

Name: _____
Date: _____

Business Data Analysis
201-316-VA

In Class Exercise #8: Probability: Compound Events

1. Medical Tests

Diagnostic tests of medical conditions can have several types of results. The test result can be positive or negative, whether or not a patient has the condition. A positive test (+) indicates the patient has the condition. A negative test (-) indicates the patient does not have the condition. Remember, a positive test does not PROVE that the patient has the condition, additional medical work may be required!

Consider the following random sample of 270 patients, some of whom have a medical condition and some of whom do not. Results of a new diagnostic test for the condition are shown.

	Condition Present	Condition Absent	Row Total
Test Result +	72	37	109
Test Result -	82	79	161
Column Total	154	116	270

Assume the sample is representative of the entire population. For a person selected at random, compute the following probabilities. Give your answers in fractions:

(a) That the test result is positive, given the condition is present.

$$72/154$$

(b) That the test result is negative, given the condition is present.

$$82/154$$

(c) That the test result is positive, given the condition is absent.

$$37/116$$

(d) That the test result is negative, given the condition is absent.

$$79/116$$

(e) That the condition is present and the test result is positive.

$$72/270$$

(f) That the condition is present and the test result is negative.

$$82/270$$

(g) If you go to get tested, what is the probability that the test results accurately predict your condition?

$$\frac{72}{270} + \frac{79}{270} = \frac{151}{270}$$

2. Deck of Cards

A standard deck of 52 cards contains 4 suits (heart, diamonds, clubs, spades), and each suit has 1 card of each of the 13 ranks (10 number cards, and 3 face cards: J, K, Q)

Answer in fractions, and show your steps. When drawing a single card from the deck, what is the probability that you draw...

(a) A heart?

$$\frac{13}{52} = \frac{1}{4}$$

(b) A face card?

$$\frac{12}{52} = \frac{3}{13}$$

(c) A card that is a heart and a face?

$$P(H \text{ and } F) = \frac{3}{52}$$

(d) A card that is a heart or a face?

$$\begin{aligned} P(H \text{ or } F) &= P(H) + P(F) - P(H \text{ and } F) \\ &= \frac{13}{52} + \frac{12}{52} - \frac{3}{52} = \frac{22}{52} = \frac{11}{26} \end{aligned}$$

(e) A card that is either a heart or a face, but not both?

$$\begin{aligned} &= P(H \text{ or } F) - P(H \text{ and } F) \\ &= \frac{22}{52} - \frac{3}{52} = \frac{19}{52} \end{aligned}$$