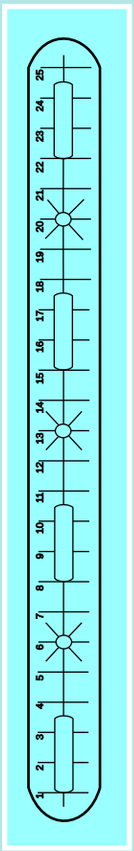
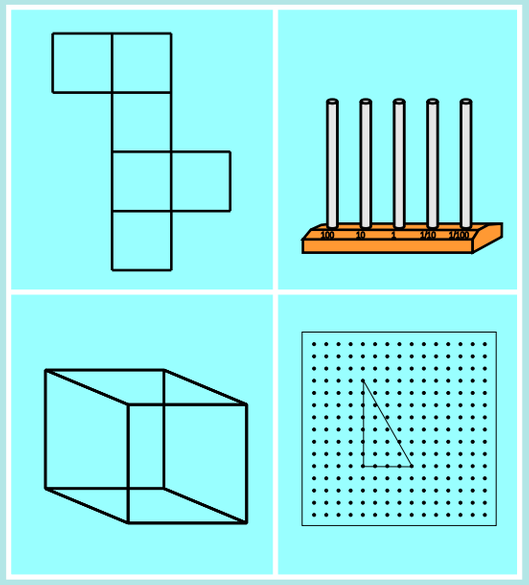
Manual of Upper Primary

Mathematics Kit





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राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

ISBN : 978-93-5007-051-2

Workshop Department

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NEW DELHI

Do You Know ?

According to the 86th Constitutional Amendment Act, 2002, free and compulsory education for all children in the 6–14-year age group is now a Fundamental Right under Article 21-A of the Constitution.

EDUCATION IS NEITHER A PRIVILEGE NOR FAVOUR BUT A BASIC HUMAN RIGHT TO WHICH ALL GIRLS AND WOMEN ARE ENTITLED

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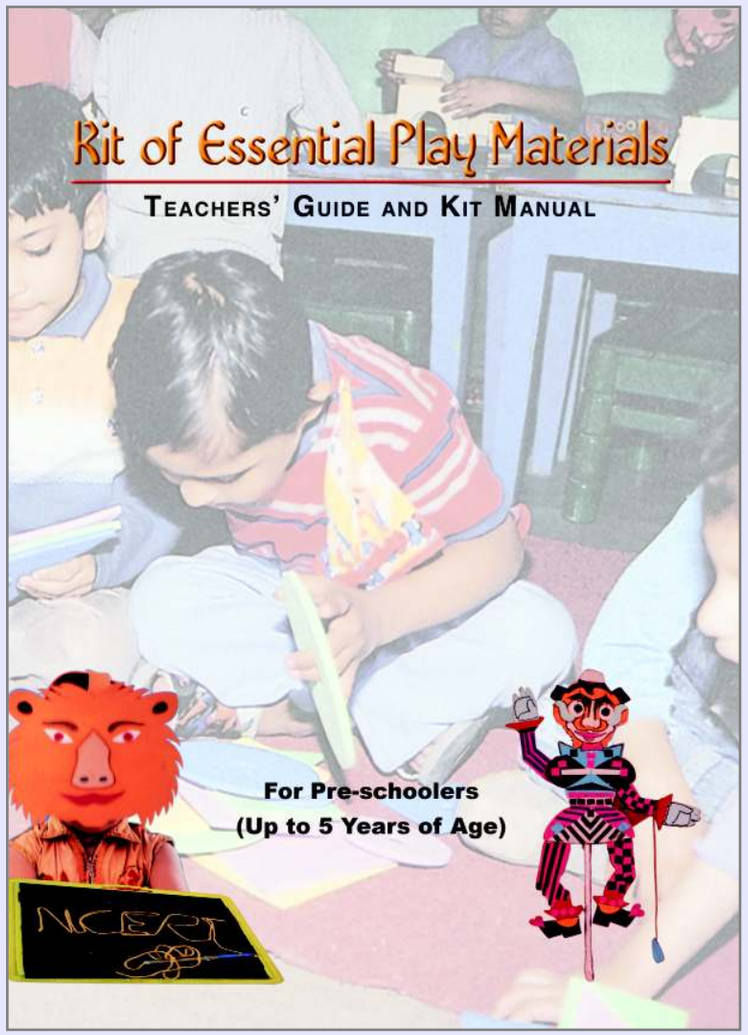

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MANUAL
OF
UPPER PRIMARY
MATHEMATICS
KIT

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ISBN 978-93-5007-051-2

First Edition
October 2010 Kartika 1932

Reprinted
May 2012 Jyaistha1934

PD 15T RPS

OFFICES OF THE PUBLICATION DEPARTMENT, NCERT

NCERT Campus
Sri Aurobindo Marg
New Delhi 110 016 **Phone : 011-26562708**

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Guwahati 781 021 **Phone : 0361-2674869**

₹ 50.00

Printed on 80 GSM watermark paper

Published at the Publication Department by the Secretary, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110 016 and printed at Arun Packers and Printers, C-36, Lawrence Road Industrial Area, Delhi 110 035

Publication Team

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D. K. Shende

PREFACE

One of the most significant recommendations of the *National Curriculum Framework (NCF)–2005* is the mathematisation of the child's thought processes. In achieving this goal, concrete mathematical experiences play a major role. A child is motivated to learn mathematics by getting involved in handling various concrete manipulants in various activities. In addition to activities, games in mathematics also help the child's involvement in learning by strategising and reasoning. For learning mathematical concepts through the above-mentioned approach, a child-centred Mathematics Kit has been developed for the students of upper primary stage based on some of the concepts from the newly developed NCERT mathematics textbooks. The kit includes various kit items along with a manual for performing activities and playing games.The kit broadly covers the activities in the areas of number system, geometry and mensuration. The kit has the following advantages:

- Availability of necessary materials at one place;
- Multipurpose use of items;
- Economy of time in doing the activities;
- Portability from one place to another;
- Provision for teacher's innovation; and
- Low-cost material and use of indigenous resources.

Here are some of the special features of the kit items (Plastic strips with slots and markings have been provided. These help in creating angles, triangles and quadrilaterals. The slots facilitate the adjustment of the strips over one another so that triangles and quadrilaterals of different dimensions can be made). Markings have been provided on the strips and these markings help in measuring the lengths, wherever required. The 360^0 protractors can be fixed on the strips while forming angles, triangles and quadrilaterals, and are used for measuring angles.

Nets of different solids in laminated papers have been provided for the formation of solids by folding. Then another interesting item is an innovative 'Geoboard'. It is a board of dimensions 19cm x 19cm x 1cm. Holes have been drilled on the board on side A at equal distance of 1 cm

each. Small pins (Called Dowels) can be fitted in the holes and with the help of rubber bands different geometrical shapes can be formed

Cutouts of plastic corrugated sheets in the form of parallelogram, triangle, trapezium and circle help in learning concepts related to areas. For an activity regarding different views of solids from various perspectives, plastic cubes have been provided. Each cube has a notch on one of its faces which helps in fixing it to other cubes to form different shapes like cubes or cuboids. These plastic cubes are also helpful in learning regarding surface area and volume of solids and fractions.

An abacus has been prepared to inculcate understanding of place values of numbers. In the base dowels have to be fixed in them indicating different place values. Beads have been specially provided to be put in these dowels. This abacus is useful in creating an understanding of addition and subtraction of decimal numbers.

Counters of different colours have been put in the kit for the activities related to integers. These can also be used for playing one of the games usingintegers. A number board marked with numbers from +104 to –104 has also been provided for this game. For game on factors of numbers, 100 pieces of laminated cards numbered 1 to 100 are provided. It makes the game enjoyable for children.

The kit items, apart from being academically useful, are also designed in an attractive manner. It is hoped that this kit will generate enough interest for learning mathematics at upper primary stage. It will also prove to be an important part of the mathematics lab in the schools across the country.

H. O. Gupta
Professor and Head
NIE Workshop
National Council of Educational
Research and Training

New Delhi
15 July 2009

ACKNOWLEDGEMENT

The National Council of Education Research and Training (NCERT) express its gratefulness to A.K. Wazalwar, *Reader*, DESM, NCERT, New Delhi; Roohi Fatima, *Lecturer*, Jamia Millia Islamia, New Delhi; S. B. Tripathi, *Lecturer,* RPVV Surajmal Vihar, Delhi; Mahendra Shanker, *Lecturer (Selection Grade) Retd,* Pitampura, Delhi; Magan Lal Meena, *TGT(Maths)*, DMS, RIE, Ajmer, Rajasthan; R.K.Nayak, *TGT(Maths)*, DMS, RIE, Bhopal, Madhaya Pradesh; and P.K.Chaurasia, *Lecturer*, DESM, NCERT, New Delhi, for their contribution in the development, reviewing, editing, refining and finalisation of the manuscript of the "Manual of Upper Primary Mathematics Kit" for Classes VI, VII and VIII.

Special thanks are due to Dharam Prakash, *Professor*, NIE Workshop, NCERT, New Delhi, for critically reviewing it.

The Council acknowledges with thanks the contribution of NIE Workshop staff: Ajay Ambwani, *Computer Assistant*; Manoj Kumar Dubey, *JPF* for development of the Kit; Amarnath and Satish Kumar, *Jr. Foremen* ; Rajender Kumar, *Fine Mechanic;* and Balbir Singh Rawat and Anil Nayal, *Draftsmen* for technical support in development of the Kit.

Gandhiji's Talisman

I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test:

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to Swaraj for the hungry and spiritually starving millions?

Then you will find your doubts and your self melting away.

CONTENTS


THE 'BLUES' ARE OVER
LET US
SEE THE GREEN

List of Kit Items

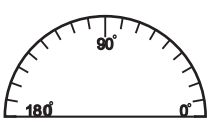
1. **Plastic strips** (6)

   Use: in creating angles, triangles and quadrilaterals.

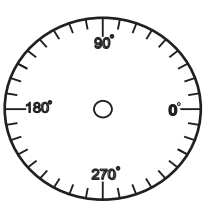
2. **Protractor**

   Use: in measuring the angles.

   (a) Half protractor (4)

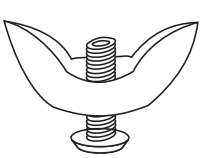


   (b) Full protractor (3)



3. **Fly Screws** (12)

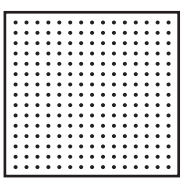
   Use: To connect the plastic strips.



4. **Geoboard**

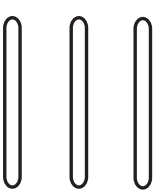
   Use: Geoboard is used to represent planar shapes/ figures and also to find the approximate areas.

   (a) Geoboard (190cmx190cmx1cm)

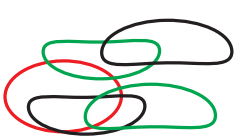


   (b) Dowels/Pins (25)

   Use: For use with geoboard.



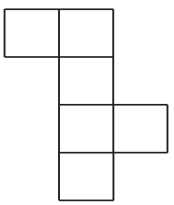
   (c) Rubberbands (10)



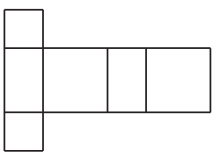
5. **Paper nets for solid shapes**

   Use: Used to make solid shape.

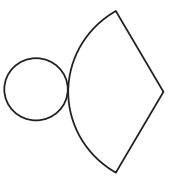
(a) Cube



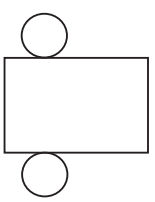
(b) Cuboid



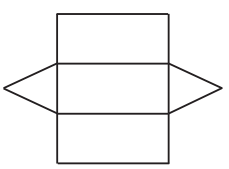
(c) Cone



(d) Cylinder

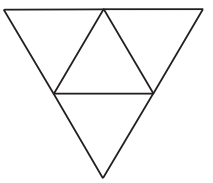


(e) Prism

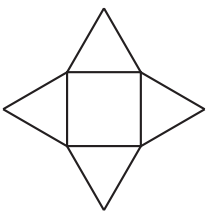


(f) Pyramid

(i) Triangular base

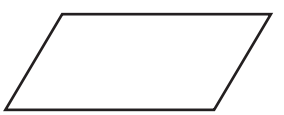


(ii) Square base

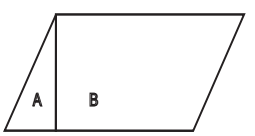


6. Cutouts of

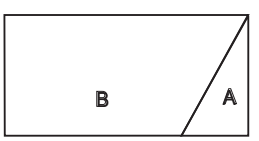
(a) Parallelogram



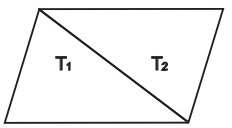
(i) Triangles cut from a parallelogram.



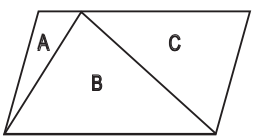
(ii) Trapezium and triangle to form a rectangle.



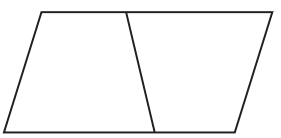
iii) Two congruent triangles



iv) Parallelogram showing triangles in it. Triangles A and C fitting on triangle B.



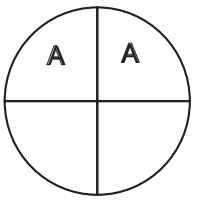
(vi) Two congruent trapeziums forming a parallelogram.



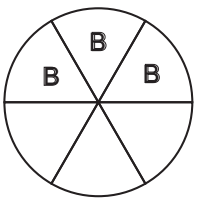
(b) Circle

Use: Used for exploring "Area of Circle"and activities related to "Fractions" Used in activity "Viewing Solids from Different Properties and Exploring their Surface Areas and Volumes".

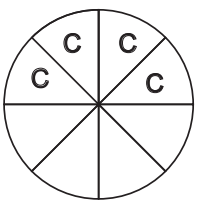
(i) Four equal parts of a circle, 2 marked with A.



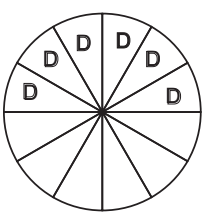
(ii) Six equal parts of a circle, 3 marked with B.



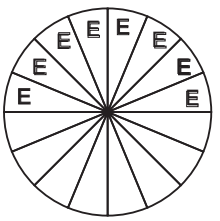
(iii) Eight equal parts of a circle, 4 marked with C.



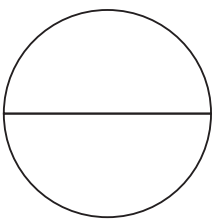
(iv) Twelve equal parts of a circle, 6 marked with D.



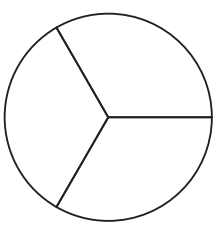
(v) Sixteen equal parts of a circle, 8 marked with E.



(vi) Two equal parts of a circle.

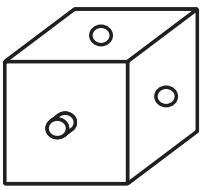


(vii) Three equal parts of a circle.



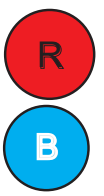
7. Sixty-four plastic cubes of unit length and of four different colours.

Use: Used in activity "Viewing Solids from Different Properties and Exploring their Surface Areas and Volumes



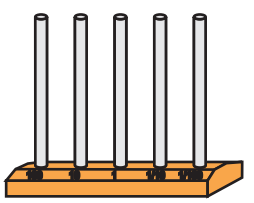
8. Counters: Whose one side is blue and other side is red. (20)

Use: Used in activity "Addition and Subtraction of Integers".

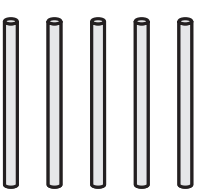


9. Abacus

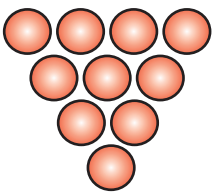
(a) Abacus stand



(b) Aluminium dowels (6)

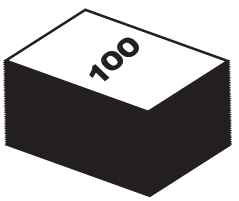


(c) Beads of one colour
(50 in total)



10. A pack of cards numbered from 1 to 100

Use: Used in game 1 for factorisation of numbers.

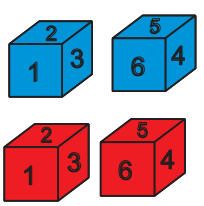


11. Sheet showing numbers from +104 to –104.

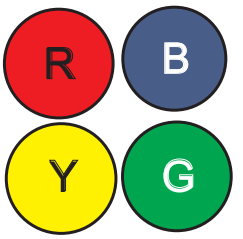
104	103	102	101	100	99	98	97	96	95	94
83	84	85	86	87	88	89	90	91	92	93
82	81	80	79	78	77	76	75	74	73	72
61	62	63	64	65	66	67	68	69	70	71
60	59	58	57	56	55	54	53	52	51	50
39	40	41	42	43	44	45	46	47	48	49
38	37	36	35	34	33	32	31	30	29	28
17	18	19	20	21	22	23	24	25	26	27
16	15	14	13	12	11	10	9	8	7	6
-5	-4	-3	-2	-1	0	1	2	3	4	5
-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16
-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17
-28	-29	-30	-31	-32	-33	-34	-35	-36	-37	-38
-49	-48	-47	-46	-45	-44	-43	-42	-41	-40	-39
-50	-51	-52	-53	-54	-55	-56	-57	-58	-59	-60
-71	-70	-69	-68	-67	-66	-65	-64	-63	-62	-61
-72	-73	-74	-75	-76	-77	-78	-79	-80	-81	-82
-93	-92	-91	-90	-89	-88	-87	-86	-85	-84	-83
-94	-95	-96	-97	-98	-99	-100	-101	-102	-103	-104

12. Dice numbered 1–6

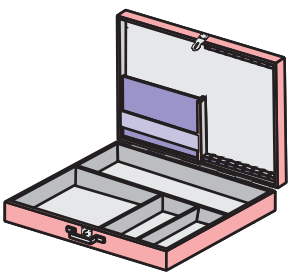
a) Two blue dice
b) Two red dice



13. Counters of different colours (8)



14. Kit box



Notes

Activity 1

Addition and Subtraction of Integers

Objective

To add and subtract integers using counters (or buttons) of different colours.

Material Required

Counters coloured differently on both the faces, one face is red and the other face is blue.

How to Proceed?

1. Consider blue side of the counter as negative (–) and the red side of the counter as positive (+).
2. Addition of Integers.

(a) For adding two positive integers, say, we have to add (+3) + (+4). For this first take 3 counters and place them in a row in such a way that the top faces are red. Now take 4 more counters and place them in the other row, so that their top faces are red (Fig.1.1).

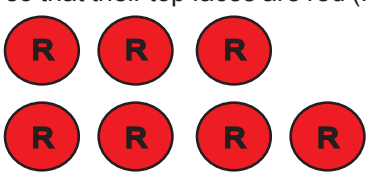


Fig. 1.1

Since top faces of all the counters are red, so count all these counters. You get the sum (+3) + (+4) = +7

(b) For adding two negative integers, say, -2 and -5, first take 2 counters and place them in a row in such a way that the top faces are blue. Now, take 5 more counters and place them in the other row so that their top faces are blue (Fig.1.2).

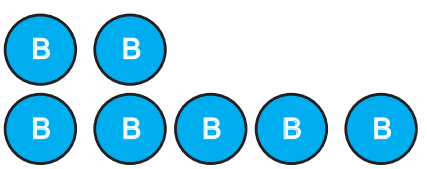


Fig. 1.2

Since top faces of all the counters are blue, so count them and find the sum as

(-2) + (-5) =_____.

(c) For adding one positive integer and one negative integer, say, +5 and –3, first take 5 counters and put them in a row in such a way that their top faces are red.

Now take 3 more counters and place them in the other row so that their top faces are blue (Fig. 1.3).

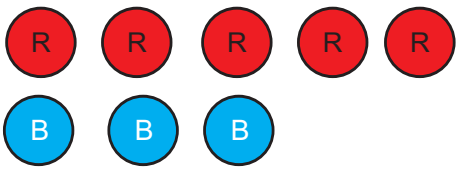


Fig. 1.3

Now, match each red-faced counter with blue-faced counter (Fig.1.4). Count the number of remaining unmatched counters with their colours. This will give their sum. The sum of (+5) + (–3) = ___+2____.

Take some more collections of counters, like above, and find the sum of integers represented by them.

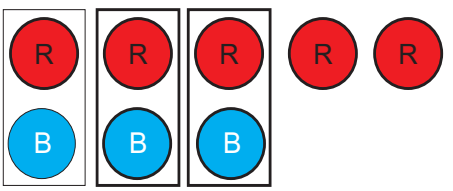


Fig. 1.4

(d) Inference

1. Sum of two positive integers is a _____ Integer.
2. Sum of two negative integers is a _____ Integer.
3. Sum of one negative integer and one positive integer is a
   a) negative integer if numerical value of _____ integer is greater.
   b) positive integer if numerical value of _____integer is greater.

3. Subtraction of Integers

   a) For subtracting two integers, for example, consider the subtraction of (–4) from (-3) i.e. (–3) – (– 4) = ?

Take 3 counters and place them in a row so that their top faces are blue. Now take another 4 counters and place them in the second row so that their top faces also are blue (Fig. 1.5).

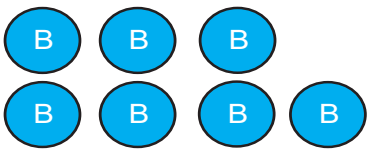


Fig. 1.5

Now, keep the counters of the first row as they are and place the counters of the second row after inverting sides as shown in Fig.1.6.

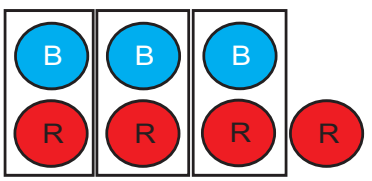


Fig. 1.6

Match red-faced counters with blue-faced counters. Count remaining unmatched counters along with their colours. From this, find

$(-3) - (-4) =$ ____+1____.

Note: 1. Pairing of the counters will be done only if they are of different colours.

2. You can also take red side of the counter as negative and the blue side as positive.

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Activity 2

Exploring Fractions

Objective

To understand various fractions and their comparison.

Material Required

A set of 8 circular sheets of equal size which is divided into 1,2,3,4,6,8,12 and16 equal parts respectively.

How to Proceed?

1. Concept of fraction

(a)Take any circular sheet from the set. For example take the sheet which is divided into 8 equal parts. Now take out some (say 3) equal parts from it for understanding the concept of $\frac{3}{8}$ (as a part of a whole).(Fig. 2.1).

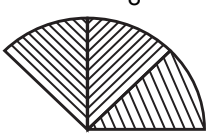

Fig. 2.1

(b) Take another circular sheet (divided into 12 equal parts) and take out 5 parts from it. This represents fraction 5/12 .

(c) Seven parts from the circular sheet having 16 equal parts represents 7/16

2. Comparison of fractions

(a) Take out the fractions $\frac{1}{2}$ and $\frac{2}{3}$ (Fig. 2.2) and compare them by placing on one another.

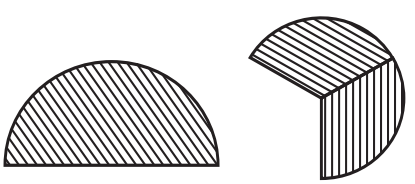

Fig. 2.2

(b) Now take some other pairs of fractions and compare them.

(c) Now take the following pairs of fractions compare them and fill up the blanks using the sign '<' or '>'.

(i) $\frac{2}{3}$ ---------- $\frac{7}{16}$

(ii) $\frac{7}{8}$ ---------- $\frac{8}{12}$

(iii) $\frac{1}{2}$ ---------- $\frac{7}{12}$

(iv) $\frac{7}{12}$ ---------- $\frac{15}{18}$

(v) $\frac{3}{4}$ ---------- $\frac{9}{16}$

(vi) $\frac{5}{8}$ ---------- $\frac{9}{16}$

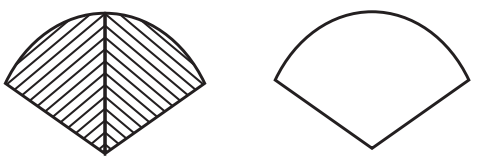

Fig. 2.3

3. Equivalent fractions

a) Take the pieces which represent $\frac{8}{16}$, $\frac{1}{3}$, $\frac{2}{6}$, $\frac{4}{8}$ and $\frac{4}{12}$ fractions.

b) Place 2 pieces representing $\frac{2}{6}$ and $\frac{1}{3}$ one over the other. (Fig.. 2.3).

(c) Are they covering each other? Yes.

(d) So, $\frac{1}{3} = \frac{2}{6}$.

(e) Similarly, take 4 pieces representing $\frac{1}{8}$ each.

(f) Place these 4 pieces on piece representing $\frac{1}{2}$. So, $\frac{4}{8} = \frac{1}{2}$

(g) Are they covering each other? Yes.

(i) Do you know that what type of fractions are these? They are equivalent fractions.

(j) Using the above pieces, write the equivalent fractions of the following.

(i) $\frac{3}{4}$ (iii) $\frac{2}{3}$ (v) $\frac{1}{6}$

(ii) $\frac{1}{2}$ (iv) $\frac{1}{4}$ (vi) $\frac{1}{8}$

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Activity 3

Abacus

Objective

To understand the concepts of place value and also the addition and subtraction of decimal with the help of abacus.

Material Required

Dowels, beads of one colour and wooden base.

How to Proceed?

1. Put the dowels in the holes of wooden base and prepare an abacus as shown in Fig. 3.1

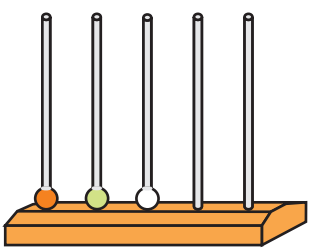

Fig. 3.1

To make it visually convenient assign place value to beads as follows:

1st place from right	=	Hundredth's place (1/100)
2nd place from right	=	Tenth's place (1/10)
3rd place from right	=	Unit's place or (One's place)
4th place from right	=	Ten's place
5th place from right	=	Hundred's place.

Every bead used represents a One. By changing its place on the pegs (which represent different place values) it can have different value, for example, value of one bead at hundred's place will be 100.

2. Concept of place value

Place 1 bead in the dowel at hundred's place. So it represents one hundred and so its place value is 100. Place one bead in the dowel at ten's place. Place value being ten, its value will be 10.

Place one bead white in the dowel at one's place. Place value being one its value will be 1.

Now, place one bead in the dowel immediately after the decimal point on the right. Its place value is one tenth ($\frac{1}{10}$) or it is represented as 0.1.

Now, place one bead in the dowel next to the previous dowel (on the right). Its place value is one hundredth ($\frac{1}{100}$). So it is also represented as 0.01

3. Addition of decimal numbers

(a) To add two decimal numbers, say 8.23 and 9.92.

To show 8.23

8 unit places can be shown in the abacus by putting 8 beads in the dowel representing unit's place.

Two tenth's places (0.2) can be shown by putting 2 beads in the dowel representing tenth's place.

Three hundredth's places (0.03) can be shown by putting 3 beads in the dowel representing hundredth's place (Fig. 3.2). Now beads in abacus represent 8.23.

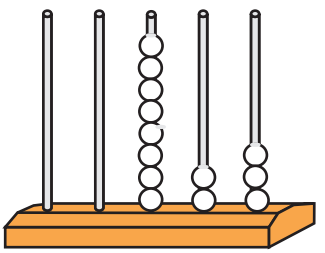

Fig. 3.2

To show 8.23 + 9.92

Starting from hundredth's place, put 2 beads in the dowel representing hundreth's place.(Fig. 3.3).

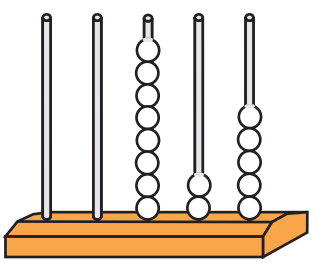

Fig. 3.3

Put 9 beads in the dowel representing tenth's place.

You will find that beads cannot be put beyond 9. So, count total number of beads it will be 11. Leave one bead in the dowel and in place of 10 beads which are equivalent to one bead at unit's place, put one bead in the unit's place (Fig. 3.4).

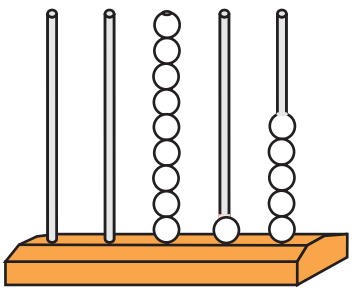

Fig. 3.4

Put 9 beads in the dowel representing unit's place. You will find that beads cannot be put beyond 9. So, count total number of beads it will be 18. Leave 8 beads in the dowel, and in place of 10 beads which are

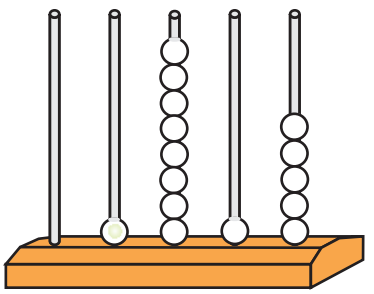

Fig. 3.5

equivalent to one in the ten's place (Fig. 3.5), put one bead in the ten's place.

Now count the number of beads and write:

Number of beads at hundredth's place = _____.

Number ofbeads at tenth's place = _____.

Number of beads at unit's place = _____.

Number of beads at ten's place = _____.

So, 8.23 + 9.92 = _____.

4. Subtraction of decimal numbers

(a) To subtract one decimal number from another decimal number, say, to find 28.74 – 12.96.

To show 28.74

Put 2 beads in the dowel representing ten's place.

Put 8 beads in the dowel representing one's place.

Put 7 beads in the dowel representing tenth's place. Put 4 beads in the

dowel representing hundredth's place (Fig. 3.6). Now abacus represents 28.74.

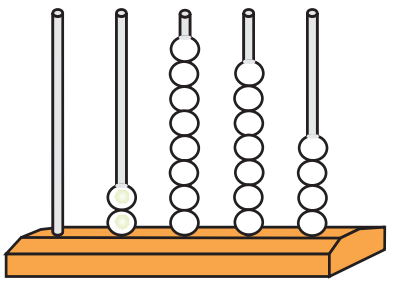

Fig. 3.6

To show 28.74 – 12.96

First we subtract the hundredth's digit (6) from hundredth's digit (4). But 6 > 4. So remove 1 bead from the tenth's place and add 10 beads to 4 beads the total becoming 14. After removing 6 beads and put the remaining 8 beads at the hundredth's place. (Fig. 3.7).

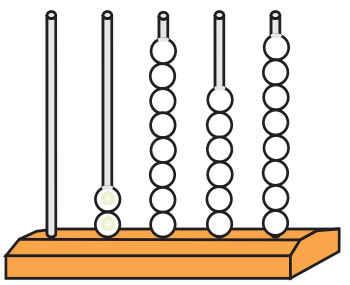

Fig. 3.7

To subtract 9 beads from 6 beads, takeout 1 bead from the unit's place and add 10 beads to 6 beads total becoming 16. After removing 9 beads put the remaining 7 at the tenth's place.(Fig. 3.8)

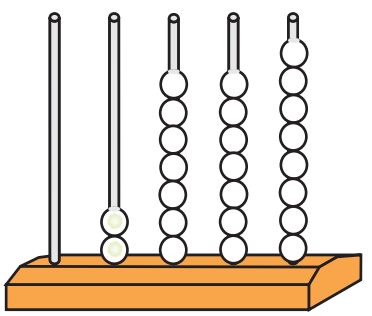

Fig. 3.8

Now, to subtract 2 from 7, remove 2 beads from the unit's place (Fig. 3.9).

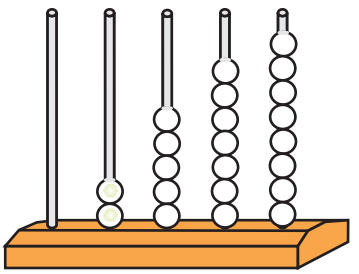

Fig. 3.9

Lastly, to subtract 1 from 2, remove 1 bead from ten's place. The abacus looks as shown in (Fig. 3.10).

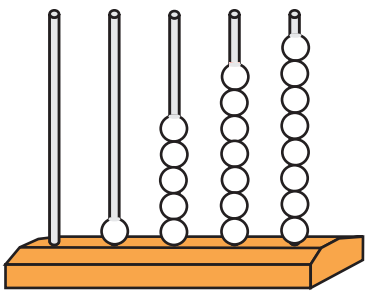

Fig. 3.10

Now, count the number of beads and write.

Number of beads at hundredth's place = _____.

Number of beads at tenth's place = _____.

Number of beads at unit's place = _____.

Number of beads at ten's place= _____.

So, 28.74 – 12.96 = _____.

Using the above methods, find the following

1. 53.82 + 25.64
2. 87.25 + 19.78
3. 73.45 – 38.59
4. 53.18 – 21.29

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Activity 4

Measurement of Angles

Objective

To form different angles and measure them.

Material Required

Two plastic strips, 360^0 protractor and fly screws.

How to Proceed?

1. Take two plastic strips and a 360^0 protractor.
2. Fix the strips along with the protractor at their end points with the fly screw.
3. Fix one of the strips along the 0^0-180^0 marked line of the protractor (Fig. 4.1)

Fig. 4.1

4. By moving other strip (in anticlockwise direction), try to make angles of different measures Fig. 4.2, Fig. 4.3, Fig. 4.4, Fig. 4.5 and Fig. 4.6.

Note: 1. All angles are to be measured in anticlockwise direction from first strip.

2. Use the markings of the scale of the protractor carefully.

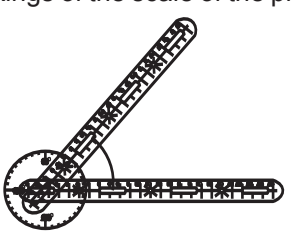

Fig. 4.2: Acute angle

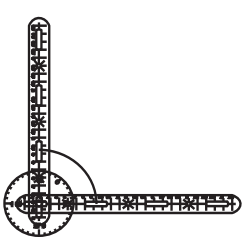

Fig. 4.3: Right angle

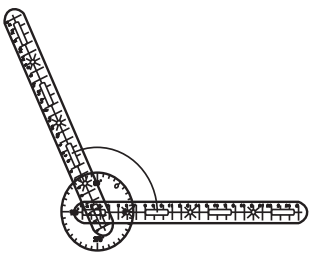

Fig. 4.4: Obtuse angle

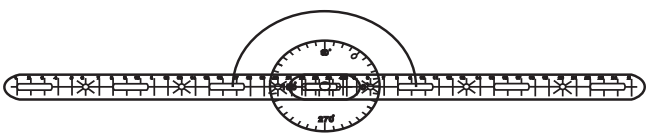

Fig. 4.5: Straight angle

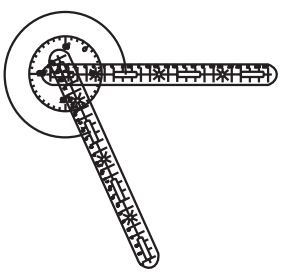

Fig. 4.6: Reflex angle

Classify them and complete the table

S. No.	Acute angle	Obtuse angle	Reflex angle
1.			
2.			
3.			
4.			
5.			
6.			

Right angle is formed when the measure is _____.

Straight angle is formed when the measure is _____.

Complete angle is formed when the measure is _____.

Measuring Angles with starting point of any degree other than zero degree.

Fix the first strip along with the 30^0 marked line of the protractor and second strip along with 70^0 marked line.

What is the measure of the angle formed?

What type of angle is it?

Similarly, take the two strips at different marked lines of the protractor and then complete the following table:

S. No.	Position of first strip	Position of second strip	Measure of angle	Type of angle
1.	10^0	50^0	40^0	Acute
2.	25^0	60^0	—	—
3.	—	170^0	135^0	—
4.	50^0	200^0	—	—
5.	—	115^0	—	Right
6.	—	230^0	180^0	—

Now, fix the first strip at 40^0. Give measures of some angles by which the second strip will be moved in anticlockwise direction so as to get :

(a) Acute angle

(b) Obtuse angle

(c) Right angle

(d) Straight angle

(e) Reflex angle

Note: If need be copy the above table in your note book.

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Activity 5

Two Parallel Lines and a Transversal

Objective

To verify the relation of different types of angles formed by a transversal with two parallel lines.

Material Required

Three plastic strips, two 360^0 protractors and fly screws.

How to Proceed?

1. Take three strips and two protractors and fix them with the help of fly screws in such a manner that the two strips are parallel to each other and the third strip is a transversal to them as shown in Fig. 5.1. How would you check the lines are parallel?

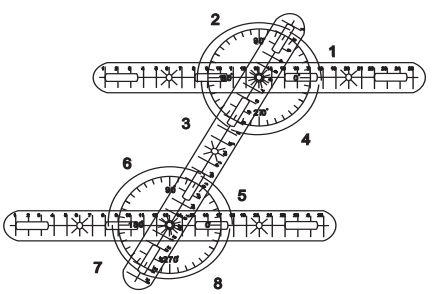


Fig. 5.1

2. Measure all the angles numbered from 1 to 8.
3. Write your data in the following tables.

Table A: Corresponding angles

S. No.	Name of the angle	Measure of the angle	Name of the angle	Measure of the angle	Observation
1.	$\angle 1$	52^0	$\angle 5$	52^0	Equal
2.	$\angle 2$		$\angle 6$		
3.	$\angle 3$		$\angle 7$		
4.	$\angle 4$		$\angle 8$		

Inference: _____.

Table B: Alternate angles

S. No.	Name of the angle	Measure of the angle	Name of the angle	Measure of the angle	Obser-vation
1.	$\angle 3$	52^0	$\angle 5$	52^0	Equal
2.	$\angle 4$		$\angle 6$		
3.	$\angle 1$		$\angle 7$		
4.	$\angle 2$		$\angle 8$		

Inference: _____.

Table C: Interior angles on the same side of the transversal

S. No.	Name of the angle	Measure of the angle	Name of the angle	Measure of the angle	Obser-vation
1.	$\angle 4$	128^0	$\angle 5$	52^0	$\angle 4+\angle 5=180^0$
2.	$\angle 3$		$\angle 6$		

Inference: _____.

4. Now, fix these strips and two protractors in such a manner that the two strips are not parallel to each other and the third strip is transversal to them as shown in Fig. 5.2.

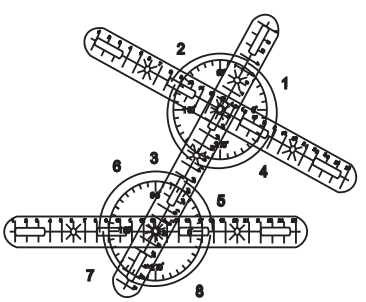
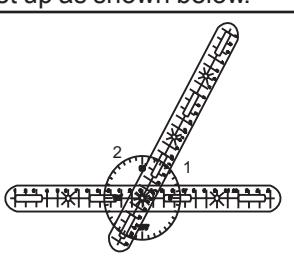


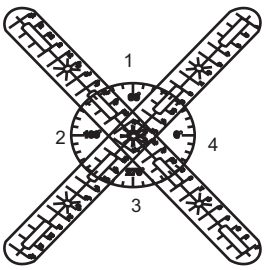
Fig. 5.2

Repeat the activity and fill the Tables A, B and C given above.

You can also observe the properties of vertically opposite angles and linear pair using the set up as shown below.



(i) For linear pair.



(ii) For vertically opposite angles.

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Activity 6

Properties of a Triangle

Objective

To explore the properties of a triangle.

Material Required

Three plastic strips, three 180^0 protractors and fly screws.

How to proceed?

1. Fix the strips with protractors as shown in Fig. 6.1.

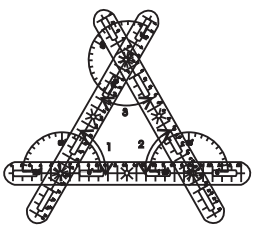

Fig. 6.1

2. Make different triangles by moving the strips, and for each triangle, measure the angles (interior as well as exterior taken in an order) and the sides of the triangles, and complete tables A and B.

Table A: Angle sum property of a triangle — Vary the angles of the triangle and note down their measurement and find out the relationship

S. No.	Angle1	Angle2	Angle3	∠1+∠2+∠3
1.				
2.				

Inference: _____

_____.

Table B: Exterior angle property — Look at the exterior angle formed by the extended side and interior opposite angles. Note down their measurements and find the relationship.

S. No.	Exterior angle	Interior opposite angles		Sum of interior opposite angles
1.				
2.				

Inference: _____

_____.

3. Make different isosceles triangles (Fig. 6.2) by moving the strips and complete Table C:

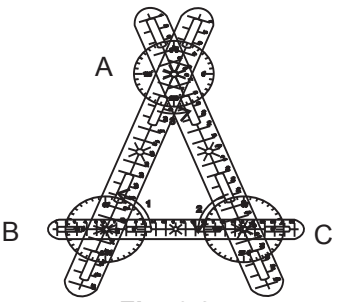

Fig. 6.2

Table C: Isosceles triangle — Make triangles with two sides equal (Isoceles triangles). Note down the measurements of sides and angles. Is there a connection between sides and angles?

S. No.	Length of the side			Measure of the angle			Equal sides	Equal angles
	AB	BC	AC	∠1	∠2	∠3		
1.								
2.								

Inference: _____

_____.

4. Make different equilateral Triangles (Fig. 6.3) by moving the strips and complete Table:

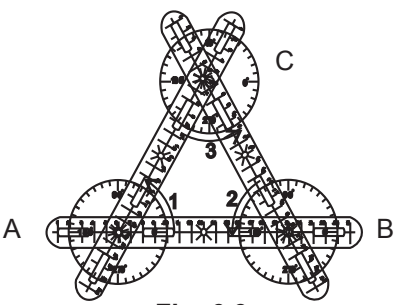

Fig. 6.3

Table D: Equilateral triangle

S. No.	Length of the side			Measure of the angle		
	AB	BC	AC	∠1	∠2	∠3
1.						
2.						

Inference: _____

_____.

5. Make different scalene triangles (Fig. 6.4) by moving the strips and complete Table E:

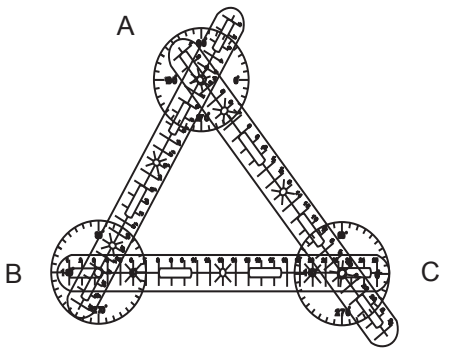

Fig. 6.4

Table E: Is there a relationship between sides and angles?

S. No.	Length of the side			Measure of the angle		
	AB	BC	AC	∠1	∠2	∠3
1.						
2.						
3.						

Inference: _____

_____.

Table F: Angle opposite to longest side in a triangle — Vary the length of one side so that it becomes longest. Measure sides and angles and make note of them. Similarly vary the angle to make it biggest and make note. Explore the relationship between angle and side.

S. No.	Length of the side			Measure of the angle			Longest side	Biggest angle
	AB	BC	AC	∠1	∠2	∠3		
1.								
2.								
3.								

Inference:

(1) Regarding the relationship of longest side and its opposite angle.

(2) Regarding the relationship of biggest angle and its opposite side.

Table G: Sum of any two sides in a triangle- Make triangle with different sides and note the measurement. Explore the relationship of sum of two sides with the third side.

S. No.	Length of the side			AB + BC	BC + A C	AB +AC
	AB	BC	AC			
1.						
2.						
3.						

Inference: _____

_____.

6. Make different right triangles (Fig. 6.5) by moving the strips and complete table H.

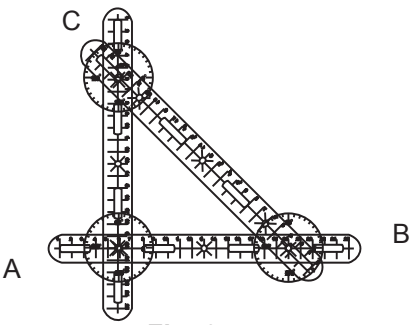

Fig. 6.5

Table H: Right triangle — Make different right triangles and note their measurements. Do the squares of their sides have some relationship.

S. No.	Length of the side			Measure of the Angle			Longest side	Squares of the lengths of the sides		
	AB	BC	AC	∠1	∠2	∠3		AB^2	BC^2	AC^2
1.										
2.										
3.										

Inference:

In a Right angle triangle _____

_____.

---------- * * * * * ----------

Activity 7

Quadrilaterals and their Properties

Objective

To explore various properties of different types of quadrilaterals.

Material Required

Six plastic strips, four 180^0 protractors, one 360^0 protractors and fly screws.

How to Proceed?

1. Fix the strips along with the protractors as shown in Fig. 7.1.
2. Make different quadrilaterals by moving strips for each quadrilateral measure the angles, and complete Table A.

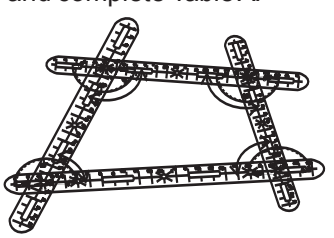

Fig. 7.1

Table A: Angle sum property of a quadrilateral

S. No.	∠1	∠ 2	∠3	∠4	Sum of the angles ∠1 + ∠2 + ∠3 +∠4
1.					
2.					
3.					

Inference: _____.

Properties of a Parallelogram

Make different parallelograms by moving the strips as shown in Fig. 7.2, and for each parallelogram measure the angles and the lengths of different line segments.

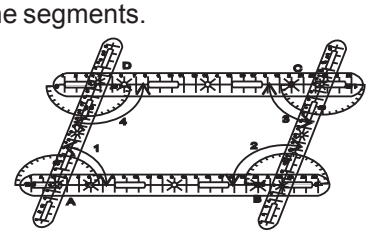

Fig. 7.2(i)

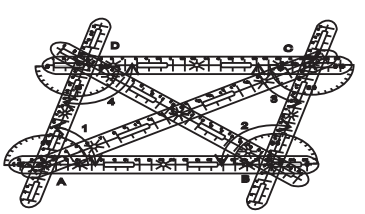

Fig. 7.2(ii)

Now complete the following tables:

Table B (i): Properties of a parallelogram

S. No.	Length of Sides				Measure of angles				∠1+∠2	∠2+∠3	∠3+ ∠4	∠2+ ∠3
	AB	BC	DC	AD	∠1	∠2	∠3	∠4				
1.												
2.												
3.												
4.												

Inference: _____.

1. Regarding opposite angles _____.
2. Regarding opposite sides _____.
3. Regarding adjacent angles _____.

Table B (ii): Diagonals of a parallelogram

S. No.	Length along the diagonal		Distance from intersectionpoint			
	AC	BD	AO	OC	BO	OD
1.						
2.						
3.						
4.						

Inference regarding diagonals

1. diagonals _____.
2. point of intersection of diagonals _____.

Properties of a Rhombus

Make rhombuses by moving the strips (Fig. 7.3). For each rhombus measure the angles, line segments, sides and diagonals and distance of vertices from intersection point of the diagonals, and complete Tables (i) and (ii).

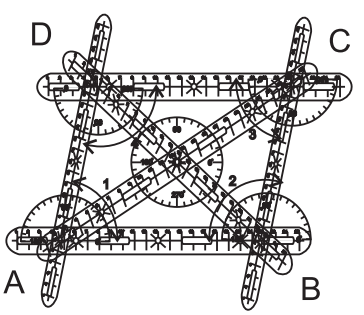

Fig. 7.3

Table C (i): Rhombus

S.No.	Measure of angles				∠AOD	∠DOC	∠BOC	∠BOA	∠1+∠2	∠2+∠3	∠3+∠4	∠2+∠3
	∠1	∠2	∠3	∠4								
1.												
2.												
3.												

Inference regarding

1. opposite angles of a rhombus _____.
2. opposite sides _____.
3. angles between the diagonals _____.

Table C (ii): Diagonals of a rhombus

S. No.	Length along the diagonal		Distance form intersection point			
	AC	BD	AO	OC	BO	OD
1.						
2.						
3.						

Inference regarding

1. diagonals _____.
2. point of intersection of diagonals _____.

Properties of a Rectangle

Make different rectangles by moving the strips (Fig. 7.4). Measure its angles, sides and diagonals, and complete Table.

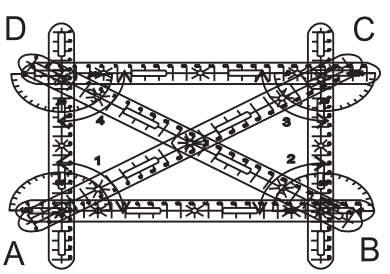

Fig. 7.4

Table D: Rectangle

S.No.	Length of the Side				Measure of angle				Length along the diagonal					
	AB	BC	DC	AD	∠1	∠2	∠3	∠4	AC	AO	OC	BD	BO	OD
1.														
2.														
3.														

Inference regarding

1. opposite sides _____.
2. angles _____.
3. point of intersection of diagonals_____.
4. lengths of diagonals _____.

Properties of a Square

Make different squares by moving the strips(Fig. 7.5). Measure its angles, sides and different line segments, and complete Table E.

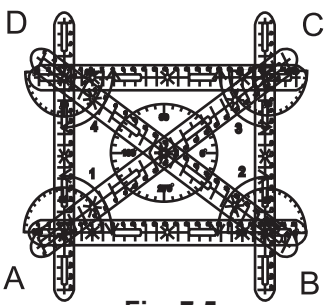

Fig. 7.5

Table E: Square

S. No.	Measure of angle				Length along the diagonal						∠AOB	∠BOC	∠COD	∠DOA
	∠1	∠2	∠3	∠4	AC	AO	OC	BD	BO	OD				
1.														
2.														
3.														

Inference regarding

1. sides _____.
2. points of intersection of diagonals _____.
3. angles _____.
4. angles between diagonals _____.
5. lengths of diagonals _____.

Note: Similarly, trapeziums can also be formed by moving the strips and their properties may be explored.

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Activity 8

Exploring Area with Geoboard

Objective

To form different shapes on a geoboard and explore their areas.

Material Required

Geoboard and rubber bands.

How to Proceed?

1. Form an irregular figure on the geoboard as shown in Fig. 8.1, by using pins and rubber band.

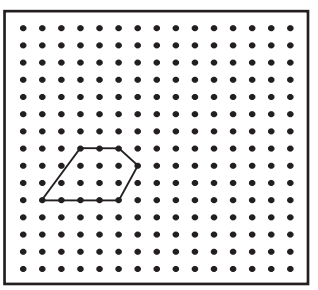


Fig. 8.1

2. Find out the area of this Figure by counting the squares as follows:
   (a) Count the number of full squares enclosed by the Figure, taking area of one full square as one square unit.
   (b) Count the number of squares that are more than half enclosed by the Figure, taking area of one such square as one square unit.
   (c) Count the number of half squares enclosed by the Figure, taking area of one half square as half square unit.
   (d) Neglect the squares less than half enclosed by the Figure.
   (e) By adding the number of square units counted in the steps (a), (b) and (c), you get the approximate area of the above Figure $7+1+\frac{1}{2}(3)$ $= 9\frac{1}{2}$ square units approx.

3. Now make some more irregular figures and try to find their areas.

Area of a Rectangle

Form the shapes of different rectangles using rubber bands on the geoboard as shown in Fig. 8.2. Count the unit squares in each rectangle enclosed and fill Table A.

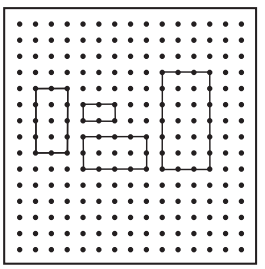


Fig. 8.2

Table A: Rectangle

S. No.	Total number of unit squares in the rectangle	Length of the rectangle	Breadth of the rectangle	Length x Breadth
1.				
2.				
3.				
4.				

Inference: Area of a rectangle_____.

Area of a Square

Form the shapes of different squares using rubber bands on geoboard as shown in the Fig. 8.3. Count the squares and fill Table B.

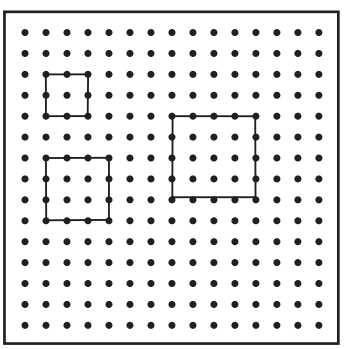


Fig. 8.3

Table B: Square

S. No.	Total number of unit squares in the square	Side of the square	side x side
1.			
2.			
3.			
4.			

Inference: Area of a square_____.

Area of a Right Triangle

Make different right-angled triangles with the help of rubber bands on the geoboard, as shown in Fig. 8.4. Count the squares and fill Table.

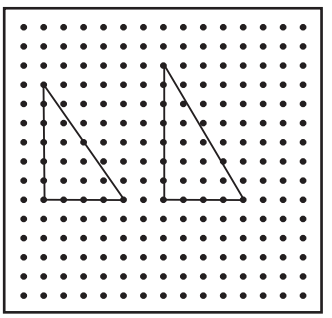


Fig. 8.4

Table C: Right Triangle

S. No.	Total Number of unit squares in the right triangle	Height(h)	Base(b)	$\frac{1}{2}$x(b x h)
1.				
2.				
3.				
4.				

Inference: Approximate area of a right-angled triangle _____.

---------- * * * * * ----------

Activity 9

Areas of Triangle, Parallelogram and Trapezium

Objective

To explore areas of triangle, parallelogram and trapezium.

Material Required

Cut-outs of different shapes made of corrugated sheet and connectors

How to Proceed?

1. Parallelogram

(a) Put together a parallelogram comprising of part A and part B. Part A is a right-angled triangle (Fig. 9.1).

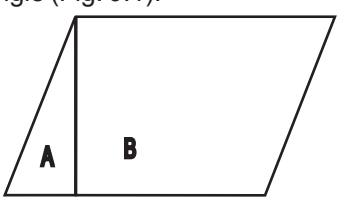


Fig. 9.1

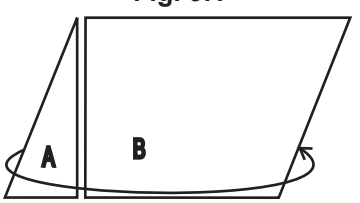


Fig. 9.2

(b) Remove part A (Fig. 9.2) and attach it to the other side of part B as shown in the (Fig. 9.3) given below. You will get a rectangle. Is the area of the rectangle formed same as that of the parallelogram? Yes, it is the same.

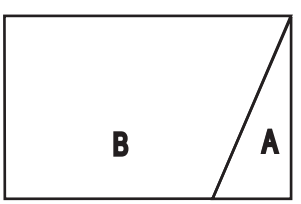


Fig. 9.3 Rectangle

Inference: Area of the Parallelogram = Area of _____.

= _____.

= _____.

2. Triangle

(a) Assemble the cut-outs of the two congruent triangles T1 and T2 to form a parallelogram as shown in Fig. 9.4.

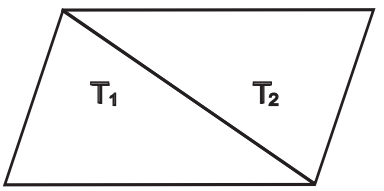
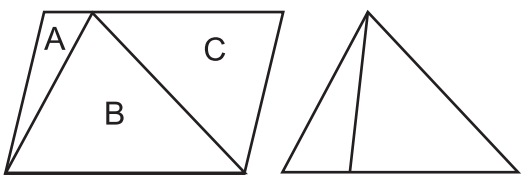


Fig. 9.4

Inference: Area of the triangle (T1 or T2) = $\frac{1}{2}$ x area of ----------

(b) Take a parallelogram and three triangular pieces A, B and C which exactly cover the parallelogram as shown in Fig. 9.5(i)



(i) **(ii)**

Fig. 9.5

The triangular pieces A and C also together cover the triangle B (Fig. 9.5(ii))

Inference: Area of ÄB = Area of Ä A+ Area of Ä C

Area of the parallelogram = 2 x area of Ä B

Area of Ä B = ----------

3. Trapezium

(a) Form a parallelogram with the help of two congruent trapeziums C and D with parallel sides *a* and *b* and height *h* as shown in Fig. 9.6 given below.

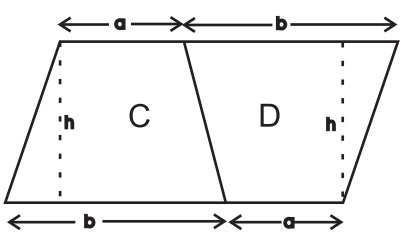


Fig. 9.6

Inference: Area of trapezium C = Area of trapezium D.

Area of parallelogram = Area of _____ + Area of _____.

Therefore, area of trapezium = $\frac{1}{2}$ x area of _____.

= $\frac{1}{2}$ x (a + b) x _____.

Note: Students may be encouraged to make more cut outs of parallelograms, trapeziums and triangles to explore the inter-relationship among the areas of various shapes.

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Activity 10

Area of a Circle

Objective

To explore area of a circle.

Material Required

Plastic corrugated circular sheets divided into a number of 4,6,8,12 and 16 equal parts (sectors)

How to Proceed?

1. Take four sectors, half of them (i.e. 2) are labelled A. Arrange them to form a circle using connectors (Fig. 10.1).

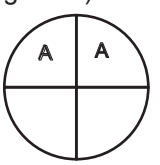


Fig. 10.1

2. Now, rearrange these sectors to form a figure as shown below (Fig. 10.2).

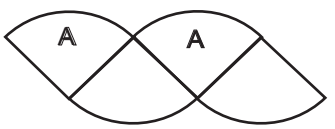


Fig. 10.2

3. Now arrange six sectors, half of them (i.e., 3) labelled B, to form a circle as shown in Fig. 10.3.

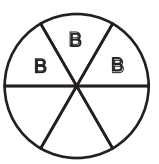


Fig. 10.3

4. Rearrange these sectors to form shape as shown below (Fig. 10.4).

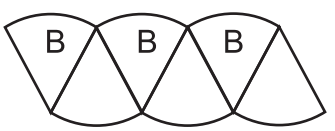


Fig. 10.4

5. Now arrange eight sectors, half of them (i.e., 4) labelled C to form a circle as shown in Fig. 10.5.

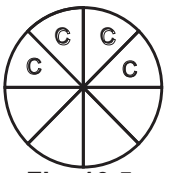


Fig. 10.5

6. Rearrange these sectors to form a shape as shown below.(Fig. 10.6).

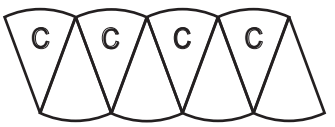


Fig. 10.6

7. Now arrange 12 sectors, half of them (i.e., 6) labelled D to form a circle as shown in Fig. 10.7.

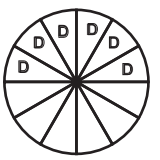


Fig. 10.7

8. Rearrange these sectors to form a shape as shown below (Fig. 10.8).

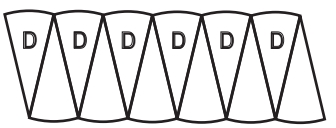


Fig. 10.8

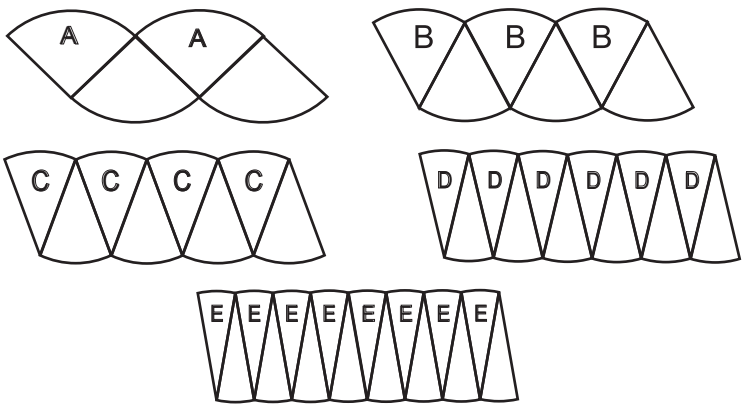
9. Arrange 16 sectors, half of them (i.e., 8) labelled E to form a circle as shown in (Fig. 10.9).

Fig. 10.9

10. Rearrange these sectors to form a shape as shown below.(Fig. 10.10).

Fig. 10.10

11. Observe Figures. 10.2, 10.4, 10.6, 10.8 and 10.10.



Inference: What do you observe? As number of equal sectors of the circle are increasing, the shape of the Figure is becoming a rectangle.

Area of circle = L x B of the rectangle

$$= (\frac{1}{2} \times 2\pi r) \times r.$$

Note: Students may be encouraged to try out with 32 or 64 parts.

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Activity 11

Viewing Solids from Different Perspectives and Exploring their Surface Areas and Volumes

Objective

To explore different shapes made up of unit cubes, their different views, surface areas and volumes.

Material Required

64 Plastic cubes of unit length.

How to Proceed?

1. Take some unit cubes and arrange them to form 5 different shapes as shown below

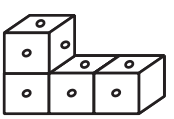


Fig. 11.1

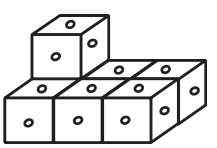


Fig. 11.2

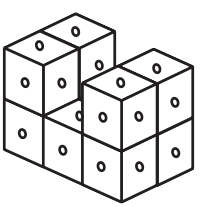


Fig. 11.3

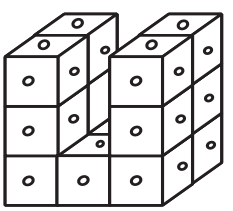


Fig. 11.4

2. In each of these Figures, observe and draw its top view, front view and side view.

For Fig. 11.1

| --- | --- | --- |
| Top view | Front view | Side view |

Note: Encourage students to look at various solids from different perspectives and draw the views.

For Fig. 11.2

| --- | --- | --- |
| Top view | Front view | Side view |

For Fig. 11.3

| --- | --- | --- |
| Top view | Front view | Side view |

For Fig. 11.4

| --- | --- | --- |
| Top view | Front view | Side view |

3. Volumes

How will you find the volume of various solids? Do you know the volume of one cube?

For Fig. 11.1, Volume = _____.

For Fig. 11.2, Volume = _____.

For Fig. 11.3, Volume = _____.

For Fig. 11.4, Volume = _____.

4. Surface areas

Observe the surface areas of these shapes.

For Fig. 11.1, Surface Area = _____.

For Fig. 11.2, Surface Area = _____.

For Fig. 11.3, Surface Area = _____.

For Fig. 11.4, Surface Area = _____.

5. Volumes and Surface areas of cubes and cuboids

Form cubes and cuboids of different sizes with the help of unit cubes, as shown in Figs. 11.5, 11.6 and 11.7.

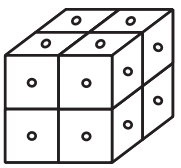


Fig. 11.5

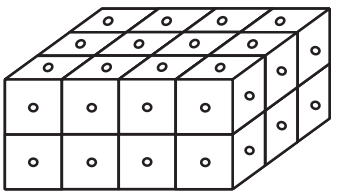


Fig. 11.6

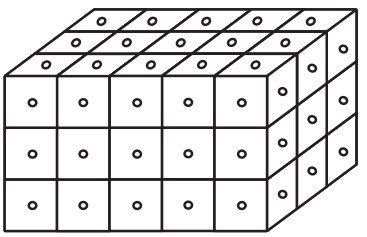


Fig. 11.7

Find the volume of the above cube and cubiods is given in Fig. 11.7.

For Fig. 11.5

Volume = _____ x _____ x _____

= _____.

For Fig. 11.6

Volume = _____ x _____ x _____

= _____.

For Fig. 11.7

Volume = _____ x _____ x _____.

= _____.

6. Observe the surface areas of these cuboids and cubes and write these,

For Fig. 11.5

Surface Area = 6 x _____ = _____.

For Fig. 11.6

Surface Area = 2 x (_____ + _____ + _____) = _____.

For Fig. 11.7

Surface Area = 2 x (_____ + _____ + _____) = _____.

Note: These given cube and cubiods are examples students should be encouraged to explore. Make many more and find out their surface areas and volumes.

---------- * * * * * ----------

Activity 12

Nets of Solid Shapes

Objective

To fold and explore the formation of solid shapes through their nets.

Material Required

Nets of cubes, cuboids, cones, cylinders, prisms and pyramids.

How to Proceed?

1. Fold the paper cut outs of the given nets of different solid shapes and explore the possibility of formation of different solids like cubes, cuboids, cones, cylinders, prisms (base as triangle or hexagon) and pyramid (base as square or triangle).
2. By observation try to explore the formulae for the total surface area of cube, cuboid as well as the curved surface area and total surface area of the cylinder. Find out various ways of calculating surface area.
3. Try to make some more solids of the above type using these nets in different ways.
4. Try to verify the Euler's formula in the case of cube, cuboid, prism and pyramid.

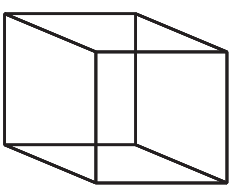


Fig. 12.1 (Cube)

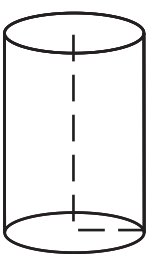


Fig. 12.2 (Cylinder)

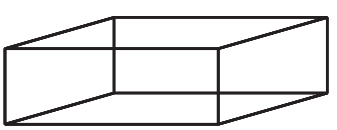


Fig. 12.3 (Cuboid)

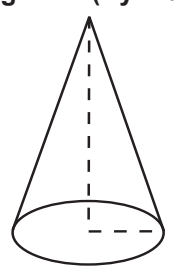


Fig. 12.4 (Cone)

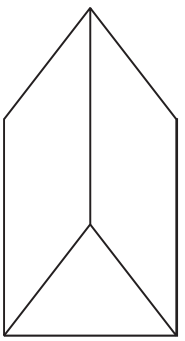


Fig. 12.5 (Prism)

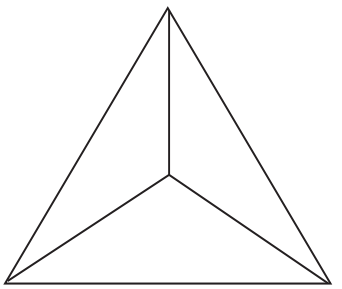


Fig. 12.6 (Pyramid)

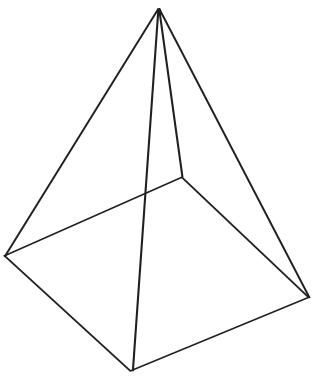
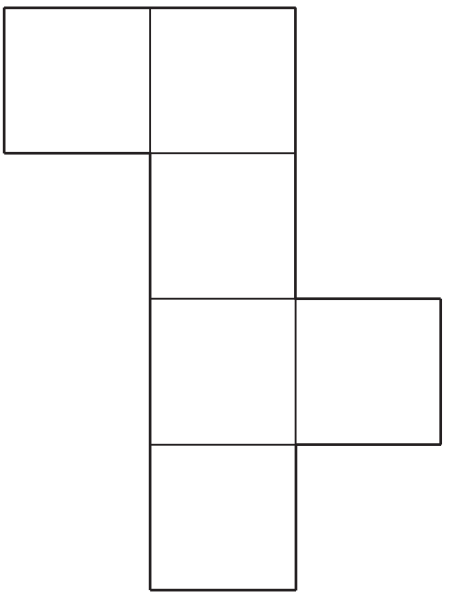
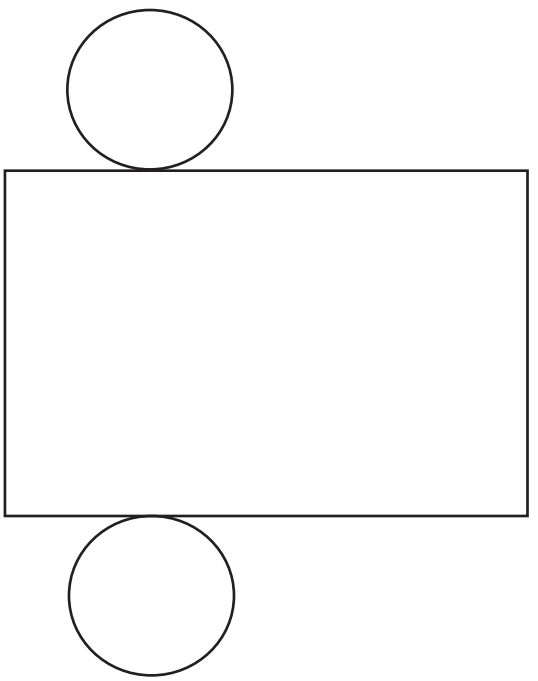


Fig.. 12.7 (Pyramid)

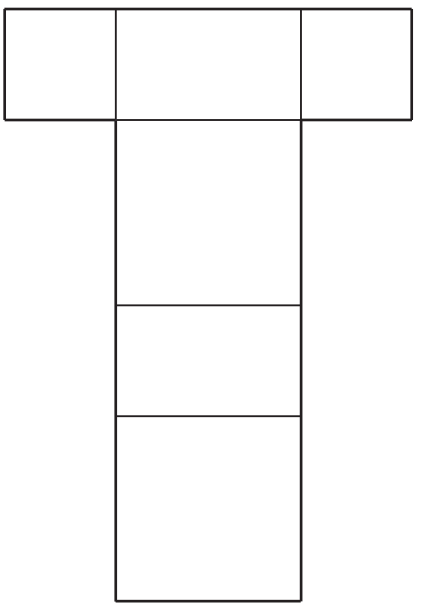
Note: Students may be encouraged to trace the nets on the thick paper and explore folding into hollow solids in different ways. Encourage students to open cube or cubiod shaped cardboard boxes and create different nets other than which are shown.



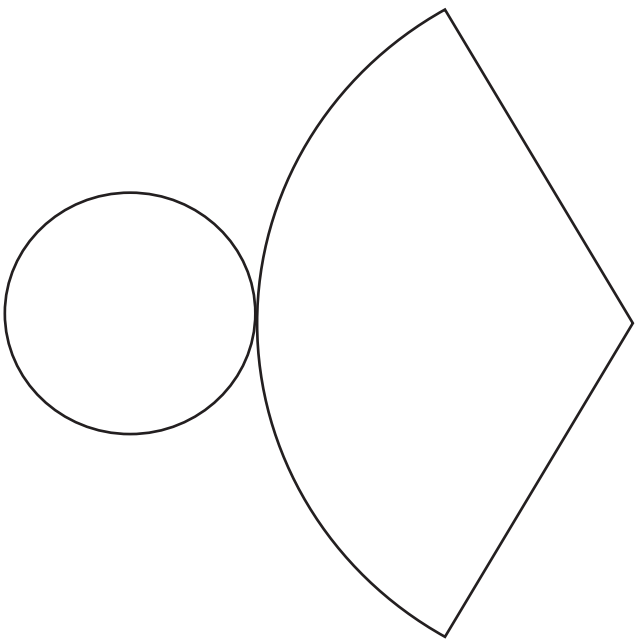
Net of Cube of Fig. 12.1



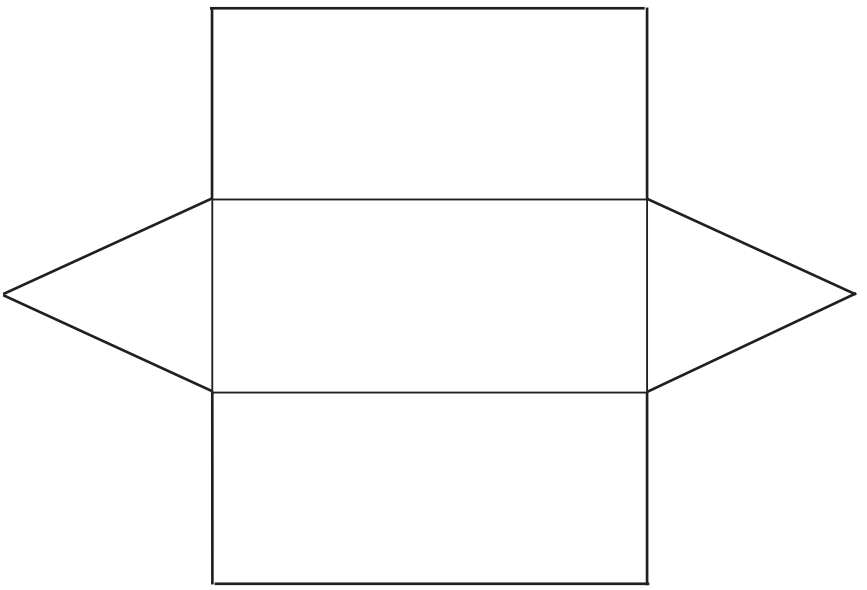
Net of Cylinder of Fig. 12.2



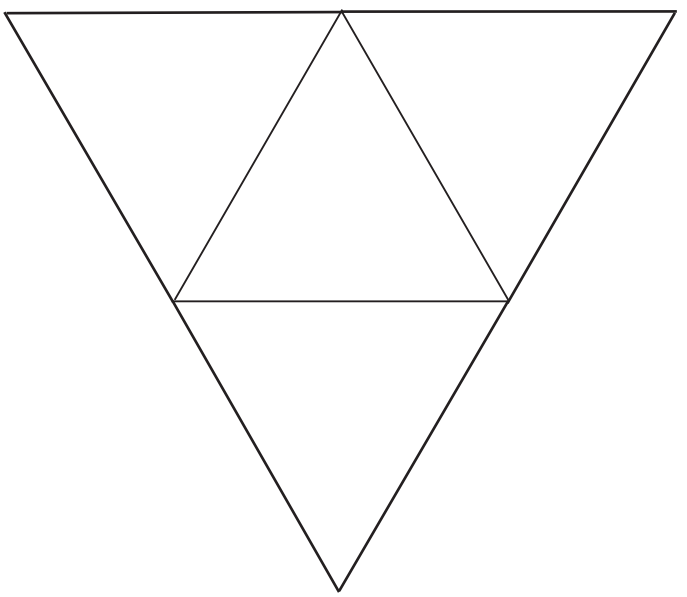
Net of Cuboid of Fig. 12.3



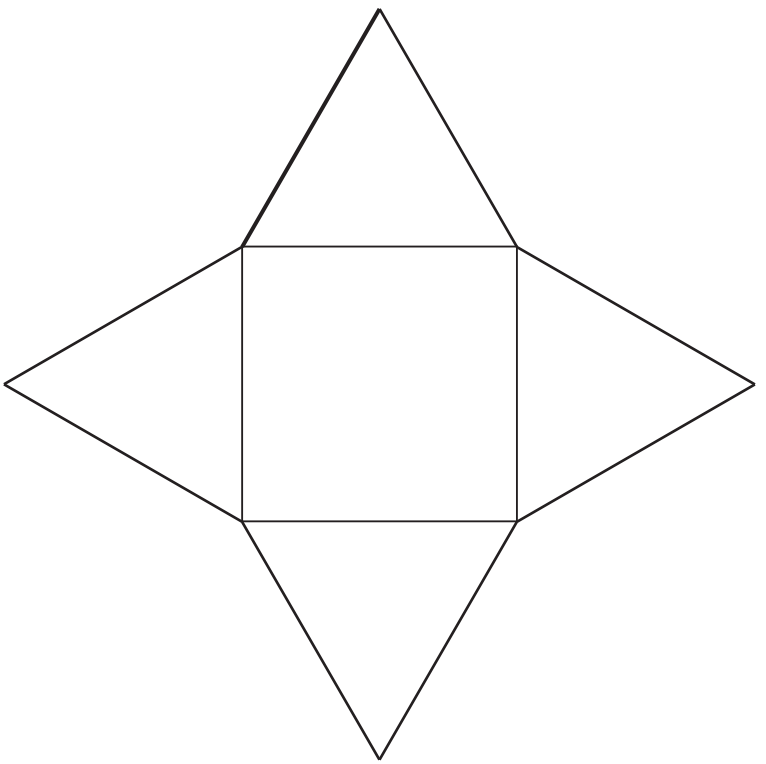
Net of Cone of Fig. 12.4



Net of Prism of Fig. 12.5



Net of Pyramid of Fig. 12.6



Net of Pyramid of Fig. 12.7

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Game 1

Factors of Numbers

Objective

To identify factors of numbers from a given collection.

Material Required

Hundred pieces of cards made up of hard cardboard sheets numbered 1 to 100 and a sheet showing factors of numbers from 1 to 100.

Rule

(a) Two players with referee can play the game.

(b) First player picks a number and second player picks all the cards which are number factors of the number picked up by the first player.

(c) Then first player picks up a number again and second player picks up its factors (whichever are available).

(d) The player with largest total cards win.

How to Proceed?

Example:

1. First player picks up a card (say 36) and keep it with her/him.
2. The second player picks up cards bearing numbers which are factors of 36 (1,2,3,4,6,9,12,18). she/he keeps these cards with her/him.
3. The second player now picks up one more card (say 28), and keeps it with her/him.
4. The first player now picks up cards bearing numbers which are factors of 28 (only 7, 14, since 1, 2, 4 have already been picked up).

The game continues. When all the cards are picked up, each player makes the total of numbers on the cards with him/her. One who gets larger total is the winner.

Note: There are chances of following type of mistakes during the game. Suitable penalty may be decided in advance with mutual consent.

1. The player may pick a card which is not a factor.
2. The player may miss some factors during picking the cards.

Factors of numbers from 1 to 100

No.	Factors	No.	Factors	No.	Factors
1.	1	35.	1,5,7,35	68.	1,2,4,17,34,68
2.	1,2	36.	1,2,3,4,6,9,12,18,36	69.	1,3,23,69
3.	1,3	37.	1,37	70.	1,2,5,7,10,14,35,70
4.	1,2,4	38.	1,2,19,38	71.	1,71
5.	1,5	39.	1,3,13,39	72.	1,2,3,4,6,8,9,12,18,24,36,72
6.	1,2,3,6	40.	1,2,4,5,8,10,20,40	73.	1,73
7.	1,7	41.	1,41	74.	1,2,37,74
8.	1,2,4,8	42.	1,2,3,6,7,14,21,42	75.	1,3,5,15,25,75
9.	1,3,9	43.	1,43	76.	1,2,4,19,38,76
10.	1,2,5,10	44.	1,2,4,11,22,44	77.	1,7,11,77
11.	1,11	45.	1,3,5,9,15,45	78.	1,2,3,6,13,26,39,78
12.	1,2,3,4,6,12	46.	1,2,23,46	79.	1,79
13.	1,13	47.	1,47	80.	1,2,4,5,8,10,16,20,40,80
14.	1,2,7,14	48.	1,2,3,4,6,8,12,16,24,48	81.	1,3,9,27,81
15.	1,3,5,15	49.	1,7,49	82.	1,2,41,42
16.	1,2,4,8,16	50.	1,2,5,10,25,50	83.	1,83
17.	1,17	51.	1,3,17,51	84.	1,2,3,4,6,14,21,28,42,84
18.	1,2,3,6,9,18	52.	1,2,4,13,26,52	85.	1,5,17,85
19.	1,19	53.	1,53	86.	1,2,43,86
20.	1,2,4,5,10,20	54.	1,2,3,6,9,18,27,54	87.	1,3,29,87
21.	1,3,7,21	55.	1,5,11,55	88.	1,2,4,8,11,22,44,88
22.	1,2,11,22	56.	1,2,4,7,8,14,28,56	89.	1,89
23.	1,23	57.	1,3,19,57	90.	1,2,3,5,6,9,10,15,18,30,45,90
24.	1,2,3,4,6,8,12,24	58.	1,2,29,58	91.	1,7,13,91
25.	1,5,25	59.	1,59	92.	1,2,4,23,46,92
26.	1,2,13,26	60.	1,2,3,4,5,6,10,12,15, 20,30,60	93.	1,3,31,93
27.	1,3,9,27			94.	1,2,47,94
28.	1,2,4,7,14,28	61.	1,61	95.	1,5,19,95
29.	1,29	62.	1,2,31,62	96.	1,2,3,4,6,8,12,16,24,32,48,96
30.	1,2,3,5,6,10,15,30	63.	1,3,7,9,21,63	97.	1,97
31.	1,31	64.	1,2,4,8,16,32,64	98.	1,2,7,14,49,98
32.	1,2,4,8,16,32	65.	1,5,13,65	99.	1,3,9,11,33,99
33.	1,3,11,33	66.	1,2,3,6,11,22,33,66	100.	1,2,4,5,10,20,25 ,50,100
34.	1,2,17,34	67.	1,67		

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Game 2

Operations on Integers

Objective

To understand the operations on Integers.

Material Required

1. A board divided into squares marked from –104 to + 104.
2. A bag containing two blue dice and two red dice each marked with dots and numbers from 1 to 6 respectively, on their faces. Number of dots on each of the blue dice indicates negative integers and the numbers on each of the red dice indicate positive integers.
3. Counters of different colours.

How to Proceed?

Board

104	103	102	101	100	99	98	97	96	95	94
83	84	85	86	87	88	89	90	91	92	93
82	81	80	79	78	77	76	75	74	73	72
61	62	63	64	65	66	67	68	69	70	71
60	59	58	57	56	55	54	53	52	51	50
39	40	41	42	43	44	45	46	47	48	49
38	37	36	35	34	33	32	31	30	29	28
17	18	19	20	21	22	23	24	25	26	27
16	15	14	13	12	11	10	9	8	7	6
–5	–4	–3	–2	–1	0	1	2	3	4	5
–6	–7	–8	–9	–10	–11	–12	–13	–14	–15	–16
–27	–26	–25	–24	–23	–22	–21	–20	–19	–18	–17
–28	–29	–30	–31	–32	–33	–34	–35	–36	–37	–38
–49	–48	–47	–46	–45	–44	–43	–42	–41	–40	–39
–50	–51	–52	–53	–54	–55	–56	–57	–58	–59	–60
–71	–70	–69	–68	–67	–66	–65	–64	–63	–62	–61
–72	–73	–74	–75	–76	–77	–78	–79	–80	–81	–82
–93	92	91	90	89	88	87	86	85	84	83
–94	–95	–96	–97	–98	–99	–100	–101	–102	–103	–104

1. Two players will play the game. Each player keeps his/her counter at zero(0).

2. The game could be played for one operation for example, “Multiplication” or “addition” or “subtraction”. It means whatever may be the numbers there would be only one kind of operation in a given game.

3. First player takes out two dice from the bag and throws them and observe the numbers appearing on the dice. Suppose she gets both blue dice and obtains 4 and 3 on these dice, which represent (–4) and (–3) respectively. Then she finds (–4) × (–3) = 12 and puts her counter at 12 on the board.

4. Second player gets one red dice and one blue dice from the bag and throws the two dice obtaining the numbers 3 and 4 respectively. These represent (+3) and (–4) respectively. So, she finds (+3) × (-4) = (–12) and puts her counter at (–12).

5. Now again first player got one red dice and one blue dice and throws them, and obtaining the numbers 5 and 4 respectively. So, she finds (+5) ×(– 4) = (-20). She moves her counter from 12 towards the number -104 and puts her counter at (+12) + (– 20) = -8.

6. The game continues. one who reaches -104 or +104 first is the winner.

Note: 1. Product found by players may not always be correct. This should be counted as “foul” by person acting as a referee. Suitable penalty should be decided in advance for such faults.

2. Similar game can be played for “addition” or “subtraction” of integers.

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