Mathematical Thinking
Activity Questions
Week 6

1 Why Study Sequences?

1. For the sequence a_n constructed using the continued fraction representation of $\sqrt{2}$, show that

$$a_{n+1} = 1 + \frac{1}{1 + a_n}$$

2.

$$\text{Let } a_n = \left(1 + \frac{1}{n}\right)^n.$$

Show that the kth term in the binomial expansion of a_n is less than that of a_{n+1}.

2 Binomial Coefficients

1. We want to form of committee of k members from a group of n people. One member from each committe is its chairperson. What are the number of ways in which the chairperson can be selected?

2. There is a group of n people from which one is selected to be the chairperson. The chairperson gets to pick the $k - 1$ members from the group of $n - 1$ people to form a committee of k members.

3. From a group of 10 candidates, 5 committees of 5 members each are formed. In how many ways can we select a chairperson for each of these committees from its members?

4. In how many ways

5. Evaluate $\binom{10}{5}$.

   (a) How many ways can a committee of 5 people be selected from a group of 10 candidates?

   (b) If you flip a coin 10 times, what is the probability of getting exactly 5 heads?