

Solutions

Math 321-01 Spring 2015

Quiz 2 28.01.15

Name: _____

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible; You have 20 minutes to take this 10 point quiz.

1. (4 points) Consider a drug screening for airplane pilots. Suppose only 1% of airplane pilots who get tested for drugs really using them. If a pilot is using drugs, then 90% of the time he or she will correctly fail the test. But 10% of the clean pilots will also fail the test. Assume that 1000 pilots were tested for drugs.

a. (2 pts) Fill in the table below.

	Fail Test	Pass Test	Total
Drug Users	90% = 9	10% = 1	10
Clean	10% = 99	90% = 891	990
Total	108	892	1000

b. (1 pt) If a pilot fails the test, what is the chance he or she is really clean?

F = pilot fails the test

C = pilot is clean

$$P(C|F) = \frac{P(C \cap F)}{P(F)} = \frac{99}{108} \quad \leftarrow \begin{array}{l} \text{clean \& fail} \\ \text{failed test} \end{array}$$

c. (1 pt) If a pilot passes the test what is the chance he or she is really using the drugs?

P = pilot passes the test

D = pilot is using the drugs

$$P(D|P) = \frac{P(D \cap P)}{P(P)} = \frac{1}{892}$$

2. (6 points) If men constitute 47% of the population and tell the truth 78% of the time, while women tell the truth 63% of the time, what is the probability that a person selected at random will answer a question truthfully.

B = event that a selected person says the truth.

A_1 = event that a man is selected

A_2 = event that a woman selected.

want: $P(B) = ?$

$A_1 \cap A_2 = \emptyset$ and $A_1 \cup A_2 = \text{sample space}$

so,

$$P(B) = P(B|A_1) \cdot P(A_1) + P(B|A_2) \cdot P(A_2)$$

$$= \frac{78}{100} \cdot \frac{47}{100} + \frac{63}{100} \cdot \frac{53}{100}$$