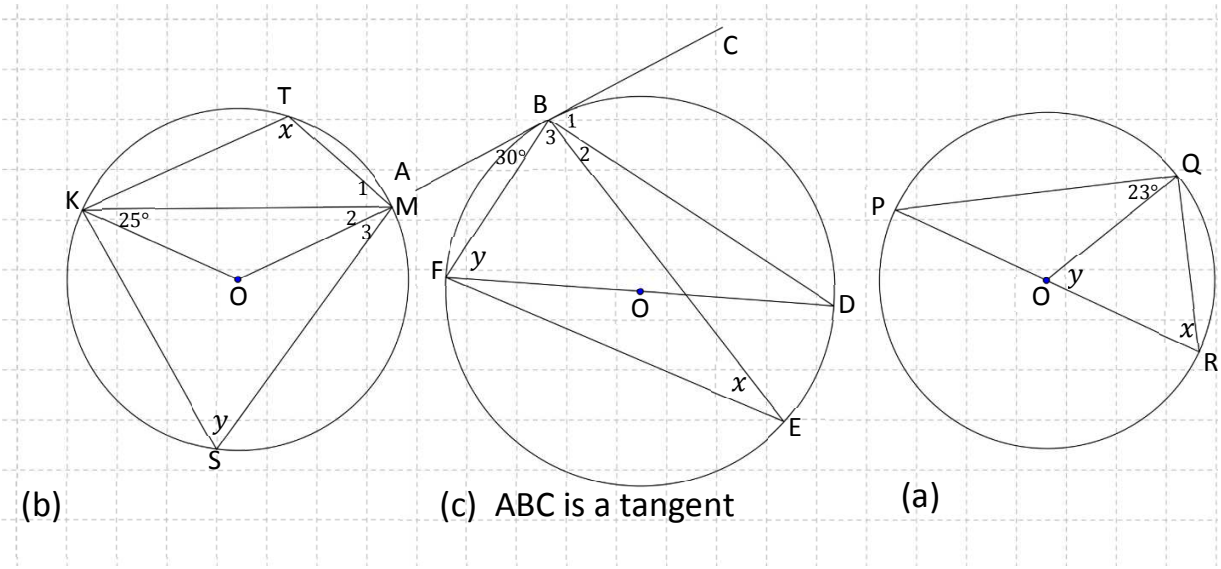
EUCLIDEAN GEOMETRY ACTIVITIES

1. Calculate the values of x and y in each diagram. Give reasons for your answers. In each case, O is the centre of the circle.

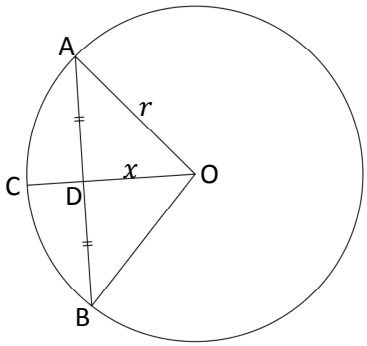


(b) (c) ABC is a tangent (a)

2. AB is a chord of the circle with centre O.

D is the midpoint of AB. If AB = 12cm, OD = x cm and DC = 2 cm, calculate the values of x and r.

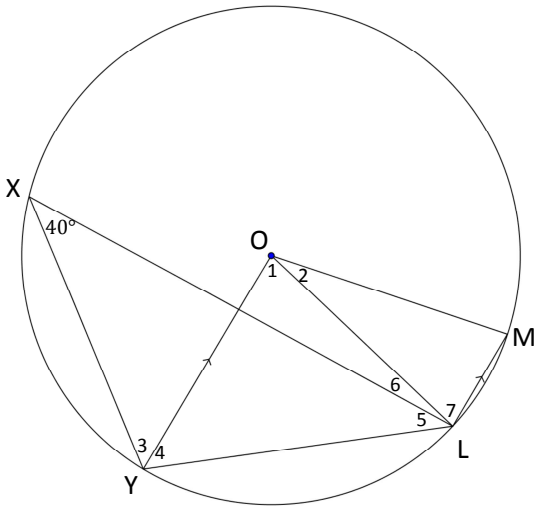
Give reasons for your statements.



3. O is the centre of the circle. X, Y, L and M are points on the circumference. $OY||ML$ and $\angle YXL = 40°$.

Calculate, with reasons the size of:

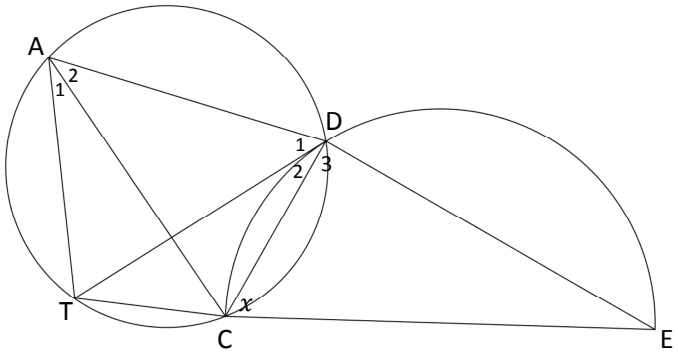
(a) $\angle O_1$
(b) $\angle Y_4$
(c) $\angle O_2$



4. CE is the diameter of the semi-circle CDE, and TD is a tangent at D.

(a) Why is $\angle D_2 = \angle E$?

(b) If $\angle DCE = x$, prove that $\angle A_1 = 90° - x$.



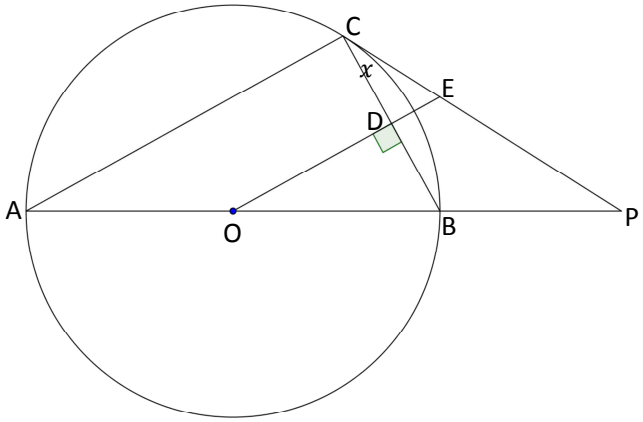
5. In the figure, AB is the diameter of the circle with centre O. AB is produced to P. PC is a tangent to the circle at C, and the perpendicular from O to BC intersects BC at D and PC at E. Answer with reasons:

(a) Prove that $AC||OE$.

(b) If $\angle BCP = x$, two other angles equal to x.

(c) Prove that OBEC is cyclic.

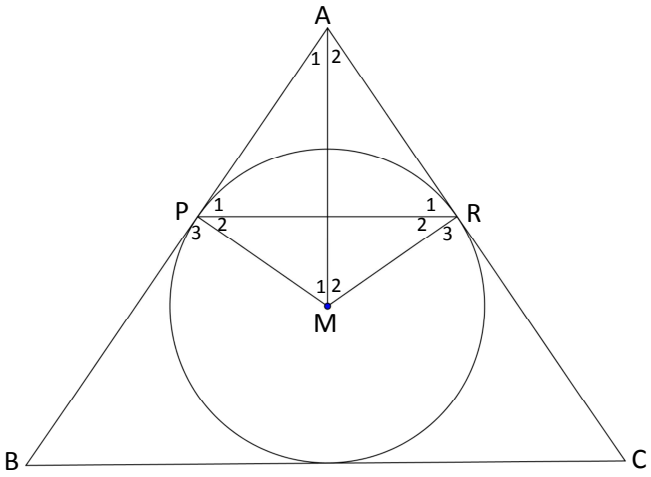
(d) Prove that $\angle P = (90° - 2x)$ and hence calculate $\angle P$ if $\angle ABC = 60°$



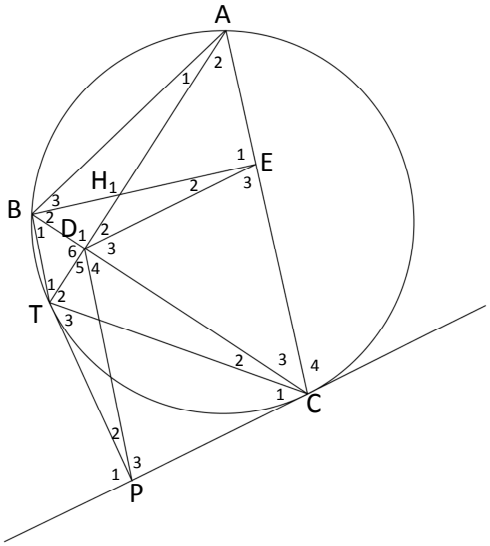
6. M is the centre of the inscribed circle of ΔABC. AB and AC touch the circle at P and R respectively. AM and PR cut at S. Prove that:

(a) APMR is a cyclic quadrilateral.

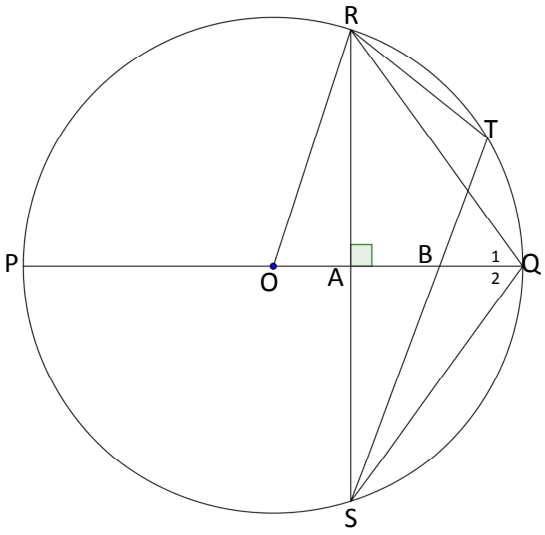
(b) MP is a tangent to circle APS.



7. AD and BE are altitudes of ΔABC. AD produced cuts the circumcircle at T. TP is perpendicular to the tangent PC at P. DE, DP, TC and BT are drawn.



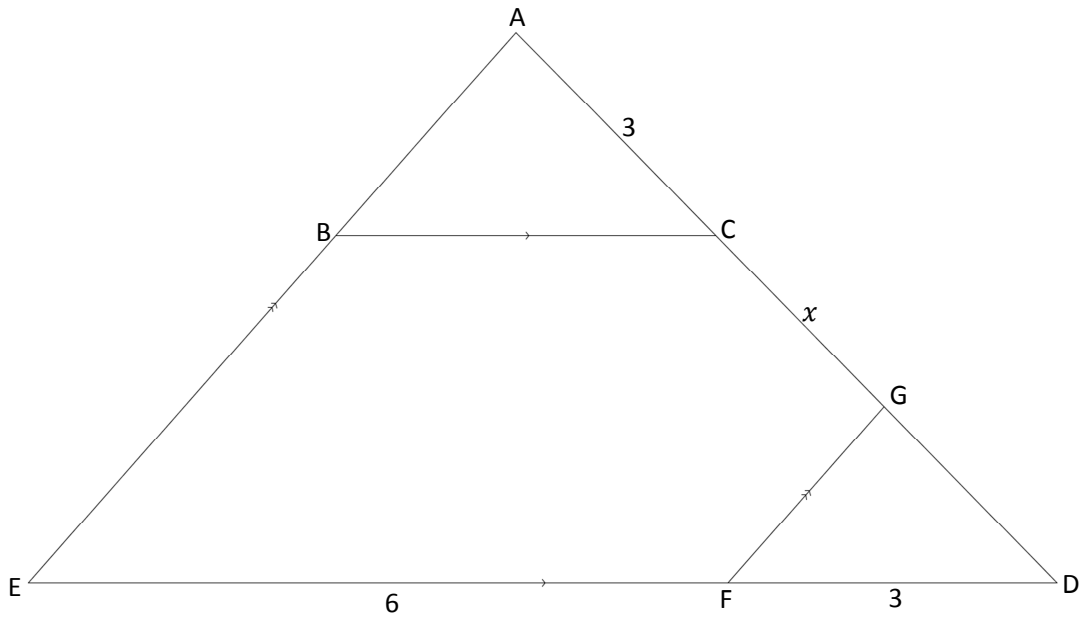
a) ABTC is cyclic; name with reasons other three cyclic quads in the figure.
b) Name with reasons, three other angles equal to $\angle C_1$.
c) Prove that $\angle B_1 = \angle B_2$.
d) Prove that DP is a tangent to the circle BDT



8. In the figure, O is the centre of the circle, and the diameter PQ cuts chord RS at right angles at A. Chord ST cuts PQ at B.

a) Why is AR = AS?
b) Prove that $\angle Q_1 = \angle Q_2$.
c) If $\angle Q_1 = \angle Q_2 = t$, express each of the following angles in terms of t:
   (i) RTS (ii) RSQ (iii) ROA
d) Prove that ROBT is a cyclic quad.

9. In the diagram, ADE is a triangle having $BC \parallel ED$ and $AE \parallel GF$. It is also given that $AB: BE = 1: 3$, $AC = 3$ units, $EF = 6$ units, $FD = 3$ units and $CG = x$ units.



Calculate with reasons:

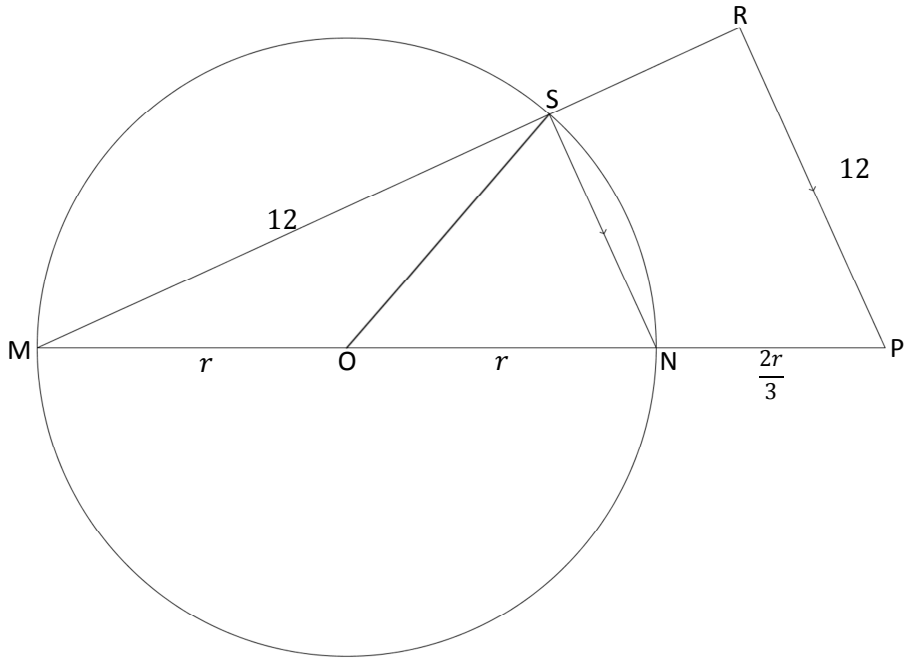
9.1. The length of CD.

9.2. The value of x.

9.3. The length of BC.

9.4. The value of $\frac{\text{area of } \Delta ABC}{\text{area of } \Delta GFD}$

10. In the diagram below, the circle with centre O and radius r units passes through M, N and S. Diameter MN is produced to P such that $NP = \frac{2r}{3}$ units. MS is produced to R such that $NS \parallel RP$. $MS = RP = 12$ units.



Determine, with reasons

10.1. the length of SR.

10.2. the length of SN.

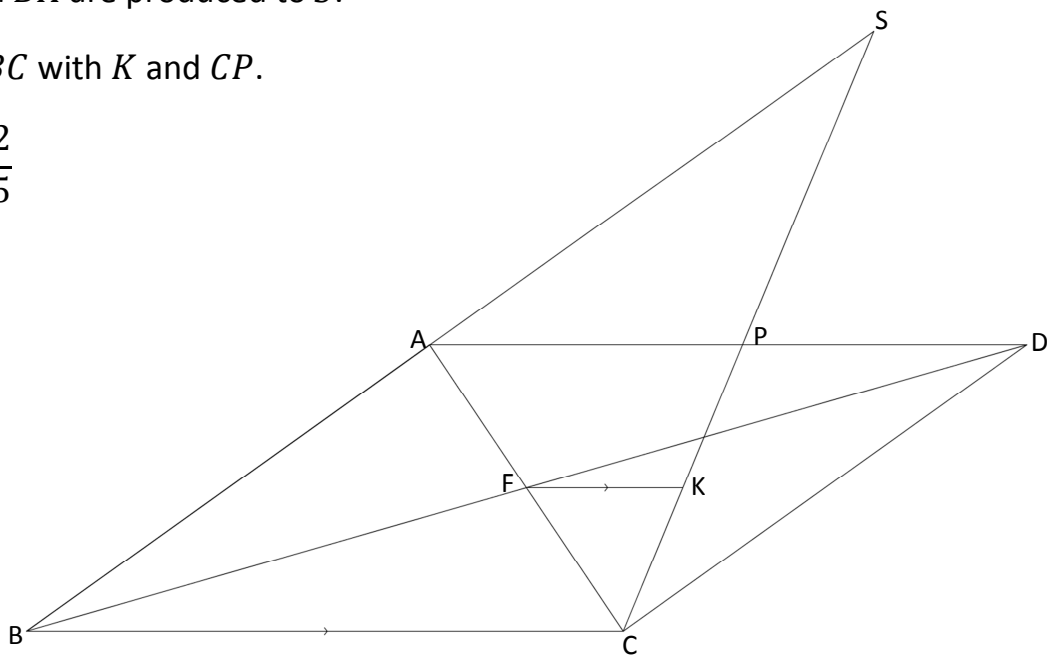
10.3. the numerical value of r.

11. In the diagram alongside, $ABCD$ is a parallelogram with diagonals AC and BD intersecting at F. P is a point on AD.

CP and BA are produced to S.

$FK \parallel BC$ with K and CP.

$$\frac{BA}{BS} = \frac{2}{5}$$

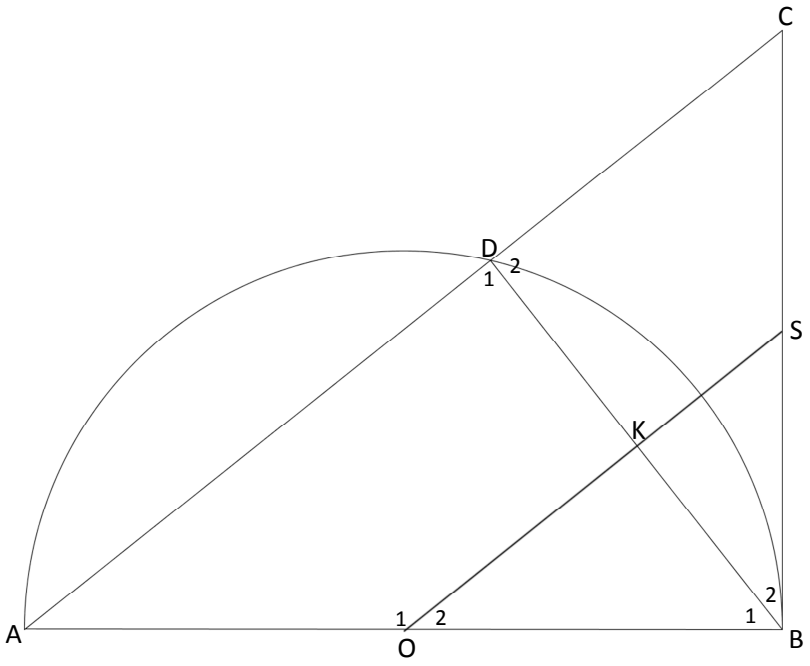


11.1. Show that K is the midpoint of PC.

11.2. Determine, with reasons, the value of the ratio $KC:SP$.

11.3. If $BC = 15cm$, calculate the length of AP.

12. In the diagram below, AOB is the diameter of the semi-circle ADB with O the centre. ADC is straight line. CB is a tangent at B. $OK \perp DB$ with K on DB. OK produced cuts CB at S.



12.1. Prove that:

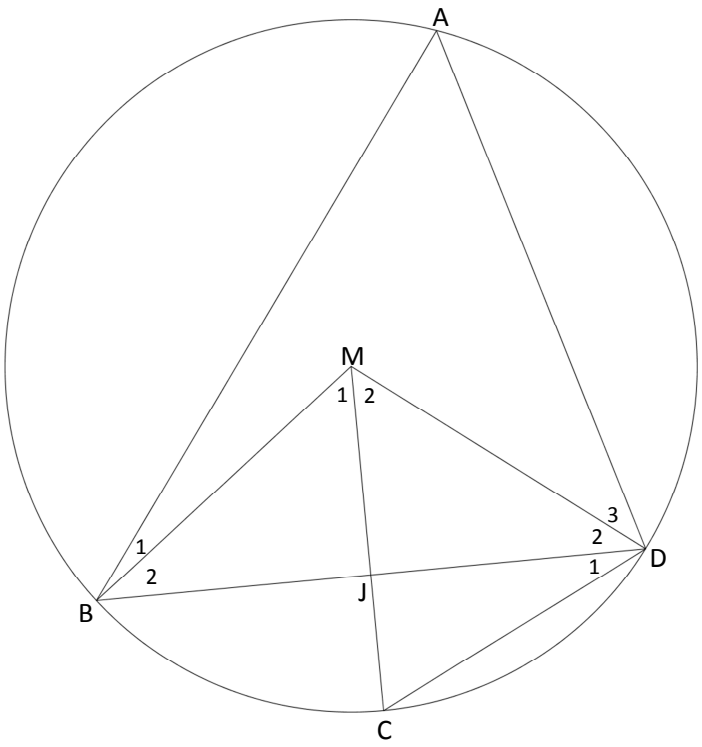
12.1.1. $OS \parallel AC$

12.1.2. $\Delta ABC|||\Delta ADB|||\Delta BDC$

12.1.3. $AB^2 = AD.AC$

12.2. Calculate the numerical value of $\frac{\text{area of } \Delta ABC}{\text{area of } \Delta OSB}$

13. In the diagram below, M is the centre of circle $ABCD$. MC cuts BD at J.



Prove that:

13.1. $\frac{AB}{MD} = \frac{BD}{DC}$

13.2. $AB = \frac{2.MB.JD}{DC}$