Central Tendency Worksheet

## Mean

1. A professor, who has three separate classes for the same subject, just finished grading everyone's grade on their first test of the semester. The professor wants to know the class average of each individual class, as well as the average of all three classes. Using the data below, find the information that the professor wants.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C-1 | 89 | 70 | 73 | 56 | 93 | 84 | 67 | 80 | 76 | 68 | 70 | 97 | 90 | 58 | 55 | $n_1 = 15$ |
| C-2 | 78 | 66 | 93 | 97 | 100 | 45 | 56 | 74 | 88 | 72 | 80 | | | | | $n_2 = 11$ |
| C-3 | 44 | 79 | 72 | 84 | 81 | 98 | 100 | 90 | 93 | 97 | 99 | 60 | 85 | | | $n_3 = 13$ |

Class 1 (C-1) mean:

$\Sigma x_1 = 89 + 70 + 73 + \ldots + 55 = 1126$

$\overline{X_1} = \frac{\Sigma x_1}{n_1} = \frac{1126}{15} = \boxed{75.07}$

Class 2 (C-2) mean:

$\Sigma x_2 = 78 + 66 + 93 + \ldots + 80 = 849$

$\overline{X_2} = \frac{\Sigma x_2}{n_2} = \frac{849}{11} = \boxed{77.18}$

Class 3 (C-3) mean:

$\Sigma x_3 = 44 + 79 + 72 + \ldots + 85 = 1082$

$\overline{X_3} = \frac{\Sigma x_3}{n_3} = \frac{1082}{13} = \boxed{83.23}$

Overall mean:

$\overline{X}_{Overall} = \frac{\overline{X_1} + \overline{X_2} + \overline{X_3}}{3} = \frac{75.07 + 77.18 + 83.23}{3} = \boxed{78.49}$

2. Riley, a student instructor tasked with grading the tests for a class, had just finished calculating the average when she realized that the test scores for one of the students were lost. Rather than re-grade the test, she decided to find it with the data she had already and thinks the test grade is 58. Using that same data, determine whether or not Riley is correct. (Round to nearest whole number.)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 78 | 92 | 60 | 59 | 48 | 80 | 88 | 75 | 82 | ? | 74 | 95 | 86 | 66 | 68 | 89 |
| **Class average:** 74.41 | | | | | | | | | | | | | | | | |

$\overline{X} = \frac{\Sigma x}{n} \rightarrow \Sigma x = \overline{X} \cdot n = (74.41) \cdot (17) = 1264.97$ — subtract

$\Sigma x_{1-10} + \Sigma x_{12-17} = \underbrace{(65 + 78 + \ldots + 82)}_{727} + \underbrace{(74 + 95 + \ldots + 89)}_{478} = 1205$

$59.97 \approx \boxed{60}$

Riley is incorrect!

# Median

Find the median of each data set below. (Hint: make sure to sort the data first!)

A. 42, 17, 20, 89, 23, 56, 78, 34, 91, 65, 65, 12 → 12 values → $\frac{12}{2}$ = 6th & 7th values

12, 17, 20, 23, 34, (42, 56) 65, 65, 78, 89, 91

$M = \frac{42+56}{2} = (49)$

B. 10, 29, 33, 42, 20, 9, 89, 66, 87, 33, 59 → 11 values

9, 10, 20, 29, 33, (33) 42, 59, 66, 87, 89

$M = (33)$

C. 1, 3, 3, (5, 6) 7, 9, 9 → sorted w/ 8 values
→ $\frac{8}{2}$ = 4th & 5th values

$M = \frac{5+6}{2} = (5.5)$

D. 10, 13, 14, 15, 16, 16, 18, 19, (20) 44, 50, 50, 65, 70, 70, 87, 99 → 17 values, sorted

$M = (20)$

# Mode

1. A student is gathering research on the length of a lizard's tail in relation to a behavioral mechanism. The measurements that were gathered are below. What is the mode of tail length?

Research collected: 4, 4.5, 4.25, 3, 2.75, 3.5, 4.5, 3.75, 4, 4, 4.25

(4:3x), 4.5:2x, 4.25:2x, 3:1x, 2.75:1x, 3.5:1x, 3.75:1x

Mode = (4)

2. A professor had an ice-breaker survey on the first day of class on what type of hair length each student prefers. What type of hair length is the mode of the class? *(Note: the result of each individual is represented by the orange shaded cell.)*

| Short Hair | Medium Hair | Long Hair |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Mode = Medium

3. In an experiment to see what toy is more favorable to a family's dog (Button), Aaron tests which of 2 different toys Button runs for first in 5 different trials every 30 minutes. Based off the results below, which toy is the dogs favorite?

Ball: 2x
Rope: 3x

| Trial 1 | Trail 2 | Trail 3 | Trail 4 | Trail 5 |
|---|---|---|---|---|
| Rope toy | Ball | Ball | Rope | Rope |

Mode = Rope toy

4. Out of curiosity, a professor asks her class of 13 what classification (i.e. freshman, sophomore, junior, or senior) everyone in the class is. Based on the results below, what is the mode? *(Note: the result of each individual is represented by the orange shaded cell.)*

| Freshman | Sophomore | Junior | Senior |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Mode = Freshman

## Relationship between Mean, Median, and Mode

For each diagram, determine what the mean, median, and mode is. Based off that, what is the type of symmetry, and what does that tell you about the relationship between the three central tendencies?

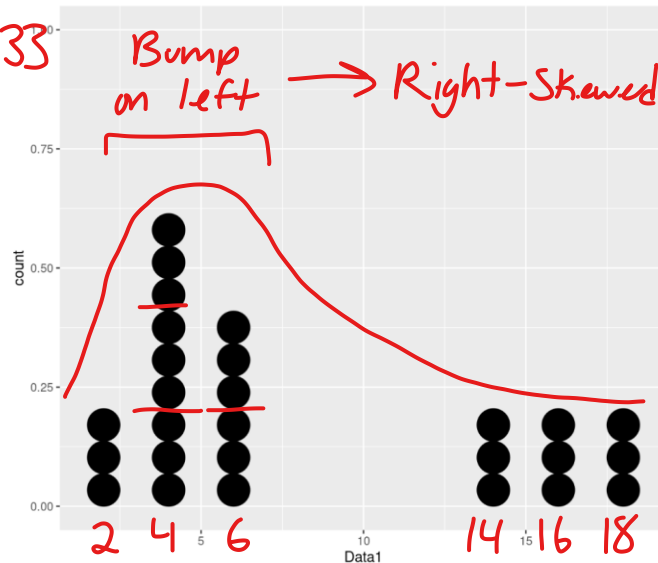1.  Data that the diagram shows: **27 values → 13 on each side**

Data1 = 2, 2, 2, 4, 4, 4, 4, 4, 4, 4, 4, 6, 6, 6, 6, 6, 6, 14, 14, 14, 16, 16, 16, 18, 18, 18

$$\bar{X} = \frac{\Sigma x}{n} = \frac{198}{27} = 7.33$$

$$M = 6$$

$$Mode = 4$$

$$Mode < M < \bar{X}$$

**Right-Skewed**

Bump on left → Right-Skewed



2.  Data that the diagram shows: **18 values → $\frac{18}{2}$ = 9th & 10th values**

Data2 = 2,2,4,4,4,4,6,6,6,6,6,6,8,8,8,8,10,10

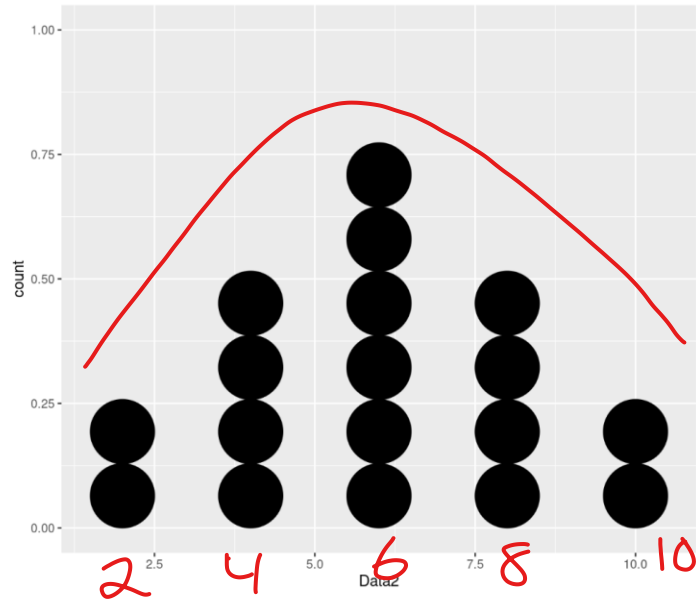$$\overline{X} = \frac{\Sigma x}{n} = \frac{108}{18} = 6$$

$$M = 6$$

$$Mode = 6$$

$$Mode = M = \overline{X}$$

Symmetric



3. Data that the diagram shows: 27 values → 13 on each side

Data3 = 2,2,2,4,4,4,6,6,6,14,14,14,14,14,14,16,16,16,16,16,16,16,16,16,18,18,18

$$\overline{X} = \frac{\Sigma x}{n} = \frac{318}{27} = 11.78$$

$$M = 14$$

$$Mode = 16$$

$$\overline{X} < M < Mode$$

Left-Skewed

Left-Skewed ← Bump on Right