**MDA 525-1**  Name

**Solutions to Handout 1**

1. B1, B2 and B3 are mutually exclusive events. Event B = B1 or B2 or B3. Consider the following contingency table of probabilities.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B1 | B2 | B3 | total |
| A | 0.1 | 0.2 | g | 0.4 |
| Ac | d | f | h | e |
| total | 0.4 | 0.25 | i | 1.00 |

1. Complete the contingency table.

d = 0.3

e = 0.6

f = 0.05

g = 0.1

h = 0.25

i = 0.35

1. Find the following probabilities.

*P*(A) = 0.4

*P*(Aand B1) = 0.1

*P*(Aor B1) = 0.4 + 0.4 – 0.1 = 0.7

*P*(A*|*B1) = 0.1/0.4 = 0.25

*P*(B1|A) = 0.1/0.4 = 0.25

*P*(A*|*B) = 0.4 (note B is a sure event)

*P*(B*|*A) = 1 (note B is a sure event)

1. Are event A and event B1 independent? Are event A and event B independent?

*P*(A) = 0.4 ≠ *P*(A*|*B1) = 0.1/0.4 = 0.25. Aand B1 are not independent.

*P*(A) = 0.4 = *P*(A*|*B). Aand B are independent.

1. B1, B2 and B3 are mutually exclusive events. Event B = B1 or B2 or B3. Consider the following contingency table of probabilities. Suppose that event A and event B1 are independent.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B1 | B2 | B3 | total |
| A | 0.4 | 0.2 | 0.2 | 0.8 |
| Ac | 0.1 | 0.1 | 0 | 0.2 |
| total | 0.5 | 0.3 | 0.2 | 1.00 |

1. Complete the contingency table.

Because A and B1 are independent, *P*(Aand B1) = *P*(A) *P*(B1) = (0.8) (0.5) = 0.4.

1. Find the following probabilities.

*P*(A) = 0.8

*P*(Aand B1) = 0.4

*P*(Aor B1) = 0.8+0.5 – 0.4 = 0.9

*P*(A*|*B1) = 0.8

*P*(B1|A) = 0.5

*P*(Aand B2) = 0.2

*P*(Aor B2) = 0.8 + 0.3 – 0.2 = 0.9

*P*(A*|*B2) = 0.2/0.3 = 0.667

*P*(B2|A) = 0.2/0.8 = 0.25

(c) Which two events are mutually exclusive?

Ac and B3 are mutually exclusive.

(d) Are event A and event B2 independent? Are event Ac and event B3 independent?

*P*(A) = 0.8 ≠ *P*(A*|*B2) = 0.667. Aand B2 are not independent.

Ac and B3 are mutually exclusive, not independent?

3. Three data entry specialists enter requisitions into a computer. Specialist 1 processes 30 percent of the requisitions, specialist 2 45 percent, and specialist 3 25 percent. The proportions of incorrectly entered requisitions by data entry specialists 1, 2 and 3 are 0.03, 0.05 and 0.02, respectively. Suppose that a requisition randomly selected is found to have been incorrectly entered. What is the probability that it was processed by data entry specialist 1? By data entry specialist 2? By data entry specialist 3?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Specialist 1 | Specialist 2 | Specialist 3 | Total |
| Incorrect | 0.3×0.03 = 0.009 | 0.45×0.05 = 0.0225 | 0.25×0.02 = 0.005 | 0.0365 |
| Correct | 0.291 | 0.4275 | 0.245 | 0.9635 |
| Total | 0.3 | 0.45 | 0.25 | 1 |

P(S1|I) = 0.009/0.0365 = 0.247; P(S2|I) = 0.0225/0.0365 = 0.616; P(S3|I) = 0.005/0.0365 = 0.137.