1. A large group of people were surveyed in order to determine how many minutes each week they spent reading a newspaper. The results showed that the group read newspapers an average of 400 minutes per week with a standard deviation of 100 minutes per week.

\[ \mu = 400 \quad \sigma = 100 \]

(a) According to Chebyshev's rule, at least \( \frac{15}{16} \) proportion of people read newspapers between _______ and _______ minutes per week.

\[ \frac{15}{16} = \left(1 - \frac{1}{k^2}\right) \quad \Rightarrow \quad 1 - \frac{1}{k^2} = \frac{1}{16} \quad \Rightarrow \quad k^2 = \frac{16}{15} = \frac{1}{16} = \frac{1}{4} \]

\( k = 4 \) std. deviations, so

\[ 400 \pm (4)(100) = 400 \pm 400 = (0, 800) \]

(b) What does Chebyshev's rule say about the proportion of people who spend between 200 and 600 minutes per week reading newspapers?

\[ 200 \pm (k)(100) = (200, 600), \quad \Rightarrow \quad 400 - (k)(100) = 200 \quad k = 2 \]

So, \( (200, 600) = \bar{x} \pm 2.5 \) which contains at least 75\%
2. A sample of five computer diskettes that were lying around my office showed they had the following amounts of free space (in kilobytes): 900, 500, 200, 300, and 700. (Note that the sample mean is 520.)

(a) (4 points.) The sample median is \[ \text{\underline{500}} \]

(b) (4 points.) The sample range is \[ 900 - 200 = 700 \]

(c) (4 points.) The sample variance is

\[
S^2 = \frac{\sum x^2 - \left( \frac{\sum x}{n} \right)^2}{n-1} = \frac{(900^2 + 500^2 + 200^2 + 300^2 + 700^2) - (900+500+200+300+700)^2}{5} \]

\[
= \frac{1680000 - 3000000}{4} = 750000 \]

\[ \text{\underline{286.36}} \]

(d) (4 points.) The sample standard deviation is \[ S = \sqrt{750000} \]

3. On a particular college campus, 60% of students are female and 40% of students are taking statistics. The events \{a randomly selected student is female\} and \{a randomly selected student is taking statistics\} are independent. If a student is selected at random from this campus, what are the probabilities that the selected student will be taking statistics or female?

\[ P(F) = .60 \]

\[ P(\text{Stats}) = .40 \]

\[ P(\text{Stats} \cup \text{Female}) = P(\text{Stats}) + P(F) - P(\text{Stats} \cap \text{Female}) \]

\[ = P(\text{Stats}) + P(F) - P(\text{Stats})P(F) \]

\[ = .60 + .60 - (.40)(.60) \]

\[ = .76 \]

4. A lie detector is used to classify subjects as either truth-tellers or liars. One particular machine, is believed to be 80% accurate. In other words, if a liar is tested the machine has an 80% probability of classifying him or her as a liar while, if a truth-teller is tested, the machine has an 80% probability of classifying him or her as a truth-teller. Suppose that 90% of all people are truth-tellers and 10% are liars. (Also note that 74% of all people classified as truth-tellers by the machine.) If the machine classifies a person as a truth-teller, what is the probability that person is actually a truth-teller? (Hint: Let $T = \{a randomly selected person is a truth-teller\}$ and $C = \{a randomly selected person is classified by the machine as a truth-teller\}$.)

$$P(C|T) = 0.80 = P(\text{Not Class}|\text{Truth})$$

$$P(T) = 0.9 \quad P(T) = 1 \quad P(C) = 0.74$$

$$P(T|C) = \frac{P(T \cap C)}{P(C)} = \frac{P(C|T) \cdot P(T)}{P(C)} = \frac{(0.80)(0.9)}{0.74} = 0.973$$

5. The amounts of money that students spent last semester at Brady's Grill follow a mound-shaped distribution with a mean of $80 and a standard deviation of $25.

(a) Approximately 99.7% of students spent between ____________ and ____________ at Brady's Grill last semester.

$$99.7\% \rightarrow 3 \text{ std. deviations} \rightarrow x \pm 3 \sigma = 80 \pm (3)(25)$$

$$= 80 \pm 75$$

$$= (5, 155)$$

(b) Determine the approximate percentile rank of a student who spent $55 at Brady's Grill last semester.

* Find the area below $55 \text{ and convert to percentile rank.} \quad 80 - 55 = 25 = 1 \text{ std. deviation.} \quad 

area \text{ below 1 std. dev.} \approx 68\%

so area below $55 \approx 16\%$

so 16th percentile
6. A discrete random variable has probability function:
   \[ p(x) = \frac{x}{200} \text{ for } x = 10, 20, 30, 40, 100. \]

   Find \( P(x > 35) \).

   \[
   P(x > 35) = P(x = 40 \text{ or } 100) = P(40) + P(100) - P(\text{both})
   = \frac{40}{200} + \frac{100}{200} = 0.70
   \]

7. The table below classifies the 200 used car on a dealer's lot according to their age (measured to most recent year) and whether the car is foreign or domestic.

<table>
<thead>
<tr>
<th>MAKE</th>
<th>0 - 2 years</th>
<th>3 - 5 years</th>
<th>over 5 years</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign</td>
<td>40</td>
<td>35</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Domestic</td>
<td>35</td>
<td>45</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>TOTAL</td>
<td>75</td>
<td>80</td>
<td>43</td>
<td>200</td>
</tr>
</tbody>
</table>

Suppose that a car that is randomly selected from this dealer's lot.

(a) Determine the probability that the selected car will be more than 2 years old.

\[
P(x > 2) = \frac{80 + 45}{200} = 0.625
\]

(b) If the selected car is not over 5 years old, what is the probability that it will be domestic?

\[
P(\text{Domestic} | \leq 5 \text{ yrs}) = \frac{80}{155} = 0.516
\]

(c) Are the events \{the selected car is domestic\} and \{the selected car is 0 - 2 years old\} independent? Show why or why not.

\[
P(\text{Dom} \cap 0-2\text{yr}) = \frac{35}{200} = 0.175
\]

\[
P(\text{Dom}) \cdot P(0-2) = \left(\frac{100}{200}\right) \left(\frac{35}{200}\right) = 0.1875
\]

\( \boxed{\text{not equal so not independent}} \)