

## Answer on Question #71770 – Math – Statistics and Probability

### Question

A company has made available to his employees (without charges) extensive club facilities that may be used before work, during the lunch hour, after work and on weekend. The record for the last year indicates that of 250 employees, 110 used the facilities at sometimes. Of 170 males employed by a company, 65 used the facilities. What is the probability that an employer chooses at random (setup contingency table)

- a) is a female or has used the health club facilities
- b) is a male and has not used the health club facilities
- c) suppose that we select the female employees of the company. What then the probability that she has used the health club facilities.

### Solution

Set up a  $2 \times 2$  table to evaluate the probabilities of using the facilities

Event	Symbol
Employee Used Facility	$U$
Employee did not Used Facility	$\bar{U}$
Employee is Male	$M$
Employee is not Male	$\bar{M}$

Table of probabilities (contingency table)

	$M$	$\bar{M}$	
$U$	$65/250 = 0.260$	$45/250 = 0.180$	$110/250 = 0.440$
$\bar{U}$	$105/250 = 0.420$	$35/250 = 0.140$	$140/250 = 0.560$
	$170/250 = 0.680$	$80/250 = 0.320$	1.000

- a) The probability that an employer chooses at random is a female or has used the health club facilities

$$P(\bar{M} \cup U) = P(\bar{M}) + P(U) - P(\bar{M} \cap U)$$
$$P(\bar{M} \cup U) = 0.32 + 0.44 - 0.18 = 0.58$$

- b) The probability that an employer chooses at random is a male and has not used the health club facilities

$$P(M \cap \bar{U}) = 0.42$$

- c) Bayes' Law

$$P(U|\bar{M}) = \frac{P(U \cap \bar{M})}{P(\bar{M})}$$

Suppose that we select the female employees of the company. Then the probability that she has used the health club facilities

$$P(U|\overline{M}) = \frac{0.18}{0.32} = 0.5625$$