

MISSOURI S&T MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

## Chapter 3

# Discrete Random Variables

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## Random Variables

For a given sample space of some experiment, a **random variable (rv)** is any rule that associates a number with each outcome in the sample space. In mathematical language, an rv is a function from the sample space to the set of real numbers.

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## Example

Roll a die. Specify the following random variables:

- a)  $X(s)=s$
- b)  $Y(s)=2s-1$
- c)  $Z(s)=1$  if  $s$  is even and  $Z(s)=0$  if  $s$  is odd

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## Bernoulli Random Variables

Any random variable whose only possible values are 0 and 1 is called a **Bernoulli random variable**.

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## Example

Roll two dice. Specify the following random variables:

- a)  $X(s)$  is the sum of both numbers
- b)  $Y(s)$  is the number of even numbers
- c)  $Z(s)=1$  if the sum is smaller than 7 and  $Z(s)=0$  otherwise

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## Discrete Random Variables

A random variable that takes finitely or at most countable infinitely many values is called a **discrete random variable**. Otherwise it is called a **continuous random variable**.

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## Example

- a) Roll a die until the sum of all numbers exceeds 10
- b) Roll a die until the first 6 comes up
- c) Pick a random number between 0 and 1, let  $X(s)=10s$

