1. (a) Complete the given frequency table, with appropriate sums, and find

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>14</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>xf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x²f</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) the location of the median   (c) the median   (d) the mean
(e) the location of the 37th percentile   (f) the 37th percentile
(g) the sample standard deviation

2. (a) X has a distribution with mean 23 and standard deviation 11.

   Find the z-score for X = 46.

(b) According to Chebyshev’s Theorem, what is the minimum fraction of a distribution that is within k = 2.75 standard deviations of the mean?

(c) We want to include at least 71% of an unknown distribution within k standard deviations of its mean. Find the smallest k that will guarantee this.

3. One card is drawn at random from a standard deck of 52 cards. Events are F = face card, R = red card, M = card lower than seven, N = card higher than four. Ace is high.

   (a) From these events list a pair of events that are
   (i) mutually exclusive ____________________________
   (ii) independent _________________________________
   (iii) neither independent not mutually exclusive. ________________

(b) Find the probabilities, as simplified fractions.
   (i) \( P(M) = \)   (ii) \( P(M \cap N) = \)   (iii) \( P(M \mid N) \)

4. An urn contains five red marbles, six white marbles and seven blue marbles. We draw two marbles, one at a time, without replacement.

   (a) What is the probability of getting a blue marble on the second draw, given that we got a red one on the first draw?

   (b) In the tree diagram below, label each branch with its conditional probability, and each branch tip with its probability.

   (c) What is the sum of the branch tip probabilities? What should it be?

   (d) Find the probability of getting one red marble and one non-red, in any order.
5. (a) Given the probability distribution below, complete the table and find

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>0.18</td>
<td>0.11</td>
<td>0.06</td>
<td>0.29</td>
<td>0.36</td>
</tr>
</tbody>
</table>
| xp | \begin{align*} &0.18 \times 1 \\ \ \ \ \ \ \ \ \ \ \ \\
| x^2p| &0.18 \times 1 \ \ \ \ \ \ \ \ \ \ \\
| x^2p| &0.18 \times 2 \ \ \ \ \ \ \ \ \ \ \\
| x^2p| &0.18 \times 3 \ \ \ \ \ \ \ \ \ \ \\
| x^2p| &0.18 \times 4 \ \ \ \ \ \ \ \ \ \ \\
| x^2p| &0.18 \times 5 \ \ \ \ \ \ \ \ \ \ |

(i) \( \mu \), the expected value of \( x \)

(ii) \( \sigma \), the standard deviation of \( x \)

(b) If \( P(C) = 0.7 \), \( P(D) = 0.65 \), and \( P(C \cap D) = 0.5 \), (i) complete the following Venn Diagram.

(ii) Find \( P(C \cup D) \).

(iii) Find \( P(\overline{C} \cap \overline{D}) \).
6. We get 45% of our parts from supplier A, 15% from supplier B, and 40% from supplier C.
Defective rates are 5% of A parts, 8% of B parts, and 4% of C parts.

(a) Find the probability that a randomly chosen part is both defective and from supplier A.
(Hint: multiplication rule for conditional probability.)

(b) Make a complete table with labeled columns to apply Bayes' Theorem.

|   | P(X) | P(D|X) |
|---|------|------|
| A |      |      |
| B |      |      |
| C |      |      |

(c) Find the probability that a randomly chosen part is defective. _____________
(d) Find the probability a defective part came from supplier A. _____________

7. Let X be the number of successes in 10 independent trials, where the probability of success on each trial is \( p = 0.28 \)

(a) Calculate \( P(X = 4) \), showing the binomial formula used.

(b) Complete the probability distribution table for \( X \), using formula or calculator function.

(c) Find the mean of the distribution.

(d) Find the standard deviation of the distribution.

(e) Find the 'usual' values of \( X \), by the two S.D. rule.

8. (a) How many election outcomes are there if a club of 14 elects five officers?
Give an appropriate formula, and actual number.

(b) How many ways are there to select a committee of five people in the club of 14 people?
Give an appropriate formula, and actual number.

(c) An urn contains five red marbles, six white marbles and seven blue marbles.
We draw a sample of nine marbles. Find the probability of getting exactly three of each of the three colors in the sample.

9. 56% of the shoppers at a mall are women. 40% of these women are over 30.
45% of the men shopping at the mall are over 30. Use a Venn diagram, or tree diagram, to find the probability that a randomly chosen shopper at the mall
(a) is over 30                (b) is a woman, given that the shopper is over 30.

GO TO PAGE 4.
10. (a) Classify the following variables as qualitative nominal, qualitative ordinal, quantitative discrete, or quantitative continuous.

(i) "High", "Medium" or "Low" heat.  
(ii) The number of calculators you have.  
(iii) Your favorite vegetable  
(iv) Oven temperature

(b) A natural number from 1 to 60, inclusive, is drawn at random. (Each of the 60 numbers has probability $\frac{1}{60}$ of being drawn.) Let $E$ be the event "the number is even", and $G$ be the event "the number is a multiple of 11". Find

(i) $P(E) =$  
(ii) $P(G) =$  
(iii) $P(E \cap G) =$  
(iv) $P(E \cup G) =$  
(v) $P(G \mid E) =$  
(vi) if $E$ and $G$ are independent or not. (explain)

11. Let $X$ be the number of successes in $n = 700$ independent trials where the probability of success on each trial is $p = 0.35$. Find

(a) the mean value of $X$  
(b) the standard deviation of $X$  
(c) $P(250 \leq X \leq 273)$ by using the binomial functions on the TI.  
(d) Find the 'usual' values of $X$, by the two S.D. Rule.

12. (This may or may not be on the first test.) $z$ has the standard normal distribution. Find the probabilities below, using a calculator, writing down the calculator command line. Draw a diagram of the normal curve with appropriate shading in each part and endpoints labeled.

(a) $P(-1.34 \leq z \leq 0)$  
(b) $P(z \leq 1.34)$  
(c) $z_0$, so that $P(z \geq z_0) = 12.8\%$  
(d) $z_0$, so that $P(|z| \geq z_0) = 12.8\%$