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Teacher Training Module:

Mathematics

Learning Cycle Four

Ratio and Proportion

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

STEDA

PITE Sindh, Pakistan

Sukkur IBA University

THE AGA KHAN UNIVERSITY

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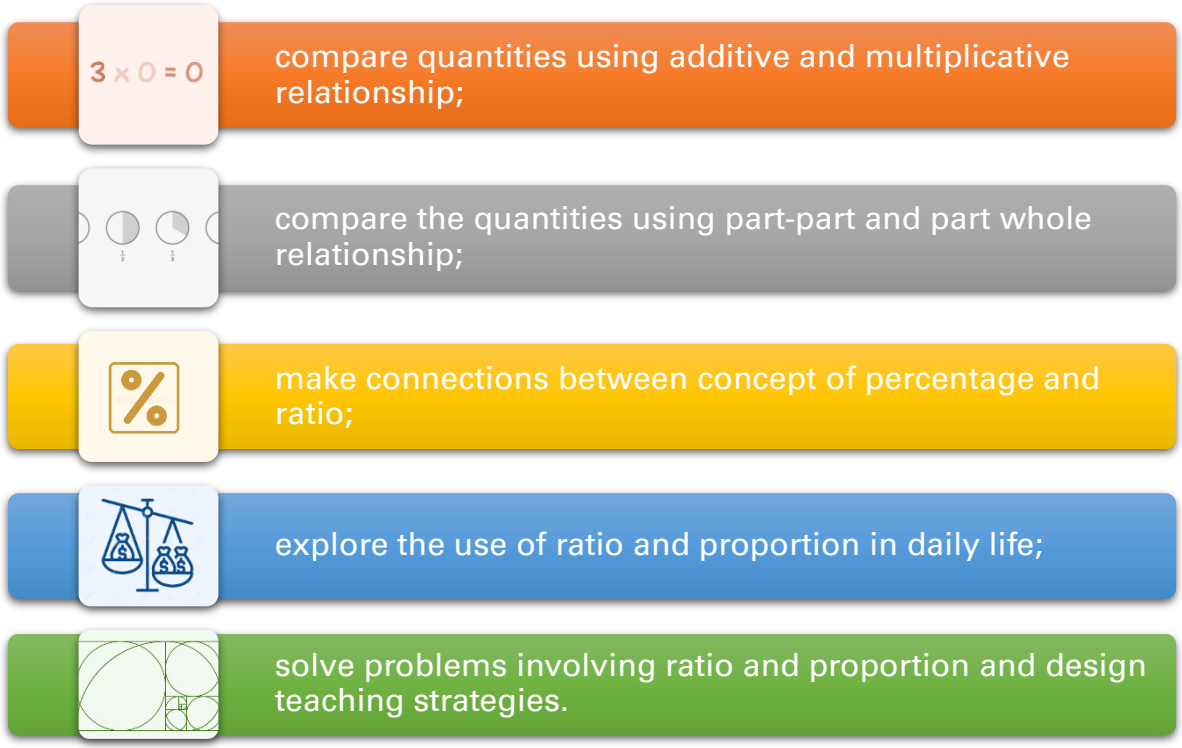
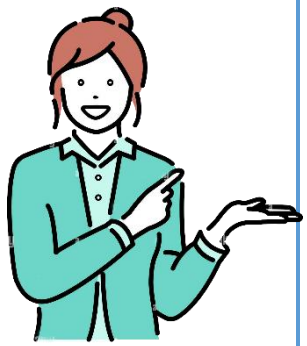
Learning Objectives: By the end of the session, the teachers will be able to:

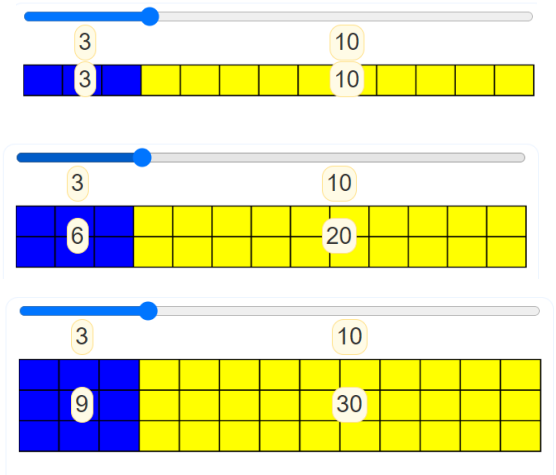


Session Plan

Instructional strategies/activities

Time	Objective/purpose of the activity	Activities/learning experiences	Materials/resources
 10 mins	**Welcome and Warm-up Activity** To elicit prior knowledge of participants about their understanding of fractions and ratio 	1. Greet and ask by showing the below picture, "What can you tell about the given figure?"  2. Discuss how their responses similar or different **Expected responses:** • Number of blue blocks is two more than the number orange block • Number of orange block is two less than the number blue blocks • ¼ part of the figure is the orange. • ¾ of the figure is blue • The blue part of the figure is three times larger than the orange part. • The orange part of the figure is three times smaller than the orange part. • The orange part is 1/3 of the blue part. • The ratio between the number of blue and orange squares is 3:1 • The ratio between the number of orange and blue squares is 1:3	

20 mins	**Ratio as multiplicative comparison**	1. Display the list of the expected answers to the task given in warm-up. 2. Ask the teachers to complete Handout 1. 3. Explain, “a ratio compares values multiplicatively and it often compares part to part”. 4. The following is a typical example of ratios.  • A ratio says how much of one thing there is compared to another thing. There are three blue squares to one orange square. • The ratio between the number of blue and orange squares is 3:1. • Ratios can be shown in different ways: • Use the ":" to separate the values:3: 1 or we can use the word "to" as 3 to 1 • Ratio can compare part with whole multiplicatively. For example, it can be said that ‘the portions covered by orange colour is 1: 4 of the whole figures.’	Chart paper Handout 1
		1. Explain that the ratio can be scaled up: 	Handout 2

30 mins	**Scaling up the ratios**	In the following figures, area covered by blue and yellow portion are in 3:10 irrespective of their sizes.  Here the ratio is still 3 blue squares to 10 yellow square, even though there are more squares. 2. Ask them to complete Handout 2. 3. Follow-up Discussion, "What do you notice while you did task sheet? 4. Probably they would notice that to scale up the ratios we always multiply or divide the numbers by the same value. Example: 4: 5 is the same as 4×2: 5×2 = 8: 10 or 8: 10 is same as 8÷2: 10÷2 = 4:5	

 40 mins	**Identifying proportional or non-proportional situations**	1. Tell the teachers that two quantities are proportional if the ratios between them are equal in different situations. 2. Present the following example; Example: A rope's length and weight are in proportion. When 20m of rope weighs 1kg, then: • 40m of that rope weighs 2kg • 200m of that rope weighs 10kg So: 20:1 = 40: 2 3. Ask: Is your age proportional to your father's age? Tell Yes or No. and give the reason. 4. Explain "If you are 30 years and your father is 60 years old in 2023. The ratio between your age and your father's age is: 30:60 in 2023 1:2 But next year your age will be 31 and your father will be 61. So, the ratio 31: 61 ≠ 1:2. Therefore, the ages of two persons are not proportional. 5. Like ages, make some situations where quantities do not vary proportionally. 6. Ask: If 1 kilogram meat is cooked in 1 hour. How much time 10 kilograms meat will take? 7. Explain that amount of meat and cooking time is not proportional as amount of meat will remain constant. 10 kg meat will require the same time which 1 kg meat requires.	Chart sheets

8. Present another example.

Big Foot?

Sara measured her foot, and it was 21cm long, and then she measured her mother's foot, and it was 24cm long.

"I must have big feet; my foot is nearly as long as my mother's!"

9. Pose question. Is Sara, right? discuss and explain.

Sara thought to measure heights, and found she is 133cm tall, and her Mum is 152cm tall.

In a table this is:

	Sara	Mother
Length of Foot:	21cm	24cm
Height:	133cm	152cm

The "foot-to-height" ratio in fraction style is:

Sara:	*21*/**133**	mother:	*24*/**152**

We can simplify those fractions by dividing sara 's height and her feet's size by common factor which is 7.

21/133= 3/19.

dividing mother 's height and her feet's size by common factor which is 8.

= 24/152= 3/19

And we get this

Sara:	*3/***19**	Mother:	*3/***19**

"Oh!" "The Ratios are the same".

"So, Sara's foot is only as big as it should be for her height and is not really too big.

The height and feet size of Sara and her mother are proportional.

10. Present one more example of proportional situation.

A recipe for halwa uses 3 cups of flour and 2 cups of milk. So, the ratio of flour to milk is 3: 2

To make Halwa for a lot of people we might need 4 times the quantity, so we multiply the numbers by 4:

3×4: 2×4 = 12: 8

In other words, 12 cups of flour and 8 cups of milk.

The ratio is still the same, so the halwa should be just as yummy.

Conclusion: To make the taste of halwa in larger quantity, amount of milk and flour should be proportional.

Group Task:

1. Make groups.
2. In groups of 4-5, make three contextual stories where ratios are applied.
3. Ask groups to display stories on the walls.
4. Invite one volunteer from the group to read stories from their group and other teachers will give comments

10 mins	BREAK		
 25 mins	**Using Proportions to solve Percentages**	1. Tell teachers that a percent is also based on ratio! Saying "25%" is actually saying "25 per 100": 25% = 25:100= $\frac{25}{100}$. We can use proportions to solve questions involving percent. For that we put what we know into this form: $$\frac{part}{whole} = \frac{percent}{100}$$ Example: What is 25% of 160? The percent is 25, the whole is 160, and we want to find the "part": $$\frac{part}{whole} = \frac{percent}{100}$$ $$\frac{part}{160} = \frac{25}{100}$$ Multiply across the known corners, then divide by the third number: Part = (160 × 25) / 100 = 4000 / 100 = 40 2. Ask teacher to solve the percentage sums using proportional reasoning in Handout 3. 3. Discuss and summarize	Handout 3

 40 mins	**Alignment with Textbooks** 	1. Assign grade 5 to two of the groups, grade 6 to the next two groups and grade 7 to the last two groups. 2. Ask the teachers to design a teaching strategy for teaching the concept of ratio to a particular grade level. 3. Invite a few volunteers to present their strategy 4. Summarize the activity	STBB Textbooks Grades 6, 7 and 8 for each participant
 5 mins	**Reflection**	Invite teachers to share their learning experiences during the session with the whole class (refer to reflection questions)	

Handout 1

Fill in the table for each expected responses given above.

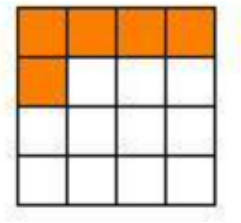
	Which two quantities are compared		How the quantities are compared (tick mark with √ or × in the appropriate column)	
	Quantity 1	**Quantity 2**	**Additively**	**Multiplicatively**
1				
2				
3				
4				
5				
6				
7				
8				
9				

Handout 2

Q1. Look at the picture and answer the questions in the given space.

A. What is the ratio of apples to lemons? ……
B. What is the ratio of lemons to apples?.....
C. What is the ratio of apples to total fruit?.....
D. What is the ratio of lemon to total fruits?.....

Q2. In the following diagram



What is the ratio of orange to white square (Tick the correct option):

A. 11: 15
B. 5:11
C. 5:16
D. 16:5

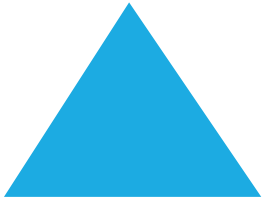
Q3. A class of 32 students has 12 girls. What is the ratio of girls to boys? (Tick the correct option)

A. 3: 5
B. 5:3
C. 3:8
D. 8:3

Q4. The distance between two towns on a map is 5 cm. If the real distance between the two town is 25 km. What is the scale of the map? (Tick the correct option)

A. 1:5000,000
B. 1:500,000
C. 1:50,000
D. 1:5,000

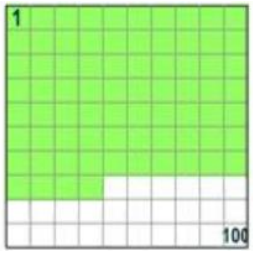
Make a couple of questions more on the same content using different situations and share in the session.



Handout 3: Using Proportions to solve Percentages

Tick the correct option

Q1. What percent of the above box is green?



A: 24 %
B: 26%
C: 74%
D: 76%

Q2. If 16 of 20 apples were rotten, what percentage of apples are fresh?

A. 8%
B. 10%
C. 12%
D. 20%

Q3. In a class of 25 students, 16 had at least one pet. What percentage of students have one pet?

A. 32%
B. 40%
C. 64 %
D. 80%

Q4. The population of a city in the year 2000 was 500, 000. Over the following decade, the population grew by 8%. What was the population of the city in 2010? (Tick the correct option)

A. 540,000
B. 550,000
C. 575,000
D. 580,000

Make a couple of questions more on the same content using different situation and share in the session.