I.G.C.S.E. Circle Geometry

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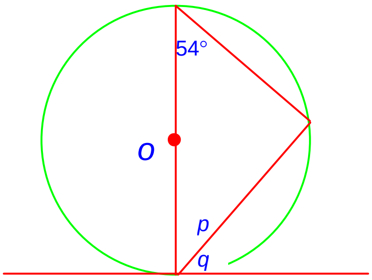
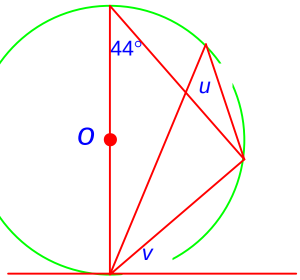
Question 1

In the diagrams below, find the angles marked with letters, **giving reasons**. In each diagram O denotes the centre of the circle. Diagrams not drawn to scale.

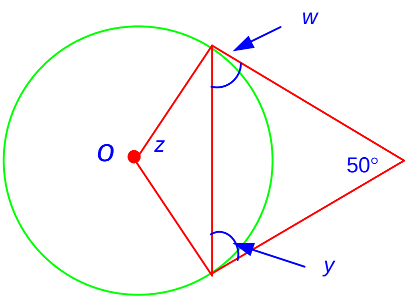
a.



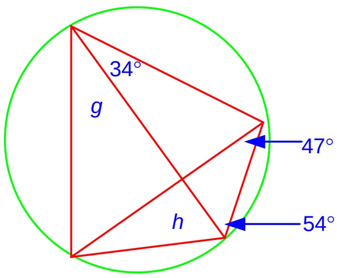
b.



c.



d.



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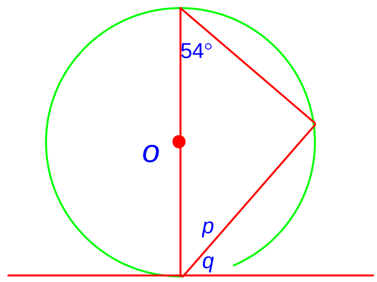
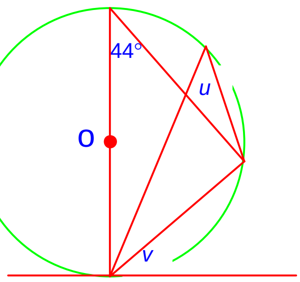
Solution to question 1

a.



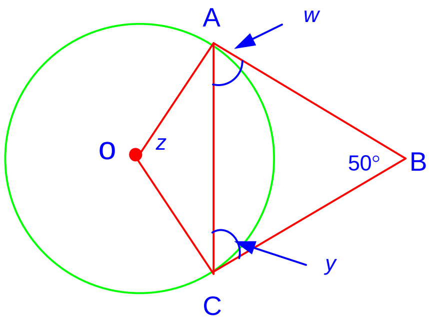
$p = 90^\circ - 54^\circ = 36^\circ$
(angles in a semicircle).
$q = 90^\circ - 36^\circ = 54^\circ$
(tangent radius property)
or $q = 54^\circ$
(alternate segment theorem)

b.



$u = 44^\circ$
(angles in the same segment)
$v = 44^\circ$
(alternate segment theore

c.

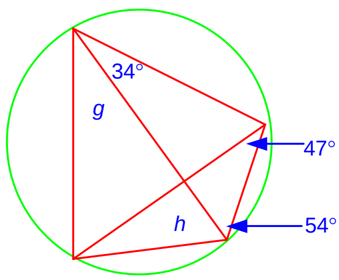


ΔABC is isosceles as $AB = CB$
as tangents drawn from a point out a circle to a circle are of equal length.

$w = \dfrac{180^\circ - 50^\circ}{2} = 65^\circ$, $y = 65^\circ$

$O\hat{A}C = O\hat{C}A$, as ΔAOC is isosceles.
$O\hat{A}C = 90^\circ - 65^\circ = 25^\circ$
(tangent radius property)
$z = 180 - 2 \times 25^\circ = 130^\circ$

d.



$g = 47^\circ$
(angles in the same segment)

$(g + 34^\circ) + (h + 54^\circ) = 180^\circ$

(opposite angles in a cyclic quadrilateral).
$h = 180^\circ - 47^\circ - 34^\circ - 54^\circ = 45^\circ$

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Question 2

In the diagram below if $F\hat{H}G = 35^{\circ}$ and $E\hat{H}O = 21^{\circ}$, find, **giving reasons**:

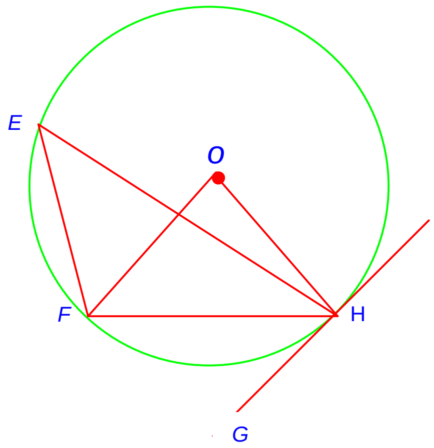
a. $F\hat{E}H$

b. $F\hat{O}H$

c. $O\hat{F}H$

d. $E\hat{H}F$

e. $H\hat{F}E$



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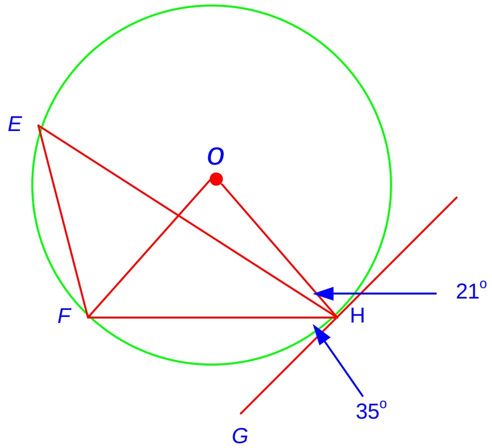
Solution to question 2



a. $F\hat{E}H = 35^{\circ}$ (alternate segment theorem).

b. $F\hat{O}H = 2 \times 35^{\circ} = 70^{\circ}$ (angle at the centre).

c. ΔFOH is isosceles $OF = OH$ (equal radii) $\Rightarrow O\hat{F}H = \dfrac{180^{\circ} - 70^{\circ}}{2} = 55^{\circ}$.

d. $E\hat{H}F = 90^{\circ} - 35^{\circ} - 21^{\circ} = 34^{\circ}$ (tangent radius property).

e. $H\hat{F}E = 180^{\circ} - 35^{\circ} - 34^{\circ} = 111^{\circ}$ (angle sum of ΔEFH).

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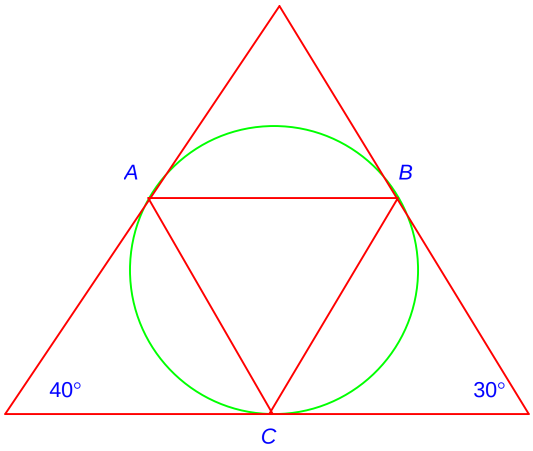
Question 3



For the diagram find, **giving reasons**:

a. $A\hat{C}B$

b. $C\hat{A}B$

c. $A\hat{B}C$

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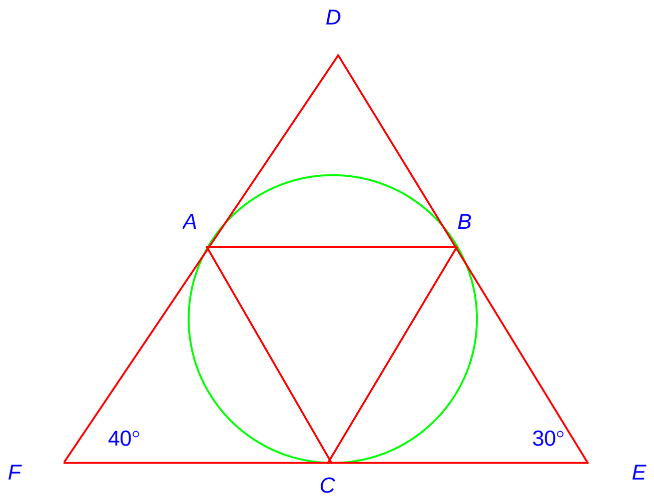
Solution to question 3



a. Δ's ACF and CBF, are isosceles. (Two tangents drawn from a point from outside a circle are equal).

Hence $A\hat{C}F = \dfrac{180^\circ - 40^\circ}{2} = 70^\circ$ and $E\hat{B}C = \dfrac{180^\circ - 30^\circ}{2} = 75^\circ$

$A\hat{C}B = 180^\circ - 70^\circ - 75^\circ = 35^\circ$

Considering ΔDEF, $E\hat{D}F = 180^\circ - 40^\circ - 30^\circ = 110^\circ$.

b. Δ's ACF and CBF, are isosceles. (Two tangents drawn from a point from outside a circle are equal).

Hence $D\hat{A}B = \dfrac{180^\circ - 110^\circ}{2} = 35^\circ$ and $C\hat{A}F = \dfrac{180^\circ - 40^\circ}{2} = 70^\circ$

$C\hat{A}B = 180^\circ - 35^\circ - 70^\circ = 75^\circ$

c. Δ's BCE and ABD, are isosceles. (Two tangents drawn from a point from outside a circle are equal).

Hence $D\hat{B}A = \dfrac{180^\circ - 110^\circ}{2} = 35^\circ$ and $E\hat{B}C = \dfrac{180^\circ - 30^\circ}{2} = 75^\circ$

$A\hat{B}C = 180^\circ - 35^\circ - 75^\circ = 70^\circ$

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