Test I Do Over Solutions

MAT 203, Elementary Statistics, Term IV
Coker College

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This is a take home test on the subject matter covered on the first test for those who were not satisfied with their score on the first test. **This test is completely optional.** If your score on this test is higher than your score on the in-class version, I will average the two scores and enter that as your score for Test I. If you don't take this do over, then your score on the first test will stand as is.

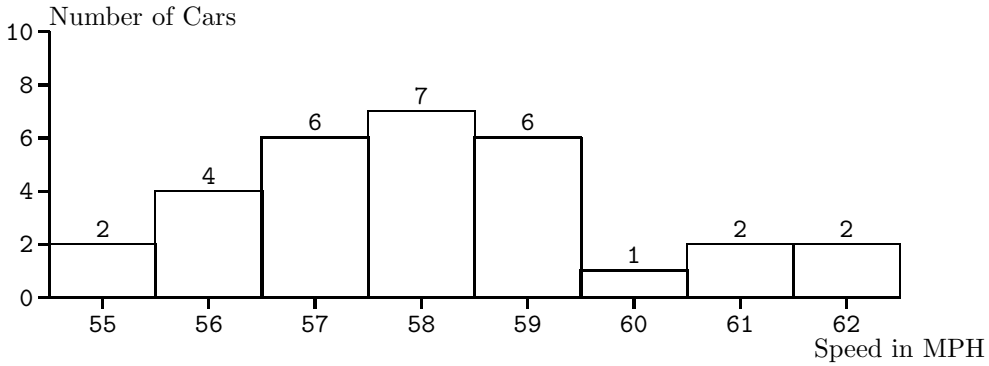
Please complete the following problems. You may use a calculator, paper and pencil, your text and your class notes. You must work alone. Please write legibly. **You must show your work in order to receive full credit.** Please write out any formulae that you use so that I can understand how you did the problem. You may, of course, check your answers using the statistical functions on your calculator. Please turn this test in at the beginning of class on 31 March. Good Luck!

A policeman measures the speed of 30 randomly chosen cars along a stretch of highway. His results are shown in Table 1. All speeds are given in MPH.

1. Calculate the relative frequency of finding cars going 57 MPH.

   Six cars out of thirty are going 57 MPH, so the relative frequency f_{relative} of 57 MPH is just $f_{\text{relative}} = \frac{6}{30} = \frac{1}{5}$ or 20%.

2. Draw a histogram of this distribution.



3. What is the mode of this distribution?

   The mode of a distribution is just that value of the distribution that appears with the greatest frequency. From Table 1, cars going 58 MPH appear more often than any of the others, so $x_{\text{mode}} = 58$ MPH.

4. What is the mean of this distribution?

$$\begin{aligned} x_{\text{mean}} &= \frac{1}{n}\sum_i f_i^{\text{class}} x_i^{\text{class}} \\ &= \frac{1}{30}\left[(2\times 55)+(4\times 56)+(6\times 57)+(7\times 58)+(6\times 59)+(1\times 60)+(2\times 61)+(2\times 62)\right] \\ &= \frac{1}{30}\left[110+224+342+406+354+60+122+124\right] \\ &= \frac{1742}{30} \\ &= 58.1 \text{ MPH} \end{aligned}$$

5. What is the median of this distribution?

   Since there are an even number of data points in the distribution, we need to average the center-most two.

$$x_{\text{median}} = \frac{x_{15} + x_{16}}{2} = \frac{58 + 58}{2} = 58 \text{ MPH}$$

6. What is the standard deviation of this distribution?

$$\begin{aligned} s &= \sqrt{\frac{\sum_i f_i^{\text{class}}(x_i^{\text{class}} - x_{\text{mean}})^2}{n-1}} \\ &= \sqrt{\frac{1}{30-1}} \times [2 \times (55-58.1)^2 + 4 \times (56-58.1)^2 + 6 \times (57-58.1)^2 + 7 \times (58-58.1)^2 \\ &\quad +6 \times (59-58.1)^2 + 1 \times (60-58.1)^2 + 2 \times (61-58.1)^2 + 2 \times (62-58.1)^2]^{\frac{1}{2}} \\ &= \sqrt{\frac{1}{29}} \times [19.2 + 17.6 + 7.3 + 0.1 + 4.9 + 1.9 + 16.8 + 30.4]^{\frac{1}{2}} \\ &= 1.84 \text{ MPH} \end{aligned}$$

7. Calculate the range of this distribution.

$$R = x_{\max} - x_{\min} = 62 - 55 = 7 \text{ MPH}$$

8. Find Q_1, Q_2 and Q_3 for this distribution.

   Q_1 is just the median if the *left* half of the distribution (ie from x_1 to x_{15}), so we want $x_8 = 57$ MPH. So $Q_1 = 57$ MPH. Q_2 is just x_{median}, so $Q_2 = 58$ MPH. Q_3 is just the median if the *right* half of the distribution (ie from x_{16} to x_{30}), so we want $x_{23} = 59$ MPH. So $Q_3 = 59$ MPH.

9. Calculate the interquartile range for this distribution.

   The interquartile range IQR is given by $\text{IQR} = Q_3 - Q_1 = 59 - 57 = 2$ MPH.

10. Find the z-score that corresponds to 56 MPH. Interpret your result.

$$z = \frac{x_i - x_{\text{mean}}}{s} = \frac{56 - 58.1}{1.84} = -1.1$$

    So, 56 MPH is 1.1 standard deviations below the mean.

Speed on MPH	Number of Cars
55	2
56	4
57	6
58	7
59	6
60	1
61	2
62	2

Table 1: The first column shows the speed of the cars in MPH, and the second column gives the number of cars going that speed.