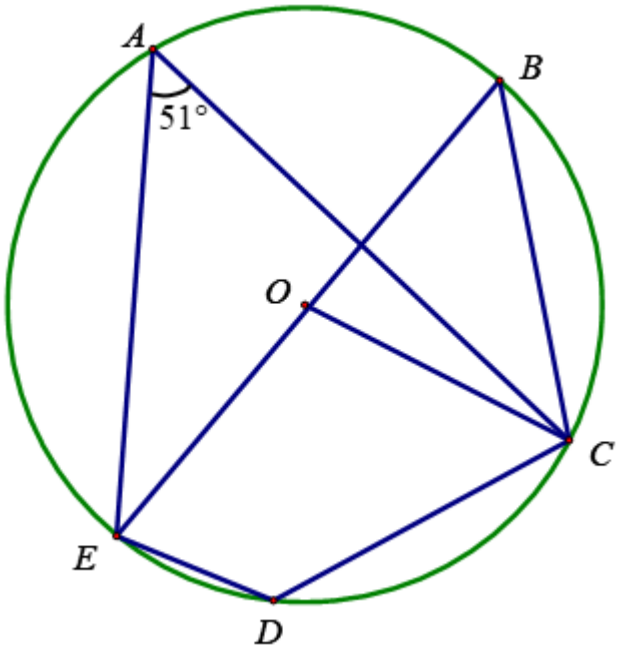
EQUITY
LEARNING PLACE

Elementary Math Topical (Properties of Circle)

Question 1:

In the diagram below, A, B, C, D and E are points on a circle with centre O.



Given that $\angle EAB = 51°$, find

a) $\angle EBC$

b) $\angle EOC$

c) $\angle EDC$.

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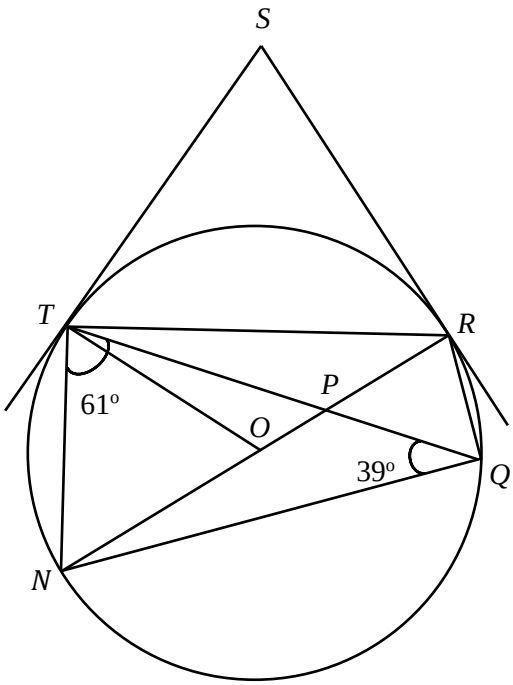
Question 2:



In the above diagram, *TS* and *RS* are straight lines touching the circle, with centre *O*, at points *T* and *R* respectively. Points *T*, *R*, *Q* and *N* are points on the circumference of the circle. *NR* is the diameter of the circle. The straight line *TQ* intersects the diameter of the circle at point *P*. Angle *NTP* = 61° and angle *NQT* = 39°.

a) Give a reason to explain why angle *NQR* is a right angle. Hence, find angle *TNR*, stating your reasons clearly.

Calculate the following angles, stating your reasons clearly.

b) Angle *QTR*,

c) Angle *TON*,

d) Angle *TSR*.

e) It is given that the length of the straight line *TN* = 10 cm, find the area of the circle with centre at *O*.

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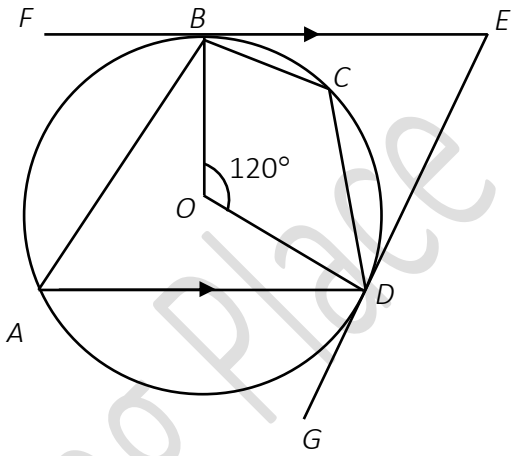
Question 3:

ABCD is a circle with centre *O*. *FE* and *GE* are tangents to the circle at *B* and *D* respectively. *AD* and *FE* are parallel and angle $BOD = 120°$.

Find, giving reasons for each answer,



a) angle *BED*,

b) angle *BAD*,

c) angle *BCD*,

d) angle *OBD*,

e) angle *ADO*.

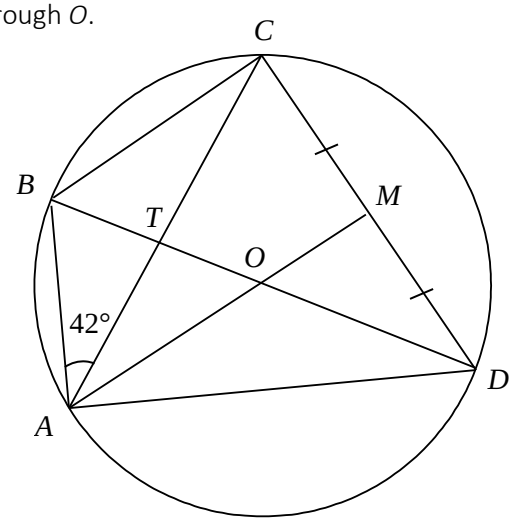
f) Explain why *OBED* lies on the circumference of another circle.

Question 4:

The diagram shows a circle *ABCD*, centre *O*.

M is the midpoint of the chord *CD* and *MA* passes through *O*.
T is the point of intersection of *AC* and diameter *BD*.

Angle $BAC = 42°$.



Find, giving reasons for each answer,

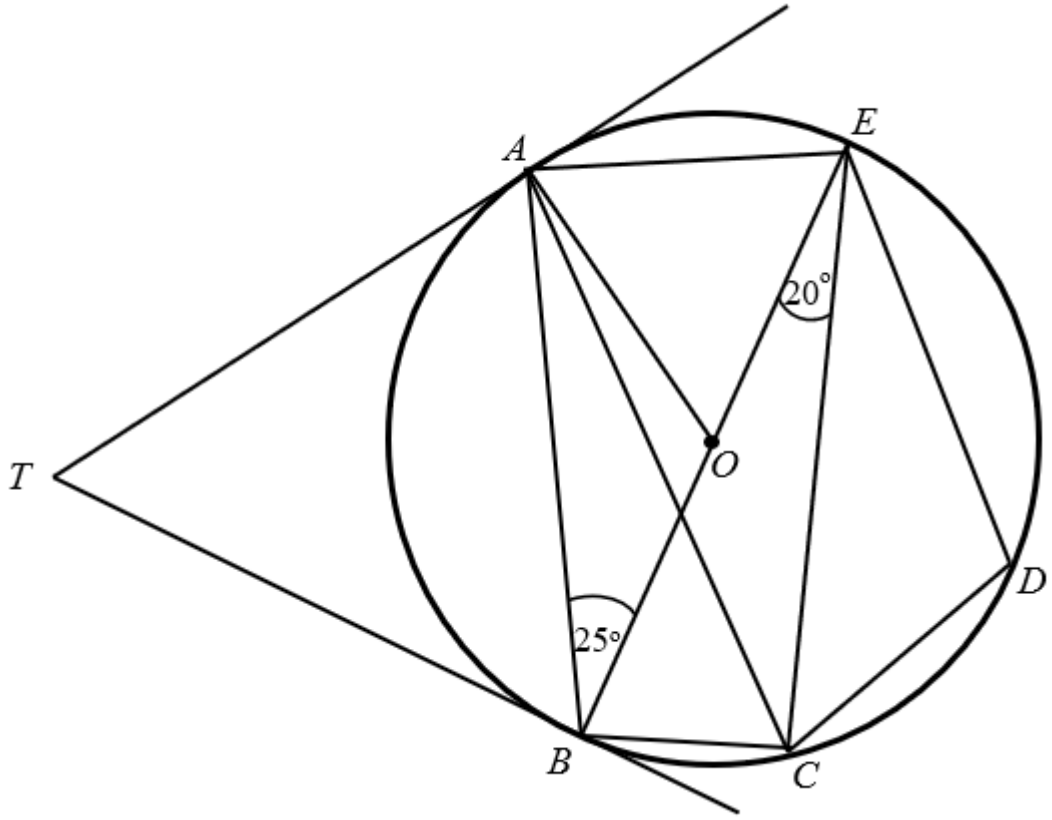
a) angle *BDC*,

b) angle *CBD*,

c) angle *AOD*,

d) angle *CTD*.

Question 5:



In the diagram, *O* is the centre of the circle. *A*, *B*, *C*, *D* and *E* are points on the circle. *TA* and *TB* are tangents to the circle. Angle *OBA* = 25° and angle *OEC* = 20°. Find, stating your reasons clearly,

a) angle *AOE*,

b) angle *CBE*,

c) angle *CDE*,

d) angle *OAC*.

e) angle *ATB*.

f) Explain why a circle may be drawn to pass through *A*, *O, B* and *T*.

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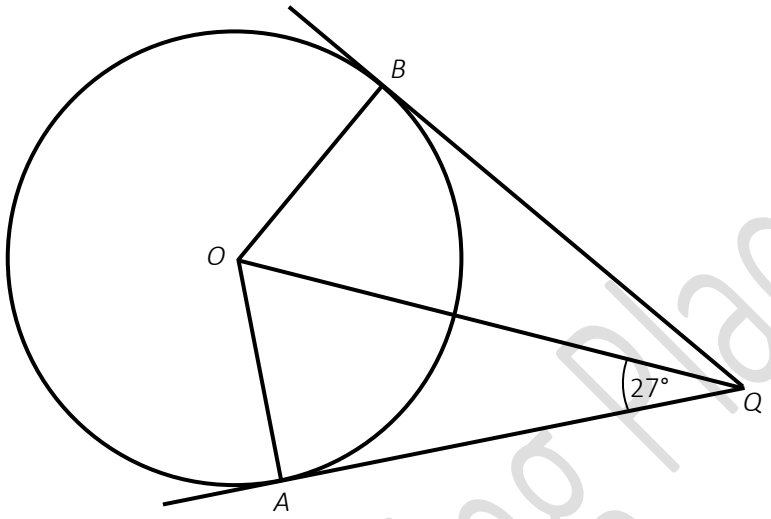
Question 6:

The circle has centre O. QA and QB are tangents to the circle at A and B respectively, and $\angle OQA = 27°$.



a) Prove that triangles OAQ and OBQ are congruent.

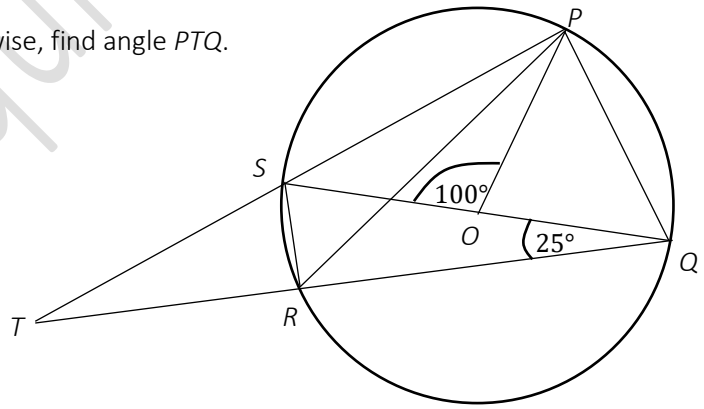
b) Find $\angle BOQ$.

Question 7:

P, *Q*, *R* and *S* lie on the circumference of a circle with centre *O*. *QS* is a straight line which passes through *O*. *PS* and *QR*, when produced, meet at point *T*.

a) Find angle *PRS* and angle *RPS*.

b) Hence or otherwise, find angle *PTQ*.



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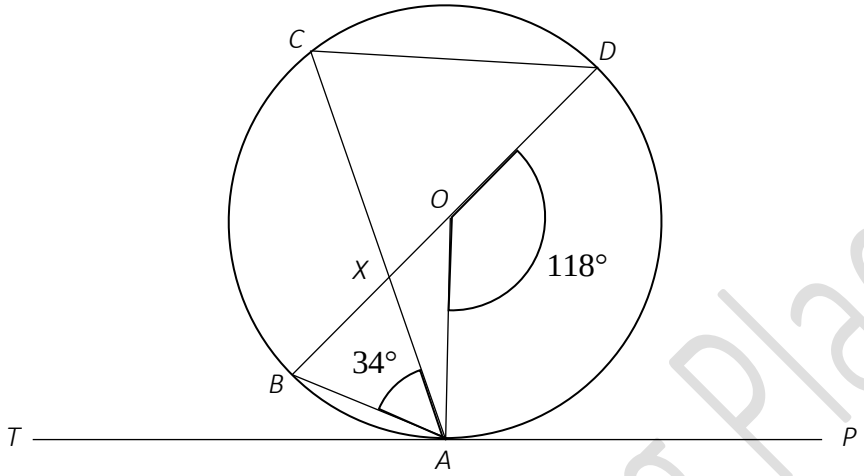
Question 8:

In the figure, *BXOD* is a diameter of the circle with centre *O*. *TAP* is a tangent to the circle at *A*.



Angle *AOD* = $118°$ and angle *BAX* = $34°$.

Find, giving reasons for each answer,

a) angle *BDC*,

b) angle *ACD*,

c) angle *CXD*,

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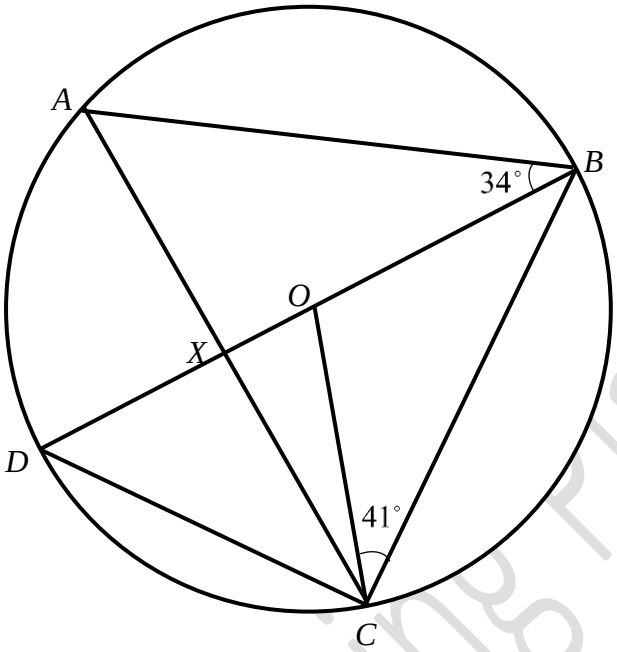
Question 9:



In the diagram, *O* is the centre of the circle. Lines *BD* and *AC* meet at *X*. Given angle *ABD* = 34° and angle *OCB* = 41°. By stating your reason(s) clearly, find

a) angle *ACD*

b) angle *BOC*

c) angle *CAB*

d) Show that triangles *ABX* and *DCX* are similar.

e) Given also that *AB* = 6.5 cm, *DC* = $4\frac{1}{3}$ cm and *DX* = 3 cm, calculate *AX*.

f) Find the values of $\frac{\text{Area of triangle } DCX}{\text{Area of triangle } ABX}$.

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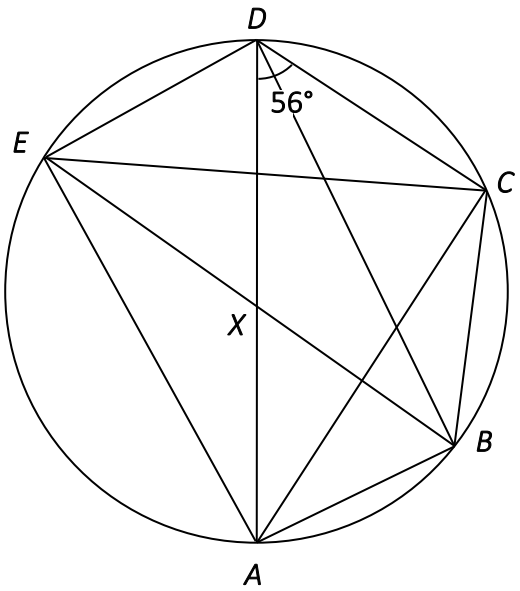
Question 10:

The points *A*, *B*, *C*, *D* and *E* lie on a circle with centre *X*. *AD* intersects *EB* at *X*. *DB* bisects angle *ADC*. Angle *ADC* = 56°.



Giving your reasons, write down

a) angle *DCA*

b) angle *DAC*

c) angle *CBA*

d) angle *AEB*

e) Triangle *BDX* is a special type of triangle. Name the triangle.

f) Find angle *AXB*

g) *Y* is a point that is not shown inside the diagram. Given that angle *AYB* is 40°, comment whether *Y* lies is inside the circle or outside the circle. Show your reasons clearly.

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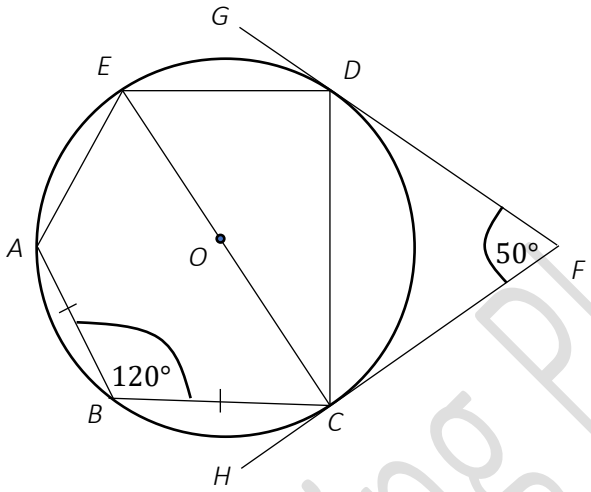
Question 11:

In the diagram below, the points *A*, *B*, *C*, *D* and *E* lie on the circumference of a circle with centre *O*. *CE* is the diameter of the circle, angle $ABC = 120°$ and angle $DFC = 50°$. *GDF* and *HCF* are tangents to the circle at *D* and *C* respectively.



Giving your reasons, find

a) angle *ABE*,

b) angle *ADC*,

c) angle *AOC*,

d) angle *COF*

e) angle *CDF*

f) John claimed that tangent lines drawn from any 2 points that lie on the circumference of the circle will always meet. Do you agree? Explain.

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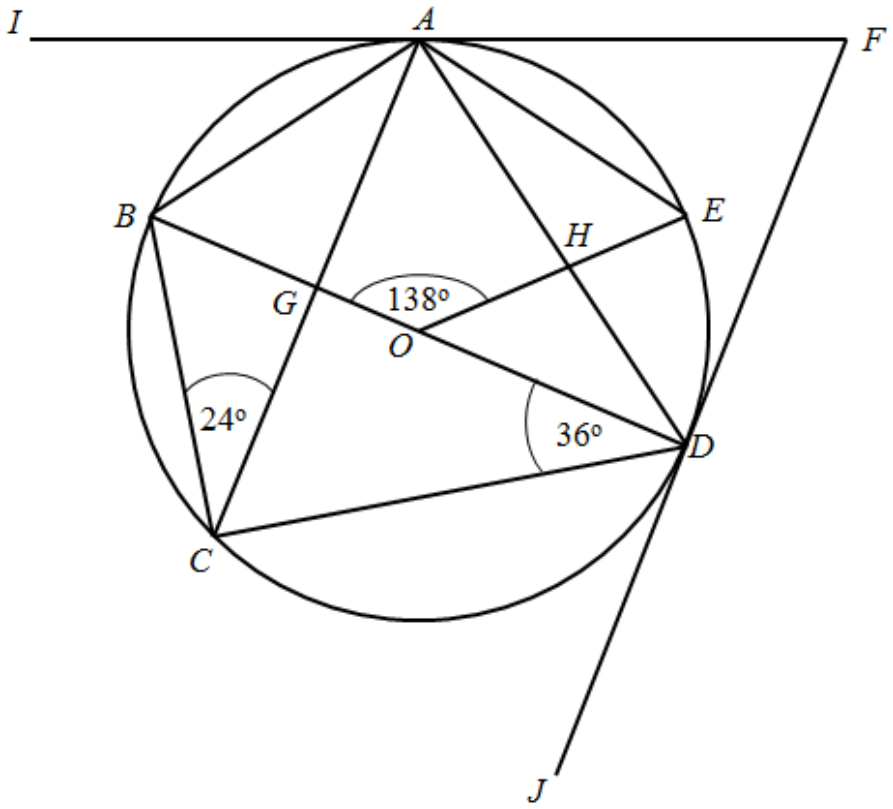
Question 12:



Find, giving reasons for each answer,

a) $\angle BDA$

b) $\angle CBA$

c) $\angle ABD$

d) Prove that $\angle HAE = 21^o$

e) Explain why *BD* is not parallel to *AE*.

f) Find $\angle AFD$, giving the reason for your answer

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Question 13:

In the diagram, *O* is the centre of the circle *ABCD* and *AC* is a diameter. *TP* and *TQ* are the tangents to the circle at *A* and *B* respectively. $\angle ATB = 48º$ and $\angle CAD = 37º$.

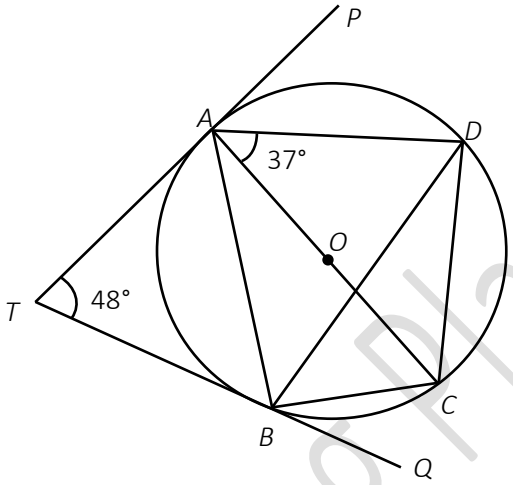
Find

a) $\angle ADC$

b) $\angle TAB$

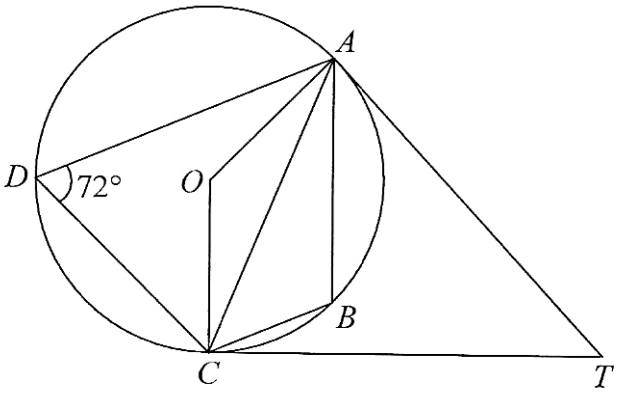
c) $\angle BAC$

d) $\angle DBC$



Question 14:

In the diagram below, *A*, *B*, *C* and *D* lie on the circumference of a circle with centre *O*. The tangents at *A* and *C* meet at *T* and $\angle ADC = 72°$.



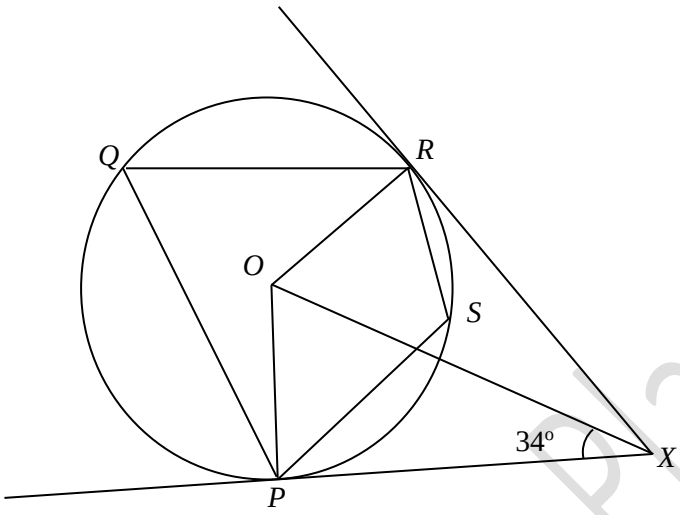
Find, giving your reasons for your answer,

a) $\angle AOC$

b) $\angle ABC$

c) $\angle ATC$

Question 15:



The diagram shows a circle *PQRS*, with centre *O*. *XP* and *XS* are tangents to the circle. Angle *PXO* = 34°.

a) Show that ΔOXP and ΔOXR are congruent triangles.

Stating the reasons, find

b) angle POR

c) angle PSR

d) It is given that angle $PYR = 56°$, where point *Y* is on the same side of *PR* as point *Q*. Does the point *Y* lie on the circumference of the circle, the centre of the circle, inside the circle or outside the circle? Give a reason for your answer.

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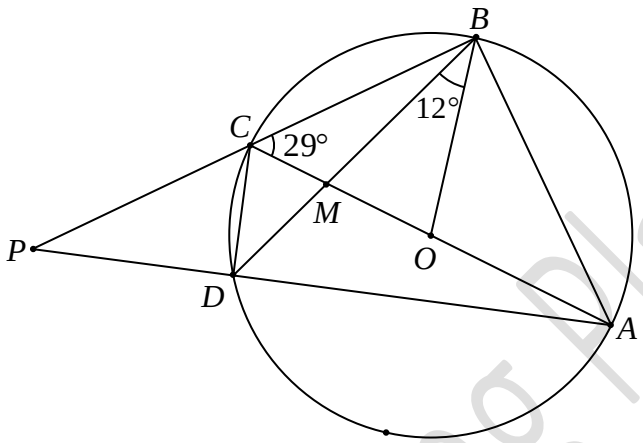
Question 16:

The diagram shows a circle with centre *O* and *A*, *B*, *C* and *D* are points on the circle. *AOC*, *BMD* and *CMA* are straight lines. *BC* produced and *AD* produced meet at point *P*. $\angle OBM = 12°$ and $\angle BCM = 29°$.



Find, stating your reasons clearly,

a) $\angle BAC$

b) $\angle BAD$

c) $\angle CPD$

d) $\angle ACD$

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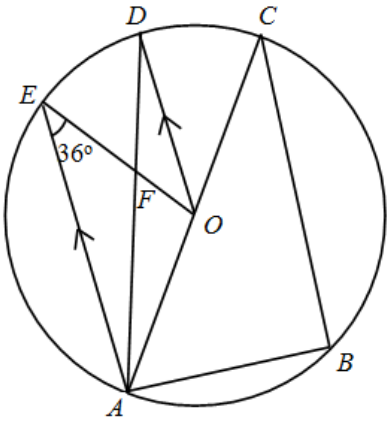
Question 17:

The points *A*, *B*, *C*, *D* and *E* lie on a circle with centre *O* and diameter *AC*. The angle *AEO* = 36° and *AE* is parallel to *OD*. *AD* intersects *OE* at *F*.



Calculate, showing your working clearly with stated reasons,

a) $\angle ABC$

b) $\angle COE$

c) $\angle DFE$

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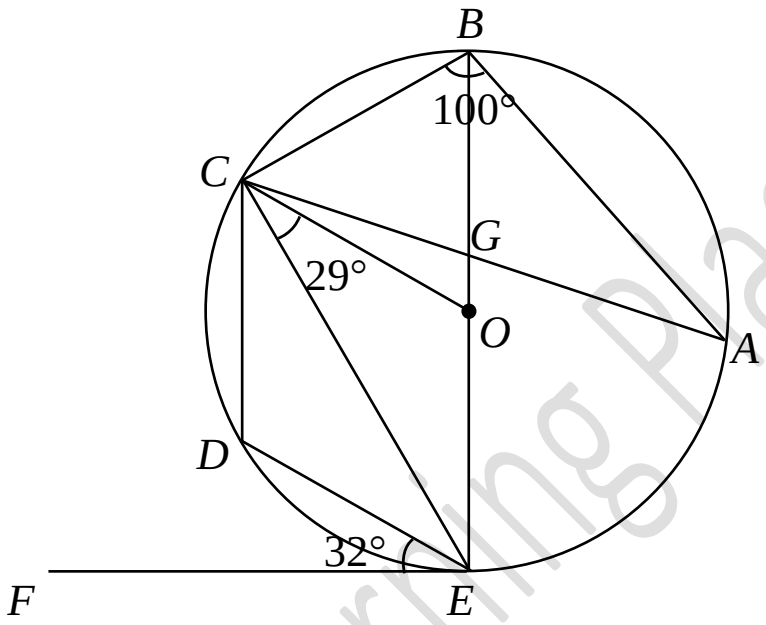
Question 18:

In the diagram, *O* is the centre of the circle and *EF* is the tangent to the circle at *E*. The chord *AC* and the diameter *BE* intersect at *G*, $\angle ABC = 100°$, $\angle OCE = 29°$ and $\angle DEF = 32°$.



a) Showing all reasons clearly, find $\angle CED$.

b) Explain why *CO* is parallel to *DE*.

c) find $\angle CDE$,

d) find $\angle ACO$.

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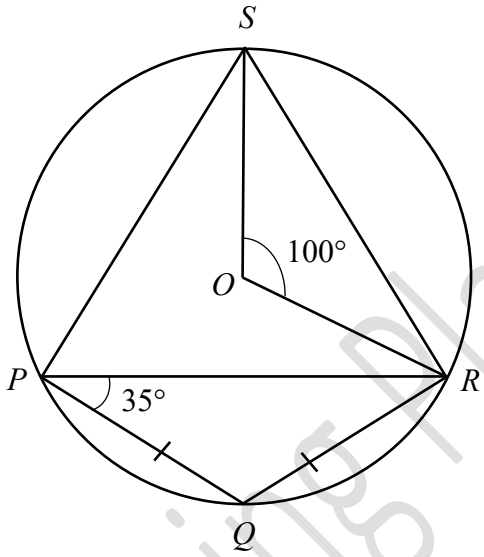
Question 19:

P, Q, R and *S* are points on a circle, with centre *O*. It is given that *PQ* = *QR*, $\angle QPR = 35°$ and $\angle SOR = 100°$.



a) Calculate $\angle PQR$.

b) Find $\angle PSR$. Give a reason for each step of your working.

c) Find $\angle SPR$. Give a reason for each step of your working.

d) Explain why triangle *SRQ* is not a right-angled triangle.

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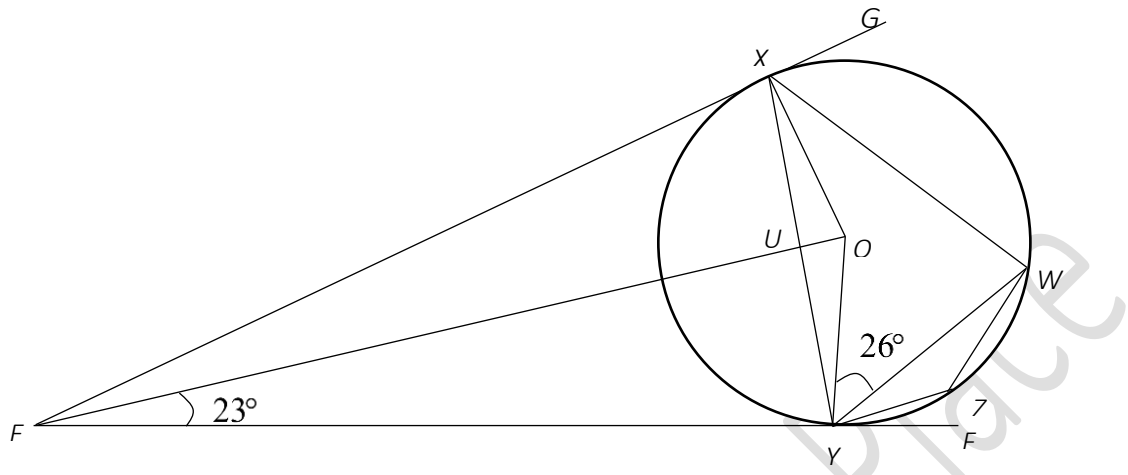
Question 20:



The diagram shows a circle *WXYZ*, with centre *O*. *EYF* and *EXG* are tangents to the circle and *U* is the point of intersection of *XY* and *OE*. $\angle YEO = 23°$ and $\angle WYO = 26°$

a) Name a pair of congruent triangles.

Find

b) $\angle YOE$

c) $\angle OXY$

d) $\angle YXW$

e) $\angle YZW$

f) A point *V* is to be marked on the diagram on the same side of *XY* as *W* such that $\angle YVX = 56°$. Does the point *V* lie inside the circle, outside the circle or on the circumference of the circle? Explain your answer.