Problem 1 – Binomial Experiments with Lots of Trials

Experiment 1

1. What does the command **coinflip(20, 1)** simulate?

2. Run this simulation on page 1.4. What number of heads did you get and how does this compare to your classmates?

3. What does the command **coinflip(20, 5)** simulate?

4. Run this simulation on page 1.4. What number of heads did you get for each trial and how does this compare to your classmates?

5. Increase the number of trials from 5 to 10, then 20, then 100, then 1,000. Adjust the vertical scale as necessary. Describe how the graph changes as the number of trials increases.

Experiment 2

6. What does the command **diceroll(30, 1)** simulate?

7. Run this simulation on page 1.5. How many times was a 2 rolled and how does this compare to your classmates?

8. What does the command **diceroll(30, 5)** simulate?

9. Run this simulation on page 1.5. How many times was a 2 rolled for each trial and how does this compare to your classmates?

10. Increase the number of trials from 5 to 10, then 20, then 100, then 1,000. Adjust the vertical scale as necessary. Describe how the graph changes as the number of trials increases.

11. Compare this graph with the one in Experiment 1. How can you explain the similarity of the graphs, given that one experiment involves coin flips and the other dice rolls?

Experiment 3

12. On page 1.6, simulate tossing a coin 10 times and counting the number of heads. Record the result.

13. Simulate repeating the experiment (10 coin flips) 5 times. Record the result.

14. Increase the number of trials from 5 to 10, then 20, then 100, then 1,000. Adjust the vertical scale as necessary. Describe how the graph changes as the number of trials increases.

15. Compare this graph with those in Experiments 1 and 2. How can you explain the similarity of the graphs?

As the number of trials increases, the histogram approaches a smooth, bell-shaped curve called a **normal curve**. The **normal probability distribution** calculates probabilities based on this curve.

16. Add a normal curve to each of the histograms on pages 1.4 – 1.6. Summarize your observations.

Problem 2 – Probability Distributions

On page 2.2 simulate 50 trials of 10 coin tosses, then simulate 5 trials of 10 tosses, and finally 1000 trials of 10 tosses. Each time you will record information in both the first and second table.

First table: Record the experimental probabilities as decimals.

Second table: (Row 1) Record the mean and standard deviation.
(Row 2) Experimental probability of exactly 4 heads (and 6 tails) in 10 tosses.
(Row 3) Binomial distribution probability for exactly 4 heads in 10 tosses.
(Row 4) Normal distribution probability for exactly 4 heads in 10 tosses.
(Row 5) Which distribution appears to be a better model?

	50 trials	5 trials	1000 trials
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

	50 trials	5 trials	1000 trials
Mean/ Std Dev			
Exper. Prob			
Binomial Prob			
Normal Prob			
Best Distr.			

Problem 3 – Application of the Normal Distribution

Read the problem on page 3.1. Sketch the graph of the normal distribution for this data. Be sure to label the axes and scale.

17. What is the probability that a student selected at random is 16 years old?