Section 6.1

Discrete Random Variables

Random variables = a numerical measure of the outcome of a probability experiment, so its value is determined by chance. Random variables are denoted using letters such as X.

Discrete random variable = a finite number of values or a countable number of values "counting process"
KEY: No decimals

Continuous random variable = has infinitely many values and these values can be associated with measurements on a continuous scale in such a way that there are no gaps or interruptions.
KEY: Has Decimals

Probability Distribution = For a discrete random variable X provides the possible values of the random variable and their corresponding probabilities. Can be a table, graph, or math formula.

Probability histogram = has probabilities on the vertical scale, must satisify:

$$1. \Sigma P(x) = 1$$

$$2. 0 \le P(x) \le 1$$

1. Determine whether the distribution is a discrete probability distribution. If not, state why.

X	P(x)
0	0.7
1	0.2
2	0.3
3	-0.4

Mean of a probability distribution:

$$\mu = \Sigma[x \cdot P(x)]$$

$x = $ value of the random variable

$P(x) = $ probability of observing x

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2. Find the mean

X	P(x)
0	0.20
1	0.30
2	0.10
3	0.40

Interpretation of the Mean of a Discrete Random Variable

Given n trials, as n increases the value of the mean of these independent trials approaches μ_x.

$$\bar{x} = \frac{x_1 + x_2 + ... + x_n}{n}$$

as n increases, difference

between $\bar{x}$ and μ_x goes to

zero

Expected Value

$$E(X) = \mu_x = \Sigma(x \cdot P(x))$$

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3. Find the expected profit

Small widgets will result in a profit of $10,000, mid-size widgets will results in a profit of $20,000 and large size widgets will result in a profit of $80,000. There is a 15% probability for small widgets, 25% probability for mid-size widgets and 60% probability for large size widgets.

Standard Deviation of a Discrete Random Variable

$$\sigma_x = \sqrt{\Sigma\left((x - \mu_x)^2 \cdot P(x)\right)}$$

or

$$\sigma_x = \sqrt{\Sigma\left(x^2 \cdot P(x)\right) - \mu_x^2}$$

Variance of a Discrete Random Variable

Take square of standard deviation!

4. Find the standard deviation and variance

X	P(x)
0	0.20
1	0.30
2	0.10
3	0.40

TI-83/84 Instructions

- Put x values into L1, probabilities into L2 and do 1-VARSTATS L1,L2