

5.1 + 5.2 Random Variables

(55)

A random variable is a numerical description of the outcome of an experiment.

(Random variable must assume numerical values)

Random variables are either ① discrete r.v. or ② continuous r.v.

① Discrete Random variables: are random variables that assume either finite number of values or an infinite sequence of values such as 0, 1, 2, 3, ...

Experiment

Random Variable(x)

Possible values of x

- Check 50 bulbs
- Sell an automobile
- Operate a bank
- Toss a coin twice

Number of defective ones
Gender of customer who buys
Number of customers
Number of heads

0, 1, 2, 3, ..., 50
0 if Male, 1 if female
0, 1, 2, 3, ...
0, 1, 2

② Continuous Random variables: are random variables that assume any numerical value in an interval or collection of intervals. (based on time, weight, distance and temperature)

Experiment

Random variable (x)

Possible values of x

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- Operate a bank
- Fill a tank (max 43.2 L)
- Test a machine new

Time between customer's arrival (m)
Number of Liters
Temperature (min 70°F, max 205°F)
desired T_i

$x \geq 0$
 $0 \leq x \leq 43.2$
 $70 \leq x \leq 205$

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Example (Q1 page 188) Consider the experiment of tossing a ⁵⁶ coin twice:

(a) list the experimental outcomes:

$(H, H), (H, T), (T, H), (T, T)$

(b) Define a random variable that represents the number of heads occurring. What values does the random variable take

$X = \text{number of heads occurring}$

$X = 0, 1, 2$

(c) Is the random variable discrete or continuous?
discrete since it takes only 3 values: 0, 1, 2

Example (Q2 page 188) Consider an experiment of a worker assembling a product.

(a) Define a random variable that represents the time in minutes required to assemble the product.

$X = \text{time in minutes to assemble the product}$

(b) What values may the random variable assume?

Any positive value, that is $x > 0$

(c) Is the random variable discrete or continuous?

Continuous.