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

**1** Of the students at a certain university, 60% think their courses are challenging $(C)$, 35% think their courses are fun $(F)$, while 15% think their courses are neither challenging nor fun. What is the probability a randomly selected student will think their courses are:

  (a) challenging or fun, or both,

  (b) challenging and fun,

  (c) fun but not challenging,

  (d) challenging or fun but not both?

Draw a Venn diagram to summarise your findings.                                    epr023

**2** The records at a rural medical centre show that 40% of all children treated there are iron-deficient $(A)$, 15% have chronic ear-nose-throat infections $(B)$, while 55% have neither of these two conditions. What is the probability that an untreated child will:

  (a) have one or other of the conditions or both;

  (b) have both conditions;

  (c) be iron-deficient (anaemic) but not suffer an ear-nose-throat infection;

  (d) have one condition or the other but not both.

Draw a Venn diagram to summarise your findings.                                    epr024

**3** Given
$$P(A) = 0.35 \qquad P(B) = 0.45 \qquad P(A \cap B) = 0.25$$
find

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

epr001

**4** A standard pack of 52 cards is shuffled (so that each card has an equal probability of being drawn) and a card is selected. Find the probability that the card is:

(a) a black queen     (b) a 7, 8, or 9     (c) a red card        (d) a black ace or a red queen

epr009

**5** In which of the following are events $A$ and $B$ mutually exclusive? In the cases where the events are not mutually exclusive, list the outcomes in $A \cap B$.

(a) Toss a coin twice. $A$ is the event of a head on the first toss, and $B$ is the event of a head on the second toss.

(b) Roll two dice. $A$ is the event of a sum of 7, $B$ is the event of a double (same value on both dice).

(c) Roll two dice. $A$ is the event of a 2 on at least one of the dice. $B$ is the event of a 3 on one of the dice.

(d) Draw five cards from a deck of cards. $A$ is the event of drawing at least one spade. $B$ is the event of drawing no aces.

<div align="right">epr002</div>

## Challenge Problem

**6** For two events $A$ and $B$, suppose $P(A) = P(B) = 0.6$. State whether $A$ and $B$ are mutually exclusive or not, and justify your answer.

<div align="right">epr008</div>