5/8/15

11-2-1 Probability Distributions

A probability distribution of a Random Variable X is a table, equation or graph that LINK each possible value of X with its probability of occuring.

Ex 2 Construct a probability distribution

Teacher Evaluations

Score	frequency
1	1
2	8
3	20
4	16
5	5

total 50 evaluations

$P(1) = \frac{1}{50} = .02$

$P(2) = \frac{8}{50} = .16$

$P(3) = \frac{20}{50} = .40$

$P(4) = \frac{16}{50} = .32$

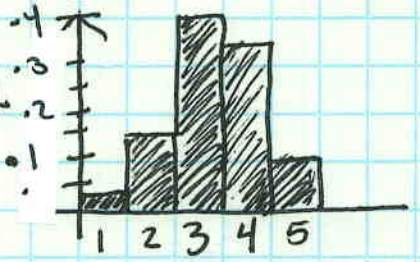
$P(5) = \frac{5}{50} = .10$

Distribution table

Score X	1	2	3	4	5
P(X)	.02	.16	.40	.32	.10

Probability of X ↑

graph



Mean of a Probability Distribution

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

X: event; P(X): probability of the event

EX3 Mean of a Probability Distribution

(from EX2) $\mu = \sum (X \cdot P(X))$

score X	P(X)	(X-P(x))
1	.02	1 · .02 = .02
2	.16	2 · .16 = .32
3	.40	3 · .40 = 1.2
4	.32	4 · .32 = 1.28
5	.10	5 · .10 = .5

$\Sigma (X \cdot P(X)) = 3.3$

The mean of the distribution is 3.32

Variance & Standard Deviation of a Prob Dist

Variance: $\sigma^2 = \sum (X-\mu)^2 \cdot P(x)$

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

Steps

1. mean
2. Subract
3. Square
4. mult by Prob.
5. sum = σ^2
6. $\sigma = \sqrt{\sigma^2}$

Ex 4 (from Ex 3) $\mu = 3.3$

Score	P(X)	$(X-\mu)^2$	$(X-\mu)^2 \cdot P(X)$
1	.02	5.38	0.1076
2	.16	1.74	0.2788
3	.40	0.10	0.0410
4	.32	0.46	0.1480
5	.10	2.82	0.2822
			Σ = 0.8576

$\sigma^2 = 0.8576$

$\sigma = 0.93$