

1. Explain why  $\binom{n}{k} = \binom{n}{n-k}$ . There are at least 3 ways to prove this.
2. Conjecture a formula for the sum of the  $n$ th row of Pascal's triangle. How could you prove the formula is correct?
  - (a) How many subsets does a set of cardinality  $n$  possess? That is, if  $|A| = n$ , what is  $|\mathcal{P}(A)|$ ?
  - (b) Of all the subsets of  $A$ , how many have cardinality 0? Cardinality 1? Cardinality 2? etc?
  - (c) How are parts (a) and (b) related? What does this have to do with Pascal's triangle?

3. The Stanley Cup is decided in a best of 7 tournament between two teams. In how many ways can your team win? Let's answer this question two ways:
- (a) How many of the 7 games does your team need to win? How many ways can this happen?
  
  
  
  
  
  
  
  
  
  
  - (b) What if the tournament goes all 7 games? So you win the last game. How many ways can the first 6 games go down?
  
  
  
  
  
  
  
  
  
  
  - (c) What if the tournament goes just 6 games? How many ways can this happen? What about 5 games? 4 games?
  
  
  
  
  
  
  
  
  
  
  - (d) What are the two different ways to compute the number of ways your team can win? What binomial identity is this an example of?
4. Generalize. That is, what if the rules changed and you played a best of  $2n - 1$  tournament? What binomial identity do you get?