**60080079 Introduction to Statistical Methods**
**Semester 2 2023-2024**
**Solutions 1**

**1.** Write your answer as a five-digit number: 13132

1.1 The individuals are the students (i.e., Advani, Barton, etc.). The variables are Major, Points and Grade.

1.2 Major is categorical (nominal). Grade is categorical (ordinal). Points is quantitative (ratio).

**2.** Write your answer as a single-digit number: 4

**3.** Write your answer as a two-digit number: 21

**4.** Write your answer as a three-digit number: 233

4.1 There are no obvious differences between the two distributions.

4.2 Both centers are between 110 and 115.

**5.** Write your answer as a four-digit number: 3542

**6.** Write your answer as a four-digit number: 3312

Without the outlier, $\bar{x} = \frac{\Sigma x}{n} = \frac{2339}{17} = 137.59$. With the outlier, $\bar{x} = \frac{2539}{18} = 141.06$. Without the outlier, the median is 137, the 9th smallest observation in the list: $p(n+1) = .5 \times (17+1) = 9$. With the outlier the median is 138.5 which is the average of the 9th and 10th smallest observations ( $p(n+1) = .5 \times (18+1) = 9.5$). The mean changed by about 3.5 while the median changed by only 1.5 as a result of dropping the outlier.

**7.** Write your answer as a two-digit number: 42

**8.** Write your answer as a five-digit number: 42311

Min = 10.8, and Max = 15.9. The median is the average of the 25th and the 26th data, so $Q_2$ = 13.9. $Q_1$ = 13 is the median of the first 25 data, which is the 12th observation. $Q_3$ = 14.4 is the median of the last 25 data, which is the 38th observation.

IQR = $Q_3$ - $Q_1$ = 1.4, so the lower cutoff is $Q_1$ - 1.5 *IQR = 10.9, and the upper cutoff is Q3 + 1.5×IQR = 16.5. The observation 10.8 is the outlier.

**9.** Write your answer as a two-digit number: 31

| $x$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 5.50 | 0.0521 | 0.0027 |
| 5.61 | 0.1621 | 0.0263 |
| ⋮ | | |
| ⋮ | | |
| 5.68 | 0.2321 | 0.0539 |
| 5.85 | 0.4021 | 0.1617 |

$\Sigma x = 157.99$ $\Sigma(x-\bar{x})^2 = 1.3669$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{157.99}{29} = 5.4479$$

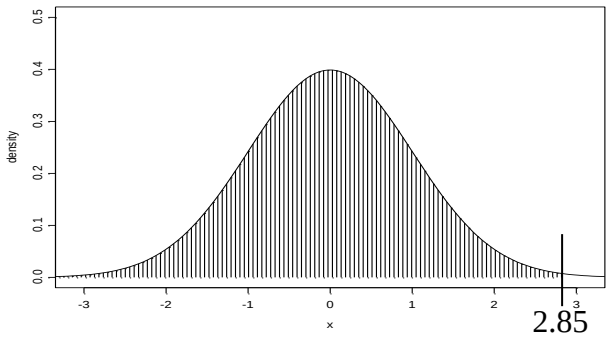
$$s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}} = \sqrt{\frac{1.3669}{29-1}} = 0.2209$$

**10.** Write your answer as a three-digit number: 332

**11.** Write your answer as a one-digit number: 1

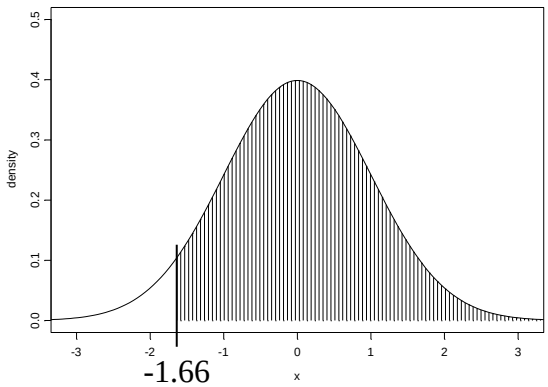
**12.** Write your answer as a four-digit number: 1243

12.1 Table A shows that the area to the left of $Z$ = 2.85 is 0.9978 .




12.2 The area to the right of $Z$ = 2.85 is just 1 - .9978 = 0.0022

12.3 The area to the right of $Z$ = -1.66 is the same as the area to the left of $Z$ = 1.66 which is 0.9515



12.4 The area between $Z = -1.66$ and $Z = 2.85$ is just the area to the left of $Z = 2.85$ minus the area to the left of $Z = -1.66$ which is 0.9515 - 0.0022 = 0.9493.