Probability: Part 1

- Topics: Simple Probabilities and Sample Spaces

- Objective: Students will be able to calculate probabilities of simple situations, compare those probabilities, and understand sample spaces and set notation.

- Standards: CCSS Math: 7.SP.C.7, 7.SP.C.7a, HSS.CP.A.1

Probability

Definition: Probability is simply how likely something is to happen.

Let's look at flipping a coin. What is the probability of flipping a head?

How do we calculate that?

$$P(head) = \frac{\#\ Heads}{TotalOutcomes}$$

Probability

Let's look at rolling a die. What is the probability of rolling a 5?

How do we calculate that?

$$P(5) = \frac{\#\ of\ 5}{Total Outcomes}$$

$\frac{1}{6}$

How about P(even)?

$\frac{3}{6}$

1, 2, 3, 4, 5, 6

Comparing Probabilities

Victor has been wrongfully accused of helping a gorilla escape from the zoo. The probabilities of the court rulings are as follows:

$$P(Guilty) = 0.25$$

$$P(Innocent) = 55\% \quad .55$$

$$P(retrial) = \frac{1}{5} = .20$$

Put the probabilities in order from least to greatest.

Subsets of Sample Spaces

Definition: A ***sample space*** is a set of elements that represents all possible outcomes of a statistical experiment.

Definition: An event is a possible outcome of an experiment, and a ***subset*** is an event of a sample space. A sample space is a set (S) of a random experiment that includes all possible outcomes of the experiment.

EXAMPLE: Sample Space of Rolling a Die:

{1, 2, 3, 4, 5, 6}

Subset (even): {2, 4, 6}

Subsets of Sample Spaces

You and your friend are playing a game where you flip a coin and roll a fair four-sided die. You win if the coin is heads and the die lands on an odd number. Your friend wins if the coin is tails and the die lands on an even number. You tie if the coin is heads and the die is even or if the coin is tails and the die is odd. All the possible outcomes of the game are listed below.

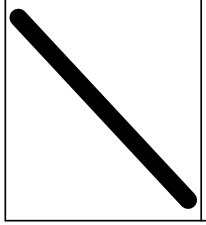
If we take outcomes 1,2,3,4,5,7 as a subset of the sample space, which of the statements below describe this subset?

	Coin result	Die result
Outcome 1	Heads	1
Outcome 2	Heads	2
Outcome 3	Heads	3
Outcome 4	Heads	4
Outcome 5	Tails	1
Outcome 6	Tails	2
Outcome 7	Tails	3
Outcome 8	Tails	4

- The subset consists of all of the outcomes where either you win or there is a tie.
- The subset consists of all of the outcomes where there is a tie.
- The subset consists of all of the outcomes where your friend does not lose.
- The subset consists of all of the outcomes where your friend does not win.

Basic Set Notation

Definition: A ***Set*** is a collection of things. Set notation uses a series of symbols to describe what is in the set.

SYMBOL	NAME	EXAMPLE	EXPLANATION
{ }	Set	A={1, 3} B={2, 3, 9} C={3, 9}	Collection of things.
	Intersect	$A \cap B = \{3\}$	Belong to both set A and set B.
	Union	$A \cup B = \{1, 2, 3, 9\}$	Belong to both set A or set B.
	Complement	A \ B={1} B \ A={2, 9}	Belong to set A, but not set B. Belong to set B, but not set A.

Basic Set Notation

Examples:

Let X and Y be the following sets:

X = {9, 25}

Y = {1, 4, 9, 16, 25}

Find the following:

$X \cup Y =$ 1, 4, 9, 16, 25 (union)

$X \setminus Y =$ { } null set

$X \cap Y =$ {9, 25}

$Y \setminus X =$ {1, 4, 16}

Displaying and Comparing Quantitative Data

You should be working on the following skills:

1. Simple probability
2. Comparing probability
3. Subsets of sample spaces
4. Basic set notation
5. No Additional Skills

Attachments

Ztable.pdf