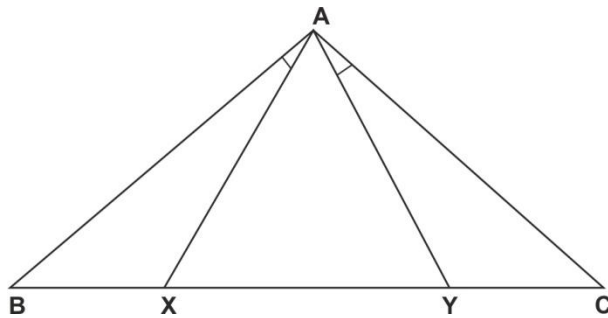


# 1<sup>st</sup> ROUND

1.

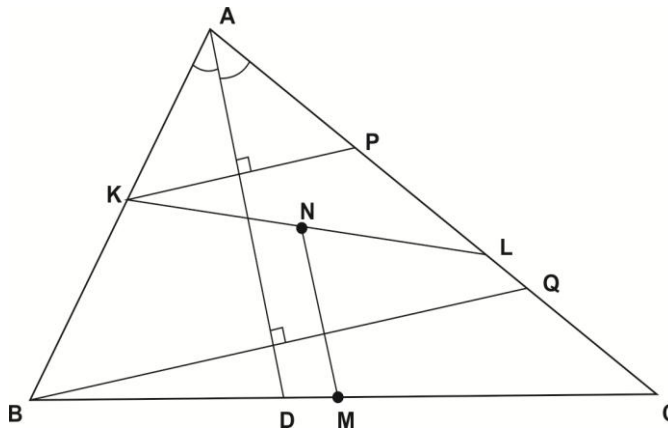


$X, Y$  are points on  $BC$  such that  $\sphericalangle BAX = \sphericalangle CAY$ .

Show that

$$\frac{BX \times BY}{CX \times CY} = \left(\frac{AB}{AC}\right)^2.$$

2.



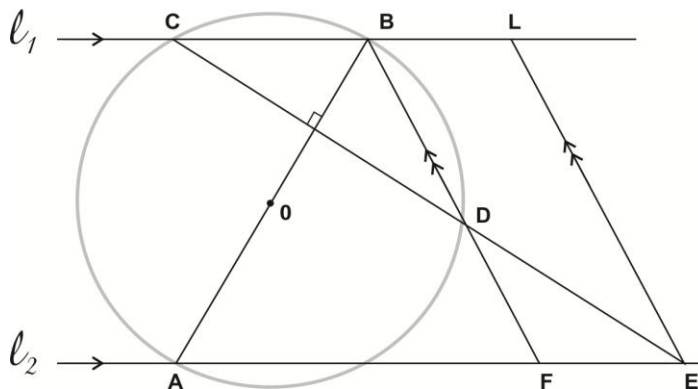
$AD$  bisects  $\sphericalangle BAC$ .  $K$  and  $L$  are points on  $AB$  and  $AC$  respectively such that  $BK = CL$ .

$KP$  and  $BQ$  are perpendicular to  $AD$ .

$M, N$  are the midpoints of  $BC$  and  $KL$  respectively.

Show that  $MN \parallel AD$ .

3.

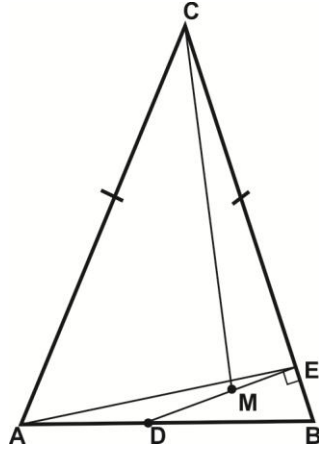


$AB$  is a diameter and  $AB \perp CD$ .  $BD, CD$  intersects line  $l_2$  at  $E$  and  $F$  respectively.  $EL \parallel FB$ .

Show that  $LF \perp AE$ .

Note that lines  $l_1$  and  $l_2$  are parallel.

4.



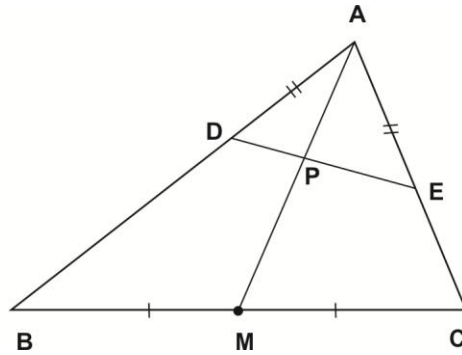
In isosceles  $\triangle ABC$ ,  $CA = CB$ .

$D$  is the midpoint of  $AB$ .

$DE \perp BC$  and  $M$  is the midpoint of  $DE$ .

Show that  $CM \perp AE$ .

5.



$M$  is the midpoint of  $BC$ .

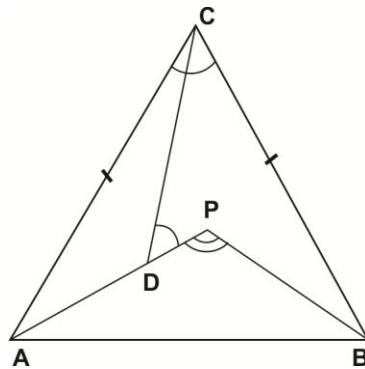
$AD = AE$ .

$DE$  intersects  $AM$  at  $P$ .

Show that

$$DP \times AB = PE \times AC.$$

6.



In isosceles  $\triangle ABC$ ,  $CA = CB$ .

$$\angle APB = 2 \times \angle ACB;$$

$$\angle CDP = \angle ACB.$$

Show that  $CD = BP + DP$ !