

Chapter 5:**Lesson 1: Probability Distributions**

- A **random variable** is a variable whose values are determined by chance.
- A **discrete probability distribution** consists of the values a random variable can assume and the corresponding probabilities of the values.
- The sum of the **probabilities** of all events in a sample space add up to 1. Each probability is between 0 and 1, inclusively.

Discrete: Variables that can be counted
(Ex. # of children in a family)

Continous: Variables that are measured
(Ex. Weights of a football team)

2 Rules for a Probability Distribution

- 1.) The sum of the probabilities of all the events in the sample space must equal 1.
- 2.) The probability of each event in the sample space must be between or equal to 0 and 1.

Nov 2-11:22 AM

Example 1: Rolling a Die

Construct a probability distribution for rolling a single die.

Outcome X	1	2	3	4	5	6
Probability $P(X)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

Nov 2-11:23 AM

Example 2

Determine whether each Distribution below is an example of a Probability Distribution.

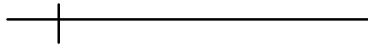
a.)
$$\begin{array}{c|ccc} X & 2 & 3 & 7 \\ \hline P(x) & .5 & .3 & .4 \end{array}$$

b.)
$$\begin{array}{c|ccccc} X & 0 & 5 & 10 & 15 & 20 \\ \hline P(x) & 1/5 & 1/5 & 1/5 & 1/5 & 1/5 \end{array}$$

c.)
$$\begin{array}{c|ccc} X & 0 & 2 & 4 & 6 \\ \hline P(x) & -1 & 1.5 & .3 & .2 \end{array}$$

Solutions

- a.) No, the sum of the probabilities are greater than 1
- b.) Yes
- c.) No, each probability must be between or equal to 0 and 1



Example 1

Example 3

Create a Probability Distribution for the number of boys in a 3 child family.

Solution:

From a tree diagram below we can get a list of all possible outcomes.

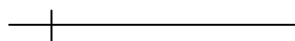
BBB, BBG, BGB, BGG, GBB, GGB, GBG, GGG

The possible Outcomes (Sample Space for boys in a 3 child family are)

0, 1, 2, 3

The Probability of Each occurring is: P(0 Boys) = 1/8
 P (1 Boy) = 3/8
 P (2 Boys) = 3/8
 P (3 Boys) = 1/8

Therefore the Probability Distribution is shown below:

$$\begin{array}{c|cccc} X & 0 & 1 & 2 & 3 \\ \hline P(x) & 1/8 & 3/8 & 3/8 & 1/8 \end{array}$$


Example 2

Example 4

During the summer months, a rental agency keeps track of the number of chain saws it rents each day during a period of 90 days. The number of saws rented per day is represented by the variable X . The results are shown below. Complete a Probability Distribution for the sample space and Probability of each outcome.

X	Number of days
0	45
1	30
2	15
	total 90

Solution:

$$P(0 \text{ saws}) = 45/90 \text{ or } .5$$

$$P(1 \text{ saw}) = 30/90 \text{ or } .33$$

$$P(2 \text{ saws}) = 15/90 \text{ or } .17$$

The Distribution is:

X	0	1	2
$P(x)$.5	.33	.17

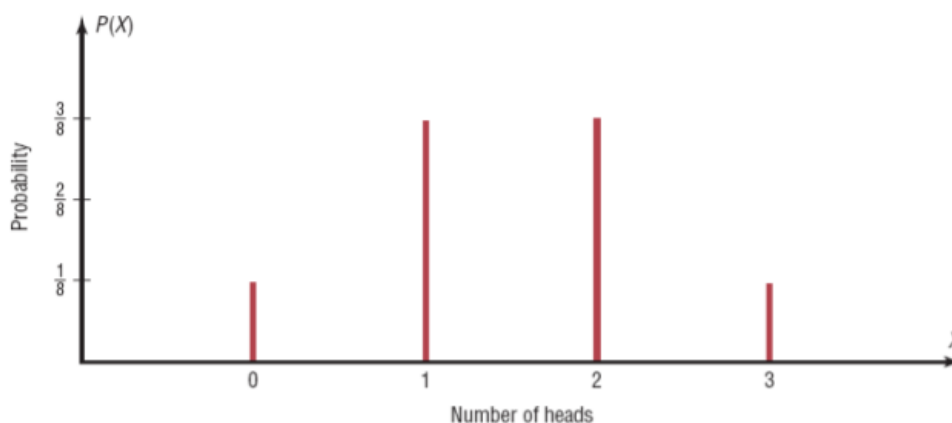
Example 3

Example 5:

Tossing Coins

Represent graphically the probability distribution for the sample space for tossing three coins.

Number of heads X	0	1	2	3
Probability $P(X)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$



Nov 2-11:26 AM

Assignment

Page 258-259

1-18 All

20-30 Evens

Nov 2-11:41 AM