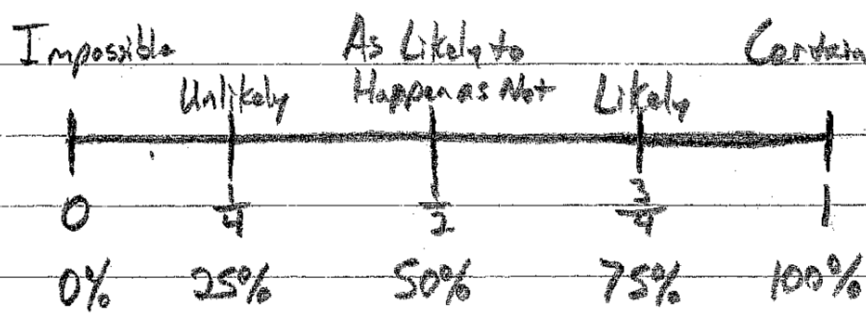
Simple Events

$$P(\text{Event}) = \frac{\#\text{ of favorable outcomes}}{\#\text{ of possible outcomes}}$$

What is the probability of rolling an odd number on a six-sided number cube?

$$P(\text{odd}) = \frac{3}{6} = \boxed{\frac{1}{2}}$$

Probability of an Event Occuring



Complementary Event $\rightarrow$ $P(A) + P(\text{not } A) = 100\%$

Using a spinner, what is $P(\text{red})$ if $P(\text{not red}) = 82\%$

$$P(\text{red}) = 100\% - 82\% = \boxed{18\%}$$

Sample Spaces

The set of all possible outcomes

1) A vendor sells vanilla and chocolate ice cream. Customers can choose from a waffle or sugar cone and either hot fudge or caramel toppings. Find the sample space.

VWF	CWF	8 Possible Outcomes
VWC	CWC	
VSF	CSF	
VSC	CSC	

2) A game is played by flipping a coin and spinning a spinner with 5 color choices (red, green, blue, yellow, purple). Create a tree diagram to show all possibilities.

Coin	Spinner		
H	R	HR	10 Possibilities
	G	HG	
	B	HB	
	Y	HY	
	P	HP	
T	R	TR	
	G	TG	
	B	TB	
	Y	TY	
	P	TP	

The Fundamental Counting Principle

1) In a game, a coin is flipped, a card is drawn (50 different cards), and a number cube is rolled. How many possible outcomes?

$$2 \times 50 \times 6 = 100 \times 6 = \boxed{600 \text{ Possibilities}}$$

2) In a closet, there are 6 pairs of shoes, 11 different shirts, and 3 pairs of shorts. How many different outfits?

$$6 \times 11 \times 3 = 66 \times 3 = \boxed{198 \text{ Possibilities}}$$

Permutations

An arrangement of objects in which order is important.

1) How many different arrangements can 9 people sit in 3 chairs?

9 × 8 × 7

Chair 1 Chair 2 Chair 3

$$9 \times 8 \times 7 = 72 \times 7 = \boxed{504 \text{ different arrangements}}$$

2) A four-letter password is used to login to a computer. How many possibilities of passwords are there if no letter can be repeated?

$$\underline{26} \times \underline{25} \times \underline{24} \times \underline{23}$$

$$= \boxed{358{,}800 \text{ different passwords}}$$

Combinations

An arrangement of objects in which order is not important.

Student Council consists of 4 students. Ten students are running for these positions. How many different student arrangements are possible?

$\underline{10} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7}$ ← Number of Permutations (Entire Set)

$\underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$ ← Number of Permutations (Smaller Set)

$10 \cdot 9 \cdot 8 \cdot 7 = 5{,}040$
$4 \cdot 3 \cdot 2 \cdot 1 = 24$

Combinations: $\frac{5{,}040}{24} = \boxed{210 \text{ Possibilities}}$

Theoretical and Experimental Probability

What is the probability of rolling two dice and getting a sum of 7?

Theoretical

$$\underset{\substack{\uparrow \\ \text{Roll \#1}}}{\underline{\underset{\text{Possibilities}}{6}}} \times \underset{\substack{\uparrow \\ \text{Roll \#2}}}{\underline{\underset{\text{Possibilities}}{6}}} = 36 \text{ Possibilities}$$

Favorable Outcomes → 1,6 / 2,5 / 3,4 / 4,3 / 5,2 / 6,1

$$P(7) = \frac{6}{36} = \boxed{\frac{1}{6}}$$

Experimental

✓ Two dice rolled 100 times
✓ Sum of the dice is written down
✓ The sum of 7 is rolled 19 times

$$P = \boxed{\frac{19}{100}}$$