

# EXAM P QUESTIONS OF THE WEEK

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## Week of August 27/07

A survey of a large number of adult city dwellers identified two characteristics involving personal transportation:

- have a driver's licence
- own a bicycle .

The following information was determined.

- 80% of those surveyed had a driver's licence or owned a bicycle, or both
- $\frac{1}{3}$  of those who had a driver's license also owned a bike
- $\frac{1}{2}$  of those who owned a bike also had a driver's license.

Of those surveyed who didn't own a bike, find the fraction that didn't have a driver's license.

**The solution can be found below.**

## Week of August 27/07 - Solution

$A$  = have driver's license

$B$  = own a bike

$$P(A \cup B) = .8 = P(A) + P(B) - P(A \cap B)$$

$$P(B|A) = \frac{1}{3} = \frac{P(A \cap B)}{P(A)}, \quad P(A|B) = \frac{1}{2} = \frac{P(A \cap B)}{P(B)}.$$

$$\frac{P(A \cup B)}{P(A \cap B)} = \frac{.8}{P(A \cap B)} = \frac{P(A) + P(B) - P(A \cap B)}{P(A \cap B)} = \frac{1}{1/3} + \frac{1}{1/2} - 1 = 4,$$

and it follows that  $P(A \cap B) = .2$ .

Then  $P(A) = 3P(A \cap B) = .6$  and  $P(B) = 2P(A \cap B) = .4$ .

$$\text{We wish to find } P(A'|B') = \frac{P(A' \cap B')}{P(B')} = \frac{P[(A \cup B)']}{P(B')} = \frac{1 - P(A \cup B)}{1 - P(B)} = \frac{1 - .8}{1 - .4} = \frac{1}{3}.$$