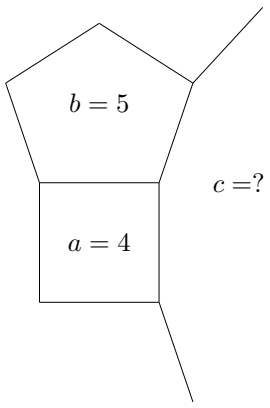
Power Questions

1. An ancient puzzle called the *Tower of Hanoi* consists of three pegs on a stand and n punctured discs of different sizes that are placed in decreasing order on one of the pegs. The object of the puzzle is to transfer the pile of discs to another peg, by moving one disc at a time, and without placing any disc on top of a smaller disc.
   (a) Show that it is possible to solve the puzzle starting with 3 discs in 7 moves.
   (b) Show that it is possible to solve the puzzle starting with n discs in $2^n - 1$ moves.

2. Three regular polygons have a, b and c sides respectively. Each polygon has sides of length 1. Each polygon shares exactly one side with each of the other two polygons and all three polygons meet at exactly one point.
   (a) Given that $a = 4$ and $b = 5$, calculate c.
   (b) Find all triples (a, b, c) where $a = 4$ and $a \leq b \leq c$.
   (c) Find the maximum value of c given that $a \leq b \leq c$.



3. In the game of baseball, batters have a batting average which is calculated by dividing the total number of hits by the total number of at-bats. A player goes up to bat and gets a hit. He notices that his batting average went up by exactly 0.01. Find all possible values for the total number of at-bats for this player (including this latest one).