BRITISH COLUMBIA SECONDARY SCHOOL MATHEMATICS CONTEST, 2018

Junior Final, Part B

Friday, May 4

1. The multiplication shown has all the digits missing except the digit 1 as shown. If the digit 1 occurs only once, restore all the digits. Be certain to clearly explain your reasoning.

2. Bill is thinking of a 2-digit integer. When the number is divided by 3, the remainder is 2; when divided by 5 the remainder is 3, and when divided by 7 the remainder is 4. Find the number. Justify your answer.

3. Consider a triangle with side lengths 13, 14, 15, and with height h, as shown in the diagram. Find the value of h and justify your answer.
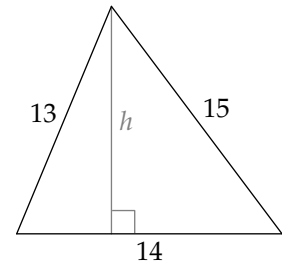
4. Find all possible sequences of consecutive positive integers that sum to 100, and explain why your list is complete.

5. Pick any five points on or inside a square of side length 2.

   (a) Explain why two of these five points must be separated by at *most* $\sqrt{2}$ units.

   (b) Find all sets of five points on this square so that each pair of points is separated by at *least* $\sqrt{2}$ units.