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Systematic Sampling

Discussion

The next method is called **Systematic Sampling**. This method consists of selecting any unit at random from the first k units numbered 1 to k and then selecting every k th unit in succession subsequently.

Definition :
A **systematic sampling** is a technique in which *first unit of sample is selected at random and then each subsequent unit is picked at a fixed distance from the previous unit selected in the sample.*

For example, the researcher has a population total of **100** individuals and needs **12** subjects. He first picks his starting number, **4**. Then the researcher picks his interval, **8**. The members of his sample will be individuals **4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92**.

Another example of systematic sampling would be checking the oxygen level in a river. The researcher stops every **10th** mile to take a measurement.

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Set Operations

Union of two Sets **Intersection of two Sets** **Set Difference** **Illustration**

The union of two sets A and B is the collection of elements which are in A or in B or in both.

To symbolically demonstrate the union of two sets, we will use a set builder notation:
 $A \cup B = \{x : x \in A \text{ or } x \in B\}$

Mutually Exclusive Sets **Non - Mutually Exclusive Sets**

In the figures above, the colored part represents the union of the two sets.

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Empirical Rule for data with a Symmetric (Bell-Shaped) Distribution

The Empirical Rule **Empirical Rule**

Introduction **Illustration**

1. Approximately **68.3%** of data falls within **1** standard deviation of the **mean**.
2. Approximately **95.4%** of data falls within **2** standard deviation of the **mean**.
3. Approximately **99.7%** of data falls within **3** standard deviation of the **mean**.

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Discrete Probability Distribution

Graphic form called the **Probability Histogram** :

Note that the height of the bars in the **histogram** is equal to the corresponding **probabilities**. The values of the random variable are shown on the **x axis** and the corresponding probabilities are shown on the **vertical axis**.

Three ways Representing Probability Distribution of a Random Variable

Formula form :

$$P(X=x) = \frac{x}{15}, \quad x = 1, 2, 3, 4, 5.$$

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Properties of the Normal Distribution

These results are very important in solving problems using applications of the **Normal distribution**. It would be wise to memorize them.

Empirical Rule

99.73%
95.44%
68.26%
34.13% 34.13%

$\mu - 3\sigma$ $\mu - 2\sigma$ $\mu - \sigma$ μ $\mu + \sigma$ $\mu + 2\sigma$ $\mu + 3\sigma$

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Chi-Square (χ^2) Distribution

The shape of the Chi-Square probability curve depends on the degrees of freedom v and changes with different values of v .

A rough sketch of the Chi-Square probability curves for $v = 1, 2, 3, 4, 5$ and 6 is given in Figure .

Probability curve of Chi-Square Distribution

$P(\chi^2)$

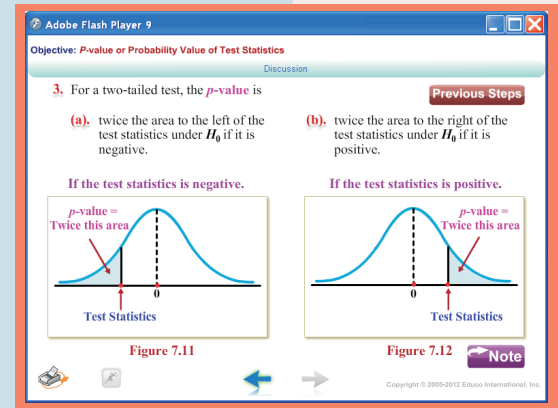
χ^2

$v = 1$
 $v = 2$
 $v = 3$
 $v = 4$
 $v = 5$
 $v = 6$

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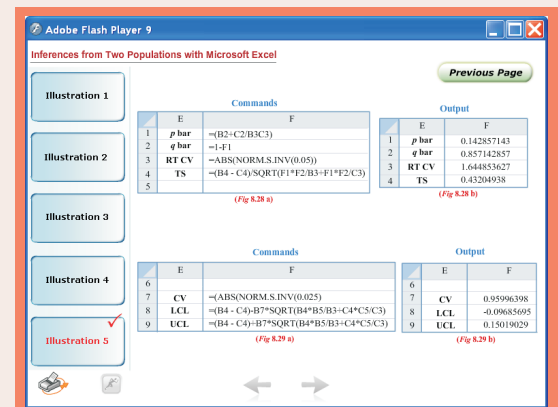
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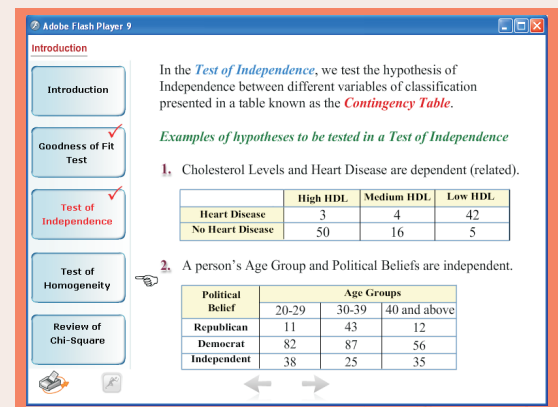
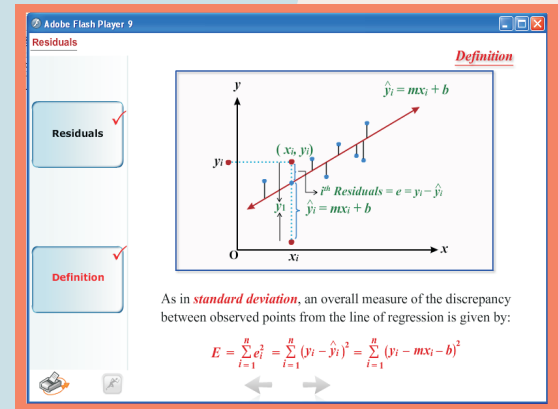


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