

## Math 351: Probability & Statistics

## Horse Races

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1. Choose the horse you think will win
2. Two dice will be tossed to represent a move of a horse.
3. Add the two numbers to determine which horse advances
4. Continue rolling two dice until one horse reaches the finish line.



## Probability and Statistics

Discussion / Overview of key vocabulary

1. Fair
2. Experiment
3. Sample Space
4. Empirical Probability
5. Theoretical Probability
6. Events

*What do these terms mean in the context of probability?*

# Probability and Statistics

## Discussion / Overview of key vocabulary

1. Fair
2. Experiment (pg 1)
3. Sample Space (pg 1)
4. Empirical Probability
5. Theoretical Probability
6. Events (pg 9)

What do these terms mean in the context of probability?

# Probability Theory

## 3 Key Ingredients of Probability...

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- Experiment

procedure for which there are more than one outcome

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*Horse race?*

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set of all possible experimental outcomes

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- Probability

# Probability Theory

## 3 Key Ingredients of Probability...

- **Experiment**  
procedure for which there are more than one outcome
- **Sample Space**  
set of all possible experimental outcomes
- **Probability**  
Outcomes  Events

# Probability Theory

## 3 Key Ingredients of Probability...

- Experiment
- Sample Space
- Probability

Examples: section 1.1 (pg 8)

# Probability Theory

## • What's the purpose of Probability?

Mathematical structure which allows us to explain the chance of the different possible outcomes

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*i.e., it takes some of the uncertainty out*

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$S = \{1, 2, 3, 4, 5, 6\}$

6 sides, each equally likely  $\Rightarrow$

$P(1) = P(2) = P(3) = P(4) = P(5) = P(6) = 1/6$

## Probability Theory

**Definition:**

An event  $A$  is a subset of the sample space  $S$ .  
It collects **outcomes** of particular interest.

e.g., *tossing a die.*

Recall,  $S = \{1, 2, 3, 4, 5, 6\}$

What are some possible events?



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**Definition:**

An event  $A$  is a subset of the sample space  $S$ .  
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e.g., *tossing a die.*

Recall,  $S = \{1, 2, 3, 4, 5, 6\}$

What are some possible events?

Getting an even number  $\{2, 4, 6\}$

Getting an odd number  $\{1, 3, 5\}$

Getting a number greater than 4  $\{5, 6\}$

Getting a number less than 10  $\{1, 2, 3, 4, 5, 6\}$

