LESSON - 2

# ANGLE

In the summer vacation last year, Rumi went to Shillong with her parents and other members of the family. After reaching Shillong they first visited the Golf play ground. Having sighted the pine trees near by, Rumi said, "Oh! our teacher told the other day in the class that the branches and leaves on many a trees form various shapes with their trunks". Looking at the angles formed by the pine trees she exclaimed– "really, they look exactly like those we draw in our practice books."

Rumi's brother Rohan (a student of class-IV) asked, "What are you referring to as angles?" Rumi pointed her finger to a small tree and showed various angles formed by its branches and leaves.

Rohan responded by saying "We noticed many such shapes on walls, cow sheds, fishing tools like "Jakoi" etc., when we made a visit to our village at the time of Bihu. Even, I could notice such shapes when our elder brother Biren and others made kites for playing. At that time, of course, I could not understand that these shapes are called angles". Rumi said, Don't wory, I know it and, I will explain about it to you".









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# Angle



#### Let us learn about angles :

Take a match box. Having sketched on paper we can have a picture of it as given in the margin. Physically touching the match box we will be able to feel about something like length, breadth and height of it. Such objects are called three dimensional objects. It has planes, edges and corners. As shown by arrow heads in the adjoining picture, we can demonstrate them by physicaly handling the match box also. Such a three dimensional object has six planes and each plane is two dimensional.

Observe that any two planes on the match box meet along what is called an **edge**. Also, two or more edges meet at what is called a **corner** or **a vertex**.

Identify the corners by arrows and write them on the above picture. Activity : Count and write down the number of edges and vertices, if any in the figures below–



Observing the figures shown in the previous page (on activity) we can understand that they are covering a certain region of the plane. The parts of the surface covering these regions are called plane regions. Some parts of the surface of these objects are planes while others are curved (i.e. non plane)

While drawing planar shapes we come across edges and corners which are respectively termed as **side**s (line segments) and **verticles**.

Activity : Identify the sides and vertices of the following planar shapes-



The shapes formed by sides at the corners or vertices are called **angles**. In other words, two edges at a corner or two sides at a vertex of a planar shape form an angle. Identify the angles in the figures given above. We can make angles with the help of different objects also. Let us make angles with Match Box sticks as shown below–



Rumi said, "Look, the angles we have made are not all the same! Someone's angle is small ( $\land$ ), some other's angle is large ( $\checkmark$ ), and someone another's angle in even larger ( $\checkmark$ ).

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**Activity :** In this manner, you form various shapes by using various numbers say 4,5,7,8,9 etc. of match sticks and look at the angles formed.



#### Games with match sticks :

- You can form the shape of a fish by using 8 match sticks as shown in the adjoining figure. Now, pick up three sticks and place then in such a way that the fish swims in opposite direction.
- 2. Form the shape as shown in the margin. Pick up 5 sticks and replace them such that you can obtain the shape of a house.





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# Activities : Make angle by paper folding

- Take a sheet of paper, one for each of you.
- Make a fold across the middle of the sheet [fig. (b)]
- Fold it again across the middle so that the two creases on the first fold coincide with one another [fig. (c)]
- Now, unfold the paper. You will see creases on the paper as shown in the adjoining figure [fig. (d)]
- Do the creases meet at one point?
- Or, do you see that the creases made by the folds produce four angles at the meeting point?
  - The four angles produced at the vertex are all equal and each of these angles is a **right angle**.

**Note carefully :** All angles are not right angles. Some angles are greater than a right angle while some other angles are found to be smaller.









## Let us make Angle Measurer to measure angle :

- Cut off two strips from a thick paper sheet as shown in the picture.
- Fix a pin at one end of the two pieces as shown in the picture so that the pieces can move freely around the pin.
- An Angle Measurer has been made!
- Placed in the shape of the letter L the two strips of the Angle Measurer form 1 right angle.
- Placed closer to each other than those in L, the strips form an angle less then 1 right angle.
- Also, placed farther away from each other than those in L the strips form an angle greater than 1 right angle.

Activity : Let us form angles greater and smaller than a right angle by using Match Sticks.



Angle



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## Let us learn-

There is a tool to draw angles in a Geometry Box. It is called a pencil compass.

A Geometry Box has two other tools called Set Squares. These are used in drawing right angles.

There is also another tool in a Geometry Box to measure any angle. It is called Protractor. Mostly, The tools in a Geometry Box are as given below, Familiarise yourself with the tools in Geometry Box.



# Let us find angles in letters :

The name of the most talented girl in the class is LATA. She was talking to her classmates– "There are 13 angles in my name and amongst those you will find right angles, angles smaller than right angles and angles greater than right angles also". She demonstrated the angles as given below–



The angles 1,2 and 3 are smaller than a right angle. Also, the angles 4 and 5 are greater than a right angle. Therefore, for two A's, there are 6 angles less than a right angle and 4 angles greater than right angle.



Activity : Write down at least 5 letters and complete the table given below by finding out angles from them–

Letter	No. of right angle	No.of angles greater than right angle	No. of angles smaller than ritht angle
E			
-0			

- Now, find out the angles in the letters from your own name and compare them with a right angle.
- Try to write down your name by making use of line segments. Verify if you can find more angles by using with segments than by your usual manner. For example, by using segments, the name SOMA can be written as  $S_{\text{max}}$

As Mentioned in the earlier activity, the angles greater than a right angle are called **obtuse angle** and those smaller are called **acute angles**. To understand, you may observe the following angles–



Obtuse angle



#### Angle and Time :

Angle

A beautiful table clock was presented to Munia on his birth day. He was surprised to see the hands of the clock forming different angles. Next day, he took the clock to the school for showing it to his friends.

The school bell rang up indicating time for prayer meeting and all were surprised to see the hands of Munia's clock forming a right angle. The prayer started at 9 o'clock.

At the end of the first period after prayer meeting, he showed the clock to his teacher. Then, all could see the hands of the clock forming an angle less than a right angle and it was 10:00 by the clock. Out of curiosity, they began asking various questions to their teacher and the teacher tried to satisfy their querries by manually moving the hands of the clock.

During the day, they came across a lot of moments when the hands of the clock formed right angles.





Activity : Draw hands on the following clocks forming right angle-



Activity : Draw hands on the following clocks forming angles less than right angles. Also mention the time–



With passing of time, the hands of the clock also form angle greater than a right angle.

Activity : The hands of a clock as shown below are forming some angles. Mention the kinds of the angles they form. Also mention the time indicated.



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Angle

#### Let us make angles by paper folding :

#### **Direction-A**

- Take a paper sheet in square form.
- Fold it equally across the middle as shown.
- Fold is again across the corners as shown.
- Fold the folded paper again as shown and you have obtained an angle of 45°.



#### **Direction-B**

- Take a rectangular piece of paper. Fold it across the middle as shown (fig.-i)
- Fold one half of the folded paper through the opposite corners (fig.-ii)
- Fold the other half also so that it looks like (Fig.-iii)
- You have got an angle of 60° now. (Fig.-iii)
- Folded again you will get an angle of 30° (fig.-iv)

(i) (i) (i) (i) (ii) (iv)

Let us learn : Angles are usually measured in degrees. Degree is denoted by  $A^0$  and it is read as 'A degree'. An appropriate measure of a given angle must be substituted for A such as  $-30^0$ ,  $45^0$ ,  $90^0$  etc. The tool used for measuring an angle is protractor.

#### Let us familiarise with the protractor :

Just like we use ruler or measuring tap to measure length, breadth or height, similarly we use protractor to measure angles. In the adjoining figure, a protractor has been shown.

The straight edge of the protractor is called a horizontal line and its mid point is called the centre. The round edge of the protractor is indicated with marks from 1 to 180. You can



# Angle

verify by counting yourself. Each of these marks indicates a degree and one degree is denoted by  $1^{\circ}$ . For user's convenience, measures in degrees are mentioned after every 10 marks like 10, 20, 30 etc. Two measuring scales are given on the protractor, one from  $0^{\circ}$  to  $180^{\circ}$  and the other  $180^{\circ}$  to 0. Which scale to choose to measure an angle depends upon how we place the protractor up on the angle.

# Let's measure angles with a protractor :

Using protractor, measure the angle given below and mention its degree measure:



Vertex

Firstly, the vertex of the angle to be measured is made to coincide with the centre of the protractor. The horizontal side of the protractor is then adjusted to coincide with one arm of the angle (as shown in the picture).



Now, look at the mark, the other arm of the protractor is coinciding. Have you noticed two marks? The measure indicated by the mark is the required measure of the given angle. Which one is the measure, 60 or 120? Which one does represent he angle.

Look at the first arm of the angle. Where is it touching the measure 0? Is it on the inner scale or on the outer one? If it is on the inner scale then the inner of the two marks indicated by the other arm will be the measure of the angle. On the other hand if the measure 0 touched by the first arm is on the outer scale, then the outer of the two marks indicated by the other arm of the angle will indicate the measure of the angle. Let us see this in the diagram. Since the mark 0 (indicated by the first arm) is on the inner scale, the measure of the angle is to be read by the mark indicated by the other arm of the angle is to be read by the mark indicated by the other arm on the inner scale. Thus the measure of the angle will be  $60^{\circ}$ .

## Let us measure angles :

Angle

With the help of the protractor, find the measures of the angles given below and also write down the values as parts of their respective measures.



**Direction to teachers :** Every student must be helped to use the protractor so that they can correctly measure the angle and thereby complete the training in the class itself.

# **Practice session :** Look at the angles below and classify them.



Improper measurement

Angle

Angle

Let us find angles in Yoga Practice :



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