

# WEEK 12 REVIEW (8.3 and 8.4)

## 8.3 Variance and Standard Deviation

3 3 3 3 3

2 2 3 4 4

0 0 5 5 5

$X$	$P(X)$	$X - \mu$	$(X - \mu)^2$	$P(X)(X - \mu)^2$

VARIANCE

STANDARD DEVIATION,

*Example:* Find the variance and standard deviation for the given sets of numbers: 6, 12, 3, 14, 9, 99

*Example:* We are given the following data for the number of a certain magazine sold each week at a newsstand during the past year. What is the standard deviation in the number of magazines sold each week?

# of weeks	5	4	8	11	9	15
# of magazines	15	16	17	18	19	20

## **8.4 The Binomial Distribution**

In a Bernoulli trial we have the following:

- The same experiment repeated several times.
- The only possible outcomes of these experiments are success or failure.
- The repeated trials are independent so the probability of success remains the same for each trial.

*Example:* In a certain neighborhood,  $1/3$  of the houses have swimming pools. If a random sample of 4 houses is chosen, what is the probability that exactly one of them has a pool?

**BINOMIAL PROBABILITY:** If  $p$  is the probability of success in a single trial of a binomial (Bernoulli) experiment, the probability of  $x$  successes and  $n-x$  failures in  $n$  independent repeated trials of the same experiment is

*Example:* In a different neighborhood, 35% of the houses have a swimming pool and a random sample of 20 houses is chosen

(a) What is the probability that exactly 10 of the houses have pools?

DEFINE SUCCESS:

$n$  = number of trials =

$p$  = probability of success in a single trial =

$x$  = number of successes =

binompdf( $n$ ,  $p$ ,  $x$ ) on the calculator:  $P(x = 10) =$

(b) What is the probability of at most 12 houses have pools?

# of successes =  $x =$

$P(X \leq 12) =$

binomcdf( $n$ ,  $p$ ,  $x$ ) is the sum of the probabilities from 0 to  $x$ .

(c) What is the probability that more than 8 houses having pools?

(d) What is the probability that between 10 and 20 houses have pools?

(e) What is the probability that 4 of the first 8 houses have pools and 5 of the last 12 houses have pools?

(f) What is the expected number of houses that have pools? What is the standard deviation in the number of houses that have pools?

If  $X$  is a binomial random variable associated with a binomial experiment consisting of  $N$  trials with probability of success  $p$  in a single trial, then the mean (expected value) and standard deviation associated with the experiment are:

$$\mu = Np \text{ and } \sigma = \sqrt{Np(1-p)}$$