

CLASS QUESTIONS

BASIC PROBABILITY

Question 1

Jo and Em are often caught for talking in class.

The probability that Jo starts a conversation is 70%. If Jo starts talking, the chance that Em responds is 80%. If Jo doesn't start a conversation, the chance that Em does is 10%.

- a. Draw a tree diagram to represent the outcomes in this situation.

- b. Determine the probability that Em was talking to Jo in class.

- c. Given that Em didn't talk in class, what was the chance that Jo also didn't talk in class? Give your answer in simplified fraction form.

Question 2

In the month of June, it rains on average 17 days of the month in Perth. If it rains, the chance that Peter catches the bus to work is $\frac{3}{10}$. If it doesn't rain, the chance that Peter catches the bus to work is $\frac{9}{10}$.

- a. Draw a Tree diagram to represent the outcomes in this situation.
- b. Determine the probability that on a given day in June, Peter catches the bus to work.
- c. Given that Peter caught the bus to work, what was the chance it was raining that day?

Question 3

Suppose $P(A \cup B) = 0.9$, $P(A') = 0.4$ and $P(B') = 0.2$.

Find $P(A \cap B')$.

Find $P(B \cap A')$.

Hence determine $P(A \cap B)$.

Are events A and B mutually exclusive?

Question 4

Suppose $P(A | B) = 0.4$ and $P((A \cup B)') = 0.15$, where A and B are independent.

Find $P(A)$.

Determine $P(A' \cap B)$.

Given that $P(A \cap B) = x$, write an expression for $P(B)$ in terms of x .

Use the above results to solve for x .

Hence state the value of $P(B)$.

Question 5

In a factory, machines A , B and C are all producing metal rods of the same length. Machine A produces 35% of the rods, machine B produces 25% and the rest are produced by machine C . Of their production of rods, machines A , B and C produce 3%, 6% and 5% defective rods respectively.

- (a) Draw a tree diagram to represent this information.

- (b) Find the probability that a randomly selected rod is
 - (i) produced by machine A and is defective,
 - (ii) is defective.

- (c) Given that a randomly selected rod is defective, find the probability that it was produced by machine C .

Question 6

A disease is known to be present in 2% of a population. A test is developed to help determine whether or not someone has the disease.

Given that a person has the disease, the test is positive with probability 0.95

Given that a person does not have the disease, the test is positive with probability 0.03

(a) Draw a tree diagram to represent this information.

A person is selected at random from the population and tested for this disease.

(b) Find the probability that the test is positive.

A doctor randomly selects a person from the population and tests him for the disease. Given that the test is positive,

(c) find the probability that he does not have the disease.

Question 7

- i. Jake and Kamil are sometimes late for school.
The events J and K are defined as follows

J = the event that Jake is late for school
K = the event that Kamil is late for school

$$P(J) = 0.25, P(J \cap K) = 0.15 \text{ and } P(J' \cap K') = 0.7$$

On a randomly selected day, find the probability that

- (a) at least one of Jake or Kamil are late for school,

(b) Kamil is late for school.

Given that Jake is late for school,

- (c) find the probability that Kamil is late.

The teacher suspects that Jake being late for school and Kamil being late for school are linked in some way.

- (d) Determine whether or not J and K are statistically independent.

(e) Comment on the teacher's suspicion in the light of your calculation in (d).

Question 8

(a) Given that $P(A) = a$ and $P(B) = b$ express $P(A \cup B)$ in terms of a and b when

- (i) A and B are mutually exclusive,
- (ii) A and B are independent.

Two events R and Q are such that

$$P(R \cap Q') = 0.15, \quad P(Q) = 0.35 \text{ and } P(R|Q) = 0.1$$

Find the value of

(b) $P(R \cup Q)$,

(c) $P(R \cap Q)$,

(d) $P(R)$.