ACADEMIC WORLD SCHOOL™
BEMETARA

SESSION: 2023-24
SUMMER VACATION ASSIGNMENT
CLASS: XI SCIENCE

General Instructions:

1. Write in a clear and legible handwriting.
2. Complete all the homework in a separate subject Summer Vacation Homework Notebook.
3. **DO NOT COPY AND PASTE FROM THE INTERNET**. (Assignment will be rejected)
4. In case of reference from the internet, you may:
   A. Read the content from the internet, if you wish and paraphrase (Rewrite in your own words)
   B. Mention the source of your information by providing the link from the internet for the verification by the teachers.
5. Marks awarded will be counted in the final scores at the end of the session.
6. The Summer Vacation HW will be submitted immediately upon arrival to school after Summer Vacation.
7. For any assignment related query do post your question on E-Mail Id of respective subject teacher. List of Subject Teacher's E-Mail ID attached.

Note for the Parents:

Parents are requested to guide his/her wards to complete their assignments honestly and submit by the due date.

Class: XI

Subject: English Core (301)

Q1. You are Vikram/Sonia, an Hon's graduate in history with specialization in Medieval India. You are well acquainted with places of historical interest in Delhi, Agra and Jaipur. You are looking for the job of tourist guide. Write an **advertisement** in about 50 words for the situations wanted column of a local newspaper. Your contact no. 991234567.

Q2. Applications are invited from suitable candidates for the post of assistant in the Delhi administration. All applications are to be addressed to Director, Recruitment, Old Secretariat, 5, Rajpur Road, Delhi. Draft a suitable **advertisement** to this account in about 50 words giving necessary details.

Q3. Indian Institute of Foreign Language is going to start a course in various foreign languages. Draft an **advertisement** for the classified columns of a newspaper giving details of the same [50 words].

Q4. You are a fitness trainer in a health club. Design a **poster** in not more than 50 words, to emphasize the importance of exercise in maintaining mental and physical fitness. You are Prem/Priya.

Q5. Open drains are death traps, risky for old people and children. They are also breeding grounds for rats, cockroaches etc. Design a **poster** highlighting the danger of open drains.

Q6. Read the passage given below:

BALANCING THE SCALES

Artificial intelligence (AI) is making a difference to how legal work is done, but it isn't the threat it is made out to be. AI is making impressive progress and shaking up things all over the world today. The assumption that advancements in technology and artificial intelligence will render any profession defunct is just that, an assumption and a false one. The only purpose this assumption serves is creating mass panic and hostility towards embracing technology that is meant to make our lives easier.

Let us understand what this means explicitly for the legal world. The ambit of AI includes recognizing human speech and objects, making decisions based on data, and translating languages. Tasks that can be defined as 'search-and-find' type can be performed by AI.

Introducing AI to this profession will primarily be for the purpose of automating mundane, tedious tasks that require negligible human intelligence. The kind of artificial intelligence that is employed by industries in the current scene, when extended to the law will enable quicker services at a lower price. AI is meant to automate a number of tasks that take up precious working hours lawyers could be devoted to tasks that require discerning, empathy, and trust- qualities that cannot be replicated by even the most sophisticated form of AI. The legal profession is one of the oldest professions in the world. Thriving over 1000 years; trust, judgement, and diligence are the pillars of this profession. The most important pillar is the relationship of trust between a lawyer and clients, which can only be achieved through human connection and interaction.

While artificial intelligence can be useful in scanning and organizing documents pertaining to a case, it cannot perform higher-level tasks such as sharp decision making, relationship-building with valuable clients and writing legal briefs, advising clients, and appearing in court. These are over and above the realm of computerization.

The smooth proceeding of a case is not possible without sound legal research. While presenting cases lawyers need to assimilate information in the form of legal research by referring to a number of relevant cases to find those that will favour their client's motion. Lawyers are even required to thoroughly know the opposing stand and supporting legal arguments they can expect to prepare a watertight defence strategy. AI, software that operates on natural language enables electronic discovery of information relevant to a case, contract reviews, and automation generation of legal documents.

AI utilizes big-data analytics which enables visualization of case data. It also allows for creation of a map of the cases which were cited in previous cases and their resulting verdicts, as per the website Towards Data Science. The probability of a positive outcome of a case can be predicted by leveraging predictive analytics with machine learning. This is advantageous to firms as they can determine the return on investment in litigation and whether an agreement or arbitration should be considered.

(a) On the basis of your understanding of the above passage, make notes on it using headings and subheadings. Use recognizable abbreviations (wherever necessary- minimum four) and a format you consider suitable. Also supply an appropriate title to it.
(b) Write a summary of the passage in about 80 words.

Passage 2

Q7. Read the passage below and answer the questions that follow.

We have been brought up to fear insects. We regard them as unnecessary creatures that do more harm than good. Man, continually wages war on them, because they contaminate his food, carry diseases or devour his crops. They sting or bite without provocation; they fly uninvited into our rooms on summer nights or beat against our lighted windows. We live in dread not only of unpleasant insects like spiders or wasps but of quite harmless ones like moths. Reading about them increases our understanding without dispelling our fears. Knowing that the industrious ant lives in a highly organised society does nothing to prevent us from being filled with revulsion when we find hordes of them crawling over a carefully prepared picnic lunch.

No matter how much we like honey or how much we have read about the uncanny sense of direction which bees possess, we have a horror of being stung. Most of our fears are unreasonable but they are difficult to erase. At the same time, however, insects are strangely fascinating, we enjoy reading about them, especially when we find that, like the praying mantis, they lead perfectly horrible lives. We enjoy staring at them, entranced as they go about their business, unaware (we hope) of our presence. Who has not stood in awe at the sight of a spider pouncing on a fly or a column of ants triumphantly bearing home an enormous dead beetle?

Last summer, I spent days in the garden watching thousands of ants crawling up the trunk of my prize of peach tree. The tree has grown against a warm well on a sheltered side of the house. I am especially proud of it, not only because it has survived several severe winters, but because it occasionally produces luscious peaches. During the summer I noticed that the leaves of the tree were beginning to wither. Clusters of tiny insects called aphis were to be found on the underside of the leaves. They were visited by a large colony of ants which obtained a sort of honey from them. I immediately embarked on an experiment which, even though it failed to get rid of the ants, kept me fascinated for twenty-four hours. I bound the base of the tree with sticky tape, making it impossible for the ants to reach the aphis. The tape was so sticky that they did not dare to cross it. For a long time, I watched them scurrying around the base of the tree in bewilderment.

I even went out at midnight with a torch and noted with satisfaction (and surprise) that the ants were still swarming around the sticky tape without being able to do anything about it. I got up early next morning hoping to find that the ants had given up in despair. Instead, I saw that they had discovered a new route. They were climbing up the wall of the house and then on to the leaves of the tree. I then realised sadly that I had been completely defeated by their ingenuity. The ants had been quick to find an answer to my thoroughly unscientific methods!

(a) On the basis of your understanding of the above passage, make notes on it using headings and subheadings. Use recognizable abbreviations (wherever necessary- minimum four) and a format you consider suitable. Also supply an appropriate title to it.
(b) Write a summary of the passage in about 80 words.

Class- XI
Subject: Mathematics (041)

TO BE DONE IN LAB MANUAL

ACTIVITY 1 : To obtain formula for the sum of squares of first n-natural numbers.

ACTIVITY 2 : To identify a relation and function.

ACTIVITY 3 : To verify the relation between the degree measure and the radian measure of an angle.

ACTIVITY 4 : To find the values of sine and cosine functions in second, third and fourth quadrants using their given values in first quadrant.

ACTIVITY 5 : To obtain a quadratic function with the help of linear functions graphically.

ACTIVITY 6 : To find the number of ways in which three cards can be selected from given five cards

TO BE DONE IN STICK FILE

QUESTION : Write a brief description on any one topic given below (page limit at least 10)

1. Sets
2. Relations and functions
3. Complex numbers
4. Permutations and combinations
5. Conic sections
6. Probability

The Purpose of the Mathematics Laboratory

National Policy on Education (1986) states "Mathematics should be visualised as a vehicle to train a child to think, analyse and articulate logically". National Curriculum Framework - 2005 brought out by NCERT states that the main goal of Mathematics education is mathematisation of child's thought process. These objectives can only be achieved if there is an opportunity of creating a scope of exploring, verifying and experimenting upon mathematical results by students themselves. Thus, there is need of adopting activity — oriented process rather than merely concentrating upon mastery of rules and formulae so as to do mathematical problems mechanically and pass out the examinations. There is need to provide the learners the scope for interaction, communication and representations of mathematical ideas by practising processes.

No doubt a laboratory is a place where scientific research and experiments are conducted for verification, exploration or discovery. Specifically, in mathematics the role of laboratory is helpful in understanding the mathematical concepts, formulae through activities. It is worth mentioning that pattern is central theme in mathematics which we need to develop practically to get insight into the mathematical concepts/theorems/formulae. Mathematics laboratory should not be solely a store house of teaching aids but in turn emphasis has to be laid on organising activities by students/teachers to rediscover the truth underlying the mathematical concepts. However, there may be a few interesting readymade geometrical and other models to motivate students. Moreover these models should be manipulative and dynamic.

A mathematics laboratory can foster mathematical awareness, skill building, positive attitude and learning by doing experiments in various topics of mathematics such as Algebra, Geometry, Mensuration, Trigonometry, Calculus, Coordinate Geometry, etc. It is the place where students can learn certain concepts using concrete objects and verify many mathematical facts and properties using models, measurements and other activities. It will also provide an opportunity to the students to do certain calculations using tables, calculators, etc., and also to listen or view certain audio-video cassettes relating to, remedial instructions, enrichment materials, etc. Mathematics laboratory will also provide an opportunity for the teacher to explain and demonstrate many mathematical concepts, facts and properties using concrete materials, models, charts, etc.

The teacher may also encourage students to prepare similar models and charts using materials like thermocol, cardboard, etc. in the laboratory. The laboratory will act as a forum for the teachers to discuss and deliberate on some important mathematical issues and problems of the day. It may also act as a place for teachers and the students to perform a number of mathematical celebrations and recreational activities.

Mathematics laboratory is expected to offer the following opportunities to learners:

- To discover the pattern for getting insight into the formulae
- To visualise algebraic and analytical results geometrically.
- To design practical demonstrations of mathematical results/formulae or the concepts.
- To encourage interactions amongst students and teachers through debate and discussions.
- To encourage students in recognising, extending, formulating patterns and enabling them to pose problems in the form of conjectures.
- To facilitate students in comprehending basic nature of mathematics from concrete to abstract.
- To provide opportunities to students of different ability groups in developing their skills of explaining and logical reasoning.
- To help students in constructing knowledge by themselves.
- To perform certain recreational activities in mathematics.
- To do certain projects under the proper guidance of the teacher.
- To explain visually some abstract concepts by using three dimensional models.
- To exhibit relatedness of mathematics with day to day life problems.

Role of Mathematics Laboratory in Teaching-Learning

Mathematics at Senior Secondary stage is a little more abstract as compared to the subject at the secondary stage. The mathematics laboratory at this stage can contribute in a big way to the learning of this subject.

Some of the ways are:

- Here the student will get an opportunity to understand the abstract ideas/ concepts through concrete objects and situations.
- The concepts of relations and functions can be easily understood by making working models and by making arrow diagrams using wires.
- Three dimensional concepts can only be conceived by three dimensional models in the laboratory, where as it is very difficult to understand these concepts on a black board.
- The concept of function and its inverse function, becomes very clear by drawing their graphs using mathematical instruments and using the concept of image about the line $y = x$, which can be done only in the laboratory.
- It provides greater scope for individual participation in the processes of learning and becoming autonomous learner.
- In the laboratory a student is encouraged to think, discuss with others and with the teacher. Thus, he can assimilate the concepts in a more effective manner.
- To the teacher also, mathematics laboratory enables to demonstrate and explain the abstract mathematical ideas, in a better way by using concrete objects, models etc.

Management and Maintenance of Laboratory

There is no second opinion that for effective teaching and learning 'Learning by doing' is of great importance as the experiences gained remains permanently affixed in the mind of the child. Exploring what mathematics is about and arriving at truth provides for pleasure of doing, understanding, developing positive attitude, and learning processes of mathematics and above all the great feeling of attachment with the teacher as facilitator. It is said 'a bad teacher teaches the truth but a good teacher teaches how to arrive at the truth.

A principle or a concept learnt as a conclusion through activities under the guidance of the teacher stands above all other methods of learning and the theory built upon it, can not be forgotten. On the contrary, a concept stated in the classroom and verified later on in the laboratory doesn't provide for any great experience nor make child's curiosity to know any good nor provides for any sense of achievement.

A laboratory is equipped with instruments, apparatus, equipments, models apart from facilities like water, electricity, etc. Non availability of a single material or facility out of these may hinder the performance of any experiment activity in the laboratory. Therefore, the laboratory must be well managed and well maintained.

A laboratory is managed and maintained by persons and the material required. Therefore, management and maintenance of a laboratory may be categorised as the personal management and maintenance and the material management and maintenance.

(A) Personal Management and Maintenance

The persons who manage and maintain laboratories are generally called laboratory assistant and laboratory attendant. Collectively they are known as laboratory staff. Teaching staff also helps in managing and maintenance of the laboratory whenever and wherever it is required.

In personal management and maintenance following points are considered:

1. **Cleanliness**

   A laboratory should always be neat and clean. When students perform experiment activities during the day, it certainly becomes dirty and things are scattered. So, it is the duty of the lab staff to clean the laboratory when the day's work is over and also place the things at their proper places if these are lying scattered.

2. **Checking and arranging materials for the day's work**

   Lab staff should know that what activities are going to be performed on a particular day. The material required for the day's activities must be arranged one day before.

   The materials and instruments should be arranged on tables before the class comes to perform an activity or the teacher brings the class for a demonstration.

3. The facilities like water, electricity, etc. must be checked and made available at the time of experiments.
4. It is better if a list of materials and equipments is pasted on the wall of the laboratory.
5. Many safety measures are required while working in laboratory. A list of such measures may be pasted on a wall of the laboratory.
6. While selecting the laboratory staff, the school authority must see that the persons should have their education with mathematics background.
7. A days training of 7 to 10 days may be arranged for the newly selected laboratory staff with the help of mathematics teachers of the school or some resource persons outside the school.
8. A first aid kit may be kept in the laboratory.

(B) Management and Maintenance of Materials

A laboratory requires a variety of materials to run it properly. The quantity of materials however depends upon the number of students in the school.

To manage and maintain materials for a laboratory following points must be considered:

1. A list of instruments, apparatus, activities and material may be prepared according to the experiments included in the syllabus of mathematics.
2. A group of mathematics teachers may visit the agencies or shops to check the quality of the materials and compare the rates. This will help to acquire the material of good quality at appropriate rates.

3. The materials required for the laboratory must be checked from time to time. If some materials or other consumable things are exhausted, orders may be placed for the same.
4. The instruments, equipments and apparatus should also be checked regularly by the laboratory staff. If any repair is required it should be done immediately. If any part is to be replaced, it should be ordered and replaced.
5. All the instruments, equipments, apparatus, etc. must be stored in the almirahs and cupboards in the laboratory or in a separate store room.

Equipment for Mathematics Laboratory at the Higher Secondary Stage

As the students will be involved in a lot of model making activities under the guidance of the teacher, the smooth running of the mathematics laboratory will depend upon the supply of oddments such as strings and threads, cellotape, white cardboard, hardboard, needles and pins, drawing pins, sandpaper, pliers, screw-drivers, rubber bands of different colours, gummed papers and labels, squared papers, plywood, scissors, saw, paint, soldering, solder wire, steel wire, cotton wool, tin and plastic sheets, glazed papers, etc. Besides these, some models, charts, slides, etc., made up of a good durable material should also be there for the teacher to demonstrate some mathematical concepts, facts and properties before the students. Different tables, ready reckner should also be there (in the laminated form) so that these can be used by the students for different purposes. Further, for performing activities such as measuring, drawing and calculating, consulting reference books, etc., there should be equipments like mathematical instruments, calculators, computers, books, journals mathematical dictionaries etc., in the laboratory.

In view of the above, following is the list of suggested instruments/models for the laboratory:

Equipment

Mathematical instrument set (Wooden Geometry Box for demonstration containing rulers, set-squares, divider, protractor and compasses), some geometry boxes, metre scales of 100 cm, 50 cm and 30 cm, measuring tape, diagonal scale, clinometer, calculators, computers including related software etc.

Models for demonstration of–

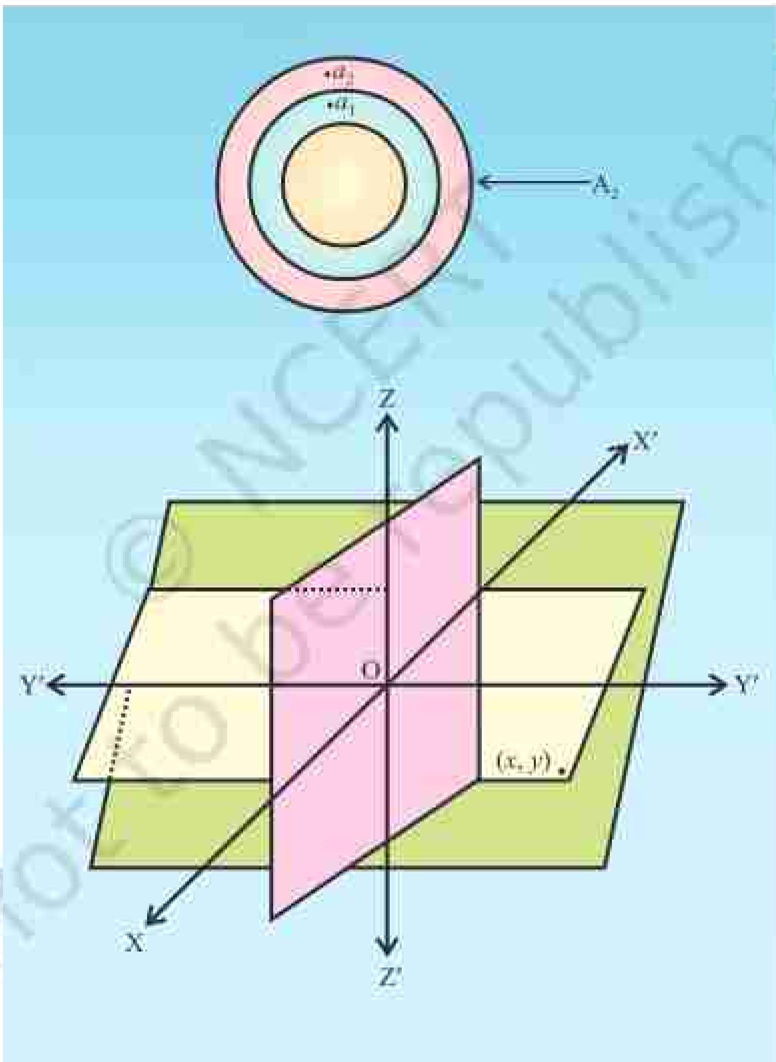
- Sets
- Relations and Functions
- Quadratic functions with the help of linear functions
- Sequence and series
- Pascal's triangle
- Arithmetic Progression

- Conic Sections
- Increasing, decreasing functions
- Maxima, minima, point of inflection
- Lagrange's minima, point of inflection
- Rolle's theorem
- Definite Integral as limit of sum
- Angle in semicircle using vectors
- Construction of parabola when distance between directrix and focus is given
- Construction of ellipse when major and minor axes are given
- Octants
- Shortest distance between two skew lines
- Geometrical interpretation of scalar and vector product
- Equation of a straight line passing through a fixed point and parallel to a given vector
- Equation to a plane
- Angle between two planes
- Bisection of the angles between two planes by a third plane
- Intersection of three planes
- Projection of the line segment
- Sample spaces
- Conditional Probability

Stationery and oddments

Rubber-bands of different colours, Marbles of different colours, a pack of playing cards, graph paper/ squared paper, dotted paper, drawing pins, erasers, pencils, sketch pens, cellotapes, threads of different colours, glazed papers, kite papers, tracing papers, adhesive, pins, scissors and cutters, hammers, saw, thermocol sheets, sand paper, nails and screws of different sizes, screw drivers, drill machine with bit set, and pliers.

Activities for
Class XI



Mathematics is one of the most important cultural components of every modern society. Its influence another cultural element has been so fundamental and wide-spread as to warrant the statement that her "most modern" ways of life would hardly have been possilbly without mathematics. Appeal to such obvious examples as electronics radio, television, computing machines, and space travel, to substantiate this statement is unnecessary : the elementary art of calculating is evidence enough. Imagine trying to get through three day without using numbers in some fashion or other!

–R.L. Wilder

Activity 1

OBJECTIVE

To find the number of subsets of a given set and verify that if a set has n number of elements, then the total number of subsets is 2^n.

MATERIAL REQUIRED

Paper, different coloured pencils.

METHOD OF CONSTRUCTION

1. Take the empty set (say) A_0 which has no element.
2. Take a set (say) A_1 which has one element (say) a_1.
3. Take a set (say) A_2 which has two elements (say) a_1 and a_2.
4. Take a set (say) A_3 which has three elements (say) a_1, a_2 and a_3.

DEMONSTRATION

1. Represent A_0 as in Fig. 1.1

   Here the possible subsets of A_0 is A_0 itself only, represented symbolically by ϕ. The number of subsets of A_0 is $1 = 2^0$.

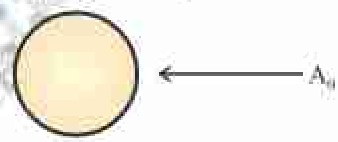


Fig. 1.1

2. Represent A_1 as in Fig. 1.2. Here the subsets of A_1 are ϕ, $\{a_1\}$. The number of subsets of A_1 is $2 = 2^1$

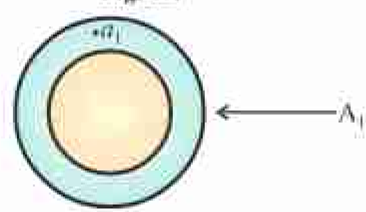


Fig. 1.2

3. Represent A_2 as in Fig. 1.3

   Here the subsets of A_2 are ϕ, $\{a_1\}$, $\{a_2\}$, $\{a_1, a_2\}$. The number of subsets of A_2 is $4 = 2^2$.

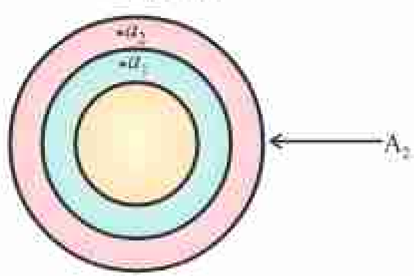


Fig. 1.3

4. Represent A_3 as in Fig. 1.4

Here the subsets of A_3 are ϕ, $\{a_1\}$, $\{a_2\}$, $\{a_3\}$, $\{a_1, a_2\}$, $\{a_2, a_3\}$, $\{a_3, a_1\}$ and $\{a_1, a_2, a_3\}$. The number of subsets of A_3 is $8 = 2^3$.

5. Continuing this way, the number of subsets of set A containing n elements $a_1, a_2, ..., a_n$ is 2^n.

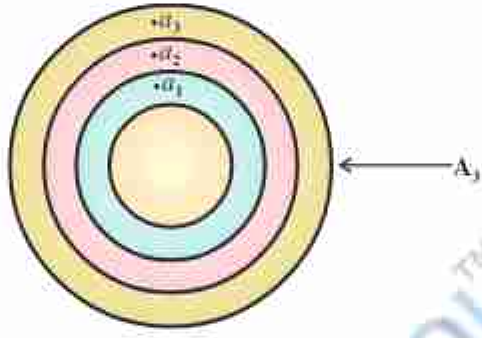


Fig. 1.4

Observation

1. The number of subsets of A_0 is __________ = $2^{\square}$
2. The number of subsets of A_1 is __________ = $2^{\square}$
3. The number of subsets of A_2 is __________ = $2^{\square}$
4. The number of subsets of A_3 is __________ = $2^{\square}$
5. The number of subsets of A_{10} is = $2^{\square}$
6. The number of subsets of A_n is = $2^{\square}$

Application

The activity can be used for calculating the number of subsets of a given set.

Activity 2

Objective

To verify that for two sets A and B, n (A×B) = pq and the total number of relations from A to B is 2^{pq}, where n(A) = p and n(B) = q.

Material Required

Paper, different coloured pencils.

Method of Construction

1. Take a set A_1 which has one element (say) a_1, and take another set B_1, which has one element (say) b_1.
2. Take a set A_2 which has two elements (say) a_1 and a_2 and take another set B_3, which has three elements (say) b_1, b_2 and b_3.
3. Take a set A_3 which has three elements (say) a_1, a_2 and a_3, and take another set B_4, which has four elements (say) b_1, b_2, b_3 and b_4.

Demonstration

1. Represent all the possible correspondences of the elements of set A_1 to the elements of set B_1 visually as shown in Fig. 2.1.

Fig. 2.1

2. Represent all the possible correspondences of the elements of set A_2 to the elements of set B_3 visually as shown in Fig. 2.2.

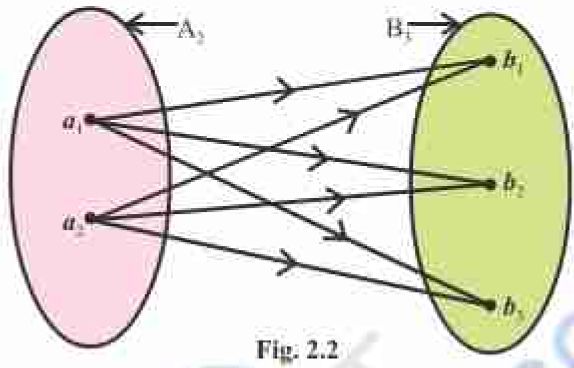


Fig. 2.2

3. Represent all the possible correspondences of the elements of set A_3 to the elements of set B_4 visually as shown in Fig. 2.3.

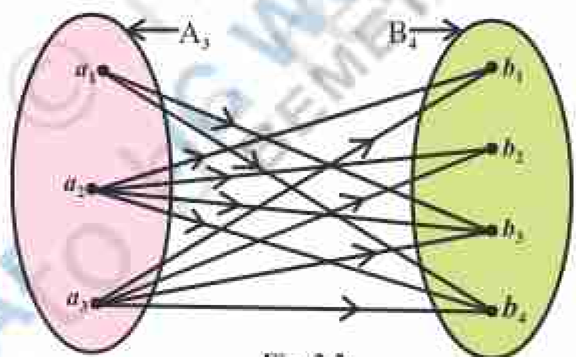


Fig. 2.3

4. Similar visual representations can be shown between the elements of any two given sets A and B.

OBSERVATION

1. The number of arrows, i.e., the number of elements in cartesian product $(A_1 \times B_1)$ of the sets A_1 and B_1 is _ × _ and the number of relations is $2^{\square}$.
2. The number of arrows, i.e., the number of elements in cartesian product $(A_2 \times B_3)$ of the sets A_2 and B_3 is _ × _ and number of relations is $2^{\square}$.
3. The number of arrows, i.e., the number of elements in cartesian product $(A_3 \times B_4)$ of the sets A_3 and B_4 is _ × _ and the number of relations is $2^{\square}$.

NOTE

> The result can be verified by taking other sets $A_4, A_5, ..., A_p$, which have elements 4, 5,..., p, respectively, and the sets $B_4, B_6, ..., B$ which have elements 5, 6,..., q, respectively. More precisely we arrive at the conclusion that in case of given set A containing p elements and the set B containing q elements, the total number of relations from A to B is 2^{pq}, where $n(A \times B) = n(A)\, n(B) = pq$.

Activity 3

OBJECTIVE

To represent set theoretic operations using Venn diagrams.

MATERIAL REQUIRED

Hardboard, white thick sheets of paper, pencils, colours, scissors, adhesive.

METHOD OF CONSTRUCTION

1. Cut rectangular strips from a sheet of paper and paste them on a hardboard. Write the symbol U in the left/right top corner of each rectangle.
2. Draw circles A and B inside each of the rectangular strips and shade/colour different portions as shown in Fig. 3.1 to Fig. 3.10.

DEMONSTRATION

1. U denotes the universal set represented by the rectangle.
2. Circles A and B represent the subsets of the universal set U as shown in the figures 3.1 to 3.10.
3. A' denote the complement of the set A, and B' denote the complement of the set B as shown in the Fig. 3.3 and Fig. 3.4.
4. Coloured portion in Fig. 3.1. represents $A \cup B$.

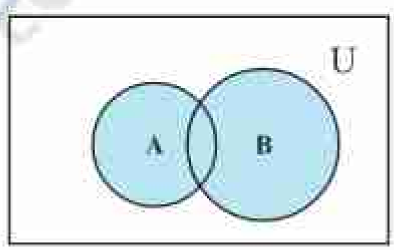


Fig. 3.1

5. Coloured portion in Fig. 3.2. represents A ∩ B.

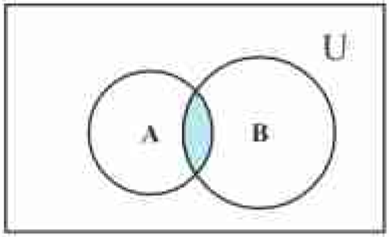


Fig. 3.2

6. Coloured portion in Fig. 3.3 represents A′

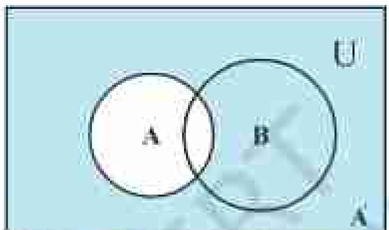


Fig. 3.3

7. Coloured portion in Fig. 3.4 represents B′

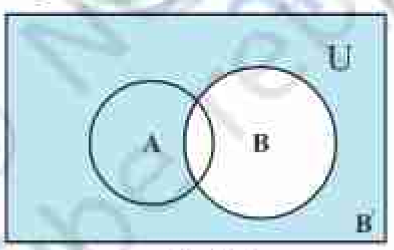


Fig. 3.4

8. Coloured portion in Fig. 3.5 represents (A ∩ B)′

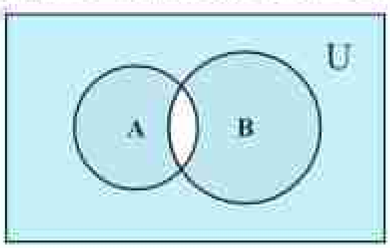


Fig. 3.5

9. Coloured portion in Fig. 3.6 represents $(A \cup B)'$

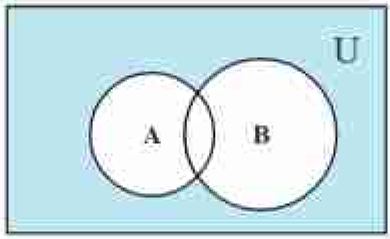


Fig. 3.6

10. Coloured portion in Fig. 3.7 represents $A' \cap B$ which is same as B – A.

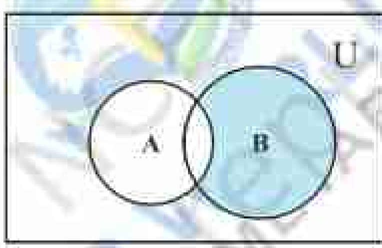


Fig. 3.7

11. Coloured portion in Fig. 3.8 represents $A' \cup B$.

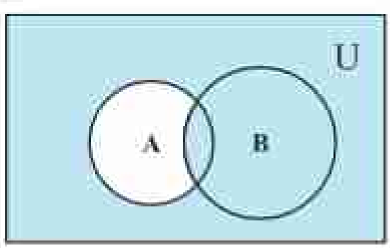


Fig. 3.8

12. Fig. 3.9 shows $A \cap B = \phi$

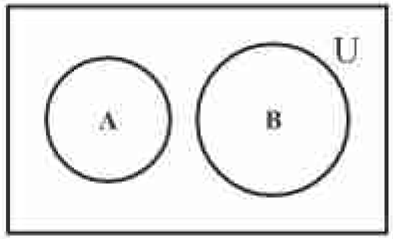


Fig. 3.9

13. Fig. 3.10 shows $A \subset B$

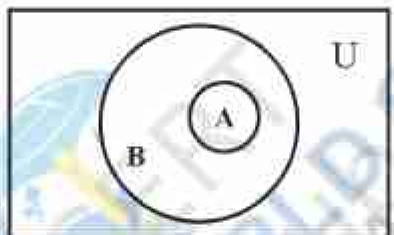


Fig. 3.10

Observation

1. Coloured portion in Fig. 3.1, represents _______________
2. Coloured portion in Fig. 3.2, represents _______________
3. Coloured portion in Fig. 3.3, represents _______________
4. Coloured portion in Fig. 3.4, represents _______________
5. Coloured portion in Fig. 3.5, represents _______________
6. Coloured portion in Fig. 3.6, represents _______________
7. Coloured portion in Fig. 3.7, represents _______________
8. Coloured portion in Fig. 3.8, represents _______________
9. Fig. 3.9, shows that $(A \cap B) =$ _______________
10. Fig. 3.10, represents A _______________ B.

Application

Set theoretic representation of Venn diagrams are used in Logic and Mathematics.

Activity 4

Objective

To verify distributive law for three given non-empty sets A, B and C, that is, $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

Material Required

Hardboard, white thick sheets of paper, pencil, colours, scissors, adhesive.

Method of Construction

1. Cut five rectangular strips from a sheet of paper and paste them on the hardboard in such a way that three of the rectangles are in horizontal line and two of the remaining rectangles are also placed horizontally in a line just below the above three rectangles. Write the symbol U in the left/right top corner of each rectangle as shown in Fig. 4.1, Fig. 4.2, Fig. 4.3, Fig. 4.4 and Fig. 4.5.
2. Draw three circles and mark them as A, B and C in each of the five rectangles as shown in the figures.
3. Colour/shade the portions as shown in the figures.

Demonstration

1. U denotes the universal set represented by the rectangle in each figure.
2. Circles A, B and C represent the subsets of the universal set U.

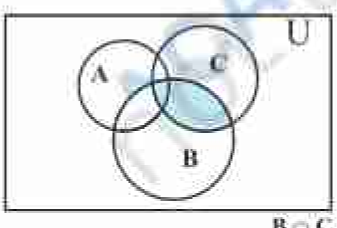


Fig. 4.1

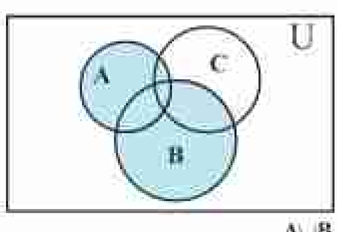


Fig. 4.2

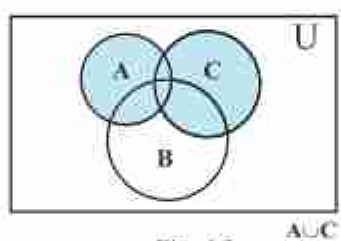


Fig. 4.3

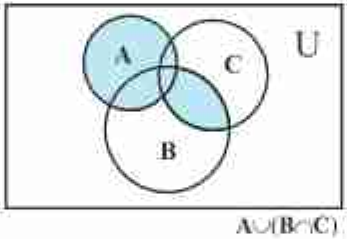


Fig. 4.4

=

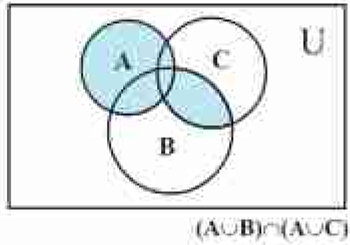


Fig. 4.5

3. In Fig. 4.1, coloured/shaded portion represents $B \cap C$, coloured portions in Fig. 4.2 represents $A \cup B$, Fig. 4.3 represents $A \cup C$, Fig. 4.4 represents $A \cup (B \cap C)$ and coloured portion in Fig. 4.5 represents $(A \cup B) \cap (A \cup C)$.

Observation

1. Coloured portion in Fig. 4.1 represents __________.
2. Coloured portion in Fig. 4.2, represents __________.
3. Coloured portion in Fig. 4.3, represents __________.
4. Coloured portion in Fig. 4.4, represents __________.
5. Coloured portion in Fig. 4.5, represents __________.
6. The common coloured portions in Fig. 4.4 and Fig. 4.5 are __________.
7. $A \cup (B \cap C) =$ ____________.

Thus, the distributive law is verified.

Application

Distributivity property of set operations is used in the simplification of problems involving set operations.

Note

In the same way, the other distributive law

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ can also be verified.

Activity 5

Objective

To identify a relation and a function.

Material Required

Hardboard, battery, electric bulbs of two different colours, testing screws, tester, electrical wires and switches.

Method of Construction

1. Take a piece of hardboard of suitable size and paste a white paper on it.
2. Drill eight holes on the left side of board in a column and mark them as A, B, C, D, E, F, G and H as shown in the Fig.5.
3. Drill seven holes on the right side of the board in a column and mark them as P, Q, R, S, T, U and V as shown in the Figure 5.
4. Fix bulbs of one colour in the holes A, B, C, D, E, F, G and H.
5. Fix bulbs of the other colour in the holes P, Q, R, S, T, U and V.

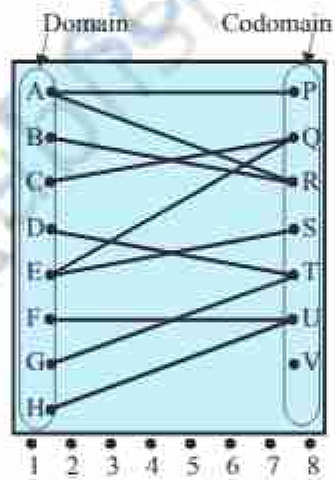


Fig. 5

6. Fix testing screws at the bottom of the board marked as 1, 2, 3, ..., 8.
7. Complete the electrical circuits in such a manner that a pair of corresponding bulbs, one from each column glow simultaneously.
8. These pairs of bulbs will give ordered pairs, which will constitute a relation which in turn may /may not be a function [see Fig. 5].

Demonstration

1. Bulbs at A, B, ..., H, along the left column represent domain and bulbs along the right column at P, Q, R, ..., V represent co-domain.
2. Using two or more testing screws out of given eight screws obtain different order pairs. In Fig.5, all the eight screws have been used to give different ordered pairs such as (A, P), (B, R), (C, Q) (A, R), (E, Q), etc.
3. By choosing different ordered pairs make different sets of ordered pairs.

Observation

1. In Fig.5, ordered pairs are _________.
2. These ordered pairs constitute a _______.
3. The ordered pairs (A, P), (B, R), (C, Q), (E, Q), (D, T), (G, T), (F, U), (H, U) constitute a relation which is also a _____.
4. The ordered pairs (B, R), (C, Q), (D, T), (E, S), (E, Q) constitute a _____ which is not a _____.

Application

The activity can be used to explain the concept of a relation or a function. It can also be used to explain the concept of one-one, onto functions.

Activity 6

Objective

To distinguish between a Relation and a Function.

Material Required

Drawing board, coloured drawing sheets, scissors, adhesive, strings, nails etc.

Method of Construction

1. Take a drawing board/a piece of plywood of convenient size and paste a coloured sheet on it.
2. Take a white drawing sheet and cut out a rectangular strip of size 6 cm × 4 cm and paste it on the left side of the drawing board (see Fig. 6.1).

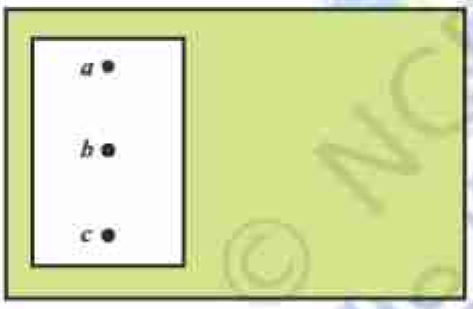


Fig. 6.1

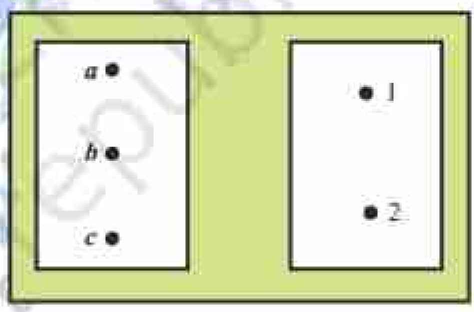


Fig. 6.2

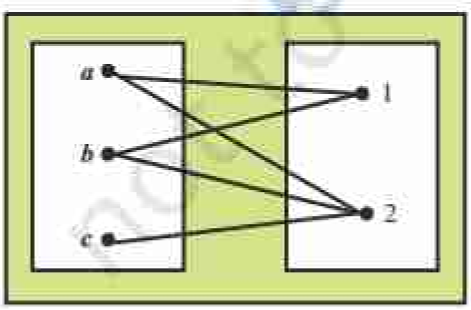


Fig. 6.3

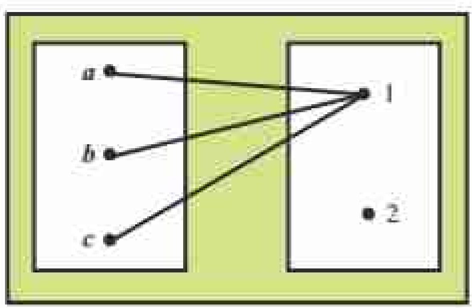


Fig. 6.4

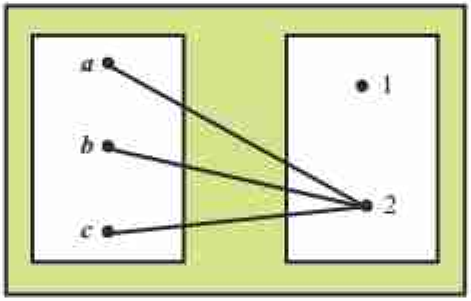


Fig. 6.5

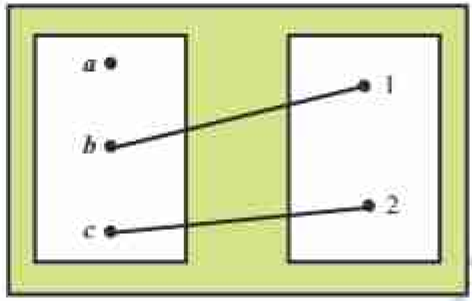


Fig. 6.6

3. Fix three nails on this strip and mark them as *a, b, c* (see Fig. 6.1).
4. Cut out another white rectangular strip of size 6 cm × 4 cm and paste it on the right hand side of the drawing board.
5. Fix two nails on the right side of this strip (see Fig. 6.2) and mark them as 1 and 2.

Demonstration

1. Join nails of the left hand strip to the nails on the right hand strip by strings in different ways. Some of such ways are shown in Fig. 6.3 to Fig. 6.6.
2. Joining nails in each figure constitute different ordered pairs representing elements of a relation.

Observation

1. In Fig. 6.3, ordered pairs are ___________.

   These ordered pairs constitute a ___________ but not a _________.
2. In Fig. 6.4, ordered pairs are __________. These constitute a _______ as well as ________.
3. In Fig 6.5, ordered pairs are _______. These ordered pairs constitute a ________ as well as ________.
4. In Fig. 6.6, ordered pairs are ________. These ordered pairs do not represent ______ but represent ________.

APPLICATION

Such activity can also be used to demonstrate different types of functions such as constant function, identity function, injective and surjective functions by joining nails on the left hand strip to that of right hand strip in suitable manner.

NOTE

In the above activity nails have been joined in some different ways. The student may try to join them in other different ways to get more relations of different types. The number of nails can also be changed on both sides to represent different types of relations and functions.

Activity 7

OBJECTIVE

To verify the relation between the degree measure and the radian measure of an angle.

MATERIAL REQUIRED

Bangle, geometry box, protractor, thread, marker, cardboard, white paper.

METHOD OF CONSTRUCTION

1. Take a cardboard of a convenient size and paste a white paper on it.
2. Draw a circle using a bangle on the white paper.
3. Take a set square and place it in two different positions to find diameters PQ and RS of the circle as shown in the Fig.7.1 and 7.2

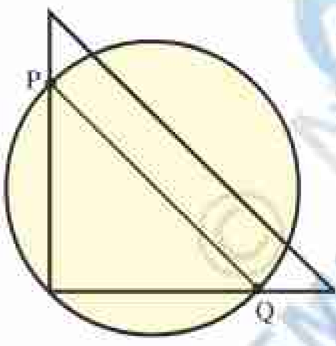


Fig. 7.1

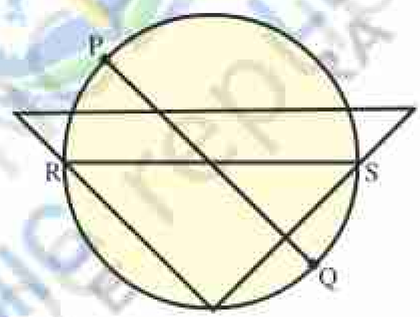


Fig. 7.2

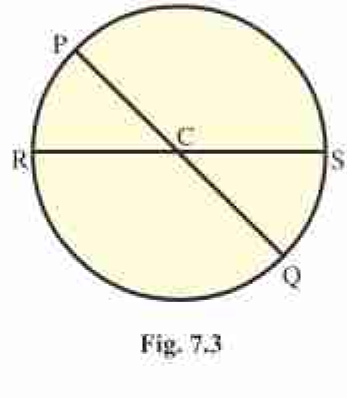


Fig. 7.3

4. Let PQ and RS intersect at C. The point C will be the centre of the circle (Fig. 7.3).
5. Clearly CP = CR = CS = CQ = radius.

Demonstration

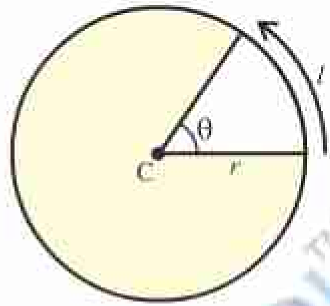


Fig. 7.4

1. Let the radius of the circle be r and l be an arc subtending an angle θ at the centre C, as shown in Fig. 7.4. $\theta = \frac{l}{r}$ radians.

2. If Degree measure of $\theta = \frac{l}{2\pi r} \times 360$ degrees

Then $\frac{l}{r}$ radians $= \frac{l}{2\pi r} \times 360$ degrees

or 1 radian $= \frac{180}{\pi}$ degrees = 57.27 degrees.

Observation

Using thread, measure arc lengths RP, PS, RQ, QS and record them in the table given below :

S.No	Arc	length of arc (l)	radius of circle (r)	Radian measure
1.	$\widehat{RP}$	---------	---------	$\angle RCP = \frac{\widehat{RP}}{r} =$ __
2.	$\widehat{PS}$	---------	---------	$\angle PCS = \frac{\widehat{PS}}{r} =$ __
3.	$\widehat{SQ}$	---------	---------	$\angle SCQ = \frac{\widehat{SQ}}{r} =$ __
4.	$\widehat{QR}$	---------	---------	$\angle QCR = \frac{\widehat{QR}}{r} =$ __

2. Using protractor, measure the angle in degrees and complete the table.

Angle	Degree measure	Radian Measure	Ratio = $\frac{\textit{Degree measure}}{\textit{Radian measure}}$
∠ RCP	--------	--------	--------
∠ PCS	--------	--------	--------
∠ QCS	--------	--------	--------
∠ QCR	--------	--------	--------

3. The value of one radian is equal to ________ degrees.

Application

This result is useful in the study of trigonometric functions.

Activity 8

Objective

To find the values of sine and cosine functions in second, third and fourth quadrants using their given values in first quadrant.

Material Required

Cardboard, white chart paper, ruler, coloured pens, adhesive, steel wires and needle.

Method of Construction

1. Take a cardboard of convenient size and paste a white chart paper on it.
2. Draw a unit circle with centre O on chart paper.
3. Through the centre of the circle, draw two perpendicular lines $X'OX$ and YOY' representing x-axis and y-axis, respectively, as shown in Fig.8.1.

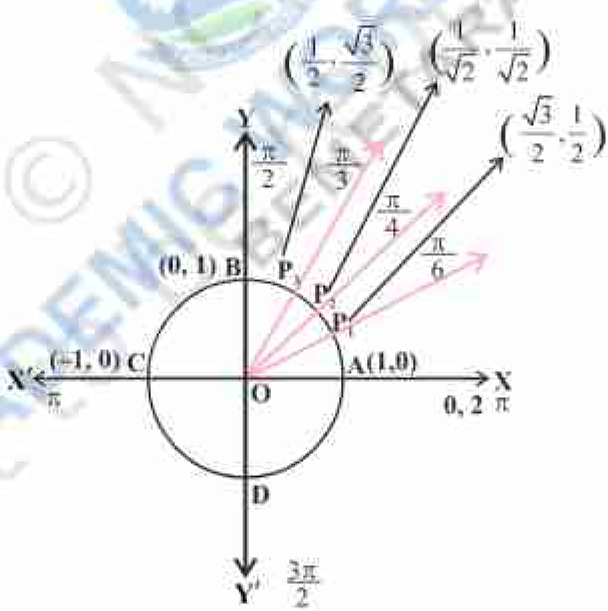


Fig. 8.1

4. Mark the points as A, B, C and D, where the circle cuts the x-axis and y-axis, respectively, as shown in Fig. 8.1.

5. Through O, draw angles P_1OX, P_2OX, and P_3OX of measures $\frac{\pi}{6}, \frac{\pi}{4}$ and $\frac{\pi}{3}$, respectively.

6. Take a needle of unit length. Fix one end of it at the centre of the circle and the other end to move freely along the circle.

Demonstration

1. The coordinates of the point P_1 are $\left(\sqrt{\frac{3}{2}}, \frac{1}{2}\right)$ because its x-coordinate is $\cos\frac{\pi}{6}$ and y-coordinate is $\sin\frac{\pi}{6}$. The coordinates of the points P_2 and P_3 are $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ and $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$, respectively.

2. To find the value of sine or cosine of some angle in the second quadrant (say) $\frac{2\pi}{3}$, rotate the needle in anti clockwise direction making an angle P_4OX of measure $\frac{2\pi}{3} = 120°$ with the positive direction of x-axis.

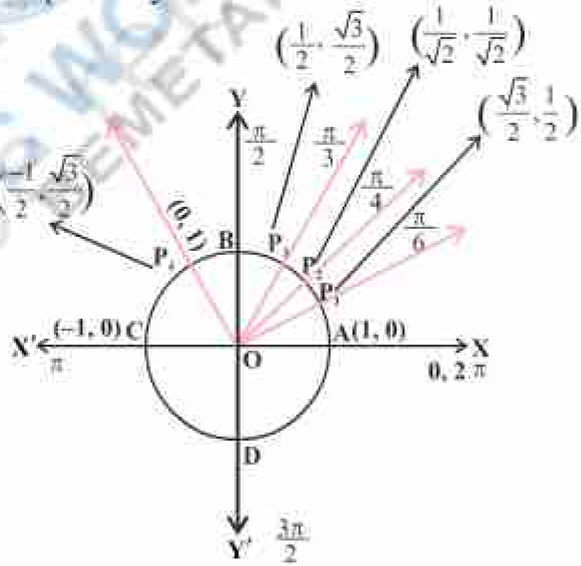


Fig. 8.2

3. Look at the position OP_4 of the needle in

Fig.8.2. Since $\frac{2\pi}{3}=\pi-\frac{\pi}{3}$, OP_4 is the mirror image of OP_3 with respect to y-axis. Therefore, the coordinate of P_4 are $\left(-\frac{1}{2},\frac{\sqrt{3}}{2}\right)$. Thus

$\sin\frac{2\pi}{3}=\frac{\sqrt{3}}{2}$ and $\cos\frac{2\pi}{3}=-\frac{1}{2}$.

4. To find the value of sine or cosine of some angle say, $\pi+\frac{\pi}{3}=\frac{4\pi}{3}$, i.e., $\frac{-2\pi}{3}$ (say) in the third quadrant, rotate the needle in anti clockwise direction making as an angle of $\frac{4\pi}{3}$ with the positive direction of x-axis.

5. Look at the new position OP_5 of the needle, which is shown in Fig. 8.3. Point P_5 is the mirror image of the point P_4 (since $\angle P_4OX' = P_5OX'$) with respect to x-axis. Therefore, co-ordinates of P_5 are $\left(-\frac{1}{2},\frac{-\sqrt{3}}{2}\right)$ and hence

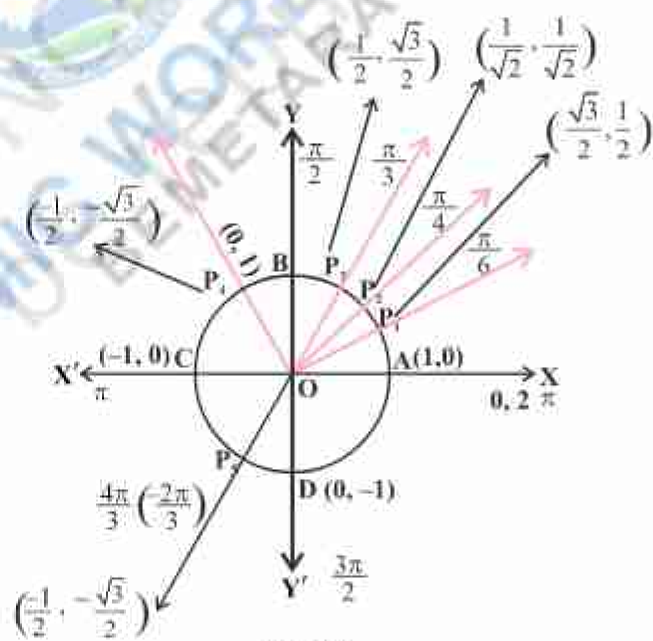


Fig. 8.3

$$\sin\left(-\frac{2\pi}{3}\right) = \sin\left(\frac{4\pi}{3}\right) = -\frac{\sqrt{3}}{2} \text{ and } \cos\left(-\frac{2\pi}{3}\right) = \cos\left(\frac{4\pi}{3}\right) = -\frac{1}{2}.$$

6. To find the value of sine or cosine of some angle in the fourth quadrant, say $\frac{7\pi}{4}$, rotate the needle in anti clockwise direction making an angle of $\frac{7\pi}{4}$ with the positive direction of x-axis represented by OP_6, as shown in Fig. 8.4. Angle $\frac{7\pi}{4}$ in anti clockwise direction = Angle $-\frac{\pi}{4}$ in the clockwise direction.

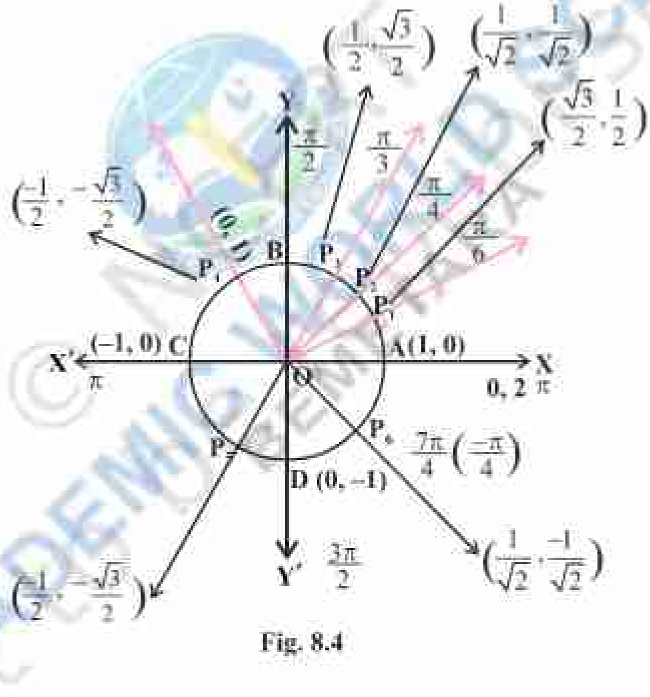


Fig. 8.4

From Fig. 8.4, P_6 is the mirror image of P_2 with respect to x-axis. Therefore, coordinates of P_6 are $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$.

Thus $\sin\left(\frac{7\pi}{4}\right)=\sin\left(-\frac{\pi}{4}\right)=-\frac{1}{\sqrt{2}}$

and $\cos\left(\frac{7\pi}{4}\right)=\cos\left(-\frac{\pi}{4}\right)=\frac{1}{\sqrt{2}}$

8. To find the value of sine or cosine of some angle, which is greater than one revolution, say $\frac{13\pi}{6}$, rotate the needle in anti clockwise direction since $\frac{13\pi}{6}=2\pi+\frac{\pi}{6}$, the needle will reach at the position OP_1. Therefore, $\sin\left(\frac{13\pi}{6}\right)=\sin\left(\frac{\pi}{6}\right)=\frac{1}{2}$ and $\cos\left(\frac{13\pi}{6}\right)=\cos\left(\frac{\pi}{6}\right)=\frac{\sqrt{3}}{2}$.

Observation

1. Angle made by the needle in one complete revolution is _________.
2. $\cos\frac{\pi}{6}=$ _________ $=\cos\left(-\frac{\pi}{6}\right)$

   $\sin\frac{\pi}{6}=$ _________ $=\sin(2\pi+$ ______$)$.
3. sine function is non-negative in _______ and _______ quadrants.
4. cosine function is non-negative in ______ and _____ quadrants.

Application

1. The activity can be used to get the values for tan, cot, sec, and cosec functions also.
2. From this activity students may learn that
   $\sin(-\theta) = -\sin\theta$ and $\cos(-\theta) = -\cos\theta$

This activity can be applied to other trigonometric functions also.

Activity 9

Objective

To prepare a model to illustrate the values of sine function and cosine function for different angles which are multiples of $\frac{\pi}{2}$ and π.

Material Required

A stand fitted with 0°-360° protractor and a circular plastic sheet fixed with handle which can be rotated at the centre of the protractor.

Method of Construction

1. Take a stand fitted with 0°-360° protractor.
2. Consider the radius of protractor as 1 unit.

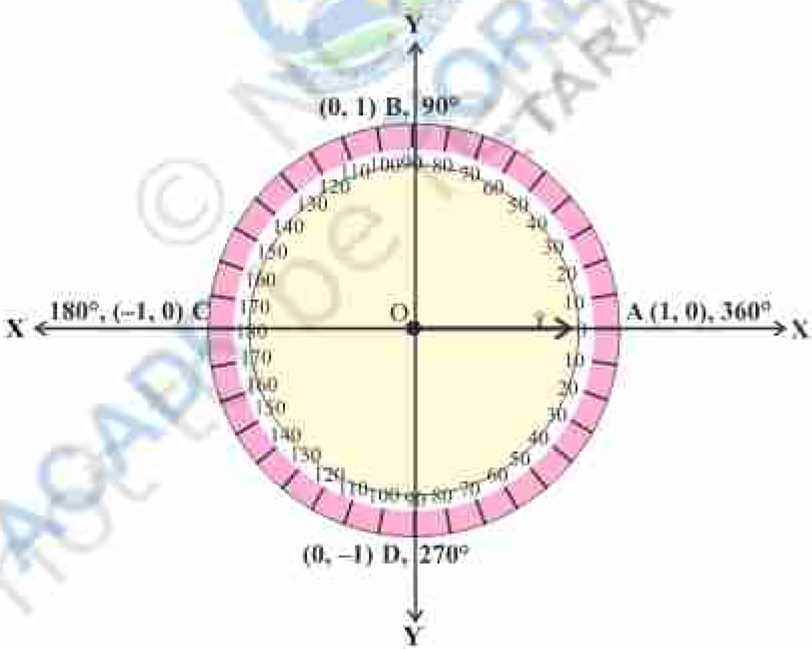


Fig. 9

3. Draw two lines, one joining 0°-180° line and another 90°-270° line, obviously perpendicular to each other.
4. Mark the ends of 0°-180° line as (1,0) at 0°, (–1, 0) at 180° and that of 90° - 270° line as (0,1) at 90° and (0, –1) at 270°
5. Take a plastic circular plate and mark a line to indicate its radius and fix a handle at the outer end of the radius.
6. Fix the plastic circular plate at the centre of the protractor.

Demonstration

1. Move the circular plate in anticlock wise direction to make different angles like 0, $\frac{\pi}{2}$, π, $\frac{3\pi}{2}$, 2π etc.
2. Read the values of sine and cosine function for these angles and their multiples from the perpendicular lines.

Observation

1. When radius line of circular plate is at 0° indicating the point A (1,0), cos 0 = _______ and sin 0 = _______.
2. When radius line of circular plate is at 90° indicating the point B (0, 1), $\cos\frac{\pi}{2}$ = _______ and $\sin\frac{\pi}{2}$ = _______.
3. When radius line of circular plate is at 180° indicating the point C (–1,0), cos π = _______ and sin π = _________.
4. When radius line of circular plate is at 270° indicating the point D (0, – 1) which means $\cos\frac{3\pi}{2}$ = _______ and $\sin\frac{3\pi}{2}$ = _______
5. When radius line of circular plate is at 360° indicating the point again at A (1,0), cos 2 π = _______ and sin 2 π = ________.

Now fill in the table :

Trigonometric function	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π	$\frac{5\pi}{2}$	3π	$\frac{7\pi}{2}$	4π
$\sin\theta$	–	–	–	–	–	–	–	–	–
$\cos\theta$	–	–	–	–	–	–	–	–	–

Application

This activity can be used to determine the values of other trigonometric functions for angles being multiple of $\frac{\pi}{2}$ and π.

Activity 10

Objective

To plot the graphs of sin x, sin $2x$, 2sin$x$ and sin$\frac{x}{2}$, using same coordinate axes.

Material Required

Plyboard, squared paper, adhesive, ruler, coloured pens, eraser.

Method of Construction

1. Take a plywood of size 30 cm × 30 cm.
2. On the plywood, paste a thick graph paper of size 25 cm × 25 cm.
3. Draw two mutually perpendicular lines on the squared paper, and take them as coordinate axes.
4. Graduate the two axes as shown in the Fig. 10.
5. Prepare the table of ordered pairs for sin x, sin $2x$, 2sin x and sin $\frac{x}{2}$ for different values of x shown in the table below:

T. ratios	0°	$\frac{\pi}{12}$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{5\pi}{12}$	$\frac{\pi}{2}$	$\frac{7\pi}{12}$	$\frac{2\pi}{3}$	$\frac{9\pi}{12}$	$\frac{5\pi}{6}$	$\frac{11\pi}{12}$	π
sin x	0	0.26	0.50	0.71	0.86	0.97	1.00	0.97	0.86	0.71	0.50	0.26	0
sin $2x$	0	0.50	0.86	1.00	0.86	0.50	0	–0.5	–0.86	–1.0	–0.86	–0.50	0
2 sin x	0	0.52	1.00	1.42	1.72	1.94	2.00	1.94	1.72	1.42	1.00	0.52	0
sin$\frac{x}{2}$	0	0.13	0.26	0.38	0.50	0.61	0.71	0.79	0.86	0.92	0.97	0.99	1.00

Demonstration

1. Plot the ordered pair $(x, \sin x)$, $(x, \sin 2x)$, $(x, \sin \frac{x}{2})$ and $(x, 2\sin x)$ on the same axes of coordinates, and join the plotted ordered pairs by free hand curves in different colours as shown in the Fig.10.

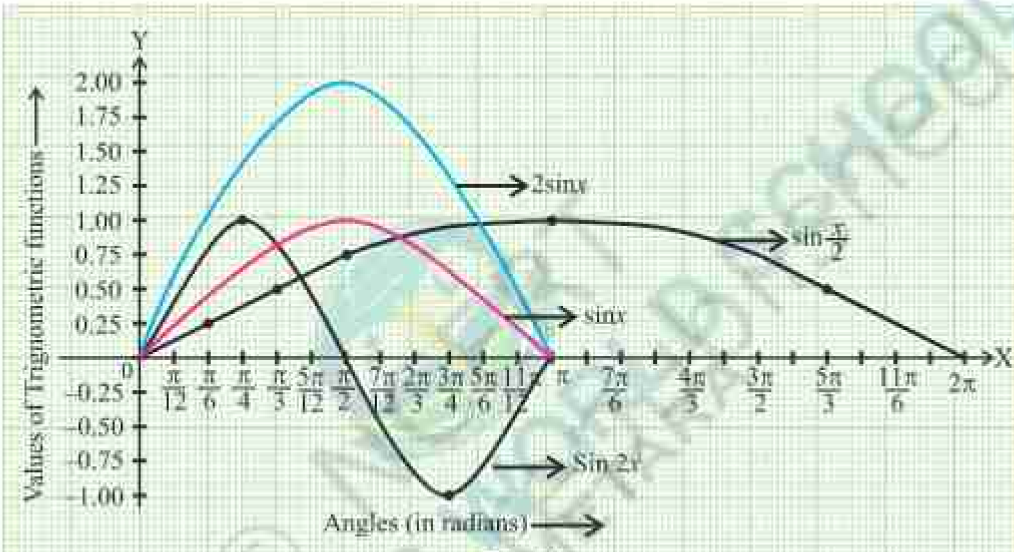


Fig. 10

Observation

1. Graphs of $\sin x$ and $2 \sin x$ are of same shape but the maximum height of the graph of $\sin x$ is ________ the maximum height of the graph of __________.
2. The maximum height of the graph of $\sin 2x$ is __________. It is at x = __________.
3. The maximum height of the graph of $2 \sin x$ is __________ . It is at x = __________ .

4. The maximum height of the graph of $\sin \frac{x}{2}$ is ___________ . It is at $\frac{x}{2}$ = _________ .

5. At x = ________, $\sin x = 0$, at x = _______, $\sin 2x = 0$ and at x = ________, $\sin\frac{x}{2} = 0$.

6. In the interval $[0, \pi]$, graphs of $\sin x$, $2 \sin x$ and $\sin \frac{x}{2}$ are _______ x- axes and some portion of the graph of $\sin 2x$ lies _______ x-axes.

7. Graphs of $\sin x$ and $\sin 2x$ intersect at x = _______ in the interval $(0, \pi)$

8. Graphs of $\sin x$ and $\sin \frac{x}{2}$ intersect at x = ________ in the interval $(0, \pi)$.

Application

This activity may be used in comparing graphs of a trigonometric function of multiples and submultiples of angles.

Activity 11

Objective

To inerpret geometrically the meaning of $i=\sqrt{-1}$ and its integral powers.

Material Required

Cardboard, chart paper, sketch pen, ruler, compasses, adhesive, nails, thread.

Method of Construction

1. Paste a chart paper on the cardboard of a convenient size.
2. Draw two mutually perpendicular lines $X'X$ and $Y'Y$ interesting at the point O (see Fig. 11).
3. Take a thread of a unit length representing the number 1 along OX . Fix one end of the thread to the nail at 0 and the other end at A as shown in the figure.
4. Set free the other end of the thread at A and rotate the thread through angles of 90º, 180º, 270º and 360º and mark the free end of the thread in different cases as A_1, A_2, A_3 and A_4 , respectively, as shown in the figure.

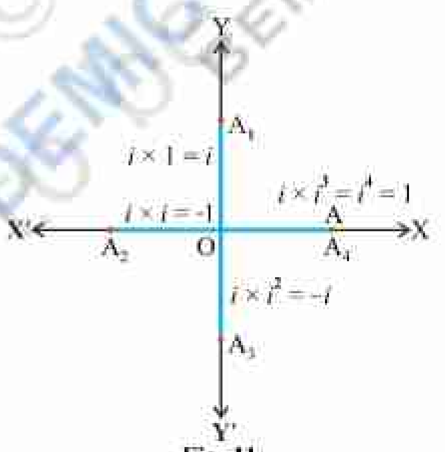


Fig. 11

Demonstration

1. In the argand plane, OA, OA_1, OA_2, OA_3, OA_4 represent, respectively, 1, i, –1, – i, 1.
2. $OA_1 = i = 1 \times i$, $OA_2 = -1 = i \times i = i^2$, $OA_3 = -i = i \times i \times i = i^3$ and so on. Each time, rotation of OA by 90º is equivalent to multiplication by i. Thus, i is referred to as the multiplying factor for a rotation of 90º.

Observation

1. On rotating OA through 90º, $OA_1 = 1 \times i =$ _________.
2. On rotating OA through an angle of 180°, $OA_2 = 1 \times$ __ $\times$ __ = ______.
3. On rotation of OA through 270º (3 right angles), $OA_3 =$

   $1 \times$ _______ $\times$ ______ $\times$ ______ = ______.
4. On rotating OA through 360º (4 right angles),

   $OA_4 = 1 \times$ _______ $\times$ ______ $\times$ ______ $\times$ ______ = __________.
5. On rotating OA through n-right angles

   $OA_n = 1 \times$ ________ $\times$ ______ $\times$ ______ $\times$ ______ $\times$ ... n times = __________.

Application

This activity may be used to evaluate any integral power of i.

Activity 12

Objective

To obtain a quadratic function with the help of linear functions graphically.

Material Required

Plywood sheet, pieces of wires.

Method of Construction

1. Take two wires of equal length.
2. Fix them at O in a plane (on the plywood sheet) at right angle to each other to represent x-axis and y-axis (see Fig.12).
3. Take a piece of wire and fix it in such a way that it meets the x-axis at a distance of a units from O in the positive direction and meets y-axis at a distance of a units below O as shown in the figure. Mark these points as B and A, respectively.

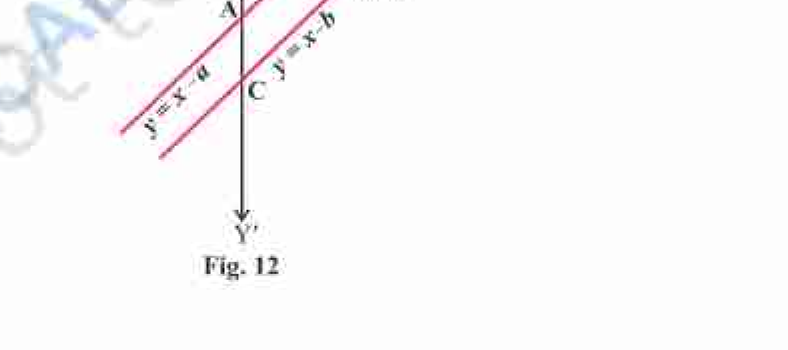


Fig. 12

4. Similarly, take another wire and fix it in such a way that it meets the x-axis at a distance of b units from O in the positive direction and meets y-axis at a distance of b units below O as shown in the Fig.12. Mark these points as D and C, respectively.
5. Take one more wire and fix it in such a way that it passes through the points where straight wires meet the x-axis and the wire takes the shape of a curve (parabola) as shown in the Fig.12.

Demonstration

1. The wire through the points A and B represents the straight line given by $y = x - a$ intersecting the x and y-axis at $(a, 0)$ and $(0, -a)$, respectively.
2. The wire through the points C and D represents the straight line given by $y = x - b$ intersecting x and y axis at $(b, 0)$ and $(0, -b)$, respectively.
3. The wire through B and D represents a curve given by the function $y = k(x - a)(x - b) = k[x^2 - (a + b)x + ab]$, where k is an arbitrary constant.

Observation

1. The line given by the linear function $y = x - a$ intersects the x-axis at the point ______ whose coordinates are _________.
2. The line given by the linear function $y = x - b$ intersects the x-axis at the point ______ whose coordinates are _______.
3. The curve passing through B and D is given by the function $y =$ ______, which is a _______ function.

Application

This activity is useful in understanding the zeroes and the shape of graph of a quadratic polynomial.

Activity 13

Objective

To verify that the graph of a given inequality, say $5x + 4y - 40 < 0$, of the form $ax + by + c < 0$, $a, b > 0$, $c < 0$ represents only one of the two half planes.

Material Required

Cardboard, thick white paper, sketch pen, ruler, adhesive.

Method of Construction

1. Take a cardboard of a convenient size and paste a white paper on it.
2. Draw two perpendicular lines X′OX and Y′OY to represent x-axis and y-axis, respectively.
3. Draw the graph of the linear equation corresponding to the given linear inequality.
4. Mark the two half planes as I and II as shown in the Fig. 13.

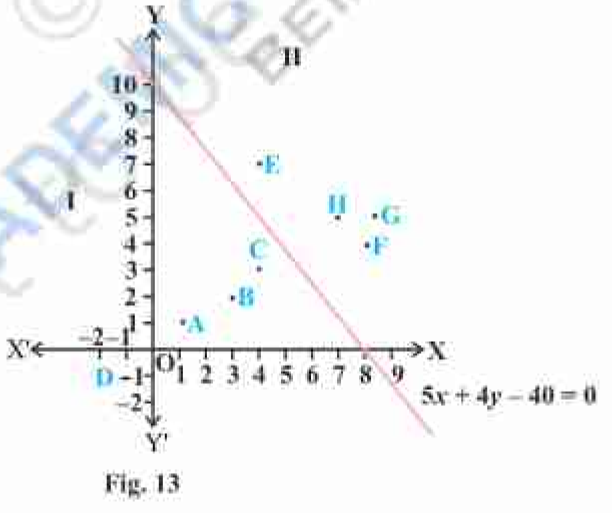


Fig. 13

Demonstration

1. Mark some points O(0, 0), A(1, 1), B(3, 2), C(4, 3), D(–1, –1) in half plane I and points E(4, 7), F(8, 4), G(9, 5), H(7, 5) in half plane II.

2. (i) Put the coordinates of O (0,0) in the left hand side of the inequality.

   Value of LHS $= 5(0) + 4(0) - 40 = -40 < 0$

   So, the coordinates of O which lies in half plane I, satisfy the inequality.

   (ii) Put the coordinates of the point E (4, 7) in the left hand side of the inequality.

   Value of LHS $= 5(4) + 4(7) - 40 = 8 \nless 0$ and hence the coordinates of the point E which lie in the half plane II does not satisfy the given inequality.

   (iii) Put the coordinates of the point F(8, 4) in the left hand side of the inequality. Value of LHS $= 5(8) + 4(4) - 40 = 16 \nless 0$

   So, the coordinates of the point F which lies in the half plane II do not satisfy the inequality.

   (iv) Put the coordinates of the point C(4, 3) in the left hand side of the inequality.

   Value of LHS $= 5(4) + 4(3) - 40 = -8 < 0$

   So, the coordinates of C which lies in the half plane I, satisfy the inequality.

   (v) Put the coordinates of the point D(–1, –1) in the left hand side of the inequality.

   Value of LHS $= 5(-1) + 4(-) - 40 = -49 < 0$

So, the coordinates of D which lies in the half plane I, satisfy the inequality.

(iv) Similarly points A (1, 1), lies in a half plane I satisfy the inequality. The points G (9, 5) and H (7, 5) lies in half plane II do not satisfy the inequality.

Thus, all points O, A, B, C, satisfying the linear inequality $5x + 4y - 40 <$ lie only in the half plane I and all the points E, F, G, H which do not satisfy the linear inequality lie in the half plane II.

Thus, the graph of the given inequality represents only one of the two corresponding half planes.

Observation

Coordinates of the point A __________ the given inequality (satisfy/does not satisfy).

Coordinates of G __________ the given inequality.

Coordinates of H __________ the given inequality.

Coordinates of E are __________ the given inequality.

Coordinates of F __________ the given inequality and is in the half plane____.

The graph of the given inequality is only half plane _________.

Application

This activity may be used to identify the half plane which provides the solutions of a given inequality.

Note

The activity can also be performed for the inequality of the type $ax + by + c > 0$.

Activity 14

Objective

To find the number of ways in which three cards can be selected from given five cards.

Material Required

Cardboard sheet, white paper sheets, sketch pen, cutter.

Method of Construction

1. Take a cardboard sheet and paste white paper on it.
2. Cut out 5 identical cards of convenient size from the cardboard.
3. Mark these cards as C_1, C_2, C_3, C_4 and C_5.

Demonstration

1. Select one card from the given five cards.
2. Let the first selected card be C_1. Then other two cards from the remaining four cards can be : C_2C_3, C_2C_4, C_2C_5, C_3C_4, C_3C_5 and C_4C_5. Thus, the possible selections are : $C_1C_2C_3$, $C_1C_2C_4$, $C_1C_2C_5$, $C_1C_3C_4$, $C_1C_3C_5$, $C_1C_4C_5$. Record these on a paper sheet.
3. Let the first selected card be C_2. Then the other two cards from the remaining 4 cards can be : C_1C_3, C_1C_4, C_1C_5, C_3C_4, C_3C_5, C_4C_5. Thus, the possible selections are: $C_2C_1C_3$, $C_2C_1C_4$, $C_2C_1C_5$, $C_2C_3C_4$, $C_2C_3C_5$, $C_2C_4C_5$. Record these on the same paper sheet.
4. Let the first selected card be C_3. Then the other two cards can be : C_1C_2, C_1C_4, C_1C_5, C_2C_4, C_2C_5, C_4C_5. Thus, the possible selections are : $C_3C_1C_2$, $C_3C_1C_4$, $C_3C_1C_5$, $C_3C_2C_4$, $C_3C_2C_5$, $C_3C_4C_5$. Record them on the same paper sheet.
5. Let the first selected card be C_4. Then the other two cards can be : C_1C_2, C_1C_3, C_2C_3, C_1C_5, C_2C_5, C_3C_5 Thus, the possible selections are: $C_4C_1C_2$, $C_4C_1C_3$, $C_4C_2C_3$, $C_4C_1C_5$, $C_4C_2C_5$, $C_4C_3C_5$. Record these on the same paper sheet.

6. Let the first selected card be C_5. Then the other two cards can be: C_1C_2, C_1C_3, C_1C_4, C_2C_3, C_2C_4, C_3C_4 Thus, the possible selections are: $C_5C_1C_2$, $C_5C_1C_3$, $C_5C_1C_4$, $C_5C_2C_3$, $C_5C_2C_4$, $C_5C_3C_4$. Record these on the same paper sheet.

7. Now look at the paper sheet on which the possible selectios are listed. Here, there are in all 30 possible selections and each of the selection is repeated thrice. Therefore, the number of distinct selection $= 30 \div 3 = 10$ which is same as $5C_3$.

Observation

1. $C_1C_2C_3$, $C_2C_1C_3$ and $C_3C_1C_2$ represent the _______ selection.
2. $C_1C_2C_4$, ______________, ______________ represent the same selection.
3. Among $C_2C_1C_3$, $C_1C_2C_3$, $C_1C_2C_3$, ________ and ________ represent the same selection.
4. $C_2C_1C_3$, $C_1C_2C_3$, represent _______ selections.
5. Among $C_3C_1C_5$, $C_1C_4C_3$, $C_3C_3C_4$, $C_4C_2C_5$, $C_2C_4C_3$, $C_1C_3C_5$

   $C_3C_1C_3$, ________ represent the same selections.

   $C_3C_1C_5$, $C_1C_4C_5$, ______, ______, represent different selections.

Application

Activities of this type can be used in understanding the general formula for finding the number of possible selections when *r* objects are selected from given *n* distinct objects, i.e., ${}^nC_r = \frac{n!}{r!(n-r)!}$.

Activity 15

OBJECTIVE

To construct a Pascal's Triangle and to write binomial expansion for a given positive integral exponent.

MATERIAL REQUIRED

Drawing board, white paper, matchsticks, adhesive.

METHOD OF CONSTRUCTION

1. Take a drawing board and paste a white paper on it.
2. Take some matchsticks and arrange them as shown in Fig.15.

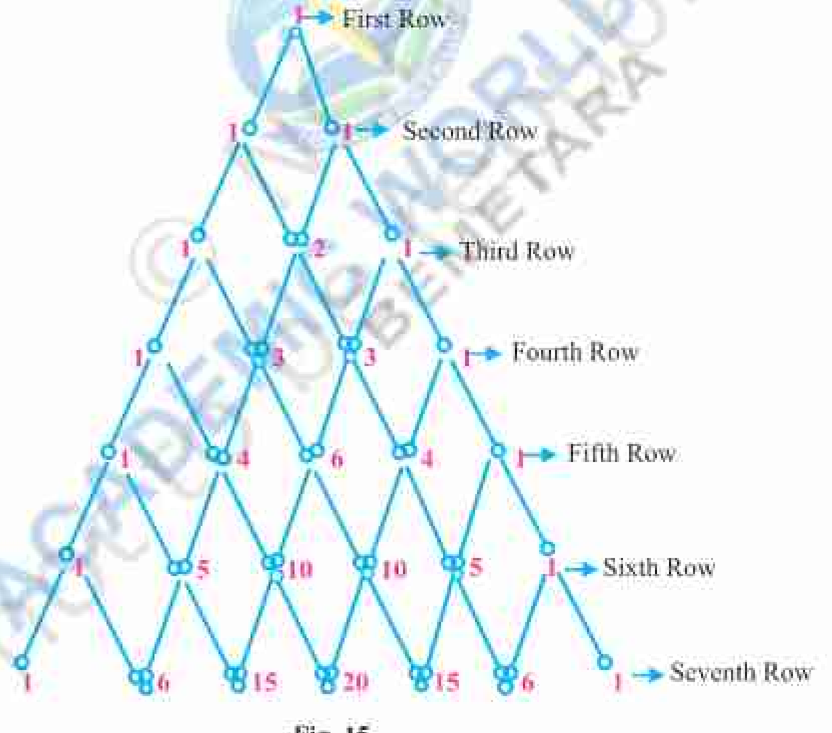


Fig. 15

3. Write the numbers as follows:

   1 (first row)
   1 1 (second row)
   1 2 1 (third row)
   1 3 3 1 (fourth row), 1 4 6 4 1 (fifth row) and so on (see Fig. 15).

4. To write binomial expansion of $(a + b)^n$, use the numbers given in the $(n + 1)^{th}$ row.

Demonstration

1. The above figure looks like a triangle and is referred to as Pascal's Triangle.
2. Numbers in the second row give the coefficients of the terms of the binomial expansion of $(a + b)^1$. Numbers in the third row give the coefficients of the terms of the binomial expansion of $(a + b)^2$, numbers in the fourth row give coefficients of the terms of binomial expansion of $(a + b)^3$. Numbers in the fifth row give coefficients of the terms of binomial expansion of $(a + b)^4$ and so on.

Observation

1. Numbers in the fifth row are __________, which are coefficients of the binomial expansion of __________.
2. Numbers in the seventh row are ____________, which are coefficients of the binomial expansion of _______.
3. $(a + b)^3$ = ___ a^3 + ___a^2b + ___ab^2 + ___b^3
4. $(a + b)^5$ = ___ + ___ + ___ + ___ + ___ + ___.
5. $(a + b)^6$ = ___a^6 + ___a^5b + ___a^4b^2 + ___a^3b^3 + ___a^2b^4 + ___ab^5 + ___b^6.
6. $(a + b)^8$ = ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___.
7. $(a + b)^{10}$ = ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + __.

Application

The activity can be used to write binomial expansion for $(a + b)^n$, where n is a positive integer.

Activity 16

OBJECTIVE

To obtain formula for the sum of squares of first n-natural numbers.

MATERIAL REQUIRED

Wooden/plastic unit cubes, coloured papers, adhesive and nails.

METHOD OF CONSTRUCTION

1. Take 1 (= 1^2) wooden/plastic unit cube Fig.16.1.
2. Take 4 (= 2^2) wooden/plastic unit cubes and form a cuboid as shown in Fig.16.2.
3. Take 9 (= 3^2) wooden/plastic unit cubes and form a cuboid as shown in Fig.16.3.
4. Take 16 (= 4^2) wooden/plastic unit cubes and form a cuboid as shown in Fig. 16.4 and so on.
5. Arrange all the cube and cuboids of Fig. 16.1 to 16.4 above so as to form an echelon type structure as shown in Fig.16.5.
6. Make six such echelon type structures, one is already shown in Fig. 16.5.
7. Arrange these five structures to form a bigger cuboidal block as shown in Fig. 16.6.

Fig 16.1

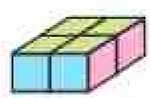


Fig 16.2

Fig 16.3

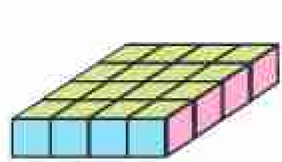


Fig 16.4

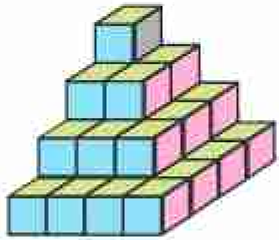


Fig. 16.5

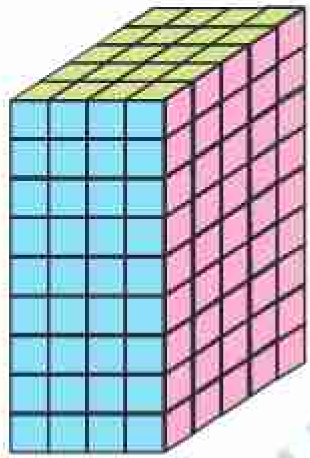


Fig. 16.6

Demonstration

1. Volume of the structure as given in Fig. 16.5

   $= (1 + 4 + 9 + 16)$ cubic units $= (1^2 + 2^2 + 3^2 + 4^2)$ cubic units.

2. Volume of 6 such structures $= 6\,(1^2 + 2^2 + 3^2 + 4^2)$ cubic units.
3. Volume of the cuboidal block formed in Fig. 16.6 (which is cuboid of dimensions $= 4 \times 5 \times 9) = 4 \times (4 + 1) \times (2 \times 4 + 1)$.
4. Thus, $6\,(1^2 + 2^2 + 3^2 + 4^2) = 4 \times (4 + 1) \times (2 \times 4 + 1)$

   i.e., $$1^2 + 2^2 + 3^2 + 4^2 = \frac{1}{6}[4 \times (4+1) \times (2 \times 4+1)]$$

Observation

1. $1^2 + 2^2 + 3^2 + 4^2 = \frac{1}{6}$ (_____) × (_____) × (_____).
2. $1^2 + 2^2 + 3^2 + 4^2 + 5^2 = \frac{1}{6}$ (_____) × (_____) × (_____).
3. $1^2 + 2^2 + 3^2 + 4^2 + ... + 10^2 = \frac{1}{6}$ (_____) × (_____) × (_____).

4. $1^2 + 2^2 + 3^2 + 4^2 ... + 25^2 = \frac{1}{6}$ (______) × (______) × (______).

5. $1^2 + 2^2 + 3^2 + 4^2 ... + 100^2 = \frac{1}{6}$ (______) × (______) × (______).

Application

This activity may be used to obtain the sum of squares of first n natural numbers as $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{1}{6} n (n + 1) (2n + 1)$.

Activity 17

Objective

An alternative approach to obtain formula for the sum of squares of first n natural numbers.

Material Required

Wooden/plastic unit squares, coloured pencils/sketch pens, scale.

Method of Construction

1. Take unit squares, 1, 4, 9, 16, 25 ... as shown in Fig. 17.1 and colour all of them with (say) Black colour.

Fig. 17.1

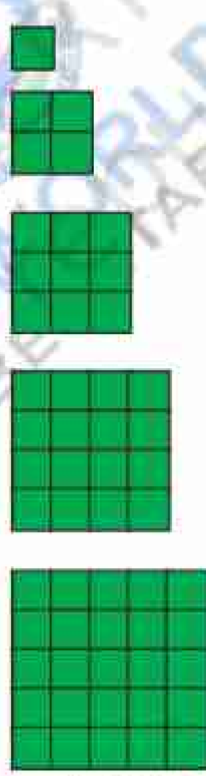


Fig. 17.2

2. Take another set of unit squares 1, 4, 9, 16, 25 ... as shown in Fig. 17.2 and colour all of them with (say) green colour.

3. Take a third set of unit squares 1, 4, 9, 16, 25 ... as shown in Fig. 17.3 and colour unit squares with different colours.

4. Arrange these three set of unit squares as a rectangle as shown in Fig. 17.4.

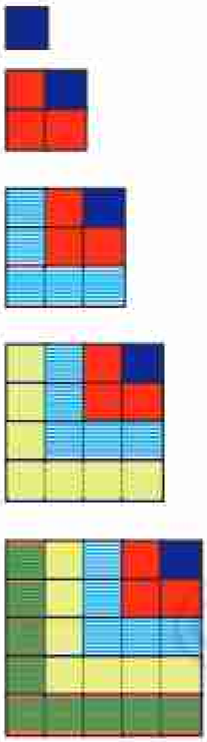


Fig. 17.3

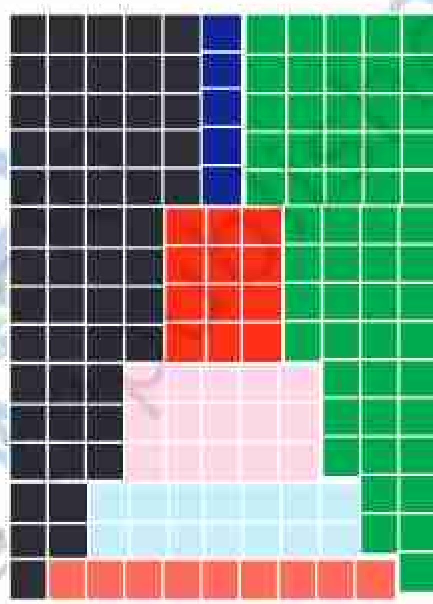


Fig. 17.4

Demonstration

1. Area of one set as given in Fig. 17.1

$$= (1 + 4 + 9 + 16 + 25) \text{ sq. units}$$

$$= (1^2 + 2^2 + 3^2 + 4^2 + 5^2) \text{ sq. units.}$$

2. Area of three such sets = $3\,(1^2 + 2^2 + 3^2 + 4^2 + 5^2)$

3. Area of rectangle = 11 × 15 = [2 (5) + 1] $\left[\frac{5\times6}{2}\right]$

$\therefore$ $3\,(1^2 + 2^2 + 3^2 + 4^2 + 5^2) = \frac{1}{2}\,[5 \times 6]\,[2\,(5) + 1]$

or $1^2 + 2^2 + 3^2 + 4^2 + 5^2 = \frac{1}{6}\,[5 \times (5 + 1)]\,[2\,(5) + 1]$.

Observation

$3\,(1^2 + 2^2 + 3^2 + 4^2 + 5^2) = \frac{1}{2}$ (_____ × _____) (___ + 1)

$\Rightarrow$ $1^2 + 2^2 + 3^2 + 4^2 + 5^2 = \frac{1}{6}$ (_____ × _____) (___ + 1)

$\therefore$ $1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 = \frac{1}{6}$ (_____ × _____) (___ + 1)

$1^2 + 2^2 + 3^2 + 4^2 + ... + 10^2 = \frac{1}{6}$ (_____ × _____) (___ + 1).

Application

This activity may be used to establish

$$1^2 + 2^2 + 3^2 + ... + n^2 = \frac{1}{6}\, n\,(n + 1)\,(2n + 1).$$

Activity 18

Objective

To demonstrate that the Arithmetic mean of two different positive numbers is always greater than the Geometric mean.

Material Required

Coloured chart paper, ruler, scale, sketch pens, cutter.

Method of Construction

1. From chart paper, cut off four rectangular pieces of dimension $a \times b$ $(a > b)$.
2. Arrange the four rectangular pieces as shown in figure. 18.

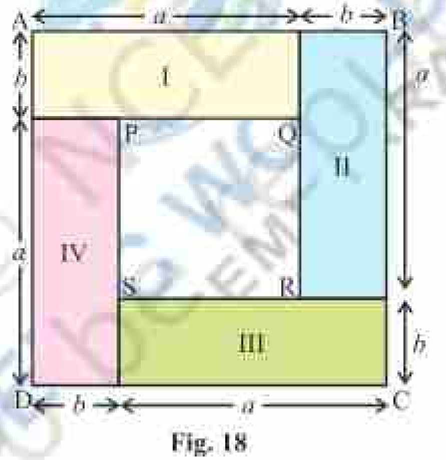


Fig. 18

Demonstration

1. ABCD is a square of side $(a + b)$ units.
2. Area ABCD = $(a + b)^2$ sq. units.
3. Area of four rectangular pieces = $4\ (ab) = 4ab$ sq. units.

4. PQRS is a square of side $(a-b)$ units.
5. Area ABCD = Sum of the areas of four rectangular pieces + area of square PQRS.

$\therefore$ Area ABCD > sum of the areas of four rectangular pieces

i.e., $(a+b)^2 > 4ab$

or $\left(\frac{a+b}{2}\right)^2 > ab$

$\therefore \frac{a+b}{2} > \sqrt{ab}$, i.e., A.M. > G.M.

Observation

Take $a = 5$cm, $b = 3$cm

$\therefore$ AB = $a + b$ = ________ units.

Area of ABCD = $(a+b)^2$ = ________ sq. units.

Area of each rectangle = ab = ________ sq. units.

Area of square PQRS = $(a-b)^2$ = ________ sq. units.

Area ABCD = 4 (area of rectangular piece) + Area of square PQRS

________ = 4 (________) + (________)

$\therefore$ ________ > 4 (________)

i.e. $(a+b)^2 > 4ab$ or $\left(\frac{a+b}{2}\right)^2 > ab$

or $\frac{a+b}{2} > \sqrt{ab}$ $\therefore$ AM > GM

Activity 19

Objective

To establish the formula for the sum of the cubes of the first n natural numbers.

Material Required

Thermocol sheet, thermocol balls, pins, pencil, ruler, adhesive, chart paper, cutter.

Method of Construction

1. Take (or cut) a square sheet of thermocol of a convenient size and paste a chart paper on it.
2. Draw horizontal and vertical lines on the pasted chart paper to form 225 small squares as shown in Fig. 19.

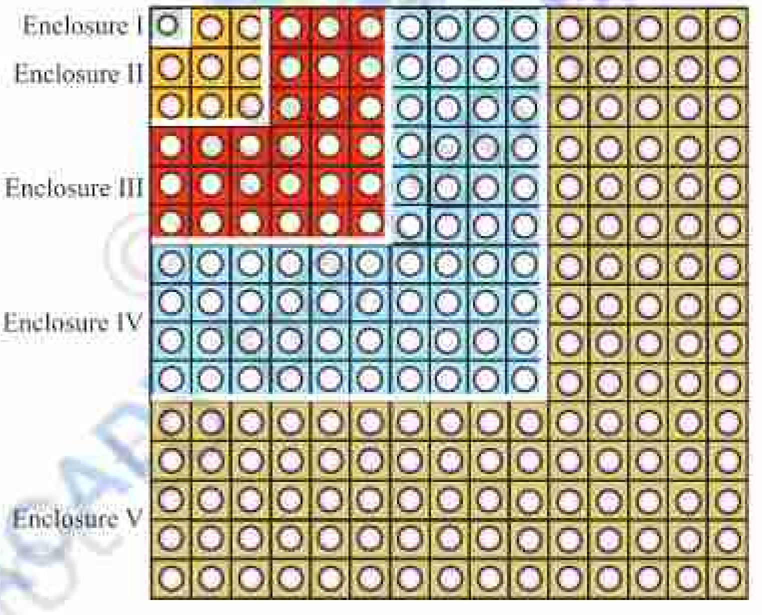


Fig. 19

3. Fix a thermocol ball with the help of a pin at the square on the upper left most corner.

4. Fix 2^3, i.e., 8, thermocol balls with the help of 8 pins on the same square sheet in 8 squares adjacent to the previous square as shown in the figure.
5. Fix 3^3, i.e., 27 thermocol balls with the help of 27 pins on the same square sheet in 27 squares adjacent to the previous 8 squares.
6. Continue fixing the thermocol balls in this way till all the squares are filled (see. Fig. 19).

Demonstration

1. Number of balls in Enclosure I $= 1^3 = 1 = \left(\frac{1\times 2}{2}\right)^2$.

2. Number of balls in Enclosure II $= 1^3 + 2^3 = 9 = \left(\frac{2\times 3}{2}\right)^2$.

3. Number of balls in Enclosure III $= 1^3 + 2^3 + 3^3 = 36 = \left(\frac{3\times 4}{2}\right)^2$.

4. Number of balls in Enclosure IV $= 1^3 + 2^3 + 3^3 + 4^3 = 100 = \left(\frac{4\times 5}{2}\right)^2$.

5. Total number of balls in Enclosure V $= 1^3 + 2^3 + 3^3 + 4^3 + 5^3$

$= 225 = \left(\frac{5\times 6}{2}\right)^2$.

Observation

By actual counting of balls

1. Number of balls in Enclosure I $= 1^3 =$ _______ $= \left(\frac{1\times 2}{2}\right)^2$.

2. Number of balls in Enclosure II = $=13^3+2^3=\underline{\qquad\quad}=\left(\frac{\underline{\quad}\times\underline{\quad}}{\underline{\quad}}\right)^2.$

3. Number of balls in Enclosure III

$$=1^3+2^3+\underline{\qquad\quad}=\underline{\qquad\quad}=\left(\frac{\underline{\quad}\times\underline{\quad}}{2}\right)^2.$$

4. Number of balls in Enclosure IV

$$=1^3+2^3+(\underline{\quad})^3+(\underline{\quad})^3=\underline{\quad}=\left(\frac{\underline{\quad}\times\underline{\quad}}{2}\right)^2.$$

5. Number of balls in Enclosure V

$$=(\underline{\quad})^3+(\underline{\quad})^3+(\underline{\quad})^3+(\underline{\quad})^3+(\underline{\quad})^3=\underline{\quad}=\left(\frac{\underline{\quad}\times\underline{\quad}}{2}\right)^2.$$

Application

This result can be used in finding the sum of cubes of first n natural numbers, i.e.,

$$1^3+2^3+2^3+\ldots+n^3=\left[\frac{n(n+1)}{2}\right]^2.$$

Activity 20

Objective

To verify that the equation of a line passing through the point of intersection of two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is of the form $(a_1x + b_1y + c_1) + \lambda\ (a_2x + b_2y + c_2) = 0$.

Material Required

Cardboard, sketch pen, white paper, adhesive, pencil, ruler.

Method of Construction

1. Take a cardboard of convenient size and paste a white paper on it.
2. Draw two perpendicular lines X′OX and Y′OY on the graph paper. Take same scale for marking points on x and y-axes.
3. Draw the graph of the given two intersecting lines and note down the point of intersection, say (h, k) (see Fig. 20.1)

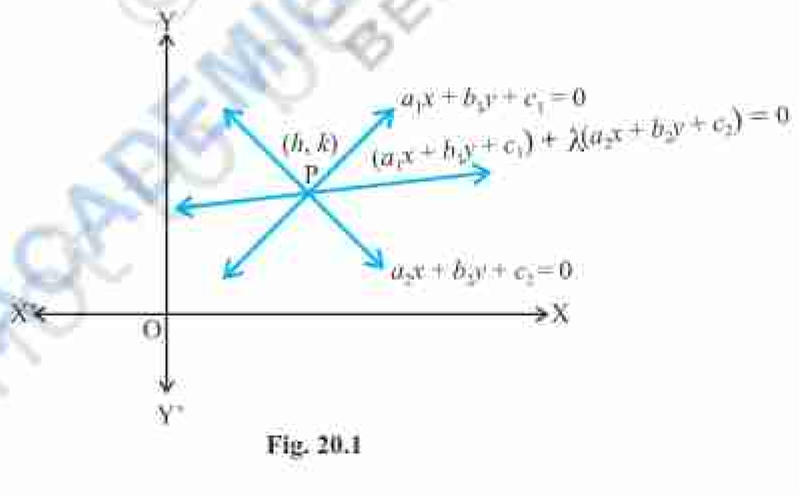


Fig. 20.1

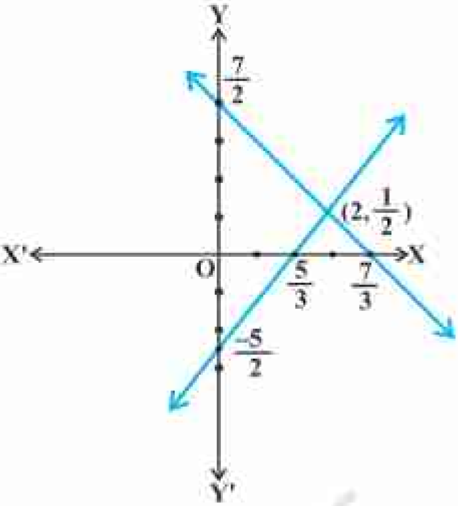


Fig. 20.2

DEMONSTRATION

1. Let the equations of the lines be $3x - 2y = 5$ and $3x + 2y = 7$.
2. The point of intersection of these lines is $\left(2, \frac{1}{2}\right)$ (See Fig. 20.2).
3. Equation of the line passing through the point of intersection $\left(2, \frac{1}{2}\right)$ of these lines is $(3x - 2y - 5) + \lambda(3x + 2y - 7) = 0$ (1)
4. Take $\lambda = 1, -1, 2, \frac{1}{2}$.
5. (i) For $\lambda = 1$, equation of line passing through the point of intersection is $(3x - 2y - 5) + 1\,(3x + 2y - 7)$, i.e., $6x - 12 = 0$, which is satisfied by the point of intersection $\left(2, \frac{1}{2}\right)$, i.e., $6\,(2) - 12 = 0$

(ii) For $\lambda = -1$, the equation of line passing through the point of intersection is

$(3x - 2y - 5) - 1\ (3x + 2y - 7) = 0$ is $-4y + 2 = 0$, which is also satisfied by the point of intersection $\left(2, \frac{1}{2}\right)$.

(iii) For $\lambda = 2$, the equation is $(3x - 2y - 5) + 2\ (3x + 2y - 7) = 0$, i.e., $9x + 2y - 19 = 0$, which is again satisfied by the point $\left(2, \frac{1}{2}\right)$.

Observation

1. For $\lambda = 3$, the equation of the line passing through intersection of the lines is _________ which is satisfied by the point $\left(2, \frac{1}{2}\right)$.
2. For $\lambda = 4$, the equation of the line passing through point of the intersection of the lines is ________ which is satisfied by the point of intersection ___________ of the lines.
3. For $\lambda = 5$, the equation of the line passing through the intersection of the lines is _____ which is satisfied by the point of intersection ________ of the lines.

Application

The activity can be used in understanding the result relating to the equation of a line through the point of intersection of two given lines. It is also observed that infinitely many lines pass through a fixed point.

ACADEMIC WORLD SCHOOL™
BEMETARA

SESSION: 2023-24
SUMMER VACATION ASSIGNMENT
CLASS: XI SCIENCE

General Instructions:

1. Write in a clear and legible handwriting.
2. Complete all the homework in a separate subject Summer Vacation Homework Notebook.
3. **DO NOT COPY AND PASTE FROM THE INTERNET**. (Assignment will be rejected)
4. In case of reference from the internet, you may:
   A. Read the content from the internet, if you wish and paraphrase (Rewrite in your own words)
   B. Mention the source of your information by providing the link from the internet for the verification by the teachers.
5. Marks awarded will be counted in the final scores at the end of the session.
6. The Summer Vacation HW will be submitted immediately upon arrival to school after Summer Vacation.
7. For any assignment related query do post your question on E-Mail Id of respective subject teacher. List of Subject Teacher's E-Mail ID attached.

Note for the Parents:

Parents are requested to guide his/her wards to complete their assignments honestly and submit by the due date.

Class: XI
Subject: English Core (301)

Q1. You are Vikram/Sonia, an Hon's graduate in history with specialization in Medieval India. You are well acquainted with places of historical interest in Delhi, Agra and Jaipur. You are looking for the job of tourist guide. Write an **advertisement** in about 50 words for the situations wanted column of a local newspaper. Your contact no. 991234567.

Q2. Applications are invited from suitable candidates for the post of assistant in the Delhi administration. All applications are to be addressed to Director, Recruitment, Old Secretariat, 5, Rajpur Road, Delhi. Draft a suitable **advertisement** to this account in about 50 words giving necessary details.

Q3. Indian Institute of Foreign Language is going to start a course in various foreign languages. Draft an **advertisement** for the classified columns of a newspaper giving details of the same [50 words].

Q4. You are a fitness trainer in a health club. Design a **poster** in not more than 50 words, to emphasize the importance of exercise in maintaining mental and physical fitness. You are Prem/Priya.

Q5. Open drains are death traps, risky for old people and children. They are also breeding grounds for rats, cockroaches etc. Design a **poster** highlighting the danger of open drains.

Q6. Read the passage given below:

BALANCING THE SCALES

Artificial intelligence (AI) is making a difference to how legal work is done, but it isn't the threat it is made out to be. AI is making impressive progress and shaking up things all over the world today. The assumption that advancements in technology and artificial intelligence will render any profession defunct is just that, an assumption and a false one. The only purpose this assumption serves is creating mass panic and hostility towards embracing technology that is meant to make our lives easier.

Let us understand what this means explicitly for the legal world. The ambit of AI includes recognizing human speech and objects, making decisions based on data, and translating languages. Tasks that can be defined as 'search-and-find' type can be performed by AI.

Introducing AI to this profession will primarily be for the purpose of automating mundane, tedious tasks that require negligible human intelligence. The kind of artificial intelligence that is employed by industries in the current scene, when extended to the law will enable quicker services at a lower price. AI is meant to automate a number of tasks that take up precious working hours lawyers could be devoted to tasks that require discerning, empathy, and trust- qualities that cannot be replicated by even the most sophisticated form of AI. The legal profession is one of the oldest professions in the world. Thriving over 1000 years; trust, judgement, and diligence are the pillars of this profession. The most important pillar is the relationship of trust between a lawyer and clients, which can only be achieved through human connection and interaction.

While artificial intelligence can be useful in scanning and organizing documents pertaining to a case, it cannot perform higher-level tasks such as sharp decision making, relationship-building with valuable clients and writing legal briefs, advising clients, and appearing in court. These are over and above the realm of computerization.

The smooth proceeding of a case is not possible without sound legal research. While presenting cases lawyers need to assimilate information in the form of legal research by referring to a number of relevant cases to find those that will favour their client's motion. Lawyers are even required to thoroughly know the opposing stand and supporting legal arguments they can expect to prepare a watertight defence strategy. AI, software that operates on natural language enables electronic discovery of information relevant to a case, contract reviews, and automation generation of legal documents.

AI utilizes big-data analytics which enables visualization of case data. It also allows for creation of a map of the cases which were cited in previous cases and their resulting verdicts, as per the website Towards Data Science. The probability of a positive outcome of a case can be predicted by leveraging predictive analytics with machine learning. This is advantageous to firms as they can determine the return on investment in litigation and whether an agreement or arbitration should be considered.

(a) On the basis of your understanding of the above passage, make notes on it using headings and subheadings. Use recognizable abbreviations (wherever necessary- minimum four) and a format you consider suitable. Also supply an appropriate title to it.
(b) Write a summary of the passage in about 80 words.

Passage 2

Q7. Read the passage below and answer the questions that follow.

We have been brought up to fear insects. We regard them as unnecessary creatures that do more harm than good. Man, continually wages war on them, because they contaminate his food, carry diseases or devour his crops. They sting or bite without provocation; they fly uninvited into our rooms on summer nights or beat against our lighted windows. We live in dread not only of unpleasant insects like spiders or wasps but of quite harmless ones like moths. Reading about them increases our understanding without dispelling our fears. Knowing that the industrious ant lives in a highly organised society does nothing to prevent us from being filled with revulsion when we find hordes of them crawling over a carefully prepared picnic lunch.

No matter how much we like honey or how much we have read about the uncanny sense of direction which bees possess, we have a horror of being stung. Most of our fears are unreasonable but they are difficult to erase. At the same time, however, insects are strangely fascinating, we enjoy reading about them, especially when we find that, like the praying mantis, they lead perfectly horrible lives. We enjoy staring at them, entranced as they go about their business, unaware (we hope) of our presence. Who has not stood in awe at the sight of a spider pouncing on a fly or a column of ants triumphantly bearing home an enormous dead beetle?

Last summer, I spent days in the garden watching thousands of ants crawling up the trunk of my prize of peach tree. The tree has grown against a warm well on a sheltered side of the house. I am especially proud of it, not only because it has survived several severe winters, but because it occasionally produces luscious peaches. During the summer I noticed that the leaves of the tree were beginning to wither. Clusters of tiny insects called aphis were to be found on the underside of the leaves. They were visited by a large colony of ants which obtained a sort of honey from them. I immediately embarked on an experiment which, even though it failed to get rid of the ants, kept me fascinated for twenty-four hours. I bound the base of the tree with sticky tape, making it impossible for the ants to reach the aphis. The tape was so sticky that they did not dare to cross it. For a long time, I watched them scurrying around the base of the tree in bewilderment.

I even went out at midnight with a torch and noted with satisfaction (and surprise) that the ants were still swarming around the sticky tape without being able to do anything about it. I got up early next morning hoping to find that the ants had given up in despair. Instead, I saw that they had discovered a new route. They were climbing up the wall of the house and then on to the leaves of the tree. I then realised sadly that I had been completely defeated by their ingenuity. The ants had been quick to find an answer to my thoroughly unscientific methods!

(a) On the basis of your understanding of the above passage, make notes on it using headings and subheadings. Use recognizable abbreviations (wherever necessary- minimum four) and a format you consider suitable. Also supply an appropriate title to it.
(b) Write a summary of the passage in about 80 words.

Class-XI

Subject – Physics (042)

1. Write 50 Physical quantities and it's dimensional formula from the NCERT Book Physics Part -1 (Appendix).
2. Write All the Fundamental quantities and their S I units.
3. Investigatory projects:- Prepare a project Report based on your investigation hand written on A4 sheet papers and submit in a punch report file to be submitted for the partial fulfilment of your class 11 Practical examinations.
   (Suggested topics for making projects are printed in your Physics Practical Book)

Class 11
Subject: Chemistry (043)

Instructions for students:

i) Complete the investigatory project allotted to you and submit it after summer vacation in a proper file.

ii) Project file should contain the front page including school name, logo, topic name & student name. Second page as certificate. Third page as acknowledgement. Fourth page showing index.

iii) Write the project in your own handwriting neatly.

INVESTIGATORY PROJECTS for class 11

1. Study of Methods of Purification of Water

2. Analysis of Hard Water

3. To Study the Foaming Capacity of Soaps

4. The Study of Contents Responsible for Flavour of Tea

5. To Study the Rate of Evaporation of Different Liquids

6. Study of the Effect of Acids and Bases on the Tensile Strength of Fibers

7. Analysis of Vegetable and Fruit Juices

8. Preparation of Rayon Thread from Filter Paper

9. Comparative Study of Commercial Antacids

10. To study adulteration in food stuff.

Class – XI
Subject: Biology (044)

Q.1) Prepare an investigatory project on the following topics-

a) Write and explain "New discoveries in the field of medicines, genetics and biotechnology".

b) Write the scientific names and taxonomic hierarchy of the followings-

1. Ten medicinal plants.

ii. Ten ornamental plants.

iii. Ten animals.

iv. Ten insects.

****