

Chapter 14: Probability

1. Consider drawing one card from a standard deck of cards. (Note: If you are unfamiliar with a deck of cards, type "deck of cards" into the search engine of your choice for a diagram of the cards.)

a) Find the probability that your card is a heart.

$$\frac{13}{52} = .25$$

b) Find the probability that your card is an ace.

$$\frac{4}{52} = .077$$

c) Find the probability that your card is the ace of hearts. $\frac{1}{52} = .019$

d) Find the probability that your card is black.

$$\frac{26}{52} = .5$$

e) Find the probability of not drawing a king.

$$\frac{48}{52} = .923$$

f) Find P(black or king).

$$\frac{26+2}{52} = .538$$

← Be careful not to over count the black kings!

2. On a roll of a 20-sided die,

a) What is the probability that the number comes up odd?

$$\frac{1}{2} = .5$$

b) What is the probability of rolling a 1?

$$\frac{1}{20} = .05$$

c) What is the probability of rolling an even number?

$$\frac{1}{2} = .5$$

d) What is the probability of rolling a 1 and an even number?

○

Impossible!

e) What is the probability of rolling a 1 or an even number?

$$\frac{11}{20} = .55$$

f) Find P(not even).

$$\frac{1}{2} = .5$$

g) Find P(not divisible by 3).

$$1 - \frac{6}{20} = .7$$

3. Among 139 subjects who did *not* use marijuana, 12 of them tested positive for using marijuana.

a) Find the probability of a positive test result for a person who does not use marijuana.

$$\frac{12}{139} = .086$$

- b) Find the probability of a negative test result for a person who does not use marijuana.

$$\frac{127}{139} = .914$$

- c) Find the probability of a wrong test result for a person who does not use marijuana.

Same as (a)!

4. Consider the following table that summarizes the results of a drug test for marijuana.

	Did Use Marijuana	Did Not Use Marijuana
Tested Positive for Marijuana Use	10	5
Tested Negative for Marijuana Use	1	50

If one person is randomly selected, find the following probabilities:

- a) The probability of a positive test result if that person did not use marijuana.

$$\frac{5}{55} = .091$$

- b) P(positive test result or did use marijuana)

$$\frac{16}{66} = .242$$

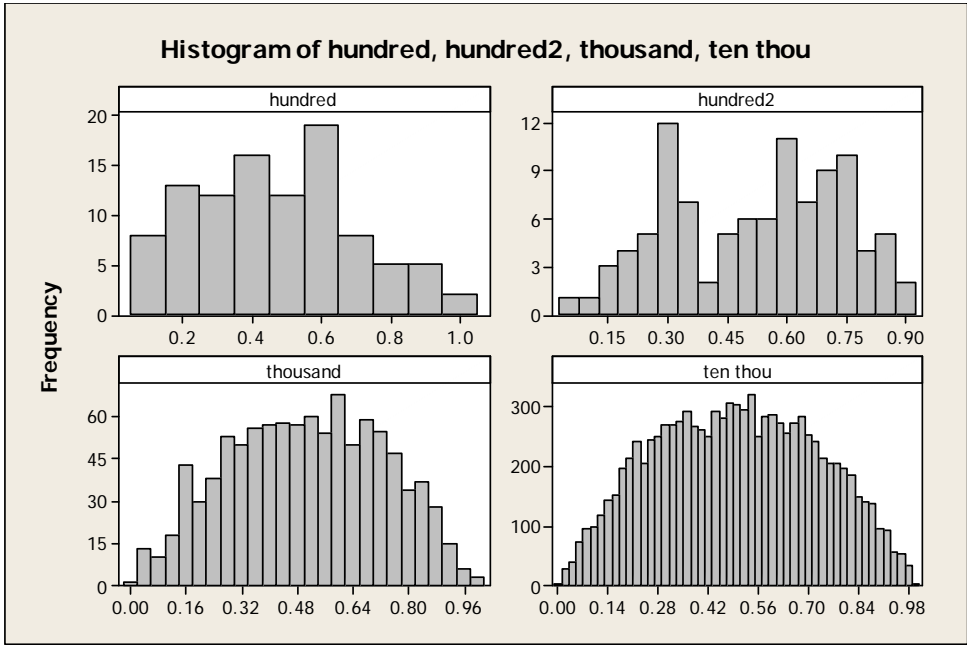
- c) P(did not use marijuana or tested negative).

$$\frac{56}{66} = .848$$

5. In a survey of college students, 112 admitted to cheating and 526 said that they never cheated in a class. Find the probability of randomly selecting one of those who cheated?

$$\frac{112}{112 + 526} = \frac{112}{638} = .176$$

6. Law of Large Numbers Simulation. For this question, you will generate numbers from the Beta(2,2) distribution.
- Generate 100 samples from the Beta(2,2). Minitab > Calc > Random Data > Beta. Number of Rows to Generate: 100. Store Column in: C1. First shape parameter: 2. Second shape parameter: 2.
 - Generate a second 100 samples and store these in C2.
 - Generate 1000 samples from the Beta(2,2) and store them in C3.
 - Generate 10,000 samples from the Beta(2,2) and store them in C4.
 - Plot histograms of each of your samples. What happens to the shape as we increase the sample size? Can you guess what the model Beta(2,2) looks like (it's a common math function)?



We are watching the LLN in action. As we increase the sample size, we are getting closer to the perfect model. The Beta(2,2) is an upside down quadratic...

