# Homework 3

## Question 1

Let $S = \{1, 2, 3, 4, 5, 6, 7, 8\}$.

### Part 1

Find $|\mathcal{P}(S)|$ - i.e., find the total number of subsets of $S$. Don't forget $\{\}$ is a subset of every set.

### Part 2

How many subsets of $S$ have $6$ elements?

### Part 3

How many of the subsets of cardinality 6 contain $\{2, 4, 6, 7\}$ as a subset?

## Question 2

Consider the set of all 12-bit strings.

### Part 1

How many 12-bit strings start with the substring $1101$?

### Part 2

How many 12-bit strings have weight $6$ and begin with $1101$?

## Question 3

Consider lattice paths that start at $(1, 2)$.

### Part 1

How many lattice paths start at $(1, 2)$ and end at $(9, 13)$.

**Part 2**

How many lattice paths start at $(1, 2)$, end at $(9, 13)$, and pass through $(5, 6)$.

**Part 3**

How many lattice paths start at $(1, 2)$, end at $(9, 13)$, and avoid $(5, 6)$.

## Question 4

What is the coefficient of $x^{14}$ in $(x + 3)^{19}$?

## Question 5

In how many ways may 8 people form a circle for a folk dance?

## Question 6

How many anagrams are there of each of the following words? 1. train 2. falafel 3. expediently

## Question 7

Mr. Jones owns 4 pairs of pants, 7 shirts, and 3 sweaters. In how many ways may he choose 2 of the pairs of pants, 3 of the shirts, and 1 of the sweaters to pack for a trip?

## Question 8

Consider sets $A$ and $B$ where $|A| = 8$ and $|B| = 15$.

**Part 1**

How many functions $f : A \to B$ are there?

**Part 2**

How many functions $f : A \to B$ are injective?