# Lecture Notes: Section 2.6: Tools for Counting Sample Points

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## 1 Overview

**Key Points**

- Being able to calculate the amount of possibilities given specific information about things like does the order matter and other relevant selection information

## 2 Detailed Notes

### 2.1 Theorem 2.1

This section will just hold a number of examples demonstrating the theorem Shapes and

colors
Square, Circle and triangle in red, yellow, blue, purple with one object of every color there are 12 possibilities because $3 * 4$

Toss 2 6 sided dice, how many possible outcomes are there.

- 6 for the first die
- 6 for the second die
- 36 total possible outcomes

List the birthdays for a group of 20 people. Assume no leap years

- $365^{20}$ possibilities

Assume all birthdays are equally likely, what is the probability that all 20 people have different birthdays

$365 * 364 * 363 \ldots 346$ this is how many sample points there are in which everyone has their own unique birthday

- $\implies$ The probability is $\frac{365...346}{365^{20}}$
- $= \frac{365}{365} * \frac{364}{365} \cdots \frac{346}{365}$

Definition: An ordered arrangement of $r$ distinct objects is called a permutation. The number of ways of ordering $n$ distinct objects, taking r at a time is $P_r^n$

Example: The names of 3 employes of a company of 30 will be drawn at random sequntially. The first picked gets 100 dollars, second gets 50 and the third gets 25

$$P_3^{30} = 30 * 29 * 28 = \frac{30!}{27!} \tag{1}$$

# 3 Important Formulas/Theorems/Definitions

**Key Formula/Theorem**

- Theorem 2.1: With M elements $a_1, a_2, a_3 \dots a_m$ and $n$ elements $b_1, b_2, b_3 \dots b_n$ it is possible to form $mn$ pairs with one element from each group
- Definition: An ordered arrangement of $r$ distinct objects is called a permutation. The number of ways of ordering $n$ distinct objects, taking r at a time is $P_r^n$

# 4 Examples

Write an example here

# 5 Questions/Topics for Further Study

- Question or topic for further study