1. Mark the following T if it is always true, or F if it could be false.

_____ Doubling the sample size halves the variance of a sampling distribution.

_____ A z-value of 3 or higher is more likely than a z-value of 2 or higher.

_____ If $P = 0.02$, we reject the null hypothesis at the 1% level.

_____ For a given sample size, a larger confidence interval has a lower confidence level.

_____ If the null hypothesis is rejected at the 1% level, then it will be rejected at the 5% level.

_____ The P-value tells us the probability that the alternative hypothesis is true.

_____ If we collect another sample and repeat a statistical test, we are certain to reach the same conclusion (eg, rejecting the null hypothesis) the second time.

_____ For any events A and B, we have $P(A \text{ or } B) = P(A) + P(B)$

_____ The value of the probability density function (PDF) for the standard normal distribution is zero at $z = 0.6$.

_____ For any events A and B, we have $P(A|B) = P(A)/P(B)$

_____ A statistical test may enable you to prove the null hypothesis.

_____ A higher significance level means that it is less likely that the null hypothesis is rejected.

2. For each research question in (a)—(f), decide what statistical procedure, (I)—(VII) would most likely be used to answer it. Assume all assumptions have been met for using the procedure. *Fill each blank with one of (I)—(VII).*

   (I) One sample test for mean
   (II) Two sample test for means
   (III) One sample test for proportion
   (IV) Two sample test for proportions
   (V) Chi-square test
   (VI) ANOVA (analysis of variance)
   (VII) Construct confidence interval

   (a) Does support for a school bond issue (For or Against) differ by neighborhood in the city?

   Use procedure_____

   (b) We sample the math self-esteem scores from a random sample of 25 females. What are the probable values of the population mean score for this group?

   Use procedure_____

   (c) A researcher wants to know if intelligence as measured by IQ scores differs between college students on academic probation and those not on probation.

   Use procedure_____

   (d) Do college grade point averages differ for students in the natural sciences, the social sciences, and the humanities?

   Use procedure_____

   (e) Do a larger proportion of patients taking a new drug recover than of those taking the old one?

   Use procedure_____

   (f) Does a majority of the adult population support tougher drinking and driving laws?

   Use procedure_____

3. For each of the following situations, identify the correct statistic and procedure. *Check one response on each line*.

   (a) Testing whether or not a sample of test scores comes from a population whose mean is 50 and whose standard deviation is 5.

   Confidence interval_____ or Hypothesis test_____

   One sample_____ or Two sample_____

   z statistic_____ or *t* statistic_____

   (b) Estimating the mean of a population of weights based on a sample of weights (with mean 25 kg and standard deviation 1.5 kg).

   Confidence interval_____ or Hypothesis test_____

   One sample_____ or Two sample_____

   z statistic_____ or *t* statistic_____

   (c) Testing to see if there is a difference in cholesterol level between patients that are treated with two different types of medicine: one group gets Medicine A and the other group gets Medicine B.

   Confidence interval_____ or Hypothesis test_____

   One sample_____ or Two sample_____

   z statistic_____ or *t* statistic_____

4. Which of the following *t* scores is most likely to be significant (if the *df* are the same for all four *t* values)?

   (a). – 0.23 (b). – 2.01 (c). 1.98 (d). 0.50

5. You are hired to conduct a study to find out which of two brands of soda college students think taste better. In your study, students are given a blind taste test. They rate one brand and then rated the other, in random order. The ratings are given on a scale of 1 (awful) to 5 (delicious). Which type of test would be the best to compare these ratings?

   (a) one-sample t
   (b) paired difference t
   (c) two-sample t
   (d) chi-square

6. Weight is a measure that tends to be normally distributed. The mean weight of all women at a large university is 135 pounds, with a standard deviation of 12 pounds. If you randomly sample 36 women at this university, there is a 68% chance that the sample mean weight is between:

   (a) 119 and 151 pounds
   (b) 123 and 147 pounds
   (c) 125 and 145 pounds
   (d) 131 and 139 pounds
   (e) 133 and 137 pounds

7. In the population of US adults over 30 years old there are 53% women. The probability of finding 49 or fewer women in a simple random sample of 100 adults over 30 years old is closest too:

   (a) 0.0053
   (b) 0.053
   (c) 0.0499
   (d) 0.211
   (e) 0.801

8. A large number of 95% confidence intervals are constructed from a population using a fixed sample size. Which of the following statements is most accurate?

   (a) 95% of the intervals constructed using this process will include the population mean; 5% will not.
   (b) 95% of the intervals constructed using this process will include the sample mean; 5% will not.
   (c) 95% of the possible population means will be included by the interval; 5% will not.
   (d) 95% of the possible sample means will be included by the interval; 5% will not.

9. A research article reports a *P*-value of 0.001. Which definition of a *P*-value is the most accurate?

   (a) The probability of observing a statistic (that is, an outcome) as extreme or more extreme than the one observed if the null hypothesis is true.
   (b) The value that an observed statistic (outcome) must reach in order to be considered significant.
   (c) The probability that an observed statistic (outcome) will not be significant.
   (d) The probability that the observed statistic (outcome) will occur again.

10. A sample is taken to test a hypothesis. Which of the following is true?

   (a) It is impossible to prove the null hypothesis.
   (b) It is always possible to prove the null hypothesis.
   (c) It is possible to prove the null hypothesis under certain conditions.

Solutions to TF-MC

1.

__T___ Doubling the sample size halves the variance of a sampling distribution.

__F___ A z-value of 3 or more is more likely than a z-value of 2 or more.

__F____ If $P = 0.02$, we reject the null hypothesis at the 1% level.

__F____ For a given sample size, a larger confidence interval has a lower confidence level.

__T____ If the null hypothesis is rejected at the 1% level, then it will be rejected at the 5% level.

__F____ The P-value tells us the probability that the alternative hypothesis is true.

__F____ If we collect another sample and repeat a statistical test, we are certain to reach the same conclusion (eg, rejecting the null hypothesis) the second time.

__F____ For any events A and B, we have $P(A \text{ or } B) = P(A) + P(B)$

__F____ The value of the probability density function (PDF) for the standard normal distribution is zero at $z = 0.6$.

__F____ For any events A and B, we have $P(A|B) = P(A)/P(B)$

__F____ A statistical test may enable you to prove the null hypothesis.

__F____ A higher significance level means that it is less likely that the null hypothesis is rejected.

2. (a) is (V)
   (b) is (VII)
   (c) is (II)
   (d) is (VI)
   (e) is (IV)
   (a) is (III)

3.
(a) Confidence interval_____ or Hypothesis test___X___
One sample__X____ or Two sample_____
z statistic__X___ or t statistic_____

(b) Confidence interval___X___ or Hypothesis test_____
One sample__X____ or Two sample_____
z statistic_____ or t statistic__X___

(c) Confidence interval_____ or Hypothesis test___X___
One sample_____ or Two sample___X___
z statistic_____ or t statistic__X___

4. (b)

5. (b)

6. (e) Standard deviation of the sample is $12/\sqrt{36} = 2$ pounds. Since 68% is within 1 standard deviation, answer is 135 ± 2 or 133 to 137 pounds.

7. (d) The proportion of women in the sample is approximately normally distributed, with mean 0.53 and standard deviation

$$\sigma_{\hat{p}} = \sqrt{\frac{0.53(1-0.53)}{100}} = 0.0499.$$

Thus

$$z = \frac{0.49 - 0.53}{0.0499} = -0.801.$$

From the table,

$$P(Z < -0.801) = 0.212.$$

Alternatively, from the calculator,

$$P(\hat{p} < 0.49) = \text{normalcdf}(-10, 0.49, 0.53, 0.0499) = 0.211.$$

8. (a)

9. (a)

10. (a)