

# BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest, 2003

Final Round, Part B

Friday May 2, 2003

1. An arrangement of the letters from the word TRIANGLE is shown. Find the number of ways that the word TRIANGLE can be spelled out, using adjacent letters, going up or left or right, in this arrangement.

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      E
    E L E
  E L G L E
E L G N G L E
E L G N A N G L E
E L G N A I A N G L E
E L G N A I R I A N G L E
E L G N A I R T R I A N G L E
    
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2. Twelve students, including Mary, Pat, and Erin, entered a race. Assuming that there will be no ties at the finish and ignoring the order in which the other entrants finish, find the number of different possible finishes with Mary, Pat, and Erin finishing in consecutive positions, but not necessarily in that order.
3. A 3-meter ladder stands vertically against a wall. It starts to slide down the wall keeping both the foot end and the top end of the ladder in contact with the floor and the wall, respectively. Find the length of the path followed by the midpoint of the ladder as it slides from the vertical position to the horizontal position.
4. (a) Find the exact value of the sum, expressed as a rational number

$$\frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \frac{1}{9 \cdot 11}$$

- (b) Find a formula for the sum

$$\frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \frac{1}{9 \cdot 11} + \cdots + \frac{1}{(2n+1)(2n+3)}$$

5. In the diagram the area of the triangle  $ABC$  is 1,  $\overline{AD} = \frac{1}{3}\overline{AB}$ ,  $\overline{EC} = \frac{1}{3}\overline{AC}$ , and  $\overline{DF} = \overline{FE}$ . Find the area of the shaded triangle  $BFC$ .

