4. Attitudes and Medians of a Triangle

Q.1. Solve the following questions.

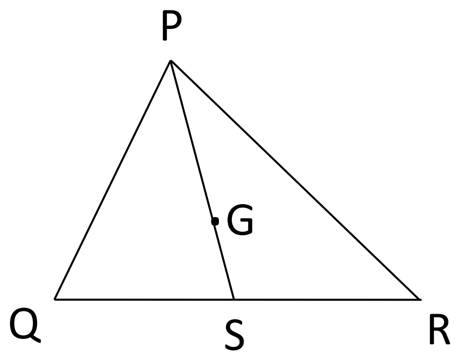
1. In Δ PQR, the length of median PS is 12 cm and G is the centroid. Find l(PG) and l (GS).

Solution :

In Δ PQR,

PS is the median and G is the centroid.

The centroid divides each median in the ratio 2 : 1



∴ PG : GS = 2 : 1

Suppose AG = 2x and   GS = x

But, PG + GS = PS

$\therefore\ 2x + x = 12 \quad \ldots\ldots(\because PS = 12\text{cm})$

$\therefore\ 3x = 12$

$\therefore x = \frac{12}{3}$

$\therefore x = 4$

$\therefore PG = 2x = 2 \times 4 = 8 \text{ and } GS = x = 4$

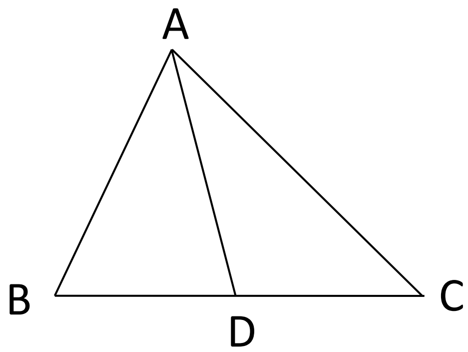
$\therefore l\,(PG) = 8\text{ cm and } l\,(GS) = 4\text{ cm}$

2. In Δ ABC, AD is the median If $\boldsymbol{l}$ (BC) = 11 cm. Find $\boldsymbol{l}$ (BD)

Solution :

In Δ ABC ,

AD is the median and D is the mid – point of side BC.



$$\therefore BC = 2BD$$

$$\therefore BD = \frac{BC}{2}$$

But, BC = 11 cm …… (given)

$$\therefore BD = \frac{11}{2}$$

$$\therefore BD = 5.5$$

$$\therefore \boldsymbol{l}\,(BD) = 5.5 \text{ cm}$$

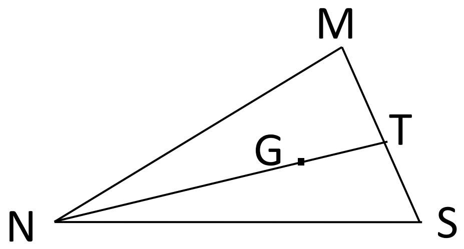
3. Δ MNS, NT is the median and G is the Centroid.

If $\boldsymbol{l}$ (GT) = 4.5 cm Find $\boldsymbol{l}$ (NG).

Solution :

In Δ MNS,

NT is the median and G is the centroid. The centroid divides each median in the ratio 2 : 1.



$$\therefore \frac{l\,(NG)}{l\,(GT)} = \frac{2}{1}$$

But, $l\,(GT) = 4.5$ cm …… (Given)

$$\therefore \frac{l\,(NG)}{4.5} = \frac{2}{1}$$

$$\therefore l\,(NG) = 4.5 \times 2$$

$$\therefore l\,(NG) = 9$$

$$\therefore l\,(NG) = 9 \text{ cm}$$

4. In Δ XYZ, ZO is the median and G is the centroid.

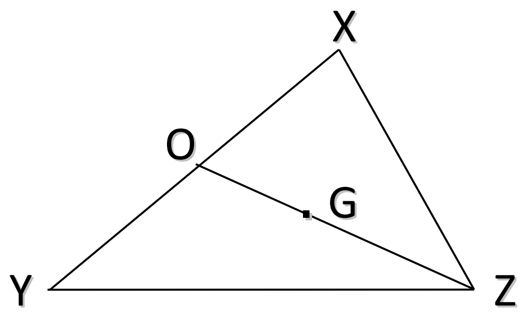
If $l\,(ZG) = 7$ cm. Find $l\,(GO)$.

Solution :

In Δ XYZ,

ZO is the median and G is the centroid.

The centroid divides each median in the ratio 2 : 1



$$\therefore \frac{l\,(ZG)}{l\,(GO)} = \frac{2}{1}$$

But, $l\,(ZG) = 7$ cm …… (Given)

$$\therefore \frac{7}{l\,(GO)} = \frac{2}{1}$$

$\therefore \ l\,(GO) = \frac{7}{2}$

$\therefore \ l\,(GO) = 3.5$

$\therefore \ l\,(GO) = 3.5$ cm.

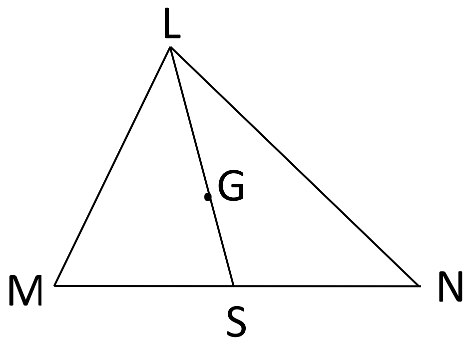
5. In Δ LMN, LS is median and G is the Centroid.

If $l\,(LG) = 10$ cm , find $l\,(LS)$

Solution :

In Δ LMN,

LS is the median and G is the centroid. The centroid divides each median in the ratio 2 : 1



$$\frac{l\,(LG)}{l\,(GS)} = \frac{2}{1}$$

But, $l\,(LG) = 10$ **cm ….. (Given)**

$$\frac{10}{l\,(GS)} = \frac{2}{1}$$

$\therefore l\,(GS) = \frac{10}{2}$

$\therefore l\,(GS) = 5$

Also, $l\,(LS) = l\,(LG) + l\,(GS)$

$= 10 + 5$

$= 15$

$\therefore l\,(\mathrm{LS}) = 15$ cm

6. Match the following pairs.

A.

Group ‘A’	Group ‘B’
(1) Altitude	(*a*) Centroid
(2) Median	(b) Circumcentre
(3) Perpendicular bisector	(c) Orthocentre
(4) Angle bisector	(d) Incentre

Ans :

Group ‘A’	Group ‘B’
(1) Altitude	(c) Orthocentre
(2) Median	(*a*) Centroid
(3) Perpendicular bisector	(b) Circumcentre
(4) Angle bisector	(d) Incentre

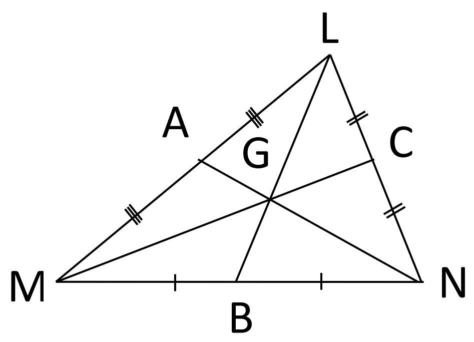
B.

Group 'A' **(Point of concurrence)**	**Group 'B'** **(Characteristics)**
(1) The point of concurrence of the angle bisectors of triangle.	**(a) To construct circumcircle of a triangle given the point of concurrence.**
(2) The point of concurrence of the perpendicular bisectors of its sides of the triangle.	**(b) The centroid divides median in the ratio 2 : 1 .**
(3) The point of concurrence of the altitudes of the triangle.	**(c) The main characteristic is not defined.**
(4) The point of concurrence of the median of the triangle.	**(d) To construct the incentre of a triangle given the point of concurrence.**

Ans :

Group 'A' (Point of concurrence)	Group 'B' (Characteristics)
(1) The point of concurrence of the angle bisectors of triangle.	(d) To construct the incentre of a triangle given the point of concurrence.
(2) The point of concurrence of the perpendicular bisectors of its sides of the triangle.	(a) To construct circumcircle of a triangle given the point of concurrence.
(3) The point of concurrence of the altitudes of the triangle.	(c) The main characteristic is not defined.
(4) The point of concurrence of the median of the triangle.	(b) The centroid divides median in the ratio 2 : 1 .

7. Observe the given diagram and complete the following activity :



(1) $l\,(LG) = \boxed{\ldots\ldots}$; $l\,(GB) = 1.5$

(2) $l\,(MG) = 4.6$; $l\,(GC) = \boxed{\ldots\ldots}$

(3) $l\,(NG) = \boxed{\ldots\ldots}$; $l\,(GA) = 5.2$

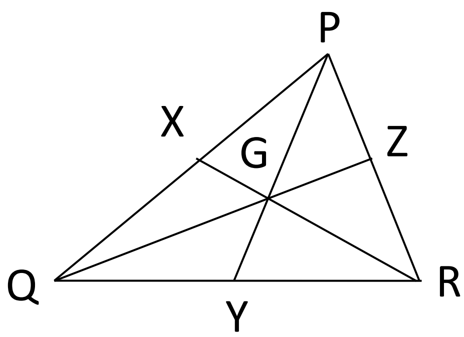
Ans :

(1) $l\,(LG) = \boxed{3}$; $l\,(GB) = 1.5$

(2) $l\,(MG) = 4.6$; $l\,(GC) = \boxed{2.3}$

(3) $l\,(NG) = \boxed{10.4}$; $l\,(GA) = 5.2$

8. Observe the given diagram and complete the following activity :



$l\,(\mathrm{QG}) = \boxed{}$	$l\,(\mathrm{GZ}) = 0.8$	$l\,(\mathrm{QG}) = \boxed{} = \boxed{} : \boxed{}$
$l\,(\mathrm{RG}) = 6.4$	$l\,(\mathrm{GX}) = \boxed{}$	$\boxed{} : l\,(\mathrm{GX}) = 6.4 : \boxed{}$
$l\,(\mathrm{PG}) = \boxed{}$	$l\,(\mathrm{GY}) = \boxed{}$	$\boxed{} : l\,(\mathrm{GY}) = \boxed{} : 8.1$

Ans :

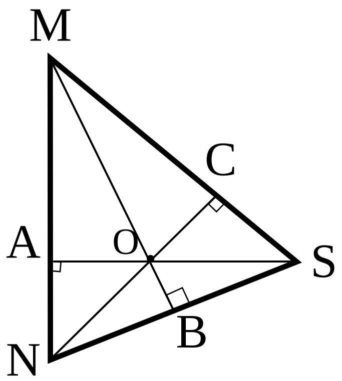
$l\,(\mathrm{QG}) = \boxed{1.6}$	$l\,(\mathrm{GZ}) = 0.8$	$l\,(\mathrm{QG}) = \boxed{l\,(\mathrm{GZ})} = \boxed{1.6} : \boxed{0.8}$
$l\,(\mathrm{RG}) = 6.4$	$l\,(\mathrm{GX}) = \boxed{3.2}$	$\boxed{l\,(\mathrm{RG})} : l\,(\mathrm{GX}) = 6.4 : \boxed{3.2}$
$l\,(\mathrm{PG}) = \boxed{16.2}$	$l\,(\mathrm{GY}) = \boxed{8.1}$	$\boxed{l\,(\mathrm{PG})} : l\,(\mathrm{GY}) = \boxed{16.2} : 8.1$

9. Observe the diagram and answer the following questions.

(1) Give the name of all altitudes.

(2) Give the name of orthocentre of a triangle.

(3) Write the observation about their points of altitudes.

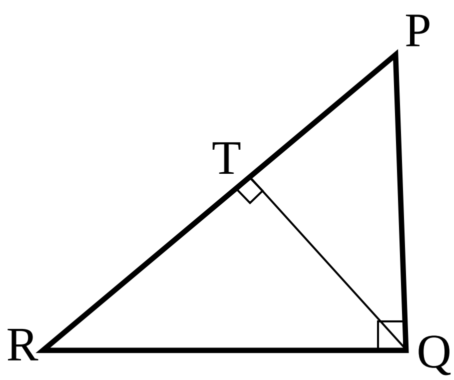


Ans : (1) Seg MB, seg SA and seg NC are the altitudes of Δ MNS .

(2) The orthocentre of a triangle is denoted by a letter 'O'

(3) The altitudes of a triangle pass through exactly one point of Δ MNS therefore seg MB, seg SA and seg NC are concurrent.

10. Observe the diagram and answer the following questions.



(1) Write the type of a triangle.

(2) Give the name of all altitudes.

(3) Where is the orthocentre of a triangle lies ?

(4) Write the observation about their points of altitudes.

Ans :

(1) Given Δ PQR is a right angled triangle.

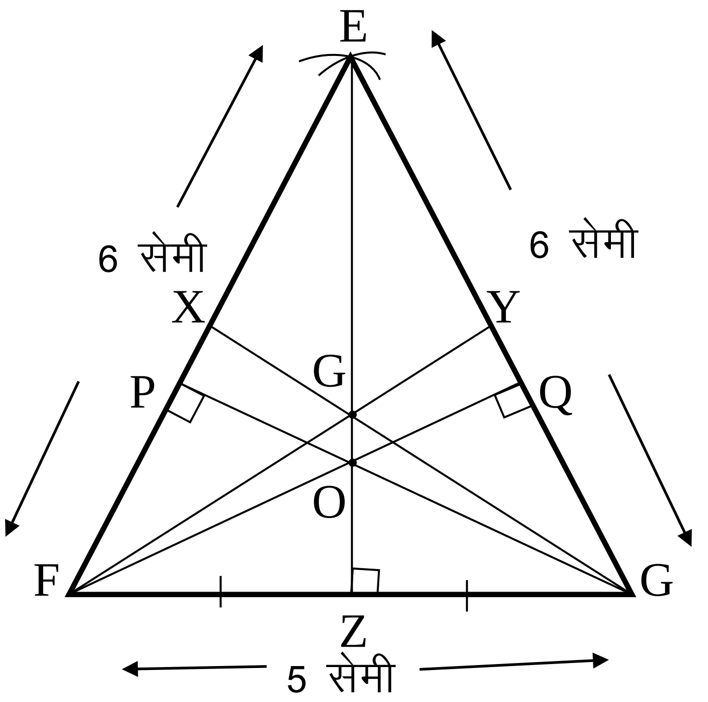
(2) Seg QT, seg PQ and seg RQ are the altitudes of right angled Δ PQR.

(3) In a right angled triangle, the orthocentre lies on the vertex containing the right angle.

(4) Seg QT, seg PQ and seg RQ are the altitudes of a triangle which are concurrent.

11. Draw and isosceles Δ EFG where $l\,(\mathrm{FG}) = 5$ cm, $l\,(\mathrm{EG}) = l\,(\mathrm{EF}) = 6$ cm. Draw all of its medians and altitudes. Write the observation about its incentre, circumcentre, centroid and the orthocentre.

Ans :



(i) The altitudes EZ, FQ and GP intersect at point 'O'

(ii) The medians EZ, FY, and GX intersect at point 'G'

Observation : The orthocentre 'O' and the centroid 'G' lies on the line which is the perpendicular bisector of base FG that means orthocentre 'O' and centroid 'G' lies on the same line.

12. Write the following statement true or false.

(1) Incentre, circumcentre, centroid and orthocentre of an isosceles triangle are collinear.

Ans : True

(2) The orthocentre of an acute angled triangle is in the exterior of the triangle.

Ans : False, the orthocentre of an acute angled triangle is in the interior of the triangle.

(3) Incentre, circumcentre, centroid and orthocentre of an equilateral triangle are collinear.

Ans : False, Incentre, circumcentre, centroid and orthocentre are all the same point.

(4) The orthocentre of a right angled triangle is on the side of triangle.

Ans : False, the orthocentre of a right angled triangle is the vertex of the right angle.

(5) The orthocentre of an obtuse angled triangle is in the exterior of the triangle.

Ans : True

(6) The centroid is also called centre of gravity of a triangle.

Ans : True

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