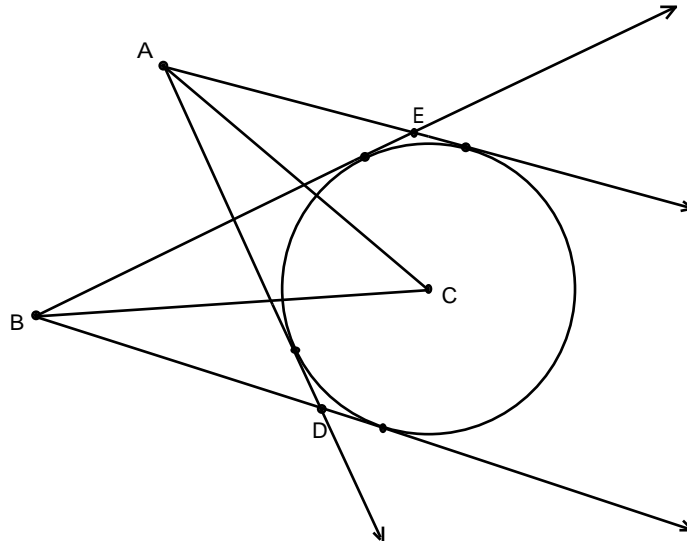
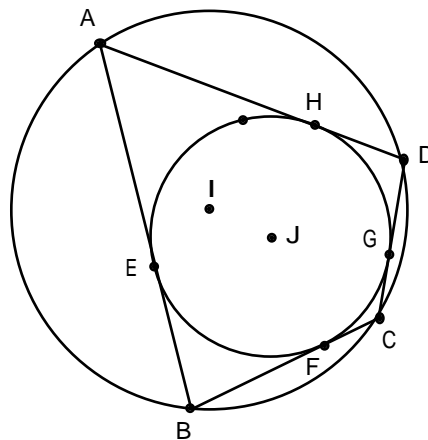


## Reader Investigations, Feb 2003

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  $BDA$ .



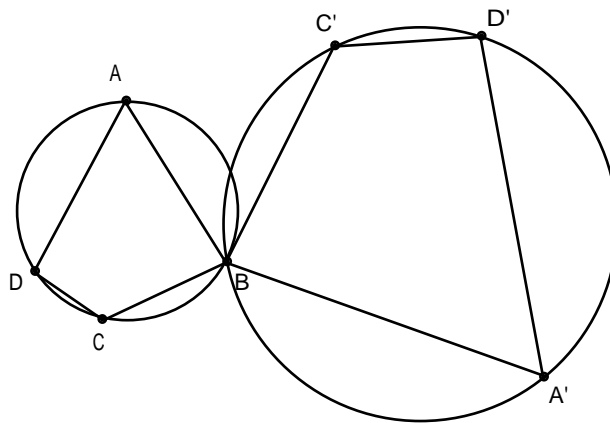
2. Circumscribe a cyclic quadrilateral  $ABCD$  around a circle. What do you notice about the lines  $EG$  and  $FH$  joining the opposite tangential points? Prove your observation.
3. (a) Keeping  $a$  fixed and varying  $d$ , investigate and make a conjecture regarding the graphs of the corresponding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