Organizational Notes

1. A Zoom recording link and class notes will be sent out after each class.

2. Remember to send your answers to the classroom worksheets. Title your email with enough to help me record your “participation”.

3. Watch for Homework #2 in your email. That will be due next Tuesday, Sept. 15.

Review

1. **Notation.** What does $\binom{n}{k}$ mean?

2. Find a formula for $\binom{n}{k}$.

3. How many combinations of any size are there of an $n$-element set (how many subsets are there of an $n$-element set)?

Pascal’s Triangle

1. Form the first 8 rows of Pascal’s triangle.

2. The entries all happen to be binomial coefficients. Why?!?!?!

3. What must be true for this *empirical* observation to hold generally? Can we prove it?

4. Find the sum of each row. Do you notice anything interesting?

5. Find a formula for the sum of the entries of each row. Can you prove it?
Newton’s Binomial Theorem

6. Find \((1 + x)^2\) (that is, multiply this expression out).

7. Find \((1 + x)^3\) (that is, multiply this expression out).

8. Find \((1 + x)^4\) (that is, multiply this expression out).

9. Can you find a formula for \((1 + x)^n\)?

Generating Functions & an explicit Catalan number formula

10. Write out the first several terms of \(C(x) = \sum_{n=0}^{\infty} C_n x^n\)

11. Check that \(\sum_{n=0} C_{n+1} x^n = \frac{C(x) - 1}{x}\).

12. Find the coefficient of \(x^n\) in \(C(x)^2\).