

UNIT 9: ANGLES AND LINES.

Lines, rays and line segments:

A **line** has no beginning or end point. Imagine it continuing indefinitely in both directions. We can illustrate that by little arrows on both ends.

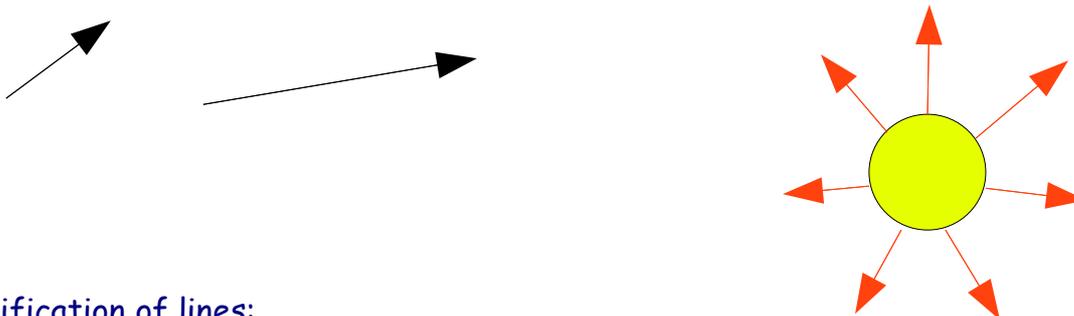


A **line segment** has a beginning point and an end point.



All the sides of this triangle are line segments.

A **ray** has a beginning point but no end point. Think of sun's rays: they start at sun and go forever...



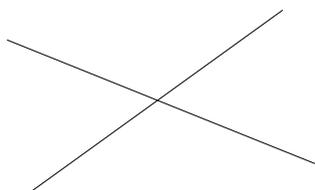
Classification of lines:

Two different lines could be classified as:

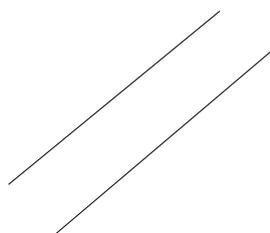
Intersecting lines: Two lines that intersect at the same point.

Parallel lines: Two lines that never intersect.

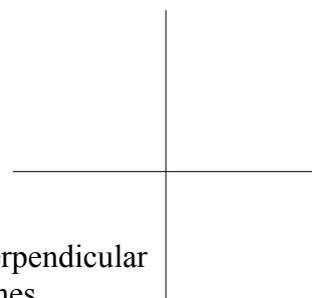
Perpendicular lines: Two lines that intersect at right angles (90°).



Intersecting lines



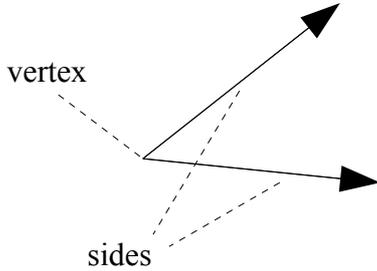
Parallel lines



Perpendicular lines

Angles:

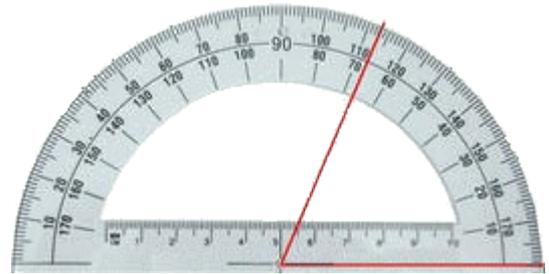
In mathematics an angle is made up from two rays that have the same beginning point. That point is called the **vertex** and the two rays are called the **sides** of the angle.



The most common unit used when measuring angles is the degree.

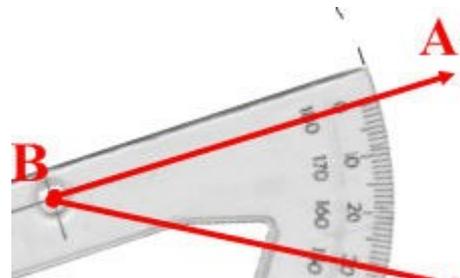
Follow these easy steps when using a protractor to measure angles:

- 1) Place the centre of the protractor on the angle's vertex.
- 2) Rotate the protractor so that the straight edge is placed over one of the angle's sides.
- 3) Use the scale that begins with zero. Read where the other side of the angle crosses this scale.

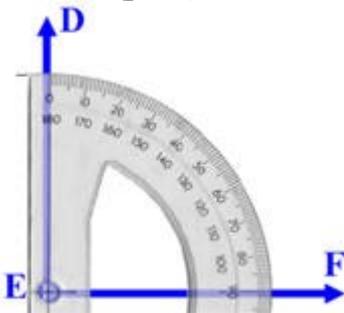


Angles can be classified based on their measure:

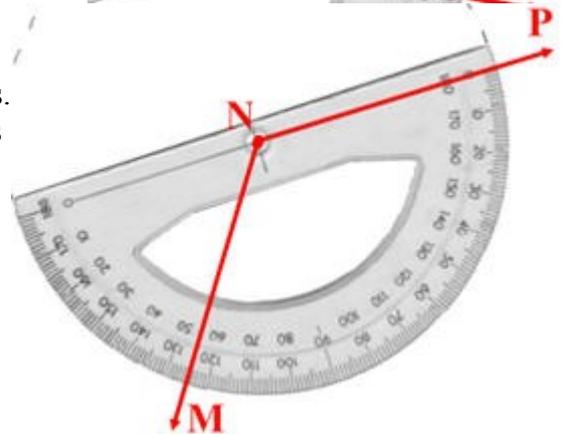
An **acute** angle measures between 0 and 90 degrees. The angle in this picture has 30 degrees, therefore it is acute.



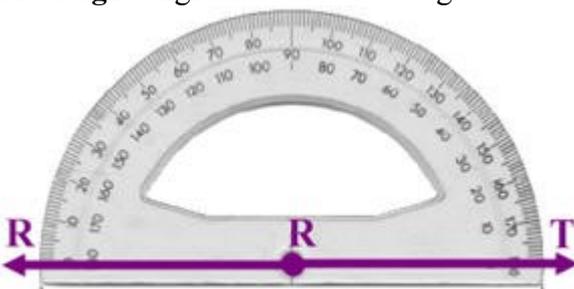
A **right** angle measures 90 degrees. The angle in this picture has 90 degrees, therefore it is right.



An **obtuse** angle measures between 90 and 180 degrees. The angle in this picture has 125 degrees, therefore it is obtuse.



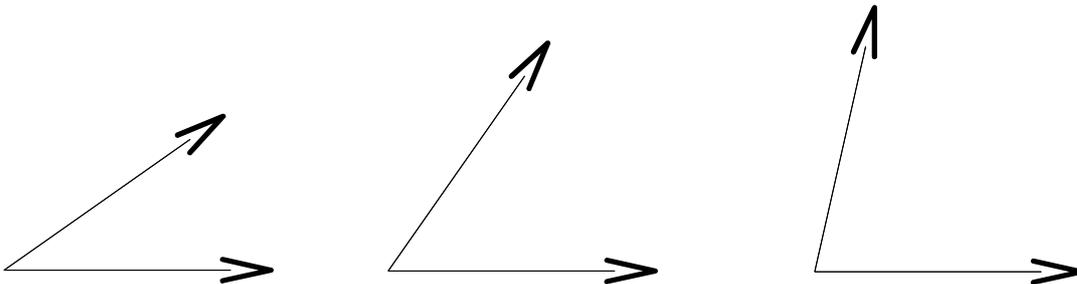
A **straight** angle measures 180 degrees.



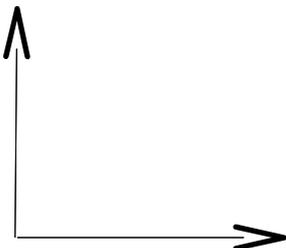
You can think of the two sides of the angle as having started side by side, and having opened up to a certain point. When the two sides “open up”, they draw an imaginary arc of a circle. Look at the pictures. Illustrate the same with two pens or pencils. Move the one pencil while keeping the other stationary, and see how the imaginary circle is drawn in the air while you rotate the other pencil. You can also think of a sun rising in the morning in the horizon, and gradually getting higher, and travelling through the sky along an arc of a circle.



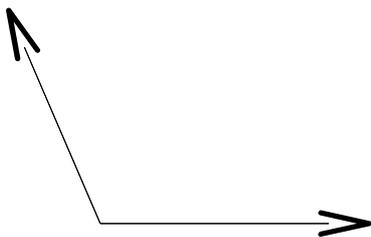
This angle is called the **zero angle**.



In each picture the angle keeps getting bigger. The arc of the circle is larger: the angle is opened more and more. These angles are **acute angles**, which means they are less than a right angle.



This angle is called the **right angle**. For example, table corners are right angles.



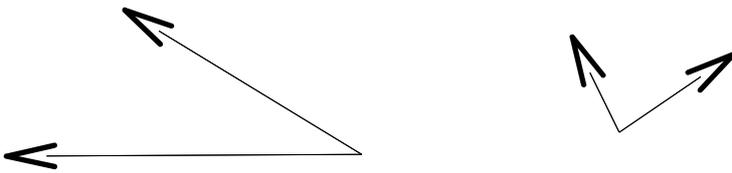
This angle is opened even more and is bigger than the right angle. It is an **obtuse angle**.



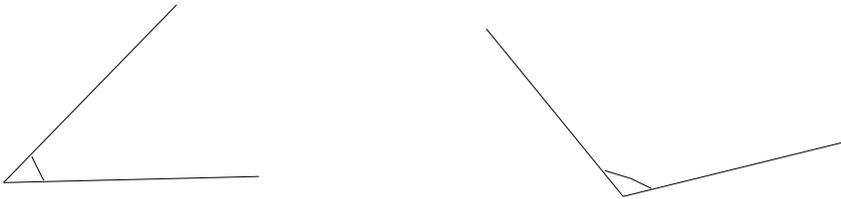
This angle is called the **straight angle**.

It does not matter how long the sides of the angles appear. Remember, they are rays, and rays don't have an endpoint, but when drawn on paper, they do end somewhere. The sides of the angle might even seem to have different length. That doesn't matter either. The size of the angle is ONLY determined by how much it has "opened", or how big part of an arc of a circle the sides have drawn.

Which of these two angles is bigger? Remember to look at how much the angle has opened, or how big part of the circle the sides have drawn.

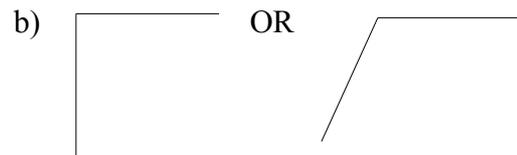
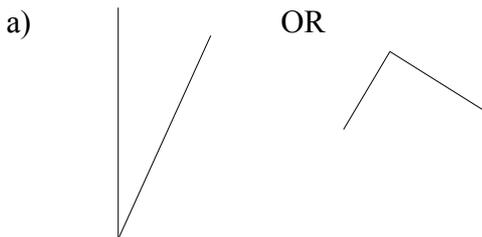


Many times the arrows are omitted from the rays, and the arc of the circle is drawn as a very tiny arc near the vertex.



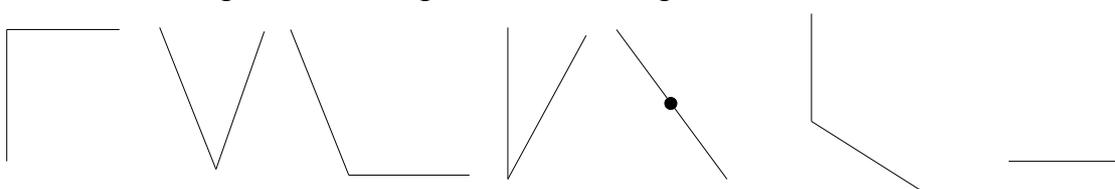
Your turn

1. Which angle is bigger?



2. Find five objects in your classroom that have right angles in them.

3. Mark the angles as acute, right, obtuse or straight.



4. Choose the correct answer:

This is a collection of points along a straight path that goes on and on in opposite directions. It has no endpoints.

ray line line segment

This is a part of a line having two endpoints.

ray line line segment

This is a part of a line with one end point and goes on and on in one direction.

ray line line segment

These are lines that never cross one another.

perpendicular parallel intersecting

These lines always cross each other at right angles.

perpendicular parallel intersecting

This two lines that meet at an endpoint called vertex.

angle secant chord

This is the point on an angle where the two lines meet.

acute obtuse vertex

This is an angle that measures less than 90 degrees.

acute obtuse right

This is an angle that measures greater than 90 degrees.

acute obtuse right

Two angles whose measure in degrees adds up to 180 degrees are

supplementary acute complementary

Two angles whose measure in degrees adds up to 90 degrees are

supplementary right complementary

5. Draw using a protractor an angle of 40 degrees and another 140 degrees.