

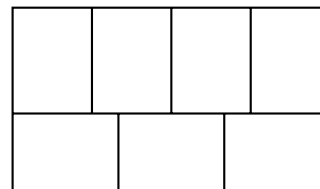
# BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest, 2002

Final Round, Part B

May 3, 2002

1. In the figure the seven rectangles are congruent and form a larger rectangle whose area is  $336 \text{ m}^2$ . What is the perimeter of the large rectangle?

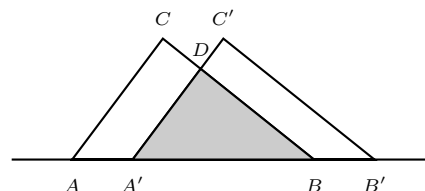


2. Two players,  $A$  and  $B$ , play a game in which each chooses, alternately, a positive integer between 1 and 6, inclusive. After each number is chosen the cumulative sum is computed. The player who chooses a number that makes the cumulative sum equal to 22 wins the game. For example,

$A$  chooses 2    sum = 2  
 $B$  chooses 6    sum = 8  
 $A$  chooses 3    sum = 11  
 $B$  chooses 6    sum = 17  
 $A$  chooses 5    sum = 22     $A$  wins

Suppose that  $A$  starts the game. Show that  $A$  has a winning strategy, that is, the player that starts the game can always win. What number must  $A$  choose on the first turn in order to have a winning strategy?

3. Triangle  $ABC$  has dimensions:  $AB = 10$ ,  $AC = 7$ , and  $BC = 8$ . How far do you need to slide it along side  $AB$  so that the area of the overlapping region (the shaded triangle  $A'BD$  in the diagram) is one-half the area of triangle  $ABC$ ?



4. In the addition below each of the letters stands for a distinct decimal digit:

$$\begin{array}{r}
 PACIFIC \\
 BALTIC \\
 + ARCTIC \\
 \hline
 CCCCCC
 \end{array}$$

Find the decimal digit corresponding to each of the letters. Show all of your work.

5. For this problem we define a *decreasing number* is a positive integer with two or more digits, all of which are written in strictly decreasing order from left to right.
- How many three digit decreasing numbers are there?
  - What is the largest number of digits that a decreasing number can have?
  - How many decreasing numbers are there?