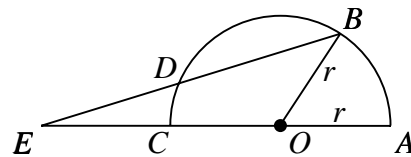


BRITISH COLUMBIA COLLEGES

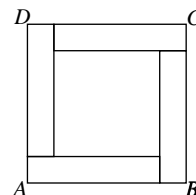
Senior High School Mathematics Contest

Part B Final Round May 5, 2000

1. In the diagram O is the centre of a circle with radius r , and $ED = r$. The angle $\angle DEC = k\angle BOA$. Find k .



2. The square $ABCD$, whose area is 180 square units, is divided into 5 rectangular regions of equal area, four of which are congruent as shown. What are the dimensions of one of the rectangular regions which is not a square?



3. An integer i *evenly divides* an integer j if there exists an integer k such that $j = ik$, that is, if j is an integer multiple of i .

(a) Recall $n! = (n)(n-1)(n-2)\cdots(2)(1)$. Find the largest value of n such that 25 evenly divides $n! + 1$.

(b) Show that if 3 evenly divides $x + 2y$, then 3 evenly divides $y + 2x$.

4. A circular coin is placed on a table. Then identical coins are placed around it so that each coin touches the first coin and its other two neighbours. It is known that exactly 6 coins can be so placed.

(a) If the radius of all 7 coins is 1, find the total area of the spaces between the inner coin and the 6 outer coins.

(b) If the inner coin has radius 1, find the radius of a larger coin, so that exactly 4 such larger coins fit around the outside of the coin of radius 1.

5. The 6 edges of a regular tetrahedron are of length a . The tetrahedron is sliced along one of its edges to form two identical solids.

(a) Find the perimeter of the slice.

(b) Find the area of the slice.

