SOLUTIONS

# CHAPTER 3: MEASURES OF CENTRAL TENDENCY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | *f* | *cf* | *%* | *c%* | *f·x* |
| 9 | 1 | 1 | 2% | 2% | 9 |
| 10 | 9 | 10 | 18% | 20% | 90 |
| 11 | 10 | 20 | 20% | 40% | 110 |
| 12 | 5 | 25 | 10% | 50% | 60 |
| 13 | 7 | 32 | 14% | 64% | 91 |
| 14 | 4 | 36 | 8% | 72% | 56 |
| 15 | 7 | 43 | 14% | 86% | 105 |
| 16 | 5 | 48 | 10% | 96% | 80 |
| 17 | 1 | 49 | 2% | 98% | 17 |
| 19 | 1 | 50 | 2% | 100% | 19 |
| Σ | 50 |  | 100 |  | 637 |

1. The following data represent the age of first arrest for a sample of 50 boys:

a. What is the mode, median and mean of this data? Which is a better measure of central tendency?

**Mode = 11 years old**

**Median Position = **

**Median = 12.5 years old**

** years old**

**In this example, the mean would be the most appropriate measure of central tendency, as there are no outliers or extreme values.**

b. Without graphing the data, what can you assume the distribution will look like?

**In this example, the mean is slightly greater than the median—practically a normal distribution, but slightly skewed to the right (positively skewed).**

2. You take a sample of 50 police officers from large urban police departments in Maryland. The table below provides information on your sample of 50 officers and the number of civilian complaints filed against those officers over the past 10 years. Use this ungrouped frequency distribution to answer the questions below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *# Complaints* | *f* | *cf* | *%* | *c%* | *f·x* |
| 0 | 19 | 19 | 38 | 38 | 0 |
| 1 | 7 | 26 | 14 | 52 | 7 |
| 2 | 8 | 34 | 16 | 68 | 16 |
| 3 | 6 | 40 | 12 | 80 | 18 |
| 5 | 4 | 44 | 8 | 88 | 20 |
| 6 | 2 | 46 | 4 | 92 | 12 |
| 7 | 2 | 48 | 4 | 96 | 14 |
| 9 | 1 | 49 | 2 | 98 | 9 |
| 13 | 1 | 50 | 2 | 100 | 13 |
| Σ | 50 |  | 100 |  | 109 |

Calculate the mean, median, and mode.

**Mode = 0 complaints**

**Median Position =; median = 1 complaint**

** complaints**

3. In a study of 40 incidents of domestic assault reported to law enforcement agencies in Maryland, researchers collect information about the age of each victim.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Stated Limits | Real Limits | *mi* | *f* | *cf* | *p* | *%* | *cp* | *c%* | *fi·mi* |
| 16–19 | 15.5–19.5 | 17.5 | 1 | 1 | 0.025 | 2.50 | 0.025 | 2.50 | 17.5 |
| 20–23 | 19.5–23.5 | 21.5 | 2 | 3 | 0.050 | 5.00 | 0.075 | 7.50 | 43 |
| 24–27 | 23.5–27.5 | 25.5 | 10 | 13 | 0.250 | 25.00 | 0.325 | 32.50 | 255 |
| 28–31 | 27.5–31.5 | 29.5 | 9 | 22 | 0.225 | 22.50 | 0.550 | 55.00 | 265.5 |
| 32–35 | 31.5–35.5 | 33.5 | 6 | 28 | 0.150 | 15.00 | 0.700 | 70.00 | 201 |
| 36–39 | 35.5–39.5 | 37.5 | 4 | 32 | 0.100 | 10.00 | 0.800 | 80.00 | 150 |
| 40–43 | 39.5–43.5 | 41.5 | 5 | 37 | 0.125 | 12.50 | 0.925 | 92.50 | 207.5 |
| 44–47 | 43.5–47.5 | 45.5 | 0 | 37 | 0.000 | 0.00 | 0.925 | 92.50 | 0 |
| 48–51 | 47.5–51.5 | 49.5 | 1 | 38 | 0.025 | 2.50 | 0.950 | 95.00 | 49.5 |
| 52–55 | 51.5–55.5 | 53.5 | 1 | 39 | 0.025 | 2.50 | 0.975 | 97.50 | 53.5 |
| 56–59 | 55.5–59.5 | 57.5 | 1 | 40 | 0.025 | 2.50 | 1.000 | 100.00 | 57.5 |
|  |  | Σ | 40 |  | 1 | 100 |  |  | 1300 |

a. What are the mode, mean, and median of these data?

*Xmode = 23.5-27.5 (or 25.5)* 

 = , where . . .

**L = lower limit of the real class limit containing the median = 27.5**

**N = number of observations in the sample = 40**

**f = frequency of the interval containing the median = 9**

**cf = cumulative frequency of the class interval before the median = 13**

**w = width of the class interval = 4**

**The median is a better measure of central tendency due to several large observations (potential outliers) pulling the mean upward.**

**The distribution will be positively skewed as the mean is larger than the median.**

4. You want to look at the relationship between officer rank and the number of citizen complaints received. You gather the following data from 83 police officers from the Prince George’s County Police Department.

|  |  |  |  |
| --- | --- | --- | --- |
| Rank | *n* |  |  |
| Patrolman | 62 | 5 | 310 |
| Sergeant | 15 | 3 | 45 |
| Lieutenant | 6 | 1 | 6 |
| **Σ** | **83** | **9** | **361** |

a. Calculate the *unweighted* mean number of citizen complaints.

**, where k is the number of categories**

*9/3 = 3*

b. Calculate the *weighted* mean number of citizen complaints.

**, where nk is the number in each category and is the mean of each category**

**361/83 = 4.35**

c. Which is better and why?

**Weighted mean because it takes into account the frequency with which each rank occurs.**