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# Classifying of 2-Dimensional Shapes

Guide Notes

**Math 5**

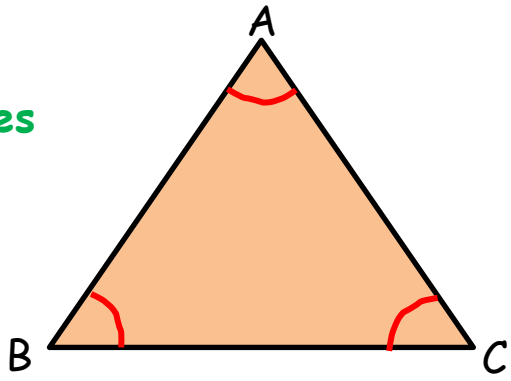
## Classifying 2-Dimensional Shapes

This lesson covers the definition and the properties of **triangles** and **trapezoids**, as well as the classification of the same according to their sides and angles. Though trapezoids are classified under **quadrilaterals**, this lesson will only touch its different types. An in-depth lesson on quadrilaterals will be discussed in the next lesson.

## Triangles

A triangle is a three-sided 2-dimensional shape that has the following parts:

- **three vertices**
- **three sides**
- **three angles**




| Vertices | Sides | Angles |
|---|---|---|
| point A | $\overline{AB}$ | $\angle A$ |
| point B | $\overline{BC}$ | $\angle B$ |
| point C | $\overline{AC}$ | $\angle C$ |

**Vertices** – these are the corners or the points where the sides meet.

**Sides** - these are segments that make up the triangle.

**Angles** – these are formed by the intersection of the segments/sides of a triangle.

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# Classifying of 2-Dimensional Shapes

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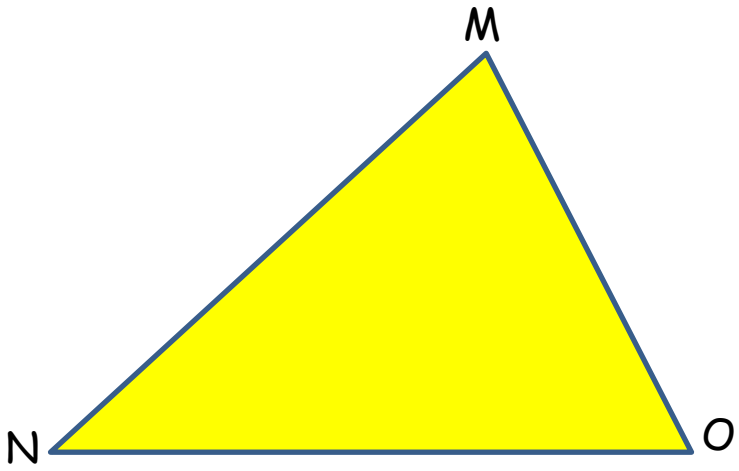
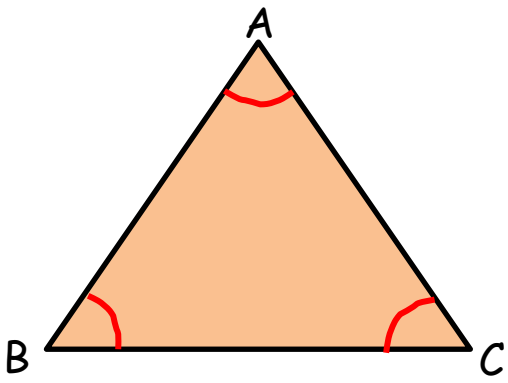
**Sample Problem 1:** Refer to the given triangle to complete the table.

| Vertices | Sides | Angles |
|---|---|---|
| | | |
| | | |
| | | |




## The Sum of the Angles of a Triangle

The unit of measure of angles in any 2-dimensional shape is in **degrees**. In the case of triangles, the sum of the measures of the three angles is 180 degrees.




$$m\angle A + m\angle B + m\angle C = 180^\circ$$

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# Classifying of 2-Dimensional Shapes

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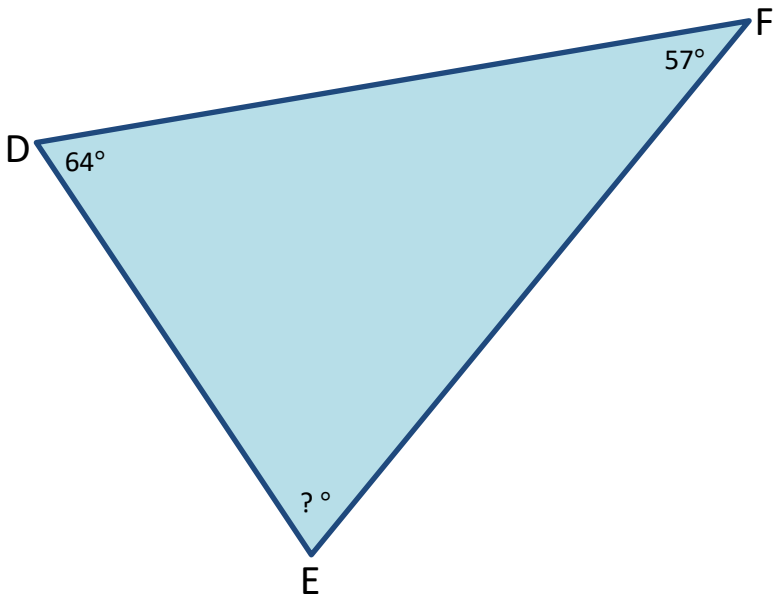
## Sample Problem 2: Find the measure of ∠E.



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# Classifying of 2-Dimensional Shapes

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## Classification of Triangles

Not all triangles are the same; they can be classified according to their **sides** and **angles**.

## Classification of Triangles According to Sides

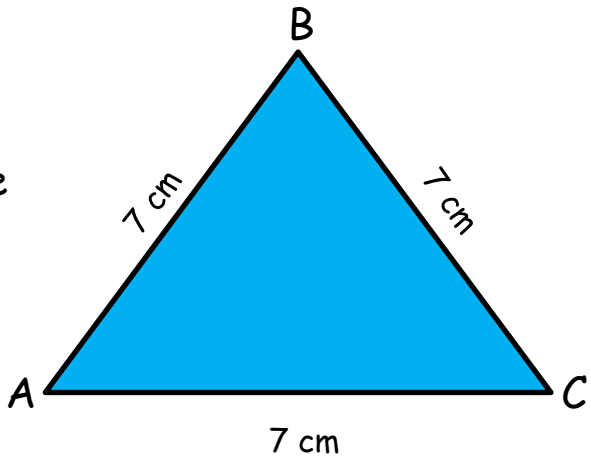
A triangle differs from another triangle in the measure of their sides. These triangles are classified as:

- **EQUILATERAL**
- **ISOSCELES**
- **SCALENE**

## Equilateral Triangle

If **all** three sides of a triangle have the same measure, then the triangle is called an equilateral triangle.

$\triangle ABC$ on the right is an equilateral triangle since all its three sides have the same measure.



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# Classifying of 2-Dimensional Shapes

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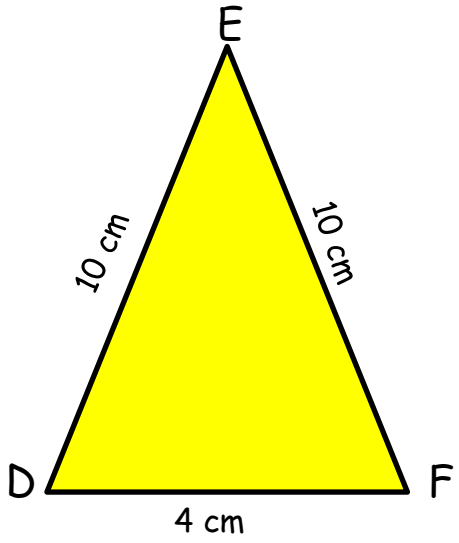
## Isosceles Triangle

An isosceles triangle is a triangle with two sides (at least) that have the same measure.

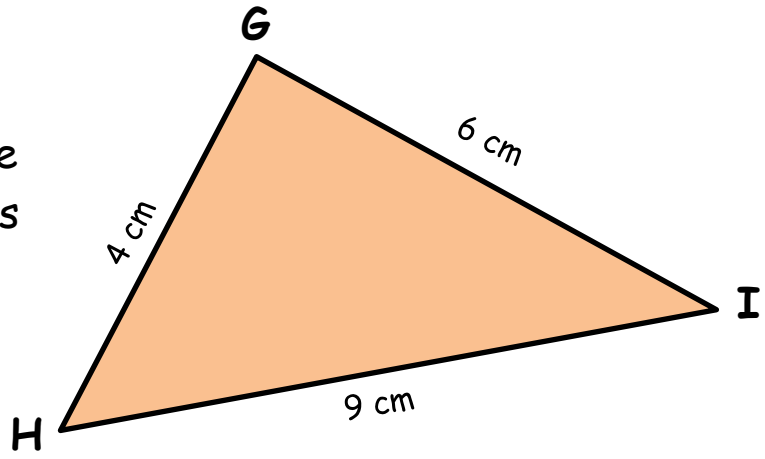
$\triangle DEF$ on the right is an isosceles triangle since the measure of at least two of its sides are the same.




## Scalene Triangle

A scalene triangle is a triangle that has three unequal sides.

$\triangle GHI$ on the right is a scalene triangle, since all its three sides don't have the same measure.



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# Classifying of 2-Dimensional Shapes

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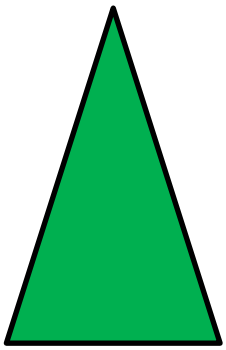
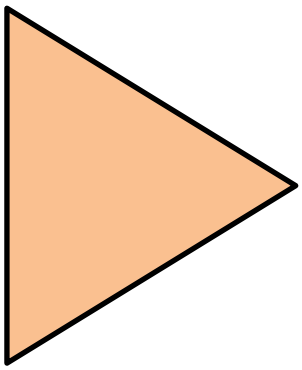
**Sample Problem 3:** Classify the following triangles by their sides.

1.



2.



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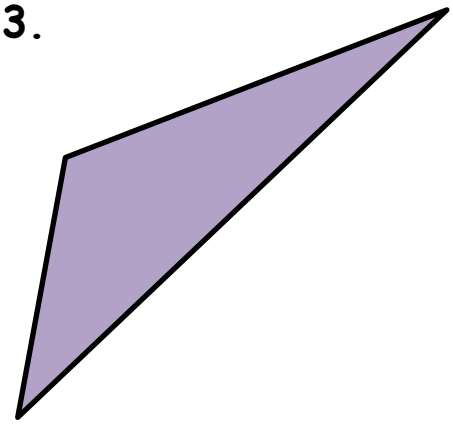
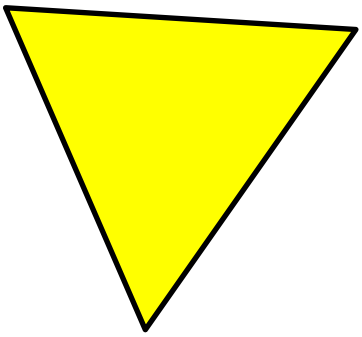
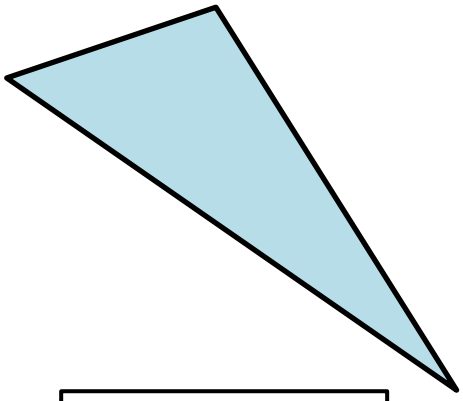


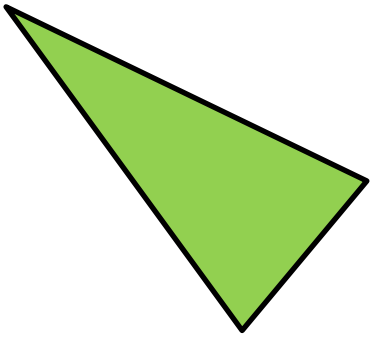
4.



5.



6.



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# Classifying of 2-Dimensional Shapes

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## Classification of Triangles According to Angles

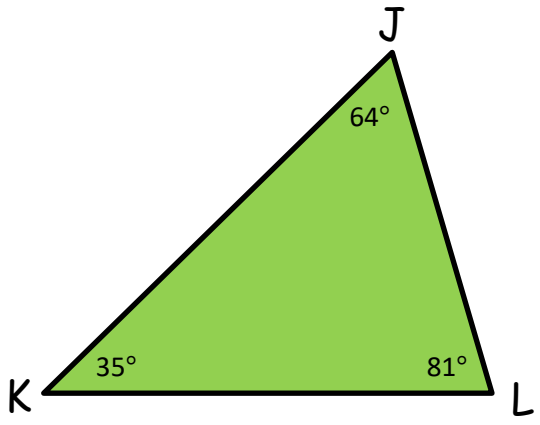
A triangle also differs from another triangle in the measure of their angles. These triangles are classified as:

- ACUTE
- OBTUSE
- RIGHT
- EQUIANGULAR

## ACUTE TRIANGLE

An acute triangle is a triangle in which all three angles are acute. An acute angle is an angle the measures less than 90 degrees. $45°, 63°$ and $89°$ are some examples of acute angles.

In $\triangle JKL$; $\angle$J, $\angle$K and $\angle$L measure less than 90 degrees. All three angles are acute. Therefore, $\triangle JKL$ is an acute triangle.



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# Classifying of 2-Dimensional Shapes

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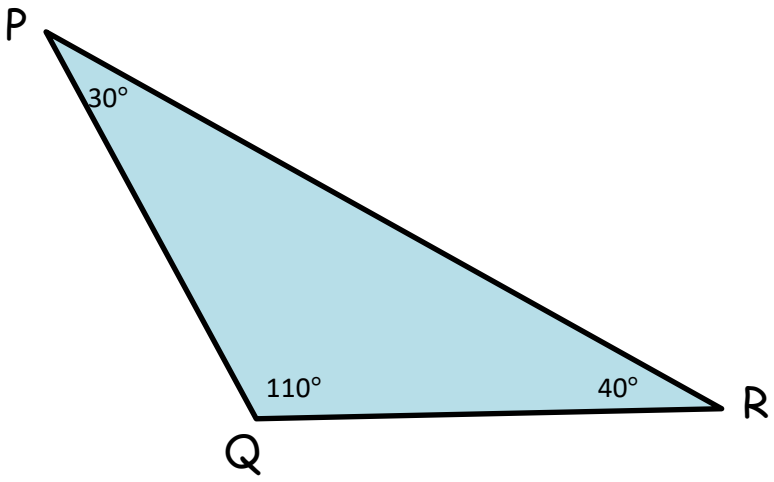
## OBTUSE TRIANGLE

An obtuse triangle is a triangle whose one angle is obtuse. An obtuse angle is an angle the measures greater than 90 degrees but less than 180 degrees. $100°, 155°$ and $179°$ are some examples of obtuse angles.

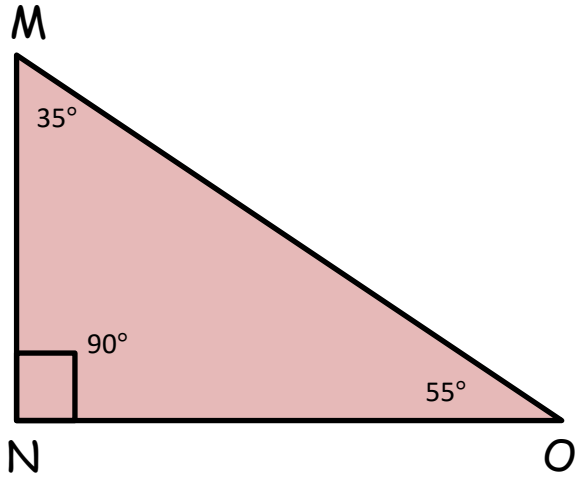
In $\triangle PQR$; $\angle Q$ is an obtuse angle because it measures greater than 90 degrees but less than 180 degrees, while $\angle P$ and $\angle R$ are acute. Therefore, $\triangle PQR$ is an obtuse triangle.




## RIGHT TRIANGLE

A right triangle is a triangle whose one angle is a right angle. A right angle measures 90 degrees. The other two angles in a right triangle are acute.

In $\triangle MNO$; $\angle N$ is a right angle because it measures greater than 90 degrees. $\angle M$ and $\angle O$ are acute angles. Therefore, $\triangle MNO$ is a right triangle.



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# Classifying of 2-Dimensional Shapes

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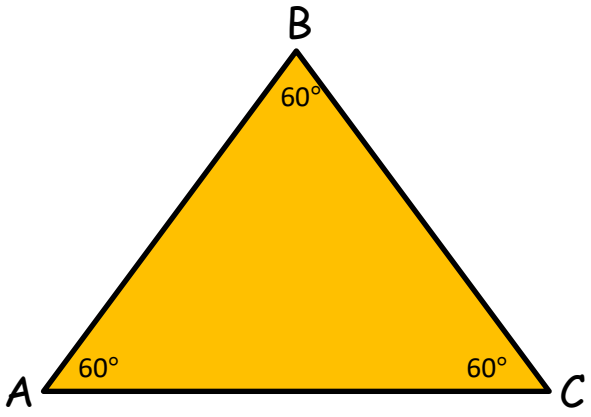
## EQUIANGULAR TRIANGLE

An equiangular triangle has three equal angles and each angle measures 60 degrees.

In $\triangle ABC$; $\angle A$, $\angle B$ and $\angle C$ have the same measure. Therefore, $\triangle ABC$ is an equiangular triangle.



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# Classifying of 2-Dimensional Shapes

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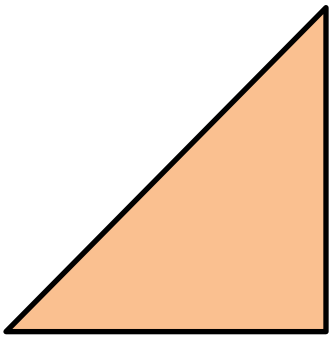
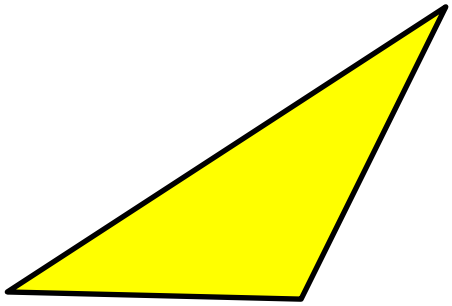
**Sample Problem 4:** Classify the following triangles by their angles.

1.



2.



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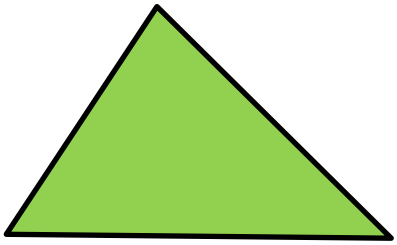

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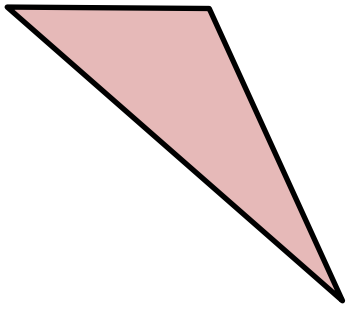

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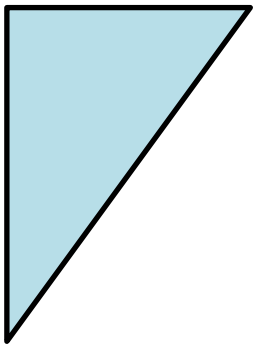

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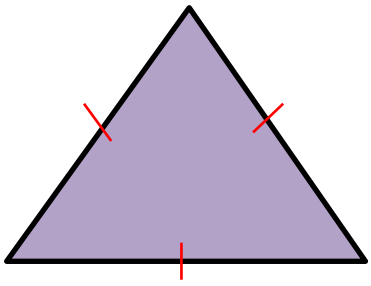

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# Classifying of 2-Dimensional Shapes

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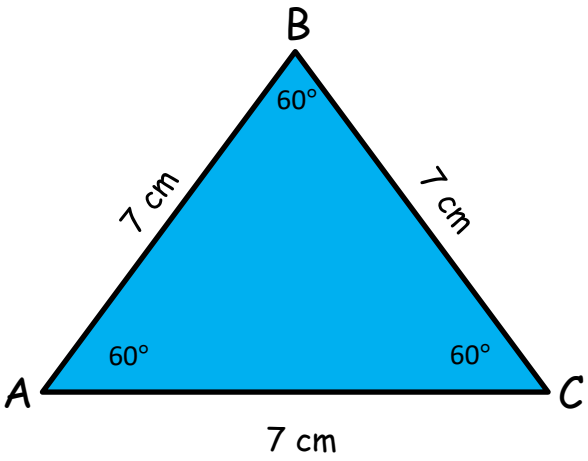
## Important Facts About Triangles

Take note of the following important fact about the relationship of the angles and sides of a triangle.

1. An **equilateral triangle** has three equal sides. It also follows that all its three angles are equal. The measure of the sides may vary, but the measure of the angles of the triangle remains the same, 60 degrees. Therefore an **equilateral triangle** is also an **equiangular triangle**.



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# Classifying of 2-Dimensional Shapes

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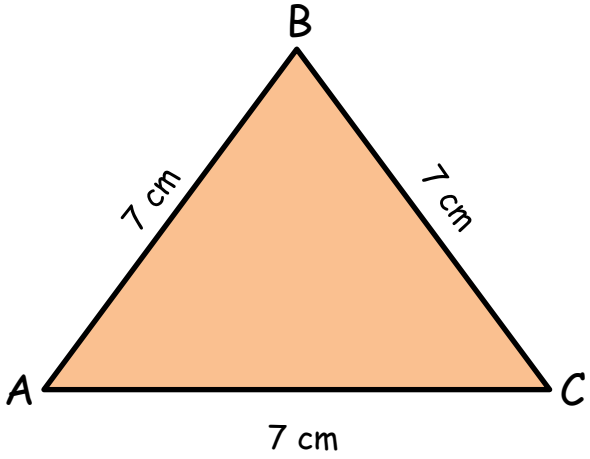
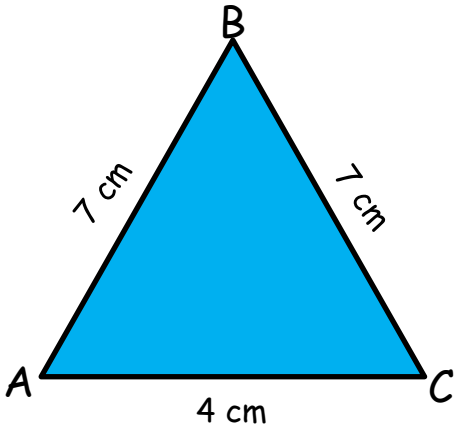
2. An **equilateral triangle** is also an **isosceles triangle**. The condition for a triangle to be isosceles is to have "at least" two sides that are equal. An **equilateral triangle** has three equal sides, so it satisfies the condition that qualifies it to be an **isosceles triangle**. So, an **equilateral triangle** is **always** an isosceles triangle, but an isosceles triangle can **sometimes** be equilateral.

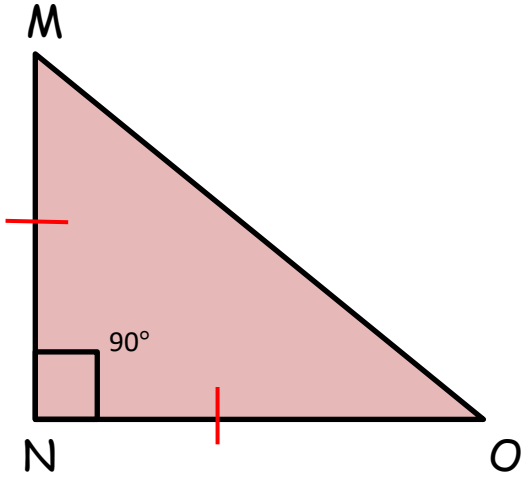



**Equilateral Triangle**

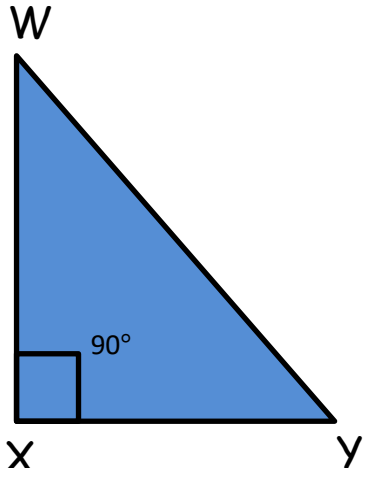



**Isosceles Triangle**

3. A **right triangle** can **sometimes** be an **isosceles triangle** or a **scalene triangle,** vice versa.




**Isosceles Right Triangle**




**Scalene Right Triangle**

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# Classifying of 2-Dimensional Shapes

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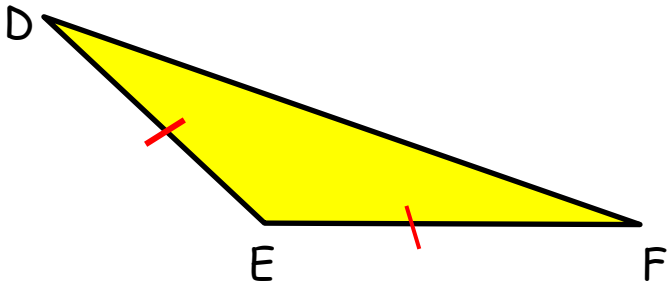
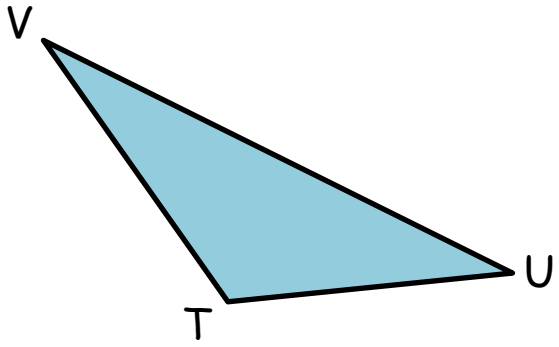
4. An **obtuse triangle** can be an **isosceles** or a **scalene triangle**.




**Isosceles Obtuse Triangle**




**Scalene Obtuse Triangle**

**Sample Problem 5:** Tell whether you agree to the given statement below. Explain your thoughts.

" An isosceles triangle is ALWAYS equilateral."

Justify your thoughts: _____

_____

_____

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# Classifying of 2-Dimensional Shapes

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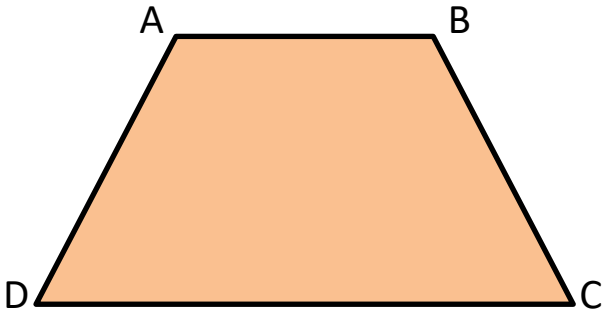
## Trapezoid

A trapezoid is a quadrilateral. A quadrilateral has four sides. It goes to say that trapezoids have 4 sides. But there is more to that. Below are the parts of trapezoids.

- **four vertices**
- **four sides**
- **two upper base angles**
- **two lower base angles**
- **one pair of opposite sides that are parallel**




| Vertices | Point A | Point B | Point C | Point D |
|---|---|---|---|---|
| Legs | $\overline{AD}$ and $\overline{BC}$ | | | |
| Upper Base Angles | ∠A and ∠B | | | |
| Lower Base Angles | ∠C and ∠D | | | |
| Pair of parallel sides | $\overline{AB}$ and $\overline{CD}$ | | | |

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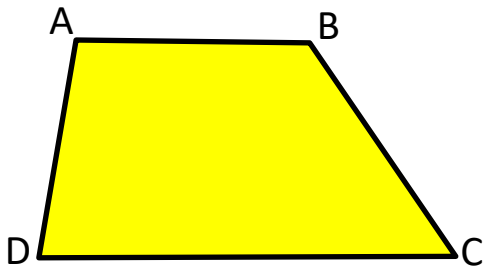
## The Sum of the Angles of a Trapezoid

The sum of the measures of the four angles of a trapezoid is 360 degrees.

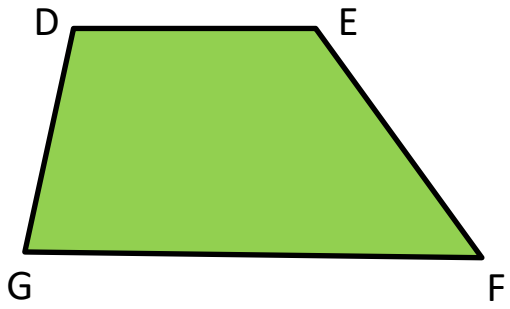



**Below is the relationship of the sum if the angles of a trapezoid:**

- $m\angle A + m\angle B + m\angle C + m\angle D = 360$
- $m\angle A + m\angle D = 180$
- $m\angle B + m\angle C = 180$

**Sample Problem 6:** Complete the table below.

| Vertices | | | | |
|---|---|---|---|---|
| Legs | | | | |
| Upper Base Angles | | | | |
| Lower Base Angles | | | | |
| Pair of parallel sides | | | | |



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# Classifying of 2-Dimensional Shapes

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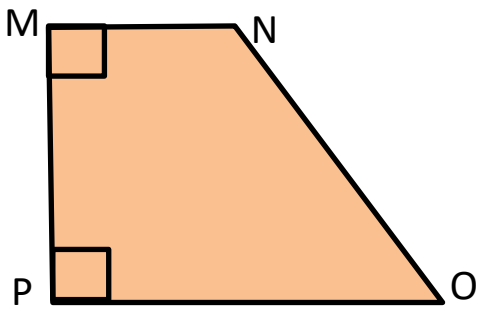
## Classification of Trapezoids

Trapezoids are classified as follows:

- **RIGHT**
- **ISOSCELES**
- **SCALENE**

## RIGHT TRAPEZOID

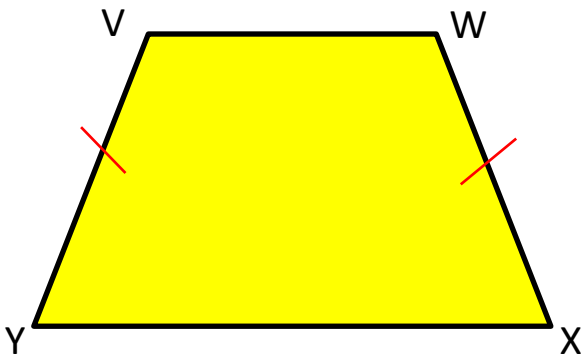
A right trapezoid has a pair of right angles.




In trapezoid MNOP, adjacent angles ∠M and ∠P are right angles, therefore it is a right trapezoid.

## ISOSCELES TRAPEZOID

An isosceles trapezoid has equal legs. The lower base angles are equal and the upper base angles are equal.




In trapezoid VWXY, the legs $\overline{VY}$ and $\overline{WX}$ are equal. The measures of the upper base angles ∠V and ∠W are equal, and so as the lower base angles ∠Y and ∠X. Therefore it is an isosceles trapezoid.

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# Classifying of 2-Dimensional Shapes

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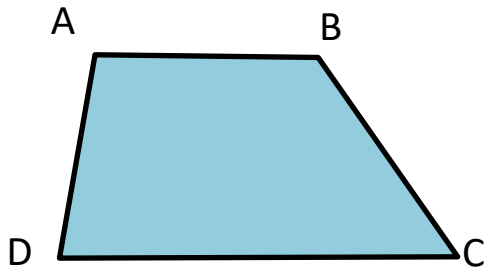
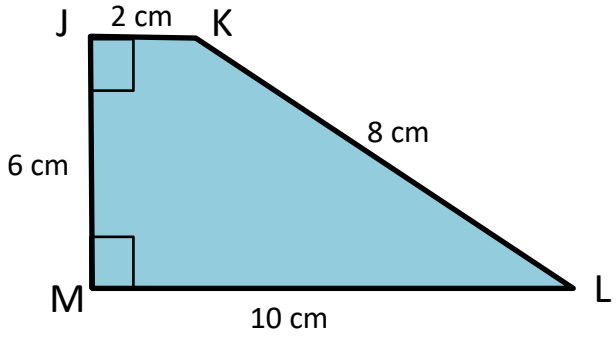
## SCALENE TRAPEZOID

A scalene trapezoid has no equal sides.




In trapezoid ABCD, none of the sides are equal, therefore the trapezoid is scalene.

Take note that a **right trapezoid** can be **scalene**, and vice versa.



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# Classifying of 2-Dimensional Shapes

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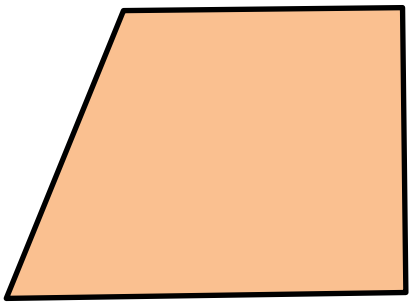
**Sample Problem 7:** Classify the following trapezoids.

1.



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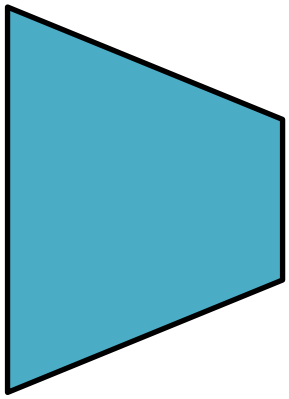

3.