The Thinking Classroom
Lesson Plans for Primary Teachers

MATHEMATICS: ANGLES AND SHAPES
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...?”
I'm Going on a Shape Hunt

ECE


Competency 3: Children will recognise basic geometrical shapes and the position of objects in relation to each other.

Expected Learning Outcomes
By the end of the year children will begin to develop the attitudes, knowledge and skills to
a. Recognise, name and draw two-dimensional shapes, such as, circle, oval, square, rectangle and triangle.
b. Identify the shapes in their environment.
c. Draw objects of their own choice using various shapes.

Prior Knowledge
Children will certainly have seen and observed shapes in their environment. They will have observed different shapes, for example, in the furniture in their homes and places they have visited, their toys, in the kitchen, the food they eat, in nature, in buildings and tiles on floors and walls. Parents and adults may or may not have helped them learn the names of these shapes. So it is always a good idea to find out what they already know.

Teaching Material & Preparation
- Beginning: Ten or more pictures of objects and buildings mentioned above in the section on Prior Knowledge and adhesive tape. Place these pictures on all four walls of your classroom before the children come in.
- Middle: Paper and crayons or paint for each child to draw and colour objects of their own choice.
- Conclusion: The pictures children have made and a song about shapes.
- Extension Activity: Natural materials, like clay and recycled materials, for example, string, empty boxes, ice cream sticks, straws, pencil shavings, beads and buttons. Cut out shapes: circle, oval, square, rectangle and triangle.

Methodology
• Beginning: Ask children to walk around the classroom and look at the pictures. Walk around with them and draw their attention to the shapes in the pictures. Involve them in identifying and talking about similarities and differences among the shapes in the pictures. Talk with the children about how objects in the environment are made of different shapes.

Then get everyone to sit down in their places and pointing to the pictures, introduce the names of the shapes: circle, oval, square, rectangle and triangle.

Draw a picture of a house on the chalkboard with different shapes and have the children identify all the shapes that complete that picture i.e. square, rectangle, oval and so on.

• Middle: Take children outside the classroom for a ‘shape hunt’ looking for geometric shapes in the environment. Look for shapes in the environment such as, shapes of the windows, doors, leaves on plants, tiles on the floors, bins or baskets and anything else you and the children can see as you walk around.

- When you return, request them to sit down and give them a couple of minutes to settle down. Then tell them: “I am going to give each one of you a sheet of paper and some crayons. You can draw anything you like, but you must try and make sure that you are thinking about shapes today while you are drawing.”

- Then hand out the paper and crayons and let them begin.
- After a few minutes, walk around the classroom and see if anyone needs to talk or ask you something. Please don't instruct the children on what to draw. However, if anyone of the children is lost for ideas or hasn't started drawing, you can gently prompt them. Say something like, “I’m wondering what you are going to draw today. I’m also wondering which shapes you are going to use.” The child may tell you or may keep quiet. If the child keeps quiet, you can say something like, “I wonder if you are going to draw a tree or an animal or your ammi or abbu or your classroom.” This will hopefully help the child get started.

- When the children have finished you can move towards the conclusion of the activity.

• Conclusion: To bring this activity to an end you can sit in a circle with the children and talk about the pictures they have made. Give them an opportunity to describe their picture and name the shapes they have used to make it. If you know a song about shapes sing it with them or make one up yourself.

Extension Activity: Provide experiences in making shapes with natural and recycled materials mentioned under the heading, Teaching Material & Preparation.

Show the children how they can use the collection of shapes and other materials to make their own picture. For example, the oval can represent the body, the ice cream sticks the arms, the circle the head, the rectangles the legs and so on. Encourage children to experiment with different shapes as they create pictures of themselves. Let them decide what to do. If someone wants to use a circle for a body, let them, or a square for the head, that is okay too. Let them express themselves the way they want to and be creative.

A Note for the Teacher: Engage and encourage children to carefully observe and compare basic geometrical shapes. Through these activities children will begin to develop a sense of shapes and space. You can talk about shapes conversationally even when you are exploring different concepts, such as Fractions, Measurement, Environment or Plants.
**Shapes All Around Us**

**Class 1**

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

**Students’ Learning Outcomes:**

i) Recognize and match objects, from daily life, of similar shape.

ii) Identify the following basic shapes

- rectangle
- square
- circle
- oval
- triangle

iii) Identify the basic shapes from real life objects

**Prior Knowledge:** By the time children reach Class 1, they have an understanding of the different attributes of objects, such as colour, size and weight. They also have a basic understanding of quantity and can count from 0–9. They can identify shapes in their environment and at the ECE level they have also learned the names of some basic shapes. At this stage they need to observe and understand that the objects in their environment are formed from a combination of different shapes.

**Teaching Material and Preparation**

- **Beginning:** Two sets of the following shapes: circle, oval, rectangle, triangle and square. A cloth or paper bag to keep the shapes in and a clean piece of cloth to be used as a blindfold.
- **Middle:** Board and chalk.
- **Conclusion:** Paper and pencil for each child and soft board or washing line.

**Methodology**

- **Beginning:** Introduce the game Mystery Bag to the class. Show the children the bag and the blindfold, and tell them that there are some shapes inside the bag. Tell them that you will call some of them one by one and blindfold them. The blindfolded child will have to put his or her hand into the bag and pull out one shape. Then they will have to touch and feel the shape and guess what it is. Ask the children if they understand and repeat the instructions if required. Do this conversationally without demonstrating any impatience.

  Start the game by calling any one child. Blindfold him/her and begin the Mystery Bag game. As the child tries to guess, you can ask questions such as:

  - Does it feel as though it is round or straight?
  - Can you feel any corners?
  - How many corners do you think there are?

- **Middle:** Introduce the next activity by saying: “We found different shapes in the mystery bag, can you find some of these shapes in the classroom as well?” Tell the children that in a little while, you will ask them to get up and look around the classroom to try and find those shapes. Explain that you will make columns on the board for each shape and that they will have to tell you the name of the object that they find and tell you what shape it is and that you will note it in the column. Repeat the instructions if necessary.

  Let the children move around the classroom and observe and identify objects of different shapes. While children look for the objects, you should draw five columns on the board. On top of each column either write the name of a shape or draw it. As soon as the children find an object of a particular shape, ask them which column you should note the name of the object in. Then write or draw that object in the respective column.

  When they are done with the objects in the classroom, ask them to shut their eyes and think about the objects in their homes, neighbourhood, streets, park or playground.
Give them time to think and visualise different objects. As they name different objects, encourage them to think about the details of the objects that they name. Ask “Does this object have only one shape or can you see other shapes in it too?” For example, if one of them mentions a bus, then the main shape is a rectangle and it has several wheels, which are circles and it may have square windows.

Now pose a challenge and ask the children: “Now which column should I write bus in?” Let them think about this and give you a rationale for why it should be written in the column they are suggesting. Staying with the bus example, the child may say it should be written in the Rectangle Column because the rectangle is the largest shape in the bus. Alternatively, the child may say it should be in the Circle Column, because the number of circles (wheels) are more in number than the rectangle. Ask different children for their opinions and get some general agreement before writing it in the column that has been decided on.

**Conclusion:** Begin this session by reviewing the previous activities and tell the children that for this activity they will be working individually.

Hand a piece of paper to the children and ask them to draw a picture using different shapes. Tell them they can draw whatever they like, but they are to use all the shapes at least once.

Give them time to think and draw. After they are done, ask them to look at each other’s drawings. Encourage them to compare and contrast the drawings to see which shapes they used and how. Ask them to display their work on a soft board or washing line.

**Assessment:** Collect their drawings and keep them safe in a folder. When you need to assess them, give them the opportunity to talk about the picture they drew. They can describe their drawing and talk about the shapes they used to make it. While they are talking about their drawings, ask questions such as:

- Do you have any idea about why the wheels on vehicles are always circular in shape?
- What do you think it would be like if all the rooms in our homes were triangular in shape?
Two-dimensional Figures

Class 2

Unit 5: Geometry. 5.1 Two-dimensional Figures & 5.2 Lines and Curves. Pages 17 and 18.

Students’ Learning Outcomes:

5.1 Two-dimensional Figures
i) Identify the figures like square, rectangle, triangle, circle, semi-circle and quarter circle
ii) Identify vertices and sides of a triangle, rectangle and square

5.2 Lines and Curves
i) Differentiate between a straight line and a curved line

Prior Knowledge: Children make sense of the world around them through observation and experience. They learn about colours, shapes and sizes as they come across different objects and figures during their daily activities. They have become familiar with two-dimensional shapes such as rectangles, triangles, squares, circles, and ovals. They can name these shapes and also match them with real life objects. They are also familiar with the semi-circle and the quarter circle, as they have learnt the concept of half and quarter. However, they may lack the proper vocabulary to describe these shapes.

Teaching Material and Preparation

- Beginning: Four sets of the following shapes: circle, square, rectangle, triangle, semi-circle and quarter circle.
- Middle: You will need the sets of shapes again.
- Conclusion: Old newspapers, chart paper, glue, colour pencils, rulers and scissors. You should have enough for all the children.

Methodology

• Beginning: Introduce the activity by saying: “Today we are going to talk about shapes and you will be working in groups.” Tell them that you will give each group some shapes and they have to discuss which objects in their homes and in the classroom look like those shapes.

Divide the children into four groups and give each group a set of shapes. Give them time to look at them and talk about them. During the discussion, you can move around the classroom and observe and assess how much the children know about these shapes.

When they are done with the discussion, ask each group to share what they discussed. Ask questions such as:

- I wonder if our bodies have any shapes that are similar to these? What do you think?
- Do cars, trucks and buses have only one shape? Or do you think there are some other shapes too? I wonder what would happen if these vehicles had square or triangular wheels?
- Has anyone of you ever seen a round house? What did it look like and where did you see it?

• Middle: Start a whole class discussion by saying: “Let’s talk about these shapes a little more.” Then ask questions such as:

- Which of these shapes can roll like a wheel? Do you know what it is about the shape that makes it roll?
- Can you figure out what is different in a square and a rectangle? Or do they look similar to you?

Give children the opportunity to look at the shapes to compare and identify similarities and differences.

As the children respond to these questions and compare and contrast the shapes, you can start focusing on geometrical terms, such as ‘sides’ and ‘vertices’, and ‘straight’ and ‘curved’ ‘lines.

Now ask some more questions such as,
- Let us look at how circles and ovals are alike and how they are different. Do these shapes have any vertices or sides? What do you think?

Next you can focus on the semi-circle and quarter-circle and ask:

- Have you ever seen anything that looks like these shapes? Where? How are those things being used?
- What do you think, are these shapes complete or do they look incomplete to you?
- What do we call these shapes? Do they have any sides or vertices? Have you seen any objects shaped like this at home or in school?

Remember to reinforce the words ‘semi-circle’ and ‘quarter circle’.

• Conclusion: Initiate the group work by telling the children that they will do an interesting activity with the same group as before. Tell them that you will give each group some newspapers and that they will cut out different shapes from it. They will then use those shapes to create a picture by pasting the shapes on the chart paper. Repeat the instructions and respond to any questions if necessary.

Let the children settle in their groups and then tell them that the first thing they have to do is to decide as a group, what they want to create and which shapes they want to use. Tell them to let every member of the group air his or her opinion and that they should listen to everyone before deciding what to do as a group. Remind them to respect each other’s views. Repeat the instructions if necessary without demonstrating any impatience. Tell them that after they have created their picture each group will be required to present their work to the whole class.

Give each group the materials required for this section of the plan. Encourage them to discuss and mutually agree on the picture that they want to create. Give them time to work on their ideas. Remind them to clean up the area after they are done.

When all the groups are done with the task and have cleaned up, ask them to present their work to the whole class. Ask the presenters to tell everyone which shapes they used and to point out straight and curved lines and vertices in the picture that they created.

Assessment: The children’s group presentations and contribution to the discussions can be used to assess their learning and understanding of these concepts. Children can be asked to draw two-dimensional shapes in their notebooks and draw or write the names of objects, which contain these shapes.
We are Architects & Builders

Class 3


Unit 6: Geometry. 6.1 Geometrical Shapes. Page 23.

Students’ Learning Outcomes:

ii) Classify figures according to number of sides as quadrilaterals (rectangles and squares) and triangles

Prior Knowledge: Children are introduced to basic shapes from the time they enter a formal school setting. They are familiar with two-dimensional figures, such as squares, rectangles, triangles and circles. They not only recognise the shapes, but are also able to identify them and link them to real life objects. You have recently, in the last week, introduced children to the mathematical terms: line segment, point and ray.

Teaching Material and Preparations

- **Beginning:** Board and chalk
- **Middle:** Board, chalk, children’s notebooks
- **Conclusion:** Sheets of paper and pencils and colour pencils for each group

Methodology

- **Beginning:** After the children are comfortably seated and you have their attention, make a point (dot) on the board. Make sure it is prominent and the children can see it. Say to the children, “Okay, now tell me what have I just made on the board?” Accept the children’s responses and emphasise on the concept of a point and reinforce its significance with regard to shapes.

Make another point at a distance from the first one and draw a line to connect or join the two points. Ask the children to explain what you have done. Using their responses, talk about a line segment and the two points.

Make a third point at such a place on the board that on joining the three points you will make a triangle, but don’t join them yet. Now say to the children, “Can you tell me what I will get if I join these three points?” Encourage children to think and predict. Accept their responses and say, “Can someone come to the board and join these points, so that we can see what is created?” Call any one of the children to the board. You may need to guide and support the children if they are not clear about how to go about it.

Say to the children, “We made a triangle just as some of you had predicted.” Thank the child for making the shape. Next use the words ‘line segment’, ‘point’ and ‘vertices’ by saying to the children, “Take a minute and carefully look at the shape. I want you to count and tell me how many line segments and vertices there are in this shape.” You may need to revisit the word ‘vertices’ with them.

- **Middle:** Repeat the above process with a four-sided shape. You can use a square or a rectangle and introduce the word ‘quadrilateral’ to the children. Emphasise that a quadrilateral has four sides, which can be of any length and four vertices. Draw some quadrilaterals on the board to help them understand this concept and give them some time to get familiar with the word. Refer to any mathematics textbook to see the different ways that quadrilaterals are represented.

Request the children to take out their notebooks. Tell them that you would like each of them to draw four different quadrilaterals. They can use a ruler; however each shape has to be different from the other. Address any questions the children may have about the task or the concept.

As children work on their own, you will need to circulate among them to support and guide anyone who needs your assistance.

- **Conclusion:** Recap the learning from the previous session and say to the children, “Look around your classroom and name the objects with different shapes.” Give children time to look around their environment and identify different objects. Encourage them to tell you what shapes these objects look like. Count the number of sides and vertices of those objects. The children could talk about the sides and vertices of the display boards, the cupboards, the shelves, the ceiling, the classroom walls and the
corners. Accept the responses and question them further to challenge them or help them gain clarity on these concepts.

Next you can ask the children some questions, which will get them to think critically:

- What if you were asked to change the shape of your classroom? Which shape would you choose? In your opinion, how will the new shape improve the classroom?

- How many doors and windows would you make? Which shape would you use for the doors and windows? Why? Where would you put them to get the maximum benefit?

Now give the children a design and construction task. Tell them that they are going to become architects, builders and carpenters. All these professionals need to understand angles and shapes to do their work in a skillful manner. In groups, their task is to create a new classroom. Divide them into four groups and when they are settled, give them instructions about their task. Please discourage any competition in this task. The focus is on critical thinking and sharing ideas collaboratively and not seeing who makes the best classroom layout. Here are some instructions you can give them:

- The classroom must have sufficient sunlight and must be airy enough to save on electricity and make the room eco-friendly.

- All the classroom furniture must be rearranged: the board, the display boards, the shelves and their own desks and chairs. They have to use all the furniture that is present in the classroom and cannot discard anything.

Spend time with each group. First just listen to children’s discussions about the proposed changes and then support them if required by asking questions and challenge them further if the plan is flawed or not sound enough.

Once they have discussed the changes they have decided to make, give them the paper, pencils and colour pencils to make their drawing of this imaginary classroom to see how it looks on paper. When they are done ask them to present and share their classroom layout with the entire class. Then collect their classroom layouts and keep them safely in the cupboard.

**Assessment:** The work children do in their notebooks during the middle session can be used right away for assessment purposes. The group work from the concluding session can also be used to assess their understanding of the objectives of this lesson when it is assessment time for you.

When you are ready to assess children’s understanding of shapes and angles, divide them into the same four groups and ask them to review and discuss a different group’s layout. They need to look critically at what the group had come up with. What are the similarities and differences in their layouts and which plan is the most workable. Please remember not to turn this into a competitive activity.
Looking for Angles Everywhere

Class 4


Unit 6: Geometry. 6.3 Angle. Pages 29 and 30

Students’ Learning Outcomes:

vii) Draw a right angle using a protractor

viii) Draw acute and obtuse angles of different measures using protractor

Prior Knowledge: By the time children reach Class 4, they have a sound understanding of geometrical shapes. They have moved beyond learning about squares, rectangles and triangles and have been introduced to the word ‘quadrilaterals’. They have been introduced to a geometry box and have practiced using the ruler skilfully. They have also been introduced to a protractor, but still need more practice in manoeuvring it skilfully and confidently. At this stage children use mathematical terms, such as ‘line segments’ and ‘rays’, and are familiar with and understand the difference between horizontal, vertical and parallel lines. They can recognise and represent angles using the symbol ‘∠’ and know that the unit used to measure angles is called degrees and is represented like this: 40°.

Teaching Material and Preparation

- Beginning: Board and chalk.
- Middle: Board and chalk, children’s notebooks. Each child should have pencils, rulers and protractors. Two children can share one protractor if required.
- Conclusion: A sheet of paper, pencil, ruler and protractor for each group. Board and chalk to write down ‘Instructions for Group Task’ (Please see page 14), and space for children to display their group work.

Methodology

• **Beginning:** When you have all the children’s attention, write the word ‘Angles’ on the board and begin a discussion with them. The following questions will help you get started:
  - What do we know about angles? Do you know how they are measured?
  - What are the different types of angles you have learned about?
  - Do we see angles in our daily lives? Can you tell me where? What are angles used for?

Tell the children that you want them to look around their environment and search for angles in the classroom. If they find it difficult to spot angles in the classroom, you can ask the following questions to steer them in the right direction. Tell them to look at the walls of their classroom and ask:

  - Which angles do you see where two walls meet?
  - What about the ceiling? Do you see any angles there?

Bring their attention to the classroom door when it is half open and when it is wide open. Ask them, what angles they see. Get the children to observe the windows, lights and fans, the furniture and the sunlight coming through the windows and the door and ask them what kind of angles they can see. Let them investigate, identify and talk about the kinds of angles they see.

• **Middle:** Using the children’s responses, say to them, “Today we will draw some angles. We will make some acute, some obtuse and some right angles.” Tell the children that they have to give you instructions about how to make these angles.

Listen to their instructions and draw an angle on the board. As children guide you in making the angle, ask them questions regarding their instructions. For example, a child may say, “Draw a line” to which your response should be, “Where should I draw it?” and “What kind of a line? Should I draw a horizontal one? Or do you think it should be a vertical one? How about a curved one or how about a wavy one? Or a diagonal one?” You can also ask them if they want you to make angles of a specific measurement, such as a 40° acute angle or a 120° obtuse angle.
Using such questions will reinforce the previous concepts, help children use mathematical language with confidence and be clear when giving instructions.

After following the children’s instructions to make 2 or 3 different angles, tell them that now they will make angles the way you just did on the board. Tell them that they will now be making ‘estimated angles’ in their notebooks. This means that if they decide to make a 40° angle, they will draw an angle that they estimate to be 40° and they will write down the estimated value. They will not measure it first.

Then they will exchange their notebook with a partner and use a protractor to find out the actual value of the angle they have drawn and write it down before returning the notebook to their partner. Tell them that you want them to make any two angles using estimates and they can choose from an acute angle, an obtuse angle and a right angle. Repeat your instructions if necessary.

While the children are busy making their estimated angles, circulate around the classroom observing them and supporting them where necessary.

• Conclusion: Tell the children that they will be working in small groups for this activity in which they have to make a closed figure. Ask them if they know what a closed figure is and make sure they understand that it is a figure that has no opening. Tell them that their task is to construct a figure that will have at least one right angle, one acute angle and one obtuse angle. They can decide on the measurements of each of these angles. Tell them that once they have finished drawing their figure they will have to write the measurements of the angles used in the figure. Ask them to discuss with their group members, the measurements they will use to draw the angles and also to decide who will draw them. Tell them to split the tasks and start work as soon as they decide who will do what.

Give each group a sheet of paper for their drawing and give them 30 minutes for the task, after which they will display their work so every group can see the other group’s work. Write the instructions on the board (Please see Instructions for Group Task at the end of page 2) and address any questions that the children may ask.

Divide the children into four or five groups, write the instructions on the board and then move around from group to group supporting the children in this activity.

After each group has displayed their work, encourage the children to look at the displayed work and raise questions with groups whose figures they find interesting, challenging or confusing.

Assessment: Give children a list of different measurements such as 55°, 130°, 90°, 22°, and 100° and so on. Ask them to choose any four measurements and draw those angles in their notebooks. Also ask them to write whether the angle is a right angle, an acute angle or an obtuse angle. This individual task will help you assess children’s understanding of these different types of angles.

Instructions for Group Task
1. Decide as a group on the measurements of the closed figure and assign tasks for the members.
2. Make a closed figure using at least one acute angle, one obtuse angle and one right angle.
3. Measure and draw the angles that the group has agreed upon.
4. Write down the measurement of each angle in the figure.
5. Measure the angles with a protractor.
6. Write the names of all group members at the top right hand corner of the sheet.
7. Put up your work in the display area.
Maps & Angles in the Neighbourhood

Class 5


Unit 7: Geometry. 7.1 Angles. Page 36.

Students’ Learning Outcomes:

iii) Describe adjacent, complementary and supplementary angles

Prior Knowledge

By the time they reach Class 5, children have studied various two-dimensional and three-dimensional shapes in previous classes. They understand the basic concepts of geometry and can classify figures according to the number of sides and vertices. They are familiar with the instruments of a geometry box and have experience working with a protractor. They have also learned about the different angles such as acute, obtuse and right angles. They have already been introduced to adjacent, complementary and supplementary angles, but they still need time and practice to understand these concepts more clearly.

Teaching Material and Preparation

- Beginning: Board and Chalk.
- Middle: A wall clock and a pair of scissors.
- Conclusion: Chart paper, pencils, rulers and colour pencils.

Methodology

• Beginning: Begin this session by saying to the children, “In previous classes we learned about adjacent angles, let’s see what you have understood so far. I will draw a few angles on the board and you will have to tell me whether they are adjacent or not and why you think so. You will also need to tell me whether they are supplementary or complementary angles and again why you think so.”

Then draw the angles one by one on the board. You can look for examples in the textbook if you need some help. Ask the children to tell you which type of angles they are. Based on their responses you can ask more questions in order to involve all the children.

Give children time to think and respond. Encourage them to give reasons for their answers. This discussion will help you gauge children’s understanding of different types of angles.

• Middle: Based on the children’s responses, you will need to reinforce or clarify any incorrect or incomplete concepts. Ask the children, “Can you think of any real life examples where these angles are being used?” Encourage them to look around, and think and visualize objects in homes, streets, and playgrounds. If they find it difficult to come up with examples you may need to share some, such as:

- The angles that form between a clocks’ hour, minute and second needles
- The angles that form between the points and crossing of railway tracks
- The angles that form between the intersections of two or more roads
- The angles that form in a hopscotch grid, a pair of scissors and pliers, an open door and wall
- The angles formed by our bodies with the earth

As you share these examples give children the opportunity to move the clock’s hands and form different supplementary and complementary angles. Give them scissors to explore adjacent angles.

After this discussion, ask the children, “Can we find some of these angles in our environment? Where? Let’s find them.” Encourage them to move and look around in the class and even outside the class to identify adjacent, complementary and supplementary angles. Ask them to open the door and windows of the classroom to see how they make angles with the wall.

• Conclusion: Introduce the group activity and say to the children, “In the previous session we talked about adjacent angles, complementary and supplementary angles and we also discussed some
examples from our daily life.” Tell them that you now want them to work in groups. The task of the group is to draw a map from school to the park or library or mosque or shops nearby. In the map they will need to indicate the landmarks along the way and highlight the different angles that were discussed. Once they are done with their drawings, each group will have to come forward and present their work to the rest of the class. Repeat the instructions if you need to.

Divide the children into groups. Give each group chart paper, rulers, pencils and colour pencils. Walk around the classroom to see if all the groups are clear on what they have to do. You may need to support some of the groups that are facing difficulty or you may need to challenge their decisions.

When the groups are done with their drawings, ask them to present their work. When one group is presenting, encourage the other groups to raise questions in order to understand the angles they have made and why.

**Assessment:** To assess children’s understanding of the lesson’s objectives observe their participation in the group work and class discussions. Assign individual tasks to the children and give them different measurements to draw complementary and supplementary angles in their notebooks. You will have to give them the measurement of any one angle and the children will need to calculate how much another angle measures before drawing it. This will help assess each child’s learning individually.
Shapes around Us

Class: Multiage


Class 2: Unit 5: Geometry. 5.1 Two-dimensional Figures. Page 17.
Class 5: Unit 7: Geometry. 7.1 Angles. Page 36.

Students’ Learning Outcomes:
Class 1: ii) Identify the following basic shapes: rectangle, square, circle, oval, and triangle.
Class 2: i) Identify the figures like square, rectangle, triangle, circle, semi-circle and quarter-circle.
Class 4: vii) Draw a right angle using protractor
viii) Draw acute and obtuse angles of different measures using protractor
Class 5: iii) Describe adjacent, complementary and supplementary angles

Prior Knowledge
Young children learn about their environment through observation and exploration. They see and use different objects, vehicles, tools and machines. Through experience, they start developing an understanding of different shapes and sizes. They can recognise and name some of the basic shapes they see in their environment, such as circle, square, rectangle and triangle. Some of the young children find it difficult to differentiate between a circle and an oval, or between a square and a rectangle.

Older children can recognise different shapes and even name and write them. They are also familiar with corners, sides and the concept of angles. In classes 3 and 4, they are introduced to different types of angles. However, they still need more practice in using a protractor accurately.

You have children of different ages in your classroom and you can plan activities in which all of them are involved at the same time. The younger ones and the older ones will be at different levels of development and understanding and will have different things to say and you can view that as an advantage, because they can teach and learn from each other.

Teaching Material & Preparation
- Beginning: One set of the following shapes: circle, oval, rectangle, triangle and square. A cloth or paper bag to keeps the shapes in and a clean piece of cloth to be used as a blindfold.
- Middle: Paper, pencil, chalk and board
- Conclusion: Sheets of paper and pencils for everyone and protractors for older children. Soft board or washing line to display their work.

Methodology
• Beginning: Introduce the game Mystery Bag to the class. Show the children the bag and the blindfold, and tell them that there are some shapes inside the bag. Tell them that you will call some of them one by one and blindfold them. The blindfolded child will have to put his or her hand into the bag and pull out one shape. Then they will have to touch and feel the shape and guess what it is.
Ask the children if they understand and repeat the instructions if required. Do this conversationally without demonstrating any impatience.
Start the game by calling any one child. Blindfold him/her and begin the Mystery Bag game. As the child tries to guess, you can ask questions such as:
For younger children:
- Does it feel as though it is round or straight?
- Can you feel any corners? How many corners do you think there are?

For older children:

- Are there any angles? Can you name the angle?

**Middle:** Before you give instructions for the group activity, divide the children into groups. Put children from Classes 1, 2 and 3 in one group and children from Classes 4 and 5 in a separate group. Give instructions by saying, “We found different shapes in the mystery bag, now let us see which shapes we can find in objects in our environment. You can look around the classroom, and outside and try and visualise what is in your home and on the streets.” Assign the Class 3 children to write down the names of objects and their shapes that they see in their environment. Assign the older children to observe and come up with the shapes and also note down the names of shapes and the number of different angles.

Explain that you will draw a table on the board to note down their findings. Repeat the instructions if necessary. Let the children move around the classroom and observe and identify objects of different shapes. While children look for the objects, you can draw a table to note down their findings. Please look at the sample on page 2.

After the groups are done, ask them to share their findings and you can fill in the table that you have drawn on the board.

**Conclusion:** Introduce the individual task for the younger children (Classes 1, 2 and 3) by saying: “Now, let’s see what you can draw using the different shapes we talked about.” Give them a sheet of paper and ask them to draw something similar to any of the shapes. For instance, they can draw a wheel or a clock inside the shape of a circle. Or they can draw a book, a blackboard, a window or a door with a rectangle. Ask the children in Class 3 to draw a picture with the help of all the shapes discussed in the beginning of the session. Ask them to make sure they use each shape at least once.

Tell the older children (Classes 4 and 5) that they will be working individually to make a closed figure. Ask them if they know what a closed figure is and make sure they understand that it is a figure that has no opening. Tell them that their task is to construct a figure that will have at least one right angle, one acute angle and one obtuse angle. They are free to decide what the measurements of these angles should be. Tell them that once they have finished drawing their figure they will have to write the measurements of the angles used in the figure. After they have made the closed figure, tell them that they will have to pin their work in an area that is reserved for classroom displays. Address any questions that come from the children.

After everyone has displayed their work, encourage the children to look at the displays and raise questions about the figures they find interesting, challenging or confusing.

**Assessment:** You can collect their individual work and keep it safe in a folder and when its assessment time ask them to talk about it. Ask them to describe their drawings and talk about the shapes and angles and measurements. This will enable you to assess their understanding of the topic.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Object</th>
<th>Shape/s in it</th>
<th>Angles it has</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wall clock</td>
<td>Circle</td>
<td>Right angle, acute angle and obtuse angle</td>
</tr>
<tr>
<td>2.</td>
<td>Door</td>
<td>Rectangle</td>
<td>Acute angle when half opened, obtuse angle when fully opened</td>
</tr>
</tbody>
</table>