**Problems for Chapter 3**

**1. *Example 3.4*** *In a manufacturing operation we are interested in better understanding defect rates as a function of our various process steps. The inspection points in the process are initial cutoff, turning, drilling, and assembly. These data are qualitative data and is shown in Table 3.5. Now using* ***JMP*** *construct a pie chart* for these data*.*

**Table 3.5** Understanding defect rates as a function of various process steps.

|  |  |  |  |
| --- | --- | --- | --- |
| Process Steps | Frequency | Relative Frequency | Angle Size |
| Initial Cutoff | 80 | 80/360 | 80 |
| Turning | 170 | 170/360 | 170 |
| Drilling | 73 | 73/360 | 73 |
| Assembly | 37 | 37/360 | 37 |
| Total | 360 | 1.000 | 360.00 |

**2.** **Example 3.5** The following data give the number of new employees hired by a manufacturing company over a period of six years (2014 – 2019).

128 245 130 154 152 165

respectively. Using JMP, construct a bar chart for these data.

**3.** **Example 3.7** The following data give the frequency of defect types for auto parts manufactured over the same period of time in two different plants that have the same manufacturing capacity. Construct a side-by-side bar chart comparing the types of defects occurring in the auto parts that are manufactured in two different plants.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Defect Type | A | B | C | D | E | Total |
| Plant I | 14 | 13 | 9 | 7 | 7 | 50 |
| Plant II | 12 | 18 | 12 | 5 | 8 | 52 |

4. **Example 3.8** The following data give the number of Fuel Pumps for SUVs, produced per day by a manufacturing companies during the month of June of a given year.

72 88 65 68 68 75 87 79 89 79

65 76 81 84 67 82 61 89 85 90

67 68 82 85 79 65 79 74 81 82

Using JMP construct frequency histograms for the above data.

**5. Example 3.9** The following data give the number of flu vaccines applied by a small pharmacy in a midwestern town over a period of 12 months of a given year.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Month | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
| vaccines | 40 | 30 | 21 | 10 | 5 | 2 | 3 | 5 | 25 | 45 | 43 | 48 |

Using JMP prepare a line graph for the above data.

**6. Example 3.10.** The cholesterol level and the systolic blood pressure of 30 randomly selected U.S. males in the age group of 40 to 50 years are given in Table 3.8. Using JMP construct a scatterplot of this data and determine if there is any association between the cholesterol levels and systolic blood pressures.

**Table 3.8** Cholesterol levels and Systolic BP of 30 randomly selected U.S. males between the ages of 40 and 50.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subject | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Cholesterol (*x*) | 195 | 180 | 220 | 160 | 200 | 220 | 200 | 183 | 139 | 155 |
| Systolic. BP (*y*) | 130 | 128 | 138 | 122 | 140 | 148 | 142 | 127 | 116 | 123 |
| Subject | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Cholesterol (*x*) | 153 | 164 | 171 | 143 | 159 | 167 | 162 | 165 | 178 | 145 |
| Systolic. BP (*y*) | 119 | 130 | 128 | 120 | 121 | 124 | 118 | 121 | 124 | 115 |
| Subject | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Cholesterol (*x*) | 245 | 198 | 156 | 175 | 171 | 167 | 142 | 187 | 158 | 142 |
| Systolic. BP (*y*) | 145 | 126 | 122 | 124 | 117 | 122 | 112 | 131 | 122 | 120 |

**7. Example 3.23** Using JMP find the mean, median, mode, variance, standard deviation and interquartile range for the following salary data of a group of nurses in a city hospital.

Salaries: 58 63 65 68 64 66 68 72 73 79 82 83 86 88 89

**8. Example 3.24** The following data gives the noise level measured in decibels, (a normal conversation by humans produced noise level of about 75 decibels) produced by different machines in a very large manufacturing plant.

85, 80, 88, 95, 115, 110, 105, 104, 89, 97, 96, 140, 75, 79, 99

Using JMP construct a box plot and examine if the data set contains any outliers.

**9. Example 3.25** The probability is 0.80 that a randomly selected technician will finish his/her project successfully. Let X be the number of technicians among a randomly selected group of five technicians who will finish their project successfully. Using JMP find the probability distribution of the random variable X.

**10. Example 3.27** A quality control engineer selects randomly ten parts from a box

containing 5 defective and 15 non-defective parts. Using JMP find the probability that she will select *x* (*x* = 0, 1, 2, 3, 4, 5) number of defectives.

**11. Example 3.31** The average number of accidents occurring in a manufacturing plant over a period of one year is equal to two. Using JMP find the probability that during any given year five accidents will occur.

**12. Example 3.33** Suppose a quality characteristic of a product is normally distributed with

mean μ = 18 and standard deviation σ =1.5. The specification limits furnished by the customer are (15, 21). Using JMP determine what percentage of the product meets the specifications set by the customer.