# Introduction to Probability

## Permutations with Constraints

kobriendublin.wordpress.com

Twitter: @StatsLabDublin

# Permutations with Constraints

How many different four digit numbers greater than 5000 can be formed from the digits

$$2, 4, 5, 8, 9$$

if each digit can only be used once in any given number.

# Permutations with Constraints

How many of these four digit numbers are odd, given they are greater than 5000?

$$2, 4, 5, 8, 9$$

# Permutations with Constraints

# Introduction to Probability

## Calculations using the Choose Operator

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# Choose Operator

For the positive integer $n$ and non-negative integer $k$ ( with $k \leq n$), the choose operater is calculated as follows:

$$\binom{n}{k} = \frac{n!}{k! \times (n-k)!}$$

# Choose Operator

Evaluate the following:

1. $\binom{5}{2}$
2. $\binom{5}{0}$
3. $\binom{6}{3}$
4. $\binom{6}{6}$
5. $\binom{10}{1}$
6. $\binom{10}{9}$

# Choose Operator

**Part 1**

$$\binom{5}{2}$$

# Choose Operator

**Part 2**

$$\begin{pmatrix} 5 \\ 0 \end{pmatrix}$$

# Choose Operator

**Part 3**

$$\binom{6}{3}$$

# Choose Operator

**Part 4**

$$\binom{6}{6}$$

# Choose Operator

**Part 5**

$$\binom{10}{1}$$

# Choose Operator

**Part 6**

$$\binom{10}{9}$$

# Counting Sets with Venn Diagrams

- The Venn Diagram shows the number of elements in each subset of set $S$.
- If $P(A) = 3/10$ and $P(B) = 1/2$, find the values of $x$ and $y$

# Counting Sets with Venn Diagrams

- The total number of items in the data set is $x + y + 5$
- There are $x + 1$ items in Area $A$
- There are $x + y$ items in Area $B$
- We can say

$$P(A) = \frac{3}{10} = \frac{x+1}{x+y+5}$$

$$P(B) = \frac{1}{2} = \frac{x+y}{x+y+5}$$

## Cross Multiplication

$$P(A) = \frac{3}{10} = \frac{x+1}{x+y+5}$$

**Cross Multiplication**

$$P(B) = \frac{1}{2} = \frac{x+y}{x+y+5}$$

# Counting Sets with Venn Diagrams

**Simultaneous Equations**

1) $7x - 3y = 5$
2) $x + y = 5$

# Counting Sets with Venn Diagrams

## Simultaneous Equations

- $7x - 3y = 5$
- $x + y = 5$