

Activity 12

Name _____

1. Suppose I flip a coin many times. If the coin is fair, what is the proportion of heads I will expect to get?

2. If I flipped the coin 100 times, how many heads would I be expected to get?

3. What is the standard error for this estimate? ($SE = \sqrt{\left(\frac{p(1-p)}{n}\right)}$, where p is the proportion of heads you would expect, and n is the sample size.)

4. Suppose I repeatedly flipped the coin 100 times, and each time I recorded the proportion of heads that came up. Assuming the proportion of heads is normally distributed, use the Empirical Rule to determine the range of proportions you'd expect to get 95% of the time.

5. No we won't actually flip real coins, but we can use Excel to simulate the coin tosses.

a.) Open Excel.

b.) In the A1 cell type: `=ROUND (RAND () , 0)`

This will randomly choose a 0 or 1, simulating a coin toss. Let's say that a 1 is heads and 0 is tails.

c.) Now, grab the little black box in the lower right hand corner and drag it to right so the formula is spread to the CV column. This represents 100 coin tosses.

d.) In the CW1 cell, press the Σ button, and hit enter. This should sum the whole row and tell you how many heads you got out of 100 tosses.

e.) In the CX1 cell type: `=CW1/100`

This gives the proportion of heads you got in that game.

f.) Highlight the whole first row, from A1 to CX1. Grab the little black box in the lower right and drag it down to row 100. Make sure the first row is highlighted when you do this. This should duplicate the 100 tosses 100 times. We're taking 100 samples of 100 tosses each.

g.) In the CW101 cell, type: `=AVERAGE (CW1 : CW100)` Interpret this calculation.

h.) In the CX101 cell, type: `=AVERAGE (CX1 : cx100)` Interpret this calculation.

*Notice the field of numbers changes every time you add something new. This is okay.

6. Count the number of sample proportions that fall within two standard errors of the expected proportion (see problem #4 and look at the CX column). Go ahead and count samples that fall right on the border as being outside of the interval. This is the percent of samples that are within two standard errors of the expected proportion. (It might be easier to count the samples that are outside of the predicted range then subtract this number from 100).

7. How do your results from 6 compare to what you'd expect from the Empirical Rule?

8. Let's Graph the results.

a.) Highlight the cells 1 through 100 in the CX column. From the Edit menu, select Copy. b.) Open Minitab.

c.) Place the cursor in the C1 row, first white cell. (Cell 1).

d.) From the Edit Menu, Select Paste Cells. Your data should appear in the first column.

e.) From the Stat Menu, Select Basic Statistics, and then Display Descriptive Statistics.

f.) Type C1 in the Variables box.

g.) Click the Graphs... button and select Histogram of data, with normal curve. Select the Graphical Summary also. Press the OK button twice.

h.) Print the graphical summary.

9. Look at the shape of the graph. Does the proportion of heads in a sample appear to be normally distributed? Explain.

10. Return to Excel. Edit the Formula in the A1 box to read:

=ROUND((.2 + RAND()),0)

Drag this new formula to column CV, and down to row 100. Leave the CW and CX columns alone. Copy the CX column into the Minitab C2 column. Make a new graph and print it.

11. Answer these three questions: What is the predicted proportion for the number of times this new coin comes up heads? What is the 95% Confidence Interval for this prediction? (Both of these are given on the graphical summary.) Is this coin fair?