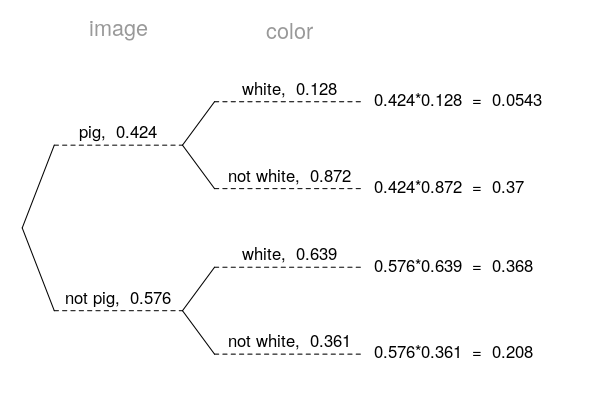
1. **Question**  
   In a deck of strange cards, there are 1115 cards. Each card has an image and a color. The amounts are shown in the table below.

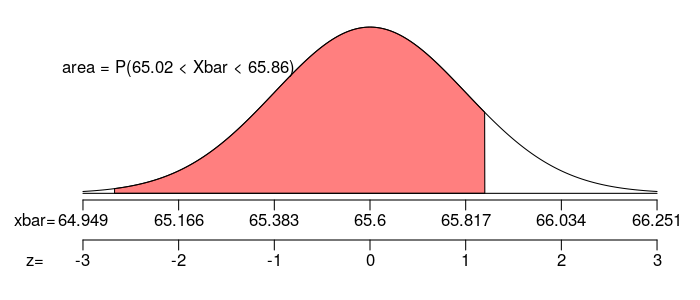
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | * black | * gray | * indigo | * violet | * yellow |
| * cat | * 25 | * 97 | * 66 | * 69 | * 55 |
| * dog | * 28 | * 60 | * 35 | * 49 | * 81 |
| * flower | * 15 | * 63 | * 54 | * 95 | * 21 |
| * horn | * 53 | * 87 | * 84 | * 14 | * 64 |

* 1. What is the probability a random card is a horn given it is gray?
  2. What is the probability a random card is a cat?
  3. What is the probability a random card is either a flower or violet (or both)?
  4. What is the probability a random card is both a cat and yellow?
  5. What is the probability a random card is black given it is a cat?
  6. What is the probability a random card is yellow?
* **Solution**

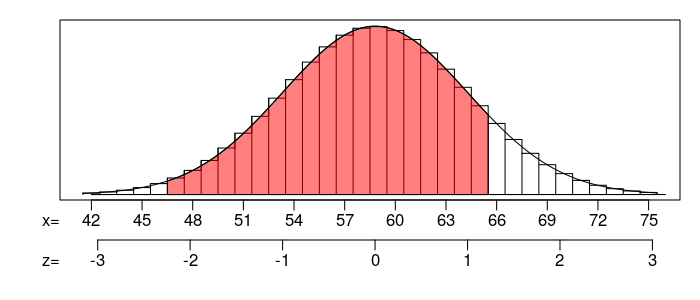
1. **Question**  
   In a deck of strange cards, each card has an image and a color. The chance of drawing a pig is 42.4%. If a pig is drawn, there is a 12.8% chance that it is white. If a card that is not a pig is drawn, there is a 63.9% chance that it is white.

* Now, someone draws a random card and reveals it is not white. What is the chance the card is not a pig?
* **Solution**  
  I’d recommend making a tree. Remember, on the first branch, we put simple probabilities. On the second branches we put conditional probabilites. The results (products) are joint probabilities.
* 
* Determine the appropriate conditional probability.

1. **Question**  
   In a very large pile of toothpicks, the mean length is 65.6 millimeters and the standard deviation is 2.66 millimeters. If you randomly sample 150 toothpicks, what is the chance the sample mean is between 65.02 and 65.86 millimeters?

* **Solution**  
  Label the given information.
* Find the standard error.
* Describe the sampling distribution.
* Draw a sketch.  
  
* Calculate a scores.
* Determine the probability.

1. **Question**  
   In a game, there is a 49% chance to win a round. You will play 120 rounds.
   1. What is the probability of winning exactly 64 rounds?
   2. What is the probability of winning at least 47 but at most 65 rounds?

* **Solution**  
  We use the formula for binomial probabilities.
* Find the mean.
* Find the standard deviation.
* Make a sketch, specifically try to picture whether you need to add or subtract 0.5 for the continuity correction.
*  Find the scores.
* Calculate the probability.

1. **Question**  
   As an ornithologist, you wish to determine the average body mass of *Oporornis formosus*. You randomly sample 35 adults of *Oporornis formosus*, resulting in a sample mean of 16.08 grams and a sample standard deviation of 2.84 grams. Determine a 99.5% confidence interval of the true population mean.

* **Solution**  
  We are given the sample size, sample mean, sample standard deviation, and confidence level.
* Determine the degrees of freedom (because we don’t know and we are doing inference so we need to use the distribution).
* Determine the critical value, , such that .
* Calculate the standard error.
* We want to make an inference about the population mean.
* Determine the bounds.
* We are 99.5% confident that the population mean is between 14.6 and 17.5.

1. **Question**  
   A treatment group of size 23 has a mean of 119 and standard deviation of 22. A control group of size 12 has a mean of 103 and standard deviation of 15.3. If you decided to use a signficance level of 0.01, is there sufficient evidence to conclude the treatment causes an effect?

* By using the Welch-Satterthwaite equation, I’ve calculated the degrees of freedom should be 30.
  1. State the null hypothesis.
  2. State the alternative hypothesis.
  3. Evaluate the critical value. (The critical value is either or . Determine its value.)
  4. Determine the standard error of the relevant sampling distribution.
  5. Evaluate the absolute value of the test statistic. (The test statistic is either or . Determine its absolute value.)
  6. If possible, evaluate the -value. Otherwise, describe an interval containing the -value.
  7. Do we reject or retain the null?
* **Solution**  
  We are given unpaired data. We are considering a difference of means. Label the given information.
* State the hypotheses.
* We are using a two-tail test. Find such that by using a table.
* Calculate the standard error.
* Determine the test statistic.
* Compare and .
* We can determine an interval for the -value using the table.
* Compare -value and .
* We conclude that we should retain the null hypothesis.
  1. retain the null

1. **Question**  
   From a very large population, a random sample of 5900 individuals was taken. In that sample, 44.2% were cold. Determine a 96% confidence interval of the population proportion.
   1. Find the lower bound of the confidence interval.
   2. Find the upper bound of the condifence interval.

* **Solution**  
  Determine such that .
* Calculate the standard error.
* Calculate the margin of error.
* To find the confidence interval’s bounds, find the sample proportion plus or minus the margin of error.
* Determine the interval.
* We are 96% confident that the true population proportion is between 42.9% and 45.5%.
  1. The lower bound = 0.429, which can also be expressed as 42.9%.
  2. The upper bound = 0.455, which can also be expressed as 45.5%.

1. **Question**  
   An experiment is run with a treatment group of size 127 and a control group of size 140. The results are summarized in the table below.

|  |  |  |
| --- | --- | --- |
|  | * treatment | * control |
| * cold | * 57 | * 83 |
| * not cold | * 70 | * 57 |

* Using a significance level of 0.04, determine whether the treatment causes an effect on the proportion of cases that are cold.
  1. State the null hypothesis.
  2. State the alternative hypothesis.
  3. Evaluate the critical value. (The critical value is either or . Determine its value.)
  4. Determine the standard error of the relevant sampling distribution.
  5. Evaluate the absolute value of the test statistic. (The test statistic is either or . Determine its absolute value.)
  6. If possible, evaluate the -value. Otherwise, describe an interval containing the -value.
  7. Do we reject or retain the null?
* **Solution**  
  State the hypotheses.
* Find such that .
* Determine the sample proportions.
* Determine the difference of sample proportions.
* Determine the pooled proportion (because the null assumes the population proportions are equal).
* Determine the standard error.
* We can be more specific about what the null hypothesis claims.
* We want to describe how unusual our observation is under the null by finding the -value. To do so, first find the score.
* Determine the -value.
* Compare the -value to the signficance level.
* So, we reject the null hypothesis. Thus the difference in proportions is significant.
  1. reject the null