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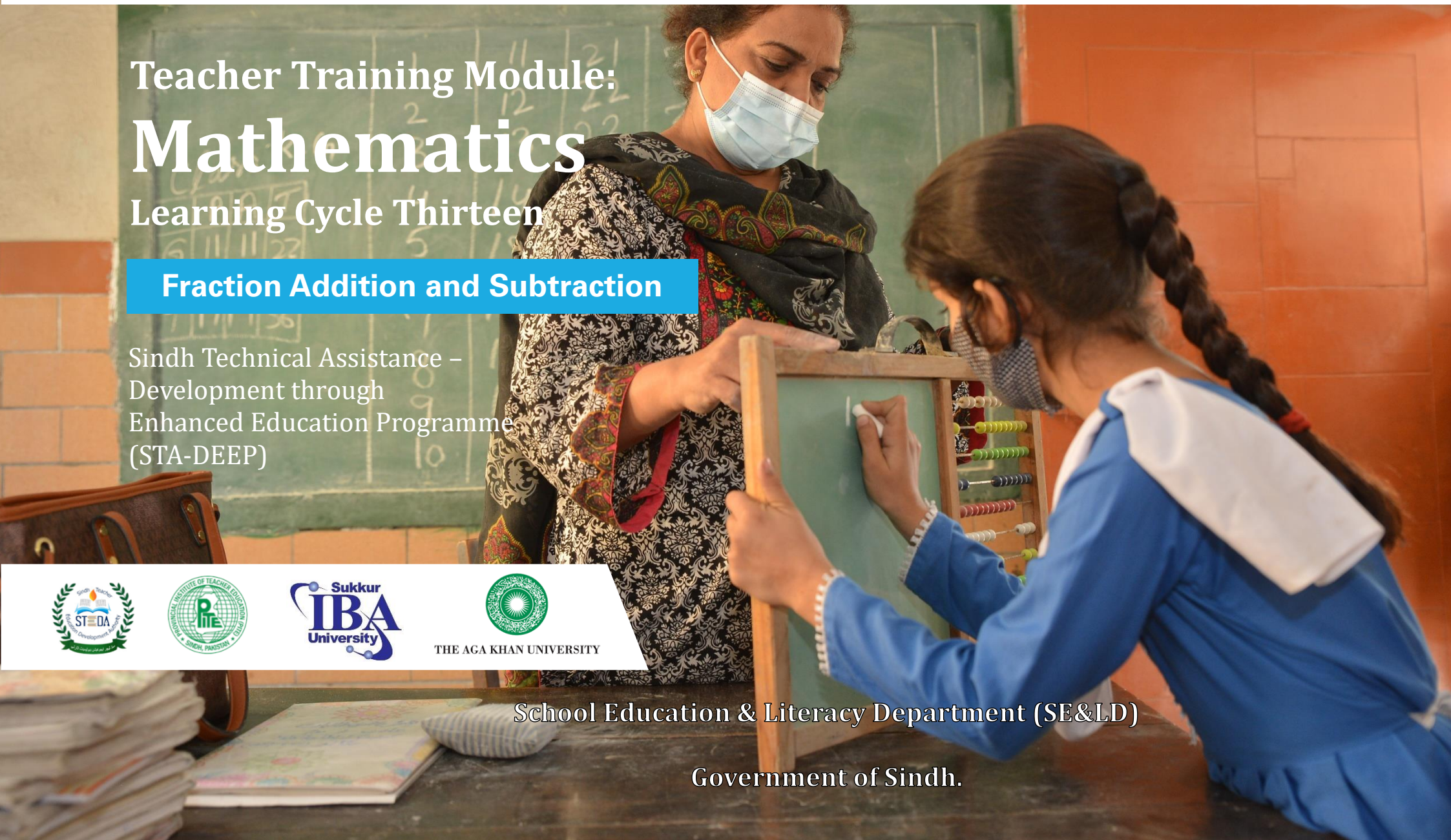
Teacher Training Module:

Mathematics

Learning Cycle Thirteen

Fraction Addition and Subtraction

Sindh Technical Assistance – Development through Enhanced Education Programme (STA-DEEP)



School Education & Literacy Department (SE&LD)

Government of Sindh.

Introduction and Rationale of the Training

Dear Teachers!

Welcome to the new phase of the Continuous Professional Development (CPD) Program. In the previous phase, we had focused on pedagogical skills that helped you to develop your skills to make classroom more interactive, participative, and joyful for our students. In the new phase, we will continue practicing those pedagogical skills and also learn about the introduced content knowledge and skills in Mathematics, Science, English, Urdu, and Sindhi. As a result, you will be better prepared to deal classroom situation using modern teaching strategies integrated with subject knowledge.

Our vision

Our common goal is to improve the quality of teaching in schools all over Sindh. We want students to become active and collaborative learners, problem solvers, and critical thinkers who approach tasks with creativity and confidence. They are conceptually clear about the subject content and have the skills to link this content with the world around them. To make this possible, we, as teachers, must be better prepared for the classroom demands in pedagogy and the subject content. Moreover, we aim to professionalize these trainings so that the CPD teacher training courses make an impact and substantially change student performance.

Our Teaching Philosophy

The CPD training sessions, including this training, follow a participatory teaching philosophy that engages teachers to apply and practice active and collaborative learning, as well as engage in self and peer reflection to become community of practice. The objective is not only to improve the teaching practices but to help you understand the theory of the subject content and the strategies that help students apply the content in daily life with confidence and mastery.

Supporting You

The training module is designed to support you in your classroom teaching. It will introduce you to the subject content and some approaches for use in the classroom. This will make your teaching more manageable and help you grow as a skillful teacher.

Acknowledgement

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We would like to express sincere gratitude to the following contributors:

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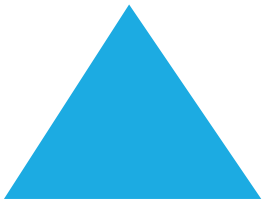
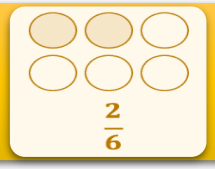


Fraction Addition and Subtraction

Learning Objectives: By the end of the session, the teachers will be able to:

Define like and unlike fractions

Add and subtract like fraction using area model, line model, and symbolic representation



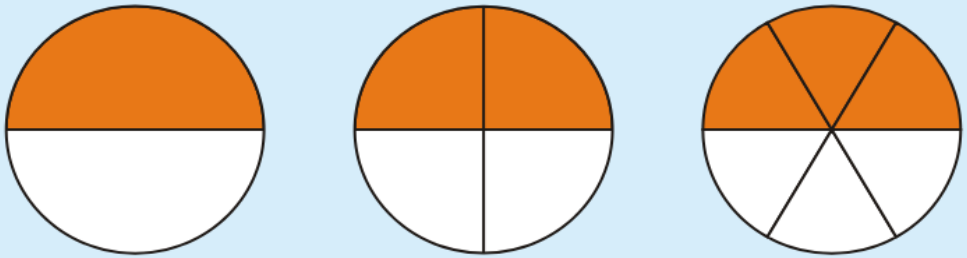
Add and subtract unlike fractions using equivalent fractions method,area model and least common multiple method to visualize the connection

Solve real world problem involving fraction addition and subtraction

Session Plan

Instructional strategies/activities

Time	Objective/purpose of the activity	Activities/learning experiences	Materials/resources
 10 mins	**Activity 1:**  **Grouping Strategy**	This activity will help the teachers to recap the fractions size based on the benchmark such as less than a quarter, a quarter, more than a quarter but less than a half, more than a half but less than a whole and more than a whole. Stick this benchmark on each table. Cut the fractions and keep it in a bowl / basket. • Ask teachers to pick a fraction, read it and identify the group where the fraction is aligned with the benchmark. • Ask teachers to show the fractions within group to ensure that all match with the given benchmark. • Now show the handout 13.1 and ask teachers to identify equivalent fractions. • Discuss that equivalent fractions are different ways of describing the same amount using different fractional parts.	Handout 13.1

		Example: Observe the coloured part in the following three figures.  The coloured part in each figure represents the following fractions: $\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{6}$ • Show the pictorial representation of equivalent fraction from the grade 3 textbook p.5	
 15 min	**Activity 2:**  **Area model to add like fractions**	Ask teacher to define like fraction. Facilitator will invite a teacher to add $\frac{1}{4} + \frac{2}{4}$ using area model on the board. Example can be used from grade 3 textbook p. 59	

		Example 1: Add $\frac{1}{4}$ and $\frac{2}{4}$. ***Solution:*** Look at the figures of given fractions  $\frac{1}{4} + \frac{2}{4} = \frac{1+2}{4} = \frac{3}{4}$ i.e one-fourth and two-fourth give three fourth. Ask teachers to add the like fractions using area model a) $\frac{1}{5} + \frac{3}{5}$ b) $\frac{2}{7} + \frac{4}{7}$ c) $\frac{1}{3} + \frac{1}{3}$	
 15 mins	**Activity 3:**  **Area model to subtract like fractions**	Facilitator will invite a teacher to subtract $\frac{3}{5} - \frac{2}{5}$ using area model on the board. Example can be used from grade 3 textbook p. 61	

Example 1: Subtract $\frac{2}{5}$ from $\frac{3}{5}$.

Solution: Consider the figures of given fractions.

$\frac{3-2}{5} = \frac{1}{5}$

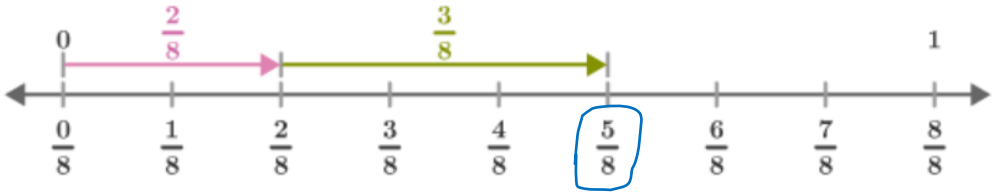
i.e. From $\frac{3}{5}$ subtracted $\frac{2}{5}$ and get $\frac{1}{5}$.

Ask teachers to add the like fractions using area model

a) $\frac{4}{5} - \frac{2}{5}$

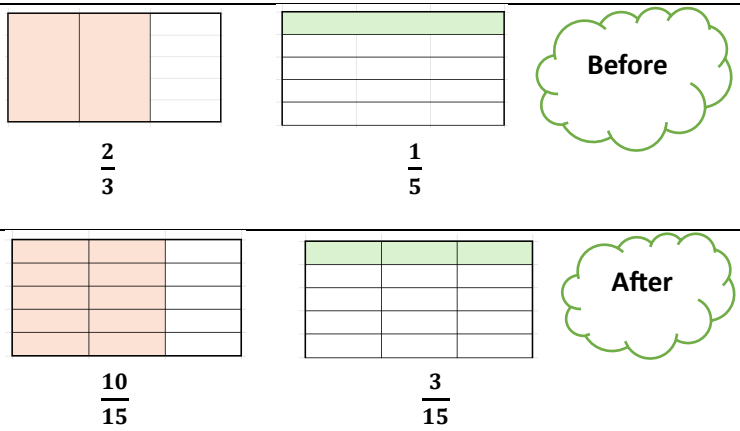
b) $\frac{6}{7} - \frac{4}{7}$

c) $\frac{5}{8} - \frac{2}{8}$

15 mins	**Activity 4:**  **Line model to add and subtract like fractions**	Ask teachers to show $\frac{2}{8} + \frac{3}{8}$ using number line on board.  $\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$ Ask teachers to solve addition and subtraction of like fraction using line model (handout 13.2 – empty number line) a) $\frac{1}{5} + \frac{3}{5}$ b) $\frac{2}{7} + \frac{4}{7}$ c) $\frac{1}{3} + \frac{1}{3}$ d) $\frac{4}{5} - \frac{2}{5}$ e) $\frac{6}{7} - \frac{4}{7}$ f) $\frac{5}{8} - \frac{2}{8}$	Handout 13.2

40 mins	**Activity 5:**  **Add and subtract unlike fractions**	Facilitator will show teachers why we convert unlike fractions to like fractions before adding or subtracting! Facilitator will use one example and solve it in three ways: writing equivalent fractions, using area models, and finding the least common multiple (LCM). This will help them see why fractions need the same denominator to be added or subtracted easily.	

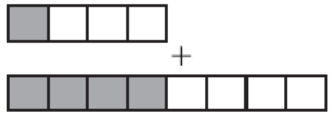
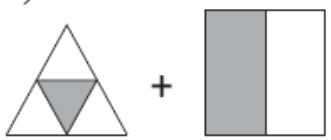
Add $\frac{2}{3} + \frac{1}{5}$

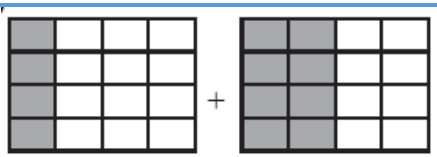
Equivalent Fraction Method	Area Model [use 3 by 5 rectangle]	Least Common Multiple
$\frac{2}{3}, \frac{4}{6}, \frac{6}{9}, \frac{8}{12}, \mathbf{\frac{10}{15}}, \frac{12}{18}, \frac{14}{20}$ $\frac{1}{5}, \frac{2}{10}, \mathbf{\frac{3}{15}}, \frac{4}{20}, \frac{5}{25}, \frac{6}{30}, \frac{7}{35}$ $\mathbf{\frac{10}{15} + \frac{3}{15} = \frac{13}{15}}$		$\mathbf{\frac{2}{3} + \frac{1}{5}}$ $= \mathbf{\frac{2(5)+1(3)}{15}}$ $= \mathbf{\frac{10}{15} + \frac{3}{15} = \frac{13}{15}}$

		$\frac{10}{15} + \frac{3}{15} = \frac{13}{15}$ Teachers can see that in area models when one fraction is shown with horizontal lines and the other with vertical lines, they can overlap to get the equal size pieces. i.e., by dividing both shapes into the same number of pieces of equal size, these models help to visualize how fractions with different denominators can be added as long as they represent equal parts of a whole.	

- Ask teachers to subtract $\frac{4}{5} - \frac{1}{4}$ using equivalent fraction, area model, and LCM method in group and then one group will be invited to present to teachers.

15 mins	**Activity 6:**  **Real-world Problems**	Real-world problems: 1) Ali received a beautiful box of sweets for Eid. The box contained $3\frac{1}{5}$ bars of barfi and $\frac{5}{6}$ bars of Gulab jamun. How many sweets Ali had altogether in the box? 2) Aisha is designing a beautiful dupatta for Eid. She needs $1\frac{3}{4}$ meter of red cloth for the base and $\frac{1}{2}$ meter of green cloth for the border. How many meters of cloth altogether Aisha needs to buy? How much cloth does Aisha need in total for her dupatta?

		3) Saadia bought 5 samosas. She ate $2\frac{1}{2}$ herself. How many samosas are remaining? 4) Riha has $2\frac{1}{2}$ meters of colorful ribbon for her art projects. She needs $1\frac{1}{2}$ meters of ribbon for a friendship bracelet and $\frac{3}{4}$ of a meter for a hairband. How much ribbon does Riha have remaining after cutting for her art projects? 5) Zainab is planting a vegetable garden. She wants to plant a row $2\frac{1}{2}$ meters long with tomatoes and another row $1\frac{3}{4}$ meters long with cucumbers. What is the total length of the two rows that Zainab will plant?
10 mins	**Activity 7:**  **Assessment**	-Teachers will be asked to complete the assessment related to the learning cycle. 1. Circle the diagram that represents $\frac{1}{4}+\frac{1}{2}$ (a)  (b)  (c)



2. 3. What is $\frac{1}{4}+\frac{1}{3}$?

A. $\frac{2}{7}$

B. $\frac{7}{12}$

C. $\frac{5}{12}$

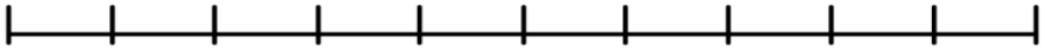
3. What is $\frac{4}{5}-\frac{1}{2}$?

A. $\frac{3}{10}$

B. $\frac{2}{5}$

C. $\frac{1}{10}$

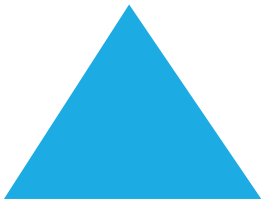
4. Using the line model provided subtract $\frac{2}{5}$ from $\frac{4}{5}$.



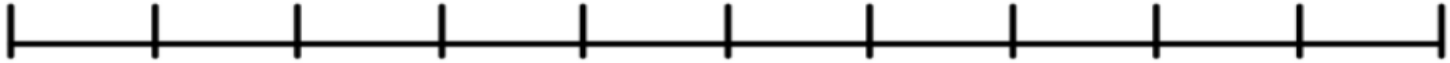
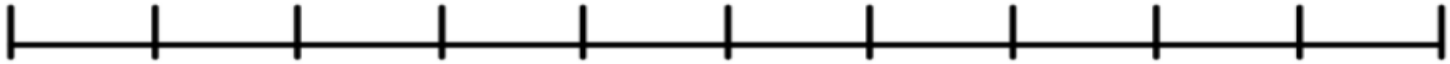
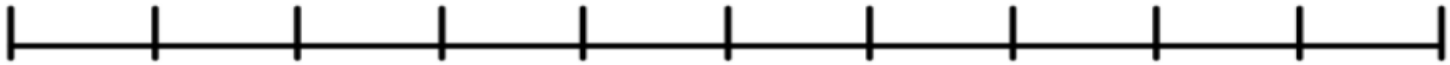
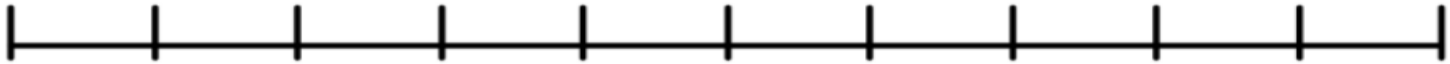
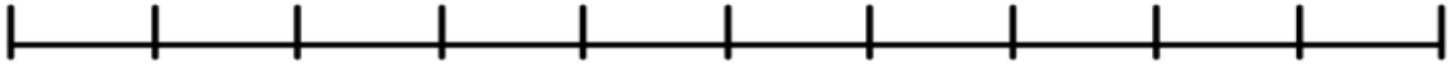
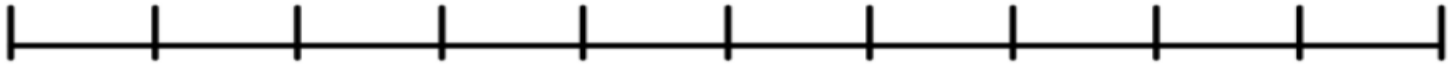
5. Add $\frac{3}{5}+\frac{2}{3}$ using area model

Handout 13.1 – Grouping Strategy

Less than a quarter	A quarter	More than a quarter but less than a half	More than a half but less than a whole	More than a whole
$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	$\frac{9}{8}$
$\frac{5}{24}$	$\frac{6}{24}$	$\frac{9}{24}$	$\frac{15}{24}$	$\frac{25}{24}$
$\frac{1}{6}$	$\frac{1}{4}$	$\frac{2}{6}$	$\frac{3}{4}$	$\frac{7}{4}$
$\frac{2}{12}$	$\frac{3}{12}$	$\frac{5}{12}$	$\frac{7}{12}$	$\frac{15}{12}$
$\frac{3}{16}$	$\frac{4}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{17}{16}$
$\frac{4}{20}$	$\frac{5}{20}$	$\frac{9}{20}$	$\frac{13}{20}$	$\frac{21}{20}$



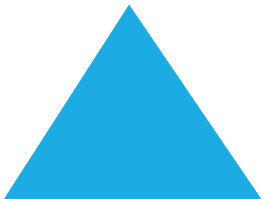
Handout 13.2 – Empty Number line

1	
2	
3	
4	
5	
6	

For reference:

List of 1-20 LCs topics

Learning Cycles (LCs)	Topics
LC-1	Developing Number Sense
LC-2	Fractions
LC-3	Decimal and Percentage
LC-4	Ratio and Proportion
LC-5	Introduction to Algebra
LC-6	Algebraic Identities
LC-7	Angle and its Constructions
LC-8	Area and Perimeter
LC-9	Three Dimensional Shapes
LC-10	Information Handling
LC-11	Place Value
LC-12	Highest Common Factor (HCF) and Least Common Multiple (LCM)
LC-13	**Fraction Addition and Subtraction**
LC-14	Fraction Multiplication
LC-15	Laws of Exponents
LC-16	Square Roots
LC-17	Simultaneous Linear Equations
LC-18	Unit Conversion
LC-19	Pythagoras Theorem
LC-20	Construction of Different Types of Triangles



For reference:

List of Resource Items for LCs (11-20)

Items	No. of items	LC-11	LC-12	LC-13	LC-14	LC-15	LC-16	LC-17	LC-18	LC-19	LC-20
Dice	8	✓							✓		
Pair of scissors	8	✓	✓								
Paper Plate	18		✓								
Red beans	½ kg	✓	✓								
Counters (Red/Black)	10								✓		
Counters (Blue/White)	10								✓		
Color pencil box	4			✓	✓						
Measuring tape	8								✓		
Geometry Box	8									✓	✓
Geometry Box	8									✓	✓

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