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11.

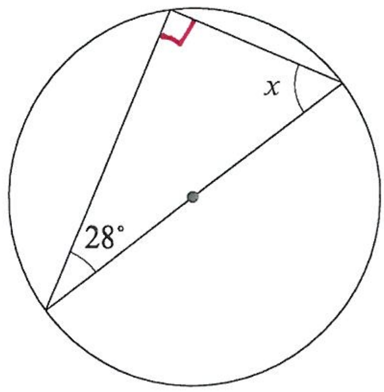

Diagram not drawn to scale

Find the size of the angle marked x.

$x = 180 - 90 - 28$

$= 62°$

Angle in a semi-circle is a right angle

[2]

19. Three points A, B and C lie on the circumference of the circle centre O. The tangent RS meets the circle at A.

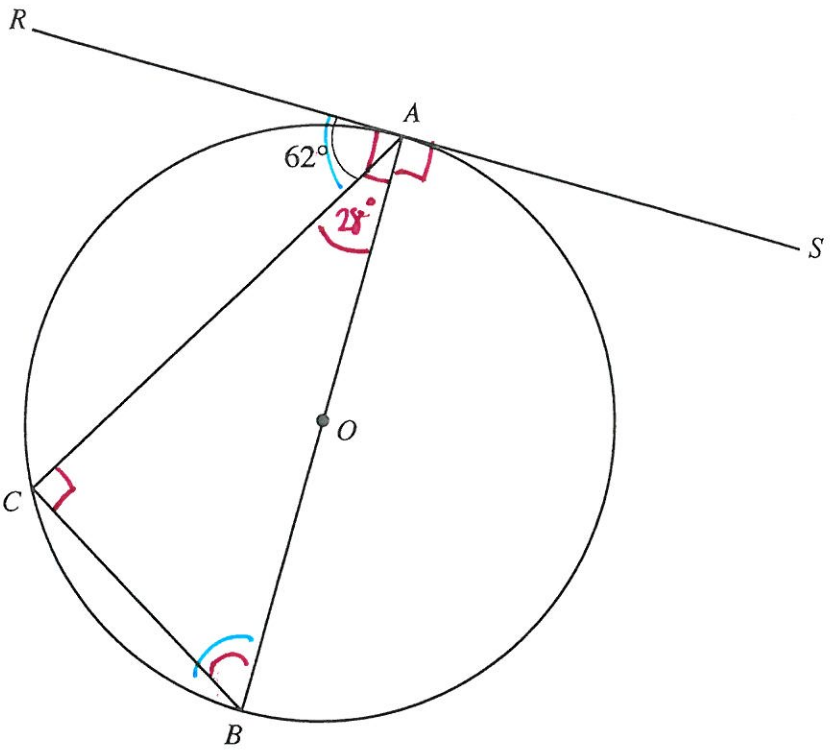

Diagram not drawn to scale.

Given that $R\hat{A}C = 62°$, find the following angles giving reasons for your answers.

(a) $A\hat{C}B$

90° Angle in a semi-circle is a right angle.

(b) $A\hat{B}C$

$O\hat{A}R = 90°$ (angle between tangent + radius)

So $O\hat{A}C = 90° - 62° = 28°$

So $A\hat{B}C = 180 - 90 - 28 = 62°$ (angles in $\triangle$ = 180°)

OR $A\hat{B}C = R\hat{A}C = 62°$ (alternate segment theorem)

[3]

13.

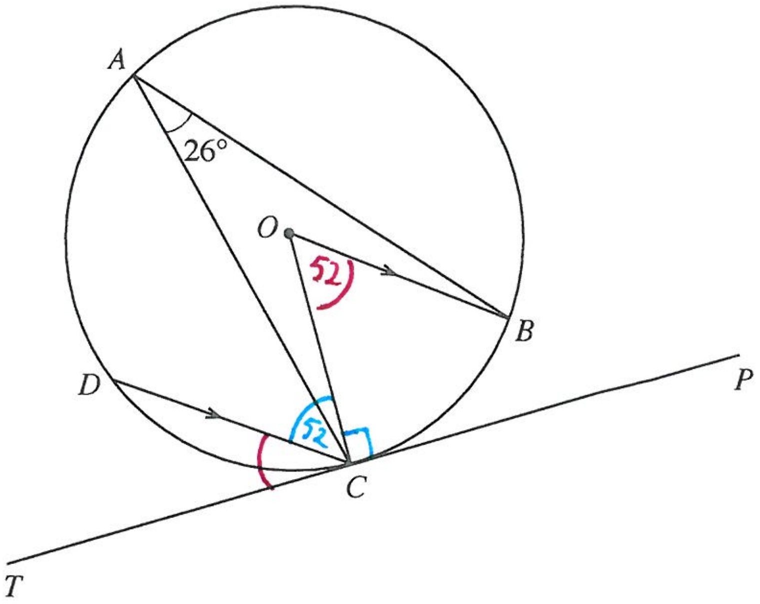

Diagram not drawn to scale.

Four points *A, B, C* and *D* lie on the circumference of the circle centre *O*.
The tangent *TP* touches the circle at *C*. The radius *OB* is parallel to *DC*.
Given that $B\hat{A}C = 26°$, find **each** of the following angles, giving reasons for your answers.

(a) $B\hat{O}C$

$B\hat{O}C = 2 \times B\hat{A}C = 26 \times 2 = 52°$

angle @ centre is twice angle @ circumf.

[2]

(b) $D\hat{C}T$

$O\hat{C}D = B\hat{O}C = 52°$ (alternate angle parallel line)

$O\hat{C}T = 90°$ (angle between radius + tangent = 90°)

So $D\hat{C}T = 90 - 52 = 38°$

[2]

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(b)

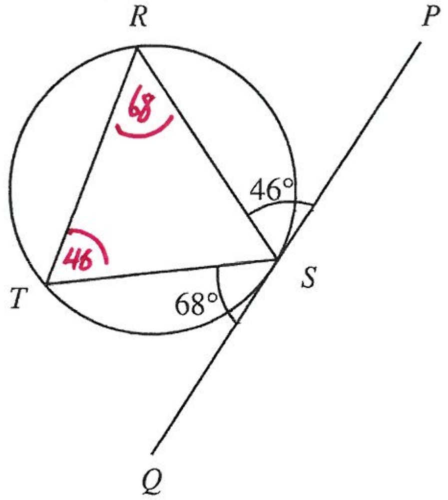

Diagram not drawn to scale.

Three points R, S and T lie on the circumference of the circle.
The tangent PQ touches the circle at S.

Find $T\hat{R}S$, giving a reason for your answer.

$T\hat{R}S = 68°$ Alternate segment theorem

[2]

15. *(a)*

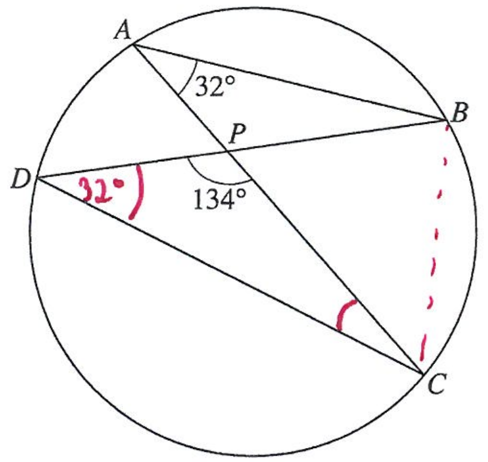

Diagram not drawn to scale.

Four points A, B, C and D lie on the circumference of the circle.
The lines AC and BD intersect at the point P.

Given that $B\hat{A}C = 32°$ and $D\hat{P}C = 134°$, find the size of $A\hat{C}D$ giving a reason for your answer.

$B\hat{D}C = B\hat{A}C = 32°$ (angles in same ~~arc~~ segment are equal)

$A\hat{C}D = 180 - 134 - 32 = 14°$ (angles in Δ = 180°)

[2]

(b)

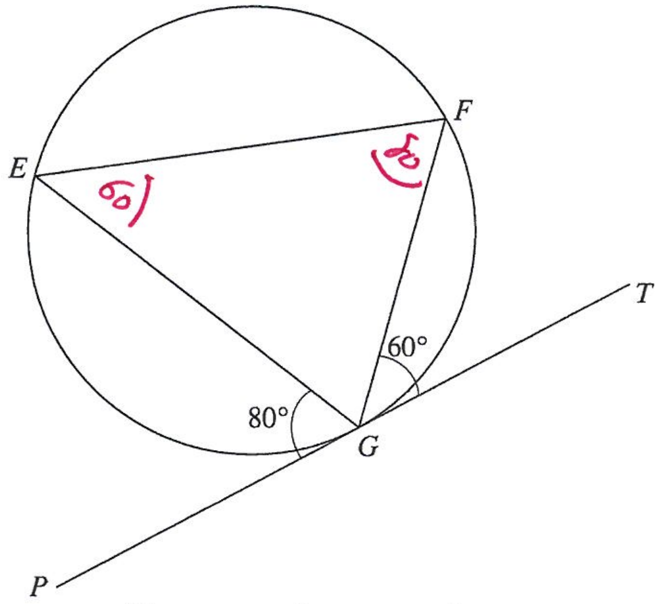

Diagram not drawn to scale.

Three points E, F and G lie on the circumference of the circle.
The tangent PT touches the circle at G.

Given that $E\hat{G}P = 80°$ and $F\hat{G}T = 60°$, find the size of $F\hat{E}G$ giving a reason for your answer.

$F\hat{E}G = 60°$ (alt segment theorem)

[2]

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20.

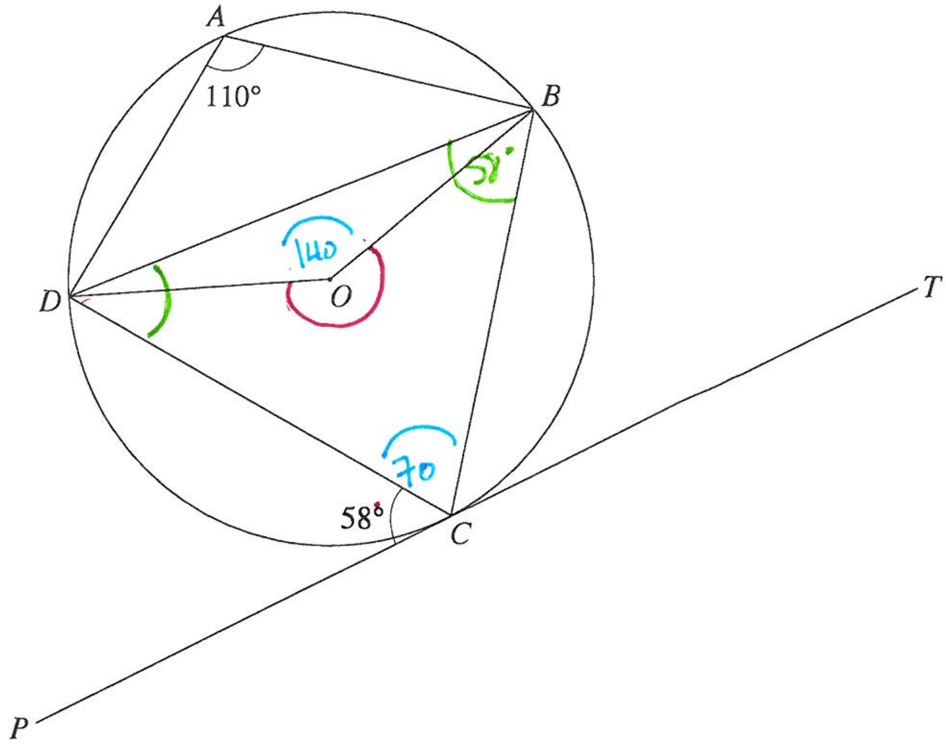

Diagram not drawn to scale.

Four points A, B, C and D lie on the circumference of the circle with centre O.
The tangent TP touches the circle at C. Given that $D\hat{C}P = 58°$ and $D\hat{A}B = 110°$, find **each** of the following angles, giving reasons for your answers.

(a) Reflex $D\hat{O}B$

$D\hat{O}B = 2 \times 110 = 220°$ (angle @ centre = 2× angle @ circumf)

OR $B\hat{C}D = 180 - 110 = 70°$ (opp ang cyclic quad)

obtuse $D\hat{O}B = 2 \times 70 = 140$ (angle @ centre = 2× angle @ circumf)

So reflex $D\hat{O}B = 360 - 140 = 220°$ (angle around point = 360°)

[1]

(b) $B\hat{D}C$

$C\hat{B}D = 58°$ (alt seg theorem)

So in $\triangle BDC$, $B\hat{D}C = 180 - 70 - 58 = 52°$

(angles in $\triangle = 180°$)

[2]

Turn over.

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16. The points A and B lie on the circumference of a circle with centre O.
The straight lines PAQ and RBQ are tangents to the circle.

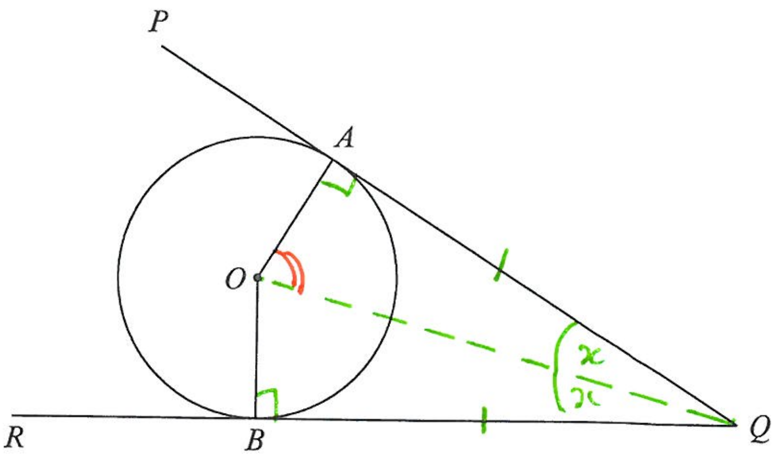

Diagram not drawn to scale

You are given that $A\hat{Q}B = 2x$, where x is measured in degrees.

Write down the size of $A\hat{O}Q$ in terms of x.
Give reasons in your answer.

$\Delta AOQ = \Delta B\hat{O}Q$ because lengths of tangents to circle from a point are equal

and $O\hat{A}Q = O\hat{B}Q = 90^\circ$ (tangent to radius $= 90^\circ$)

So $A\hat{O}Q = 180^\circ - 90^\circ - x^\circ$

$= 90^\circ - x^\circ$

[4]

 (4370-05) Turn over.

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13. The points A, B and C lie on the circumference of a circle.
The straight line PBT is a tangent to the circle and $C\hat{B}P = x$, where x is measured in degrees.

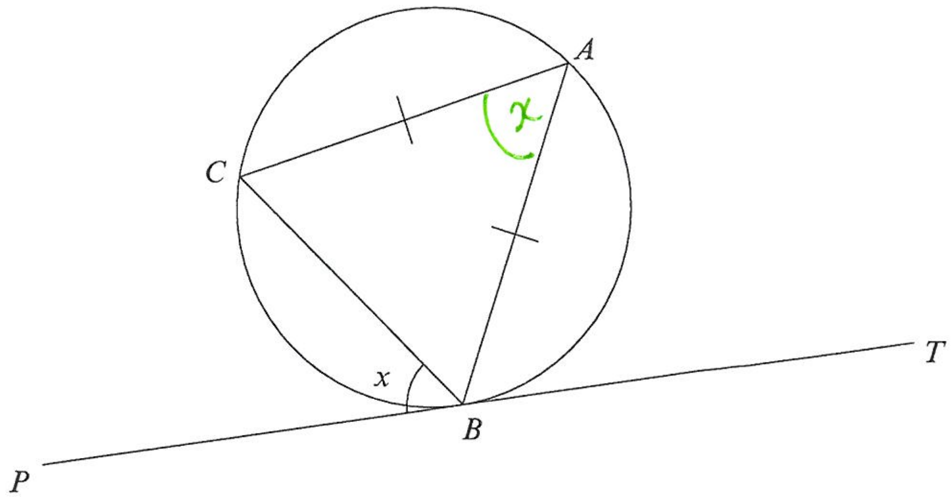

Diagram not drawn to scale

Show, giving reasons in your answer, that the size of $A\hat{B}C$ in degrees is $90 - \frac{1}{2}x$.

$B\hat{A}C = x$ (alternate angle theorem)

ΔABC is isosceles so $A\hat{B}C = A\hat{C}B = (180 - x) \div 2$

$= \frac{180}{2} - \frac{x}{2}$

$= 90 - \frac{1}{2}x$

[2]

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15. *(a)*

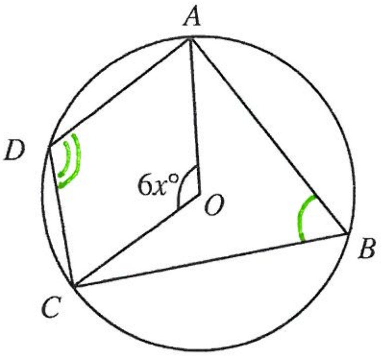

Diagram not drawn to scale.

The diagram shows four points A, B, C and D lying on the circumference of a circle centre O with $A\hat{O}C = 6x°$.

Find an expression for **each** of the following angles in terms of x.

(i) $A\hat{B}C$

$A\hat{B}C = \frac{1}{2} A\hat{O}C = 3x$ (angle at centre = twice angle @ circum)

[1]

(ii) $A\hat{D}C$

$A\hat{D}C = 180 - 3x$ (opp angles in cyclic quad add up to $180°$)

[1]