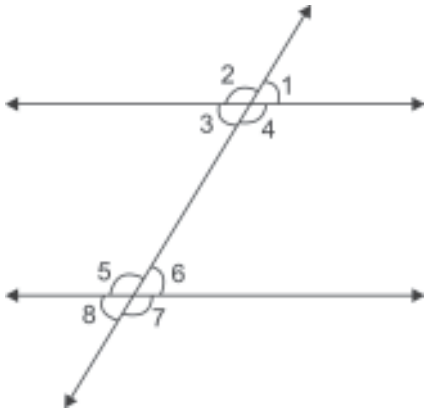
4. In figure ($< x + < y$) is



(*a*) $<z$ (*b*) 180°

(*c*) 90° (*d*) 120°

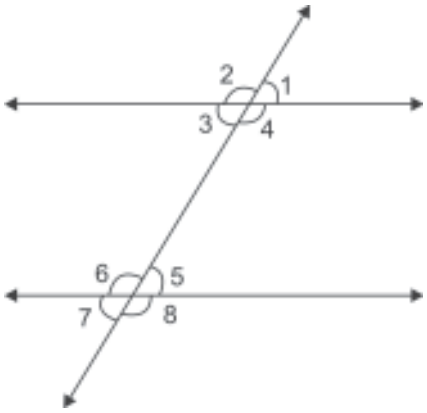
5. In figure $l \parallel m$ and $\angle 1 = 40°$ there $\angle 8$ is



(*a*) 140° (*b*) 50°

(*c*) 40° (*d*) 60°

6. In figure $l \parallel m$ is $\angle 1 = 35°$ than $\angle 6$ is



(*a*) 55° (*b*) 145°

(*c*) 35° (*d*) 105°

7. In figure value of $(\angle x + \angle y)$ is

(*a*) 100° (*b*) 140°

(*c*) 260° (*d*) 130°

8. In figure $\angle$ACD is

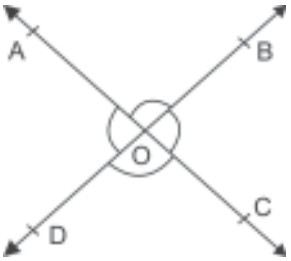
(*a*) 31° (*b*) 55°

(*c*) 84° (*d*) 94°

9. In figure lines AB and CD intersect at 0. If $\angle$AOD: $\angle$ DOC = 4 : 5 then $\angle$ COB is

(*a*) 100° (*b*) 80°

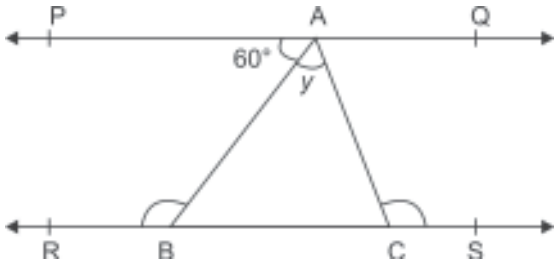
(*c*) 70° (*d*) 75°



10. In figure PQ || RS, $\angle PAB = 60°$ and $\angle ACS = 117°$ than $(\angle x - \angle y)$ is

(*a*) 3° (*b*) 57°

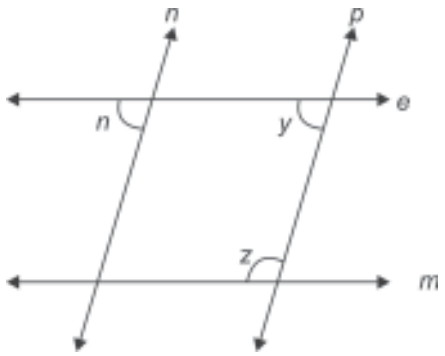
(*c*) 13° (*d*) 60°



11. In figure $l \parallel m$, $n \parallel p$ and $\angle n = 70°$

(*a*) 120° (*b*) 100°

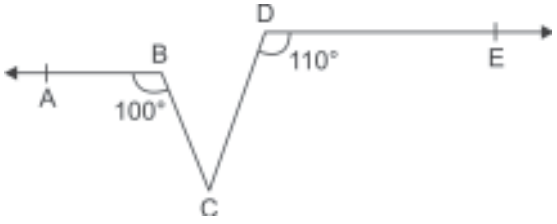
(*c*) 110° (*d*) 70°



12. In given figure if AB || DE Then $\angle$ B CD is

(*a*) 40° (*b*) 50°

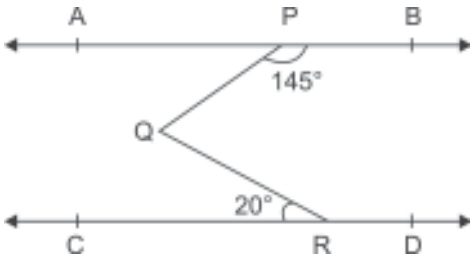
(*c*) 30° (*d*) 60°



13. In figure if AB || CD Then $\angle$ PQ R is

(*a*) 45° (*b*) 55°

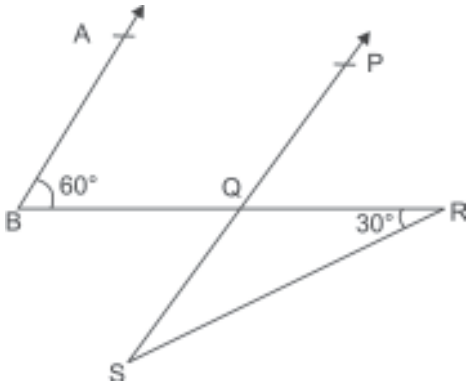
(*c*) 65° (*d*) 60°



14. In figure AB || PQ then $\angle$RS Q is

(*a*) 30° (*b*) 60°

(*c*) 20° (*d*) 40°



15. Sum of consecutive interior angles is

(*a*) 90° (*b*) 180° (*c*) 270° (*d*) 360°

SECTION-B

Fill in the blanks using the words given in box

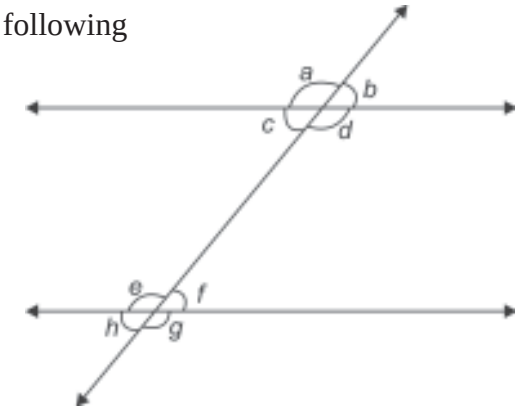
Reflenangle, Equatl, Parallel, obtuse, Equal, Parallel, right angle, Collenear, Infinite, Concurrent

1. Vertically opposite angles are .....
2. An angle which is greater than 180° and less than 360° is called .....
3. If two parallel lines are intersected by a transversal than corrosponding angles are .....
4. Two lines perpendicular to the same line are ..... to each other.
5. The sum of complementary angles are .....
6. If one angle of a linear pair is acute then it's other angle will be .....
7. If a transversal intersects a pair of lines in such away that the sum of ihnterior angles on the same sides of transversal is 180° then the lines are .....
8. Length of ray's is .....
9. There lines are ..... if the have one common point.
10. Three or more points are called ..... if they lie on a straight line.

SECTION-C

Match the column-I

Observing the figure match the following



	Column I	***Column II***
(*i*)	Interior Alternate anlages	$\angle b, \angle f$
(*ii*)	Adjacent angles	$\angle a, \angle c$
(*iii*)	Alternate enterior angles	$\angle c, \angle f$
(*iv*)	Interior angles on the same sides of the transversal	$\angle b, \angle h$
(*v*)	Vertically opposite angles	$\angle a, \angle b$
(*vi*)	Corrosponding angles	$\angle d, \angle f$

Match the Column-II

	Column I	*Column II*
(*i*)	Angle 50° lessthan its supplement is	90°
(*ii*)	Angle equal to it's complements	105°
(*iii*)	Exterior angle of a triangle if its interior opposite angle are 30° and 45°	80°
(*iv*)	Sum of two acute angles of a right triangle	45°

Match the Column-III

	Column I		*Column II*
(*i*)	Collinear points	(*a*)	an angle whose measure is between 180° and 360°.
(*ii*)	Concurrent lines	(*b*)	an angle whose measure is more than 90° but less than 180°.
(*iii*)	Acute angle	(*c*)	a trianlge in which all the sides are of different measure.
(*iv*)	Right angle	(*d*)	pair of angles sum of whose measure is 180°.
(*v*)	Obtuse angle	(*e*)	a triangle whose two sides are equal.
(*vi*)	Reflex angle	(*f*)	pair of angles sum of whose measure is 90°.
(*vii*)	Complementary angles	(*g*)	an angle whose measure is less than 90°
(*viii*)	Supplementary angles	(*h*)	a triangle having all sides equal.
(*ix*)	Scalene triangle	(*i*)	points which lie on the same line.
(*x*)	Isosceles triangle	(*j*)	a triangle with one angle 90°.
(*xi*)	Equilateral triangle	(*k*)	three or more lines intersecting at the same point
(*xii*)	Right angled triangle	(*l*)	an angle whose measure is 90°

SECTION-D

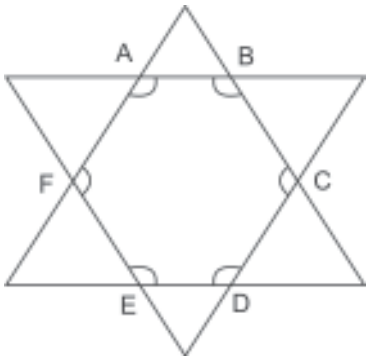
Quiz

State whether the following statements are true or false by marking T for true adn F for false

1. There lines are concurrent if they have a point in column.
2. Two congruent angles have the same measure.
3. A ray has a finite length.
4. A line segment has only one end point.
5. Lines parallel to the same line are parallel to each other.
6. Three or more points are collinear when they are in a straight line.
7. Two lines perpendicular to the same line are perpendicular to each other.
8. If sum of two adjacent anlges is 180° then the non common arins of the angles forms a line.
9. If two lines are intersected by a transversal then alternate interior angles are equal.
10. Each angle of an ervilateral triangle is 60°.

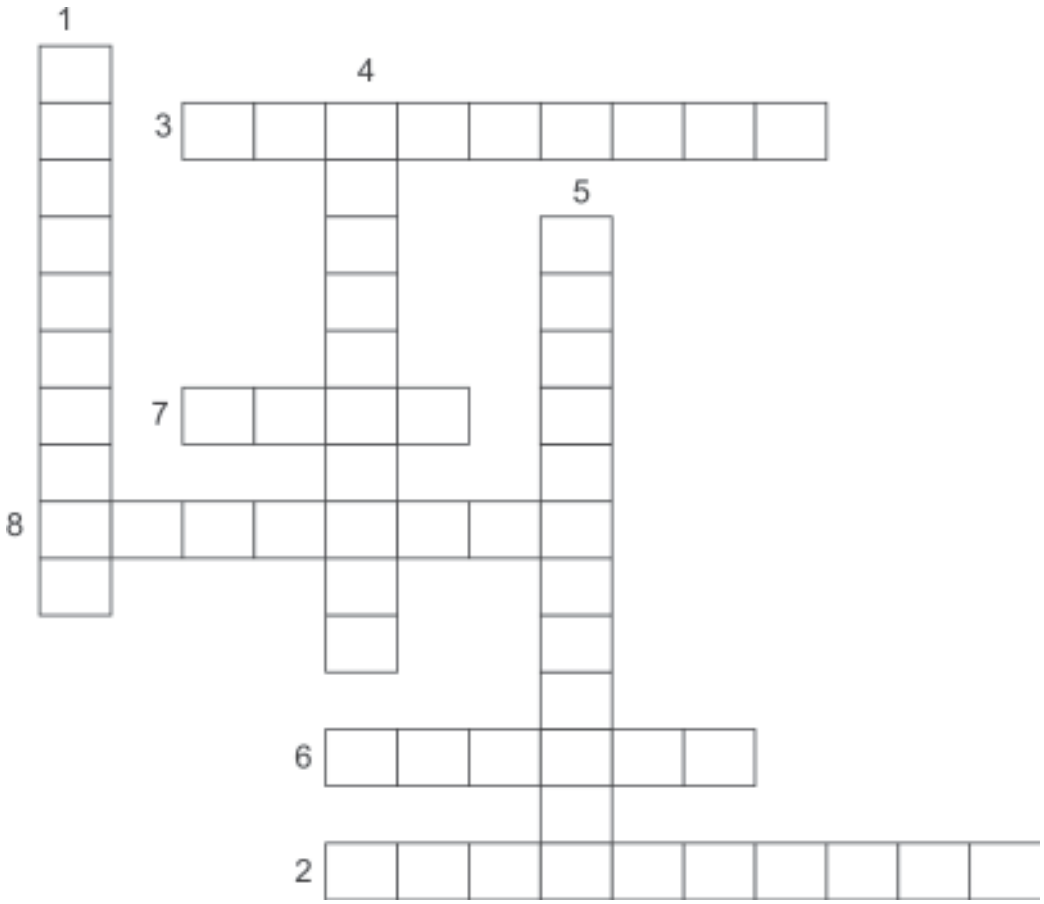
Entertainment

Can you find the sum measures of the anlge A, B, C, D, E and F



Group Discussion

Divide the class into samll groups and after then to discuss about the (*i*) types of angles (*ii*) their relation with each other, formed when transversal intersect two parallel lines.



Across

2. If a transversal intersects two parallel lines, then each pair of ..... angles is equal.
3. A line with two end points.

6. If a transversal intersects two lines such that a pair of interior angles on the same side of transversal is supplementary, then the two lines are .....
7. Through a point infinite number of ..... can be drawn.
8. An angle which a greater 180° but less than 360°.

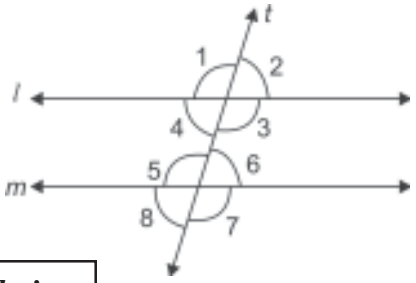
Down

1. In a triangle with a right angle, the other two angles are ..... .
4. The opposite angles of a cyclic quadrilateral are ..... .
5. Exterior angle of a triangle is equal to the sum of the corresponding two interior ..... .

Activity-I

To find relation between the corresponding angle formed when a transversal intersect two parallel line.

- Draw two parallel line *l* and *m* and a transversal *t* intersecting them. Fig. 4.1.
- Now measure any pair of corresponding angles and find out the relation between them.
- Write your observations and fill in the following table.



Angle	*Angle*	*Relation*
∠1 =	∠5 =	
∠2 =	∠6 =	
∠3 =	∠7 =	
∠4 =	∠8 =	

Suggested Activity

1. Draw two non parallel lines and a transversal intersecting them. Find relation between the anlages so formed.

Oral Question

1. Waht is linear pair axiom?
2. What is a transversal?
3. What is corresponding angle axiom?
4. What is a reflex angle?
5. What are complementary angles?
6. What are supplementary angles?

Activity-II

Some More Unsolved Problems

1. *Fermat's Last Theorem*

The most famous unproved conjecture in all mathematics is Femrat's Last Theorem. In a right triangle, the square on the hypotenuse equals the sum of the squares on the other two sides; that is $c^2 – a^2 + b^2$. There exist triples of "natural numbers" which will satisfy this equation. For example, $5^2 – 3^2 + 4^2$, $13^2 – 5^2 + 12^2$. Here we have expressed a square as the sum of two squares.

Pierre De Fermat

Piere De Fermat (1601–1665) investigated this right-triangle problem involving natural numbers while studying work on number theory by the Greek, Diophantus. Fermat wrote the following in the margin of his copy of Diophantus' book.

"It is impossible to wirte a cube as the sum of two cubes, a fourth power as the sum of two-fourth powers and in general, it is impossible to write any power beyond the second as the sum of two similar powers for this I have discovered a truly wonderful proof but the margin is too small to hold it." The proof is untraceable.

This is Fermat's Last Theorem. Algebrically it can be stated there are no $a, b, e \in$ N for which $c^n = a^n + b^n, n \in \text{N}, n > 2.$

Some of the greatest mathematicians of the last three hundred years have tried to prove or displrove this theorem without success.

2. *Three construction problems.* Soem of the first unsolved problems in mathematics were the three famous constructions proposed by the Greeks, to be solved using only a pair of a compasses and a straight edge :

(*i*) Can you construct a circle with the same area as a square?

(*ii*) Can you construct a cube exactly twice the volume of a given cube?

(*iii*) Can you divide an angle into exactly three euqal angles?

Mathematicians worked on these problems for many years before they found the solutions. However, the solutions were not what you might expect. The solution for each of these problems is the same, namely, that it is impossible to perform these constructions using only a pair of compasses and a straight edge.

3. *How to pack spheres.* A geometrical problem that is still unsolved involves the packing of spheres such as ping-pong balls. How should spheres be packed in a box so that they use the least possible space? This is similar to a problem of drawing circles. How should circles be drawn or round projects like 25 P coins be packed to cover the least surface? The arrangement for the circles on a surface has been found to be fo the patterns as shown in Fig. 22.86.

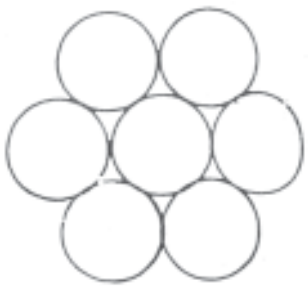


Fig. 22.86

In packing spheres, this is also the best arrangement for the first layer. But nobody has solve the problem of how to arrange the second layer of spheres.

4. *The four-colur problems.* About the middle of te nineteenth centry a problem related to map making was proposed and remains unsolved to this data. This problem, known as the four0colour problem, involves colouring of maps, using at most foru colvours. When two countries have only single points oin common they may use the same colour. Fig. 22.87 and 22.88 give examples of these restrictions.

No one has ever been able to produce a map that would require more than four colours, but no one has been able to prove that four colours are sufficient for all maps. However, it has been proved that if a map could be drawn that would require five colours are sufficient for all maps but may be necessary.

Fig. 22.87
Four colours are required for this map.

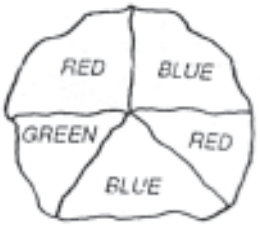
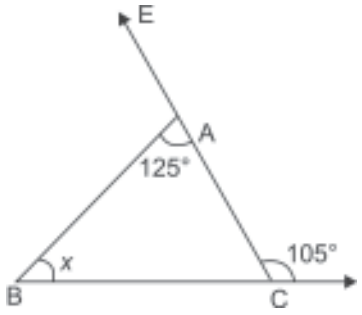


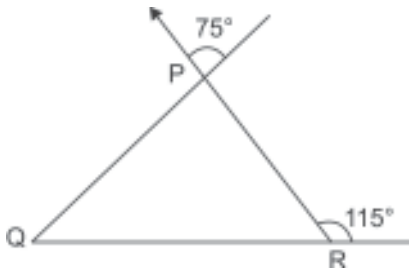
Fig. 22.88
Three colours are sufficient for this map

TRIANGLES

1. In a DABC, $\angle A = 53°$, $\angle C = 44°$ then $\angle B$ is
   (*a*) 37° (*b*) 46° (*c*) 83° (*d*) 38°
2. If angle of a triangle are $(x - 10°)$, $(2x + 10°)$ and $6x$ then value of x is
   (*a*) 40° (*b*) 30° (*c*) 90° (*d*) 20°
3. If angles of a triangle are in the ration 2 : 3 : 4 than largest angle is
   (*a*) 20° (*b*) 80° (*c*) 60° (*d*) 90°
4. A trianlge can have
   (*a*) Two sight angles
   (*b*) Two obtuse angle
   (*c*) all angles more than 60°
   (*d*) Two acute angles

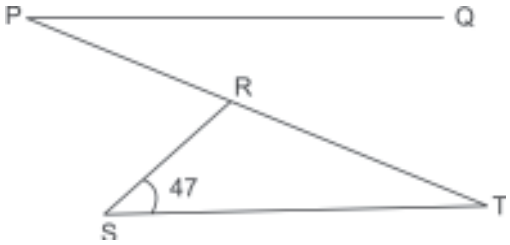


5. In figure $\angle ABC$ is
   (*a*) 50° (*b*) 40°
   (*c*) 60° (*d*) 25°
6. In figure $\angle PQR$ is
   (*a*) 30° (*b*) 50°
   (*c*) 40° (*d*) 115°



7. In ΔPQR, $\angle P = 80°$, and PQ = PR than $\angle Q$ is
   (*a*) 40° (*b*) 100°
   (*c*) 50° (*d*) 80°

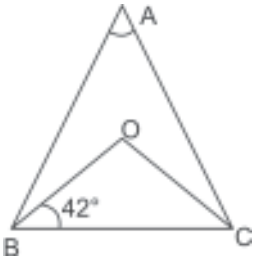
8. In fig AB || DE, angle ∠SRT is



(*a*) 108° (*b*) 98°

(*c*) 118° (*d*) 88°

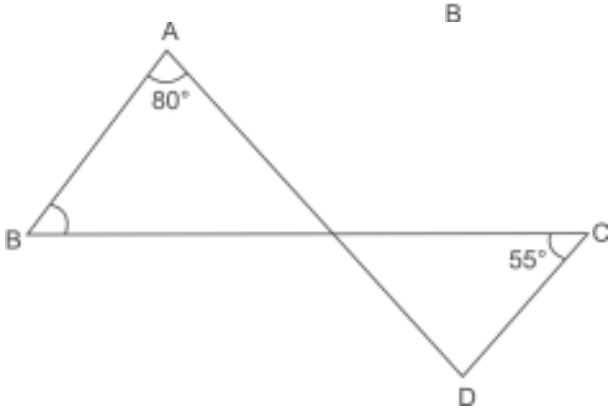
9. In figure ∠A = 74°, ∠ABC = 42°. If B O and CO are bisector of ∠ ABC and ∠BCA than ∠OBC is



(*a*) 117° (*b*) 127°

(*c*) 116° (*d*) 64°

10. In fig., ∠ CDE is

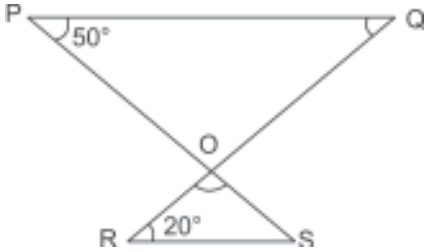


(*a*) 65° (*b*) 60°

(*c*) 55° (*d*) 50°

$32\frac{1}{2}°$

11. In fig. if PQ || RS, then ∠SOR is



(*a*) 100° (*b*) 20°

(*c*) 110° (*d*) 50°

12. In ΔABC, ∠A = 100° and AB = AC. Then the ∠B and ∠C are

(*a*) 40°, 50° (*b*) 40°, 40° (*c*) 60°, 60° (*d*) 50°, 40°

13. Angle of a triangle are in the ratio 3 : 1 : 5. The smallest angle of the triangles is

(*a*) 100° (*b*) 60° (*c*) 40° (*d*) 20°

14. An exterior angle of a triangle is 115° and its two interior opposite angles are equal. Each of these equal is

(*a*) $57\frac{1}{2}°$ (*b*) (*c*) (*d*)

15. Angles *x* and *y* form a linear pair of angles and $x - 2y = 30°$, the value of *x* is

(*a*) 180° (*b*) 50° (*c*) 130° (*d*) 30°

SECTION-B

Fill in the blanks form the words given in the box

Perpendicular	bisector	anles	congrevent
sides	larger	included	equilateral
greater		two	isosceles

1. Each angle of an ..... trianlge is 60°.
2. A point equaidistance from two given points lies on the ..... of the line segment joining the two points.
3. Sum of any two sides of a trainagle is ..... than the third side.
4. In trianlge, side opposite to the ..... angle is longer.
5. In triangle, angle opposite to the longer side is ..... .
6. If the altitude from one vertex of a triangle bisects the opposite side, then the trianlge is .....
7. ..... opposite to equal angles of a triangle are equal.
8. ..... opposite to equal sides of a triangle are euqal.
9. Two triangles are congrument if ..... sides and the ..... angle of one triangle are equal to the ..... sides and the included angle of the triangle.
10. Two figures are ....., if they are fo the same shape and the same size.

SECTION-C

Mathc the columns

	Column I		***Column II***
(*i*)	In an isosceles triangle PQR, PQ = PR and PQ is produced to S, such that PQ = PS then ∠QRS is	(*a*)	80°
(*ii*)	Angle of a trinagle are in the ratio 2 : 3 : 4 the largest angle of the triangle is	(*b*)	30°
(*iii*)	In ΔABC, if AB = AC and ∠B = 70°, then ∠C is	(*c*)	90°
(*iv*)	The vertical angle P of an isosceles triangle PQR is 120° then ∠Q is	(*d*)	70°

SECTION-D

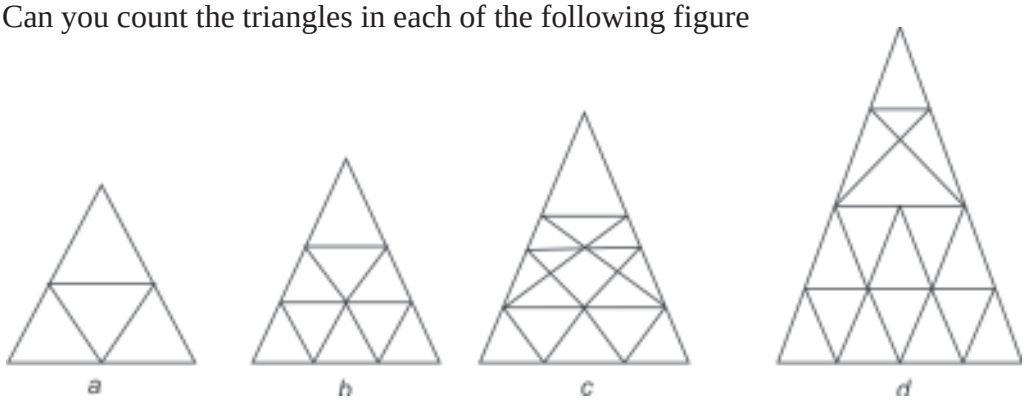
State whether the following statements are true or false by marking (T) for true and (F) for false

1. If two angles and on side of one triangle are equal to two angles and the corresponding side of the other triangle, then the two triangles are congruent.
2. If the equilateral triangle are equal, than it is equilateral.
3. If three angles of one triangle are equal to corresponding three angles of other triangle, then the two triangles are congruent.
4. The sides opposite to equal angles of a triangle are equal.
5. The sum of any two sides of a triangles is greater than the third side.
6. The triangles angles whose are in the ratio 1 : 3 : 2 is a right angled triangle.
7. Each angle of an isosceles triangle is 60°.
8. Angles opposite to equal sides of an isosceles triangle are equal.
9. Sum of three sides of a triangle is less than the sum of its three altitudes.
10. An obtuse angled triangle may be an equilaberal triangle.

Entertainment

Count the Triangle

Can you count the triangles in each of the following figure



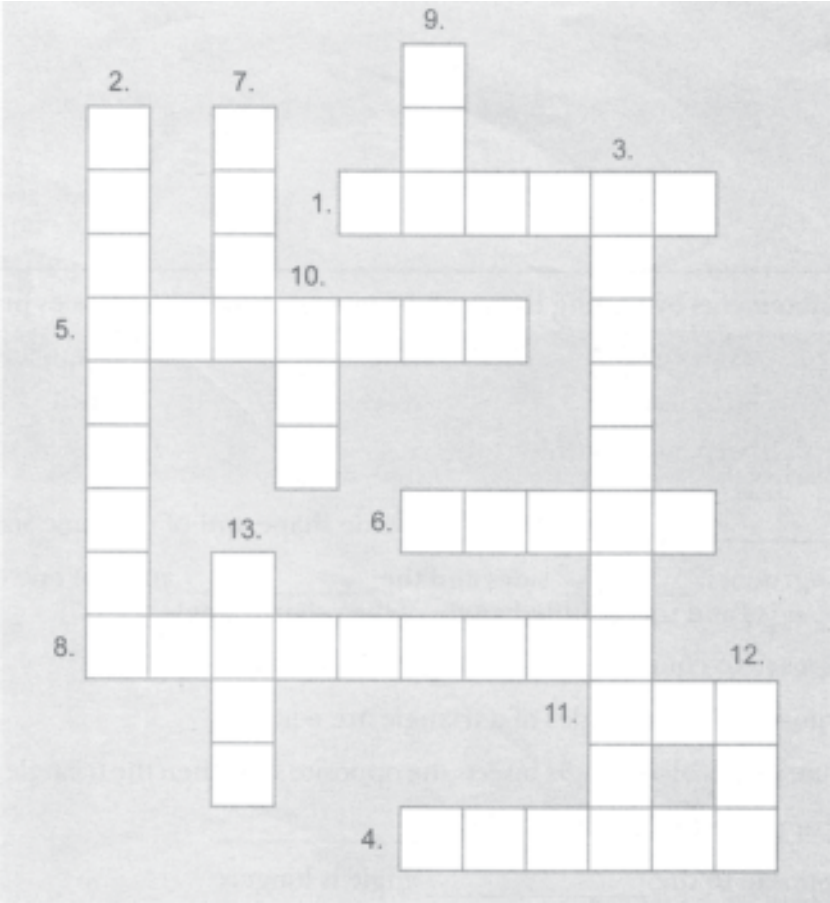
Group Discussions

Divide the class into small groups and after ask them to find and discussion criterion for congruence

1. Two triangles
2. Two rectangles
3. Two circles
4. Two quadrilaterals

Puzzle

Look the crossword puzzle given below and fill in the blanks accordingly.



Across

1. In a triangle, side opposite to the greater anlge _____.
4. _____ opposite to equal sides of a trianlge are euqal.
6. Angle opposite to greater side of a triangle _____ .
8. The sum of any two sides of a triangle is greater than _____.
11. Congruence criterion when one angle and one side of a right triangle are equal to corresponding site and angle of another ritht trianlge.

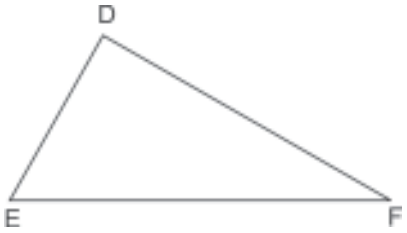
Down

2. If two sides and included angle of the triangle are equal to two sides and the included angle of the other triangle, then two triangles are _____.
3. Each angle of an _____ triangles is 60°.
7. In an isosceles trianlge altitude from the vertex bisects _____.
9. Number of equal sides of an isosceles triangles.
12. Congruence criterion when three sides of a triangles are equal to the corresponding sides of a another triangle.
13. If all angles of a triangle are equal then all of its _____ are also equal.

ACTIVITY-I

To 'examine' whether there is any relation between unequal sides and unequal angles of a triangle.

Draw three scalene triangles say ΔABC, ΔDEF and ΔPQR. Mesure all sides and angles of the three triangles

Triangle	*Sides in cm*	*Angles*
	AB = BC = CA =	∠A = ∠B = ∠C =
	DE = EF = FD =	∠D = ∠E = ∠F =
	PQ = QR = RP =	∠P = ∠Q = ∠R =

Repeat the activity with some other triangles. With this, you can arrive at the following results:

- If two sides of a triangle are unequal, the angle opposite to the longer side is greater.
- In any trianlge, the side opposite to the larger angle is longer.

Suggested Activity

1. Examine that the sum of any two sides of a triangle is greater than the third side.

Oral Questions

1. Which side will be longest in ΔABC, if ∠B = 60° and ∠C = 100°>
2. Which angle will be largest in ΔPQR if PQ = 3.5 cm, QR = 5.4 cm and PR = 7.2 cm?
3. It is possible to construct a triangle with length of its side as 4 cm, 3 cm and 8 cm?
4. It is possible to construct a triangle with lengths of tis side as 5 cm, 3 cm and 8 cm?

Activity-II

Title : The Sum of Angle of a Triangle Equals 180°

Objective : To verify the above result experimentally.

Pre-requisite knowledge : Concept of a straight angle

Materials required :

(*i*) Orange coloured glazed paper.

(*ii*) Scale

(*iii*) Pencil

(*iv*) Eraser

(*v*) A pair of scissors

(*vi*) Fevicol

Preparation for the Activity and Demonstration :

(*i*) Draw a triangle on an orange coloured glazed paper and paste them on a white sheet and then label its vertices A, B, and C.

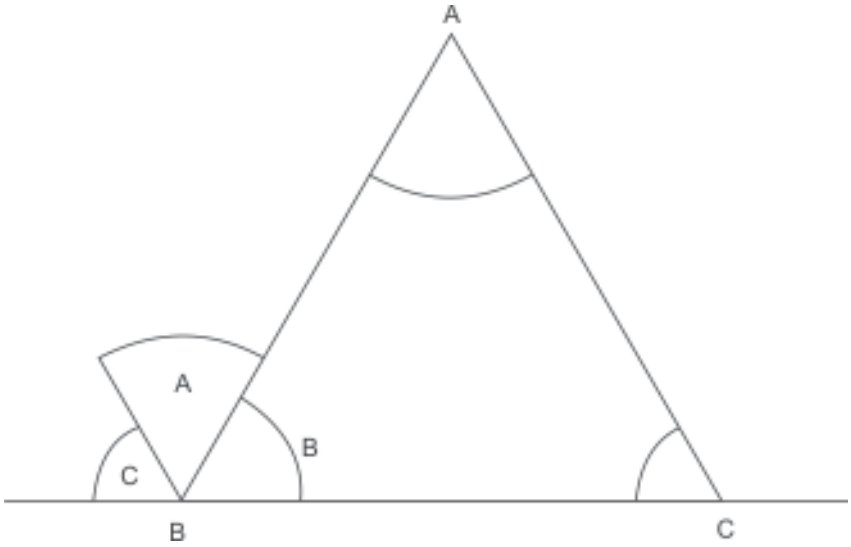
(*ii*) Cut off angles ∠ABC and ∠ACB from the triangle on glazed paper and paste them on white sheet adjacent to ∠ABC as shown in Fig. 16.1.

(*iii*) It can be seen that the three angles together from a straight angle showing thereby that the sum of the angles of a triangle is 180°.

Other results that can be verified :

This activity can also be used to verify experimentally that any exterior angle of a triangle is equal to the sum of its corresponding interior opposite angles.

Sum of the three angles of a triangle



Activity-III

Medians of a Triangle

Aim

To find the median and centroid of triangle by paper folding.

Before start you must know

— To draw a triangle.

— To find the mid-point of a line-segment by paper folding.

— To find the perpendicular to a line segment.

Materials Required

White sheets, Tracing papers, Geometry box.

Theory

- The line segment joining the mid-point of the side of a trianlge to its opposite vertex is called median of the triangle.
- All the medians of each triangle pass through the same point and the point of concurrence of all the medians is called the centroid of the trianlge.
- Centroid always lies inside the triangles.

How To Do

- Trace each of the fallowing triangle on a tracing paper.

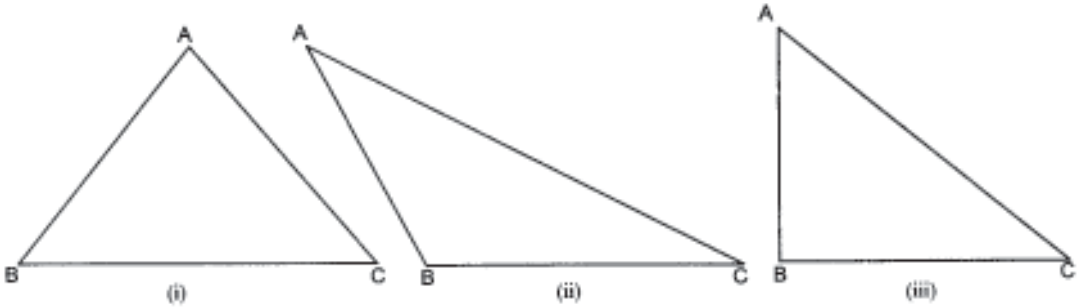


Fig. 5.14

- Cut out the above triangles from the tracing paper.
- Fold each triangle such that vertex C completely covers vertex B.
- Press firmly such that a crease is formed Fig. 5.15 (*i, ii, iii*).

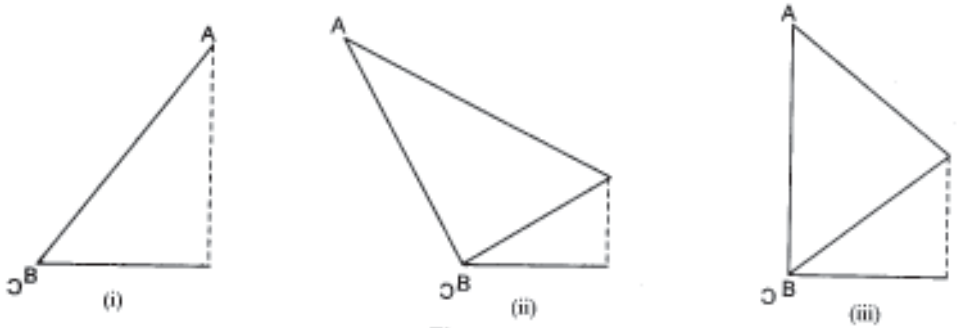


Fig. 5.15

- Unfold each figure and mark the point of intersection of *BC* and crease of fold. Let it be point *D*.

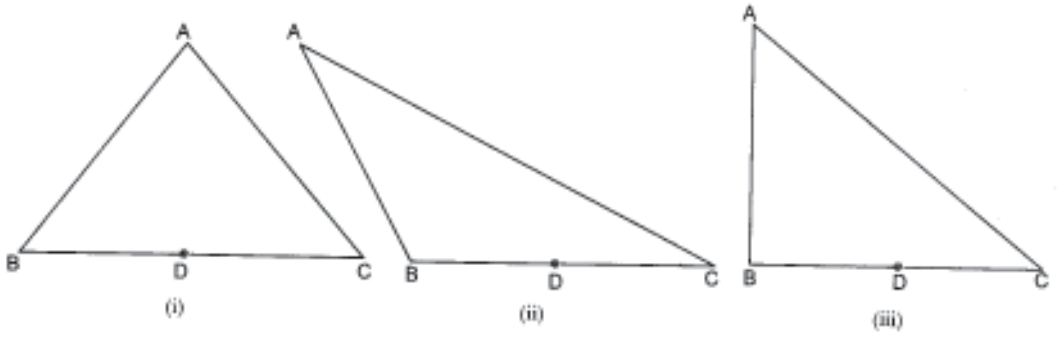


Fig. 5.16

- Draw a line by joining the points *A* and *D* in all cases.

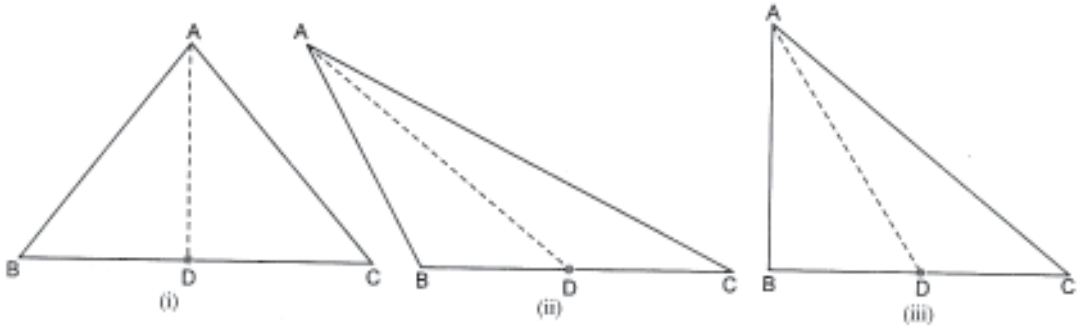


Fig. 5.17

- The line segment AD, joining the mid-point of side BC to its opposite vertex A is called a median of the triangle.
- Repeat the above procedure to find other two medians of sides AB and AC of the triangle ABC [See Fig. 5.18 (*i*, *ii*, *iii*)].

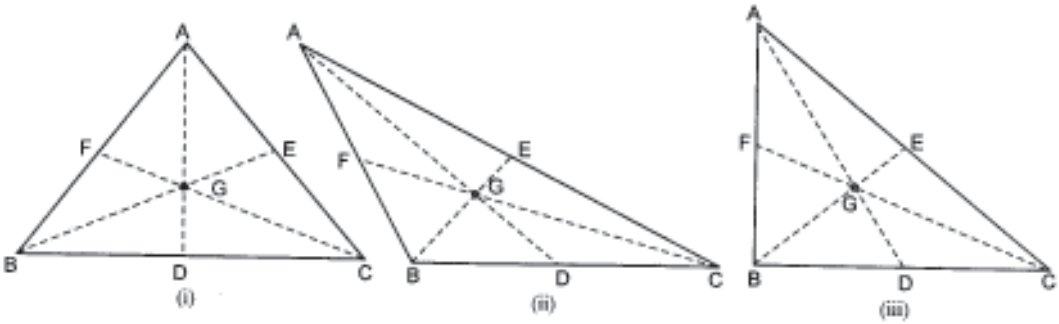


Fig. 5.18

What do you obseve?

We observe that :

— All the medians of each triangle pass through the same point and this point is called the centroid of the triangle. Usually, it is dented by letter G.

— The centroid in each case lie inside the triangle.

Additional Activity

— Draw an equilateral triangle and trace its two copies on tracing paper. Take one of the traced figures and find all the medians of the triangle on the other, find all the altitudes of the triangle.

— Then put the traced sheets one above the other so that the corresponding vertices coincide.

— What do you observe?

We find that all altitudes coincide with medians.

Conclusion

— We conclude that in a equilateral triangle altitudes and medians are the same. We can also say that orthocenter and centroid coincide in an equilateral triangle.

Do yourself

— Take several cutouts of isoscels triangles. Fold their altitudes and medians. Do you find anything speical about them? Discuss it with your friends.

FUN

Golden Ratio

Two quantities are said to be in golden ratio if the ratio of the sum of the quantities to the larger quantity is equal to the radio of the larger quantity to the smaller one

Fig. 5.10

$\frac{b(\phi+1)}{b\phi} \approx 1.618$ $\frac{b\phi}{b}$

=

The right equation shows that $a = b\,\phi$, which can be substituded in the left part, giving

$$= \frac{b\phi}{b} \Rightarrow$$

$$\phi + 1 = \phi^2 \quad \Rightarrow \phi^2 - \phi - 1 = 0$$

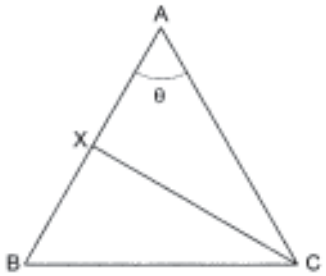
The only positive solutin to this quadratic equation is

$$\phi =$$

Thus, the number 1.618 form the Golden Ratio between two quantities.

The goldern ratio is found in many palces—art, architecture and mathematics. In the Fibonacci Sequence (1, 1, 2, 3, 5, 8, 13,...), each term is the sum of the two previous terms (for instance, 2 + 3 = 5, 3 + 5 = 8,...). As we go garther and farther to the right in his sequence, the ratio of a term to the one before it will get colser and colser to the Golden Ration.

Golden Traingle is an isosceles triangle in which the ratio of one of the equal sides to the base is the golden ratio. it.e., any isosceles traingle ABC with AB = AC is called a golden trianlge if $\frac{AB}{BC} = \frac{AC}{BC} = \phi$. Thus, a golden triangle is an isosceles triangle ABC witht he property bisecting the angle C produces a new trinagle CXB which is similar to the original.



Golden triangle
Fig. 5.11

The vertex angle in a golden traingle is θ = 36°.

Let the other two equal angles be *x* each.

So, $x + x + 36° = 180° \quad \Rightarrow \quad x = 72°$

∴ The three angle of such triangles are in the raito 72 : 72 : 36 or 2 : 2 : 1

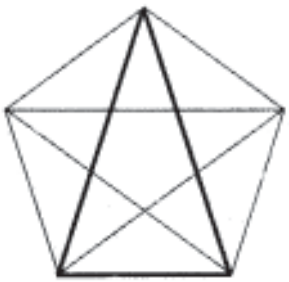


Fig. 5.12

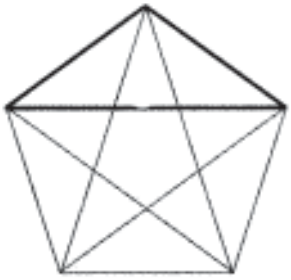


Fig. 5.13

If we connect the vertices of the regular pentagon, we can get two different Goden Triangles. The brown triangle has its sides in the golden ratio with its base, and the pink triangle has its base in the golden ratio with one of the sides.

Golden triangles are found in the nets of several saltations of dodecahedrons and icosahedron.

The Bee's Cell

Since ancient times people ahve been taking interest in the bee's cell. Pliny, the Roman historian, tells us of men who devoted their life to its study. Pappus of Alexandra (3rd centrury A.D.) left us an account of the hexagonal shape of the open end (before it is closed when full of honey) and drew from it the conclusion that the bees were endowed with a "certain geometrial forethrough" [Fig. 16.07 (*i*)].


Hexagons forming open end of bee's cell
(*i*)


3 Rhombuses forming blunt closed end of cell
(*ii*)

Fig. 16.07

He thought that the bees were very wise in selecting the hexagonal shape since this would hold more honey for the same amount of wax than other regular space-filling shapes like the equilateral triangle and the square.

The closed blunt end consists of three rhombuses, joined together so that they meet at a point. (The end is, in fact, part of the solid formed by fitting together twelve equal rhombuses, the larger angle of the rhombus being 109° 28′. This solid as shown in Fig. 16.07 (*ii*) is called the rhombic dodecahedron).

In the early eighteenth century, a young Swiss mathematician, Samuel Koenig, proved that the formation used by the bees was the one which would hold most honey for the least amount of wax. He declared that the bees had solved a problem beyond the reach of the old geometry and requiring the methods of Newton and Liebnitz. The "economical angles" for the rhombuses were found by calculation to be 109° 28′ and 70° 32′. It is now established that the form taken by the cells is due to natural forces, which make the wax fall into these shapes when softened by the bees, just as a soap falls into a definite shape when left to itself.

Geometry : (*i*) Introduction to includes' Geometry

(*ii*) Heron's formula

1. The statement which are proved through logical resioning base is called

   (*a*) Axioms (*b*) Theorems

   (*c*) Postubtes (*d*) None

2. Two line segment are said to be congruent if they have .....

   (*a*) Equal lien (*b*) Equal point

   (*c*) Equal lenght (*d*) None

3. The number of points that a line can have

   (*a*) Infinite (*b*) There

   (*c*) Two (*d*) One

4. If $a > b$ and $b > c$ then .....

   (*a*) $a > c$ (*b*) $a > c$

   (*c*) $a = c$ (*d*) Cannot be determine

5. If $a - c = b - c$, then

   (*a*) $a = c$ (*b*) $b = c$

   (*c*) $a - c = c$ (*d*) $a = b$

6. The three steps from slids to points are .....

   (*a*) Solid-lines-surface-points (*b*) Solid-surface-lines-poits

   (*c*) Solid-points-surface-solid (*d*) Points-lines-surfaces-solids

7. If l, m, n are lines in the same plane such that l intersects m and $n \parallel m$ then l and n.

   (*a*) Intersect (*b*) Parallel

   (*c*) Collinear (*d*) Cannot be determined

8. Number of points that two district lines cannot have in common

   (*a*) more than one (*b*) less than one

   (*c*) infinite (*d*) two

9. Angle x and y form linwar pair of angle and $x - 2y = 30°$, the value of x

   (a) 180° (b) 50°

   (c) 130° (d) 30°

10. An exterior angle of a tringle is 115° and its two interior opposite angles are equal. Each of these equal angle is.....

    (a) (b)

    (c) (d)

11. Angle of triangle are in reatio 3 : 1 : 5. The simallest angle of the triangle is

    (a) 100° (b) 60°

    (c) 40° (d) 20°

12. In ΔABC, ∠A= 100° and AB = AC. Then the ∠B and ∠C are .....

    (a) 40°; 50° (b) 40°; 40°

    (c) 60°; 60° (d) 50°; 40°

SECTION-B

Fill in the blanks

1. The perimeter of triangluar field is 450 m and its sides are in the ratio 13 : 12 : 15 then x is .....
2. If a and b are the length of diagonals of a rhombus of side 'x' than are = ...
3. ABC be an equalteral triangle of each side a Then attitude = ...
4. ABC be an isosiceler triangle then AB = AC = x and BC = a then perimeter = ...
5. .....
6. Area of an equilateral with side a is .....
7. Two lines in a plane not having any common point are called .....
8. Throught a given point, an ..... number fo lines can be drawn.
9. If three on more points lie on the same line, they are called ..... points.
10. A line has ..... end point.
11. A line segment has ..... end points.

SECTION-C

Match the following :

(*i*)	Line segement	(*a*)	part of a line with one end point.
(*ii*)	Ray	(*b*)	part of a line iwth two end points.
(*iii*)	Axioms	(*c*)	Statements which are proved, using definitional cross previously proved statement and deductive reasoning.
(*iv*)	Theorems	(*d*)	The assumptions which are observes universal truth.

Entertainment

There are several ways of calculating mentally with the number 11. Here is one way to multiply by 11 and one the see if a number is divisible by 11.

First multiply the number by 10, then the original number to it.

945×11

$945 \times 10 = 9450 \Rightarrow 9450 + 945 = 10395$

To find number divisiobe by 11

- To find out if any number is divisible by 11, start with the digit not he left, subtract the used digit from it, add the digit, subtract the resct, and so on.

  1257795

  $1 - 2 + 5 - 7 + 7 - 9 + 5 = 0$

- If the answer is 0 or 11, then the original number is divisible by 11.

Match the Columns

1. Match the following columns by placing the correct letter in square box.

	Column I		***Column II***
(*i*)	Postulate (1)	(*a*)	a terminated line (line segment) can be produced indefinitely.
(*ii*)	Postulate (2)	(*b*)	all right angles are equal to one another.
(*iii*)	Postulate (3)	(*c*)	a straight line may be drawn from any point to any other point.
(*iv*)	Postulate (4)	(*d*)	a circle may be described with any centre and any radius.

	Column I		***Column II***
(*i*)	Two distinct lines canot	(*a*)	be parallel tosame line.
(*ii*)	Two distinct intersecting lines cannot	(*b*)	have more than one point in common
(*iii*)	Part of the line with two end points	(*c*)	ray
(*iv*)	Part of a line with one end point	(*d*)	line segment

Papid Fire Quiz

State which of the following statementas are true or false by marking

T for true and F for false

1. Euclid belongs to Greece.
2. The side faces fo a pyramid are squares.
3. Pythagoras was a studnet of Archimedes.
4. Euclid divided his famous treastise "The element" into 12 chapters.
5. In ancient India, Altars with combination of shapes like rectangles, triangles and trapeziums were used for public worship.
6. In ancient India, the shapes of altars used for household rituals were triangles and rectangles.
7. Euclid's second axiom says that if equals be subtracted from equals, the remainders are equal.
8. Thales belongs to Egypt.
9. A solid has two dimensions.
10. In geometry, we take a points, a line and a plane as defined terms.
11. Euclid's fourth axiom says that things which coincide with one another are equal to each other.
12. The number of interwoven isosceles triangles in Sriyantra is eleven.
13. The Euclidean geometry is valid only for figures in the plane.
14. In Indus Valley Civilisation the bricks used for construction work were having dimensions in the ratio 4 : 2 : 1.
15. Thales belongs to the country Babylonia.

Arragne a Seminar on Works of Euclid

Euclid (325 BC - 265 BC)

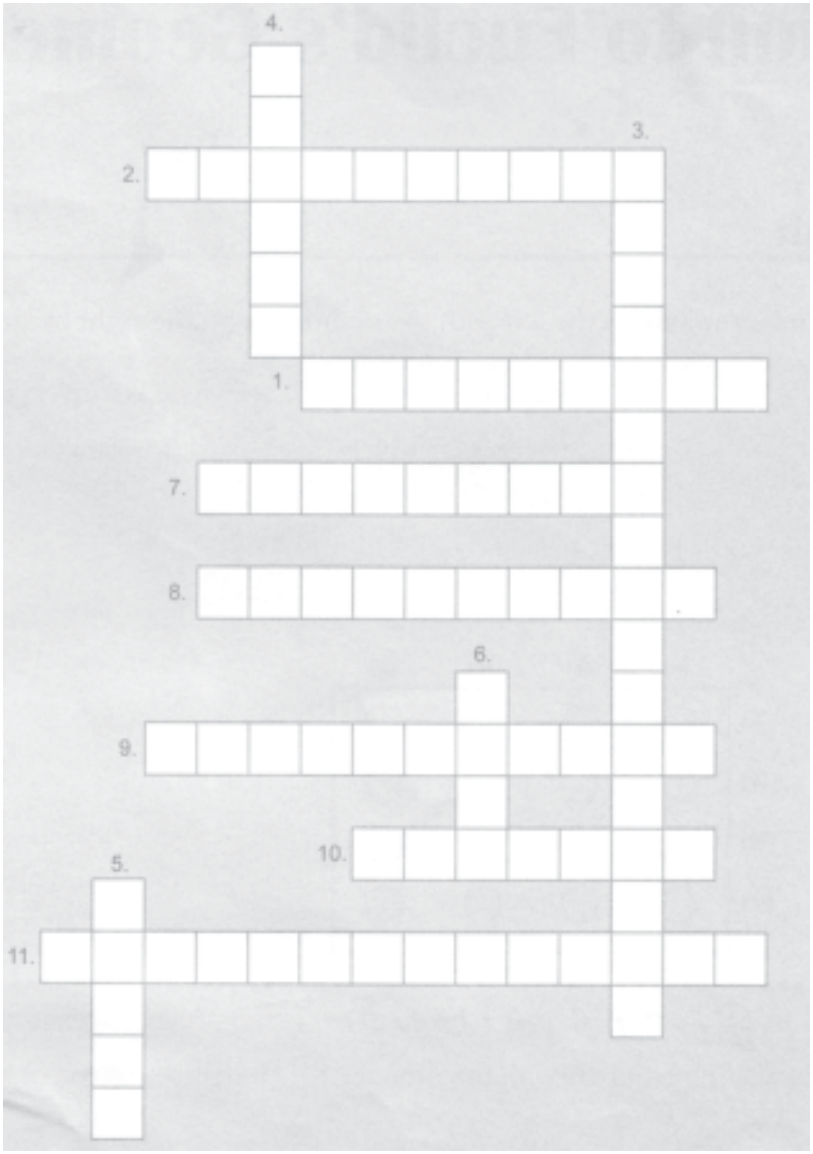
Little is known about Euclid's life except that he taught at Alexanderia in Egypt. Euclid around 300 BC. Collected all known work in the field of mathematics and arranged it in his famous treastise called Elements. He divided the 'Elements' into thirteen chapters each called a book. Starting with this definitions, Euclid assumed certain properties, which were not to be proved. These assumptionsare actually 'obvious universal truths'. He divided them into two types: axioms and postulatees. He used the term 'postulate' for the assumptions that were specific to geometry. Common notations (often called axioms), on the other hand, were assumptions used throughout mathematics not specifically linked to geometry. The long-lasting nature of the 'Element' made Euclid the leading mathematics teacher of all time.

Group Discussion

You have studied about two formulas to find area of a tringle.

1. Area of triangle = $\frac{1}{2}$ × altitude
2. Area of triangle =

Discuss among yourself and write advantage of these formulas also find why Heron developed another formula when ne was already existing?



Across

2. Throught two distinct points a _____ can pass.
6. Number of Euclid's postulates.
7. Assumption that is obvious universal truth used specifically in geometry.
8. A set of aximoms is _____ if it is impossible to deduce from these axioms that contradict any axiom or previously proved statement.
9. The statement that can be proved.
10. The result that was proved by applying deducing reasoning.
11. Geometrical terms that can not be defined.

Down

1. An equivalent version of Euclid's fifth postulate _____ axiom.
3. The geometry that valid only for the figures in the plane.
4. Assumed universal truth in all branches of mathematics.
5. A figure formed by two rays with common initial point.

Activity : To find pythagorean Triples

Pythagorean Triples

- Any three numbers a, b and c satisfying the realtion $a^2 + b^2 = c^2$ are called Pythagorean triples.
- There are infinite number of such triples.
- The best known are

(3, 4, 5)	:	$3^2 + 4^2 = 5^2$
(5, 12, 13)	:	$5^2 + 12^2 = 13^2$
(8, 15, 17)	:	$8^5 + 15^2 = 17^2$
(7, 24, 25)	:	$7^2 + 24^2 = 25^2$

They can easily be found using the formulae.

$a = m^2 - n^2$, $b = 2mn$, $c = m^2 + n^2$

Where m and n are whole numbers. For esample, when $m = 3$ and $n = 2$

$a = 3^2 - 2^2 = 5$, $b = 2 \times 3 \times 2 = 12$, $c = 3^2 + 2^2 = 13$

Directions : Match the following

1. Area of a regular hexagon with side a	(*a*)	
2. Area of a trapezicim with parallel sides and *b* and height *h*.	(*b*)	bh
3. Area of rhombus with diagonlas d_1 and d_2	(*c*)	*ab*
4. Area of parallelogram with base *b* and altitude *h*.	(*d*)	
5. Diagonal of square with side a	(*e*)	
6. Area of rectangle with length a and breadth *b*.	(*f*)	
7. Area of equilateral tringle with side *a*.	(*g*)	Area of a triangle = , where,

8. Area of trinagle with base b and altitude a. (h) $\frac{1}{2}(a+b)\times h$

9. Area of isosceles triangle with base a and equal side b ecah (i)

10. Heron's formula (j)

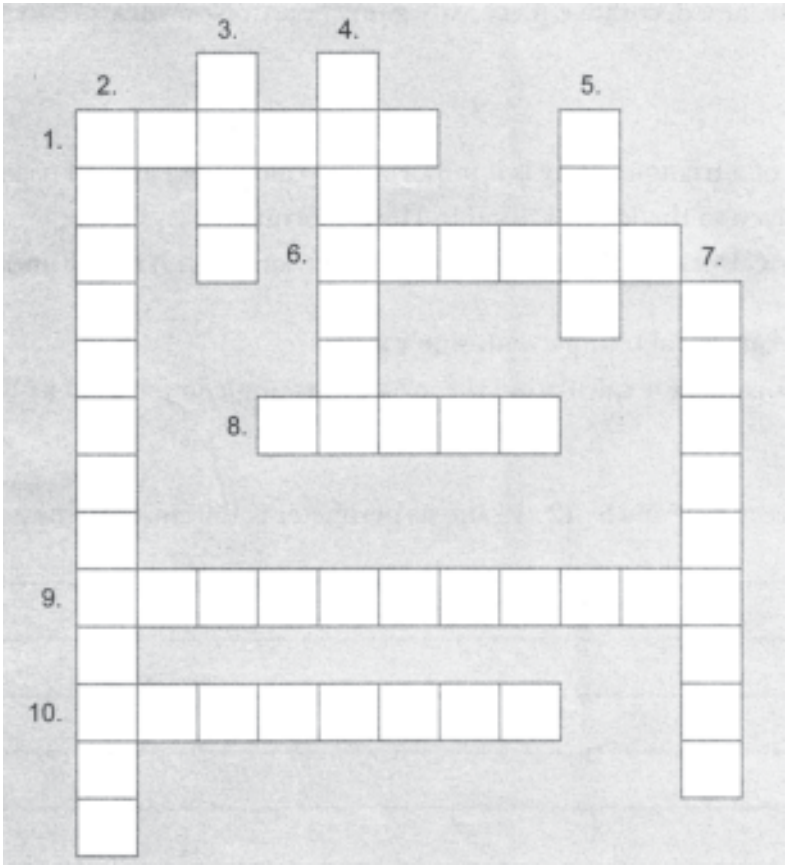
Match the following columns

	Column I	*Column II*
1.	Area of a triangle with sides 16 cm, 20 cm and 24 cm	(a)
2.	Area of a regular hexagon with side	(b)
3.	Area of rhombus with one side 25 cm and one diagonal 30 cm in length	(c) 30 cm^2
4.	Area of an equilateral triangle, each side measuring 6 cm	(d)
5.	Area of a parallelogram with base 7.5 cm and height 4 cm	(e) 37.5 cm^2
6.	Area of a trapezium with parallel sides of lengths 8 cm and 10 cm and height 6.5	(f) 600 cm^2
7.	Area of a triangle with height 12.5 cm and base 6 cm.	(g) 58.5 cm^2

State whether the following statements are true or false by marking (T) for true and (F) for false.

1. The area of a triangle with sides 12 cm, 14 cm, and 16 cm and height 6 cm corresponding to side 16 cm, is 48 cm^2.
2. The area of equilateral triangle is whose side is
3. The area of a rhombus with each side 5 cm and one of the diagonals 6 cm is 15 cm^2.
4. The area of any quadrilateral ABCD is truice the area of ΔABC.
5. Area of parallelogram is twice the area of a triangle formed by joing any diagonal to the parallelogram.
6. The area of an isosceles right triangle is the product of the lengths of its two legs.
7. The altitude of an equilateral triangle with side a is a.
8. S used in Heron's formula is the perimeter of the triangle.

Look at the Crossword Puzzle given below and fill in the blanks accordingly.



Across

1. Triangle with no two sides equal.
6. A mathematician and philosopher who discovered the basic proportionality theorem.
8. Mathematician who derived formula for calculating area of a triangle using its three sides.
9. Measurement of lengths, areas and volumes.
10. Figure obtained by joining opposite vertices of a quadrilateral.

Down

2. The letters S used in Heron's formula.
3. Twice the area of a triangle divided by its height.
4. Unit generally used for measuring area of land.
5. Measure of the region on a surface enclosed by a closed curve.
7. The area of a rhombus can be obtained by the measure of its two ..... .

Entertainment

Arrange 16 toothpicks as shown in the diagram. Remove four toothpicks so that only four triangles remain.

FUN

Geometry

In Egypt land of the Pharoahs, was its birth,
Where it was used to measure the earth,
You see, every year the Nile River would flood,
And wash away absolute tons of mud
And then it was no longer too very much clear
To distinguish whose land was whose my dear.
They invented the surveyor who found their boundary
But did nothing about cleaning the laundry.
The building of pyramids about 3000 B.C.
Used several geometric principles, see ?
Then from Greece came Thales a man,
Who was the first geometrician,
He and others learned from Egyptian priests,
Where geometry still has not ceased.
After Thales came the great Plato,
Who made the idea of proof grow and grow.
Aristotle, a Greek who really rates.
Noted the difference between axioms and postulates.
Then carne the all important EUCLID.
Probably never heard of him. You did ?
Euclid studied under the one and only Plato.
Remember, the one who made theorems grow and grow.
He was most successful text book writer,
You must understand compared with us, he was much brighter.
He wrote thirteen books called THE ELEMENTS
Which I know, don't tell me, is in the wrong tense.
THE ELEMENTS are the basis for geometry teaching
And it seems to me to be mostly on deductive reasoning
This poem tells the ancient history of geometry through Euclid
I hope you enjoyed it 'cause I sure did.

12.	E	C	A	L	P	A	L	A	B	E	L
11.	P	A	L	A	G	R	A	N	G	E	L
10.	A	Y	H	C	U	A	X	A	S	R	E
9.	S	L	R	M	S	N	B	E	E	A	S
8.	C	E	P	H	N	B	R	L	U	M	S
7.	A	Y	R	E	A	R	R	O	C	R	U
6.	L	E	V	B	A	G	R	O	L	E	R
5.	C	I	C	C	A	N	O	B	I	F	E
4.	G	O	S	S	E	T	T	R	D	X	I
3.	X	R	M	N	R	O	L	Y	A	T	P
2.	D	E	I	N	S	T	E	I	N	S	A
1.	R	E	L	U	E	N	O	T	W	E	N
	1	2	3	4	5	6	7	8	9	10	11

The names of these mathematicians are hidden in the above grid. Give the of the cooredinates of the initial and final letters of their names.

Ex. Newton (11, L) to (6, 1)

Abel	Euclld	Napier
Babbage	Euler	Newton
Boole	Fennat	Pascal
Couchy	Fibonacci	Pythagoras
Cayle	Gossett	Russel
Descartes	Lagrange	.....
Einstein	.....	.....

MATHEMATICS (IX)

Mex. Marks : 40 *Time : 2 hours*

General Instructions

1. All questions are compulsory.
2. The question paper consists of 15 questions divided in two sections A and B.
3. Section A consists of questions of 2 mark each and section B consists of 8 questions of 3 marks each.

SECTION-A

1. is equal to

(*a*) $3+\sqrt{2}$ (*b*) $\sqrt{3}+\sqrt{2}$ (*c*) $1+\sqrt{2}$ (*d*) $\sqrt{3}+1$

2. can be rewritten as

(*a*) (*b*) (*c*) (*d*)

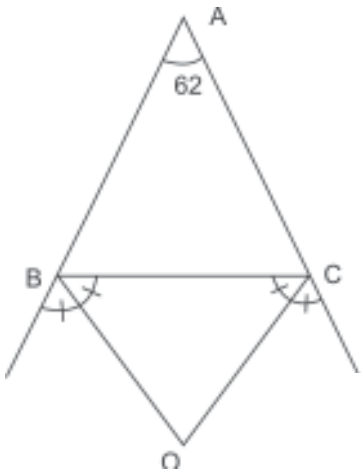
3. When of the following polymial has $(x - 1)$ as factor

(*a*) (*b*) $x^4 - x^3 - x^2 - 1$ (*c*) $x^3 + x^2 - x + 1$ (*d*)

4. Mathematical statement when are accepted without proof are called

(*a*) Theorem (*b*) Axiom (*c*) Leema (*d*) None of these

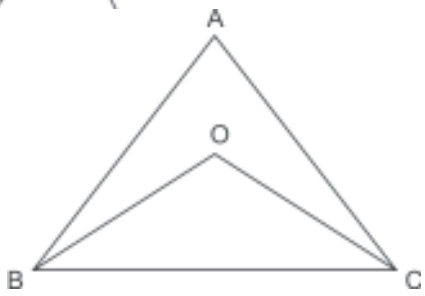
5. In the given figure 1 measure of ∠BOC is



(*a*) 51 (*b*) 59

(*c*) 31 (*d*) 39

6. In the given figure-2 the ratio ∠ABO : ∠AEO is



(*a*) 1 ; 2 (*b*) 1 : 1

(*c*) 2 : 1 (*d*) 2 : 3

7. If the sides of a triangle are doubled then it's area is

(*a*) same (*b*) doubled (*c*) becomed 3 times (*d*) become 4 times

8. The linear equation $8x - 3y = 4$ has

(*a*) No solution (*b*) Infinite solution (*c*) Unique solution (*d*) Two solution

[SECTION B]

9. Write a paragraph about life of Euclid or Aryabhatta and his contribution to mathematics.

10. Match the following columns

Column I	***Column II***
(*i*) Co'ordinate of a point on *x* axis	(*a*) (1, 1)
(*ii*) Co'ordinate of a point in IInd quadrant	(*b*) (0, 1)
(*iii*) Co'ordinates of origin	(*c*) (1, 0)
(*iv*) Co'ordinate of a point on *y* axis	(*d*) (0, 0)
(*v*) Point on line $y = x$	(*e*) (– 1, 1)

11. Usens an activity show that sum of angles of a triangles is always 180°.
12. Make a puzzle involving at least fine Geometrical concept.
13. Using graph paper obtain mirror image of a triangles whose vertices are (1, 1) (5, 1), (3, 5) about x aims and y aims.
14. Represent on number line.
15. Using graph paper find zerores of the polynomial $p(n) = 2x + 3y - 5$.
16. Using an activity find the total surface area of cylinder with radius as 7 cm and height 14 cm.

REAL NUMBERS

About the topic:–

Decimal Representation of a Rational Number

If , when p and q are co-prime and $q \neq 0$ and q has a prime factorization of the form.

$q = 2^m 5^n$ when n and m are nonnegative intergers, x has a terminating decimal representation.

$q \neq 2^m 5^n$ when n and m are nonnegative integers, x has nonterminating repeating decimal representation.

Euclid's Division Lemma

For any two positive intergers a and b, $a > b$, there exist unique factorization is unique.

inters q and r such that $a = bq + r(0 \leq r < b)$

Fundamental Theorem of Arithmetic

Every composite number can be factorized as a Product of primes factorised as a product of primes and this factorization in unique.

$x\sqrt{3}$

HCF $(a, b) = c$, mean, HCF of a and b is c

HCF $(a, b) \times$ LCM $(a, b) = a \times b$

HCF of two or more prime number is always

LCM of two or more prime numbers is equal to their product

An irrational number is a non terminating and non recurring decimal and can not be put in the form of p/q

1. If $\sqrt{ab}$ be irrational, then $\sqrt{a} + \sqrt{b}$ is also irrational.

   If p is a positive prime, then $\sqrt{p}$ is an irrational number.

SECTION A

Multiple Choice Questions

Choose the correct answer from the givne options

1. Euclid's division lemma states that for any two positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy.

   (a) $0 \angle r \leqq b$ (b) $0 \angle r \angle b$ (c) $1 \angle r \angle b$ (d) $0 \leq r \angle b$

   (Ans. d)

2. If a and b are two positive numbers and H and L are their HCF and LCM respectively them

   (a) $H = \frac{L}{a \times b}$ (b) (c) (d) $a \times b = H \times L$

   (Ans. d)

3. For some integer q, every add integer is of the form.

   (a) $q + 1$ (b) $2q + 1$ (c) q (d) $2q$

   (Ans. b)

4. In the form of , 0.3 can be expressed as

   (a) $\frac{2}{9}$ (b) (c) (d)

   (Ans. b)

5. HCF between two prime numbers is

   (a) 0 (b) 2 (c) 1 (d) None of these

   (Ans. c)

SECTION–B

Short answer type questions.

1. Express as decimal form **(Ans. 0.125)**

2. Express as decimal form of **(Ans. $\frac{37}{99}$)**

3. Write the statement of Euclid division lemma.

4. State the fundamental theorem of Arithmetic.

5. Given that HCF (306, 657) = 9 then find LCM (306, 657) **Ans. 22338**

SECTION–C

Fill in the blanks.

1. _____ can be expressed as a product of its primes.

Ans. (Every composite number)

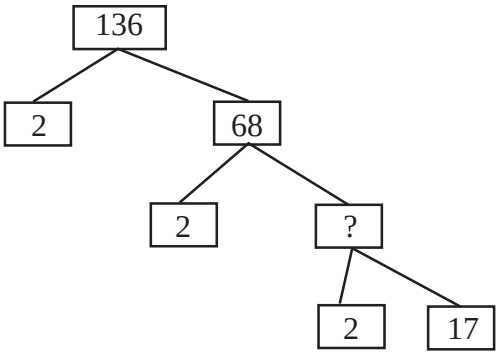
2. A number which can neither be expressed as terminating decimal nor as a repeating decimal is called _____

Ans. (irrational number)

3. is a _____.

Ans. (Non terminating repeating)

4. _____



Ans. 34

5. HCF of 60 and 72 is _____

Ans. 12

SECTION–D

Match the column.

1.

	Column A		***Column B***
(*i*)	$0.\overline{3}$	(*a*)	irrational number
(*ii*)		(*b*)	rational number
(*iii*)	0.234234234	(*c*)	$\frac{1}{3}$
(*iv*)	Product of two irrational number is	(*d*)	7
(*v*)	HCF of 455 and 42	(*e*)	non terminating repeating

Ans.

(*i*) — *c*

(*ii*) — *a*

(*iii*) — *e*

(*iv*) — *b*

(*v*) — *d*

2.

	Column A	***Column B***
(*i*)	HCF of 6, 72, 120	(*a*) Corl fridrich gauss
(*ii*)		(*b*) 6
(*iii*)	$\frac{3}{4}$	(*c*) 4
(*iv*)	HCF of 4052 and 12576	(*d*) irrational number
(*v*)	Prince of mathematics.	(*e*) 0.75

SECTION–E

Long Answer Type Questions.

1. Show that is an irrational number.
2. Use Euclid's division lemma to show that the cube of any positive interger is of the form *am*, *am* +1, *am* + 8.
3. Using prime factrigation method find the HCF and LCM of 6, 72 and 120

(Ans. HCF = 6, LCM = 360)

4. Show that the square of an add positive integer can be of the form 6*q* +1 or 6*q* + 3 for some integer *q*.
5. Using Euclid's division lemma find the HCF of 12, 30 and 144. **(Ans. 6)**

SECTION–F

Activities

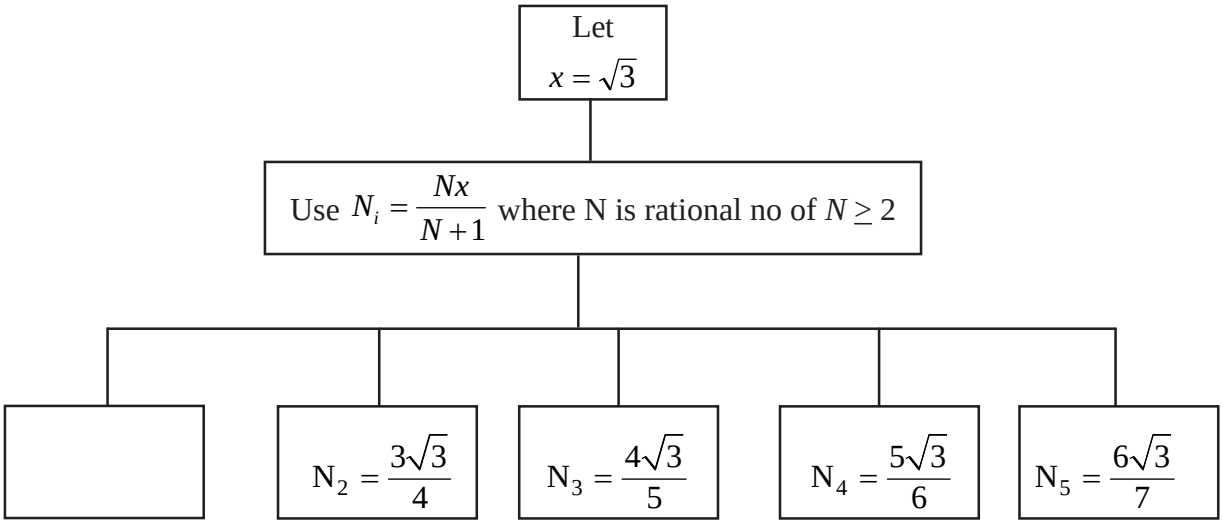
1. To find irrational number between two consecutive positive inters.
2. Verity fundamental theorem of arithmetic for any 10 composite numbers.
3. Verity the following statements.

   Let be a rational number, such that the prime factorization of *q* is of the form 2^n5^m where *n*, *m* are none negative integers, then *x*, has decimal expansion which terminates."
4. Represent $\sqrt{3}$ and $\sqrt{5}$ on number use.

Activities

Objective:— To find irrational number between two consecutive positive integer.

—Find 6 irrational numbers between 1 and 2.



Observations: 5 irrational numbers between 1 and 2 are $\frac{2\sqrt{3}}{3}$, , , ,

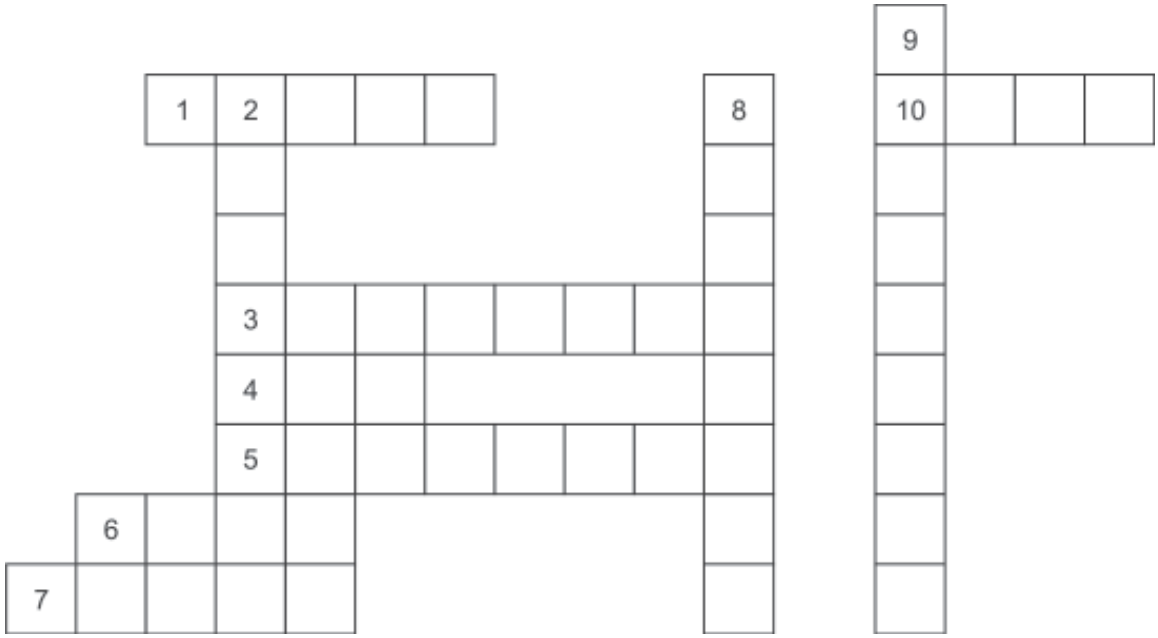
Note : On the basis of above example find 10 irrational numbers between.

(*a*) 2 and 3

(*b*) 3 ad 4

SECTION–G

Puzzle Topic real numbers



Hints:—

Across

1. 2, 3, 5, 7, 11, 13, 17, 19, 23...
2. ...–3, –2, –1, 0, 1, 2, 3 ...
4. 1, 3, 5, 7, 9, 11....
5. Counting numbers
6. Numbers on number line
7. 0,1, 2, 3, 4, 5....
10. 2, 4, 6, 8, 10....

Down

3. Numbers of the form , p, $q \varepsilon Z$ ad $q \neq 0$
8. Numbers on the right side of zero on number line.
9. Numbers on the left side of zero on number line.

Ans.

1. Prime
2. Rational
3. Integers
4. Odd
5. Natural
6. Real
7. Whole
8. Positive
9. Negative
10. even.

SECTION–H

Group Discussion

$\frac{p}{q}$

— Prince of Mathematical

Carl Friedrich Gauss is often referred to as the 'Prince of Mathematicians' and is considered one of the three greatest mathematicians of all time, along with Archimedes and Newton. He has made fundamental contributions to both mathematics and science.

Carl Friedrich Gauss
(1777–1855)

— Discuss the contribution of Carl Fridrich Gauss in mathematics.

— Prepare a project on the contribution of Indian mathematicians in mathematics. keeping the following points in mind.

(*a*) Name of mathematician

(*b*) Brit and place of birth date.

(*c*) Studies.

(*d*) Profession.

(*e*) Contribution to mathematics.

(*f*) Utility of contribution.

(*g*) Any prize of award (Like noble prize etc.).

SECTION–I

***Quiz* (Real Numbers)**

Answer the following:—

1. State fundamental theorem of Arithmetic.
2. State Euclid's division lemma
3. Who is known as 'Prince of Mathematics.'
4. What will be the HCF of any two prime numbers.
5. Is $\sqrt{16}$ an irrational number?
6. What is lemma ?
7. $\frac{p}{q}$ Form of $0.\bar{3}$ is...
8. What is the HCF of smallest composite number ad the smallest prime number.
9. What are co-prime number.
10. π is rational or irrational.

FUN GAME

How to product a person's Date of Birth

Step I. Ask the person to take the number of the month in which he/she was born Example (26^{m} June) = 6

Step II. Ask him/her to double the number = 2 × 6 =12

Step III. Add 5 to it = 12 +5 = 17

Step IV. Multiply the result by = 5 × 17 = 85

Step V. Put a zero behind the answer = 850

Step VI. Ask him/her to Add the date of birth =850 + 26 = 876

Now ask him/her to tell you the final answer , In the above case the final answer in 876.

Now subtract so from the last two digits to get the date ad subtract 2 from the remain of digits to get the month.

8	76
2	50
6	26

(month) (date)

Now tell him/her the date of both as 6^{m} June.

Class X^{th} Class Assignment

Q.1. Write one irrational number between 2 and 3.

Q.2. Write the prime factors of 35.

Q.3. Write are Rahanal Number between and .

Q.4. Has the Rahanal Number $\frac{441}{2^2 5^7 7^2}$ terminating or non terminating Representation.

Q.5. If $\frac{p}{q}$ is a Rhinal Number ($q \neq 0$) what is the condition on q. So that Decimal Representation of $\frac{p}{q}$ is termination.

Q.6.

	Rahaal	Irrational	Real	Prime	Integers	Composite
2						
$\sqrt{2}+1$						
1						
0						
π						
$\frac{22}{7}$						
8						
7						

$\sqrt{9}$

Oral Test

2. (Oral Test/Mathematical Quizzes also conducted)

Objective Question based on knowledge of formula involved in units. Oral test are useful whety student have clarity of concept or nut. It is a Quick way of asking mental ability of a child. for example True Type of question may be.

Q.1. What is the difference between Rahonal and irration Number?

Q.2. What is difference between prime and composite Number ?

Q.3. p is an rahanal Number or irration Number?

Q.4. How many rahanal Number are between two irrational number?

Q.5. Sum of two prime is also a prime number (T/F)

Whole class may be divided into group of four five student. From each group five question to be asked. Un answered question pass to the Next group. Student find this practice interesting.

ARITHMETIC PROGRESSIONS

About the topic–

A group of numbers connected by a definite law is known as sequence.

A sequence is called a series if its terms are connected by the sign of addition of subtraction.

Selection of terms of an A.P.

When odd number of terms are required, take middle term as 'a' and common difference as 'd'.

When even number of terms are required, take a – d, a + d as two middle terms and '2d' as common difference.

Sum of n terms of an A.P.

l is the last term

a is the first term

d is the common difference

The standard form of an Arithmetic progression is

$a + (a + d) + (a + 2d) + \ldots (a - d) + l$

a is first term, l is laster term, d is common difference.

$S_n =$

Arithmetic Progression

A Sequence in which each term is obtained from the preceding term by adding a constant quantity to it.

nth term of and Arithmetic Progression

$a_n = a + (n-1)d = l$

Where a is first term, d is common difference and l is the last term.

The condition for three terms to be in a an Arithmetic Progression is that common difference between them must be same.

nth term from the end is $l - (n-1)d$. where l is last term, d is common difference.

nth term of an Arithmetic Progresssion is the difference of the sum of first n terms and the sum of first $(n-1)$ terms

ARITHMETIC PROGRESSIONS

SECTION A

Multiple choice Questions:

Chose the correct option.

1. Which the following sequence are in A.P.

   (*a*) 3, 6, 12, 24... (*b*) 1, 4, 9, 16...

   (*c*) 0, –4, –8, –12.... (*d*) 2, 6, 11 , 17.... **(Ans. c)**

2. The 10^m term from the end of AP 10, 7, 4... is

   (*a*) 40 (*b*) –17 (*c*) –23 (*d*) –100 **(Ans. b)**

3. The 4^m term from the end of AP –11, –8, –5... 49 is

   (*a*) 40 (*b*) 58 (*c*) 37 (*d*) 43 **(Ans. a)**

4. In an AP if a =5 d =4 an = 125 then *n* is

   (*a*) 27 (*b*) 31 (*c*) 20 (*d*) 17 **(Ans. b)**

5. The sum of first five multiples of 3 is

   (*a*) 65 (*b*) 55 (*c*) 45 (*d*) 75 **(Ans. c)**

SECTION–B

Short Answer Type Questions.

$\frac{n}{2}\{2a + (n-1)d\}$

1. The 8^m term of an A.P. is –23 and the 12^m terrm is –39 find A.P. **(Ans. 5, 1, –3, –7...)**
2. Find the sum of all two digits add positive numbers **(Ans. 2475)**
3. Find the sum of firm 15 terms of an AP whose n^m terms is 9 – 5n. **(Ans. –465)**
4. Which term of AP 21, 42, 63, 84... is 420 ? **(Ans. 20^m terms)**
5. The P^m term of AP is *q* and q^m term is *p*. Find the $(p + q)^m$ term. **(Ans. 0)**

SECTION–C

Fill in the blanks:—

1. The sum of first *n* natural number is .... **(Ans. $\left(\frac{n(n+1)}{2}\right)$)**
2. The n^m term of an AP is.... **(Ans. $a_n = a + (n-1)d$)**
3. If *x, y, z* are in AP then *y* = ... **(Ans.)**
4. The value of *X* for which *x, x* + 2, 3*x* – 2 are three consecutive terms of an AP is **(Ans. $x = 3$)**
5. Sum to *n* terms of an AP is ... **(Ans.**

SECTION–D

Match the column.

1.

	Column A	***Column B***
(*i*)	q^m term of ...	(*a*) 8
(*ii*)	Common difference of AP 51, 59, 67, 75...	(*b*) rational number
(*iii*)	7^m term of an AP	(*c*) $\frac{19}{4}$
(*iv*)	30^m term of AP 10, 7, 4,...	(*d*) $a + 6d$
(*v*)	Sum of term 100 natural number	(*e*) –77

Ans.

(*i*) — *c* (*ii*) — *a*

(*iii*) — *d* (*iv*) — *e*

(*v*) — *b*

2.

	Column A	***Column B***
(*i*)	1 + 2 + 3 +... + 1000	(*a*) $a + (p - 1)d$
(*ii*)	Sum of first 5 even numbers	(*b*) –2
(*iii*)	P^m term of AP	(*c*) 500500
(*iv*)	Aritmetic man *a* and *c*	(*d*) 30
(*v*)	Value of *K* when k, k–2, 3k an are in AP	(*e*) –77

Ans.

(*i*) — *c* (*ii*) — *d*

(*iii*) — *a* (*iv*) — *e*

(*v*) — *b*

SECTION–E

Long Answer Type Questions.

1. The ratio of the 11^{th} term to the 18^m term of an AP is 2 : 3, find the ratio of the 5m term to the 21^{st} term. **Ans. 1 : 3**

2. A sum of Rs 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is of Rs 20 less than its preceding prize, find the value of each of the prizes. **Ans. Rs. 160, 140, 120, 100, 80, 60, 40.**

$\frac{3}{4},$

3. The sum of 4^m and 8^m terms AP is 24 and the sum of the 6^m and 10^m terms is 44. Find the first three terms of the AP. **Ans. –13, –8, –3**

4. The first ad the last term of an AP are 17 and 350 respectively of the common difference is 9 how many terms are there ad what is their sum.

Ans. n = 38, S_n = 6973

5. Show that a_1, a_2, a_3, a_4... from an AP where an is defined as below

   (i) $a_n = 3 + 4n$

   (ii) $a_n = 9 - 5n$

   Also find the sum of the first 15 terms in each case. **Ans. (*i*) S_{15} = 525**

   (*ii*) S_{15} = –465

SECTION–F

Activities

1. To find the sum of first n natural numbers.
2. To find the sum of first n odd natural numbers.
3. To establish a formula for the sum of first n terms of an AP

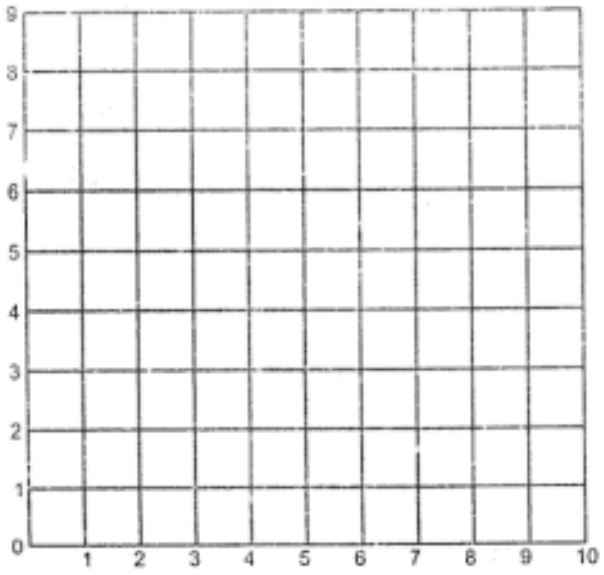
Activities

Objective:— Verify that the sum of first n natural number is

$\frac{n(n+1)}{2}$ OR $1 + 2 + 3 + ...+ n =$ by cutting ad pasting.

Let us consider the sum of natural numbers from 1 to 9, *i.e.* $1 + 2 + 3 +...+ 9$. Here $n = 9$, $n + 1 = 10$.

1. Take a squared paper of size 9 × 10 squares and paste it on a chart paper.
2. On the left side vertical line, mark the squares by 1, 2, 3,... 9 and on the horizontal line mark the squares by 1, 2, 3,... 10.
3. With the help of sketch pens shade rectangles of length equal to 1 cm, 2 cm, 3cm .... 9 cm and width 1 cm each.
4. Cut the shaded portion and place a on the remaining part of the grid. Observe tat it completely covers the grid.



1. Area of whole squared paper = 9×10 cm^2

2. Area of shaded portion = ...(i)

3. Also area of shaded portion = Area of square of size 1×1 + Area of rectangles of size 2×1 + Area of rectangles of size 3×1 + ... + Area of rectangle of size 9×1.

   $= (1 \times 1 + 2 \times 1 + 3 \times 1 .... + 9 \times 1)$ Square unit. ...(ii)

   $\therefore$ From (i) and (ii), $1 + 2 + 3 + ... + 9 = \frac{9 \times 10}{2} =$

Very Interesting (Fun)

Mental mains method to find the difference between 19^m and 6^m term of AP.

1, 3, 5, ...

Usual Method

AP 1, 3, 5, ...

$a = 1, d = 3 - 1 = 2$

$a_{19} = 1 + 18d = 1 + 18 \times 2 = 37$

$a_6 = a + 5d = 1 + 5 \times 2 = 11$

$\Rightarrow \quad a_{19} - a_6 = 37 - 11 = 26$

Mental mans Method.

AP 1, 3, 5, ...

$d = 3 - 1 = 2$

$\Rightarrow \quad a_{19} - a_6 = (19 - 6)d = 13 \times 2 = 26$

Take some more AP and verify the method.

SECTION–G

Quiz (AP)

Answer the following questions:

1. What is an AP?
2. What is the n^m term of an AP.
3. If first term of an AP is a d common difference is d then what will be its 100^{th} term ?
4. What is the formula for sum to n terms of AP.
5. What does $a_n - a_n - 1$ represent in AP?
6. What is the common difference of AP?
7. What does S_n, S_{n-1} represent in AP –3, –1, 1, 3, 5,...

8. What is the sum of first 50 natural numbers ?
9. If a, b, c are in AP then what will be the value of b ?
10. What is the name of mathematician associated with finding the sum of first 100 natural numbers.

SECTION–H

Project (AP)

Given an AP whose first term is a d common difference is d, to obtain a formula for the sum of its n terms.

i.e. $S =$

$\frac{n}{2}[2a + (n-1)d]$

Pre–requires knowledge:

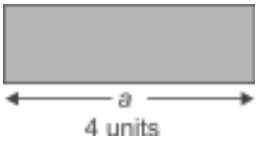
1. Understanding the concept of an AP
2. Formula n^{th} term of AP
3. Knowledge of formula of area of rectangle.

Materia Required

1. Coloured papers
2. Chart paper
3. Pair of scissor
4. Adhesive
5. Geometry box.

Steps Involved

1. Cut off few rectangle strips of any length say a units, ad breath 1 unit from one a coloured paper say blue.



2. Cutt off another few rectangular strips of any length, say d units, and breadth 1 units from the other coloured paper, say green.

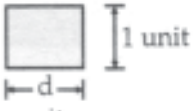


Fig (ii)

3. Past both of these rectangular strips on a white poster paper, as shown in the Fig, so as to obtain rectangles of length $a, a + d, a + 2d, ... a + (n – 1)d$ and of breadth 1 units each.

4. Produce *BK* to *C* such that *KC* = *a* units and complete the rectangle *ABCD*.

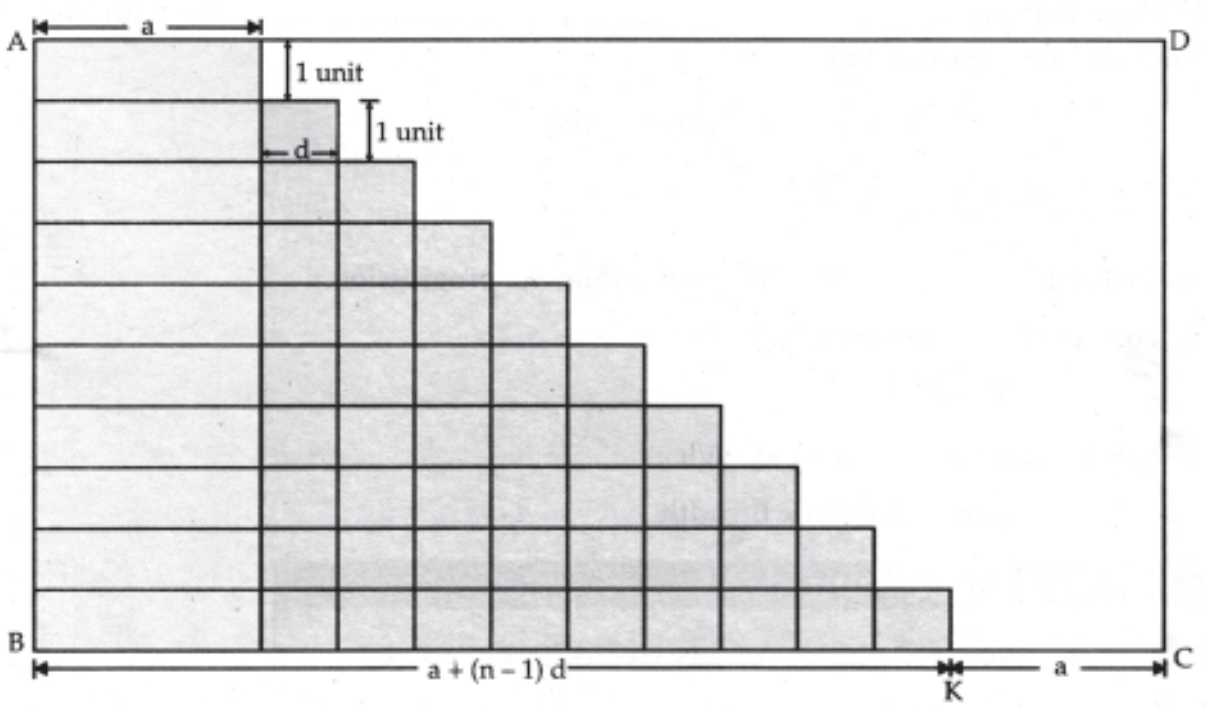


Fig (iii)

Observations

1.

Rectangle (coloured)	***Length***	***Breadth***	***Area***
First	*a*	1	*a* sq. units.
Second	a + d	1	(*a* + *d*) sq. units
Third	A + 2*d*	1	(*a* + 2*d*) sq. units
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
Last	*a*(*n* – 1)*d*	1	*a* + (*n* – 1)*d* sq. units

2. Length of ABCD = BC = BK + KC

$= a + (n - 1)d + a$

$= 2a + (n - 1)d$

3. Breadth of ABCD = CD

= 1 + 1 + 1 + ... + 1 (n times.)

= n units

4. Area of ABCD = $[2a + (n - 1)d]n$ sq. units. ...(i)

5. Total area of coloured region

= Sum of areas of all coloured rectangles.

= sq. units ...(ii)

6. Total area of coloured region

= area of ABCD

From (i), (ii), (iii)

= $= \frac{n}{2}[2a + (n-1)d]$

But LHS represent the sum of firm n terms of AP

$$\Rightarrow S = \frac{n}{2}[2a + (n-1)d]$$

TRIANGLES

$\frac{n}{2}[2a + (n-1)d]$ $[a + (a+d) + (a+2d) + ... + [a + (n-1)d]$

About the topic:–

Similar Triangles

Two triangles are said to be similar if (i) Their corresponding angles are equal and (ii) their corresponding sides are proportional.

Similarity of Triangles.

In two triangles if, the corresponding angles are equal, then their corresponding sides are proportional (i.e., in the same ratio and hence, the triangles are similar.)

If the corresponding sides of two triangles are proportional (*i.e.*, in the same ratio), then, their corresponding angles are equal and hence, the triangles are similar.

If one angle of a triangles is equal to one angle of the other triangles and the sides including these angles are proportional, the triangles are similar.

The ratio of the areas of two similar triangles is equal tot the ratio of the square of the corresponding sides.

The bisector of an angles of a triangles divides the opposite side in the ratio of the sides containing the angle.

Basic proportionality Theorem

In a triangle, a line drawn parallel to one side, to intersect the other two sides in distinct points, divides the two sides in the same ratio.

Converse of Basic

Proportionality Theorem

If a line divides any two sides of a triangles in the same ratio, the line must be parallel to the third side.

Pythagoras Theorem

In a right triangles, the square of the hypotenuse is equal to the sum of the square of the other two sides.

Converse of Pythagoras theorem

In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle.

SECTION–A

Multiple choice Questions:

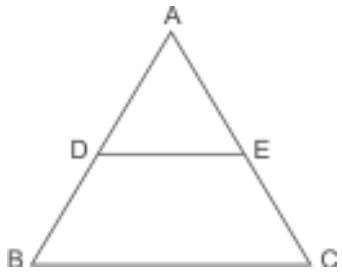
Chose the correct option.

1. If in two triangle Δ ABC ad ΔPQR , $= \frac{BC}{PR} =$ then

(*a*) Δ PQR ~ Δ CAB (*b*) Δ PQR ~ Δ ABC

(*c*) Δ CBA ~ Δ PQR (*d*) Δ BCA ~ Δ PQR **(Ans. *a*)**

2. In the given figure, DE || BC od $\frac{AD}{DB} =$, of AC = 4.8 cm then AE =...



(*a*) 1.6 cm (*b*) 1.8 cm

(*c*) 3 cm (*d*) 3.5 cm **(Ans. *b*)**

3. Δ PQR is a right triangle, right angled at P ad PS QR, Then = ...

(*a*) $\frac{PQ}{PR}$ (*b*) (*c*) (*d*) $\left(\frac{PQ}{PR}\right)^2$ **(Ans. *c*)**

4. If An ΔABC and ΔDEF where ΔABC ~ ΔEF ad AB = 1.2 cm, DE = 1.4 cm. then =...

(*a*) 49 : 36 (*b*) 49 : 30

(*c*) 7 : 6 (*d*) 36 : 49 **(Ans. *b*)**

5. ΔABC is and isosceles triangle right angled at C then AB^2 =...

(*a*) AC^2 (*b*) $3AC^2$

(*c*) $2AC^2$ (*d*) BC^2 **(Ans. *c*)**

SECTION–B

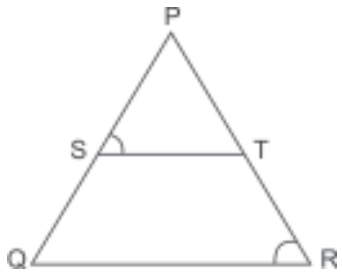
Short Answer Type Questions:—

1. ABC is an equilateral triangle of side 2a. Find each of its altitudes. **(Ans. $a\sqrt{3}$)**

2. If in ΔABC, $AD \perp BC$ then prove that $AB^2 + CD^2 = BD^2 + AC^2$

3. In figure $= \frac{PT}{TR}$ and $\angle PST = \angle PRQ$

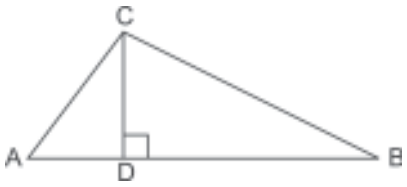
   Prove that PQR is an Isosceles triangle.



4. In given figure $\angle ACB = 90°$

   ad CD AB, Prove that

$\frac{BC^2}{AC^2} = \frac{BD}{AD}$



5. Let $\Delta ABC \sim \Delta DEF$ and their areas be, respectively 64 cm^2 and 121 cm^2, If EF = 15.4 cm find BC.

Ans. 11.2 cm.

SECTION–C

Fill in the Blanks:—

1. In a right triangle, the square of the .... is equal to the sum of the squares of the other two sides.

(Ans. Hypotonus)

2. All ... Triangles are similar. **(Ans. Equilateral)**

3. Sides of two similar triangles are in the ratio of 8 : 10, areas of these triangles are in the ratio...

(Ans. 64 : 100)

4. Any two geometrical figures having the same shape and size are called.

(Ans. Congruent Figure)

5. Basic proportionality theorem is also called .... theorem.

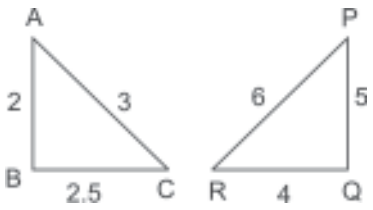
(Ans. Thallus)

SECTION–D

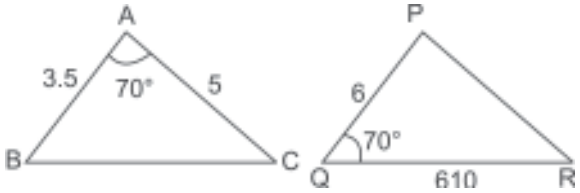
Match the column:–

Match the following similarity oriterion:—

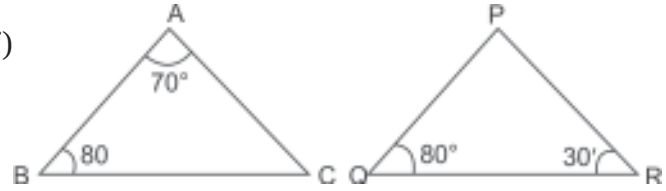
1. **Column A** **Column B**

(*i*) 

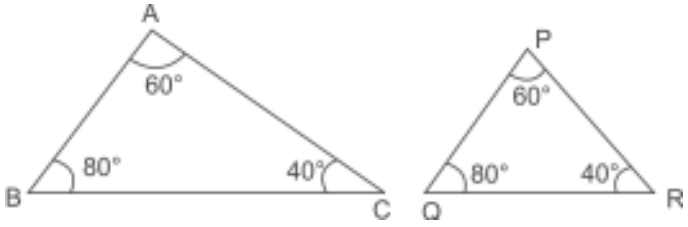
(*a*) AA

(*ii*) 

(*b*) SSS

(*iii*) 

(*c*) AAA

(*iv*) 

(*d*) SAS

Ans.

(*i*) — *b* (*ii*) — *d* (*iii*) — *a* (*iv*) — *c*

SECTION–E

Long answer Type questions:

1. In an equilateral triangle ΔABC, D is point on side BC such that BD = $\frac{1}{3}$BC, Prove that $9AD^2 = 7AB^2$

2. The perpendicular from A on side BC of a DABC intersects BC at Such that BD = 3CD, prove that $2AB^2 = 2AC^2 + BC^2$.
3. State and prove pytogoras tnm.
4. State and prove Basic proportionality theorem.
5. Prove that "The ratio of the areas of two similar triangular is equal to the square of the ratio of their corresponding sides."

SECTION–F

Activities

1. To verify Basic Proportionality theorem.
2. To verify Pythagoras theorem.
3. To find the relationship between areas as sides of two similar triangles.
4. To establish the criteria for similarity of triangles.
5. To verify experimentally that the ratio of the areas of two similar triangles is equal to the ratio of the square of their corresponding sides.

Activities

Objective

To Verify Basic Proportionality theorem.

Pre requisite knowledge

– Statement of BPT

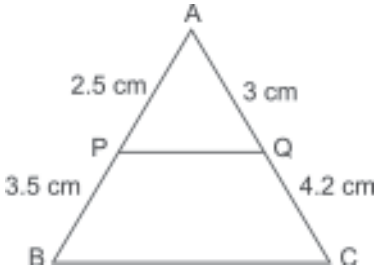
– Concept of parallel line

Material Required

1. Geometry box
2. Drawing sheets
3. Pencil
4. Colored sketch pens.
5. Eraser.

Steps

1. Construct and acute angled triangle say ABC, of any size on a drawing sheet.
2. Take a point pon the side of AB of ΔABC.
3. Through P, draw a straight line PQ || BC intesecting AC in Q.



4. Using a scale, measure the length of the line segments AP, PB, AQ and QC, and record your observations in the table given in Fig.
5. Repeat the entire activity for a right angled triangle and also for an obtuse angled triagnled, of sizes different than that of the acute angled triangle.

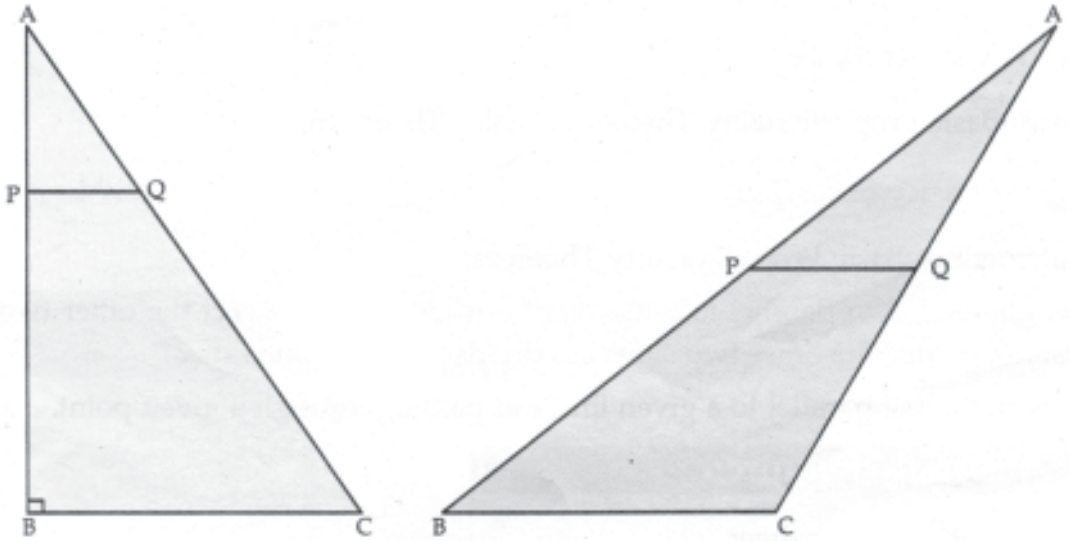


Fig (ii)

Length of the line segment

S.No.	Triangle (ABC)	AP	PB	AQ	QC	$\frac{AP}{PB}$	$\frac{AP}{PB} = \frac{AQ}{QC}$
1.	Acute angled	2.5 cm	3.5cm	3 cm	4.2 cm		$\frac{3.0}{4.2} = \frac{5}{7}$
2.	Right angled	...cm	...cm	...cm	...cm	.....	.....
3.	Obtuse angled	...cm	...cm	...cm	...cm	.....	.....

Observation

Observe from the table that in case of each of the triangles, $\frac{AP}{PB} = \frac{AQ}{QC}$

Result

From the above observation, it is verified that:

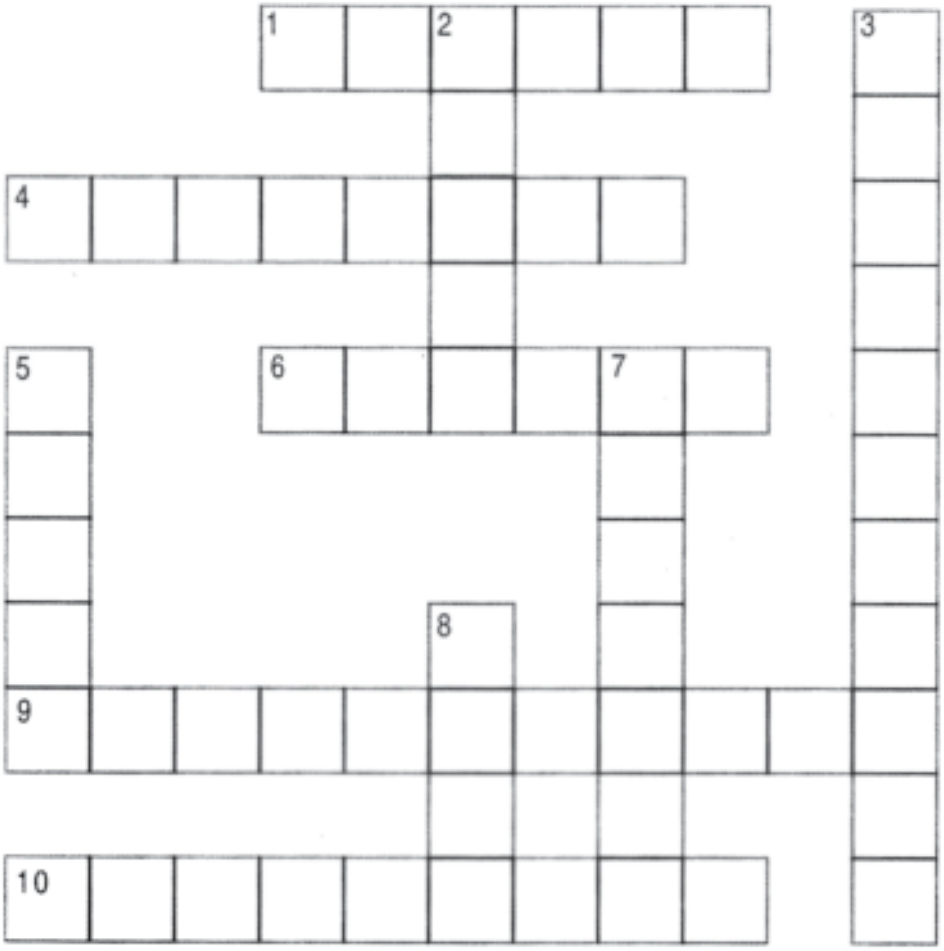
A line drawn parallel to one side of a triangle to intersect the other two sides in distinct points, divides these two sides in the same ratio.

Note:

You may verify the above result drawing a line parallel to side AB (Or AC) of the triangle ABC, also.

SECTION–F

Crossed Puzzles



Hints:—

Across

1. The____ angle does not has the same measure as the other two angles in an isosceles triangles.
4. A three sides polygon
6. An ___ angled triangled has one angle measuring more than 90 degrees.
9. A triangle with all sides of same length.
10. Two sides have the same length in an ___ triangle.

Down

2. A ___ angled triangle has an angle measuring 90 degrees.
3. All of the angles have the same measure.
5. An___ triangle has three angles measuring less than 90 degrees.
7. A ___ triangle has sides with three different lengths.]
8. The___ angles of an isosceles triangle have the same measure.

Answer: Crossed Puzzle

1. Vertex
2. Right
3. Equiangular
4. Triangle
5. Acute
6. Obtuse
7. Scalene
8. Base
9. Equilateral
10. Isosceles.

SECTION–H

Quiz (Triangle)

Answer lie following questions:—

1. State BPT theorem.
2. For What type of triangle is Pythogoras theorem applicable.
3. What is AAA similar criterion?
4. What is Pythogoras theorem?
5. What is the converse of thales theorem?
6. What is the longest side of a right angled triangle is called?
7. Which type of triangles are always similar?
8. What is SSS criterion?
9. What is the other name of Basic proportionality?
10. When does two polygons of the same number of sides are similar?

TRIGONOMETRY

About the topic

If BAC is a right triangle right, angled at Band $\angle BAC = \theta$ less than 90° then, base= AB, perpendicular = BC and hypotenuse = AC.

$$\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$$

$$\cos\theta =$$

$\tan \theta =$

$\text{cosec } \theta =$

$\sec \theta =$

$\cot \theta =$

For acute angler θ :

$\sin (90 - \theta) = \cos \theta$

$\cos (90 - \theta) = \sin \theta$

$\tan (90 - \theta) = \cot \theta$

$\cot (90 - \theta) = \tan \theta$

$\sec (90 - \theta) = \text{cosec } \theta$

$\text{cosec } (90 - \theta) = \sec \theta$

Reciprocal relations :

$\tan \theta =$

$\cot \theta =$

$\text{cosec } \theta =$

$\sec \theta =$

The value of sin θ and cos θ never exceed 1. But the values of sec θ and cosec θ are always greater than or equal to 1.

Trigonometric identities are :

1. $\sin^2 \theta + \cos^2 \theta = 1$

   $\sin^2 \theta = 1 - \cos^2 \theta$

   $\cos^2 \theta = 1 - \sin^2 \theta$

2. $\sec^2 \theta + \tan^2 \theta = 1$

   $\sec^2 \theta = 1 + \tan^2 \theta$

   $\sec^2 \theta - 1 = \tan^2 \theta$

3. $\text{cosec}^2 \theta - \cot^2 \theta = 1$

   $\text{cosec}^2 \theta = 1 + \cot^2 \theta$

   $\text{cosec}^2 \theta - 1 = \cot^2 \theta$

SECTION–A

Multiple choice questions :

1. Value of is

   (*a*) 1 (*b*) 0 (*c*) –1 (*d*) 2 **(Ans. *b*)**

2. If ΔABC is right angled at C, then value of cos (A + B) is

   (*a*) 1 (*b*) 0 (*c*) (*d*) **(Ans. *b*)**

3. If sin (A + B) = 1 and cos (A – B) = 1, then A and B are :

   (*a*) 60°, 30° (*b*) 30°, 45° (*c*) 45°, 45° (*d*) 0°, 90° **(Ans. *c*)**

4. If cos θ = then value of

   (*a*) (*b*) (*c*) (*d*) 1 **(Ans. *b*)**

5. If sin θ = cos θ and θ is acute this value of θ is

   (*a*) 45° (*b*) 0° (*c*) 30° (*d*) 60° **(Ans. 45°)**

SECTION-B

Short answer type questions:

1. If tan θ = , these *a* and *b* are real numbers then find sin A.

2. Find **(Ans. 2)**

3. If A = 30° verify that sin 2A = $\frac{2\tan A}{1+\tan^2 A}$

4. Prove that

5. Prove that

SECTION–C

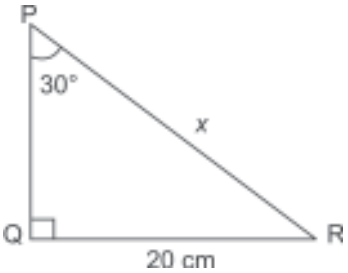
Fill in the blanks:

1. $\sin^2 53° + \sin^2 37°$ = ... **(Ans. 1)**

2. If then θ = ... **(Ans. 30°)**

3. cos θ sin (90° – θ) + sin θ cos (90° – θ) = ... **(Ans. 1)**

4. In figure the value of *x* = ... **(Ans. 40 cm)**



5. (sec A + tan A) (1 – sin A) = ... **(Ans. cos A)**

SECTION–D

1. ***Match the column.***

Column A	***Column B***
(*i*) sin 30°	(*a*) 0
(*ii*) cos 45°	(*b*) 1
(*iii*) tan 60°	(*c*) $\frac{1}{2}$
(*iv*) cot 90°	(*d*)
(*v*) cos 0°	(*e*)

Ans.

(*i*) — *c* (*ii*) — *d*

(*iii*) — *e* (*iv*) — *a*

(*v*) — *b*

2. ***Match the following:***

Column A	***Column B***
(*i*) $\sec^2 \theta$	(*a*)
(*ii*)	(*b*)

(*iii*) cot A (*c*) cosec_2 A

(*iv*) cosec A (*d*) $1 + \tan^2 \theta$

(*v*) $1 + \cot^2 A$ (*e*) cos A

Ans.

(*i*) — *d* (*ii*) — *e*

(*iii*) — *a* (*iv*) — *b*

(*v*) — *c*

SECTION–E

Long answer type questions

Prove the following :

1.

2.

3.

4. $\dfrac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \dfrac{1 + \sin\theta}{\cos\theta} = \dfrac{\cos\theta}{1 - \sin\theta}$

5. If $\tan\theta + \sin\theta = m$

and $\tan\theta - \sin\theta = n$

then show that $m^2 - n^2 =$

SECTION–F

Activities

1. To compare the ratios of sides of right angled triangle ΔABC, right angled at B.
2. To find the trigonometirc ratios for 30°, 45° and 60° gametically.
3. To observe that is a right angled triangle

(*a*)

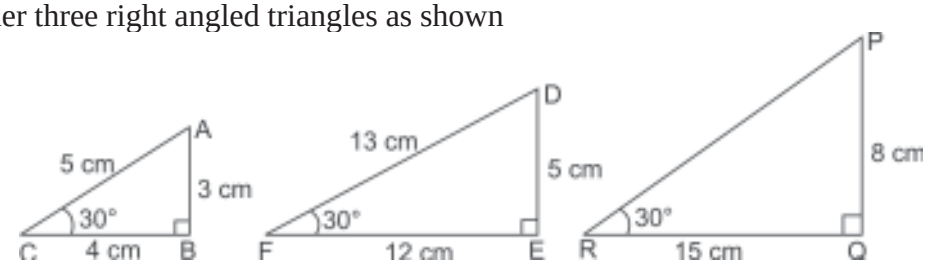
(*b*)

(*c*)

ACTIVITY I (TRIGONOMETY)

Objective: To verify

1. Consider three right angled triangles as shown



(*i*) (*ii*) (*iii*)

2. Record the results in the table

(*i*)	Δ ABC	sin C =	cos C =	$\sin^2 C + \cos^2 C =$
(*ii*)	Δ DEF	sin F =	cos F =	$\sin^2 F + \cos^2 F =$
(*iii*)	Δ PQR	sin R =	cos R =	$\sin^2 R + \cos^2 R =$

Observation

$\sin^2 \theta + \cos^2 \theta = 1$

In figure (*i*)

$\left(\frac{3}{5}\right)^2 + \left(\frac{4}{5}\right)^2 = 1$

sin c =

cos c =

=

=

$= \frac{25}{25}$

= 1

Do the same for figure (*ii*) and figure (*iii*)

Note: Take same more right angle triangle and verify the same.

Activity II (Trigonometry)

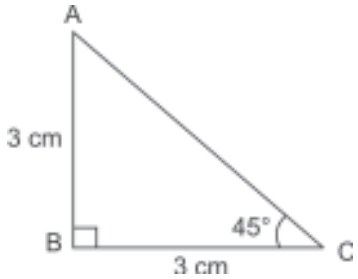
Objective

To find trigonometric ratios for

30°, 45° and 60°

Method: (*a*) For 45°

— Draw an isosceles right angled triangle



— Calculate the length of hypotenuse

Here

— ∠BCA = 45°

— ∠BAC = 45°

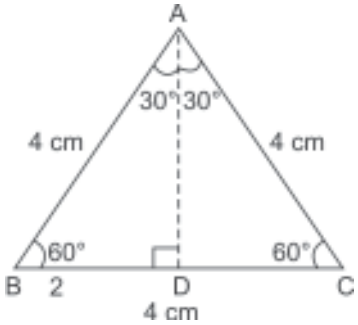
Using the triangle, find value of

sin 45°, cos 45° and tan 45°

sin 45°	= .....
cos 45°	= .....
tan 45°	= .....

(*b*) for 30° and 60°

— Draw an equilateral tringle



— Draw AD ⊥ BC

BD = DC = 2 cm

Here

∠DAB = 30°

and ∠ABD = 60°

AD =

— Using ΔADB, find values for sin 60°, cos 60°, tan 60° and sin 30°, cos 30°, tan 30°

sin 30°	$\frac{BD}{AB} = \frac{2}{4} = \frac{1}{2}$
cos 30°	
tan 30°	
sin 60°	$\frac{BD}{AB} = ?$
tan 60°	

SECTION-F

Draw the table on black board to used the student to for correct value against.

Value of θ / Tring ratio	0°	30°	45°	60°	90°
sin θ	0	?		?	?
cos θ	?		?		?
tan θ	?	?	1	?	?
cosec θ	?	?			?
sec θ	?		?	?	?
cot θ	?	?	1	?	0

SECTION-G

Project (Trigonometry)

— Contribution of great mathematician of ancient. India in mathematics particular in trigonometry. Arybhatta is a renowned mathematician and astronomer of ancient India. He was born in 476 A.D. in

Kerala. He studied at the University of Nalanada. His book *Aryabhatiya* dealt with many topics like astronomy, spherical trigonometry, arithmetic, algebra and plane trigonometry.


Aryabhatta
(A.D. 476–550)

In the field of astronomy, Aryabhatta was the pioneer to infer that the Earth is spherical and it rotates on its own axis which results in day and night. Aryabhatta's contribution in mathematics is unparalleled. He suggested formula to calculate the areas of a triangle and a circle, which were correct. He gave the irrational value of (pi). He was the first mathematician to give the 'table of sines'.

Keep the following point inmind :

1. Life History
2. Date of Birth
3. Place of Birth
4. Studies
5. Profession
6. Contribution in mathematics specially in trigonometry
7. Any other interesting investigations
8. Prizes and awards.

SECTION-H

Quiz (Trigonomety)

Answer the following questions:

1. What is trigonometry?
2. If $\sin\theta = \cos\theta$ then what is θ ?
3. of $\sin(A + B) =$

   waht is A + B?
4. What is the value of

   $\sin^2 30° + \sin^2 60° =$ .....
5. If $\sin 30° =$

   then what is $\text{cosec}^2 30° +$
6. In a right triangle ABC, right angled at B then what is sin A
7. What is the value of

   $\sec^2\theta - \tan^2\theta$
8. of $\cot A = \tan A$

   Then what is the value of A

$\frac{11}{2\sqrt{2}}$

9. If sin A =

   then cos A = ?

10. if tan A = 1

    then what is sin A

STATISTICS

About the topic:

Mean for a grouped frequency distribution

(*i*) Direct method :

(*ii*) Assumed-mean method:

(*iii*) Step-deviation method:

Mode

$M_0 = l + h\left[\frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)}\right]$, where

l = lower limit of the modal class interval;

f_1 = frequency of the modal class;

f_0 = frequency of the class preceding the modal class;

f_2 = frequency of the class succeeding the modal class;

h = width of the class interval.

Median for grouped data

$Me =$, where

l = lower limit of median class,

h = width of median class,

f = frequency of median class,

c = cumulative frequency of the class preceding the median class, $N = \Sigma f_i$

Graphical presentation of cumulative frequency distribution

- For a 'less than' series

  On a graph paper, we mark the upper class limits along the x-axis and the corresponding cumulative frequencies along the y-axis.

(*i*) On joining these point successively by line segments, we get a polygon, called cumulative frequency polygon.

(*ii*) On joining these points successively by smooth curves, we get a curve, known as cumulative frequency curve or an ogive.

Graphical presentation of cumulative frequency distribution

- For a 'greater than' series

  On a graph paper, we mark the lower class limits along the *x*-axis and the corresponding cumulative frequencies along the *y*-axis.

(*i*) On joining these point successively by line segments, we get a polygon, called cumulative frequency polygon.

(*ii*) On joining these points successively by smooth curves, we get a curve, known as cumulative frequency curve or an ogive.

Relationship among Means

Mode = 3 (Median) – 2(Mean)

or

$$\text{Median} = \text{Mode} + \frac{2}{3}(\text{Mean} - \text{Mode})$$

or

$$\text{Mean} = \text{Mode} + \quad (\text{Median} - \text{Mode})$$

SECTION-A

Multiple choice questions:

Choose the correct option—

1. The arithmetic mean of first five natural number is

   (*a*) 2 (*b*) 4 (*c*) 3 (*d*) 5 **(Ans. *c*)**

2. Mode is

   (*a*) Middle most term (*b*) Most frequenct value

   (*c*) Least frequent value (*d*) None of these **(Ans. *b*)**

3. If median = 20

   mode = 30

   then mean = ...

   (*a*) 15 (*b*) 20 (*c*) 60 (*d*) 10 **(Ans. *a*)**

4. If is the mean of n observations $x_1, x_2, x_3 ... x_4$ then the value of is

   (*a*) 1 (*b*) 0 (*c*) Not define (*d*) None of these **(Ans. *b*)**

5. Model class of the following distribution is :

Class interval :	5-10	10-15	15-20	20-25	25-30
Frequencies :	5	12	24	35	13

(*a*) 10-15 (*b*) 15-20 (*c*) 20-25 (*d*) 25-30 **(Ans. *c*)**

SECTION-B

Short answer type questions:

1. If the mean of the following distribution is 6 find A

x :	2	4	6	10	A + 5
f :	3	2	3	1	2

(Ans. 7)

2. Find mean

Class interval :	10-25	25-40	40-55	55-70	70-85	85-100
No of Student :	2	3	7	6	6	6

(Ans. *c*)

3. Find the median

Class interval :	135-140	140-145	145-150	150-155	155-160	160-165
Frequency :	4	7	18	11	6	5

$\left(\textbf{Ans } \frac{n+1}{2}\right)$

(Ans. 149.03)

4. The mean of 8 observation is 4.5 and mean of another 4 observation is 6, find the mean of 12 observations. **(Ans. 5)**

5. If the mean of the following data is 18, find the missing frequency K

x_i	10	15	20	25
f_i	5	10	K	8

(Ans. K = 7)

SECTION-C

***Fill in the blanks*:**

1. Mode = 3 median – 2 ..... **(Ans. mean)**
2. Cumulative frequency carvers and called ..... **(Ans. Ogive)**
3. In an ogive, on the *x*-axis you take ..... **(Ans. upper limit of class interval)**
4. Less than ogive is ..... shaped curve. **(Shaped)**
5. The mean of first *n* natural numbers is .....

SECTION-D

Match the following—

	A		***B***
(*i*)	Mode	(*a*)	O
(*ii*)	Median	(*b*)	$\frac{\text{upper limt + lover limit}}{2}$
(*iii*)	Class marks	(*c*)	Mode
(*iv*)	3 median-2 mean	(*d*)	Most frequent value
(*v*)		(*e*)	Middle most value

Ans.

(*i*) — (*d*) (*ii*) — (*e*)
(*iii*) — (*b*) (*iv*) — (*c*)
(*v*) — (*a*)

SECTION-E

Long answer type questions—

1. Draw a less than ogive for the following :

Marks	***No of students***
30-39	14
40-49	6
50-59	10
60-69	20
70-79	30
80-89	8
90-99	12

2. The mean of the following distribution is 62.8 and the sum of all frequencies is 50. Find f_1 and f_2

Class :	0-20	20-40	40-60	60-80	80-100	100-120	Total
Frequency :	5	f_1	10	f_2	7	8	50

(Ans. $f_1 = 8$, $f_2 = 12$)

3. Find mean, median and mode of the following data :

Class interval :	0-20	20-40	40-60	60-80	80-100	100-120	120-140
Frequency :	6	8	10	12	6	5	3

(Ans. 62.4, 61.67, 65)

4. Find mean, median and mode

Class interval :	0-10	10-20	20-30	30-40	40-50
Frequency :	8	16	36	34	6

(Ans. 26.4, 27.22, 29.1)

5. Draw 'less than ogive' and 'more than ogive' for the following distribution and hence find its median

Class :	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency :	8	12	24	6	10	15	25

(Ans. Median = 60)

SECTION-F

Activities

1. Find mean, median and mode of the marks obtained in unit test of mathematics of your class.
2. To draw a comulative frequency curve of less than type and more than type and verify that point of intersection of less than type and more than type is median.
3. To write the various applications of statistics in day-to-day life.

Topic : Statistics

Objective

To analysis of language text by using frequency table.

Method

Take any text of about 100 words

For example

Where the mind is without fear and the head is held hight;
Where knowledge is free;
Where the world has not been broken up into fragments by narrow
domestic wall;
Where words coem out from the depth of truth;
Where tireless striving stretches its arms towards perfection;
Where the clear stream of reason has not lost its way into the
dreary desert sand of dead habit;
Where the mind is led forward by thee into ever-widening though
and action...
Into that heaven of freedom, my Father, let my country awake

— Rabindranath Tagore

Read the above lines and obtain the frequency table:

Letter	*Tally mark*	*Frequency*
A		
B		
C		
D		
⋮		
Z		

Observations

(*i*) The most frequency occurring letter is .....

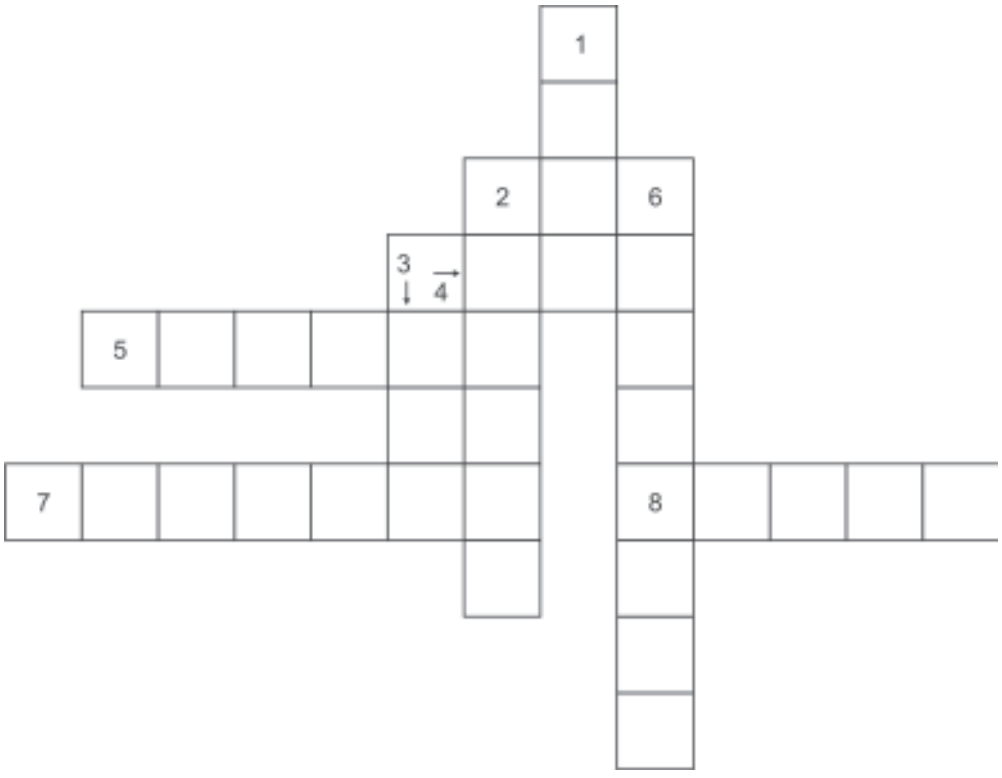
(*ii*) The most commonly used vowel is .....

(*iii*) The least frequent occuring letter is .....

(*iv*) The ratio of most to least frequency occurring letter .....

SECTION-G

Puzzle (Statistics)



Across

4. Average of observations
5.
7. S shaped curve
8. Upper limit — Lower limit

Down

1. Primary or seconday
2. Middle most term
3. Most frequent observation
6. Gap

SECTION-H

Projects

1. To analysis of text result and interpretation.
   - — After first term the marks of the student may be tabulated.
   - — Represent the data in the form of histogram & frequency polygen
   - — Find mean, median as mode
2. Cricket-Match

   To analysis of the data of a cricket-match
   - — Correct data on runs record in each over for a one-day or T-20 match and obtain frequency distribution between runs adverse.
   - — Observe interesting pattersn in cricket match.
3. Family survey

$\Sigma f_i(x - \bar{x})$

   To analysis the educational status and family income of atleast-25 families
   - — Survey atleast 25 families in your locality and collectdata and obtain significant observation about the education status and normally income.

SECTION-I

Quiz (Statistics)

1. What is mode?
2. What is primiary data?
3. What do you understand by term median?
4. In statistical measure what in the middle most term?
5. Waht is the shape of ogive?
6. What is the relation between mean, median and mode?
7. What is the name of comulative frequency curve?
8. What is the class mark of 30-70?
9. What is the most stable measure of central tendency.
10. What is the arithmetic mean of first n natural numbers.

FORMATIVE ASSESSMENT

Formative Assessment may include the following:

1. Unit Tests
   (*a*) Multiple choice questions
   (*b*) Fill in the blanks
   (*c*) Match the columns
   (*d*) Short Answer type questions
   (*e*) Long answer type questions
2. Oral Tests
3. Home assignments
4. Class work
5. Worksheets
6. Mental maths Quiz
7. Disussions
8. Project work
9. Group Activities
10. File record of activities.

Formative Assessment-I

UNIT TEST (TRIGONOMETRY)

Time: 1 Hr. *mm- 20*

1. Choose the correct answer from given options ½×5

(*i*) If then tan A = ————

(*a*) $\sqrt{3}$ (*b*) (*c*) 1 (*d*) Not define

(*ii*) The value of tan 1° tan 2° tan 3° ———— tan 89° is

(*a*) 0 (*b*) (*c*) 1 (*d*) 2

(*iii*) If then $\frac{4\sin A - \cos A}{4\sin A + \cos A}$ is equal to

(*a*) (*b*) (*c*) (*d*)

(*iv*) If tan A = cot B then A + B is equal to

(*a*) 30° (*b*) 40° (*c*) 50° (*d*) 25°

2. Write True or False in each of the following : ½ × 5

(*i*) $\sin\theta = \cos\theta$ then $\theta = 90°$

(*ii*) If $\tan\theta = 1$ then $\theta = 45°$

(*iii*) $\sec^2\theta + \tan^2\theta = 1$

(*iv*) $\sin(90 - A) = \tan A$

(*v*) $\text{cosec}^2\theta = 1 + \cot^2\theta$

3. In ΔABC, right angled at B 1

AB = 24 cm, BC = 7 cm then find sin A

4. The value of $(\cos 58° - \sin 32°) + 3$ 1

5. If $\sin A =$ and $\cos B =$

then find the value of A + B 1

6. Match the column ½ × 6 = 3

	Column A		***Column B***
(*i*)	It	then $\cos\theta$ = ...	(*a*) 45°, 45°
(*ii*)	$\sec^2\theta$		(*b*) 60°
(*iii*)	$\sin\theta - \cos\theta = 0$ then θ = ...		(*c*) $\text{cosec}^2\theta$
(*iv*)	tan A = cot B then A and B		(*d*)
(*v*)	$1 + \cot^2\theta$		(*e*) 45°
(*vi*)		then A + B = ...	(*f*) $1 + \tan^2\theta$

7. Prove that $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^2\theta - \cos\theta} = \tan\theta$ 2

8. Find the value of $3\left(\dfrac{\sin 36°}{\cos 54°}\right) - 2\left(\dfrac{\tan 18°}{\cot 72°}\right)^3 + 6\tan 45°$ 2

9. If A, B, C are interer angle of ΔABC then show that $\sin\left(\dfrac{B+C}{2}\right) = \cos\dfrac{A}{2}$. 2

10. Prove that $\dfrac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \dfrac{\cos A}{1 - \sin A}$

or

Formative Assessment II

ORAL TEST

Answer the following: **1 × 10**

1. = ...

2. = ...

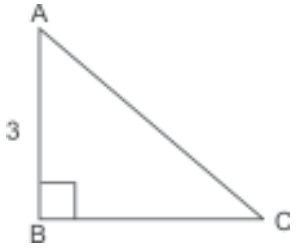
3. = ...

4. If sin θ = cos θ then θ = ...

5. If tan (A + B) =

   tan (A – B) =

   when $0 \angle A + B \leq 90°$ and A > B
   then what are A and B

6. 

since = ...

7. = ...

8. sec (90° – A) = ...

9. If sin A = and cos B =

   then A + B = ...

10. If sin A = then cos A = ...

Formative Assessment-III

Activity: Topic Trignometry m.m: 10

1. Find the value of sin 30° generically
2. Write the contribution of Aryabhatta in plane trignonomety
3. Prepare a chart of Trigonometric ratios of angle 0°, 30°, 45°, 60° and 90°

Formative Assessment IV

SUB MATHEMATICS

CLASS-X

Home Assignment

1. Prove that is an irrahonal number.
2. Obtain quadratic polynomial whose zerocs are 2 and 5.
3. Divide $2x^2 + 3x + 1$ by $x + 2$
4. Find the quadratic polynomials sum of whose zeros is 8 and their product 12.
5. If $\sqrt{3}$ and and the zeroes of polynomial $x^3 - 5x^2 - 3x + 15$ find its third zero.

Choose correct option

6. A quadratic polynomials has

   (*a*) at least one zeros (*b*) exactly two zeros

   (*c*) at most two zeroes (*d*) exactly one zeros

7. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2 the value of K is

   (*a*) 10 (*b*) – 10 (*c*) 4 (*d*) – 40

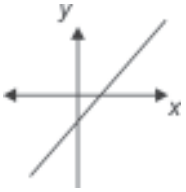
8. Which of the following is not the graph of quadratic polynomial

$3\sqrt{3}\sqrt{2}$

(*a*) 

(*b*) 

(*c*) 

(*d*) 

9. HCF of two consecutive integer x and $x + 1$

   (*a*) x (*b*) $x + 1$ (*c*) 1 (*d*) 0

10. HCF 2 LCM of two postive integrs a and b satisfy a relationship

    (*a*) HCF × LCM = ab (*b*) HCF × LCM = $\frac{a}{b}$

    (*c*) HCF × LCM = a (*d*) HCF × LCM = b

❑ ❑ ❑