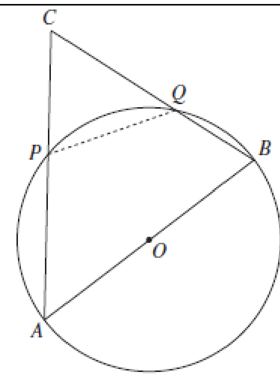
2014 **13d** In the diagram, AB is a diameter of a circle with centre O. The point C is chosen such that ΔABC is right-angled. The circle intersects AC and BC at P and Q respectively.
Copy or trace the diagram into your writing booklet.

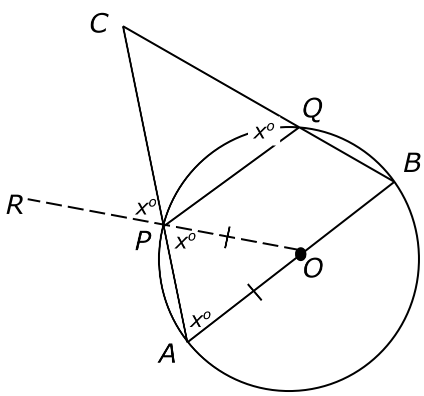
(i) Why is $\angle BAC = \angle CQP$? **1**

(ii) Show that the line OP is a tangent to the circle through P, Q and C. **2**



(i) Exterior angle of cyclic quadrilateral equals the opposite interior angle.

(ii)



Produce OP to R.

Let $\angle CQP = x^\circ$

$\angle BAC = x^\circ$ (from part (i))

$\angle APO = x^\circ$ (base $\angle$s isos Δ)

$\angle CPR = x^\circ$ (vert opp $\angle$s)

$\therefore \angle CQP = \angle CPR$

$\therefore$ OP is a tangent to circle through P, Q and C ($\angle$s in alternate segment are equal)

State Mean:
0.62
0.73

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by BOSTES.

Board of Studies: Notes from the Marking Centre

Candidates who copied the diagram in order to execute a proof had a greater chance of earning marks in this part as the examiner could confirm their assertions and could observe markings on the diagram. A significant number of candidates did not copy the diagram yet referred to points and angles that they had constructed, leaving the examiners to guess their meaning and validity.

(i) Candidates who quoted the appropriate circle geometry theorem, namely 'the exterior angle of a cyclic quadrilateral is equal to the opposite interior angle' (or equivalent) easily earned this mark. Candidates who used unclear language ran the risk of the examiners being unable to interpret their meaning.

(ii) A common and efficient proof was to produce OP and use vertically opposite angles with the isosceles triangle ΔPAO to conclude that OP is a tangent using the converse of the alternate segment theorem. Another popular response was to join OP, use the angle sum of ΔPQC and the sum of the angles at P on line CPA to prove the result.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/2014/pdf_doc/2014-maths-ext-1.pdf