1. **[VS 16]**
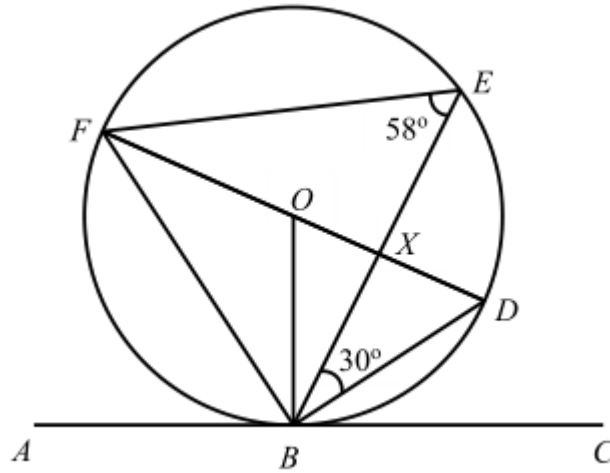
   The line DF is a diameter of the circle $BDEF$ with centre O.
   ABC is tangent to the circle at B.
   X is the point of intersection of DF and BE.
   Angle $DBE = 30°$ and angle $BEF = 58°$.

   Find

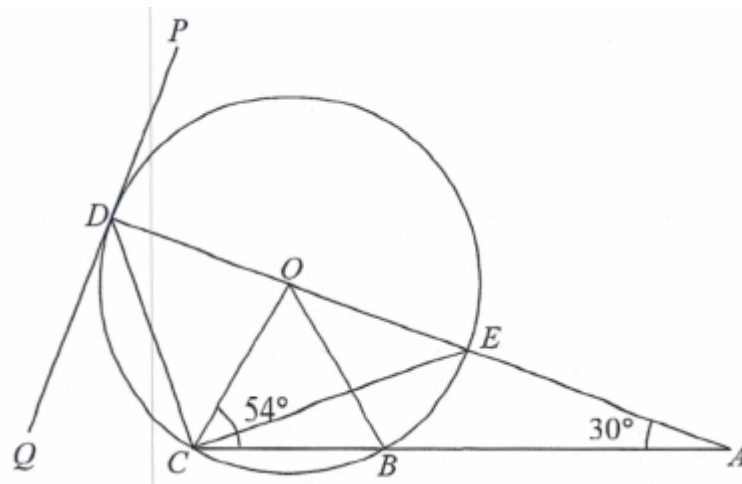   (a) angle FBO, [2]

   (b) angle ABF, [1]

   (c) angle DXE. [1]

2. **[MGS 16]**

   In the diagram, the points B, C, D and E lie on a circle with centre O. PQ is a tangent to the circle at D. ABC and $AEOD$ are straight lines. $\angle OCB = 54°$ and $\angle OAB = 30°$.

   Find, giving reasons for each answer,
   (a) $\angle ADC$, [2]
   (b) $\angle CDQ$, [1]
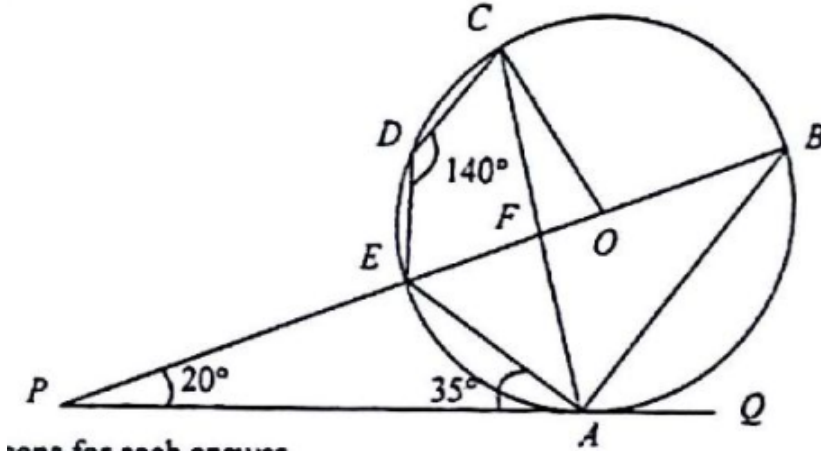   (c) $\angle ACE$, [2]
   (d) $\angle CBE$. [1]

3. **[CHS 16]**

The diagram shows a circle with centre O and passes through A, B, C, D and E.
PAQ is a tangent to the circle.
The diameter DE is extended to meet the tangent at P.
Angle $CDE = 140°$, angle $BPQ = 20°$ and angle $PAE = 35°$.

Find, giving reasons for each answer,

(a) angle BAE, [1]

(b) angle CAE, [1]

(c) angle COE, [1]

(d) angle ACB. [2]

(e) A point X is to be marked on the diagram on the same side of BE as A so that $\angle CXE = 30°$. Deduce whether X lies on the circumference of the circle, inside the circle or outside the circle, giving a reason for your answer. [2]

4. **[NGHS 16]**

In the diagram, A, B and C are points on the circumference of the circle with centre O.
AX and BX are tangents to the circle. Angle $ACB = 108°$.
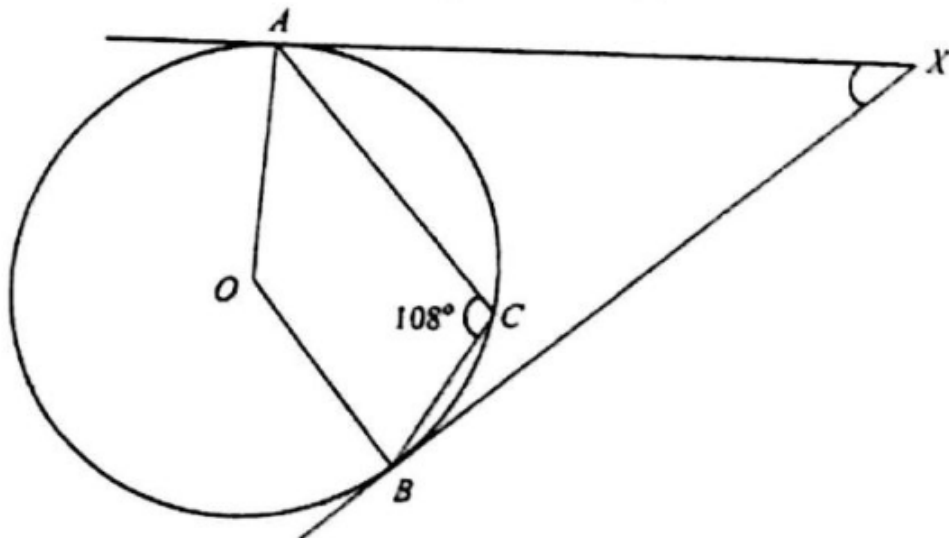
(a) Find reflex angle AOB, giving a reason for your answer. [2]

(b) Find angle AXB, giving a reason for your answer. [2]

Answers

1. (a) 32°.

   (b) 58°.

   (c) 88°.

2. (a) 48°.

   (b) 42°.

   (c) 12°.

   (d) 132°.

3. (a) 90°.

   (b) 40°.

   (c) 80°.

   (d) 55°.

   (e) X must lie outside the circle.

4. (a) Reflex angle $AOB = 216°$ (angle at centre is twice the angle at circumference).

   (b) $\angle AXB = 36°$ (tangents from external point).