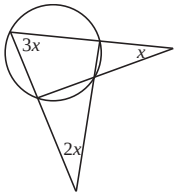
PROBLEM SET

1. If the points A, B, C and D are any 4 points on a circle and P , Q, R and S are the midpoints of the arcs AB, BC, CD and DA respectively, show that PR is perpendicular to QS.

2. Calculate the value of x.

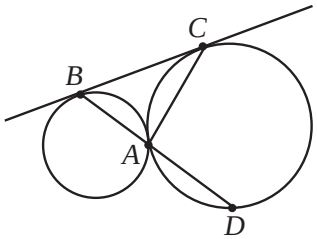


3. The three vertices of triangle ABC lie on a circle. Chords AX, BY, CZ are drawn within the interior angles A, B, C of the triangle. Show that the chords AX, BY and CZ are the altitudes of triangle XYZ if and only if they are the angle bisectors of triangle ABC.

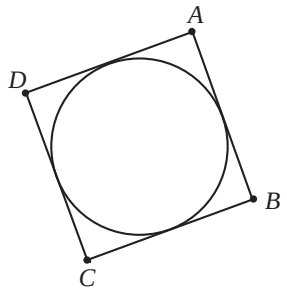
4. In the diagram, two circles are tangent at A and have a common tangent touching them at B and C respectively.

(a) Show that $\angle BAC = 90°$. Hint: (With touching circles it is usual to draw the common tangent at the point of contact!)

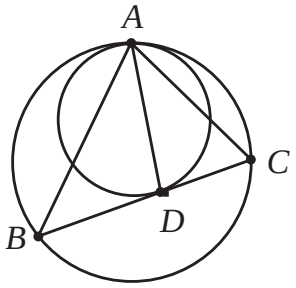
(b) If BA is extended to meet the second circle at D show that CD is a diameter.



5. If $ABCD$ is a quadrilateral with an inscribed circle as shown, prove that $AB + CD = AD + BC$.



6. In this diagram, the two circles are tangent at A. The line BDC is tangent to the smaller circle. Show that AD bisects $\angle BAC$.



7. Starting at point A_1 on a circle, a particle moves to A_2 on the circle along chord A_1A_2 which makes a clockwise angle of $35°$ to the tangent to the circle at A_1. From A_2 the particle moves to A_3 along chord A_2A_3 which makes a clockwise angle of $37°$ to the tangent at A_2. The particle continues in this way. From A_k it moves to A_{k+1} along chord A_kA_{k+1} which makes a clockwise angle of $(33 + 2k)°$ to the tangent to the circle at A_k. After several trips around the circle, the particle returns to A_1 for the first time along chord A_nA_1. Find the value of n.