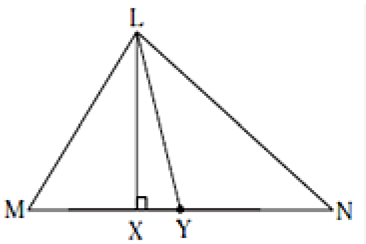
Altitudes And Medians Of a Triangle

Practice set 4.1

Q. 1. In ∆LMN, ... is an altitude and ...... is a median. (Write the names of appropriate segments.)

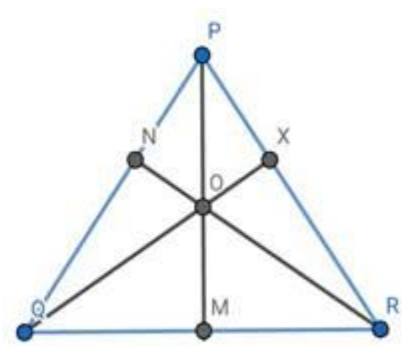


Answer : In ∆LMN, LX is an altitude (because it makes a 90° angle on the base where it falls) and LY is a median (because it divides the base into two equal halves i.e., MY = NY).

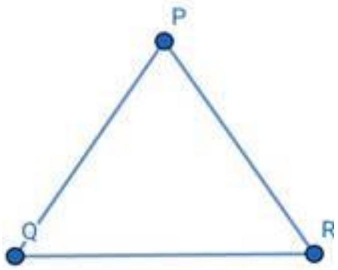
Q. 2. Draw an acute-angled ∆PQR. Draw all of its altitudes. Name the point of concurrence as 'O'.

Answer : To draw altitudes of a triangle:

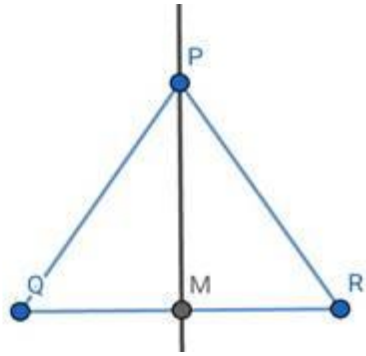
i. Draw an acute-angled ∆PQR.



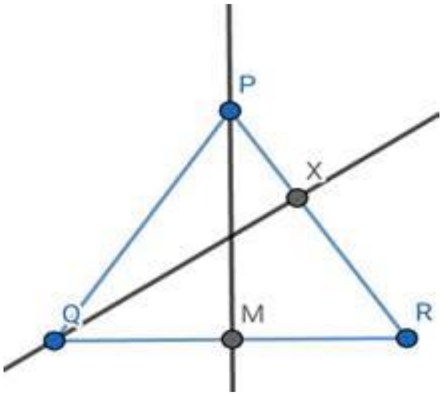
ii. Draw a perpendicular from vertex P on the side QR using a set - square. Name the point where it meets side QR as M. Seg PM is an altitude on side QR.



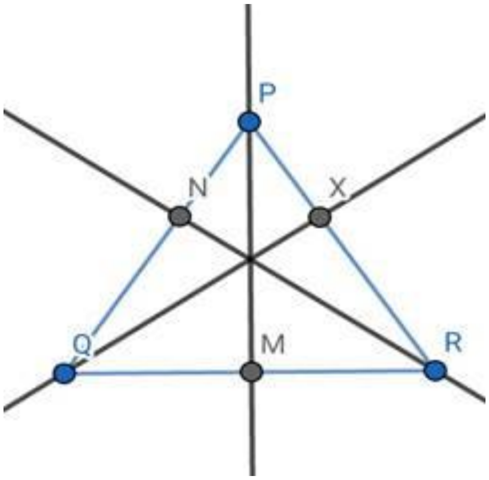
iii. Considering side PR as a base, draw an altitude QX on side XZ. Seg QX is an altitude on side PR.



iv. Consider side PQ as a base, draw an altitude RN on seg PQ. Seg RN is an altitude on side PQ.



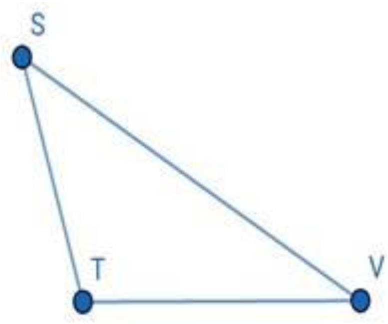
Hence,



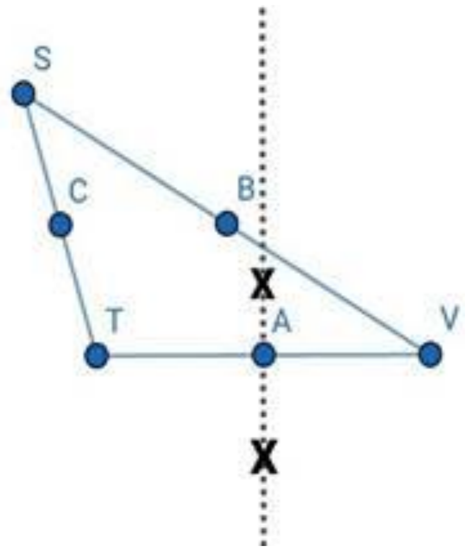
Seg PM, seg QO, seg RN are the altitudes of ∆PQR. The point of concurrence i.e., the orthocentre is denoted by the point O.

Q. 3. Draw an obtuse-angled ∆STV. Draw its medians and show the centroid.

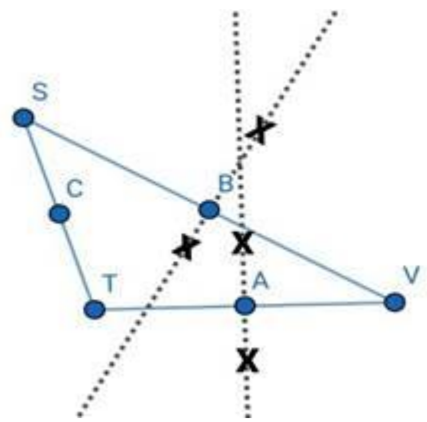
Answer : To draw an obtuse-angled ∆STV.



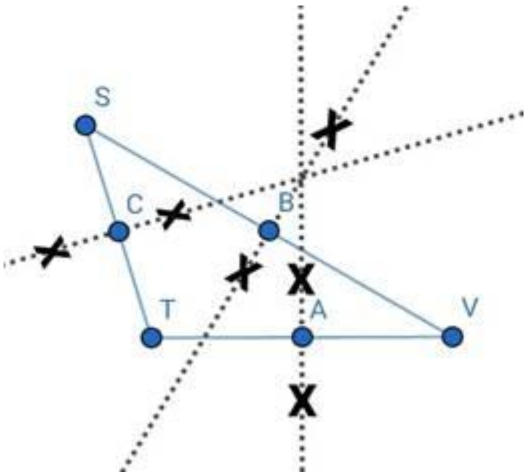
i. Draw a base line of any length, mark it TV. At T draw an obtuse angle mark that line point S. Join S and V points. ΔSTV thus formed is an obtuse angled triangle.



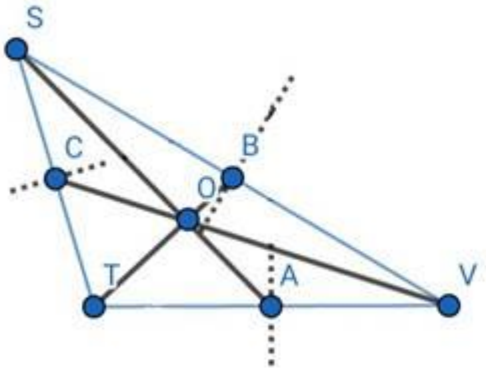
ii. Find the mid-point A of side TV, by constructing the perpendicular bisector of the line segment TV. Draw AS.



iii. Find the mid-point B of side SV, by constructing the perpendicular bisector of the line segment SV. Draw seg BT.



iv. Find the mid-point C of side ST, by constructing the perpendicular bisector of the line segment ST. Draw seg CV.



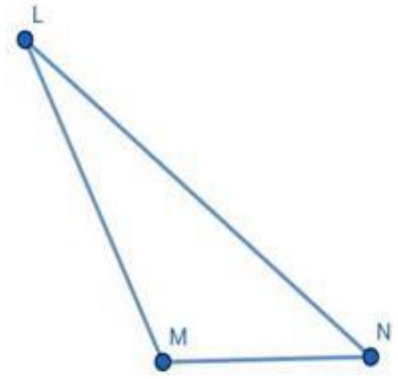
Seg AS, seg BT and seg CV are medians of ∆STV.

Their point of concurrence is denoted by O.

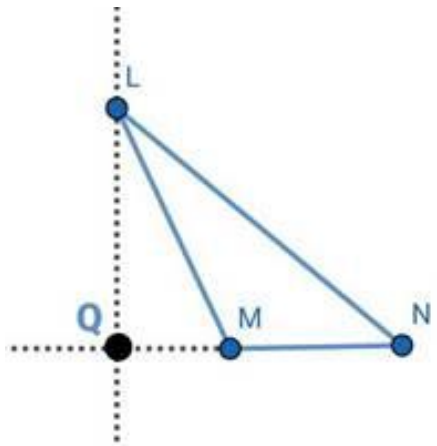
Q. 4. Draw an obtuse-angled ∆LMN. Draw its altitudes and denote the orthocentre by 'O'.

Answer : To draw an obtuse-angled ∆LMN.

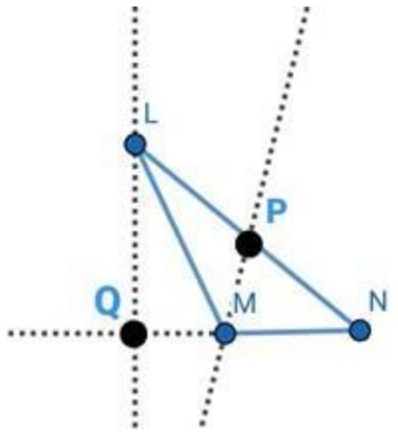
i. Draw a base line of any length, mark it MN. At M draw an obtuse angle mark that line point L. Join L and N points. ΔLMN thus formed is an obtuse angled triangle.



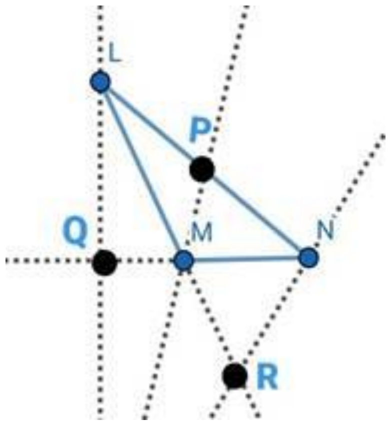
ii. To draw an altitude from vertex L, extend side MN of the triangle from point M with a dashed line, as shown in the figure, and then draw the perpendicular lines from M.



iii. Considering side LN as a base, draw an altitude MP on side LN. Seg MP is an altitude on side LN.

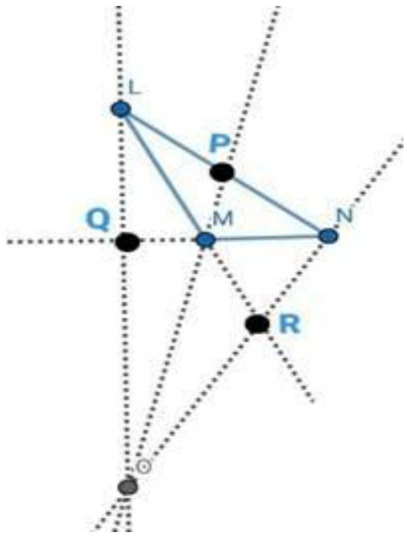


iv. To draw altitude from vertex N, extend side LM of the triangle from point M with dashed line, as shown in the figure, and then draw the perpendicular line from vertex N.



v. Now for the orthocentre, as all the altitudes do not intersect we'll have to extend them so that they can meet giving us an orthocentre of the triangle.

vi. Hence, extend the altitude LQ, from point Q ; MP from point M, and NR from point R.



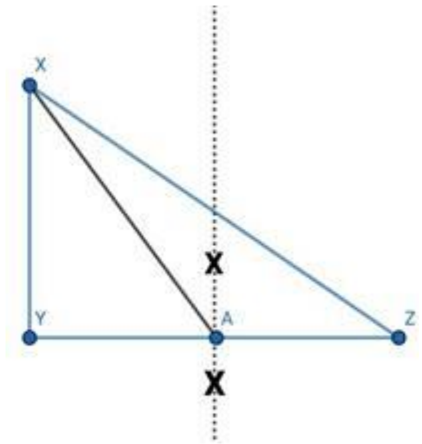
vii. The ortho centre of the Obtuse triangle lies outside the triangle.

viii. The point O denotes the orthocentre of the obtuse-angled ΔLMN.

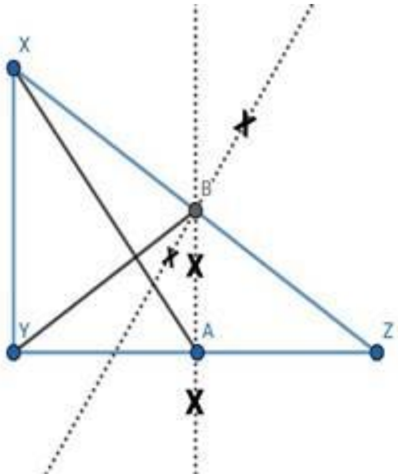
Q. 5. Draw a right angled ΔXYZ. Draw its medians and show their point of concurrence by G.

Answer : To draw an right angled ΔXYZ.

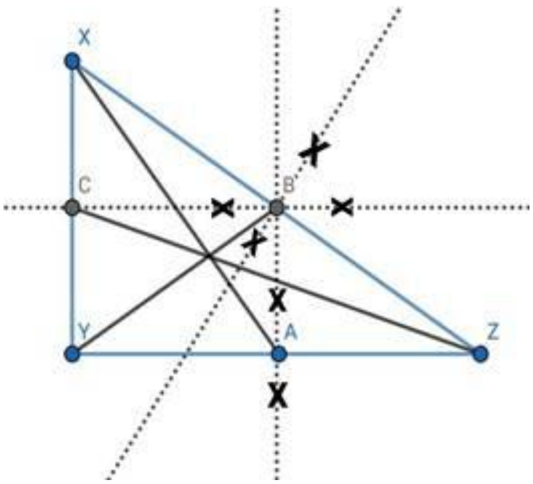
i. Draw a base line of any length, mark it YZ. At Y draw a right angle mark that line point X. Join X and Z points. ΔXYZ thus formed is right angled triangle.



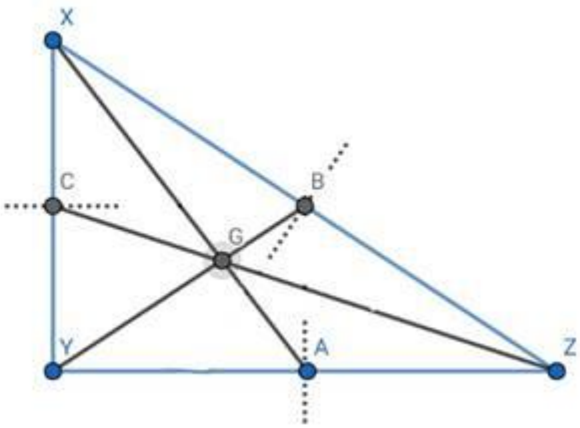
ii. Find the mid-point A of side YZ, by constructing the perpendicular bisector of the line segment YZ. Draw AX.



iii. Find the mid-point B of side XZ, by constructing the perpendicular bisector of the line segment XZ. Draw seg BY.



iv. Find the mid-point C of side XY, by constructing the perpendicular bisector of the line segment XY. Draw seg CZ.

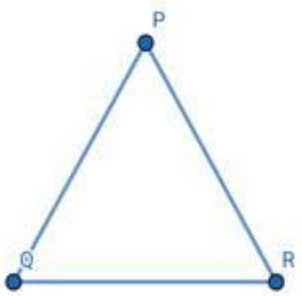


Seg AX, seg BY and seg CZ are medians of ΔXYZ.

Their point of concurrence is denoted by G.

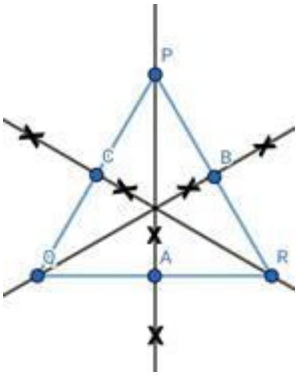
Q. 6. Draw an isosceles triangle. Draw all of its medians and altitudes. Write your observation about their points of concurrence.

Answer : i. Draw an isosceles triangle and name it as PQR.

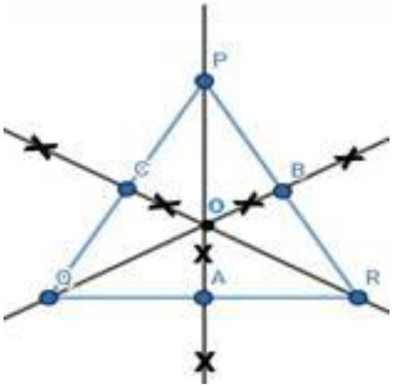


An isosceles triangle is that triangle whose base is the side which is not equal to the other two sides or An isosceles triangle is a triangle which has two equal sides.

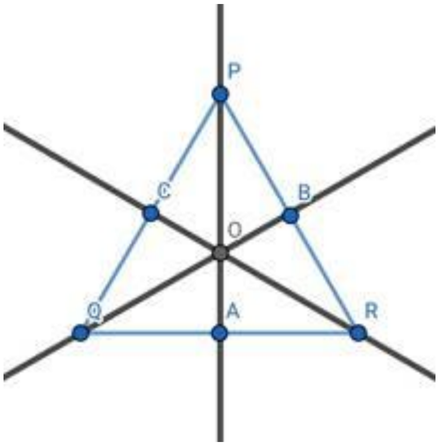
ii. Now, mark the mid-point i.e., A, B, C, of all the sides of the triangle and join it with the opposite vertex i.e., P, Q, R. The line segment i.e., PA, QB, RC hence found are the median of the triangle.



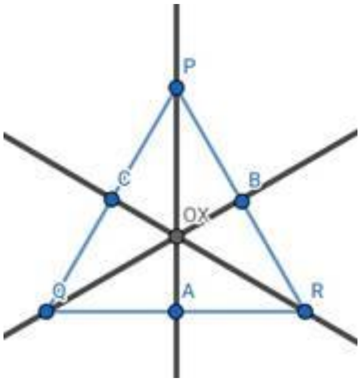
iii. Mark the point of concurrence as 'O'.



iv. Again, draw perpendicular line segment from each vertex.



v. Mark the point of concurrence X.



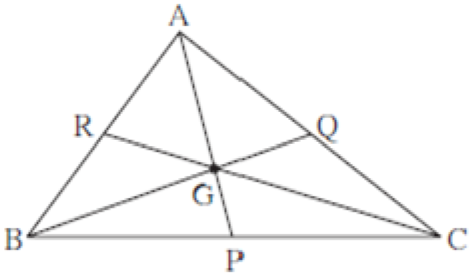
Here we see that both the point of concurrence of medians and altitudes coincides.

In the case of isosceles triangle, the two sides that are equal meet at a vertex, that lies directly above the midpoint of the base. Because of this, the altitude that runs from P to the base intersects the base at its midpoint, making it the median from P to the base as well, which is same for the other two sides also.

Therefore, in an isosceles triangle, the altitude and median are the same line segment, which is shown through the bold line in the above-given figure.

Q. 7. Fill in the blanks.

Point G is the centroid of △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) = ...

Answer :

1) If $I(RG) = 2.5$ then $I(GC) = 5$, as we know that the centroid divides each median in the ratio 2:1.

Hence, $\frac{CG}{RG} = \frac{2}{1}$

GC/2.5 = 2/1

Cross Multiplying we get,

GC × 1 = 2 × 2.5

Therefore, I(GC) = 5

2) If $l(BG) = 6$ then $l(BQ) = 9$, as we know that the centroid divides each median in the ratio 2:1.

Now, $\frac{BG}{QG} = \frac{2}{1}$

6/QG = 2/1

6 × 1 = 2 × QG

6 = 2 × QG

6/2 = QG

Hence, I(QG) = 3.

Since we have to find I(BQ), and from the figure it can be seen that,

(BQ) = I(BG) + I(QG)

Therefore, I(BQ) = 6 + 3

I(BQ) = 9.

3) If $l(AP) = 6$ then $l(AG) = 4$ and I(GP) = 2, as we know that the centroid divides each median in the ratio 2:1 --------(i)

Here both I(AG) and I(GP) are unknown so,

Let I(AG), I(GP) be 2x and x respectively, from equation (i)

Since, I(AP) = I(AG) + I(GP)

6 = 2x + x

6 = 3x

6/3 = x

x = 2.

Therefore, I(AG) = 2x = 2×2 = 4.

I(GP) = x = 2.