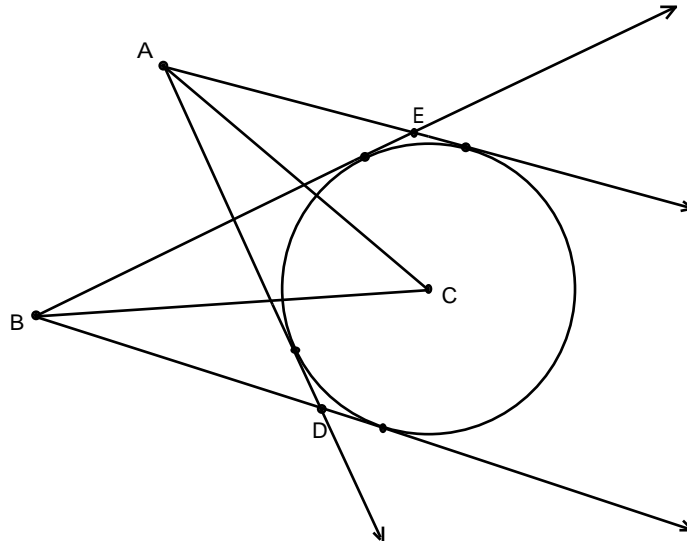
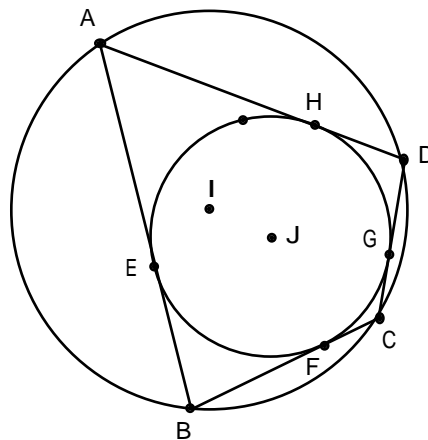


Reader Investigations, Feb 2003

Readers are invited to submit results to the Editor of their or their learners' investigations of the following problems by 1 August 2003 for the October issue of the *KZN Mathematics Journal*.



1. Tangents to a circle C are drawn from two arbitrary points A and B outside the circle. Find and prove the relationship between the "center" angle ACB , and the two angles AEB and BDA .



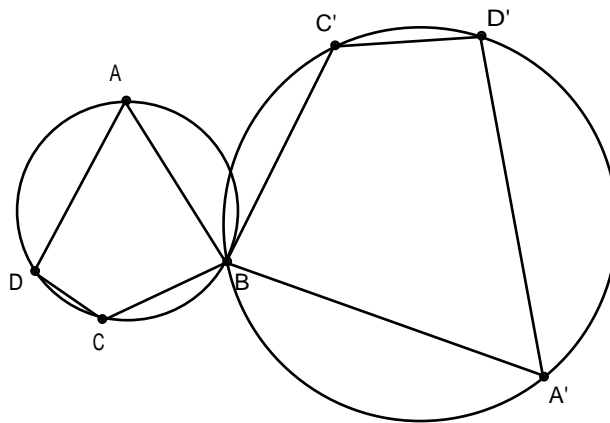
2. Circumscribe a cyclic quadrilateral $ABCD$ around a circle. What do you notice about the lines EG and FH joining the opposite tangential points? Prove your observation.
3. (a) Keeping a fixed and varying d , investigate and make a conjecture regarding the graphs of the corresponding family of quadratic functions of the form

$y = ax^2 + (a + d)x + (a + 2d)$. (For example, consider the family $y = x^2 + 2x + 3, y = x^2 + 3x + 5, y = x^2 + 4x + 7$, etc.)

(b) Keeping b fixed and varying d , investigate and make a conjecture regarding the graphs of the corresponding family of quadratic functions of the form $y = (b - d)x^2 + bx + (b + d)$.

(c) Keeping c fixed and varying d , investigate and make a conjecture regarding the graphs of the corresponding family of quadratic functions of the form $y = (c - 2d)x^2 + (c - d)x + c$.

Prove your conjectures in (a), (b) and (c) above.



4. Two similar cyclic quadrilaterals $ABCD$ and $A'BC'D'$ touch each other at the common vertex B . What do you notice about the lines AA' , CC' and DD' ? Prove your observation.
5. A rectangular prism (box) has integer sides and a surface area of A . Show that A has to be an even integer, and then find all the even values that A cannot be.

Those who are unable to solve all five problems/investigations, but obtain interesting partial solutions are encouraged to submit the results of their investigations.

Ready-made *Sketchpad 4* sketches that can be used for exploring the first four problems can be downloaded in zipped format from:

<http://mzone.mweb.co.za/residents/profmd/reader03a.zip>

The sketches can also be explored with a free demo version of *Sketchpad 4*, which can be downloaded from:

<http://www.keypress.com/sketchpad/sketchdemo.html>