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|  | Assignment 3 |
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|  | Rushabh Barbhaya  SYS 660 – Decision Making via Risk Analysis  3/3/02 |

Assignment 3

# Question 1 Often it is difficult to distinguish between the probability of an intersection of outcomes (joint probability) and the probability of a conditional outcome (conditional probability). Classify the following as joint probability statements or conditional probability statements.

Solution 1

1. Eight percent of the students in a class were left-handed and red-haired.
   * Joint Probability
   * P (Left Handed ∩ Red Haired) = 0.08 or 8%
2. Of the left-handed students, 20% had red hair.
   * Conditional Probability
   * P (Red Hair | Left Handed) = 0.2 or 20%
3. If the Orioles lose their next game, then the Cubs have a 90% chance of winning the pennant.
   * Conditional Probability
   * P (Cubs Win the pennant | Orioles lose the coming game) = 0.9 or 90%
4. Fifty-nine percent of the people with a positive test result had the disease.
   * Conditional Probability
   * P (Having Disease | Positive Test Result) = 0.59 or 59%
5. For 78% of patients, the surgery is a success and the cancer never reappears.
   * Joint Probability
   * P (Surgery Success ∩ Cancer Never Reappears) = 0.78 or 78%
6. If the surgery is a success, the cancer is unlikely to reappear.
   * Conditional probability
   * P (Cancer unlikely to appear | Surgery is a success)
7. Given the drought, food prices are likely to increase.
   * Conditional probability
   * P (Food prices increase | Drought)
8. There is an even chance that a farmer who loses his crop will go bankrupt.
   * Conditional Probability
   * P (Going bankrupt | Farmer who loses his crop) = 0.5 or 50%
9. If the temperature is high and there is no rain, farmers probably will lose their crops.
   * Both – Joint and Conditional Probability
   * P (Farmer loses their crop | (Temperature is high ∩ No Rain)
10. John probably will be arrested because he is trading on insider information.
    * Conditional Probability
    * P (John getting arrested | Ethical Practice {trading on insider information})
11. John probably will trade on insider information and get caught.
    * Joint Probability
    * P (John arrested ∩ Insider Information)

# Question 2 P(A) = 0.42, P(B|A) = 0.66 and P(B|A̅) = 0.25. Find the following

Solution 2

1. P(A̅) = 1 – P(A)

= 1 – 0.42

= 0.58

1. P(B̅|A) = 1 – P(B|A)

= 1 – 0.66

= 0.34

1. P(B̅|A̅) = 1 – P(B|A̅)

= 1 – 0.25

=0.75

1. P(B) = P(B|A) x P(A) + P(B|A̅) x P(A̅)

= 0.66\*0.42 + 0.25\*0.58

= 0.2772 + 0.145

= 0.4222

1. P(B̅) = 1 – P(B)

= 1 – 0.4222

= 0.5778

1. P(A|B) = P(B|A) x P(A) ÷ P(B)

= 0.66 \* 0.42 ÷ 0.4222

≈ 0.657

1. P(A̅|B) = 1 – P(A|B)

≈ 0.343

1. P(A|B̅) = ?

P(A) = P(A|B) \* P(B) + P(A|B̅) \* P(B̅)

0.42 = 0.657 \* 0.42 + P(A|B̅) \* 0.5778

P(A|B̅) ≈ 0.25

1. P(A̅|B̅) = 1 – P(A|B̅)

≈ 0.75

# Question 3 Find E[*f*(x)] where: *f*(x) = 2*x3* – 4*x*2 + 2 and

Solution 3

*f*(1) = 0

*f*(2) = 2

*f*(3) = 20

*f*(4) = 66

*f*(5) = 152

∴ E[*f*(x)] = 32.2

