

5.4 MEAN, VARIANCE, AND STANDARD DEVIATION FOR THE BINOMIAL DISTRIBUTION

Any Discrete pdf

Binomial Distributions

1. $\mu = \sum [x \cdot P(x)]$

1. $\mu = np$

2. $\sigma^2 = \sum [(x - \mu)^2 \cdot P(x)]$

3. $\sigma^2 = \sum [x^2 \cdot P(x)] - \mu^2$

2. $\sigma^2 = npq$

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

3. $\sigma = \sqrt{npq}$

RANGE RULE OF THUMB

Maximum usual value: $\mu + 2\sigma$ Minimum usual value: $\mu - 2\sigma$

Example 1: Mars, Inc. claims that 24% of its M&M plain candies are blue. A sample of 100 M&Ms is randomly selected.

- a. Find the mean and standard deviation for the numbers of blue M&Ms in such groups of 100.

$$p = 0.24 \quad n = 100$$

$$q = 1 - 0.24$$

$$q = 0.76$$

$$\mu = np$$

$$\mu = 100(0.24)$$

$$\mu = 24 \text{ blue m\&m's}$$

$$\sigma = \sqrt{npq}$$

$$\sigma = \sqrt{100(0.24)(0.76)}$$

$$\sigma \approx 4.3 \text{ blue m\&m's}$$

- b. Data Set 18 in Appendix B consists of 100 M&Ms in which 27 are blue. Is this result unusual? Does it seem that the claimed rate of 24% is wrong?

$$\mu - 2\sigma \leq \text{usual \# of blue m\&m's} \leq \mu + 2\sigma$$

$$24 - 2(4.3) \leq \text{usual \# of blue m\&m's} \leq 24 + 2(4.3)$$

$$15.4 \leq \text{usual \# of blue m\&m's} \leq 32.6$$