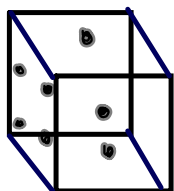


Lesson #10

Aim: What is a random variable?



$$SS = \{1, 2, 3, 4, 5, 6\}$$

$x$	$f$ (100 times)
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1	12
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2	21
---	----

3	19
---	----

4	21
---	----

5	16
---	----

6	11
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	<hr/>
	$\Sigma 100$

RANDOM  
VARIABLES

## I- RANDOM VARIABLES

1) It's a VARIABLE (most of the times  $x$ ) that HAS a SINGLE NUMERICAL VALUE, determined BY CHANCE for each outcome

2) Empirical (Experiment)

Probability Distribution

$x$	$f$	Relative freq
1	12	$12/100 = 0.12$
2	21	$21/100 = 0.21$
3	19	$19/100 = 0.19$
4	21	$21/100 = 0.21$
5	16	$16/100 = 0.16$
6	11	$11/100 = 0.11$

Random Variable

frequency  $\sum 1$  or .99

Theoretical (Model)

$x$	$P(x)$
1	$1/6 = 0.1\bar{6}$
2	$1/6 = 0.1\bar{6}$
3	$1/6 = 0.1\bar{6}$
4	$1/6 = 0.1\bar{6}$
5	$1/6 = 0.1\bar{6}$
6	$1/6 = 0.1\bar{6}$
$\sum 1$	

Prob DIST

Note: After comparing both tables we determine that the more times you conduct the Experiment the closest it will to the Theoretical Model.

3) Requirements for a Probability Distribution  
(TABLE)

$$1) \sum P(x) = 1 \text{ or } .99$$

$$2) 0 \leq P(x) \leq 1$$

4) FIND  $\mu$  and  $\sigma$   
 (Population Mean) (STANDARD Deviation for Population)

$x$	$f$	Relative freq
1	12	$12/100 = 0.12$
2	21	$21/100 = 0.21$
3	19	$19/100 = 0.19$
4	21	$21/100 = 0.21$
5	16	$16/100 = 0.16$
6	11	$11/100 = 0.11$

Probability Distribution

$P(x)$

$$\begin{array}{r} 1 \times 12 \\ 2 \times 21 \\ 3 \times 19 \\ 4 \times 21 \\ 5 \times 16 \\ \hline 6 \times 11 \\ \hline \end{array} \frac{\sum}{100} = 3.41$$

1-Variable

$\bar{x}$	= 3.41
$\sum x$	= 341
$\sum x^2$	= 1399
$\sigma x$	= 1.53684742
$sx$	= 1.54458977
$n$	= 100

Theoretical Mean

1-Variable

$\bar{x}$	= 3.5
$\sum x$	= 3.5
$\sum x^2$	= 15.1666666
$\sum x$	= 1.70782512
$sx$	= $\rightarrow$ nothing.
$n$	= 1

$$\mu = \sum x \cdot P(x)$$

$$\sigma = \sqrt{\sum (x - \mu)^2 \cdot P(x)}$$

$$\begin{array}{l} (1 - 3.4)^2 \times 0.12 \\ (2 - 3.4)^2 \times 0.21 \\ (3 - 3.4)^2 \times 0.19 \\ (4 - 3.4)^2 \times 0.21 \\ (5 - 3.4)^2 \times 0.16 \\ (6 - 3.4)^2 \times 0.11 \end{array}$$

$$\sqrt{\sum}$$