

Ganitha Kalika Andolana

Teacher's Handbook



TLM in the Maths Kit



1. Square counters



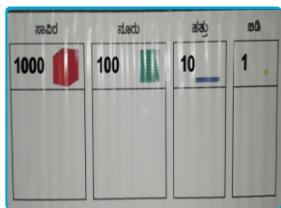
**2. Number line
3. Clothes clips**



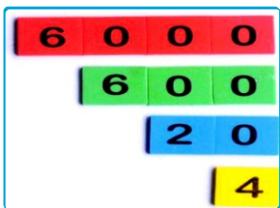
4. Abacus



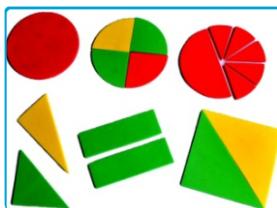
5. Base Ten Blocks



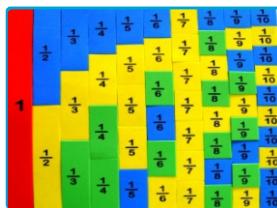
6. Place Value mat



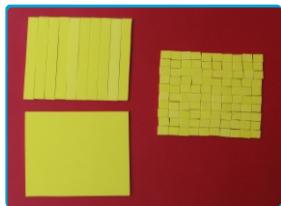
7. Place Value strips



8. Fraction shapes



9. Fraction strips



10. Decimal set



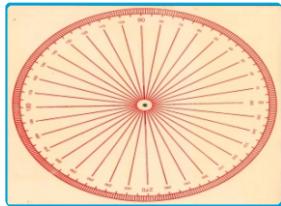
11. Decimal Place value strips



**12. Dice
13. Measuring tape**



14. GeoBoard



15. Protractor and angle measure



16. Clock



17. Weighing Balance



18. Geosolids with nets



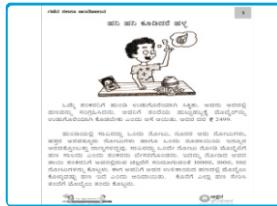
19. Play money



20. Coins



21. Tangram



22. Math Concept Cards

Ganitha Kalika Andolana

TEACHER'S HANDBOOK

Aadi Kali, Maadi Thili



 "All students can learn mathematics and all students need to learn mathematics. It is therefore imperative that we offer mathematics education of the very highest quality to all children".

(Position Paper on Maths, NCF 2005)

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National Curriculum Framework 2005 (chapter 3.2)

Position Paper of the National focus Group on the Teaching of Mathematics (NCERT)

State Curricular Policy Framework (DSERT, Karnataka, 2006-07)

Syllabus for Primary School Mathematics (DSERT, Karnataka)

Source book for Assessment (Classes 1 to 5 - Mathematics) NCERT

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OVERVIEW

Why do we need a Ganitha Kalika Andolana?

We all know that Maths as a subject instills fear in many children, and this blocks the learning of Maths. This is a big challenge for Maths teachers everywhere. It is time for us all to mount a campaign, an “andolana” to convert Maths into an interesting, child-friendly subject. The Ganitha Kalika Andolana (GKA) has been designed as a support program for primary school Maths teachers to enable them to make their classrooms joyful and deliver concepts effectively and meaningfully.

A key component of this programme is capacity-building through teacher training. The concepts that it covers are entirely in line with the current primary Maths curriculum prescribed by the Government of Karnataka for 4th and 5th standards. It aligns well with the key goals set by the National Curriculum Framework (NCF 2005) and the Karnataka State Curriculum Framework (2006-07) for the teaching of Mathematics.

What does the GKA Kit contain?

Packed in a sturdy, attractive box that is easy to store and handle, the GKA Kit, contains versatile, durable and child-friendly Teaching-Learning Materials (TLMs). Each TLM can be used for teaching multiple concepts and each concept can be taught through multiple teaching aids provided in the Kit. Thus, each concept gets reinforced through a range of visual and tactile experiences.



What is the GKA approach?

The GKA programme is designed on the **Constructivist approach**. It rests on the Philosophy that learning is an active, dynamic social process; that learning best happens when the child encounters hands-on experiences; and learning happens in an environment connected to the child’s real world. The GKA Kit contains attractive manipulatives that involve a child’s active participation.

Group Learning is a key factor in a constructivist classroom. This method encourages collaborative or peer learning where students encourage and motivate each other. In the process the entire group moves towards the learning goal. The role of the teacher is more of a facilitator than an ‘instructor’. **Continuous assessment** is a vital part of GKA’s constructivist approach. Assessment is viewed as a key tool for the teacher to obtain feedback on the learning level of every child in her classroom, thus

Children should...
Overcome the fear of Maths.

Build a strong foundation in Maths through experiential learning.

Develop logical thinking and reasoning skills.

Make Maths meaningful and relevant to daily life.

Learn co-operatively.

Position Paper on Maths, NCF 2005

The Teacher’s Handbook is a composite manual covering all the concepts in the 4th and 5th std syllabus. It provides guidelines to the teacher on how to use the Kit effectively.

Maths Concept Cards in the Kit weave together language and Maths in daily situations, bringing Maths out of the abstract and into the lived reality of the child.

allowing her to individualise her strategies, if necessary. Assessment should be continuous so that any learning barriers are detected in time. Teachers can devise ways to help children with learning difficulties or decide to re-visit a concept for the benefit of the entire class.

Sample tasks for Assessments are provided in the Handbook at the end of each chapter, which can be done during group learning sessions.

What is the GKA methodology ? “Aadi Kali; Maadi Thili” - *Learn through play. Comprehend through experiencing.* GKA uses a Concrete - Representational - Abstract (**CRA**) approach for mastering a concept.

Concrete Stage involves use of concrete teaching aids, to let each child construct her or his own knowledge. The TLM in the Kit is sensorial in nature and helps children visualize and work with the concepts. While demonstrating concepts the teaching aids must be made available to the children during class so that they handle the material. To ensure safety of the materials, teachers can have some basic rules of discipline jointly arrived at with the students.

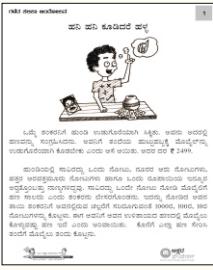
The Representational stage is accomplished by using square-ruled books. Here the focus moves from conceptual clarity to procedural fluency.

The Abstract stage makes effective use of the prescribed textbook. Here children progress using mathematical symbols and notations successfully; apply their learning to real life situation through word problems and problems of daily life.

~~The Kit is very useful for conducting the ‘Bridge Course’ in the beginning of the academic year. It helps refresh the students on concepts learnt in the previous year.~~

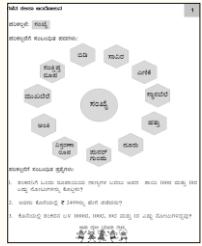
The 5 Es Model Engage-Explore-Explain-Elaborate-Evaluate based on the Constructivist approach gives a practical step-by-step guide through the five phases of learning.

1. Engage phase: Each new concept must be introduced using a story or an activity, drawing upon students' earlier knowledge. Math Concept Cards which are provided in the Kit, could be one of the tools at this stage.



2. Explore phase: provides students with a common base, using teaching aids from the Kit. Students explore the material and get a feel for the concepts and processes.
3. Explain phase: is the group learning stage, where students discuss and solve problems with their peers; they also frame their own problems. Questions on the reverse side of each Concept Card could be a starting point for discussion.

4. Elaborate phase: students develop deeper and broader understanding of concepts and refine their skills using square-ruled books and their text books. The Concept Cards provide a ready list of relevant Maths vocabulary for some of the major concepts.



5. Evaluate phase: the students' understanding of concepts and skills is assessed individually by giving tasks. The teacher constantly observes and assesses as children work in groups. A few sample tasks are given at the end of each chapter in this manual. You could add several more examples to your assessment list.

Classroom management: How to facilitate group learning

Forming groups: Set up groups in the beginning of the year such that each group has learners of mixed levels - average, below average and above average ability. Ensure that each group has a mix of boys and girls; and that children with different socio-economic background are equally distributed.

- ☞ Let each group have about 5 or 6 members. Classes with fewer students could have smaller group sizes.
- ☞ Names can be assigned to children, that are common to each group say, 'a', 'b', 'c'. Thus each group will have one student called 'a', another called 'b', and so on.



Working in groups: Children first explore the concepts in groups using various manipulatives.

- ☞ Facilitator gives a problem that a group has to solve and one member, the one called 'a', from each group has to explain the solution to the class. The question can be asked by rotation to each member.
- ☞ Each member gives a problem to their group and the rest come up with the solution and also explain their solutions to their group.
- ☞ The GKA Kit has multiple teaching aids for understanding the same concept, hence each group will tackle the same problem but by using a different TLM from the Kit.

H ow to use Maths Concept cards:

- ☞ Read out the concept cards to the children or let the children read it on their own. Ensure that every child is able to read. Inability to read could affect the student at both the abstract stage as well as during summative assessment. It is very important that a child is able to read instructions in order to solve problems.
- ☞ The facilitator then interacts with the class using the vocabulary listed in the card. This familiarizes the child with maths vocabulary. The child is also encouraged to use the appropriate maths terms, which is very essential to express solutions to problems.
- ☞ The questions listed in the concept card are suggestive. Facilitators can frame their own questions. To answer these questions, a child has to comprehend, then relate to the math concept in it and solve it using problem - solving skills.

Components in the GKA Kit

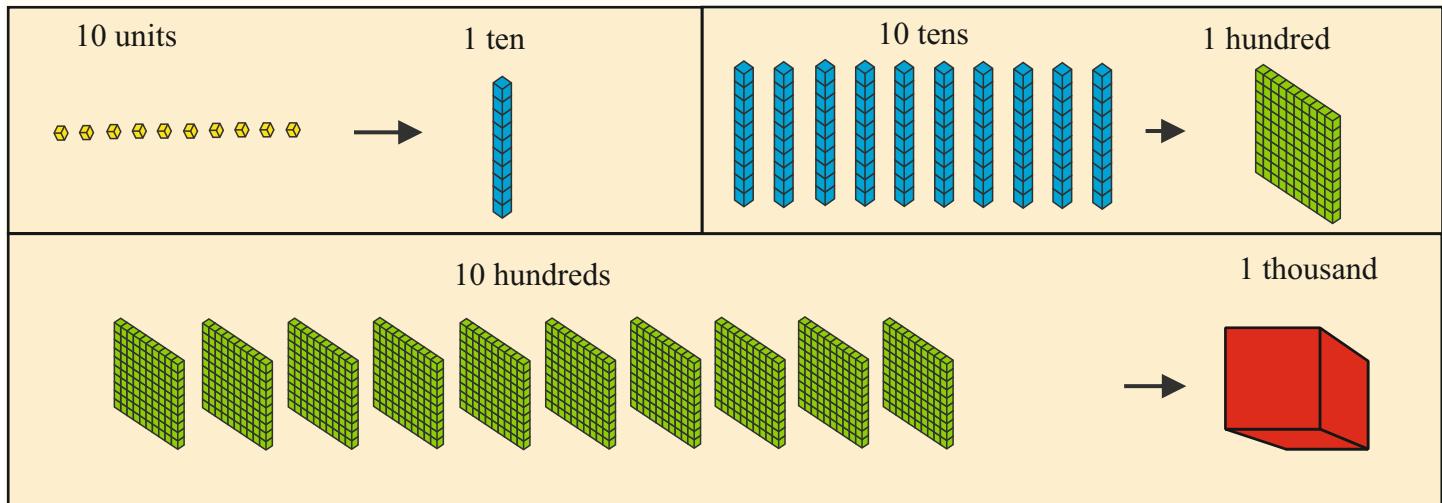
1. **Square counters :** 100 square multi-coloured counters are used for developing early number sense.
2. **Number line and clothes clips:** a string of one hundred beads in groups of ten; is used to count, to add and subtract up to 100; also to teach fractions.
3. **Abacus:** five-rod abacus with an add-on rod for rings beyond 9; to teach place value, addition and subtraction.
4. **Base Ten Blocks:** yellow unit cubes, blue rods to represent ten units, green plates to represent 100 units; a red cube to represent 1000. Useful to learn place value, addition, subtraction, multiplication, division.
5. **Place Value mat:** describes the ones, tens, hundreds, thousands places. Used to teach addition, subtraction, with borrow and carry.
6. **Place Value strips:** represent place value of units, tens, hundreds and thousands, in different colors.
7. **Fraction shapes:** set of circles and squares and their fractional parts. Ideal to introduce parts of a whole and basic fraction concepts.
8. **Fraction strips:** represent $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}$. Help understand fractions and fraction relationships.
9. **Decimal set:** consists of one whole, one tenth and one hundredth pieces; to help children understand writing decimals up to tenth's and hundredth's place.
10. **Decimal Place value strips:** in grey colour, used to represent the place value of numbers after the decimal point, up to two decimal places.
11. **Dice:** 5 pairs of colour-coded dice. In pairs, the dice generate random numbers; used in games to help understand number operations
12. **Measuring tape :** marked with centimeters as well as inches.
13. **GeoBoard:** a double-sided square GeoBoard, to understand area, perimeter, symmetry. Geometric shapes can be formed by stretching rubber bands from peg to peg.
14. **Protractor and angle measure:** a full circle protractor with 0 – 360 degree scale with angle measure made of transparent plastic.
15. **Clock:** showing 24-hour time; helps to learn the difference between hours and minutes.
16. **Weighing Balance:** to learn about concept of weights; consists of two one-liter volume-measures of clear plastic, which are marked. Helps understand volume-weight relationship.
17. **Geosolids with nets:** hollow geometric shapes made of transparent plastic; cylinder, cube, cuboid and pyramid; also fold-out paper nets to learn about area.
18. **Play money :** for counting in real life situations ; Rupee notes of different denominations from Re 1 to Rs 1000, printed to look like real money
19. **Coins :** 10 paise and 1 paise coins ; for counting operations with decimal numbers.
20. **Tangram:** has 7 shapes; used to teach geometric concepts; also used as a puzzle where all 7 pieces can create a specified shape.
21. **Math Concept Cards:** to help students relate math vocabulary with math concepts, also enhance reading skills.

Grouping by Tens

Learning objective: Grouping by tens

TLM: BaseTen Blocks, Play Money, Abacus, Place Value Mat

Base Ten System: Start from units place. On the place value mat, once we have ten units make a group of ten and replace with one rod of ten. Now move this one place left. Similarly re-group 10 ten's, replace with 1 plate of hundred and move one place left. Replace 10 hundreds by 1 thousand and move one place left.



Play Money <p>₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 → ₹ 10</p> <p>₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 → ₹ 100</p> <p>₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 → ₹ 1000</p>	Abacus <p>Add - on rod</p> <p>The abacus has five rods. The bottom row is labeled 10000, 1000, 100, 10, 1. The top row shows colored rings (yellow, red, green, blue, yellow) representing groups of 10. An 'Add-on rod' is shown above the fifth rod.</p> <p>Below the abacus, four sets of rings are shown, each with an arrow pointing to a corresponding abacus rod:</p> <ul style="list-style-type: none"> Yellow rings (10 units) → Yellow rod Blue rings (10 tens) → Blue rod Green rings (10 hundreds) → Green rod Red rings (10 thousands) → Red rod <p>Note: Each rod can hold only 9 rings. When the rings of any one colour exceed 9, insert the add-on rod. Replace the 'group of ten' by a ring of next higher value and move this one place to the left. Now the add-on rod can be removed.</p>
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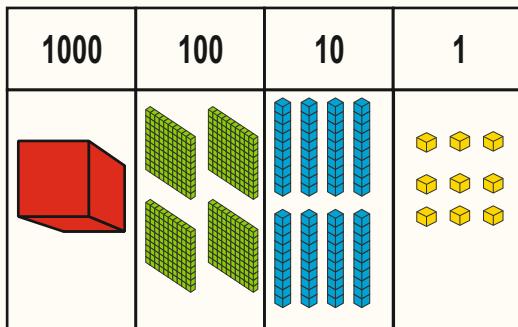
Numbers

Learning objective: Representing, reading and writing 4 and 5 digit numbers.

TLM: Base Ten Blocks, Place Value Mat, Play Money, Abacus.

- Representation of a 4 digit number using **Base Ten Blocks and Place Value Mat.**

Example : 1489

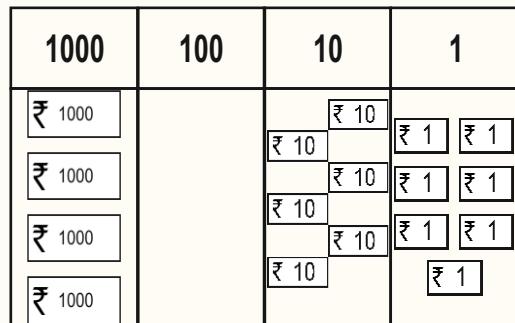


Write : 1 4 8 9

Read : One Thousand Four Hundred and Eighty-Nine

- Representation of a 4 digit number using **Play Money and Place Value Mat.**

Example: 4067

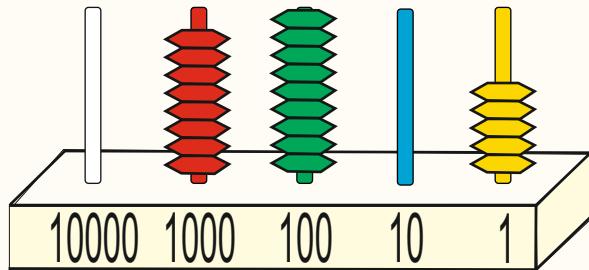


Write : 4 0 6 7

Read : Four Thousand and Sixty - Seven

- Representation of a 4 digit and 5 digit number using **Abacus.**

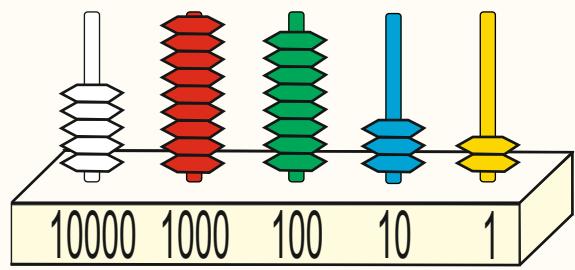
Example : 8905



Write : 0 8 9 0 5

Read : Eight Thousand Nine Hundred and Five

Example : 59832



Write : 5 9 8 3 2

Read : Fifty Nine Thousand Eight Hundred and Thirty- Two

4. Representation of 4 and 5 digit numbers using Square Line Book and Grids

a. Example : 4067

Th - 1000	H - 100	T - 10	U - 1					
1000		10	10	1	1	1		
1000 1000		10	10	1		1		
1000		10	10	1	1			
4	0	6	7					

Read 4067 as :Four thousand and sixty seven

Th	H	T	U
4	0	6	7

b. Example : 59832

T.th - 10000	Th - 1000	H - 100	T - 10	U - 1				
10000	1000 1000 1000	100 100 100	10		1			
10000 10000	1000 1000 1000	100 100 100	10					
10000 10000	1000 1000 1000	100 100 100	10					
5	9	8	3	2				

Read 59832 as : Fifty - nine thousand eight hundred and thirty-two

T.th	Th	H	T	U
5	9	8	3	2

Assessment

Sample tasks: With Base Ten Blocks, Play Money and Abacus

- Represent a number with a zero and read it. (example : 6082)
- Write two numbers in which the digits are interchanged (example : 4351 and 5314) and represent it on a Place Value Mat and read it.
- Represent 4 or 5 digit numbers on a Square Line Book.

Observations:

- Can the child read, write and represent numbers with ease.
- Can the child correctly represent zero when it occurs in any place
- Check transition from concrete to representational stage.



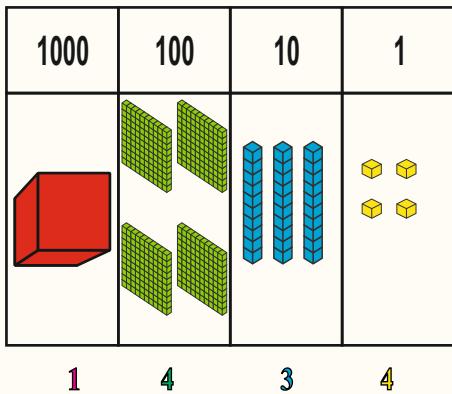
Place Value of Numbers

Learning objective : Face value and Place value of 4 and 5 digit numbers

TLM: Base Ten blocks , Place Value Mat , Play Money, Abacus.

1. Place value and Face value of number using **Base Ten Blocks** or **Play Money** on the **Place Value Mat**. Place value of a digit is the value it holds, for its position in the number. Face value of a digit is the digit itself .

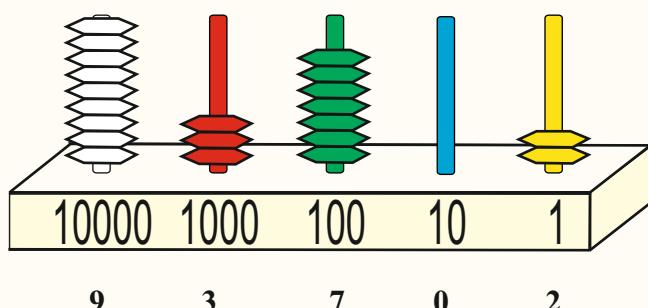
Example : 1434



1000	100	10	1
1	4	3	4

Digit	Face Value (number of base ten blocks or notes)	Place Value (value of base ten blocks or notes)
1	1	1000
4	4	400
3	3	30
4	4	4

2. Place value and Face value of number using **Abacus**. **Example :** 93702



Digit	Face Value (Number of Rings)	Place Value (Value of the Rings)
9	9	90000
3	3	3000
7	7	700
0	0	0
2	2	2

3. Place value and Face value of a number using Square Line Book

To know the face value, count number of squares filled in that place. Place value is face value x value of the place. Thus $5 \times 1 = 5$; and $6 \times 1000 = 6000$ and so on.

a. Example :6095

Th - 1000	H - 100	T - 10	U - 1	
1000 1000		10 10 10	1	
1000 1000		10 10 10	1 1	
1000 1000		10 10 10	1 1	
6	0	9	5	

Face value of 5 = 5

Place value of 5 = 5

Face value of 9 = 9

Place value of 9 = 90

Face value of 0 = 0

Place value of 0 = 0

Face value of 6 = 6

Place value of 6 = 6000

b. Example :53434

T.th - 10000	Th - 1000	H - 100	T - 10	U - 1	
10000	1000	100	10	1 1	
10000 10000	1000	100	10		
10000 10000	1000	100 100	10	1 1	
5	3	4	3	4	

3 in thousand's place has a different place value from the 3 in ten's place, even though the digit 3 has the same face value. Same case with 4 in hundred's place and 4 in unit's place.



Assessment

Sample Tasks: With Base Ten Blocks, Play Money and Abacus

- Represent numbers with the same digits in different places (ex: 1345, 3254, 34675); and give Face value and Place value of each digit.
- Represent numbers with zero in different place (ex: 1405, 1067, 8040); give Face value and Place Value of each digit.
- Give some Thousands, Hundreds, Tens and Ones mixed together using Play Money and ask the child to write the number.
- Read a number and represent it using Square Line Book.

Observations:

- Does the child take a long time to recognize Place value and Face value?
- Does the child understand that place value and face value of zero anywhere is zero itself?
- Can the child write numbers as per place value ?
- Has the child made a transition from concrete to representational stage ?

Expansion form of Numbers

Learning objective: Expansion form of 4 digit numbers.

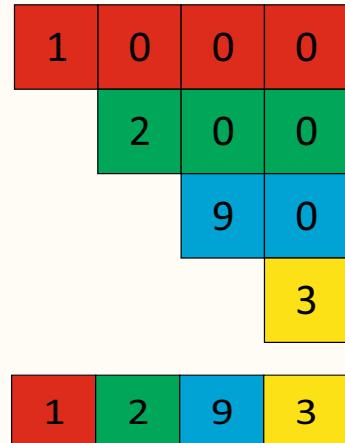
TLM: Base Ten Blocks, Place Value Mat, Place Value Strips, Play Money, Abacus.

In the Kit a red Place Value strip represents thousands, green strip is hundreds, blue strip is tens and yellow strip is ones, or units. The individual strips placed one below the other gives the expanded form. Now place the strips over each other and align to the right side. This gives the number.

1. Expansion using **Base Ten Blocks** and **Place Value Strips**

1000	100	10	1

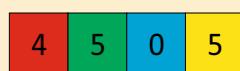
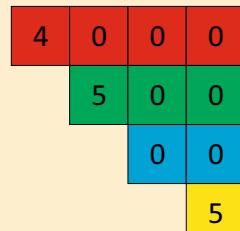
Example : 1293



Expansion form : $1 \times 1000 + 2 \times 100 + 9 \times 10 + 3 \times 1$
 $1000 + 200 + 90 + 3 = 1293$

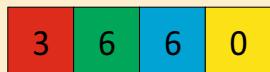
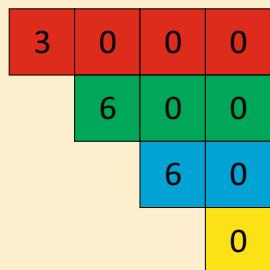
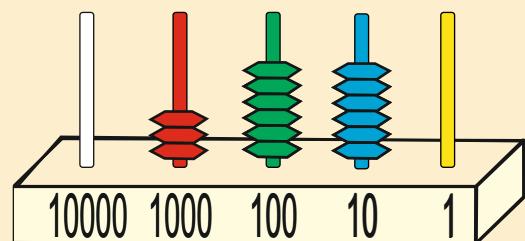
2. Expansion using **Play Money** and **Place Value Strips**. Example : 4505

1000	100	10	1
₹ 1000	₹ 100		
₹ 1000	₹ 100		
₹ 1000	₹ 100		
₹ 1000	₹ 100		
₹ 1000	₹ 100		
	₹ 1		
	₹ 1		
	₹ 1		
	₹ 1		
	₹ 1		



Expansion form : $4 \times 1000 + 5 \times 100 + 0 \times 10 + 5 \times 1$
 $4000 + 500 + 0 + 5 = 4505$

3. Expansion using **Abacus** and **Place Value Strips**
Example : 3660



Expansion form : $3 \times 1000 + 6 \times 100 + 6 \times 10 + 0 \times 1$
 $3000 + 600 + 60 + 0 = 3660$

Zero in any place remains as 0.

4. Expansion using Square Line Book .

a) Example : 1293

Th - 1000	H - 100	T - 10	U - 1	1 0 0 0
1000	100	10 10 10	1 1 1	2 0 0
	100	10 10 10		9 0
		10 10 10		3
1	2	9	3	1 2 9 3

b) Example : 53107

T.th - 10000	Th - 1000	H - 100	T - 10	U - 1	5 0 0 0 0
10000 10000	1000	1000	100	1 1 1	3 0 0 0 0
10000 10000		1000		1 1	1 0 0
10000				1 1	0 0
5	3	1	0	7	7

Assessment



Sample Tasks: With Place Value Strips, Base Ten Blocks, Play Money, Abacus

- Give a set of 4 digit numbers (include zero as one digit eg. 4067) and ask children to give its expansion form using Place Value Strips.
- Give some Thousands, Hundreds, Tens and Ones represented by play money or Base Ten Blocks, to write the expansion form of the number using Place Value Strips.
- Make the smallest 5-digit number possible using digits 4, 1, 8, 0, 7. Use each digit only once; next by using any digit as many times as needed.
- Give a 5 digit number and ask children to write the expansion form using Square Line Book.

Observations:

- Can the child write the expansion form; and understand the relation between place value and expansion form?
- Does the child understand that the digit 0 is zero and that there is no expansion
- Does the child place a zero at the beginning of the number?
- Has the child made a transition to representational stage.

Comparison of Numbers

Learning objective: Comparing two numbers

TLM: Base ten blocks, Play Money, Place value mat.

1. Comparing numbers using Base Ten Blocks.

Example : 567 and 407. Start by comparing digits in the highest place value; here, the digit in hundreds place. The number with the digit having bigger face value is greater. Here $5 > 4 \therefore 567 > 407$.

100	10	1
5	6	7

100	10	1
4	0	7

2. Comparing using Play Money

a. **Example : 4567 and 3729** Start by comparing digits in thousands place. Here $4 > 3 \therefore 4567 > 3729$

1000	100	10	1
4	5	6	7

1000	100	10	1
3	7	2	9

b. **Example : 6517 and 6836** Since face value of the digit in thousands place is 6 in both numbers , compare digits in the hundreds place. Here $5 < 8 \therefore 6517 < 6836$

1000	100	10	1
6	5	1	7

1000	100	10	1
6	8	3	6

c. Example : 3405 and 3405. Here digits in the thousands, hundreds, tens, ones place are equal in both numbers. So the two numbers are equal. $3405 = 3405$.

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100		₹ 1 ₹ 1 ₹ 1 ₹ 1
3	4	0	5

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100		₹ 1 ₹ 1 ₹ 1 ₹ 1
3	4	0	5

3. Compare using Square Line Book and Grids.

a. Example : 6517 and 6836.

Step 1 :	Th - 1000	H - 100	T - 10	U - 1	
6517	1000 1000	100 100	10	1 1 1	
	1000 1000	100 100		1 1 1	
	1000 1000	100		1	
6836	1000 1000 1000	100 100 100	10	1 1 1	
	1000 1000	100			

Step 1 : Represent the two numbers

Step 2 : Compare and strike the number of 1000's from the thousand place (highest place)

Step 3 : Since number of thousands is equal, compare and strike the number of 100's from the hundred's place

Step 4 : 6517 has fewer 100's compared to 6836 therefore the first number is smaller than the second number

Step 2 and Step 3

	Th - 1000	H - 100	T - 10	U - 1	
6517	1000 1000 1000	100 100	10	1 1 1	
	1000 1000 1000	100		1 1 1	
		100 100		1	
6836	1000 1000 1000	100 100 100	10	1 1 1	
	1000 1000	100			
		100 100			
			10		

→ 6517 is smaller

Th	H	T	U
6	5	1	7
6	8	3	6

Step 4 : $6517 < 6836$

b . Example : compare 45607 and 45067

4 5 6 0 7

T.th - 10000	Th - 1000	H - 100	T - 10	U - 1			
10000	1000 1000	100 100		1 1 1			
10000	1000 1000	100 100		1 1 1			
10000 10000		1000 100 100			1		
10000	1000	1000		10 10 10	1 1		
10000	10000 1000 1000			10 10 10	1 1 1		
10000		1000			1		

→ 45607 is greater than 45067

	T.th	Th	H	T	U			
	4	5	6	0	7			
	4	5	0	6	7			
	45607 > 45067							



Assessment

Sample Tasks: With Play Money, Place Value Mat, Square Line Book

- Give pairs of numbers (ex: 6457 and 4237; 3086 and 3346; 6457 and 6357). Compare using Play Money.
- Represent three numbers ex: 3152, 3975, 3097 using Play Money. Ask which number is closer to 3000; then ask which is closer to 4000 ?
- Represent a number using Play Money (for e.g.999) and ask the child to place any number bigger than given number on one side and smaller than this number on the other side.
- Arrange these numbers in order from greatest to smallest – 1007, 1070, 1700, 7100, 7001.
- Compare 2 numbers using Square Line Book.

Observations:

- Can the child compare two numbers?
- Has the child understood ordering of numbers?

Addition

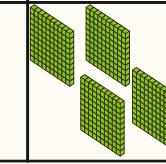
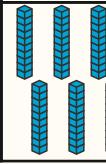
Learning objective: To add two 4 digit and 5 digit numbers without carry - over

TLM: Base Ten Blocks, Abacus, Place Value Mat.

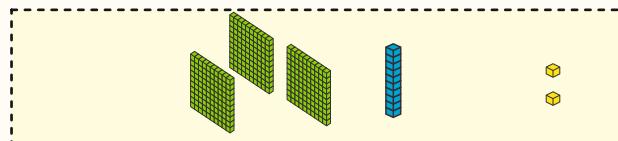
1.Addition using **Base Ten Blocks** or **Play Money** on the **Place Value Mat**

Example : $1467 + 312$

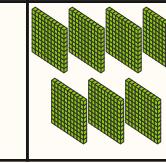
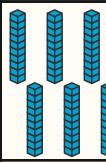
Step 1 : Represent 1467 on place value mat

1000	100	10	1
			

Step 2 : Represent 312 below it



Step 3 : Start putting together from the unit's place, then the tens, hundreds, and thousands of both numbers on the place value mat.

1000	100	10	1
			 

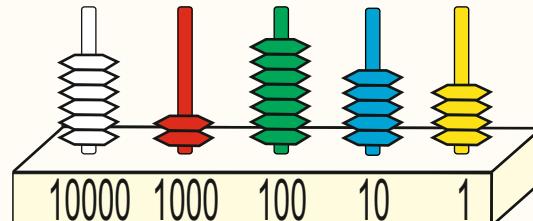
Step 4 : Count them and write the sum.

1 7 7 9

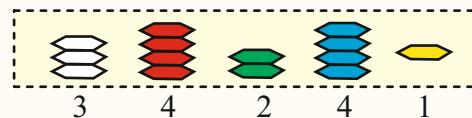
2. Addition using Abacus

Example : $62754 + 34241$

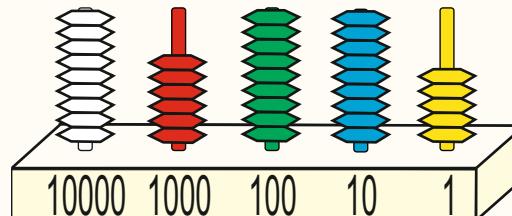
Step 1: Represent 62754 on the abacus.



Step 2 : Represent as rings



Step 3: Combine the rings starting from the units place.



Step 4: Count the rings and write the sum.

9 6 9 9 5

3. Addition using Square Line Book and Grids

Example : 3413 + 2154

	Th - 1000	H - 100	T - 10	U - 1		
Addend	1000 1000 1000	100 100 100	10		1 1	
Addendum		100	10 10 10	10	1 1	
Sum	1000	100	10 10 10	10	1 1	
	1000 1000	100 100 100		10	1 1	1
	1000 1000	100	10	10	1 1	

5

5

6

7

Step 1 : Represent the two numbers

Step 2: Starting from units place, circle and count the 1's (units) in the addend and addendum. Write that many 1's in the units place of the sum.

Step 3 : Repeat the same for 10's , 100's, 1000's

Step 4 : Count and write the sum

TH	H	T	U	
3	4	1	3	
+ 2	1	5	4	
5	5	6	7	sum

Assessment

Sample Tasks: With Base Ten blocks, Play money, Abacus

- Find sum of 2642 and 1356; next ask to find the sum of 1356 and 2642.
- Give two sets of Play Money : Rs. 2717 and Rs. 2610. Ask the child to make the numbers equal.
- Write the problems in a square ruled page.

Observations:

- Does the child know that the total does not change by reversing the order? Does the child call out the total the second time without actually adding.
- Does the child judge which group has more money by estimation or counting.

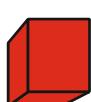
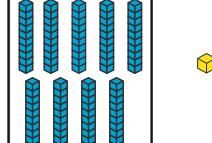
Addition with carry - over

Learning objective: To add two 4 digit and 5 digit numbers with carry - over

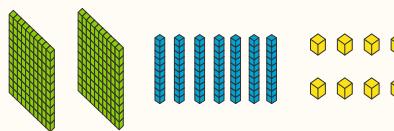
TLM: Base Ten Blocks, Play Money, Abacus, Place Value Mat.

1. Addition using **Base Ten Blocks** on the **Place Value Mat** Example : $1392 + 278$

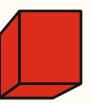
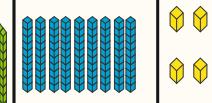
Step 1 : Represent **1392** on place value mat

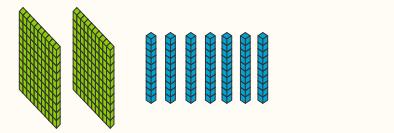
1000	100	10	1
			

Step 2 : Represent **278** below it

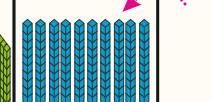


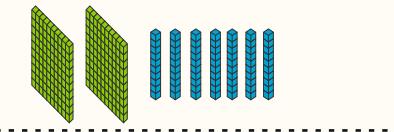
Step 3 : Join units

1000	100	10	1
			



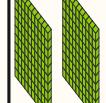
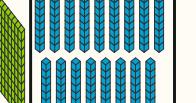
Step 4 : Regroup units

1000	100	10	1
			



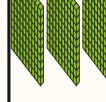
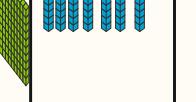
$$\begin{array}{r} \text{yellow cubes} \\ \text{yellow cubes} \\ \hline \end{array} = \begin{array}{r} \text{blue rod} \\ \hline \end{array}$$

Step 5 : Join tens

1000	100	10	1
			



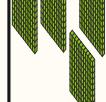
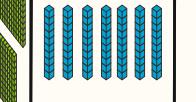
Step 6 : Regroup tens

1000	100	10	1
			



$$\begin{array}{r} \text{blue rods} \\ \hline \end{array} = \begin{array}{r} \text{green flat} \\ \hline \end{array}$$

Step 7 : Join hundreds. The sum is 1670

1000	100	10	1
			

Sum : **1 6 7 0**

2. Addition using Play Money on the Place Value Mat Example : 4378 + 4920

Step 1:
Rs 4378

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10	₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

Step 2:
Rs 4920

₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10
₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10
₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10

Step 3:
One's, ten's
and hundreds
added

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10	₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

₹ 1000 ₹ 1000
₹ 1000 ₹ 1000

Step 4:
Hundreds
re-grouped

$$\begin{array}{|c|c|} \hline ₹ 100 & ₹ 100 \\ \hline \end{array} = ₹ 1000$$

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100	₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10	₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

₹ 1000 ₹ 1000
₹ 1000 ₹ 1000

Step 5:
Thousands
added

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100	₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10 ₹ 10	₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

Sum :

9

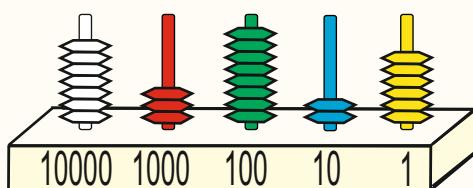
2

9

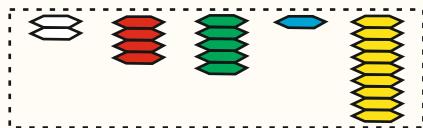
8

3. Addition using Abacus Example : 73826 + 24519

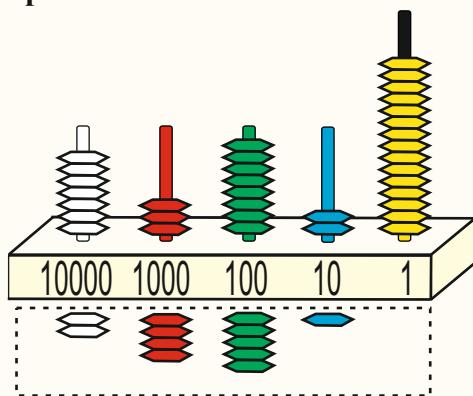
Step 1 :



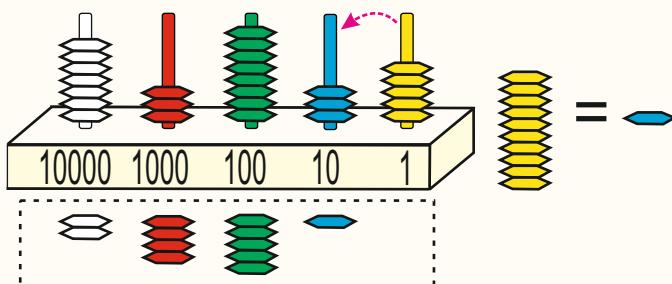
Step 2 : Represent 24519 below it



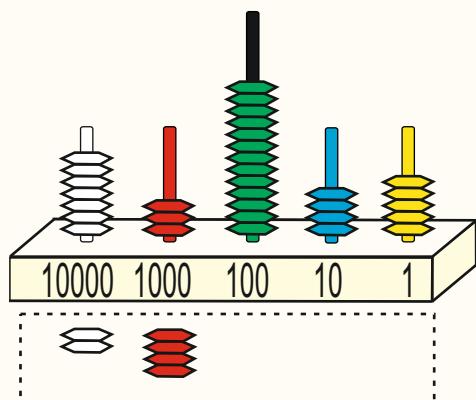
Step 3 : Add units



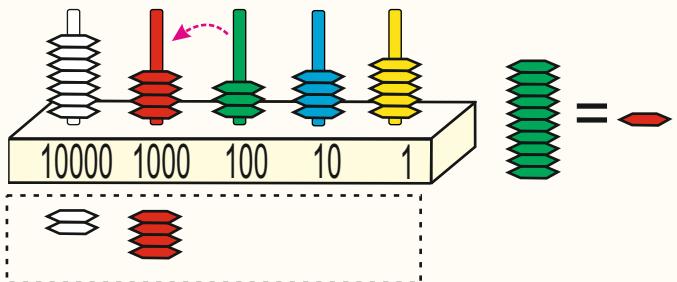
Step 4 : Re-group units; add tens



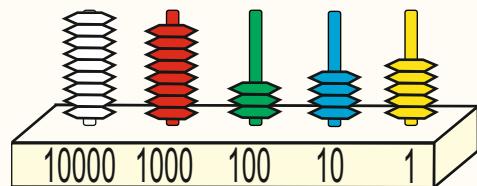
Step 5 : Add hundreds



Step 6 : Re-group hundreds



Step 7 : Add thousands. Add ten thousands



4.Addition Using Square Line Book and Grids

Ex : 6678 and 1553

	Th - 1000	H - 100	T - 10	U - 1	
Addend	1000 1000	100 100	10 10 10	1 1 1	→ Carry - over
Addendum	1000 1000	100 100	10 10	1 1	Step 2: Starting from units place, circle and count the 1's in the addends. Group by ten's and write a 10 in the carry-over box of ten's place. Circle and count remaining 1's. Write the 1's under the space marked as sum
Sum	1000 1000 1000	100	10	1	Step 3 : Repeat the same process for 10's , 100's, 1000's
					Step 4 : Write the sum
	1000 1000 1000	100	10	1	
	1000 1000	100	10		

TH	H	T	U	
1	1	1		
6	6	7	8	→ Carry-over
1	5	5	3	
8	2	3	1	

Assessment



Sample Tasks: Base ten blocks, Play Money , Abacus

- Represent two four digit numbers (ex: 5427 and 3763) and find the sum; also give word problems.
- Represent five-digit numbers (ex: 24798 and 36587) using Abacus, and find the sum.
- Ask children to add 1 to 9999.
- Solve problems (ex: 1304 + 4896; 7250 + 2779; 9999+1111); in Square Line Book ; also using standard algorithm and Grids

Observations:

- Can the child regroup all digits correctly?
- Does the child always start from the units place?
- Does the child remember to take note of the carry-over number?

Subtraction

Learning objective: To subtract a smaller number from a larger number without borrowing

TLM: Base Ten Blocks, Play Money, Abacus, Place Value Mat.

1. Subtraction using Base Ten Blocks on Place Value Mat

Ex : $1874 - 423$

Step1 : 1874 : minuend

1000	100	10	1

423 : Subtrahend

Step2 : Start subtracting from unit's place and move left to ten's place; then to hundred's place and finally thousand's place

A Z Z

1000	100	10	1

Step 3: Take away the subtrahend . The blocks on the place value mat represent the difference

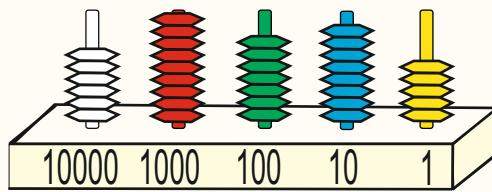
$$\begin{array}{r} 1874 \\ - 423 \\ \hline 1451 \end{array}$$

1000	100	10	1

2. Subtraction using Abacus . Ex : $69785 - 34241$

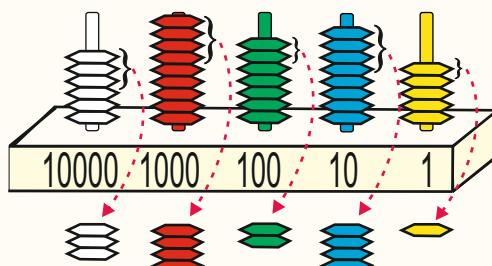
Step1:

69785 minuend
34241 subtrahend



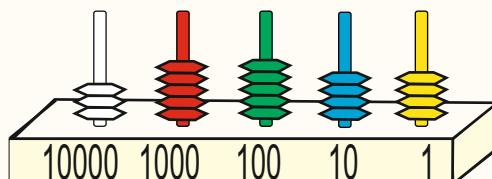
Step2:Start subtracting from unit's place (yellow rings) and move one place left at a time.

Z A Z A X



Step3: Take away the subtrahend. The rings on the abacus represent the difference

$$\begin{array}{r} 69785 \\ - 34241 \\ \hline 35544 \end{array}$$



3. Subtraction using Square Line Book and Grids Ex : 5792 - 4681

	Th - 1000	H - 100	T - 10	U - 1	
Minuend	1960 1960	100 100	10 10 10	1	
	1960 1960	100 100 100	10 10 10	1	
	(1000)	100 (100)	10 10 (10)		
Subtrahend	1960 1960	100 100	10 10 10		
	1960 1960	100	10 10 10	1	
		100 100 100	10		
Difference					
	1000	100	10	1	
	1	1	1	1	

Step 1 : Represent the minuend.
 Below it represent the subtrahend

Step 2: Starting from units place, strike as many 1's from the minuend as in the subtrahend
 Circle the remaining 1's in the minuend and write below as the difference

Step 3 : Repeat the same process for 10's , 100's, 1000's

Step 4 : Write the difference

TH	H	T	U
5	7	9	2
4	6	8	1
1	1	1	1

Difference

Assessment



Sample Tasks : With Base Ten blocks, Play money, abacus

a. Ask to find the difference between any two 5-digit numbers (ex: 61435 and 66879)

Give abacus for 5 digit numbers.

b. I have Rs 999 and have to give Rs 555 to my brother. How much is left with me?

c. Give two groups of Play Money (e.g. Rs 2717 and Rs 2610) . How much must be added and to which number, to make them equal?

Observations:

- i) Does the child know that only a smaller number can be subtracted from a bigger number
- ii) Does the child understand that subtraction is reverse of addition and uses addition facts for subtraction.
- iii) Does the child add the difference of the two numbers to the smaller number to make them equal?

Subtraction with borrowing

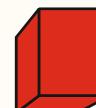
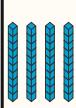
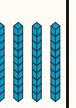
Learning objective: To subtract a smaller number from a larger number with borrowing

TLM: Base Ten Blocks, Play Money, Abacus, Place Value Mat.

1. Subtraction Using Base Ten Blocks on Place Value Mat Ex : 1392 - 863

Step 1 :

1392 minuend
863 subtrahend

1000	100	10	1
			

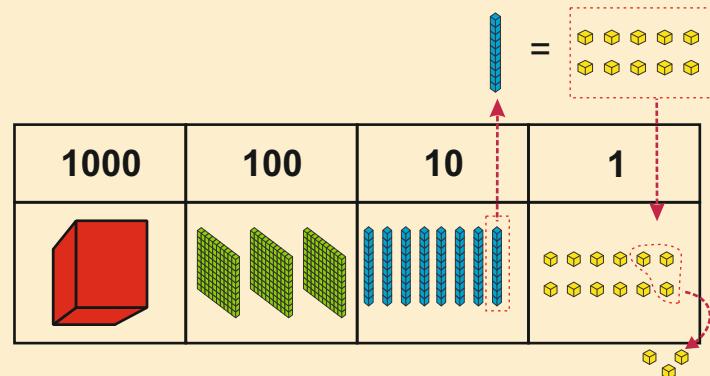
Step 2 : In the one's place the minuend has 2 ones.

The subtrahend has 3 ones. We cannot subtract 3 from 2 unless we borrow 1 ten and re-group as 10 ones.

We now have 12 ones (10+2) in the minuend.

Subtract 3 ones from 12. Keep them aside.

8 6 3

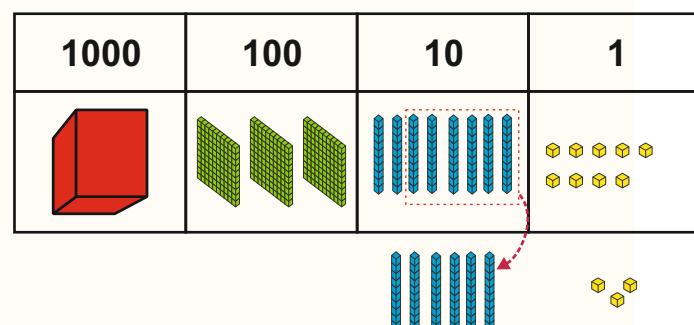


Step 3 : In the ten's place the minuend now has 8 tens.

The subtrahend has 6 tens. Subtract 6 from 8.

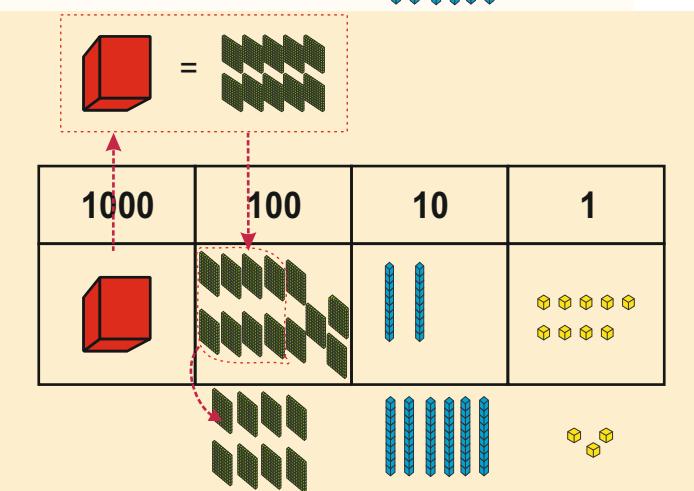
Keep 6 tens aside.

8 6 3



Step 4 : In the hundred's place the minuend has 3 hundreds. We cannot subtract 8 from 3 unless we borrow 1 thousand and re-group as 10 hundreds. We now have 13 hundreds (10+3) in the minuend. Subtract 8 hundreds from 13 hundreds. Keep 8 hundreds aside.

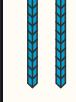
8 6 3



Step 5 : There are no thousands left in the minuend.

The subtrahend has no thousands. The subtraction process is complete. The base ten blocks on the place value mat give us the difference.

$$\begin{array}{r}
 1392 \\
 - 863 \\
 \hline
 529
 \end{array}$$

1000	100	10	1
			

2. Subtraction Using Play Money on Place Value Mat

Ex : 9471 - 7562

Step 1 :

9471 minuend
7562 subtrahend

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10 ₹ 10 ₹ 10	₹ 1

Step 2 : To subtract 2 ones from the minuend borrow 1 ten and re-group as ones. From 11 ones in the minuend (10+1) minus 2 ones; leaves 9 ones.

7562

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100	₹ 10 ₹ 10 ₹ 10 ₹ 10	₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

Step 3 : There are 6 tens left in the minuend. 6 tens minus 6 tens leaves zero.

7562

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100		₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

Step 4 : To subtract 5 hundreds from the minuend, borrow 1 thousand and re-group as hundreds.
14 hundreds (10+4) minus 5 hundreds; leaves 9 hundreds.

7562

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100		₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

Step 5 : There are 8 thousands in the minuend. Take away 7 thousands, which leaves 1 thousand.

7562

1000	100	10	1
₹ 1000 ₹ 1000 ₹ 1000 ₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100		₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

Step 6 : The Play Money on the mat gives the difference

$$\begin{array}{r}
 9471 \\
 - 7562 \\
 \hline
 1909
 \end{array}$$

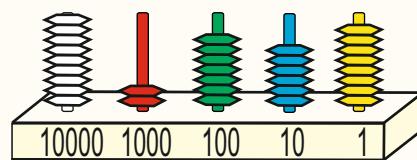
1000	100	10	1
₹ 1000	₹ 100 ₹ 100 ₹ 100 ₹ 100 ₹ 100		₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1 ₹ 1

1 9 0 9

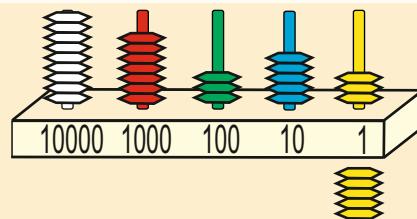
3. Subtraction using Abacus Ex : 92768 - 63825

Step 1 :

$$\begin{array}{r} 92768 \text{ minuend} \\ - 63825 \text{ subtrahend} \end{array}$$

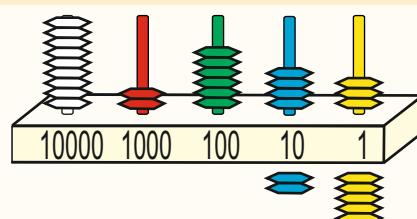


Step 2 : Subtract 5 ones from 8 ones of the minuend, keep 5 yellow rings aside



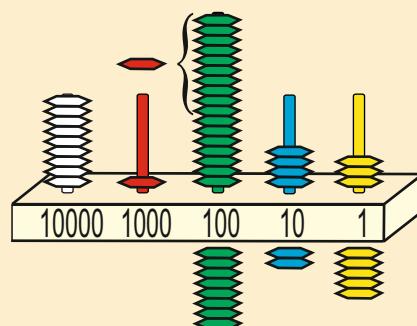
63825

Step 3 : Subtract 2 tens from 6 tens of the minuend, keep 2 blue rings aside



63825

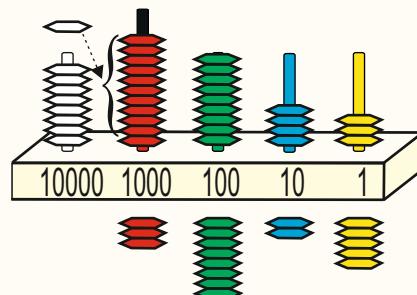
Step 4 : We cannot subtract 8 hundreds from 7 hundreds of the minuend, unless we borrow 1 red ring and re-group as 10 green rings (Add snap-on rod in 100's place). Subtract 8 hundreds from 17 hundreds; keep 8 green rings aside



63825

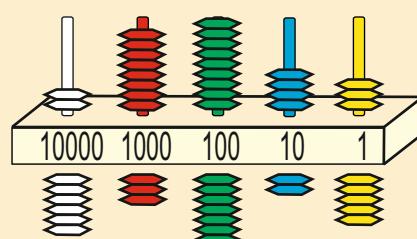
Step 5 : We have 1 thousand in the minuend. We cannot subtract 3 thousands from 1 thousand unless we borrow one white ring of 1 thousand and re-group as 10 red rings.(Add snap-on rod). Subtract 3 thousands from 11 thousands, and keep them aside.

63825



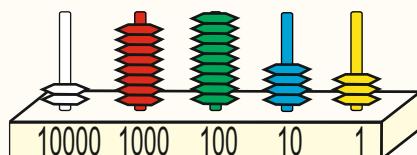
Step 6 : We have 8 rings of ten - thousand in the minuend. Subtract 6 ten thousand rings from 8 ten - thousands rings. Keep 6 white rings aside.

63825



Step 7 : Move away all the rings that were kept aside. Look at the rings on the abacus, count them. Write down the difference.

$$\begin{array}{r} 92768 \\ - 63825 \\ \hline 28943 \end{array}$$



4. Subtraction with borrowing using Square Line Book and Grids .

Ex : 9471 - 7562

Borrow box	Th - 1000	H - 100	T - 10	U - 1
Minuend	1000 1000 1000	100 100	10 10 10	1 1 1 1 1 1 1 1 1 X
Subtrahend	1000 1000 1000	100 100	10 10	X
Difference	1000	100 100 100		1 1 1
		100 100 100		1 1 1
		100 100 100		1 1 1
	1	9	0	9
				Difference

Step 1 : Represent the two numbers

Step 2: Starting from units place strike as many 1's from the minuend as in the subtrahend. If there are less 1's then borrow 1 ten. Cross this ten with a X

Re-group and write ten 1's in the borrow box of units place . Circle and count the remaining 1's in the minuend and write that as the difference

Step 3 : Repeat the same for 10's , 100's, 1000's

Step 4 : Write the difference

Th	H	T	U
8	14	6	11
X	A	Z	X
7	5	6	2
1	9	0	9

Assessment



Sample Tasks :With Base ten blocks, Play Money , Abacus

- Using TLM ask a child to represent two four digit numbers (ex; 9462 and 4758) and find the difference. Use Abacus for 5 digit numbers (ex: 64503 and 40735)
- Ask children to subtract 1 from 10000
- Solve subtraction sums requiring borrowing on square line book; and using standard algorithm. (ex: 9876-5882; 7285-5287; 48635-37728; 90456-56370)

Observations:

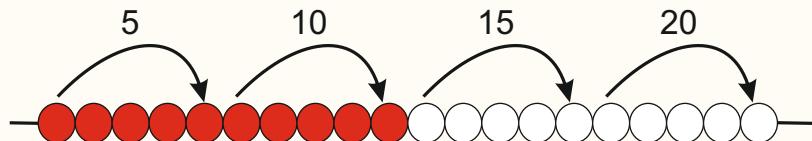
- Does the child understand the need to borrow from the next higher digit?
- Does the child handle zero confidently?
- Does the child always start form the unit's place?
- Does the child write numbers in correct place value and vertical alignment?

Multiplication

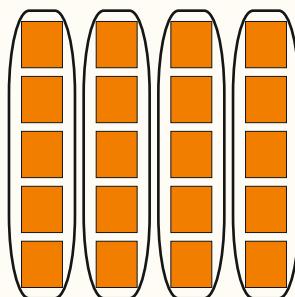
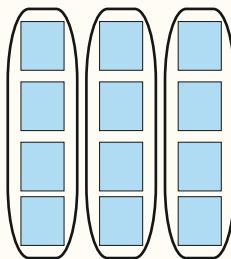
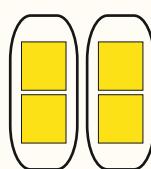
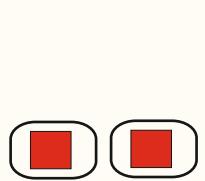
Learning Objective: Multiplication concept and multiplication of two numbers.

TLM: Square Counters, Base Ten Blocks, Play Money, Number line

1. Skip counting: Using number line show skip counting for different numbers. **Example : 5**



2. Multiplication as repeated addition a) Using **Square Counters**.



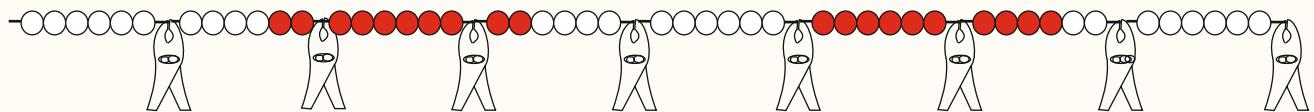
Ex : 1×2

Ex : 2×2

Ex : 4×3

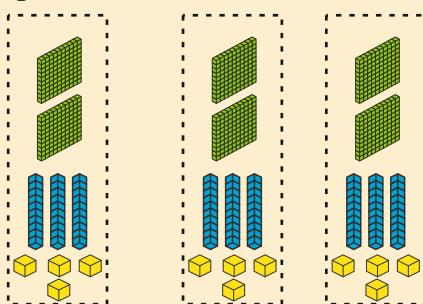
Ex : 5×4

b) Multiplication as repeated addition Using **Number Line**. **Example : 6**

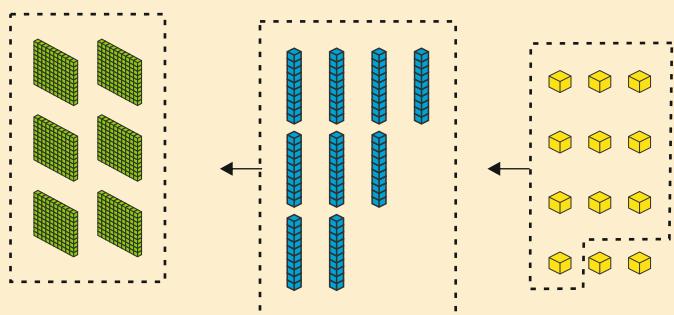


c) Using **Base Ten Blocks** Example : 234×3

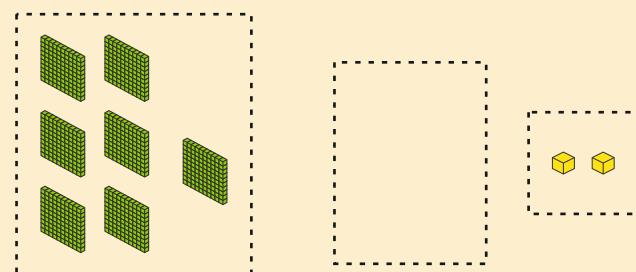
Step 1 :



Step 2: After repeated addition.



Step 3: On re - grouping ten units make 1 ten. And 10 tens re-group to make one hundred.



Step 4: Product :

7

0

2

d) Multiplication using **Play Money** and repeated addition. Example : 464×4

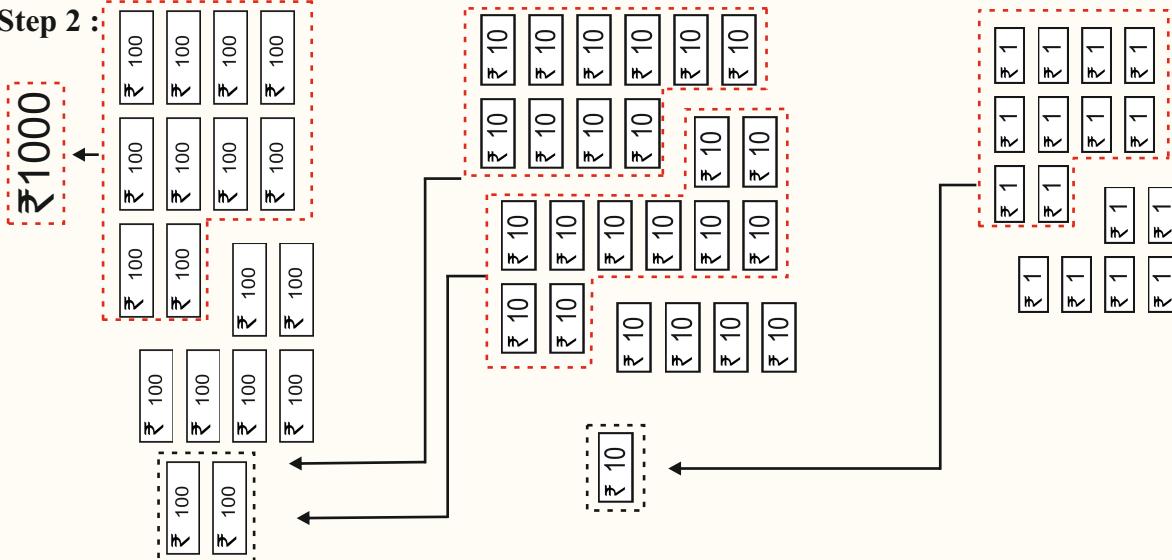
Step 1 :

$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			

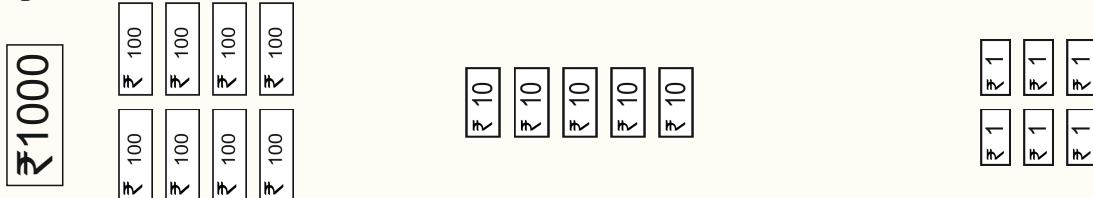
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			

$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			
$\text{₹ } 100$	$\text{₹ } 100$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 10$	$\text{₹ } 1$	$\text{₹ } 1$			

Step 2 :

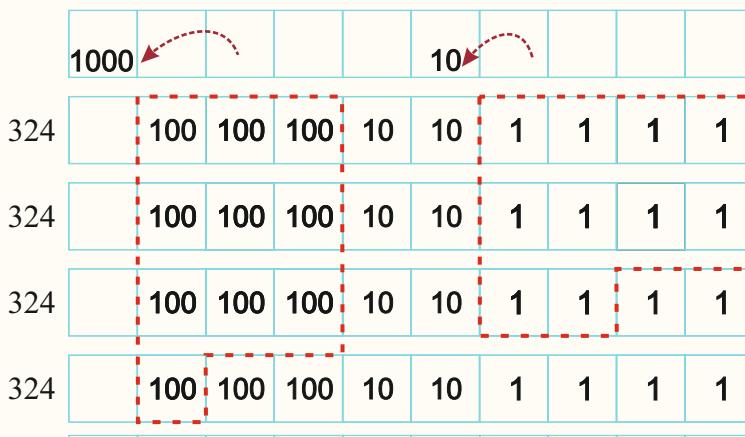


Step 3 :



After regrouping we get $464 \times 4 = 1856$

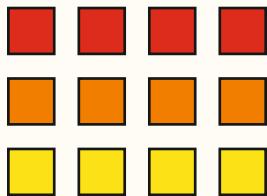
e) Multiplication as repeated addition Using **Square Line Book**. Example : 324×4



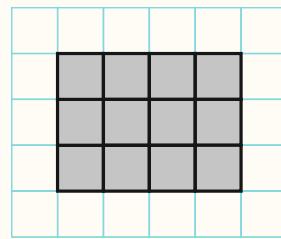
On regrouping 1 2 9 6 $324 \times 4 = 1296$

Multiplication as a rectangle with rows and columns, Example: 3x4

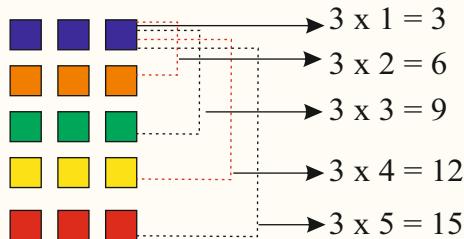
a) Using : **counters: 3 rows x 4 columns**



b) Using **Square Line Book: 3 x 4**



c) Creating multiplication table
for example 3 times table



d) Using **Square Line Book**

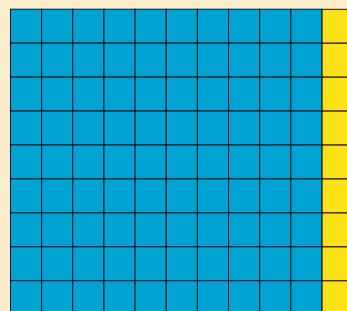
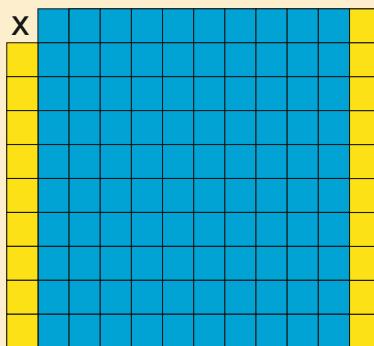
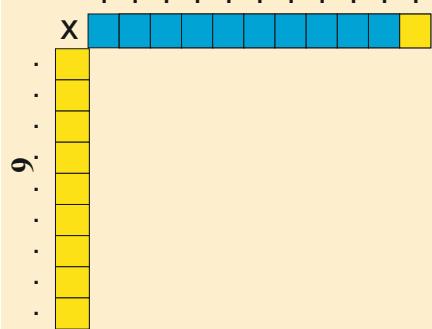
3 x 0 = 0
3 x 1 = 3
3 x 2 = 6
3 x 3 = 9
3 x 4 = 12
3 x 5 = 15
3 x 6 = 18
3 x 7 = 21
3 x 8 = 24
3 x 9 = 27
3 x 10 = 30

3 zero times	=	0
3 once	=	3
3 two times	=	6
3 three times	=	9
3 four times	=	12
3 five times	=	15
3 six times	=	18
3 seven times	=	21
3 eight times	=	24
3 nine times	=	27
3 ten times	=	30

6. Multiplication by 1 digit and 2 digit numbers using **Area** method with **Base Ten Blocks**.

a . Example : 11×9 (one blue rod and 1 yellow cube to represent 11 and 9 yellow cubes to represent 9).

$10 + 1$



Step 1 : Place the multiplier 11 and multiplicand 9
(These are marked in the diagram by a dotted line)

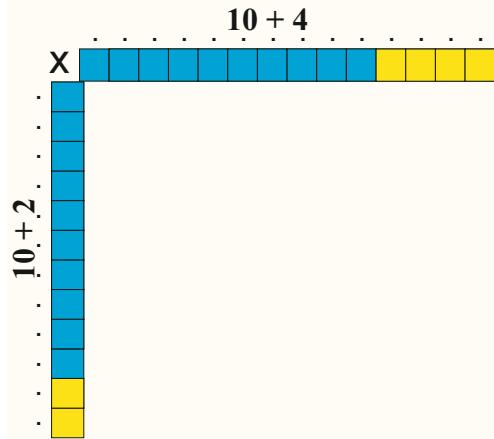
Step 2 : Fill the area inside the rectangle with suitable Base Ten Blocks

Step 3 : Remove blocks representing multiplier 11 and multiplicand 9 (dotted line) .

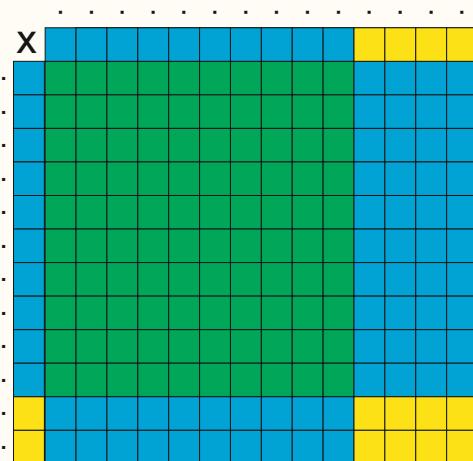
The number represented by the remaining Base Ten Blocks is the product; $11 \times 9 = 99$

b. Example : 14×12 Multiplication of 2 digit number by 2 digit number using Area method
 ($14 =$ one blue rod and 4 yellow cubes; $12 =$ 1 blue rod and 2 yellow cubes) marked in the diagram by a dotted line.

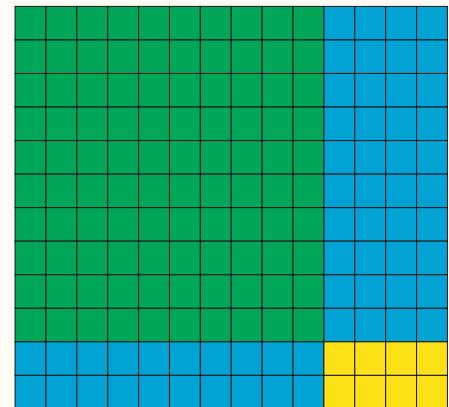
Step 1 :



Step 2 :



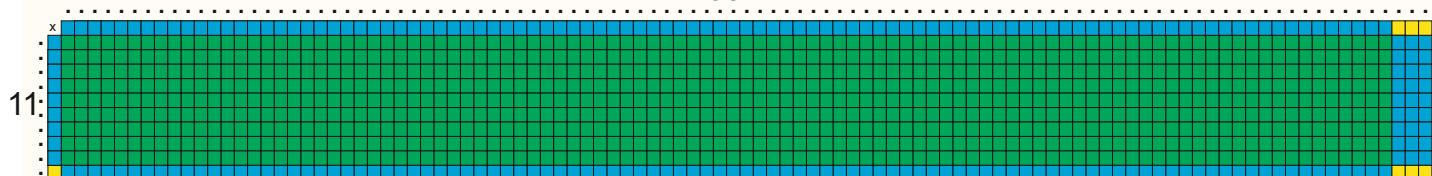
Step 3 :



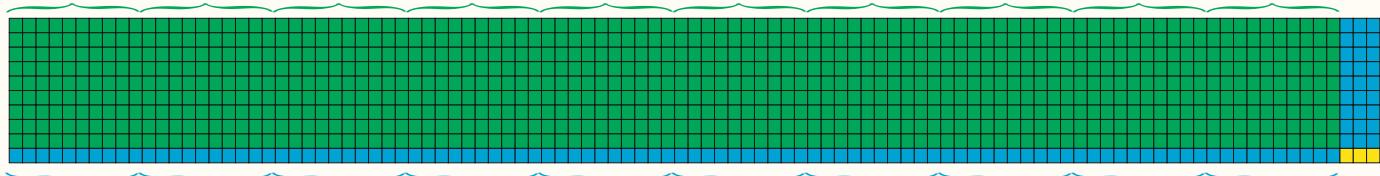
$$14 \times 12 = 168$$

c. Example : 103×11 ($103 =$ Ten blue rods and 3 yellow cubes; $11 =$ 1 blue rod and 1 yellow cube)

Step 1 :



Step 2 :

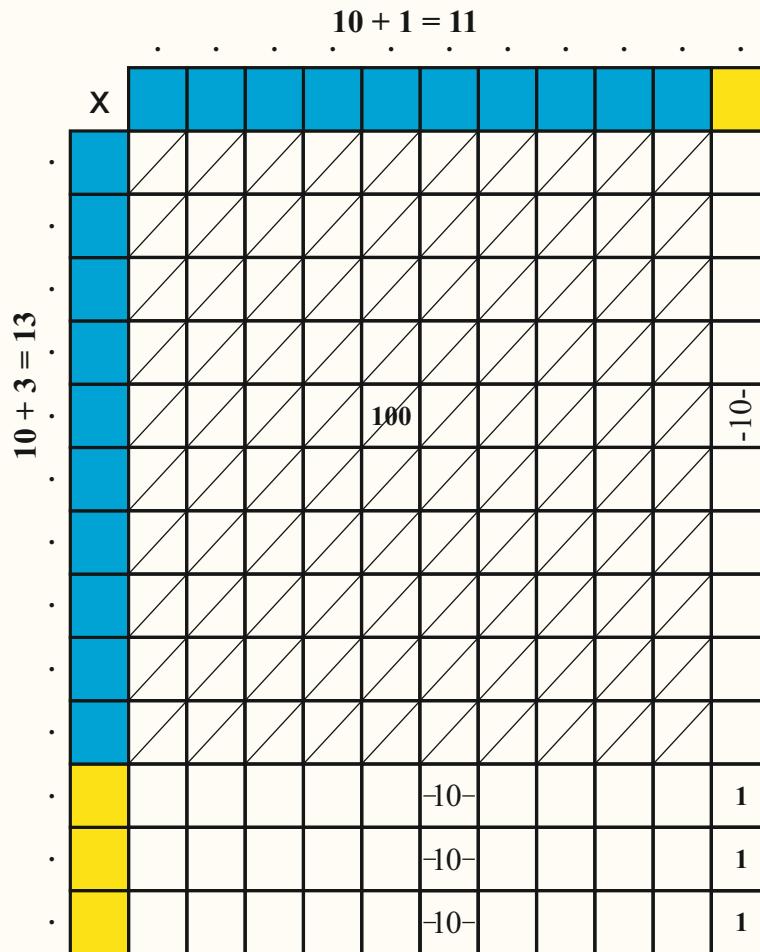


Product $103 \times 11 = 1133$, made up of 10 green plates of hundred ; 13 blue rods of tens ; and 3 yellow cubes of units.

(Note : Use only tens rods and unit cubes)

5. Multiplication using Square Line Book and Grids. Example : 11 x 13

Write 11 as $10 + 1$. Write 13 as $10 + 3$. Fill up the rectangle. Total the 100's, 10's and 1's to get the product.



H	T	U
	1	1
X	1	3
	3	3
1	1	0
1	4	3

13	X	10	1	11		
	3	30	3	=	33	
	10	100	10	=	110	
		11x	13	=	143	

Assessment



Sample Tasks: With Square Counters, Base Ten Blocks

- Ask a child to represent multiplication using counters or cubes. Eg. 8 times 3; and rearrange to show 3 times 8 is the same.
- If 4×14 is 56 what is 4×15 ?
- Can the child solve 18×4 ; 15×16 ?
- Solve 213×7 ; 206×7
- Ask the child to multiply a three digit number by a 2 digit number (ex: 345 by 62) using standard algorithm in square ruled book.

Observe:

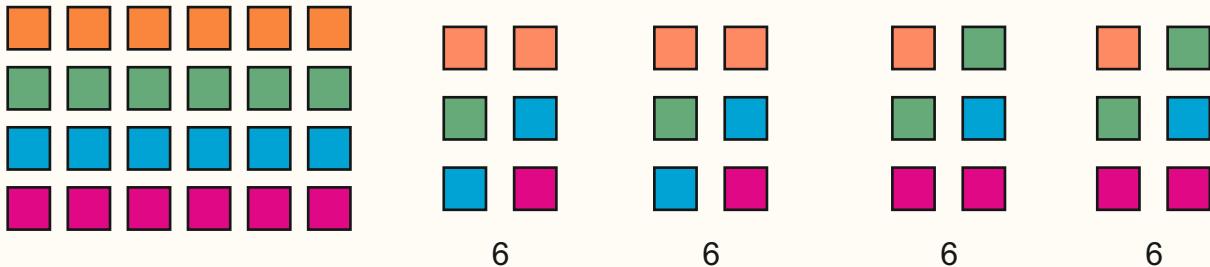
- Can the child differentiate between 8 groups of 3 and 3 groups of 8?
- Does the child understand that multiplication is repeated addition?
- Can the child find the products by breaking the larger number into hundreds, tens and ones?
- Has the child understood rules such as multiplying by zero?
- Has re-grouping by tens been done, when necessary?

Division

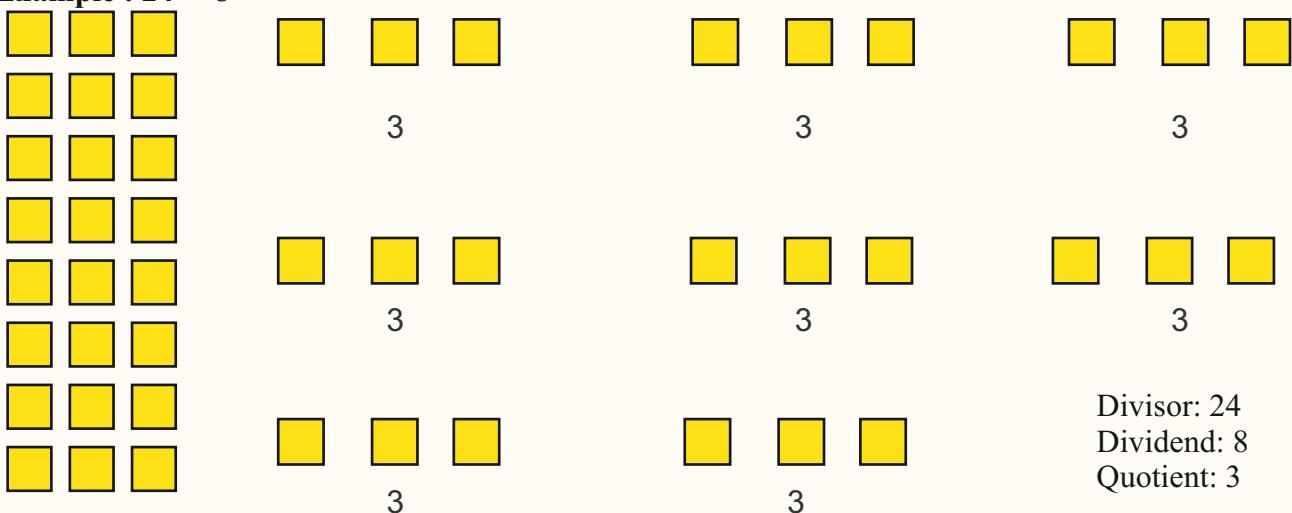
Learning objective: Division concept and division by 1 digit and 2 digit numbers

TLM: Square Counters, Base Ten Blocks, Play Money

1. Division by equal distribution **using Square Counters or Base Ten Yellow Cubes.** a. Example : $24 \div 4$



b. Example : $24 \div 8$

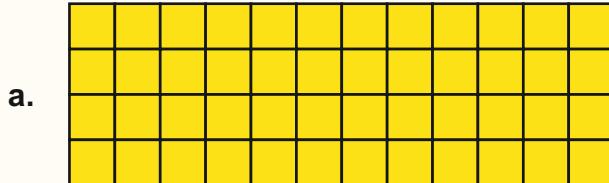


2. Show that Division and Multiplication are reversible using **Square Counters or Base Ten Yellow Cubes.**

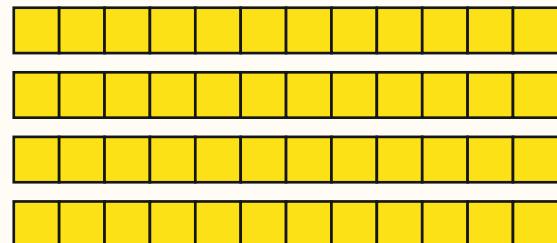
In Multiplication, number of rows are multiplied by the number of columns. The product 48 is a rectangle.

Example : 12×4 , where 4 rows are multiplied by 12 columns. In Division, the dividend 48 can be represented as a rectangle. Rows are the divisor(4 rows) the columns are the quotient (12 columns)

$$12 \times 4 = 48$$

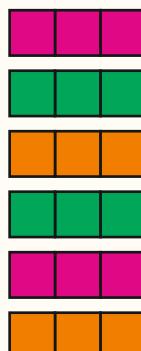


$$48 \div 4 = 12$$

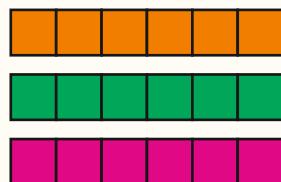


b.

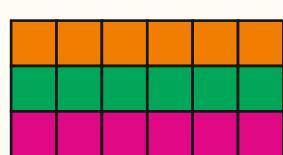
$$18 \div 3 = 6$$



$$18 \div 3 = 6$$



$$6 \times 3 = 18$$



b) Using Play Money Example : $405 \div 3$

3. Division using equal grouping.

a) Using **Base Ten Blocks** Example : $633 \div 3$

100	10	1
6	3	3

Step 1 :
expand the dividend

Step 2 : Make 3 boxes to represent divisor and distribute equally, starting with 100's, then 10's, 1's.

100	10	1

211

100	10	1

211

100	10	1

211

Step 3 : Quotient is 211

Using Square Line Book

H	T	U			
2	1	1			
3	6	3	3		
	6	↓			
	0	3			
	3	↓			
	0	3			
	3				
	0				

Step 1 :

Expand and represent the dividend

100	10	1
₹ 100		
₹ 100		
₹ 100		
₹ 100		
	4	0
		5

Step 2 : Start from highest Place Value .
Divide four 100's into 3 parts.

100	10	1
₹ 100		

100	10	1
₹ 100		

100	10	1
₹ 100		

Step 3 : Exchange one remaining 100 for 10's
Distribute 10's equally into 3 parts.

100	10	1
₹ 100	₹ 10	

100	10	1
₹ 100	₹ 10	

100	10	1
₹ 100	₹ 10	

Step 4 : Exchange remaining 1 ten for ones. Add to existing 5 ones. Distribute 15 ones equally.

100	10	1
₹ 100	₹ 10	₹ 1 ₹ 1

100	10	1
₹ 100	₹ 10	₹ 1 ₹ 1

100	10	1
₹ 100	₹ 10	₹ 1 ₹ 1

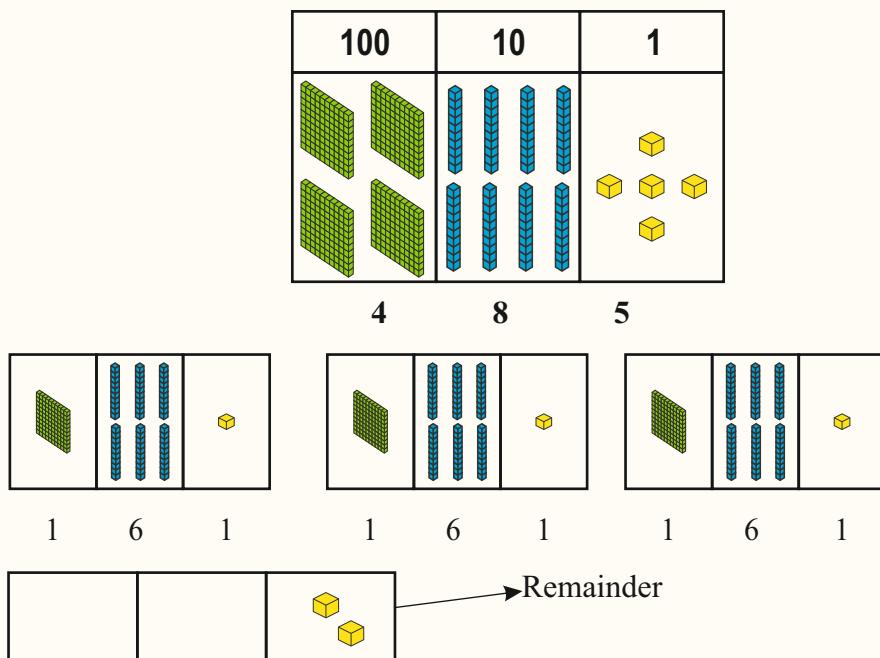
Step 5 : Quotient is 135.

Using Square Line Book

H	T	U			
1	3	5			
3	4	0	5		
	3	↓			
	1	0			
	9	↓			
	1	5			
	1	5			
	0				

4. Division with remainder.

a) Using Base Ten Blocks Example : $485 \div 3$



Using Square Line Book

Long division on paper follows the same steps as with Base ten blocks or Play money.

1. Always start division from the highest place value.
2. Distribute equally among the divisor.
3. Exchange the remainder for next lower value.
4. Move one step right and bring down the next digit, as shown by the arrow.
5. Continue with equal distribution.
6. Continue till you get the quotient, and remainder if any.
7. Verify the answer as shown in the table below.

	H	T	U
1	6	1	
3)	4	8	5
3			
	1	8	
	1	8	
	0	0	5
			3
			2

→ Remainder

Verification table

Problem	Dividend	Divisor	Quotient	Reminder	Divisor x Quotient + Remainder = Dividend
$9 \div 2$	9	2	4	1	$2 \times 4 = 8 + 1 = 9$
$30 \div 7$	30	7	4	2	$7 \times 4 = 28 + 2 = 30$
$405 \div 3$	405	3	135	0	$3 \times 135 = 405 + 0 = 405$
$485 \div 3$	485	3	161	2	$3 \times 161 = 483 + 2 = 485$

4. Division with remainder.

b) Using Play Money. Example : $5107 \div 3$

1000	100	10	1
₹ 1000			₹ 1 ₹ 1
₹ 1000			₹ 1 ₹ 1
₹ 1000		₹ 100	₹ 1 ₹ 1
₹ 1000			₹ 1
₹ 1000			

5 1 0 7

₹ 1000	₹ 100 ₹ 100		₹ 1
	₹ 100 ₹ 100		₹ 1
	₹ 100 ₹ 100		₹ 1
	₹ 100		

1 7 0 2

₹ 1000	₹ 100 ₹ 100		₹ 1
	₹ 100 ₹ 100		₹ 1
	₹ 100 ₹ 100		₹ 1
	₹ 100		

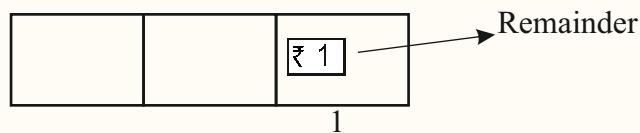
1 7 0 2

₹ 1000	₹ 100 ₹ 100		₹ 1
	₹ 100 ₹ 100		₹ 1
	₹ 100 ₹ 100		₹ 1
	₹ 100		

1 7 0 2

Using Square Line Book

	Th	H	T	U
	1	7	0	2
3)	5	1	0	7
	3			
	2	1		
	2	1		
	0	0	0	
			0	7
				6
				1



Assessment

Sample Tasks: With Counters, Play Money, Base Ten Blocks

- How will 17 sweets be divided between 3 children? Can it be divided equally?
- Ask children to solve $806 \div 6$; $963 \div 3$; $1645 \div 4$; $4610 \div 7$.
- Solve the problems in a notebook using standard algorithm.

Observations:

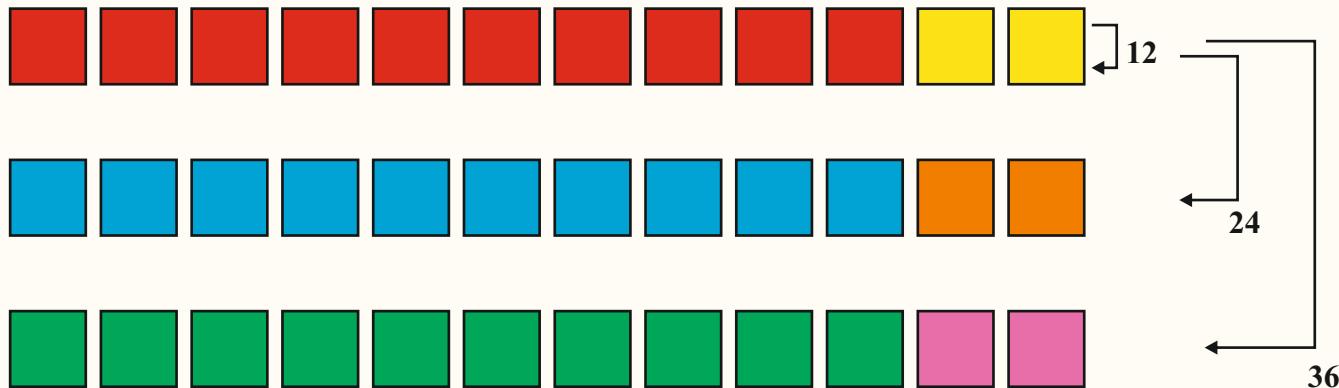
- Can the child proceed with division in the correct direction by starting from the highest place and not the ones place?
- Can the child bring down the other numbers correctly?
- Does the child understand that division is repeated subtraction?
- Can the child identify the divisor and dividend and write correctly?
- Does the child realize the importance of zero, as a place holder?
- Does the child identify the 'remainder'?
- Does the child understand the need for re - grouping ?

Factors and multiples

Learning objective: Finding factors and multiples of a given number

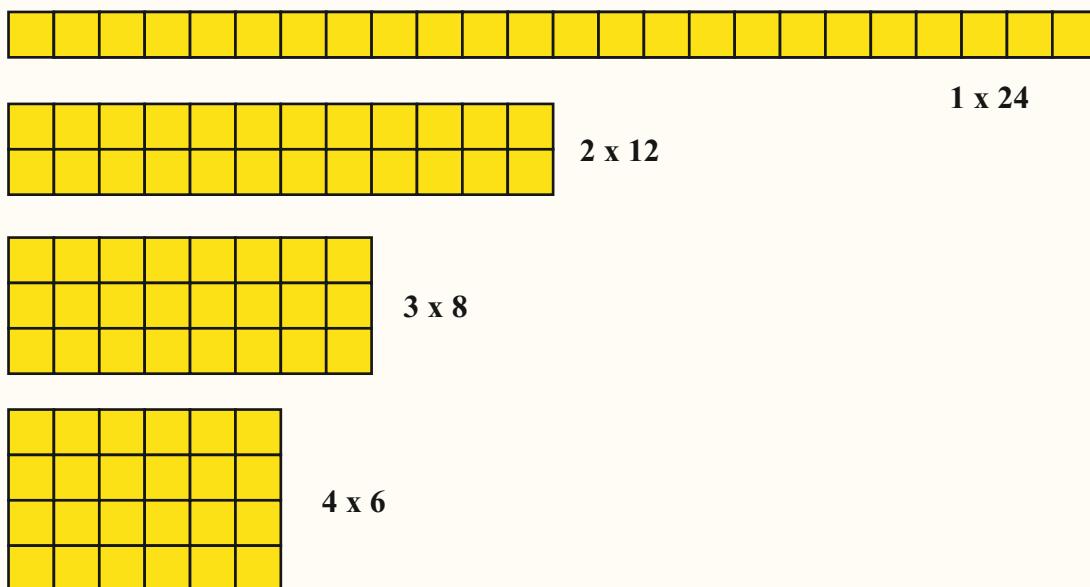
TLM: Square Counters, Base Ten Blocks

1. Multiples of a number using **Square Counters** or **Base Ten Cubes**. Example : Multiples of 12 are 12; 24; 36 and so on



2. Factors of a number using **Square Counters** or **Base Ten Cubes**.

Example : The factors of 24 are 1, 24, 2, 12, 3, 8, 4, 6



Assessment

Sample Tasks : With Counters, Base Ten Blocks.

- Ask children to represent multiples of any number (**Example :** 7)
- Ask children to find factors of a number (**Example :** 36)

Observations :

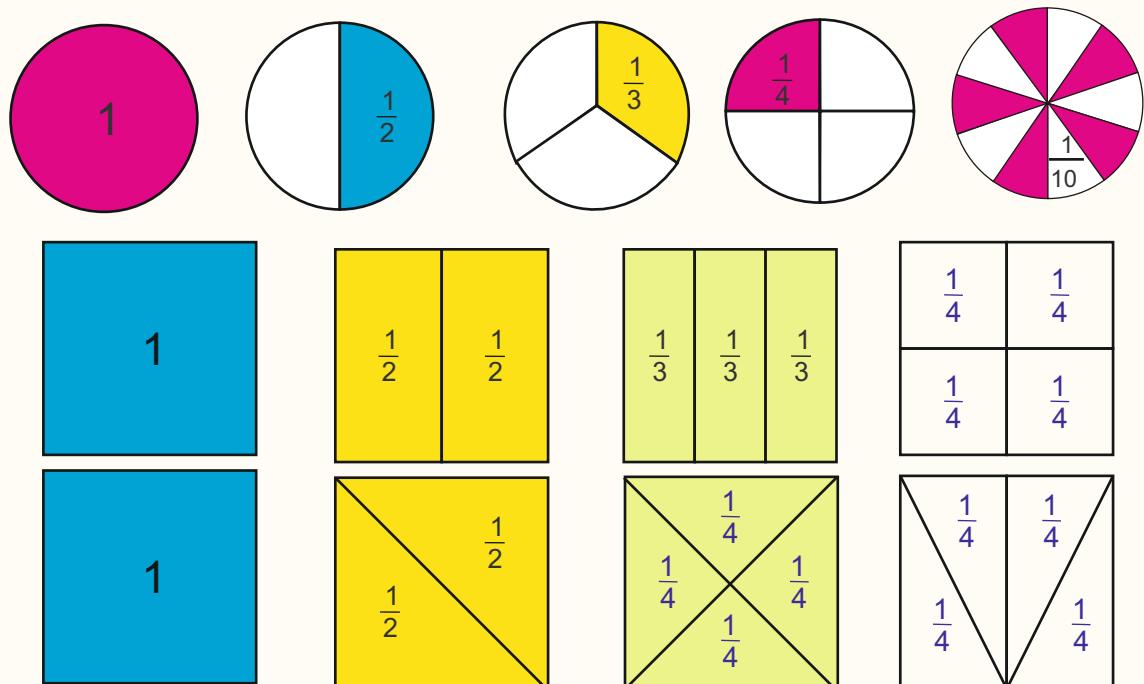
- Check if the child understands the difference between factors and multiples.
- Check if the child uses multiplication in rectangle concept to find factors and multiples.

Fractions

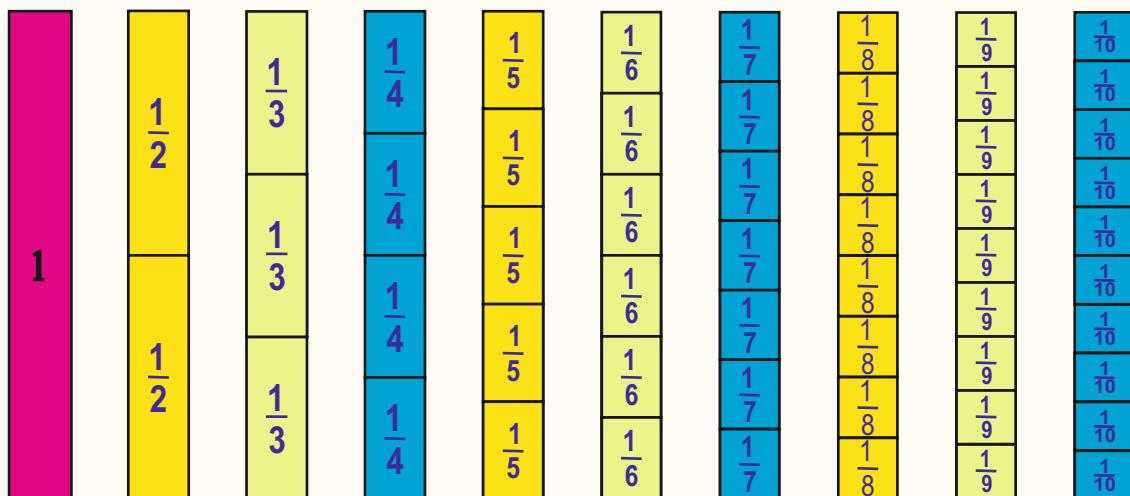
Learning Objectives: Understanding fractions and types of fractions

TLM: Fractions Shapes, Fraction Strips, Number Line, Clips, Volume Measure

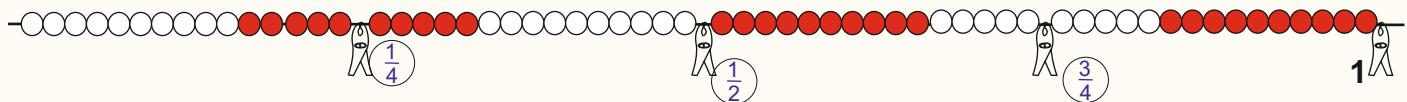
1. Fraction - a) Whole and parts using Fraction Shapes Any fraction can be written in two ways, for example as $\frac{1}{3}$ or 1/3. Here 3 is the total number of parts that the whole is divided into. It is called the Denominator. The number 1 which is above the line, shows the number of selected parts ; it is called the Numerator.



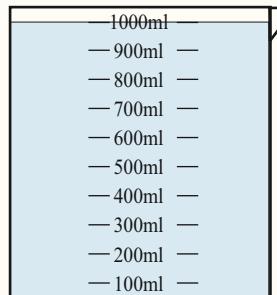
b) Using Fraction Strips



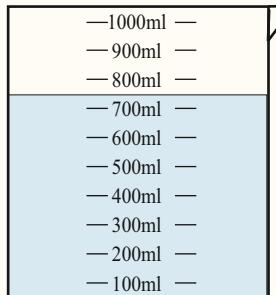
c) Using Number Line . For example where one whole = 60 beads



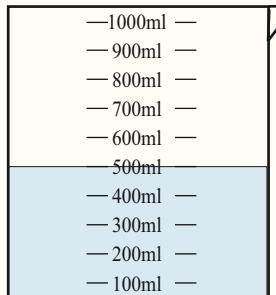
d) Using Volume Measure . One whole = 1000ml



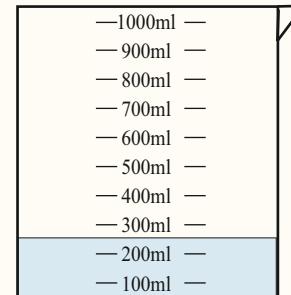
$$1 = 1000\text{ml}$$



$$\frac{3}{4} = 750\text{ml}$$

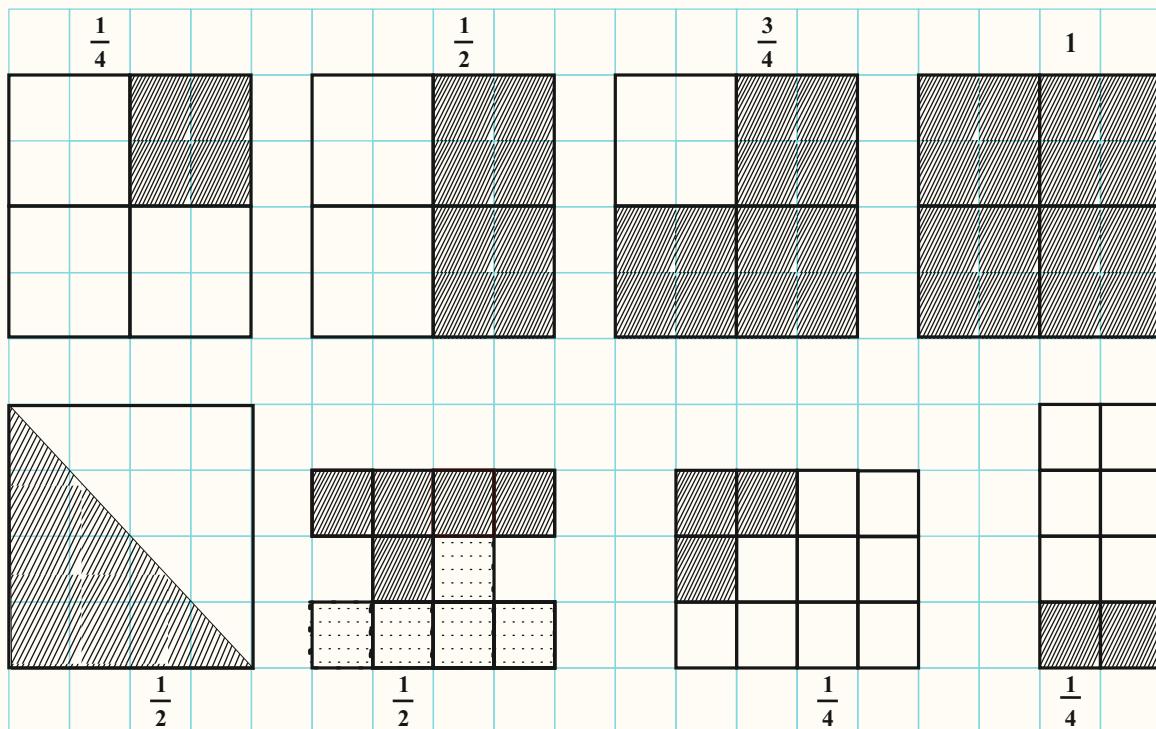


$$\frac{1}{2} = 500\text{ml}$$



$$\frac{1}{4} = 250\text{ml}$$

e) Using Square Line Book



2. Fractions - part of a collection a) Using Square Counters. Read as: Two-Fifteenth, for example.



$$\boxed{\textcolor{yellow}{\square}} = \frac{2}{15}$$

$$\boxed{\textcolor{magenta}{\square}} = \frac{3}{15}$$



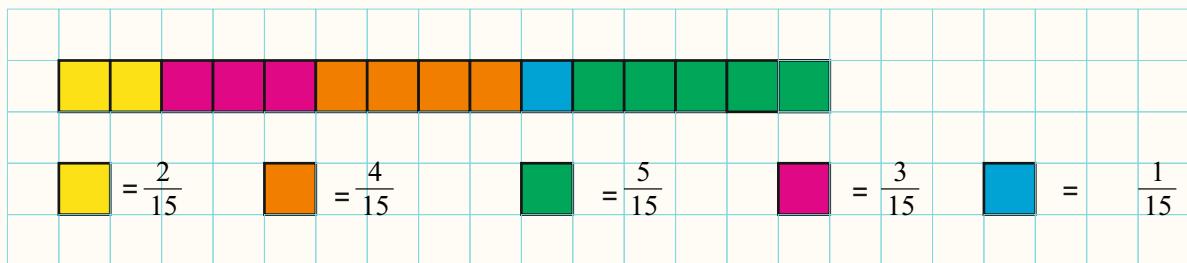
$$\boxed{\textcolor{blue}{\square}} = \frac{1}{15}$$



$$\boxed{\textcolor{orange}{\square}} = \frac{5}{15}$$

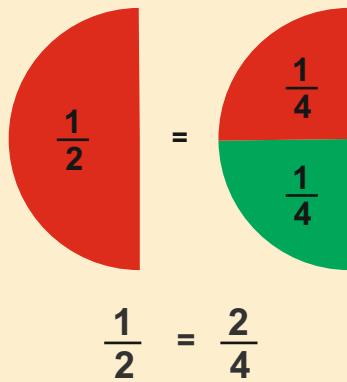
$$\boxed{\textcolor{green}{\square}} = \frac{4}{15}$$

b) Fractions - part of a collection using Square Line Book

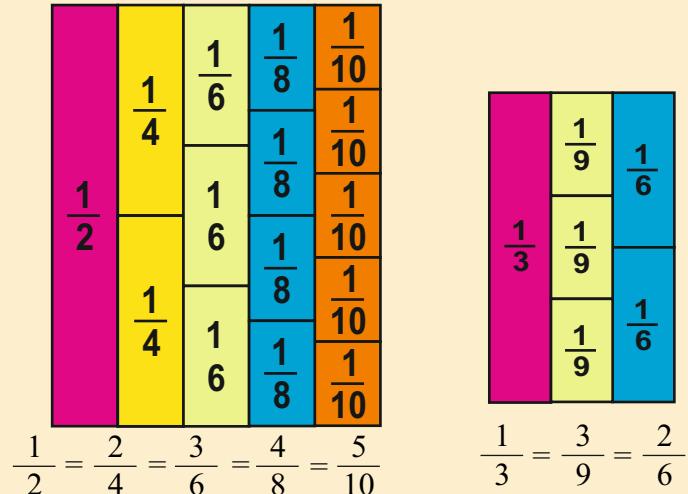


3. Equivalent fractions:

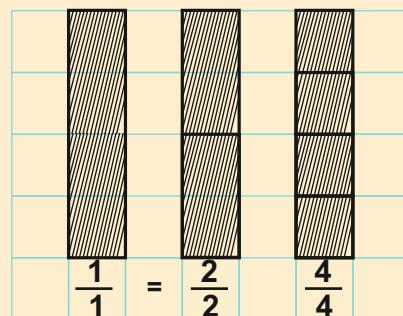
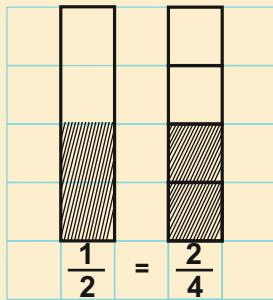
a). Using Fraction Shapes



b) Using Fraction Strips .

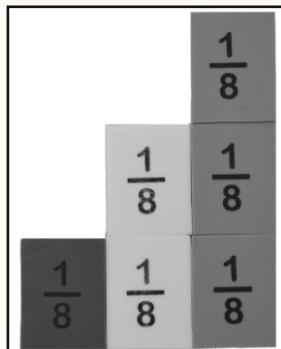


c) Equivalent fractions Using Square Line Book

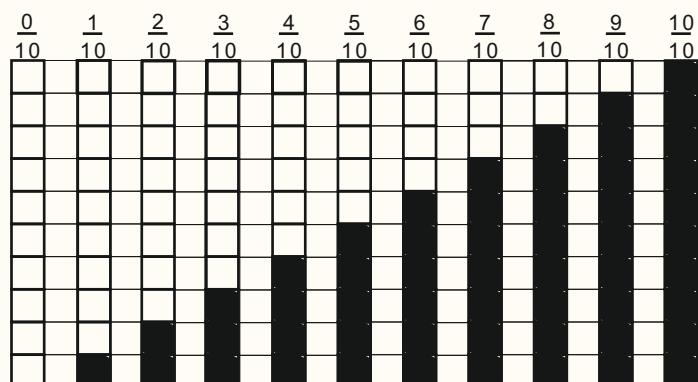


4. Comparison of Fractions with same denominator; the fraction with the smaller numerator is the smaller fraction.

a) Using Fraction Strips. Example $\frac{1}{8} < \frac{2}{8} < \frac{3}{8}$

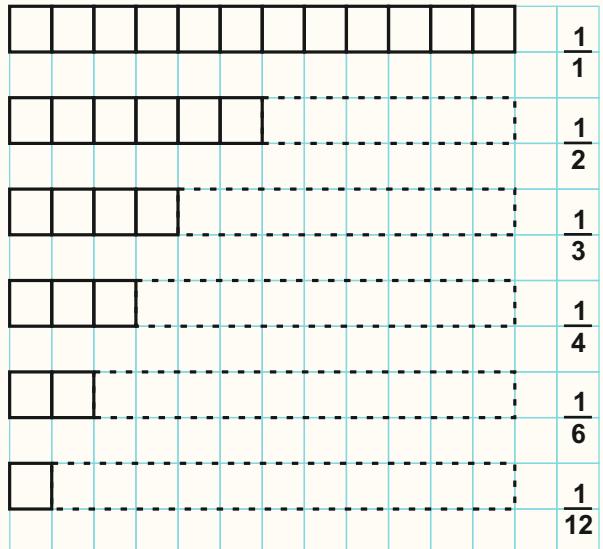
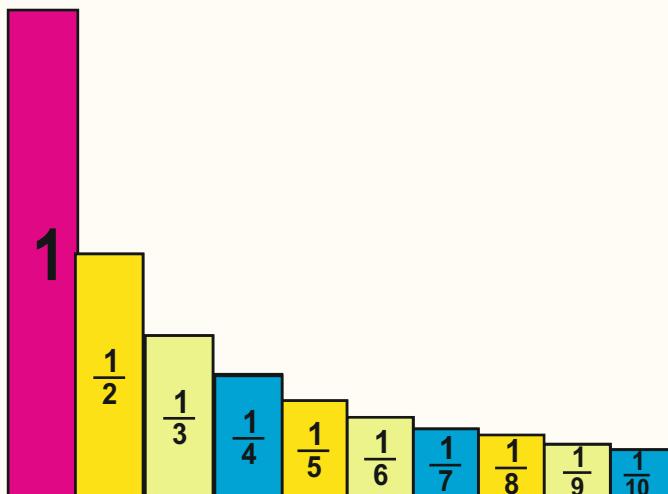


b) Using Square Line Book



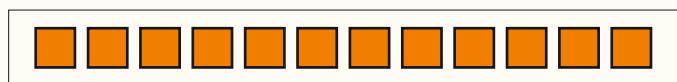
5. Comparison of Fractions with same numerator; the Fraction with the smaller denominator is the bigger fraction.

For example: $\frac{1}{2} > \frac{1}{8}$



6. Fractions as part of a collection, using counters. Find $\frac{2}{3}$ of 12.

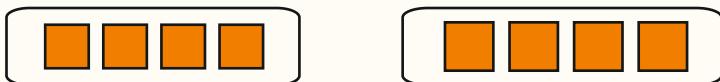
Step 1 :12 counters



Step 2 : Denominator in $\frac{2}{3}$ tells us that the whole is divided into 3 equal parts.



Step 3. Numerator in $\frac{2}{3}$ tells us that 2 of these parts are wanted. Hence $\frac{2}{3}$ of 12 = 8.



Assessment



Sample Tasks: With chalk, Fraction shapes, Fraction strips, Square Line Book

- Give 4 chalks to a child and ask her to divide this equally among three children.
- Ask the child to name the fraction $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ and place it along with the appropriate fraction strip.
- Show three circles divided into 2, 4 and 6 parts respectively. Ask child to shade half of each.
- Using Fraction strips ask children to give equivalents of various fraction like $\frac{1}{2}, \frac{1}{3}$ etc..
- Which is the greater fraction in each of the pairs: $\frac{1}{6}$ and $\frac{1}{8}$; $\frac{1}{7}$ and $\frac{2}{7}$ -Explain.

Observations:

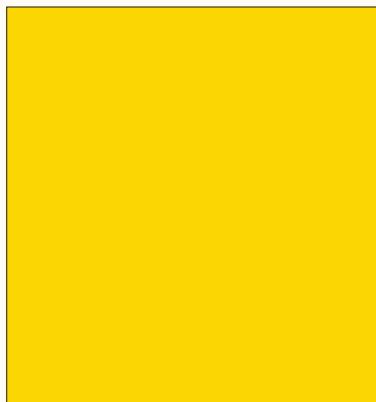
- Check if the child realizes that only 3 whole chalks can be shared. The fourth has to be broken.
- Can the child count how many equal parts the whole is divided into and represent it as the denominator of the fraction?
- Can the child visualize a fractional part being less than a whole?
- Can the child count how many equal parts are considered and represent it as the numerator of the fraction?
- Does the child understand that all parts of a fraction need to be equal?
- Does the child know the correct use of the signs “greater than >” and “< lesser than”?

Decimals

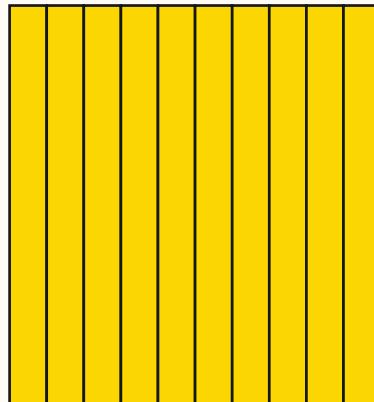
Learning objective: Understanding Decimals and their Place Value

TLM: Play Money, Decimal set, Decimal Place Value Strips.

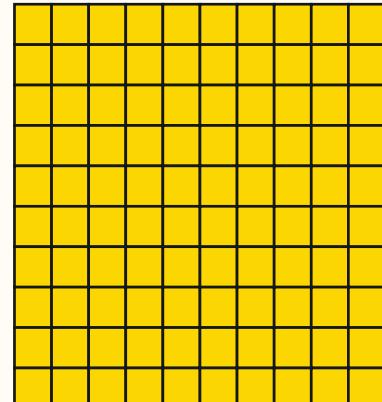
1) Using Decimal Set, Decimal place value strips. Decimals is one way of expressing fractions. Decimal fractions have denominators like 10, 100, 1000 and so on.



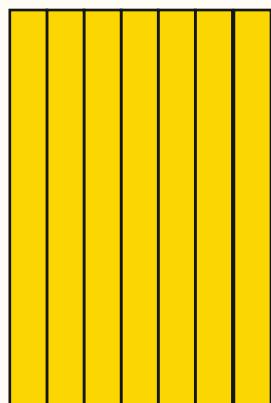
One whole 1



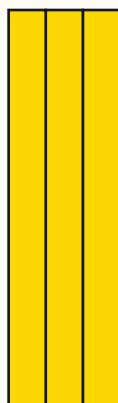
Whole cut into 10 equal parts;
each strip = $\frac{1}{10} = 0.1$



Whole cut into 100 equal parts;
each square = $\frac{1}{100} = 0.01$

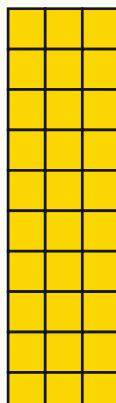


$$\frac{7}{10} = 0.7$$

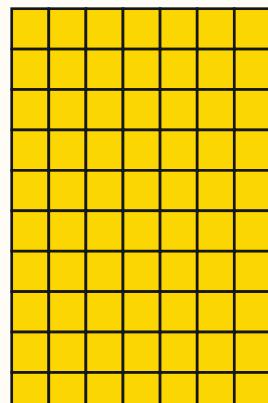


$$\frac{3}{10} = 0.3$$

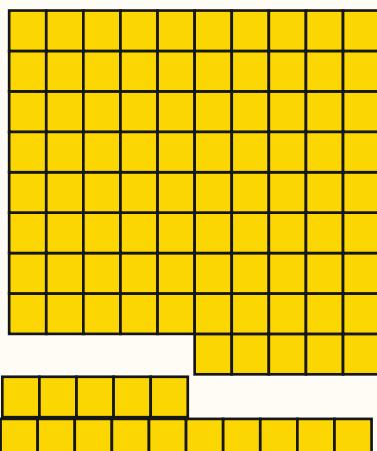
=



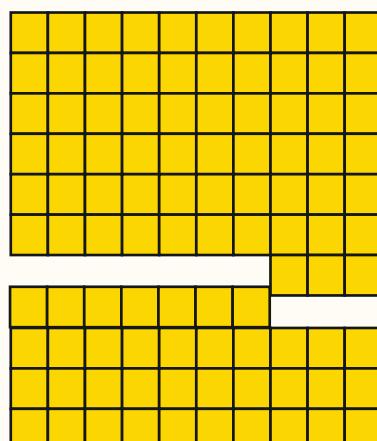
$$\frac{30}{100} = 0.30$$



$$\frac{70}{100} = 0.70$$



$$\frac{15}{100} = 0.15$$



$$\frac{37}{100} = 0.37$$

2) Using Play Money. Currency notes and coins.

₹ 1000	=	₹ 100	₹ 100
₹ 100		₹ 10	₹ 10
₹ 100		₹ 10	₹ 10
₹ 100		₹ 10	₹ 10
₹ 100		₹ 10	₹ 10

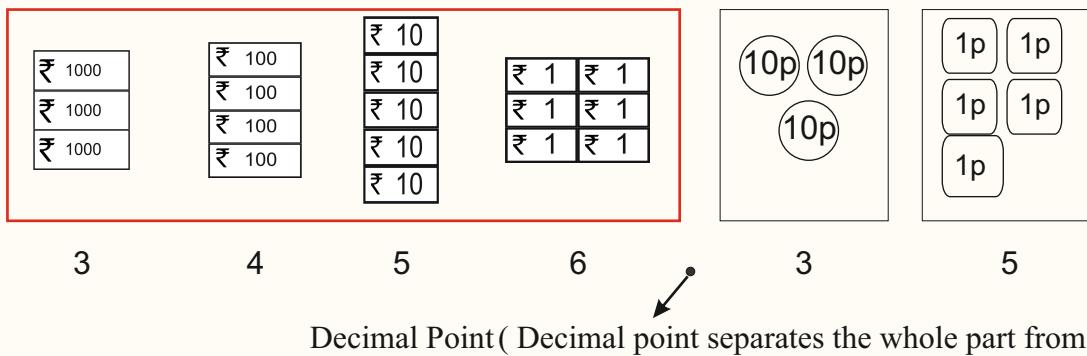
₹ 100	=	₹ 10	₹ 10
₹ 10		₹ 10	₹ 10
₹ 10		₹ 10	₹ 10
₹ 10		₹ 10	₹ 10
₹ 10		₹ 10	₹ 10

₹ 10	=	₹ 1	₹ 1
₹ 1		₹ 1	₹ 1
₹ 1		₹ 1	₹ 1
₹ 1		₹ 1	₹ 1
₹ 1		₹ 1	₹ 1

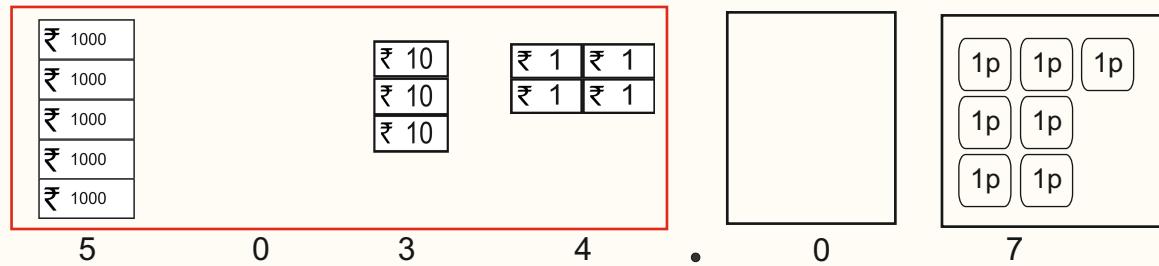
₹ 1	=	10p	10p
10p		10p	10p

10p	=	1p	1p
1p		1p	1p

a. Example : $3456 \frac{35}{100}$ or 3456.35

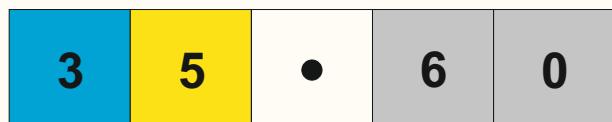


b. Example : $5034 \frac{7}{100}$ or 5034.07



3. Place value of decimal number using Decimal place value strips.

Example : 35.60



Digit	
3	30
5	5
6	$\frac{6}{10}$
0	0

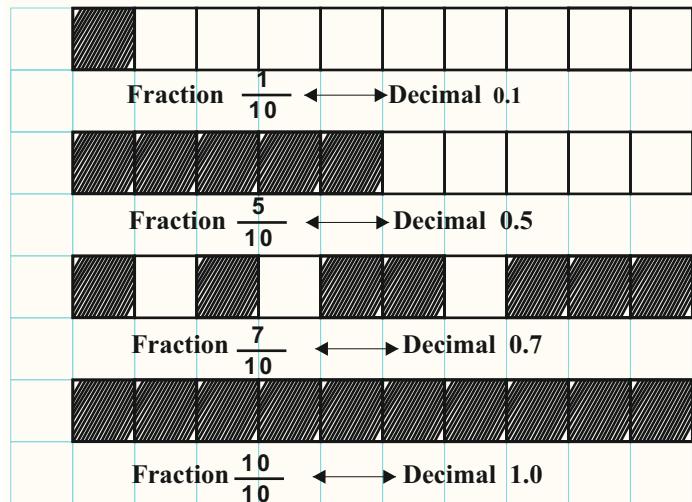
Example : 142.05



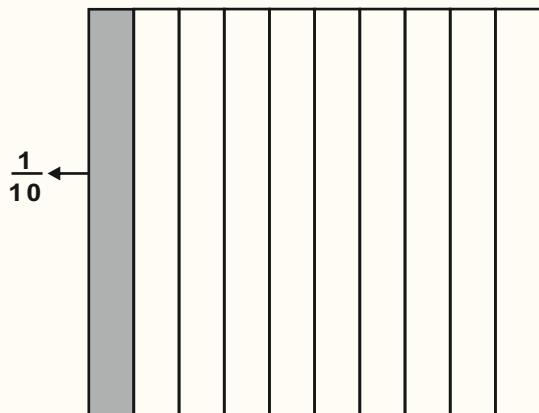
Digit	
1	100
4	40
2	2
0	0
5	$\frac{5}{100}$

4. Using Square Line Book.

a. Fraction and equivalent decimal

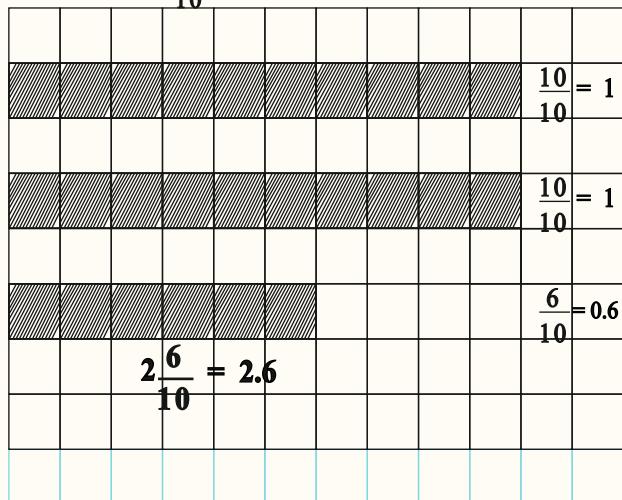


c. $\frac{1}{10} = 0.1$

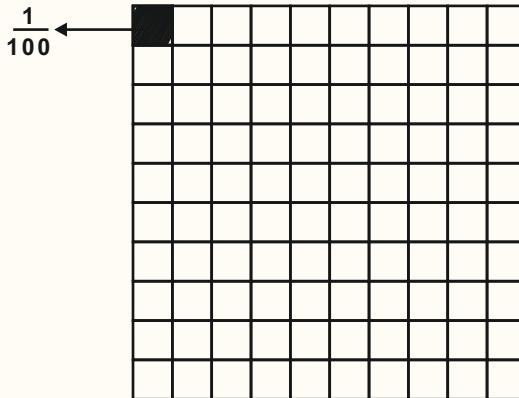


b. Expressing Mixed fraction in Decimals

Example : $2\frac{6}{10}$



$\frac{1}{100} = 0.01$



Assessment



Sample Tasks: With decimal set, 10 paise and 1 paise coins, Decimal place value strips.

- Ask children to represent $\frac{1}{10}, \frac{4}{10}, \frac{3}{100}, \frac{33}{100}$, using Decimal set.
- Ask children to write five hundred and twenty rupees and fifty paise using decimals
- Ask children to represent 5378.28, 3406.50 and 7027.07 first using Play Money then using Place value strips.

Observation:

- Can the child identify the tenths and hundredths place?
- Can the child relate to the decimal number as also being a fraction?
- Check if the child understands that $\frac{50}{100}$ and $\frac{5}{10}$ are same and explain the reason.
- Does the child understand the significance of the decimal point?
- Does the child understand that the place value of digits increases by 10s towards the left of the point. Place value of digits towards right reduces by 10s.

Money

Learning Objective: Money handling, Addition and Subtraction with money.

TLM : Play Money

1. Various denominations of money



₹ 1



₹ 2



₹ 5



₹ 10



₹ 50



₹ 100

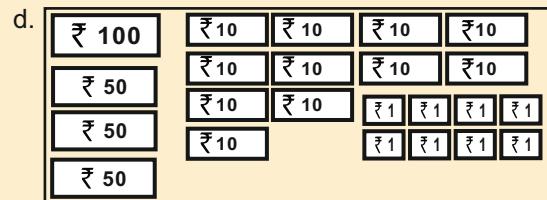
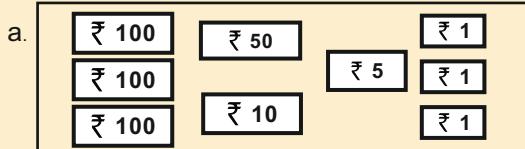


₹ 500

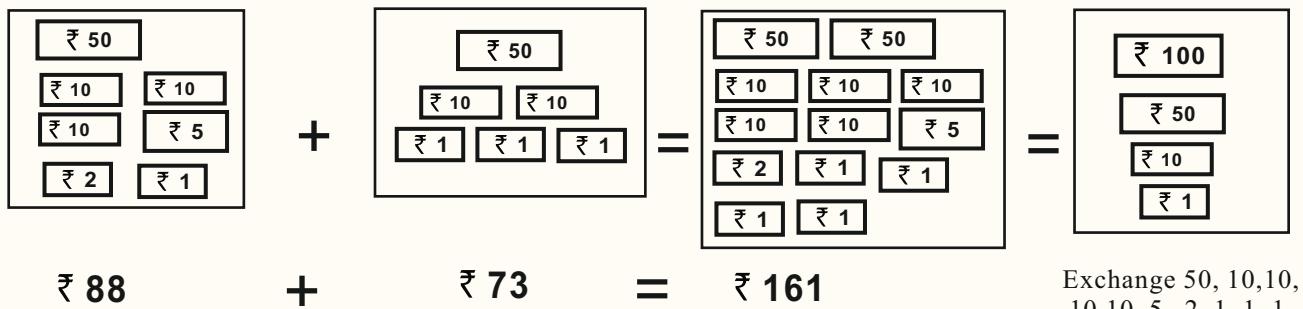


₹ 1000

2. Different ways to show an amount using Play Money. Example : Rs 368

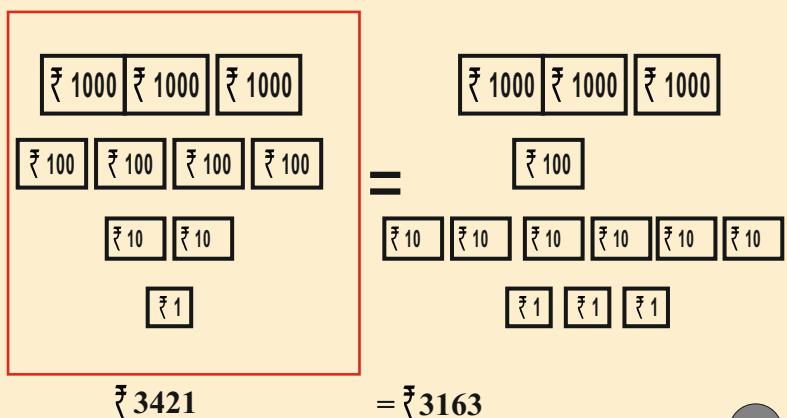
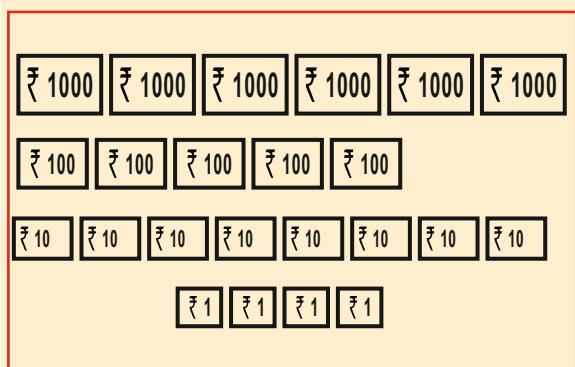


3. Sum : Two quantities of money put together gives the sum Example : Rs 88 and Rs 73



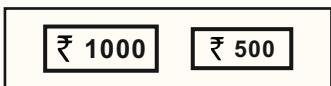
4. Difference : Giving away Play Money

a. Example : Rs 3421 from 6584



b . When Rs 768 has to be given away from Rs 1500.

Ramesh

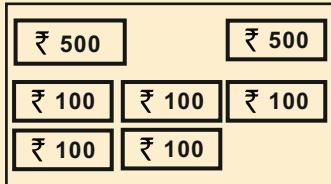


Ashok

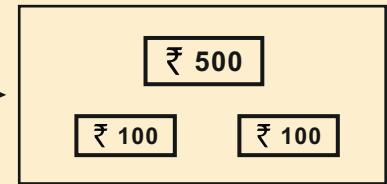
Step 1: Ramesh has Rs 1500
He has to give Rs 768 to Ashok



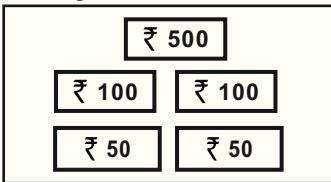
Exchange Rs 1000 for two notes of Rs 500
exchange Rs 500 for five notes of Rs 100



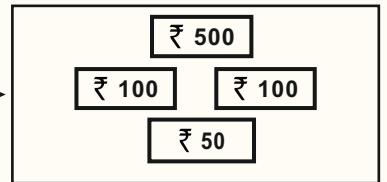
Step 2: Ramesh gives one note of Rs 500 and
two notes of Rs 100 to Ashok



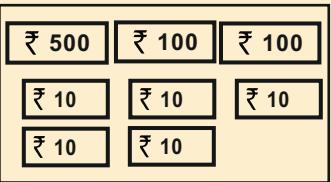
Exchanges Rs 100 for two notes of Rs 50



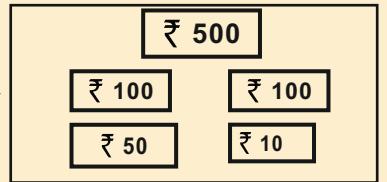
Step 3: Ramesh gives one note of Rs 50
to Ashok



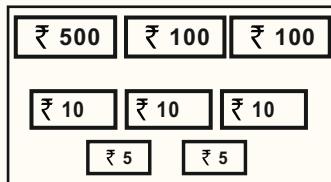
Exchanges Rs 50 for five notes of Rs 10



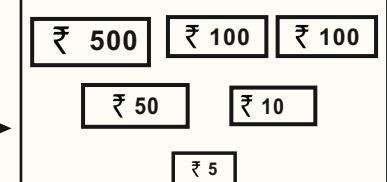
Step 4 : Ramesh gives one note of Rs 10
to Ashok



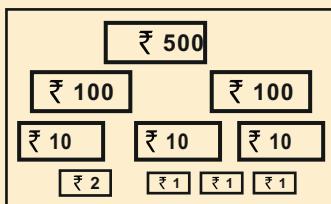
Exchange Rs 10 for two notes of Rs 5 notes



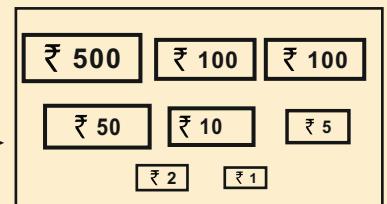
Step 5 : Ramesh gives one note of Rs 5
to Ashok



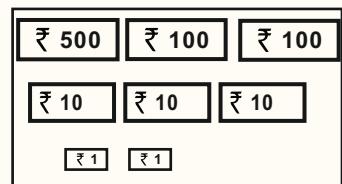
Exchange Rs 5 for one note of Rs 2 and three notes of Re 1.



Ramesh gives one note of Rs 2 and one note of
Rs 1 to Ashok



768



732

Now Ramesh has 732 and Ashok has 768

$$\text{Rs } 1500 - \text{Rs } 768 = \text{Rs } 732$$

3. Using Square Line Book

Sum and difference of money using square line book and grids.

a. Rs 3095 + Rs 4132

b. Rs 5164 - Rs 3952

Th	H	T	U
	1		
3	0	9	5
4	1	3	2
7	2	2	7

Th	H	T	U
4	11		
5	X	6	4
3	9	5	2
1	2	1	2

c. Rs 413.55 + Rs 375.09

Th	H	T	U	.	1/10	1/100
					1	
	4	1	3	•	5	5
	3	7	5	•	0	9
	7	8	8	•	6	4

d. Rs 6784.90 - Rs 2493.15

Th	H	T	U	.	1/10	1/100
	6	18			8	10
6	X	X	4	•	X	X
2	4	9	3	•	1	5
4	2	9	1	•	7	5



Assessment

Sample Tasks: With Play money

- Ask a child to give you an amount for example Rs 3785. Can it be done in more than one combination of denominations?
- Ask a child to add Rs 567 and Rs 435.
- Ask a child to give Rs 345 from Rs 1245

Observations:

- Can the child identify the various denominations of money?
- Can the child relate to Rs 3789 as being 3000+700+80+9?
- Can the child relate to various combinations of currency making the same amount?
- Can the child re-group and add or subtract?

Measurement : length

Learning objective: Understanding concept of units of length and operations on length

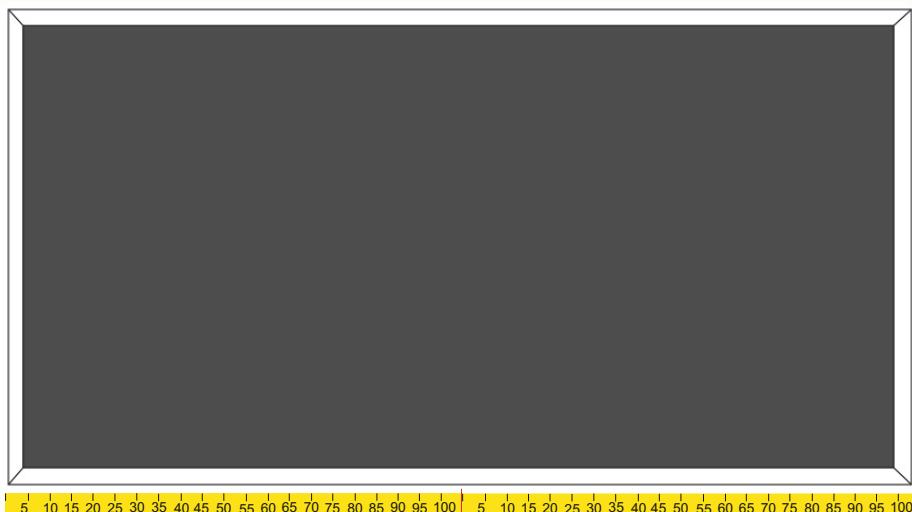
TLM: Measuring tape : has inches as well as centimeter markings.

1. Measuring



2. Addition of length

a. Measuring a long object like blackboard in parts using the **Measuring Tape**. **100 cms = 1 m**



$$1 \text{ m} + 1\text{m} = 2 \text{ m}$$

b. To buy material to make curtains for two windows of different sizes we have to measure the windows separately and add the two lengths to find how much material is required.



1.5 m



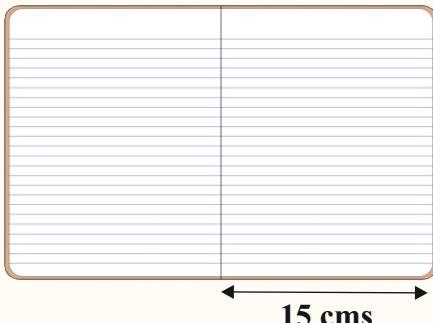
2.5 m



1.5m +2.5m = 4.0m

3. Difference in length:

When pasting a picture which is bigger than the size of the page, we need to measure the exact size of the page as well as the picture to be pasted. Note the excess and trim it from the picture.



17 cms



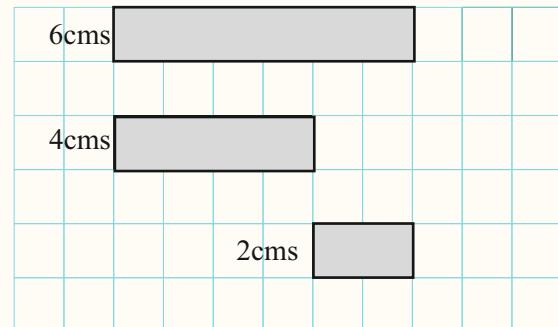
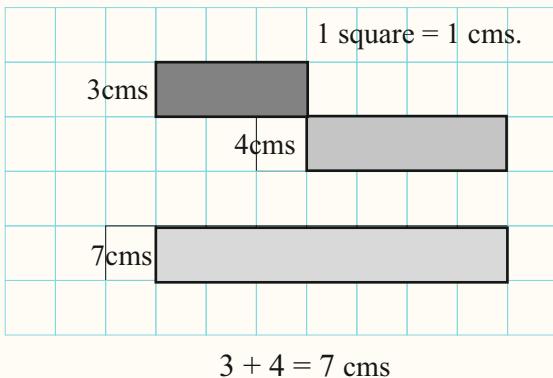
17 cms - 2 cms



15 cms

$$17 \text{ cms} - 2 \text{ cms} = 15 \text{ cms}$$

4. Using Square Line Book



Assessment



Sample Tasks: With Measuring tape

- Ask a child to measure the length of an object – note-book or table or his friend's arm.
- Ask a child to compare the length of two objects – for example two pencils, of different sizes

Observations:

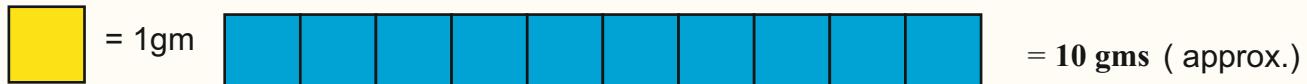
- Can the child identify the starting point and the end point of the given object to be measured?
- Can the child read the measurement from zero on the measuring tape? Can the child read the measurement if we start from a point other than zero on the tape?
- Can the child represent the measure using the correct units of length?

Measurement : weight

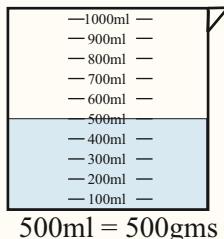
Learning objective: Understanding concept, units and operations in weight

TLM: Weighing Balance, Rods and Cubes of Base Ten Blocks

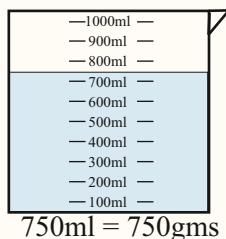
- 1. Weight:** a) Using rods and cubes to measure upto 300 gms. [Avoid using objects heavier than 300 gms. for the safety of the measuring container.]



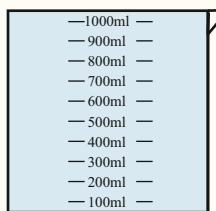
Use Volume measure with water for weighing (1ml of water = 1gm.)



500ml = 500gms



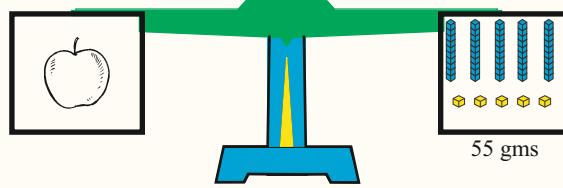
750ml = 750gms



1000 ml = 1Lt = 1 kg

2. Measuring weight

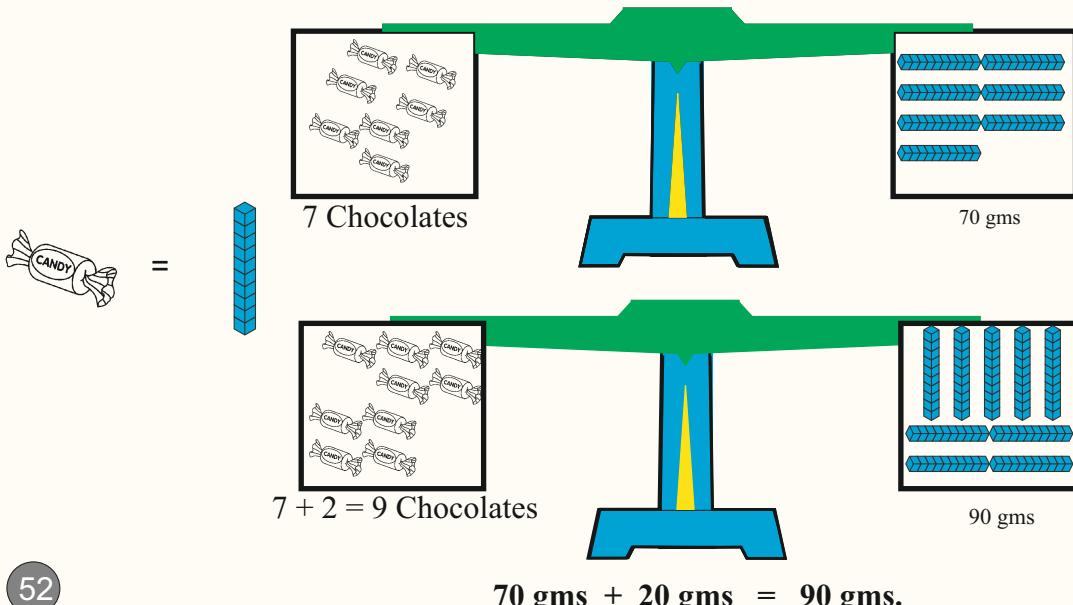
Put an object on one side of the balance. Put weights on the other side to balance this. The total weights required to balance is the weight of the object.



Weight of the apple is 55 grams

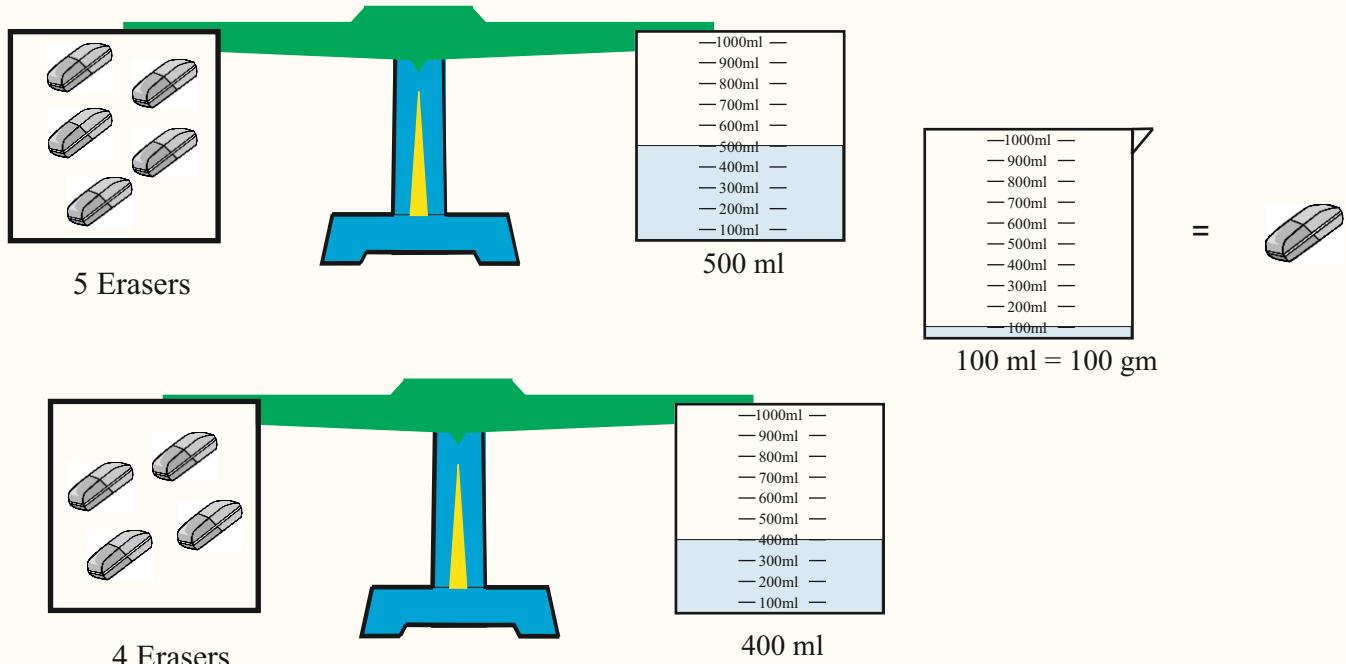
3. Addition of weight:

Put any object on one side of the balance. Now weigh this and note the weight . Now add two more objects and add more weights to balance . The additional weight is the weight of the two additional objects and the total weight 90gms is the sum of all the objects.



4. Difference in weight:

Take five erasers and note the weight. Remove one eraser, and check the weight. This gives the weight of four erasers. The difference between the first reading and the second reading, gives the weight of the eraser which is removed.



$500\text{gms} - 400\text{gms} = 100\text{gms}$. The eraser which was removed weighed 100gms.

Assessment



Sample Tasks: With weighing balance, yellow unit cubes and blue rod.

- Pick one object for example a sheet of paper and ask the child to find an object that is heavier (or lighter) or the same weight as this one.
- Note the weight of two pieces of chalk. After adding a pencil, by how much has the weight increased?
- Note the weight of 3 erasers. of different sizes. What is the weight when the biggest one is removed? What is the weight when the smallest one is removed?

Observation:

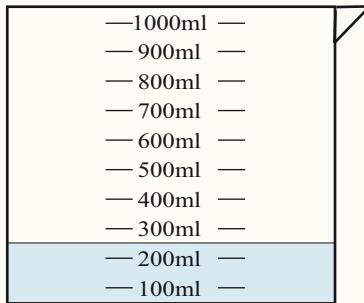
- Can the child relate to “light” as being easy to carry or lift, compared to a “heavy” object?
- Does the child understand the standard weight of gms and kilograms?
- Can a child add and subtract weights?

Measurement : volume

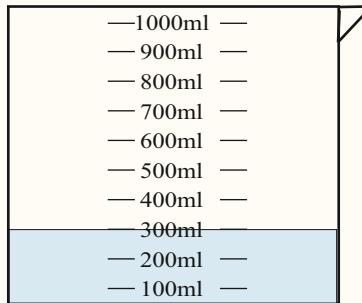
Learning objective: Understanding concept, units and operations in volume

TLM: Volume Measure

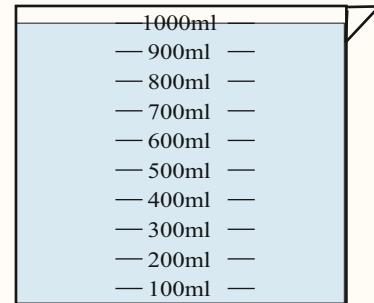
1. Measuring volume:



250ml

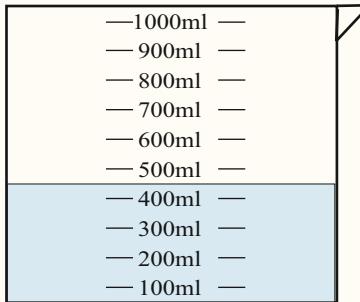


300ml

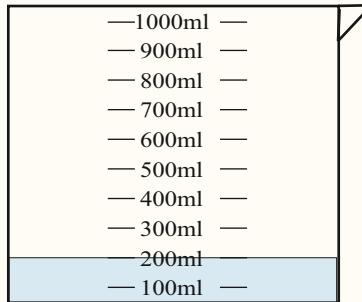


1liter

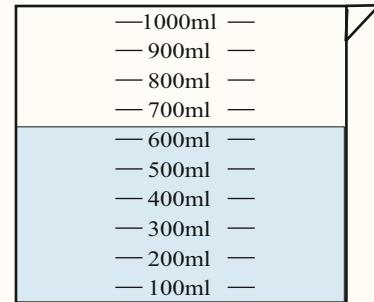
2. Addition of Volume: Example :450 ml and 200 ml. Take 450 ml water in one volume measure. Measure 200 ml water in a separate volume measure and add the two. This makes a total of 650ml.



450ml



200ml

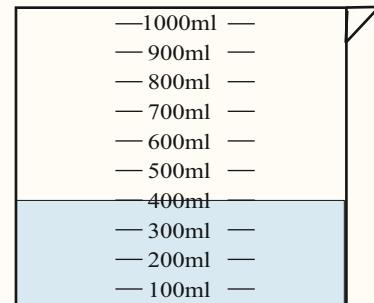
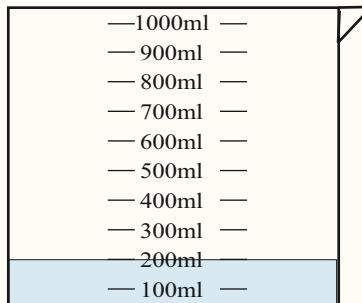
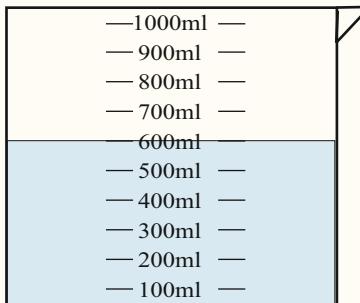


650ml

$$450\text{ml} + 200\text{ml} = 650\text{ml}$$

3. Difference in Volume

Take 600ml liquid in one volume measure. Pour out 200ml into another volume measure. The quantity remaining in the first volume measure is the difference.



$$600\text{ ml} - 200\text{ ml} = 400\text{ ml}$$

Volume measures are used in our daily life to measure liquids such as milk, water, juice, cooking oil, kerosene etc.



500 ml

1000 ml

500 ml

1000 ml

1 liter

5 liters

Assessment



Sample Tasks with: Shallow dish and an empty glass; volume measures (weighing balance pans)

- Pour water in the shallow dish and in the glass till full; which of the containers holds a larger volume?
- Ask children to show different volumes 250 ml, 300 ml, 500 ml of water in the pan

Observations:

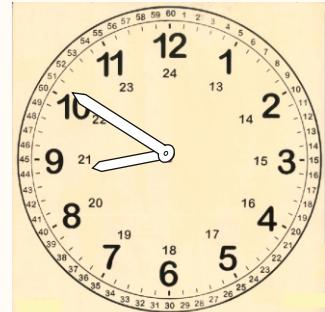
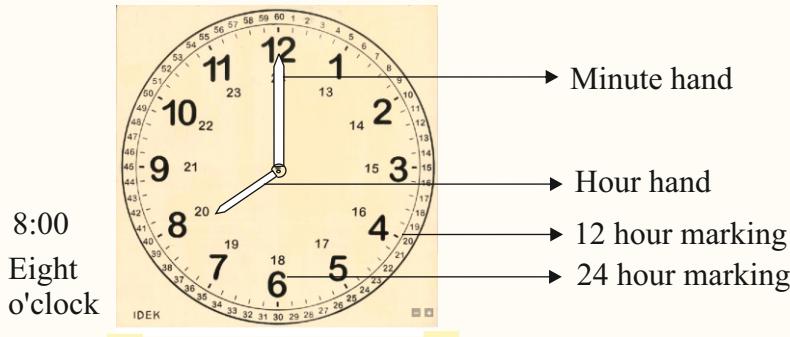
- Does the child understand how to measure volume?
- Can the child identify the various units of Volume?
- Can the child read the measurement marked on a measuring glass?
- Check if child understands the relation between volume operations and number operations.

Time

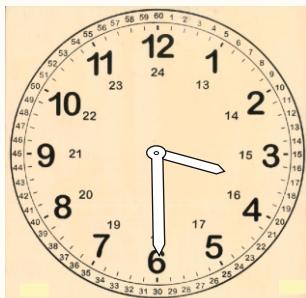
Learning objective To measure time and perform operations

TLM: Clock

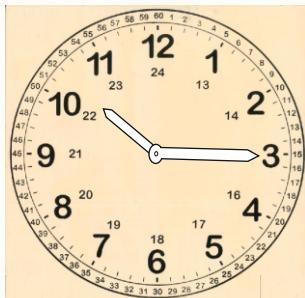
1. Parts of a clock: Discuss parts of a clock



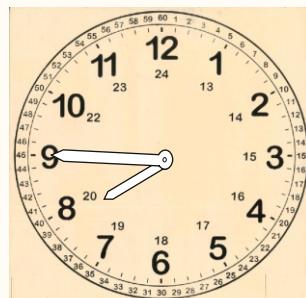
2. Different Time: show different time on the clock



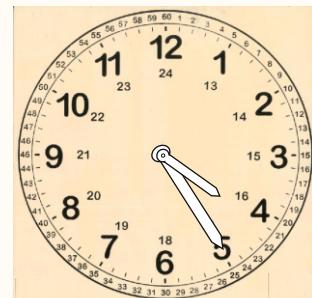
3 : 30
Half past 3



10 : 15
Quarter past 10



7 : 45
Quarter to 8



4 : 25
25minutes past 4

3. Discuss 24 hour clock and show corresponding time

3 am is 3 : 00 hrs 3 pm is 15 : 00 hrs 12 am is 12 : 00 hrs 12 pm is 24 : 00 hrs



Assessment

Sample Tasks: With clock

- Ask children to read time. 3:00, 4:30, 5:25, 7:36
- Ask children to represent various time on the clock: 6:00, 7:15, 11:55,
- It takes $2 \frac{1}{2}$ hours for a train to travel from Bangalore to Mysore. A train started from Bangalore at 11am. What time did it reach Mysore.
- Today is 23 March. Summer holidays start on 15 April. After how many days will holidays start?

Observation:

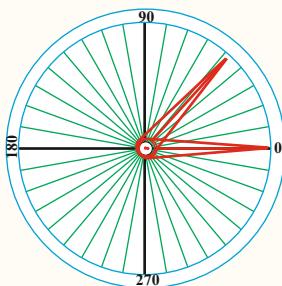
- Can the child identify the minute hand and the hour hand?
- Can the child mark the 12 hours correctly on the clock?
- Can the child calculate duration?
- Check if child understands am, pm and 24 hour clock
- Can the child read the calendar, month, dates and days?
- Can the child relate the question and match it on the calendar?

Angles

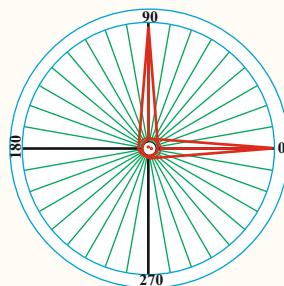
Learning Objective: Understanding angles and its types

TLM: Protractor and Angle Measure

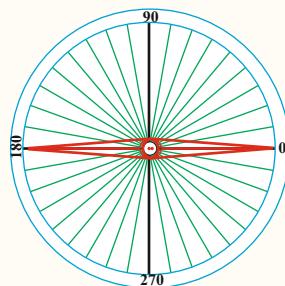
1. Measuring angles and Types of Angles



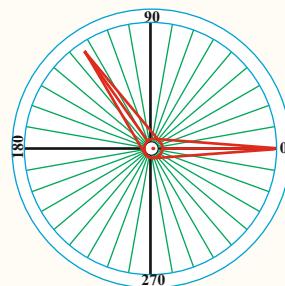
45° Acute angle



90° Right angle

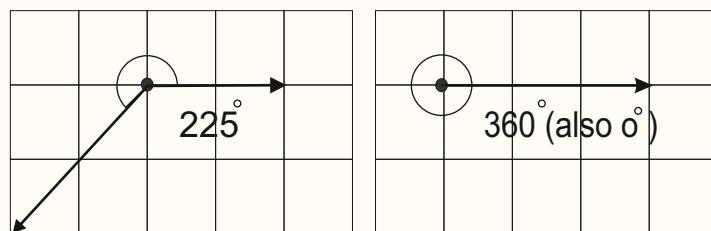
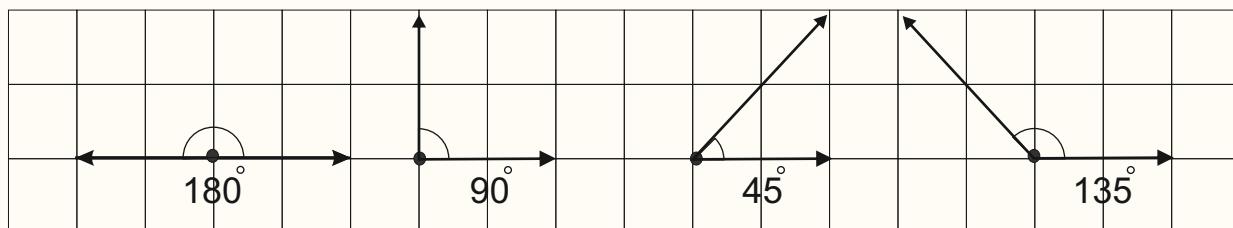


180° Straight angle

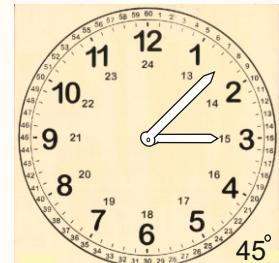
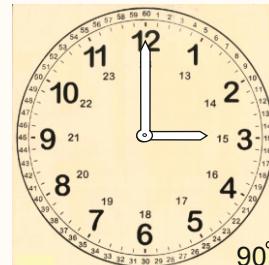


135° Obtuse angle

2. Using Square Line Book.



3. Teach angles using the clock



Assessment



Sample Tasks: Angle measure device and protractor ; Clock

- Ask children to identify angles in the environment. Ask them to compare angles. Which one is larger? Which one is smaller?
- Draw two angles of the same size but with sides of different lengths. Ask which angle is greater.
- Show the clock at 3 o'clock. Ask what angle does the hour and the minute hand make? Repeat with different times.

Observations:

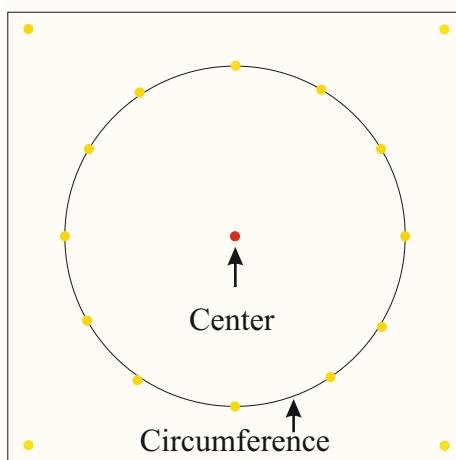
- Check if the child confuses the concept of angle with the distance between two arms.
- Is there confusion about the naming of the angles?
- Can the child place the protractor correctly on the base line?
- Can the child read the number of degrees correctly?
- Can the child identify angles of the corner of a room; a half-shut door; an open book, etc.

Circles

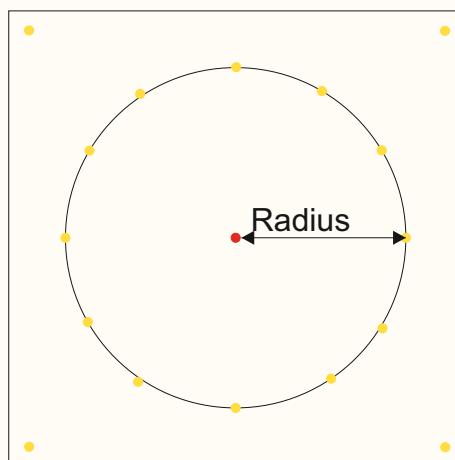
Learning Objective: Centre, radius, diameter and circumference of a circle.

TLM : Geoboard

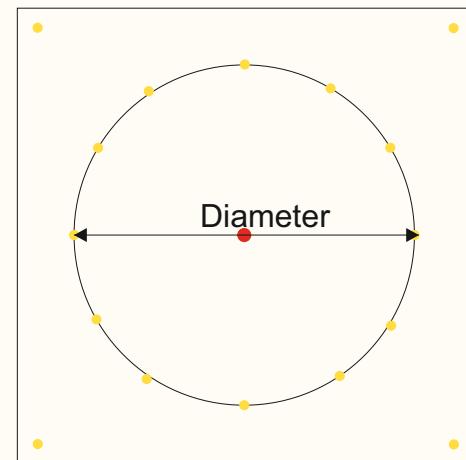
1. Center: Stretch the rubber band to make a circle. The midpoint around which the circle is drawn is called the center.



2. Radius: Using a rubber band show that every line from the center to the edge is the radius.



3. Diameter: Using the rubber band show that the line joining two points on the edge which pass through the centre is diameter.



Observe the different wheels which we see around us. Each has a different circumference and a different diameter.



car



cycle



tractor



Bullock cart

Assessment



Sample Tasks: With Geo board and Circle shape.

- Ask children what is radius, circumference, diameter and center of a circle.
- Ask if radius is 4 cm what is the diameter; if diameter is 10 cm, what is the radius?

Observations:

- Check if the child understands various concepts of a circle.
- Check if the child knows that diameter is twice the radius.

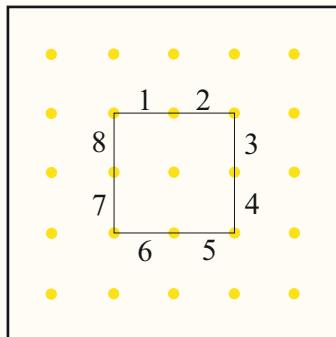
Area and Perimeter

Learning objective: Computing area and perimeter of square, rectangle and other shapes

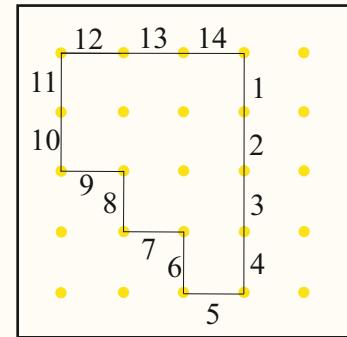
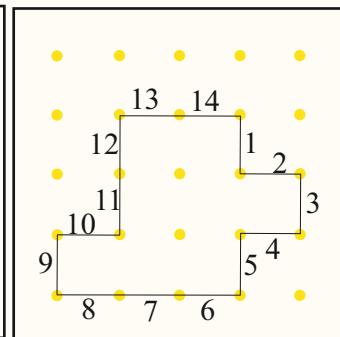
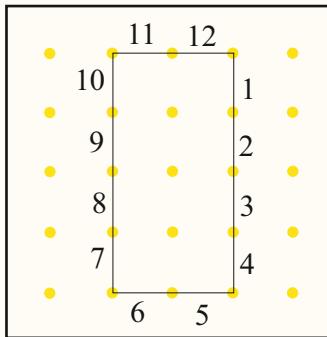
TLM: Geoboard, Tangram. Using Geo-board make regular and irregular shapes.

1. Perimeter : The continuous line forming the boundary of a closed geometrical figure or shape is called **Perimeter**.

a) Regular shape



b) Irregular shapes



i) Perimeter : 8 units

ii) Perimeter : 12 units

iii) Perimeter : 14 units

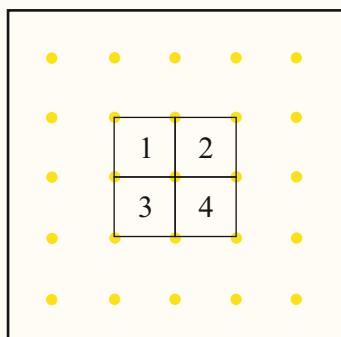
iv) Perimeter : 14 units

Though the shapes of figures (iii) and (iv) are different, the perimeter is the same

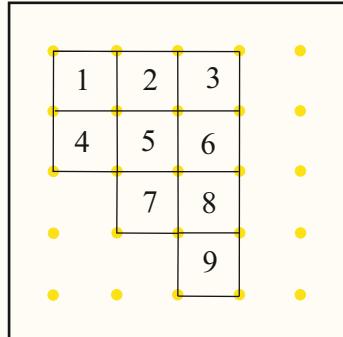
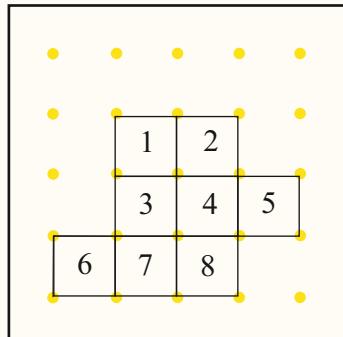
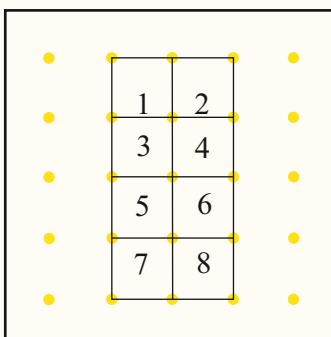
Show that Perimeter of a rectangle is $2 \text{ length} + 2 \text{ breadth units}$ ($2l + 2b$). Perimeter of a square is 4 length units ($4l$)

2. Area: the space inside the boundary of a flat (2 dimensional) object such as a square or rectangle. It is measured in square units.

a) Regular shapes



b) Irregular shapes



i) Area = 4 sq units

ii) Area = 8 sq units

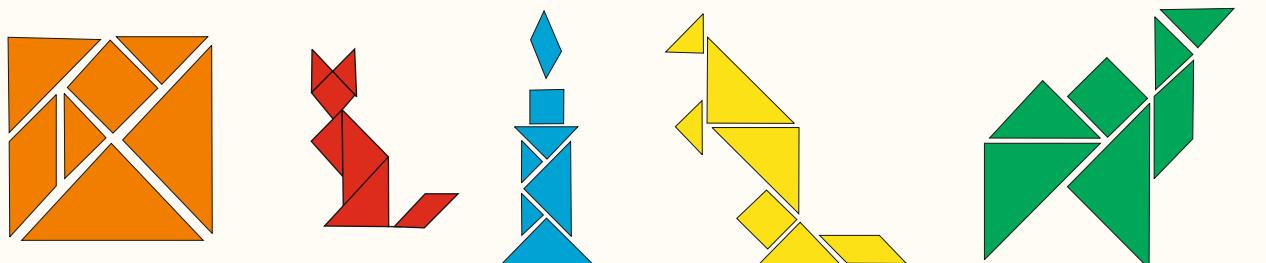
iii) Area = 8 sq units

iv) Area = 9 sq units

The area of figures (ii) and (iii) is the same, yet the perimeter differs.

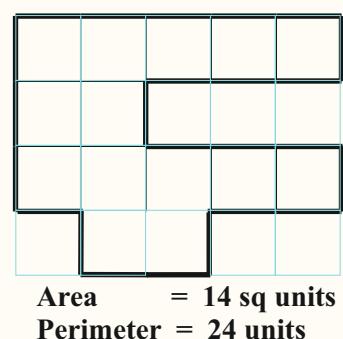
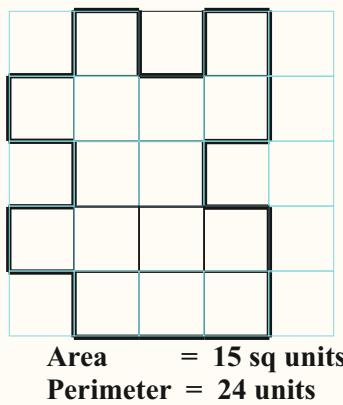
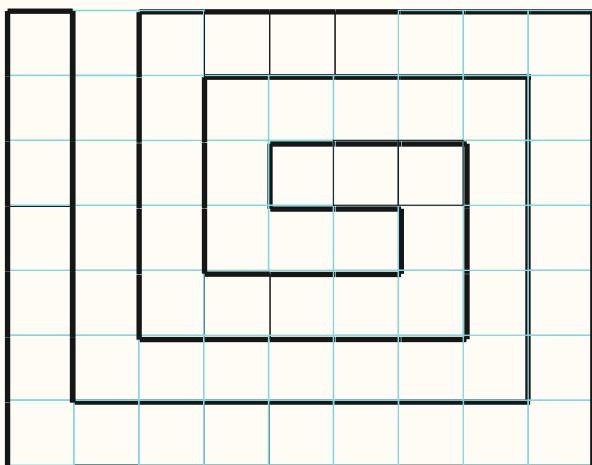
Show that area of a rectangle is $l \times b$ square units; area of square is $= 1 \times 1$ square units here l is length and b is breadth.

3. Using Tangram show that the area does not change when the same pieces are re-arranged in a different pattern; only the shape changes.



4. Using **Square Line Book** compute area and perimeter

$$\begin{array}{ll} \text{Area} & = 39 \text{ sq units} \\ \text{Perimeter} & = 80 \text{ units} \end{array}$$



Assessment



Sample Tasks: With Geoboard

- Make a shape on the Geoboard. Ask the child to find its area and perimeter
- Draw two shapes on a grid paper of perimeter 20 units each, but with different shapes.
- On square line grid draw different shapes. What is the area of each? Ask which shape is bigger in size?
- Give two leaves of different trees. Ask which is bigger in area?

Observations:

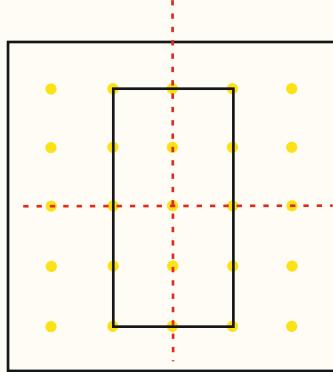
- Can the child identify perimeter as the distance around a two dimensional shape?
- Can the child identify area as the amount of space inside the boundary of a 2 dimensional object?
- Can the child calculate the perimeter as being the sum of the lengths of all the sides of the figure?
- Can the child calculate the area of the space by counting the squares inside the boundary?

Shapes and symmetry

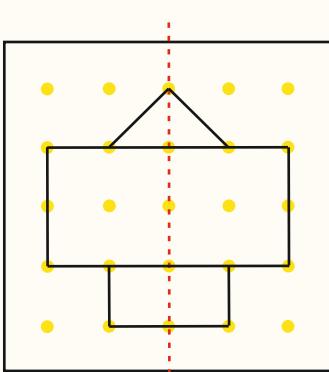
Learning objectives: Understanding symmetry and the axis of symmetry

TLM: Geoboard, Symmetrical Figures

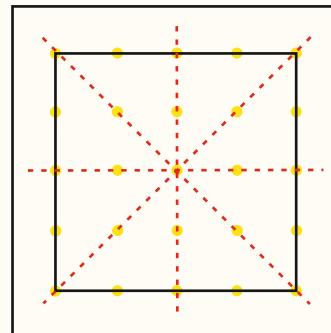
Understanding symmetry: Using rubberbands make a shape on the geoboard. Mark the line along which the two sides of the shape are mirror images. This figure is symmetrical and the dotted line is the axis of symmetry.



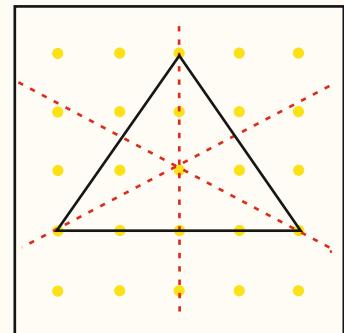
Two line symmetry



One line symmetry

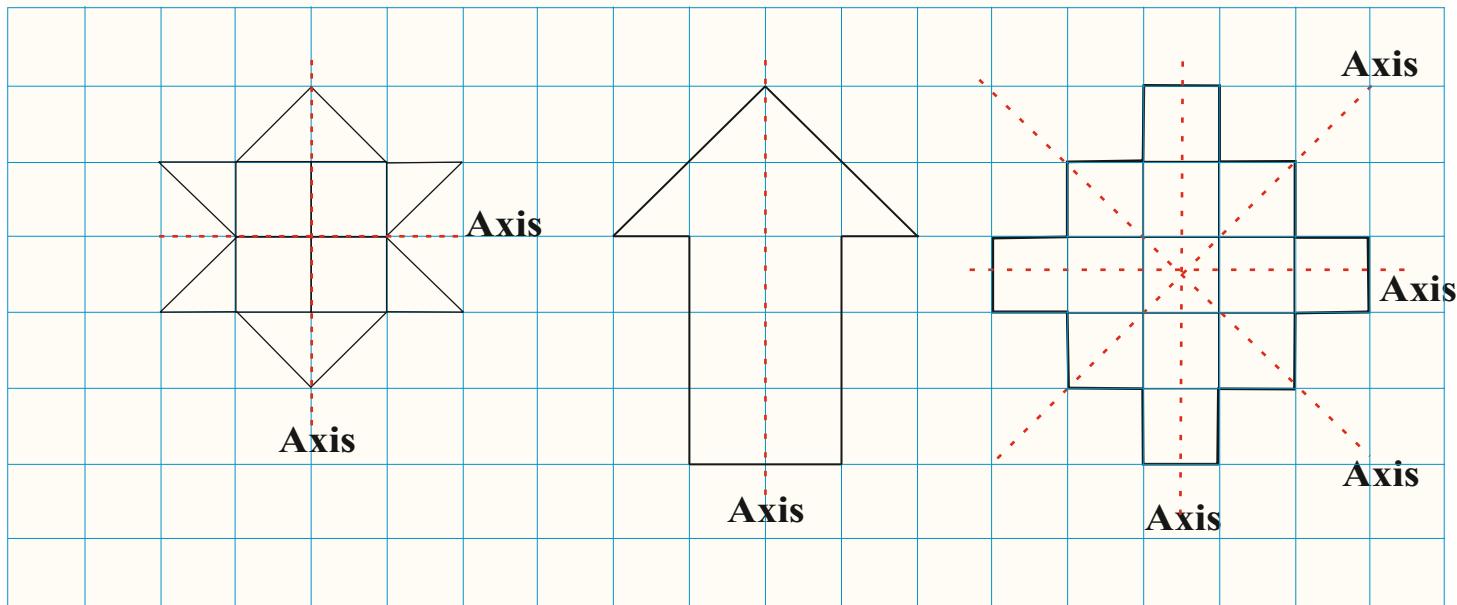


4 line symmetry



3 line symmetry

2. Using Square line Book draw symmetrical shape and mark the axis.



3. Fold the pictures along the lines of axis, to observe the symmetry.

Assessment



Sample Tasks: With Geoboard

- Make a shape and ask a child if it is symmetrical. If yes ask the child to identify the axis of symmetry.
- Using real life objects ask children to check if the object is symmetrical and identify axis of symmetry.

Observations:

- Check if the child understands the concept of symmetry.
- Check if the child understands that there can be more than one axis of symmetry.

Patterns

Learning objective: Understanding and making patterns

TLM: Tangrams, Square Counters

1. Patterns using square counters.

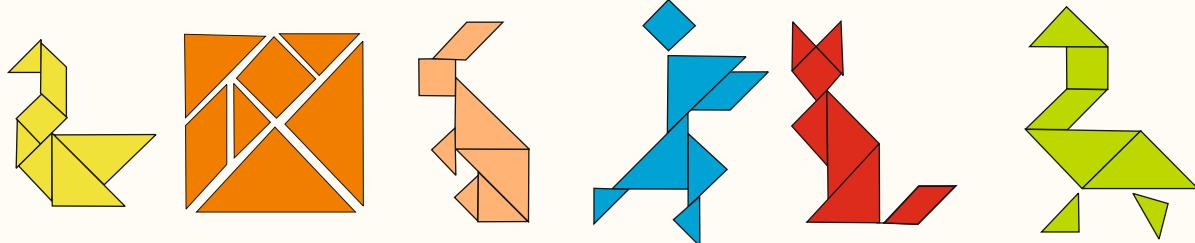
a. Based on colour



b. Based on shape

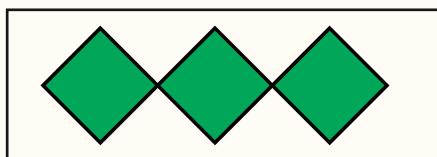


2. Shapes using tangrams.

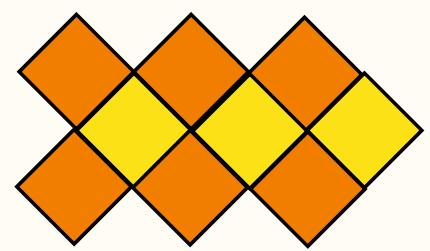
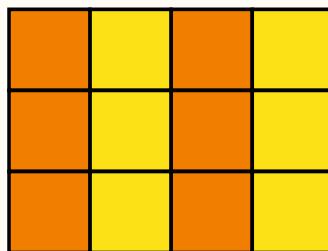


3. Border shapes and tiling using patterns

Border



Tiling



Assessment



Sample Tasks: With square counters

- Give a pattern and ask children to continue it.
- Give a pattern and ask children to identify missing shapes.

Observations:

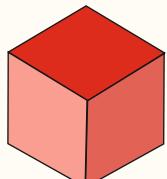
- Check if the child is able to look at previous pattern and continue.
- Check if child is able to identify the pattern rules and identify missing shapes.

Solid Shapes

Learning objective: Understanding 3 D shapes and their properties

TLM: Geo - solids and nets

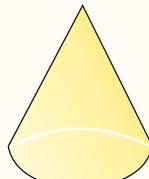
1. Solid shapes: Describe each solid using its edges, vertices and faces (flat or curved). Discuss the front views ; elevation or side view and plane or top view.



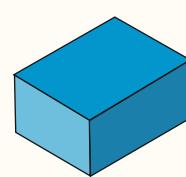
Cube



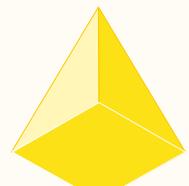
Cylinder



Cone



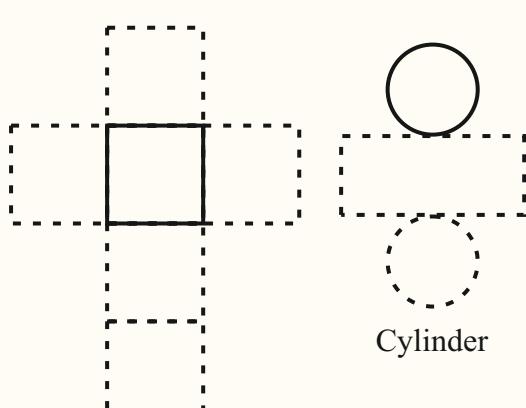
Cuboid



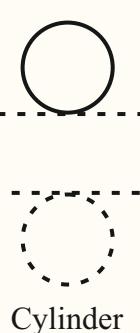
Square - based pyramid

2 . Solid shapes from Nets:

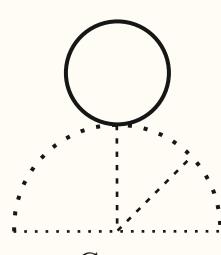
Using the nets show how each solid shape can be constructed from a flat shape.



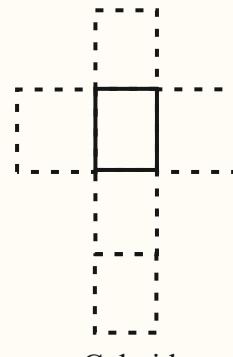
Cube



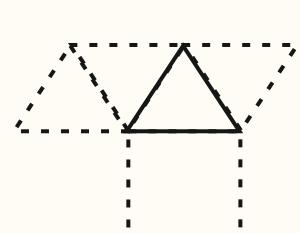
Cylinder



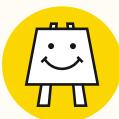
Cone



Cuboid



Square- Based Pyramid



Assessment

Sample Tasks: With various 3D shapes; Nets

- Show a cube to the child and ask what shape it is. Now rotate the cube and ask again what is the shape now.
- Blindfold the child and give a set of 3D objects from daily life – geometry box; textbook; eraser; etc.. Ask the child to identify the 2D shape of each face.
- Ask children to name the 3D shapes which the different nets make.

Observation:

- Does the child understand that the shape does not change even if the orientation is changed?
- Can the child match the 3D shape to its 2D parent shape?
- Can the child draw nets of the 3D shape?

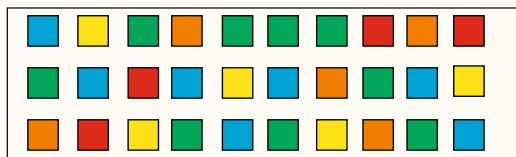
Data Handling

Learning objective: Data collection and representation

TLM: Square Counters.

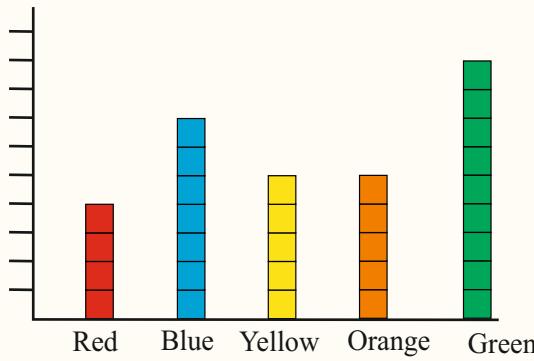
1. Collection of data:

Pick 30 counters.



3. Representation of data in a bar graph:

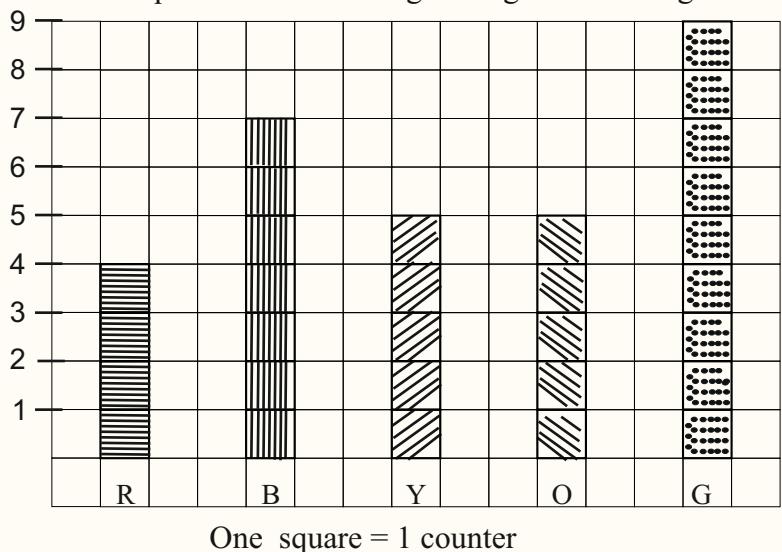
a. Using square counters



2. Representation of data in a table. Tabulate using tally method or sort- and - count method.

Sl .no	Colour	Tallies	Numbers
1	Red		4
2	Blue		7
3	Yellow		5
4	Orange		5
5	Green		9

b. In a Square line book using sorting and counting



4. Analysis of data : Ask questions like

Which colour counters are the most? Which are the least? Which are equal.



Assessment

Sample Tasks: using counters .

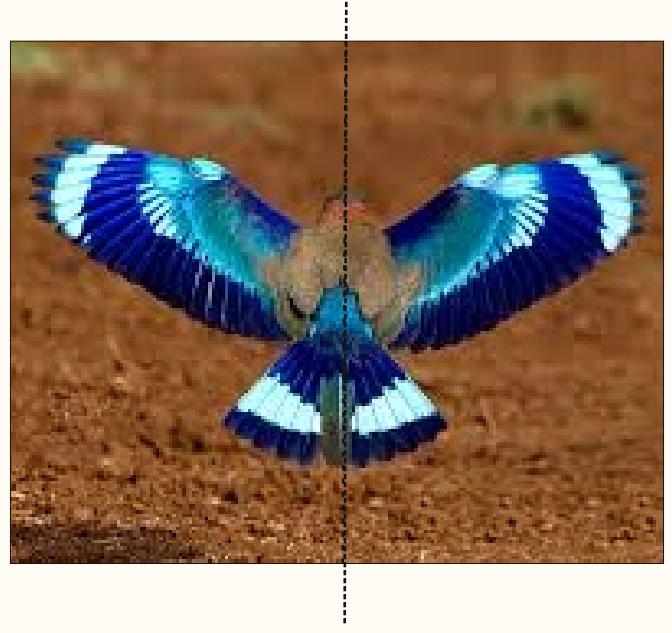
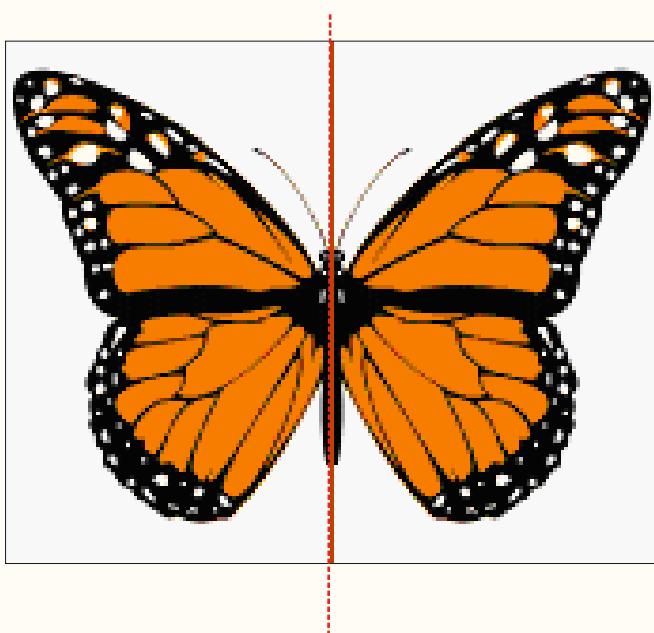
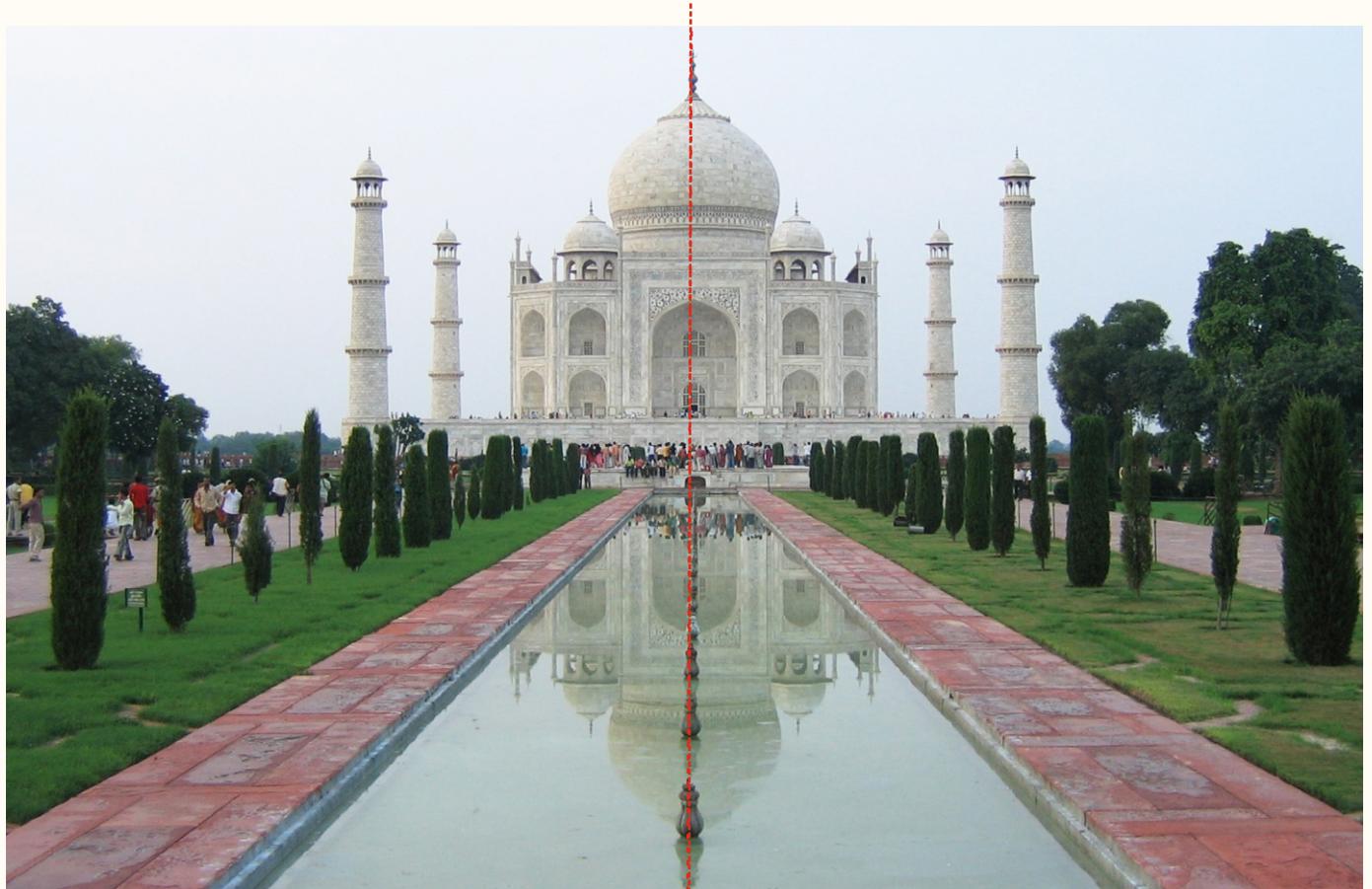
- Give a collection of square counters and ask the child to represent it both in a table form as well as bar graph form.
- Give a collection of objects and ask the child to represent it in a table and bar graph form using square counters.

Observation:

- Check if the child classifies the data given and uses this for tabulation or uses sorting and counting system for tabulating.
- Check if the child understands the concept of scale and uses it appropriately.
- See if the child can use both horizontal and vertical bar graph to represent the given data.

Symmetry

Here are a few examples of Symmetry. Cut out the pictures along the perforation. Allow students to fold along the line of axis and observe symmetrical figures.



Dear Teacher, here are some interesting problems for children who have mastered Math concepts

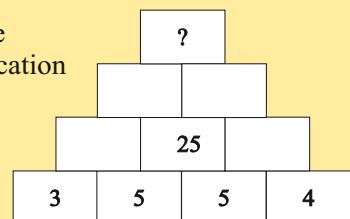
- Carryout the 4 Basic operations and find the number.

One-third of 24	x 8	-32	x 5	Divide by 4	x 10	Halve it	-35	+15	What is the answer?
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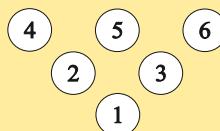
- Find the number:

- * Think of any number (*Other than Zero*).
- * Subtract 1 from the number you have thought.
- * Multiply the result with 3
- * Add 12 to the result
- * Divide the answer by 3
- * Add 5 to this
- * Subtract 8 from the total (You will arrive at the original number!)

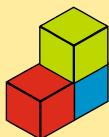
- Fill each box so that the number in each rectangle is the product of the 2 numbers below it, as shown in one sample. Complete other multiplication process. Write the final product in the top most box.



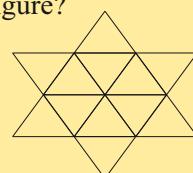
- One side of a rectangle is 5 cms long and its area is 15 sq cms. What is the width of the rectangle?
- Suppose today is Thursday. What day of the week will it be 19 days from today?
- Meena went to bed at 9.15 p.m last night. She woke up for school at 6.45 today. How long did she sleep?
- Six coins are arranged in a triangle. Turn this upside-down by changing the position of only 2 coins.



- If 3 cubes are glued together (see illustration) how many ‘faces’ are visible if you picked it up and looked at it?



- How many triangles of any size are there in this figure?



- In a class of 41 students, 8 students have pet dogs; 12 have cats; 5 have cows; 11 have goats 1 has a tortoise The rest have parrots. How many have parrots? Draw a bar graph to show the number of students with different kinds of pets.



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Aadi kali; maadi thili

