4 Altitudes and Medians of a triangle

Let's recall.

In the previous standard we have learnt that the bisectors of angles of a triangle, as well as the perpendicular bisectors of its sides are concurrent. These points of concurrence are respectively called the incentre and the circumcentre of the triangle.

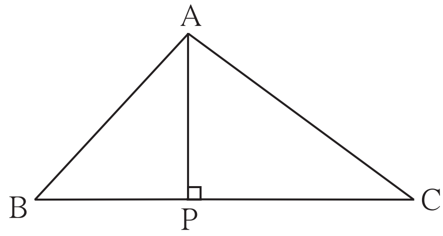
Activity :

Draw a line. Take a point outside the line. Draw a perpendicular from the point to the line with the help of a set - square.

Let's learn.

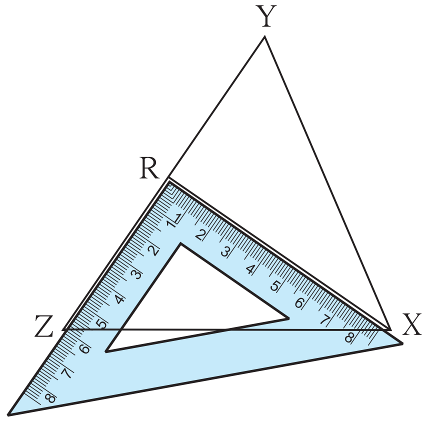
Altitude

The perpendicular segment drawn from a vertex of a triangle on the side opposite to it is called an altitude of the triangle. In Δ ABC, seg AP is an altitude on the base BC.



To draw altitudes of a triangle :

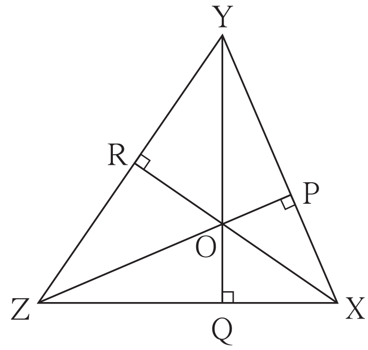
1. Draw any Δ XYZ.
2. Draw a perpendicular from vertex X on the side YZ using a set - square. Name the point where it meets side YZ as R. Seg XR is an altitude on side YZ.



3. Considering side XZ as a base, draw an altitude YQ on side XZ. seg YQ $\perp$ seg XZ.
4. Consider side XY as a base, draw an altitude ZP on seg XY. seg ZP $\perp$ seg XY.

seg XR, seg YQ, seg ZP are the altitudes of Δ XYZ.

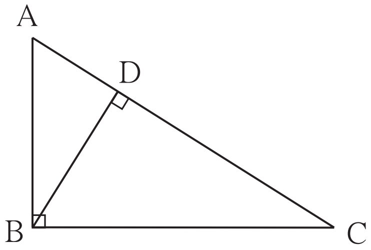
Note that, the three altitudes are concurrent. **The point of concurrence is called the orthocentre of the triangle. It is denoted by the letter 'O'.**



The location of the orthocentre of a triangle :

Activity I :

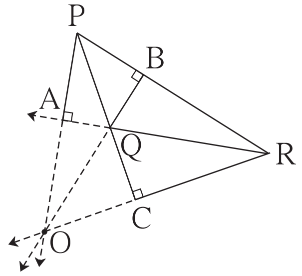
Draw a right angled triangle and draw all its altitudes. Write the point of concurrence.



Activity II :

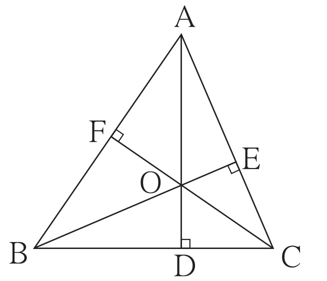
Draw an obtuse angled triangle and all its altitudes. Do they intersect each other ?

Draw the lines containing the altitudes. Observe that these lines are concurrent.



Activity III :

Draw an acute angled Δ ABC and all its altitudes. Observe the location of the orthocentre.



Now I know.

The altitudes of a triangle pass through exactly one point;that means they are concurrent. The point of concurrence is called the orthocentre and it is denoted by 'O'.

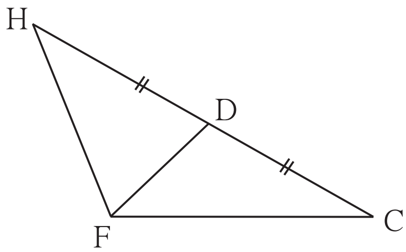
- The orthocentre of a right angled triangle is the vertex of the right angle.
- The orthocentre of an abtuse angled triangle is in the exterior of the triangle.
- The orthocentre of an acute angled triangle is in the interior of the triangle.

Let's learn.

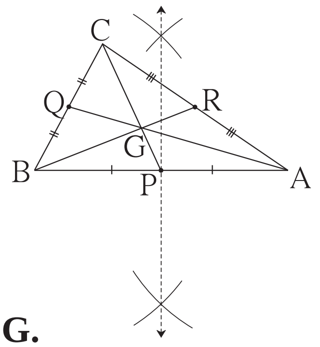
Median

The segment joining the vertex and midpoint of the opposite side is called a median of the triamgle.

In Δ HCF, seg FD is a median on the base CH.



To draw medians of a triangle :



1. Draw Δ ABC.
2. Find the mid-point P of side AB. Draw seg CP.
3. Find the mid-point Q of side BC. Draw seg AQ.
4. Find the mid-point R of side AC. Draw seg BR.

   Seg PC, seg QA and seg BR are medians of Δ ABC.

   Note that the medians are concurrent. **Their point of concurrence is called the centroid. It is denoted by G.**

Activity IV : Draw three different triangles ; a right angled triangle, an obtuse angled triangle and an acute angled triangle. Draw the medians of the triangles. Note that the centroid of each of them is in the interior of the triangle.

The property of the centroid of a triangle :

- Draw a sufficiently large Δ ABC.
- Draw medians ; seg AR, seg BQ and seg CP of Δ ABC.
- Name the point of concurrence as G.

Measure the lengths of segments from the figure and fill in the boxes in the following table.

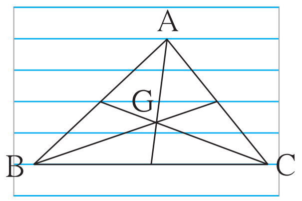
l(AG) = ☐	l(GR) = ☐	l(AG) : l(GR) = ☐ : ☐
l(BG) = ☐	l(GQ) = ☐	l(BG) : l(GQ) = ☐ : ☐
l(CG) = ☐	l(GP) = ☐	l(CG) : l(GP) = ☐ : ☐

Observe that all of these ratios are nearly 2:1.

Now I know.

The medians of a triangle are concurrent. Their point of concurrence is called the Centroid and it is denoted by G. For all types of triangles the location of G is in the interior of the triangles. The centroid divides each median in the ratio 2:1.

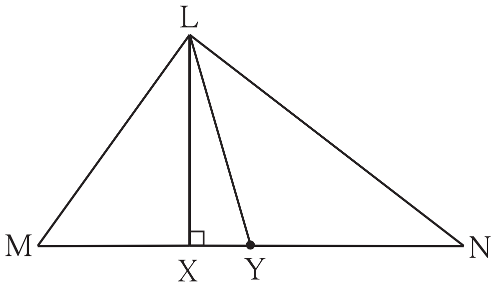
Let's discuss.



As shown in the adjacent figure, a student drew Δ ABC using five parallel lines of a note book. Then he found the centroid G of the triangle. How will you decide whether the location of G he found, is correct.

Practice Set 4.1

1.



In Δ LMN, ... is an altitude and ...... is a median. (write the names of appropriate segments.)

2. Draw an acute angled Δ PQR. Draw all of its altitudes. Name the point of concurrence as 'O'.

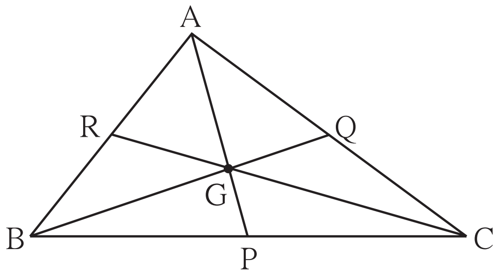
3. Draw an obtuse angled Δ STV. Draw its medians and show the centroid.

4. Draw an obtuse angled Δ LMN. Draw its altitudes and denote the orthocentre by 'O'.

5. Draw a right angled Δ XYZ. Draw its medians and show their point of concurrence by G.

6. Draw an isosceles triangle. Draw all of its medians and altitudes. Write your observation about their points of concurrence.

7. Fill in the blanks.



Point G is the centroid of Δ ABC.

(1) If l(RG) = 2.5 then l(GC) = ...

(2) If l(BG) = 6 then l(BQ) = ...

(3) If l(AP) = 6 then l(AG) = ...
and l(GP) = ...

Try this.

(I) : Draw an equilateral triangle. Find its circumcentre (C), incentre (I), centroid (G) and orthocentre (O). Write your observation.

(II): Draw an isosceles triangle. Locate its centroid, orthocentre, circumcentre and incentre. Verify that they are collinear.

Answers

Practice Set 4.1

1. seg LX and seg LY **7.** (1) 5, (2) 9, (3) 4, 2

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