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1. Problem 1
   1. Estimation, estimators, estimates
      1. Estimators are used to makes estimates of a value. For example, a sample mean is an estimator of a population mean. Estimation is the process by which these estimates are made.
   2. Unbiasedness
      1. When an estimator does not have any bias, meaning that the estimator is exactly equal to the parameter it is supposed to predict. This is the opposite of a bias estimator, which will always predict with some error the parameter.
   3. Standard errors
      1. Measurement of spread on a statistic, used when true parameter values are unknown (sample mean vs population mean)
   4. Confidence interval
      1. Interval in which the parameter like likely to be inside. The larger the interval the higher the chance the parameter’s true value is within the interval.
   5. Null/alternative hypothesis
      1. Hypotheses generated in hypothesis testing. Generally, one attempts to disprove the null hypothesis, and the logical invalidation of the null hypothesis should lead on to conclude that the alternative hypothesis is true. The alternative hypothesis is generally what the researcher is trying to conclude with the experiment.
   6. Test statistic
      1. Numbers used to generate p values that are calculated using parameters or estimates of parameters. Examples are t and z scores.
   7. Critical values, p-values, a level
      1. a level or alpha level is significance level. When hypothesis testing, one can successfully reject the null hypothesis if the probability of obtaining results at least as extreme as observed is less than the alpha level.
      2. P value is the probability of finding results as extreme as observed.
      3. Critical values are the test statistic values needed to find statistical significance in the data and reject the null hypothesis.
   8. Statistical Significance
      1. When a result is observed that has a very low likelihood to have occurred due to random chance alone.
2. Problem 2
   1. This would be an estimate since there is no control group to compare to. I would estimate amount of weight lost as a result of the exercise plan.
   2. This question I’m not entirely sure. Using physics couldn’t one plug in the position and time values to generate the exact trajectory of the missile? My guess would be an estimate.
   3. The goal here is to estimate the position of the car. You can’t test because you can’t account for error in this situation, you can only attempt to minimize it through estimation.
   4. This would be a test. You would be comparing your results with a fair die to the results of the accused. Your results would be the control since you know that you are using a fair die.
   5. This would be an estimate, you obviously cannot compare your gas costs to something else, you are trying to estimate what your commuting budget should be.
   6. This would be a test. I would take a random sample of families with at least one person who has the disease and a sample of families with no infections and compare the amount of infections within families after a period of time.