Coventry University
School of Computing, Electronics and Mathematics

5005CEM **Probability Problem Sheet 1b** **Week 5**

1 Given

$$P(A) = 0.4 \qquad P(B) = 0.7 \qquad P(A \cap B) = 0.2$$

find

(a) $P(A \mid B)$ (b) $P(\overline{A} \mid B)$ (c) $P(A \mid \overline{B})$ (d) $P(\overline{A} \mid \overline{B})$

epr015

2 *Multiple choice* — If two events A and B are such that $P(A \mid B) = P(B \mid A)$ then:

(A). A and B are independent

(B). A and B are mutually exclusive

(C). $P(A) = P(B)$

(D). $P(A) = 0.5$ epr006

3 Given

$$P(A) = 0.8 \qquad P(B) = 0.7 \qquad P(C) = 0.6$$
$$P(A \mid B) = 0.8 \qquad P(C \mid B) = 0.7 \qquad P(A \cap C) = 0.48$$

(a) Are A and B are independent?

(b) Are A and C are independent?

(c) Are B and C are independent? epr018

4 Components are made by machines A and B. Machine A makes twice as many components as machine B. When made by machine A, 3% of the components are faulty. When made by machine B, 5% of components are faulty.

(a) Draw a tree diagram representing all possible outcomes for a randomly selected component and attach probabilities for every branch.

(b) Calculate the probability that a component picked at random is

(i) made by machine B (ii) made by machine A and is faulty

(iii) made by machine B and is not faulty (iv) faulty

epr011

5 Let

$$P(B \mid A) = 0.3 \qquad P(B \mid \overline{A}) = 0.4 \qquad P(A) = 0.4$$

(a) Draw a tree diagram and attach the probabilities for every branch **and outcome**.

(b) "Flip the tree" to find

(i) $P(A \mid B)$ (ii) $P(\overline{A} \mid B)$ (iii) $P(A \mid \overline{B})$ (iv) $P(\overline{A} \mid \overline{B})$

epr021

6 An insurance company divides its policy holders into two groups: clumsy and non-clumsy. A *clumsy* person will have an accident at some time with a fixed one-year period with probability 2/5 whereas this probability decreases to 1/5 for a *non-clumsy* person. Assume that 30% of the population is clumsy.

(a) What is the probability that a new policyholder will have an accident within a year of purchasing a policy?

(b) Suppose a new policyholder has an accident within a year of purchasing a policy. What is the probability that he or she is clumsy? epr045

Challenge Problems

7 *Multiple choice* — If two events A and B are mutually exclusive, $P(A) > 0$ and $P(B) > 0$, then:

(A). A and B are independent

(B). A and B are not independent

(C). $P(A) + P(B) = 1$

(D). $P(A) = P(B)$ epr005

8 Given

$$P(A) = 0.8 \qquad P(A \mid B) = 0.8 \qquad P(A \cap B) = 0.5$$

find

(a) $P(B)$ (b) $P(B \mid A)$ (c) $P(A \cup B)$ (d) $P(A \mid A \cup B)$

(e) $P(A \cap B \mid A \cup B)$ (f) $P(A \cap B \mid \overline{B})$ (g) $P(A \cap B \mid A)$ epr016