The Thinking Classroom
Lesson Plans for Primary Teachers

MATHEMATICS: MEASUREMENT
Introduction
This module containing seven primary level lesson plans (LPs) will lead you towards transforming your classroom into a Thinking Classroom.

The Aims of Education
“To educate Pakistanis to be:
- Seekers of truth and knowledge who can apply both for the progress of society;
- Creative, constructive, communicative and reflective individuals;
- Disciplined, productive, moderate and enlightened citizens;
- Capable of effectively participating in the highly competitive global knowledge-based economy and the information age; citizens committed to creating a just civil society that respects diversity of views, beliefs and faiths.”

(Ministry of Education, Government of Pakistan, 2006)

So with these aims, surely we need to change something in the way we teach!

Why we need Critical Thinking (CT)
Everyone thinks, but a lot of it is biased, distorted and uninformed. The quality of our life and what we create and build and the decisions we make depend on how we think. Poor thinking and lack of CT can lead us to many poor decisions.

What does CT entail?
- Assessing, analysing and reconstructing any problem, situation or content
- Making informed decisions
- Logical thinking and reasoning
- Being able to create and innovate; build something new and original
- Out of the box thinking and questioning deeply from different perspectives
- Thinking about thinking & how to improve it

Why it is difficult to be Critical Thinkers in our school system
- Too many facts
- Too much memorising and too little thinking
- Lecture and rote memorisation, which does not require critical thinking
- Students are not “trained” to think

Teaching Framework for the TTC Lesson Plans
You probably teach one new concept (or chapter) for one or maybe two weeks. We have developed these LPs on the premise that it is one five-day week. If it is two, or you carry on until the children have understood, you can explore the concept in more depth.

A suggestion for the Five-Day LP is that for the first three days you deliver the content from your textbook the way you always do and then spend the next two days on CT and active learning. Active learning is when children are engaged in hands-on activities and in making sense and meaning of the content themselves rather than listening passively to a teacher’s lecture on a topic. Some examples of active learning are: classroom discussions, small group work, working with materials, debates on an idea, problem solving and listing ideas, making presentations. So, how about creating some excitement in your classroom with active learning.

Guidelines for You the Teacher
Young children are not too young for complex concepts
You may think that some of the ideas or concepts being introduced in these LPs are too difficult for such young children. In reality, however, we are introducing them to ideas that they are already familiar with because they have either heard their parents talk about them or have heard someone else either in person or on television or radio. What we are doing here is giving them the opportunity to explore these ideas, to think about them in a focused manner. Please remember, we are not expecting them to give us correct, accurate answers.

Listen to and accept children’s answers no matter what
Let the children be inventive with their responses and if their answers sound amusing or strange, we still need to accept their answers and extend the conversation. Concepts are constructed gradually
over time by exploring their attributes and thinking critically about them and coming to our own understanding of them. Both children and adults go through this process when they encounter something new. The something new can be either concrete or abstract.

**Engage with the children**

It is important for teachers to create a climate of trust and comfort where the children don't feel threatened or inhibited. Talk to them conversationally, ask after them and show them that you are interested in them as individuals. When the activity says make a circle, you need to decide what will be most appropriate for that activity, whether to sit or stand in a circle and you should sit or stand with them.

**Give children space and time to think**

During discussions, remember that some children may need a little time and positive encouragement to express their thoughts and some may prefer to remain quiet for a few seconds or minutes. Do provide waiting time after asking a question to give less confident children an opportunity to formulate their responses. Remember to smile or laugh when something is funny. Your facial expressions should match what you are saying and remember to speak in a soft, natural, conversational tone.

**Planning the lesson for the week ahead**

As the teacher, you understand your local context, what your children can do and what their interests are. You also know how much space you have in your classroom and what resources are available to you, so it is up to you to decide how to implement the active learning CT LP in your classroom. Do please read through the entire LP carefully and decide before the new week begins, what to do each day for the week ahead and also prepare all the materials you will need.

**Time required for the LP**

We have not mentioned a time frame in each lesson plan but it will probably take about 80 to 90 and in some cases about 110 minutes, spread over two days. It depends on you, the number of children you have in class and your timetable. You may need more or less.

**Group size**

Some segments of the plan require the entire class and no small groups. When you need to divide them into groups, and the LP says divide the children into groups of five you can do this easily if you have 25 children present that day. If you have one or two children left, it is not a problem, just accommodate them into any group. If you have 36 children, you can divide them into groups of six.

**Group roles**

It is a good idea to assign roles to the members of each group so that everyone knows what to do. The entire group must participate and share their ideas and views and if the task calls for more roles then listed here, please go ahead and delegate the tasks. There must be:

- A **timekeeper** who makes sure the work is done in the timeframe that you have given them.
- A **note taker** who listens to what group members are saying and writes down everything based on the task you have given them.
- A **presenter** who will present the group’s work when everyone has finished and you give the signal to present.

**Structure of The Thinking Classroom Lesson Plan**

Each LP for Classes 1 to 5, ECE and Multi-age follow a similar structure. The ECE LPs have a couple of additional features that are not in the Primary Level LPs. These are differentiated with an * at the beginning. All the modules and topics are linked to The National Curricula, developed by the MoE, Government of Pakistan, 2006-07.

This is how the LPs have been structured:

1. **Curriculum Link:** The link is stated exactly as it is in the relevant curriculum. The Student Learning Outcomes (SLOs Primary Level) and Expected Learning Outcomes (ELOs ECE) and page numbers are mentioned so that you can find it easily in the document. In certain curriculum documents bullet points have been used to separate SLOs, in others letters and in some roman numerals have been used. We have used these exactly as they are in the respective curriculum. The SLOs and ELOs may not be in sequence, for example, i ii iii or a b c. This is because all the SLOs and ELOs for one topic or theme are not addressed in one LP. So only those that are being addressed are mentioned. So you may see, i iv & viii or a d & g.
2. Students’ Learning Outcomes: These are the same as the objectives in a LP. We are familiar with objectives and have been taught that before we plan a lesson we have to be clear about our objectives for that lesson. We have to think about what we hope the children will learn when we have completed that lesson. So the SLOs are the objectives of the plan.

* Expected Learning Outcomes: These are also the objectives of the lesson plan. So why use the word ‘expected’ instead of student? The NC-ECE charts out learning outcomes that young children are expected to achieve. Given the diverse developmental levels, learning styles and pace of learning, many children may not achieve all the outcomes (objectives) at the end of the lesson or even in the one year that they are in the ECE/pre-primary class. Therefore, the outcomes for this age level have been termed as “Expected” and educators and supervisors should not be overly concerned about children completing all the activities or meeting each and every outcome. This however does not mean that teachers should not support children’s curiosity and learning, but that they should not force them to learn something they are not yet ready to learn. It is the process and not a ‘perfect’ product that’s more important at this age and stage.

3. Prior Knowledge: Studies show that learning progresses primarily from prior knowledge, and only after that from the materials we present to students. Think about this. We teachers spend so much time gathering materials, which is important no doubt, and necessary too for good teaching, but only if we build on children’s prior knowledge. Many of us are also guilty of hurrying through teaching some concept or skill, and not taking the time to slow down or ask the children what they already know about the concept or topic. So if we want to ensure that children make important mental connections about the content we are about to teach, we must build on prior knowledge.

4. Resource Requirements & Preparation: This part of the LP will tell you what materials you will need to implement the lesson plan. To make it easier for you, it clearly indicates what you will need for the Three Phases of the LP: the Beginning, Middle and Conclusion (BMC phases) and what you need to prepare beforehand so that you don’t waste any time during class. If the LP requires pictures of food, buildings, uses of water, anything at all, you can find pictures in calendars, diaries, newspapers and magazines. Don’t forget to look online too. Whenever possible, please recycle! Save old magazines, newspapers, greeting cards and invitation cards and use these to make instruction cards and slips for group work. Empty biscuit and tea boxes and gatta are also handy for making resources. Empty shoeboxes are extremely handy for storage and they stack well too.

5. Methodology: Each LP is divided into three distinct phases based on a BMC Model. Here is a brief explanation on what each phase entails:

The **Beginning** Phase: In this phase, you can ask children to think about or ask questions about the topic. This phase will help you to:
- Informally assess what the children already know including any misconceptions
- Set the purpose for learning
- Focus attention on the topic

The **Middle** Phase: In this phase, you will lead children to explore the topic in more depth. They will engage in finding out, making sense of the material, answering their prior questions and finding new questions. This phase will help you and the children to:
- Revise expectations or raise new ones
- Identify the main points
- Make inferences about the material
- Make personal connections to the lessons

The **Conclusion** Phase: During this phase you will give children the opportunity to reflect on what they have learned, reflect on how their thoughts have changed and think about application of the new knowledge. This phase will help you and the children to:
- Summarize the main idea
- Share opinions
- Think about application

6. Assessment: This part will suggest ways in which you can assess what the children have learnt and evaluate whether the SLOs or objectives have been met. The assessment strategies suggested here are not traditional paper and pencil tests, but please do try out a different way of assessment.
* **Extension Activity:** In this section, you will find some activities you can engage the children in at a later stage. As the heading suggests, these activities will help children explore the ideas in the LP in different ways thereby helping them understand the concept better.

* **A Note for the Teacher:** Under this heading you will find tips to help you understand how to address the topic with young children or how you can work on the same concept throughout the year.

**CT Questioning Techniques**
Throughout the LPs you will see a reference to CT questioning techniques. In the questions below some names of girls and boys have been used. Needless to say, these are only examples; replace these names with names of children in your class. Try and make sure that you address each child over the course of a few days so that nobody feels left out. You can follow these steps to involve children in thinking critically.

**Ask open-ended questions:** These are questions that invite more than one plausible answer. They have no right answer and no wrong answer either. You need to listen to and ‘accept’ all answers. Open-ended questions allow the formulation of any answer, rather than a selection from a set of possible answers in the questioner’s mind.

**Ask follow-up questions:** These are questions you will ask after one child has responded to a question, for example, “What can you add Nida?” or “What is your opinion, Omar?”

**Provide feedback that neither confirms nor denies children’s responses:** If you provide this kind of feedback, then the discussion remains open. For example: “That is very interesting ... I hadn’t thought about that before.”

**Survey the other children:** This kind of questioning also takes place after a child has responded to a question. Rather than you saying that it is correct or incorrect, survey the children by asking, “Who agrees with Ali?” “Who disagrees with him?” “Why?” Tell them it is okay to agree or disagree as long as we don’t hurt anyone’s feelings and do it in a polite way. It does not mean we don’t like the person we disagree with.

**Encourage children to direct questions to other children:** You can do this by saying, “Omar, ask Komal if she can add something to your response?”

**Use think-aloud:** When a child comes up with a solution to a problem that has been posed as part of the lesson, you can ask, “How did you figure out that answer Tariq?”

**Call on all children:** Involve the entire class, not only those who raise their hands. But move on quickly to another child if someone chooses not to answer.

**Assure the children that there are no wrong answers:** Encourage everyone to have a go at answering a question by saying, “There are many possible answers to this question. Come on, give it a try!”

**Encourage the children to be imaginative:** Quite a few LPs suggest this approach. You can use it in other LPs too. Just relate it to the topic and say, “Imagine what would happen if...?”
Can you guess

ECE


Competency 4: Children will develop an understanding of measurement.

Expected Learning Outcomes
By the end of the year children will begin to develop the attitudes, knowledge and skills to:

b. Observe various objects and estimate their weight and length

Prior Knowledge
Children have heard their parents and older siblings or cousins use words such as, long and short, longer than or shorter than; heavier or lighter while comparing two or more objects. They may have heard someone say, this table is too heavy for me to move, please help me. Or, please pass me the longest brush from that shelf. So these are familiar with these words.

Teaching Material & Preparation
- Beginning: Objects in the classroom to look at such as, a blackboard and soft board or pencils and brushes. Two oranges one heavier than the other
- Middle: A large collection of beads and small stones; four plastic bowls or containers for the beads and stones; weighing scales and/or tarazoos
- Conclusion: As many sets of weighing scales or Tarazoos that you can get along with the weights

Methodology
• Beginning: To lead children towards estimating measurements, show them a few objects in the environment and ask questions, such as: “Which one do you think is longer, the chalkboard or the soft board? Or, “Can you guess which one of these two oranges is heavier?” After several children have given their estimates you can verify their estimations, by measuring the objects in front of them. It is okay at this stage to use simple tools such as, your own hand span, a piece of rope and your own judgement about heavy and light by holding the oranges in your hands.

• Middle: Now you can play the game, Can you guess? Sit in a circle on the darri or ground with the children. Make sure that everyone has enough space for movement and can see the beads, stones and bowls.

Fill two bowls with beads; put few in one and many in the other. In the same way fill the other two bowls with the stones. Place a few in one, many in the other.

Place the bowls filled with beads and stones in front of you. Ask the children to guess which bowl is heavier. Wait for their response and also ask them to give reasons for their answer. They could say that the one with more beads or more stones is heavier or they could give any other reason.

Give them the opportunity, one at a time, to pick up the bowls in their hands and feel the weight of the bowls so that they can make out the difference between the heavier and lighter bowl. Pass the bowls with beads to the child on your left side and the bowl with the stones to the child on your right side. Ask them to pick up the two bowls to feel the weight and compare which is heavier. When they have decided which is heavier ask them to pass the bowl on to the children next to them until all the children have had a turn. The children who have handled the beads will in all probability want a turn with the stones too. You can decide what to do based on how much time you have.

Question them on ways that they can check out if their estimate or answer is correct. Encourage them to count the beads and stones to see which has more, to look at the size of the beads and stones. Use weighing scales or tarazoos to confirm which is heavier.

Now you can compare a bowl of stones with a bowl of beads. To add to the challenge, try putting fewer stones as compared to the beads and ask them a question, “Why do you think the bowl of stones is heavier when it has fewer stones than beads?” Guide the discussion to comparing the different objects (beads and stones) and estimating their weights.
• **Conclusion:** To bring this activity to an end, tell the children about the weights we use along with the weighing scales/ *tarazoos*. Let them handle the weights and tell them the measurement terms such as, grams or kilograms. They will observe how some weights are heavier and larger and some are smaller and weigh less. They will also observe that some numbers are written on the weights.

**Extension Activity:** Request a couple of local shopkeepers or *thelawalas* to come in to class on a day that is suitable for them and they can sit with the children and do some estimating and weighing along with their *tarazoos*, weights and fruit or vegetables.

**A Note for the Teacher:** In a corner of your classroom you can provide concrete material for children to look at, to touch and to think about. You can keep long and short pencils, strips of paper or string, heavy and light blocks, toys and pebbles and engage them in comparing and describing the relationship between these objects, using words such as, longer or shorter than, heavier or lighter than.

We are not expecting the children to actually learn and remember the concept of measurement in depth. We need to give them the exposure and the experience so that they become familiar with the concept and acquire the vocabulary when they want to talk about weights and measurement. In Class 1 they will learn about measurement in more depth and this experience will help them at that stage.
**Measurement**

**Class 1**


**Students’ Learning Outcomes:** By the end of this lesson children will be able to:

Compare objects to identify:

- Long, longer, longest
- Tall, taller, tallest
- Heavy, heavier, heaviest
- Short, shorter, shortest
- High, higher, highest
- Light, lighter, lightest

**Prior Knowledge**

By the time they get to Class 1 children are able to recognise and name different objects in their environment. They can identify different characteristics of these objects by looking at them such as long, short, tall, small, thick or thin. In the ECE class they have learned these characteristics and can compare objects accordingly. They were also introduced to the nonstandard methods of measurement. However, they still need the reinforcement of mathematical language.

**Teaching Material & Preparation**

- **Beginning:** Four to five pencils of different sizes, three pieces of ribbon or ropes of different sizes, a few stones, three different types of balls such as plastic, tennis, cricket or football, a plastic and a steel spoon, empty bottles of three different sizes, a cup and a bucket of water. All these objects need to be organised so that similar objects are kept together. You can use bowls, basket or used boxes to keep these in.

- **Middle:** A plastic chair in addition to the wooden furniture in your classroom. Children’s school bags

  - **Conclusion:** Paper, pencils and crayons. Board and chalk

**Methodology**

- **Beginning:** Start the session by showing the children the objects you have collected. Say to them, “Today I have brought some objects for you to work with.” Tell them that you will divide the class into three groups and each group will get to explore the objects before you have a discussion about them.

  Divide the children into three groups and give them the objects. Let the children talk about the objects exploring what they have in their box or basket and how many. Encourage them to compare the objects that they have and talk about the similarities and differences. Ask the group which is working with bottles and water to see which bottle holds more water.

- **Middle:** Initiate a whole class discussion by asking the following questions:

  - Which stone do you think is heavier? So, how do you know that?
  - Okay, now tell me which bottle holds more water? How did you find out?
  - Which ball do you think is the biggest? I wonder if the biggest ball will bounce higher than the small one? Let us try it and see.
  - Which ribbon do you think is the longest? How can we tell?

  Give children time to think, look at the items again and feel, measure, hold or bounce to verify their answers.

  Proceed with the discussion and ask them to guess which chair is heavier, the plastic one or the wooden one? Let them guess and encourage them to try to lift it and figure out. Ask them to look into their bags and find the lightest thing, and also to look around and identify the heaviest furniture in the classroom.
Encourage them to observe their peers and guess who is the tallest child in the class? Who is taller than you and who is shorter than you? On the basis of the children’s responses encourage them to compare heights of different children in their class.

• Conclusion: Recap the activities done previously and then say to the children, “Now we will make some drawings of different objects. Each of you can draw some pictures and then write whether it is the longest or heaviest or tallest. I will write some helping words for you on the board.” Explain to the children that they need to draw pictures of things that are long, short, tall, light and heavy. They can draw anything, such as animals, plants, fruits, vegetables, books, toys or furniture. Repeat the instructions if necessary.

You can encourage the children to think about the largest and smallest fruit or vegetables they have eaten so far, the heaviest and lightest toys they have, the tallest and shortest person in their family, the tallest building they have ever seen and so on.

If the children find it difficult to start this activity, then give them some relevant examples. Their writing skills are developing and they will need your support in writing, so do write some helping words on the board so that the children can look at the word they need and copy it from the board.

After they are done, ask them to display their work on a soft board or a washing line. Encourage children to look at each other’s work and ask questions if they have any.

Assessment: Children’s individual drawings will help you assess their understanding of these concepts. On another day, provide children with the opportunity to talk about their drawings and share their observations related to these concepts.
**Measurement**

**Class 2**


**Students’ Learning Outcomes:**
By the end of this lesson children will be able to:

i) Recognise the standard units of length i.e. metre, centimetre, unit of mass/weight, i.e. kilogramme, gram and units of capacity/volume i.e. litre

**Prior Knowledge**
In the ECE class, they were introduced to informal methods of measurement and in Class 1 they learnt about measurement in more depth. By the time they get to Class 2, they develop an understanding of the different attributes of objects such as colour, size, weight and texture. They can estimate the length, weight and width of different objects and can arrange them from smallest to biggest, shortest to longest and lightest to heaviest. In Class 2, during previous lessons you have already discussed measurement and introduced children to the standard units of length, mass and capacity along with their abbreviations. However, they still need reinforcement and practice in using appropriate units of measurement.

**Teaching Material & Preparation**

- **Beginning:** The items required are: two pieces of string of different lengths, for example, 45 cm and 62 cm; children’s books, notebooks, pencil boxes and school bags; empty bottles of soft drinks, shampoos, cooking oils and syrups. Paper and pencils for each group

- **Middle:** Empty packets of different items such as washing powder, sugar, flour, chips, soaps, *masala* packets. Each packet must have a label on it. The different bottles used in the ‘Beginning’ phase. Measuring tape, rulers of 15cm and 30cm. Board and chalk

- **Conclusion:** Units of Measurement Table. Please see page 10. Paper and pencils

**Methodology**

- **Beginning:** Introduce the measuring activity by saying, “Today we will measure some items in our classroom.” Explain that the class will be divided into four groups and each group will be given some items to measure.

Divide the children into four groups and assign tasks to each group as follows:

Group 1: This group will measure different distances with their feet (heel to toe) such as, how far it is from their desks to different parts of the classroom, such as to the blackboard, to the door or to the teacher's desk. You may need to demonstrate to the children what it means to step heel to toe.

Group 2: This group will measure with their hand span the length of pieces of string, the top of the desk and the width of the classroom door. Demonstrate if necessary.

Group 3: This group will compare different items such as books, notebooks, pencils boxes and school bags.

Group 4: This group will find out which bottle will hold more liquid.

Each member of the group will have to measure the assigned item in turn and note down measurements on a piece of paper. Repeat the instructions if needed.

As children start their work, you need to circulate among the groups and listen to their conversation and facilitate them accordingly.

- **Middle:** After all the groups are done with their tasks, ask them to take turns and share their findings. As they share, you can pose questions such as:

  - Do all members in a group have the same answers? Why or why not?
  - Do you think it matters what size of hands and feet people have? Will smaller feet need to take more steps or fewer?
I wonder what needs to be done to get an exact measurement? Does anyone know?

Who have you seen using measuring tapes, metre sticks, rulers, balances and weighing machines? Why do you think they use these tools?

After the discussion, ask children to look at the different packets, bottles, rulers and measuring tape. Look at the measurements and the different units of measurement written on these. You need to circulate, observe them and facilitate them in finding the measurements and the units used.

You need to reinforce the concept of units of measurement and their abbreviations. For instance, ‘kilogramme’ is used to measure heavy objects, while ‘gram’ is used for lighter objects. In the same way, ‘metre’ is used to measure long or tall objects while ‘centimetre’ is used to measure short things. ‘Litre’ is used to measure large volumes of liquid, while ‘millilitre’ is used for smaller volumes.

It would be helpful if you made a table on the board with measurement units with their abbreviations.

• Conclusion: Begin this session by reviewing the different units of measurement and the activities done previously.

Introduce the next task by saying, “Now think about the different objects or items that we use in our daily life, in our homes and especially in our kitchens.” Then ask the children which units are commonly used to measure these objects or items. Tell the children that they have to think of a list of different items and that while they do that you will make a table on the board.

Give children time to think and in the meanwhile, draw the Units of Measurement Table on the board like the one given at the end of this lesson plan.

Invite the children to share the names of the items they have thought of. As they name their item ask them which column you should write its name in and why. If a child says ‘Water’ write it down in the litres column, and then ask him to elaborate on whether they are talking about the water used for drinking, bathing or washing before deciding on the unit of measurement. If they say ‘Fruit’ or ‘Vegetable’, ask them to give an example of a fruit or vegetable. Continue this activity till every child has given an example.

Assessment: Children’s participation in different activities and discussions will help you to assess their understanding of the concept. You can also give children the opportunity to measure different objects and record their measurements. They can be asked to collect different empty packets or bottles with labels to read the measurement written on them. They can make a list of these objects along with the measurements.

<table>
<thead>
<tr>
<th>Units of Measurement Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass/Weight</td>
</tr>
<tr>
<td>Kilograms</td>
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<td></td>
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</tbody>
</table>
Measuring Length, Weight and Capacity

Class 3


Students’ Learning Outcomes:
By the end of this lesson children will be able to:

i) Measure and write standard units of length, weight and volume including abbreviations

iv & vi) Solve real life problems involving the same units for addition and subtraction

Prior Knowledge
By the time they get to Class 3, children are well aware of different objects in their environment. They can classify various objects on the basis of different attributes such as length, width, height and weight. At some point in their life, most children have also seen vegetables and fruit being weighed on a physical balance and clothes being measured by a measuring tape or a metre stick. They are aware that specific instruments/tools are needed to measure the weight or the length of things. In Class 2 they were introduced to different standard units of measurement, but they still need time and practice in using them appropriately.

Teaching Material & Preparation

- Beginning: Board and chalk
- Middle: Measuring instruments such as: measuring tape, a 15 cm and a 30 cm ruler, measuring jug/beakers, empty soft drink bottles of different sizes, glass and water, physical balance and weights, and a weighing machine. Strips of paper or cards with the Questions for Measuring Activities written on them. Please see page 12. A basket or a box to keep these strips
- Conclusion: 6 A4 size papers and pencils, 6 strips of papers or cards to write the Measurement Story Sums. Please see page 12.

Methodology

• Beginning: Start a whole class discussion by asking questions such as:

- Where have you seen people using rulers, metre sticks, measuring tapes, weighing machines and physical balances? Do you know why they use these measuring tools?

- What would happen if they didn’t have these tools? What kind of problems do you think could arise?

Give children time to think and respond. Make sure all the children are involved and encourage them to answer with reasons. Encourage them to share any personal experiences where they closely observed or even used these measuring tools.

Conclude the discussion by stating that each tool or instrument is designed for a specific kind of measurement. That each of the tools can measure in different units and can be used to measure different types of objects. Here you can recap the standard units of measurement with the children. Write down the units and their abbreviations on the board as the children talk about them.

• Middle: Introduce the group activity by saying, “Today we are going to find out the measurement of some objects and materials using certain measuring tools.” Place the instruments and the basket of paper strips in front of the class and say, “Here is a basket with some paper strips. On each strip, I have written some instructions about what you have to measure. For this activity you will work in small groups.”

Divide the children into six groups and then give the following instructions: “Any one member from each group will come to me and pick one strip from the basket. They will read the instructions on the strip and tell their group what has to be measured and then all of you in the group will decide which instrument is the right one to use. Remind them to mention the unit of measurement. “Once all the groups are done with their measurements, each group will decide on a presenter who will share the group’s findings with the rest of the class.” Repeat the instructions if necessary.
Let the children come forward, pick the strips and discuss the task within their groups. Ask them to select the measuring tool to measure the object stated on their strip.

After all the groups are done with their measuring tasks, ask them to take turns and share their findings. As each group shares, ask questions such as: “Why did you use this instrument? Is there any other way to measure this object? Which way is most effective and why?”

• Conclusion: Begin this session by reviewing the activities done previously and introduce the next activity by saying, “For this activity, you will have to work in the same group and each group will have a short story sum to solve.”

As children settle down in their groups, give each group a story sum and a piece of paper and say, “Read the sum carefully and discuss it in your group and figure out how to solve it.” Tell the children to copy the sum on the paper that they have been given. Tell them that they need to think about whether to add or subtract to get the answer. Once you are done, tell them to recheck their answer before they share it with their class. Tell them they can also illustrate the sum to make it more interesting.

Give the children enough time to read, understand, discuss and then solve and illustrate the story sum. When all the groups are done, invite each group to read the sum aloud and share the answer they have calculated. Encourage other groups to see whether the group has solved the sum correctly or not.

Assessment: You can assess the children’s understanding of the concept by their participation in the group tasks and discussions. In addition to this, children could be asked to measure 10 to 12 different items and write their names, measurements and their units of measurement.

Questions for Measuring Activity
1. What is the height of the classroom door?
2. Find out the thickness of the Math book.
3. Measure the length of your writing table.
4. Find out the weight of a notebook and an empty pencil box.
5. How many glasses of water are needed to fill a 1 litre and 500 ml bottle?
6. What is the width of the classroom cupboard?

Measurement Story Sums
1. Ali had some sugar in a bag. He added another 250g to get a total of 375 g of sugar. How much sugar did Ali have to begin with?
2. A jug holds 750ml of juice. After Sana pours a glass, there is 425ml of juice left in the jug. How much juice did she pour into her glass?
3. Kiran and Laila both have coconut trees in their courtyards. Kiran’s coconut tree is 19m tall. Laila’s coconut tree is 5m shorter than Kiran’s. How tall is Laila’s tree? What is the total height of both trees?
4. A farmer loads two sacks of carrots into a box. The total weight of the two sacks is 129 kg. One sack weighs 90kg. What is the weight of the other sack?
5. Batool wanted to make new clothes for her doll. She used 430cm of cloth to make a doll’s dress and 380 cm for its trousers. How much cloth did Batool use?
6. Moiz removed 450ml of water from his fish bowl. If he left 125ml in the bowl, how much water did the bowl have to begin with?
Length, Mass/Weight and Volume/Capacity

Class 4


Students’ Learning Outcomes:
By the end of this lesson children will be able to:

iii) Use appropriate units to measure the length, mass/weight and capacity/volume of different objects
iv) Solve real life problems involving conversion, addition and subtraction of units of measurement

Prior Knowledge
By this stage, children are generally aware of different formal and informal tools of measurement. They can categorise objects according to their length, weight and capacity. In previous classes, they studied the standard units of length, mass/weight and volume/capacity. They can measure, read and write standard units of measurement including abbreviations. They can also solve basic real life problems involving measurements. They can add measurements of the same unit without carrying and subtract measurements of the same unit without borrowing. In class 4, during previous lessons on measurements, they have studied conversion of the standard units of measurement. They still need to practise conversion in order to better understand this concept.

Teaching Material & Preparation
- Beginning: Two measuring tapes, two big and two small rulers. A weighing scale and weights. Some fruit and vegetables and also some packets of grain, such as rice or pulses. A measuring jug, empty soft drink bottles, a jug or a small bucket and water, small cup to fill bottles. Paper and pencils.
- Middle: No material required.
- Conclusion: Strips of paper to write the Sample Measurement Problem Sums given on page 14. These are ten sample sums and you will need to add more sums so that every child gets at least one sum. A basket to keep the strips of paper. Children’s notebooks and pencils.

Methodology
• Beginning: Introduce a group activity by saying: “We have studied measurements and the different units of measurements. Today we will learn more about them.” Tell them that they will work in groups and measure different objects, which they will record on a piece of paper.

Divide the children into three groups and assign them the following tasks:

Group 1: Give this group measuring tapes and rulers and ask them to measure the length, width or height of different things in the classroom.

Group 2: Give this group the physical balances with weights and ask them to measure the different items you brought and some other objects in the class.

Group 3: Give this group a measuring jug, bottles, the bucket and water and ask them to find out the capacity of different bottles.

Encourage them to measure different objects and compare them.

Repeat the instructions if necessary and remind them to record the measurements and mention the unit clearly.

Give the children time to work and record the measurements, while you circulate among the different groups and facilitate them accordingly.

• Middle: After they are done with the measuring activity, ask each group to share their findings. While they share their findings, ask them questions about why they used a particular unit of measurement and how it can be converted into another unit. Pose questions such as:

- Why do you think we use these standard units of measurement? What might happen if there were no standard units of measurement?
- I’m wondering why you used centimetre (cm) to measure the length of a book and a pencil? Do you think you could have used metres instead? Why or why not?
- If we want to measure the length of this classroom, which unit do you think we should use?
- What is the total weight of the rice and the apples? Do you think we could use the same unit to measure the weight of a toffee as we used for rice? Any ideas?
- Who can tell me how many 500 ml bottles will fill a 1.5 litre bottle? How many millilitres are there in 1.5 litres?

While discussing these questions, also ask them to convert the measurements they shared into other units such as kilogrammes into grams, metres into centimetre, litres into millilitres or vice versa.

Here you need to reinforce the rules of conversion: “If you want to convert a large unit to a small unit, you need to multiply. If you want to convert a small unit into a large unit, you need to divide.”

Conclusions: Introduce the next individual task by saying, “Now you will work individually. There are some problem sums in the basket.” Ask each child to pick a sum and write it down in his/her notebook and then solve it. Tell them that when they are done they can put the strip back into the basket and get another one. In this way, each child will attempt two problem sums. Repeat the instructions if necessary.

Let the children pick strips of papers and solve the sums. While they are solving the sums, move around and observe them. It will give you an idea about their understanding of the topic.

After they are done, ask them to exchange their notebooks with the child sitting next to them to check the sums, discuss each other’s work and verify answers. You need to walk around the classroom and facilitate them.

Assessment: To assess children’s understanding and learning, give them sums on conversion from one unit of measurement to another. Give the children time to solve problem sums individually in their notebooks.

Sample Measurement Problem Sums

1. Jamil rode 2 kilometres on his bike. His brother Saleem rode 3000 meters on his bike. Who rode furthest and how much further did he ride?

2. Tanya went to the store to buy three litres of orange juice for a party. The store only sold the juice she wanted in 250 ml cartons. How many 250 ml cartons does Tanya need to buy?

3. Saba bought a 1 kg bag of cherries at the market and ate 175 g of them on the way home. How many grams of cherries did Saba have left by the time she got home?

4. Danial cut a five-metre ball of string into four equal-sized lengths. How many centimetres long was each length of string?

5. My family is moving to a new house. Our old house is 3 kilometres from the new house. How many metres is the old house from the new one?

6. Sarah cut a 20 cm length of ribbon to wrap around a gift. How many millimetres is the ribbon?

7. A box contains 4 jars of pickles. The total mass of all 4 jars is 2 kg. What is the mass of each jar in grams?

8. Samra poured two litres of milk into cups that each held 250 ml. How many cups can she fill?

9. I need to mail a box of apples to my mother. The box cannot exceed a mass of 3 kg. If each apple has a mass of 200 g, what is the maximum number of apples I can send?

10. Asad served 4 litres of lassi to eight friends. How many millilitres of lassi did each friend consume?
How do we measure

Class 5

Curriculum Link: National Curriculum for Mathematics Grades I – XII 2006. Unit 5 Distance, Time and Temperature pages 34 and 35

Students’ Learning Outcomes:
By the end of this lesson children will be able to:

i) Convert measures given in kilometres to metres, metres to centimetres and centimetres to millimetres

iii) Solve real life problems involving conversion, addition and subtraction of units of length

Prior Knowledge
Children have been studying the topic of measurement from Class 1. They know that there are standard units of measurement for length, mass, weight, capacity and time. They can use different tools to measure and write the standard units and are familiar with the abbreviations used for each. In Class 3 they were introduced to the rules of conversions from one unit to another. In Class 4 they used those rules of conversions to solve real life measurement problems. Though, they have been taught this unit in the previous classes, at this level the concept of converting from one unit to another needs to be reinforced.

Teaching Material & Preparation
- Beginning: Board and chalk. Units & Common Conversions Tables Please see page 16.

- Middle: A measuring tape, a 15 cm ruler and a 30 cm ruler and a piece of paper, one for every group. A chart paper displayed somewhere in the class, a few paper strips of different sizes, and small scraps of paper of different measurements. The scraps should not be more than 10 cm in length. Date Collection Table. Please see page 16.

- Conclusion: Real Life Measurement Problems. Please see page 17. Strips of paper or cards for each child to write a sum. Board and chalk

Methodology

• Beginning: Ask the children, “Who came walking to school today?” Depending on the children’s responses, ask some of them if they know how far their home is from the school. Ask if they know which unit of distance they would use to measure the distance between their home and school.

After the children have responded, put these units on the board starting with the largest: kilometre, metre, centimetre and millimetre. Make the Units Tables on the board, which is given on page 2. Ask them questions such as, “Does anyone know how many millimetres there are in a centimetre? How many centimetres are there in a metre?” In the same way, ask about metres and kilometres and the relationship between these units. Complete the table with the children’s responses using the abbreviations and use the Conversions Table to help with the comparison of the different units.

• Middle: Tell the children that you will divide them into three groups and each group will get a few measuring tools. Tell them that they will have to use the tools to measure different things. They will measure the length of their class, the length of the door, windows, cupboards, shelves, a chart paper, a long sheet, a notebook, a textbook, some paper strips and some scraps. They can also measure the heights of their friends and compare the differences. Tell them that depending on the things they plan to measure, they will have to select the tool and also that they may use more than one measuring tool to measure something. Tell them that you will give each group a sheet of paper on which they will need to make a table similar to the one you will make on the board to record their findings. After they are done tell them that each group will get an opportunity to talk about the things they measured and the tools they used and why. Repeat the instructions if necessary.

Divide the children into three groups and hand them the materials required by each group.

As children settle down in their groups and become familiar with the material, make the Data Collection Table on the board. Move around in the classroom to support the children with any challenges they may face. Towards the end of the lesson, signal to them to wrap up their work and then share their findings with the rest of the class.
• Conclusion: Start this session by reviewing what the children did in the previous class. Remind them how they used different tools to measure the same thing. Were the measurements the same, or were they different? What was the difference and how did they find out the difference?

Now say to the children, “Today we will write down some measurement sums based on real life problems. We will use what we learnt about units of distance and time for this task. I will share a few sums with you then you will work on your own.

Write two or three sums of different types and of different measuring units on the board and invite children to solve them. Some Real Life Measurement problems are given on page 2 as samples. First you need to reinforce the rules of conversion by saying, “You do remember don’t you, when you want to convert a large unit into a small unit, you need to multiply. When you want to convert a small unit into a large unit, you need to divide?”

When the children have grasped how to make and solve problem sums, give them strips of paper and ask them to make problem sums of their own. Each child should make up only one or two sums.

After they are done with making their own sums, ask them to exchange their sums with other children in the class and solve them. Meanwhile, you need to circulate in the class to observe and facilitate children.

Assessment: The individual sums children do in their notebooks can be used to assess their learning and understanding of the topic.

### Units & Common Conversions Tables

<table>
<thead>
<tr>
<th>Unit Name</th>
<th>Unit Abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilometre</td>
<td>km</td>
</tr>
<tr>
<td>Metre</td>
<td>m</td>
</tr>
<tr>
<td>Centimetre</td>
<td>cm</td>
</tr>
<tr>
<td>Millimetre</td>
<td>mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Conversions</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mm = 1 cm</td>
</tr>
<tr>
<td>50 mm = 5 cm</td>
</tr>
<tr>
<td>3 cm = 30 mm</td>
</tr>
<tr>
<td>100 cm = 1 m</td>
</tr>
<tr>
<td>500 cm = 5 m</td>
</tr>
<tr>
<td>3 m = 300 cm</td>
</tr>
<tr>
<td>1,000 m = 1 km</td>
</tr>
<tr>
<td>5,000 m = 5 km</td>
</tr>
<tr>
<td>3 km = 3,000 m</td>
</tr>
</tbody>
</table>

### Data Collection Table

<table>
<thead>
<tr>
<th>Name of things measured</th>
<th>Tools used</th>
<th>Kilometre (km)</th>
<th>Metre (m)</th>
<th>Centimetre (cm)</th>
<th>Millimetre (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Real Life Measurement Problems

1. Zaid went to his friend’s home that was 1 km away from his home. When he left his own home he started jogging towards his friend’s home, and then he walked the rest of the way. He jogged twice as far as he walked. How far did he walk? Write your answer in metres.

2. Yasmin and Kiran were measuring their heights. Yasmin is 1.4 m tall. Kiran is 6 cm taller than Yasmin. What is Kiran’s height in centimetres?

3. A group of 8 monkeys made a monkey chain from their branch down to the ground to reach a banana. The distance from the branch to the banana was 4.8 m. How many centimetres did each monkey reach?

4. A pencil is 125 mm long. A ruler is 3 times longer than the pencil. How long is the ruler in centimetres?

5. A string of 8.5 m was cut into two equal parts. What is the length of each part in centimetres?
Measurement

Class: Multiage

**Curriculum Link:** National Curriculum for Mathematics, Grades I – XII 2006.

Class 4: Unit 5 Measurements, 5.1 Length, 5.2 Mass/Weight, 5.3 Volume/Capacity, pages 27 and 28.
Class 5: Unit 5: Distance, Time and Temperature pages 34 and 35.

**Students’ Learning Outcomes**

By the end of this lesson children will be able to:

i) Compare objects to identify:
   - Long, longer, longest
   - Tall, taller, tallest
   - Heavy, heavier, heaviest
   - Short, shorter, shortest
   - High, higher, highest
   - Light, lighter, lightest

ii) Recognise the standard units of length i.e. metre, centimetre, units of mass/ weight, i.e. kilogramme, gram and units of capacity/volume i.e. litre

iii) Measure and write the standard units of length, weight and volume including abbreviations

iv) Solve real life problems involving conversion, addition and subtraction of units of measurement

**Prior Knowledge**

By the time children start school most of them are familiar with and can name different objects in their environment. They can identify certain characteristics of these objects by looking at them, such as: long, short, tall, small, light, heavy, thick or thin. Children have seen adults use various measuring tools at home and they generally accompany their parents to the market and have seen different measuring tools used there as well. Older children have some awareness of the purpose and use of these tools. They have also studied the different units of measurement since they were in Class 2.

Children of Classes 4 and 5 have also learned conversion of different units of measurement.

**Teaching Material & Preparation**

- **Beginning:** Three pencils of different sizes, three pieces of ribbon or rope of different sizes, a few stones, three different types of balls such as plastic, tennis, cricket or football, a plastic and a steel spoon, empty bottles of different sizes, a cup and a bucket of water. Measuring tools such as: measuring tape, 15 cm and 30 cm rulers, measuring jugs/beakers, and a physical balance and weights. Three tables.

- **Middle:** No material required

- **Conclusion:** Strips of papers or cards to write the Problem Sums for Classes 2 & 3 and 4 & 5. Please see page 19. Notebooks and pencils

**Methodology**

- **Beginning:** Place the three tables, each one against a different wall in your room. On the tables place the following items:

  Table 1: Measuring tape, a ruler, strings, ribbons, books and pencils
  Table 2: A physical balance and weight, balls, spoons, stones, pencil box and book
  Table 3: Bottles, a bucket of water, cup and measuring jug/beaker.

Introduce the group activity by showing the items to the children and saying, “Today I have brought some material for you to work with. There are three workstations and you will be divided into three groups.” Tell them that each group will work with the material in one station. Tell them that after a
few minutes, you will give them a signal to change stations. After working at the second station, tell
them that you will signal for the group to change stations again. Repeat the instructions if necessary.
You have children of different ages in your class and for this activity you will need to involve them
all at the same time so make mixed groups. The younger ones and the older ones will be at different
levels of development and understanding and will have different things to say and that is a big
advantage, because they can learn from each other.

Begin the group activity and let each group go to a station and ask them to look at the material,
compare and talk about the similarities and differences. Ask young children to estimate and compare
the measurement by looking and holding, while older ones can use measuring tools and record
measurements. You need to circulate, observe and facilitate them. Encourage older children to let
young children initiate and measure different objects first. Also ask older children to mention the
units of measurement clearly.

After a few minutes, signal to the groups to wind up what they are doing and move to the next
station.

• Middle: Initiate a whole class discussion by asking the questions that follow. Make sure you involve
all the children in the discussion, particularly the younger ones and give them the opportunity to
share their observations. Give children time to think about each question and look at the
measurements that they have recorded. Here you need to reinforce the different units of
measurement. Encourage them to share their personal experiences of a time when they closely
observed or even used these measuring tools.

- Which stone do you think is heavier? So, tell me how you figured that out?
- Okay, now tell me which bottle holds more water? How did you find out?
- Which ball do you think is the biggest? I wonder if the biggest ball will bounce higher than the small
one? Let us try it and see.
- Who can tell me which ribbon is the longest? How do we know?
- Where have you seen people using rulers, metre sticks, measuring tape, weighing machine and
physical balances?
- Do you know why they use these measuring tools? What do you think would happen if they didn’t
use these tools? Do you think some problems could arise?

• Conclusion: For this session, divide children into groups in the following way:
Group 1: Children of Class 1
Group 2: Children of Class 2 and 3
Group 3: Children of Class 4 and 5
Tell Group 1 to draw pictures of things, which are long, short, tall, light and heavy. They can draw
anything such as animals, plants, fruit, vegetables, books, and furniture. Repeat the instructions if
necessary.

Also ask them to think about and draw the largest and smallest fruit or vegetables they have eaten so
far, the heaviest and lightest thing in their school bag, the tallest and the shortest person in their
family, and the tallest building they have ever seen and anything else that you and the children can
think of.

Give Groups 2 and 3 the problem sums to solve. Each child can pick up one strip, copy the sum
written on it in her/his own notebook and solve it. After solving the sum, tell them to put it back and
get another sum to solve. Tell each child that he or she will have to solve at least three sums. After
they are done, ask them to exchange their notebooks with another child in their group and verify the
answers.

Assessment: Children’s participation in the measuring activity and the group discussion will help
you to assess their understanding of the concept. Individual tasks done by them will also provide
evidence of their understanding and learning.
Sample Problem Sums for Classes 2 & 3

1. Ali had some sugar in a bag. He added another 250g to get a total of 375 g of sugar. How much sugar did Ali have to begin with?

2. A jug holds 750ml of juice. After Sana pours a glass, there is 425ml of juice left in the jug. How much juice did she pour into her glass?

3. Kiran and Laila both have coconut trees in their courtyards. Kiran’s coconut tree is 19m tall. Laila’s coconut tree is 5m shorter than Kiran’s. How tall is Laila’s tree? What is the total height of both trees?

4. A farmer loads two sacks of carrots into a box. The total weight of the two sacks is 129 kg. One sack weighs 90kg. What is the weight of the other sack?

5. Batool wanted to make new clothes for her doll. She used 430cm cloth to make a doll’s dress and 380 cm for its trousers. How much cloth did Batool use?

6. Moiz removed 450ml of water from his fish bowl. If he left 125ml in the bowl, how much water did the bowl have to begin with?

Sample Problem Sums for Classes 4 & 5

1. Jamil rode 2 km on his bike. His brother Saleem rode 3000 m on his bike. Who rode furthest and how much further did he ride?

2. Saba bought a 1kg bag of cherries at the market and ate 175g of them on the way home. How many grams of cherries did Saba have left by the time she got home?

3. Samra poured two litres of milk into cups that each held 250 ml. How many cups can she fill?

4. My family is moving to a new house. Our old house is 3 km from the new house. How many metres is the old house from the new one?

5. A box contains 4 jars of pickles. The total mass of all 4 jars is 2 kg. What is the mass of each jar in grams?

6. Asad served 4 litres of lassi to eight friends. How many millilitres of lassi did each friend consume?

Note: You can add more problem sums, depending on the number of children in each group.