

## Stat 2000 International – Final - Answers

1. Correct answer: [2] All students at the university.
2. Correct answer: [2] census
3. Correct answer: [1] exercise
4. Correct answer: [1] Both variables are qualitative.
5. Correct answer: [3] 0.999998
6. Correct answer: [4] A confidence interval consists of the following critical parts: lower value, upper value, confidence level, and population parameter.
7. Correct answer: [4] about 0.68
8. Correct answer: [2] about 0.7662
9. Correct answer: [2] 0.2
10. Correct answer: [3] Graduates in civil engineering and graduates in mechanical engineering do not differ significantly in starting salaries.
11. Correct answer: [3] about 0.0776
12. Correct answer: [2] For each sample size, the distribution is centered at about the same point, which also is approximately the population mean. For  $n = 25$ , there is more variation among the different sample means than when  $n = 100$ .
13. Correct answer: [2] \$0.056
14. Correct answer: [3] about 0.95
15. Correct answer: [3] The totals in a given category within a table, since they are the totals written into the right (for the rows) or bottom (for the columns) margins of the table.
16. Correct answer: [3]  $H_a: p > 1/2$
17. Correct answer: [2] about 0.1667
18. Correct answer: [5]  $H_0$ : Population mean = 400;  $H_a$ : Population mean  $\neq$  400

- 19.** Correct answer: [3] The chi-square statistic is 0.323. The p-value is 0.5698. Do not reject the null hypothesis, conclude that there is no relationship between opinion on English only and education.
- 20.** Correct answer: [6] If the population mean is really 23, the probability is 0.0003 that the mean of the 36 ages could be more than 25.16.
- 21.** Correct answer: [1] Sample No. 1
- 22.** Correct answer: [4] No, there is no linear relationship.
- 23.** Correct answer: [2] The p-value would decrease.
- 24.** Correct answer: [3] 20 pounds
- 25.** Correct answer: [3] 852.37
- 26.** Answer: (a) The 30th percentile is 68.6 and (b) the 80th percentile is 91.
- 27.** Answer: (a) Median BMI about 31 (b) Maximum BMI about 72 and (c) About 75% more than 25
- 28.** Answer: (a) 0.3062 and (b) 5
- 29.** Answer: Test results are independent so we use:  
 $P(\text{both of them positive}) = 0.89 * 0.89 = 0.7921$
- 30.** Answer: You can start with the "Graphing Normal z-Score/Probability" calculator for example. Enter 63 for the mean and 2.9 for the standard deviation. Calculate the "Area left of" 61 (0.2452) and "Area right of" 68 (0.0423) and then subtract these two numbers from 1.0. This will tell us that the proportion of women between 61 and 68 inches tall is  $1.0 - (0.2452 + 0.0423) = 0.7125$ .
- 31.** Answer: You can start with the "Graphing Normal z-Score/Probability" calculator for example. Enter 63 for the mean and 2.9 for the standard deviation. Choose "Area left of" and type in the area (the red number) as 0.20. Then click on "Compute!" and the answer will be that 60.56 is the 20th percentile.
- 32.** Answer:  $z\text{-statistic} = (0.36 - 0.32) / 0.047 = +0.8511$
- 33.** Answer:  $1 - 0.992^{10} = 0.0772$
- 34.** Answer: The mean blood pressure in the population of women may indeed be 115. The p-value is large (bigger than 0.05) so we cannot reject the null hypothesis.
- 35.** Answer: slope =  $(\$1.75 - \$1.25) / (32 - 24) = \$0.0625$   
Therefore, a 48 ounce jar sells for  $\$1.25 + \$0.0625 * (48 - 24) = \$2.75$ .

**36.** Answer: civil-eng = 230.4, chem-eng = 194.75, elect-eng = 205.25, comp-eng = 328

**37.** Answer: civil-eng = 233, chem-eng = 190, elect-eng = 205, comp-eng = 321

**38.** Answer: The four means are very similar to the corresponding four medians. This is a first indicator that the distributions of textbook spendings for the four majors are symmetric around the corresponding means.

**39.** Answer: According to the boxplots, there are no outliers.

**40.** Answer: We have to use a t-test (with 4 degrees of freedom) here since the sample size is relatively small ( $< 30$ ) but the data seems to approximately follow a normal curve. The p-value is 0.0682 which is obviously more than 0.05. We fail to reject  $H_0$ , concluding that the faculty might be right, i.e., civil-eng students in fact may only spend \$200 on textbooks.

**41.** Answer:

95% Confidence interval results (comp-eng): (238.53654, 417.46344)

95% Confidence interval results (elect-eng): (145.84848, 264.65152)

Since the two confidence intervals overlap, there is indeed a (slight) chance that the comp-eng faculty might be right, i.e., comp-eng students in fact on average may spend the same amount of money on textbooks as the elect-eng students.

**42.** Answer: Use a Graphing t-Distribution calculator (with 3 degrees of freedom) and determine a value such that an area of 0.9 is to the left of this value and an area of 0.1 is to the right. The value 1.638 satisfies this condition and is the multiplier (for a 80% CI) we need.

The standard error can be calculated as follows:

$$\text{standard deviation} / \sqrt{n} = 30.609095 / \sqrt{4} = 15.304547$$

**43.** Answer: No - it could easily happen that we would get some totally different outcomes if we would deal with greater sample sizes. It appears as if the very small sample sizes here prevent us from getting any significant results.

**44.** Answer: There is a linear trend, with higher AirPressure associated with higher BoilingPoints. There seems to be no outlier.

**45.** Answer: The correlation is 0.9972102. This indicates that there is a very strong positive association and also that the points are very close to a line with positive slope.

**46.** Answer:  $\text{BoilingPoint} = 155.29648 + 1.9017835 * \text{AirPressure}$

The p-value associated with AirPressure is  $< 0.0001$  (which obviously is  $< 0.05$ ), i.e., the slope is significantly different from 0. Therefore, we can use the regression equation to predict BoilingPoint from AirPressure.

**47.** Answer: For 25: around 202.84106; for 30: around 212.34999; for 35: around 221.8589. The last value (for AirPressure 35) is least reliable. We are extremely extrapolating for this value (an AirPressure of 35 is almost 5 above the highest observed value).

**48.** Answer: For AirPressure 27, the predicted BoilingPoint is around 206.64464. A 95% CI is (206.3693, 206.91998). A BoilingPoint of 208 clearly falls outside the 95% CI and therefore is a surprising result (which may be explained by limited equipment and little experience of the student).

**49.** Answer: The histogram is slightly skewed towards the higher values. There are no outliers. The modal bar is the one from 22 to 24.

**50.** Answer: The boxplot is quite skewed towards the higher values. There are no outliers.