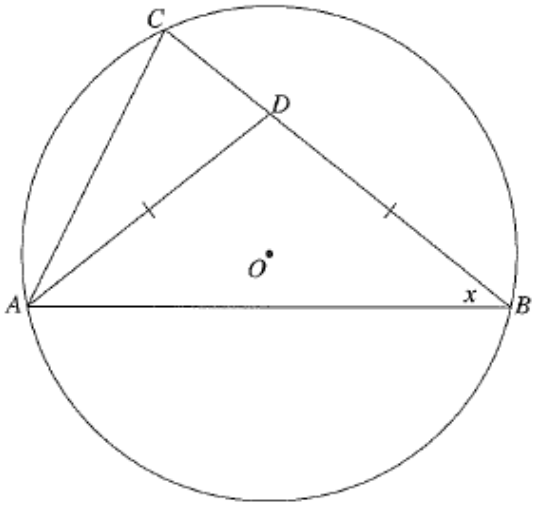
11 **4b** In the diagram, the vertices of $\triangle ABC$ lie on the circle with centre O. The point D lies on BC such that $\triangle ABD$ is isosceles and $\angle ABC = x$. Copy or trace the diagram into your writing booklet.

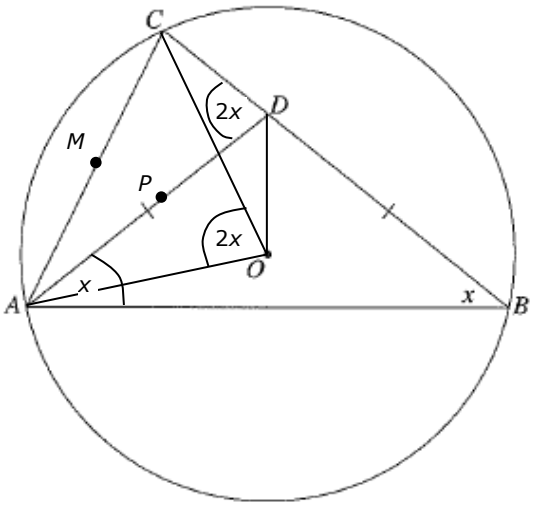


(i) Explain why $\angle AOC = 2x$. **1**

(ii) Prove that $ACDO$ is a cyclic quadrilateral. **2**

(iii) Let M be the midpoint of AC and P the centre of the circle through A, C, D and O. Show that P, M and O are collinear. **1**

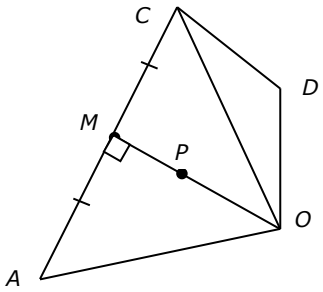
(i)



$\angle AOC = 2x$ ($\angle$ at centre is twice $\angle$ at circum. standing on same arc)

(ii) $\angle BAD = x$ (base $\angle$s of isos $\triangle ABD$)
$\angle ADC = 2x$ (ext $\angle$ of $\triangle$ equals sum of 2 int $\angle$s)
$\therefore\ \angle ADC = \angle AOC$
$\therefore$ $ACDO$ is a cyclic quadrilateral ($\angle$s in same segment equal)

(iii)



$OM \perp AC$ (perp from centre bisects chord in circle centre O)
$PM \perp AC$ (perp from centre bisects chord in circle centre P)
$\therefore$ P is on line OM
$\therefore$ P, M and O are collinear.

State Mean:
0.88/1
0.75/2
0.07/1

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

Board of Studies: Notes from the Marking Centre

(i) This was generally done well. A number of candidates did not use the correct terminology, confusing circumference and radius.

(ii) In better responses part (i) and angle CDA were used to establish the result. Many candidates proved a cyclic quadrilateral by showing opposite angles supplementary, spending more time on this part than required.

(iii) This was a challenging question. Candidates had difficulty in expressing themselves clearly and often made inappropriate assumptions. The better responses showed a sophisticated approach, such as showing that the size of angle MPO is 180°. Some candidates attempted to use other theorems, often unsuccessfully relating to two circles intersecting and the line joining their centres.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/