# WEEK 12 REVIEW (8.3 and 8.4)

## 8.3 Variance and Standard Deviation

<table>
<thead>
<tr>
<th>$X$</th>
<th>$P(X)$</th>
<th>$X - \mu$</th>
<th>$(X - \mu)^2$</th>
<th>$P(X)(X - \mu)^2$</th>
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**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?

<table>
<thead>
<tr>
<th># of weeks</th>
<th>5</th>
<th>4</th>
<th>8</th>
<th>11</th>
<th>9</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td># of magazines</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
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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:* A multiple choice test has 3 questions, each with 4 possible answers. A student guesses on each question. What is the probability that the student gets exactly two questions correct?

**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: The first 15 days of July was very dry in College Station with a 20% chance of rain every day.

(a) What is the probability of no rain in the first 15 days in July?

DEFINE SUCCESS:

n = number of trials =

p = probability of success in a single trial =

x = number of successes =

\( \text{binompdf}(n, p, x) \) on the calculator: \( P(x = 0) = \)

(b) What is the probability of at most 2 rain days? \( x = \)

\( P(X \leq 2) = \)

\( \text{binomcdf}(n, p, x) \) is the sum of the probabilities from 0 to x.

(c) What is the probability of more than 3 rain days?

(d) What is the probability it rains once in the first 5 days and twice in the last 10 days?
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:

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

*Example*: Let the random variable $X$ be the number of girls in a 6 child family. Find the probability distribution table, probability histogram and the mean and standard deviation for the number of girls in the family.