

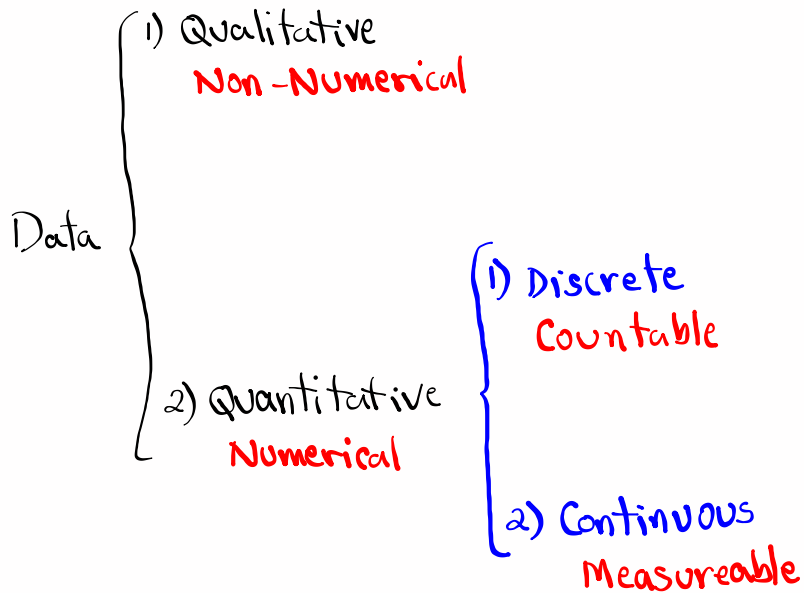
**Statistics**  
**Spring 2023**  
**Lecture 26**



Feb 19-8:47 AM

Recall

SG 14 & 15



Mar 23-7:16 AM

Let  $X$  be a discrete Random Variable with Prob. dist.  $P(x)$ .

What is probability dist.?

It is a method to provide the Prob. of all possible outcomes.

Prob. dist. can be in the form of

1) table

2) graph

3) formula

4) using the concept of Prob.

Let  $X$  be a discrete random Variable with prob. dist.  $P(x)$ .

1)  $0 \leq P(x) \leq 1$

2)  $\sum P(x) = 1$

3)  $P(x) = 1 \iff$  Sure event

4)  $P(x) = 0 \iff$  Impossible event

5)  $0 < P(x) \leq .05 \iff$  Rare event

Mar 23-7:18 AM

## Mean, Variance, and standard deviation

Mean  $\mu$  "mu"

Variance  $\sigma^2$  "Sigma squared"

Standard deviation  $\sigma$  "Sigma"

$$\mu = \sum x p(x)$$

$$\sigma^2 = \sum x^2 p(x) - \mu^2$$

$$\sigma = \sqrt{\sigma^2}$$

By Empirical Rule

68% Range  $\Rightarrow$

$$\mu \pm \sigma$$

95% Range  $\Rightarrow$

$$\mu \pm 2\sigma$$

"Usual Range"

Mar 23-7:25 AM

The chart below is for random variable  $x$  with Prob. dist.  $P(x)$ .

$x$	$P(x)$	$xP(x)$	$x^2P(x)$
1	.2	.2	.2
2	.6	1.2	2.4
3	.2	.6	1.8

1) Verify  $\sum P(x) = 1$   
 $.2 + .6 + .2 = 1 \checkmark$

2) Complete the table

3) Find  $\sum xP(x)$  &  $\sum x^2P(x)$   
 $\sum xP(x) = .2 + 1.2 + .6 = 2$   
 $\sum x^2P(x) = .2 + 2.4 + 1.8 = 4.4$

4) Find  $\mu$ ,  $\sigma^2$ , and  $\sigma$ .  
 $\mu = \sum xP(x) = 2$   
 $\sigma^2 = \sum x^2P(x) - \mu^2 = 4.4 - 2^2 = .4$   
 $\sigma = \sqrt{\sigma^2} = \sqrt{.4} \approx .632$

5) Draw Prob. dist. Histogram

$x \rightarrow$  midpoint  
 $P(x) \rightarrow$  Rel. F.

Mar 23-7:29 AM

How to find  $\mu$  &  $\sigma$  using TI:

$x \rightarrow L1$ ,  $P(x) \rightarrow L2$

L1	L2
1	.2
2	.6
3	.2

$\mu = \bar{x} = 2 \checkmark$   
 $\sigma = \sigma_x = .632 \checkmark$

STAT  $\rightarrow$  CALC  
 1: 1-Var Stats  
 with Menu } No Menu  
 List: L1 } L1, L2  
 FreqList: L2 }  
 Calculate } Enter

what about  $\sigma^2$ ?

VARS 5: Statistics 4:  $\sigma_x$   $x^2$  Enter  
 $\sigma^2 = .4$

In reduced fraction MATH 1:  $\rightarrow$  Frac Enter  
 $\sigma^2 = \frac{2}{5}$

Mar 23-7:37 AM

Consider the chart below for random variable  $x$  with prob. dist.  $P(x)$ .

$x$	$P(x)$
1	.15
2	.25
3	.45
4	.15

1) Verify  $\sum P(x) = 1$ .

$$.15 + .25 + .45 + .15 = 1 \checkmark$$

2)  $P(\underline{x=2} \text{ or } \underline{x=3})$

$$.25 + .45 = \boxed{.7}$$

3) Draw Prob. dist. Histogram



$x \rightarrow L1, P(x) \rightarrow L2$

Use **1-Var Stats** with L1 & L2 to find

$$\mu = \bar{x} = \boxed{2.6}$$

$$\sigma = \sigma_x = \boxed{.917}$$

Now find  $\sigma^2$  in reduced fraction.

**VARS** **5: Statistics** **4:  $\sigma_x$**   **$x^2$**  **MATH** **1:  $\rightarrow$  Frac** **Enter**

$$\sigma^2 = \frac{21}{25}$$

Mar 23-7:44 AM

### Class QZ 6

A deck of playing cards has  $\overset{n}{25}$  Cards with  $\overset{n}{3}$  Aces.

1) How many ways can you select  $\overset{r}{2}$  Cards?  
No replacement, order does not matter.

$${}_{25}C_2 = \boxed{300}$$

2) How many ways can you select  $\overset{r}{2}$  Aces?

$${}_{3}C_2 = \boxed{3}$$

3)  $P(\text{selecting } 2 \text{ Aces})$  in reduced fraction.

$$P(2 \text{ Aces}) = \frac{{}_3C_2}{{}_{25}C_2} = \frac{3}{300} = \boxed{\frac{1}{100}}$$

Mar 23-7:55 AM