1. [**ACJC Prelims 17**]
   In a game of penalty kicks, a player is given three attempts at scoring. Once the player scores, he wins and the game ends. Henry, who has a 0.7 chance of scoring on any penalty kick, plays the game.

   (a) Draw a probability tree diagram to illustrate one such game. [1]

   (b) Find the probability that, in one game, Henry
       i. scores on the second attempt, [1]
       ii. made two attempts, given that he wins. [2]

   (c) In 3 such games, find the probability that Henry scores on the first attempt in exact one game, and on the second attempt in exactly one game. [2]

2. [**AJC Prelims 17**]
   Independent events A and B are such that $P(A) = 0.45$ and $P(B) = 0.4$.
   (a) Find $P(A \cup B)$. [2]

   Event C is such that $P(C) = 0.4, P(B|C) = -0.4, P(A \cap C) = 0.18$ and $P(A \cap B \cap C) = 0.1$.
   (b) Find $P(B \cap C)$ and hence deduce $P(A' \cap B \cap C)$. [2]
   (c) Show that $P(A \cup B \cup C) = 0.83$ and hence find $P(A' \cap B' \cap C')$. [3]

3. [**DHS Prelims 17**]
   The insurance company Adiva classifies 10% of their car policy holders as low risk, 60% as average risk and 30% as high risk. Its statistical database has shown that of those classified as low risk, average risk and high risk, 1%, 15% and 25% are involved in at least one accident respectively.

   Find the probability that a randomly chosen policy holder

   (a) is not involved in any accident if the policy holder is classified as "average risk", [1]

   (b) is not involved in any accident, [2]

   (c) is classified as "low risk" if the policy holder is involved in at least one accident. [2]

   Two policy holders are chosen at random.

   (d) Find the probability that one is not involved in any accident while the other is involved in at least one accident. [2]

4. [**HCI Prelims 17**]

A company uses 2 production lines, A and B, to produce lunch boxes. If the lunch box cannot be closed tightly, it will be considered as faulty. Of all the lunch boxes produced, 5% are faulty and 3% of the lunch boxes produced by B are faulty. Among the lunch boxes that are faulty, 60% of them are produced by line A.

One lunch box is selected at random.

(a) Show that the probability that it is produced by line B is $\frac{2}{3}$. [2]

(b) Find the probability that it is faulty given that it is produced by A. [2]

Two lunch boxes are chosen at random.

(c) Find the probability that both lunch boxes are produced by B given that exactly one is faulty. [3]

5. [**IJC Prelims 17**]

At a lucky draw booth, each contestant will roll an unbiased die. If the die shows a 6, the contestant will pick a counter at random from Box A. Otherwise, he will pick a counter at random from Box B. Box A contains 3 red counters, 2 green counters and 3 yellow counters. Box B contains 5 red counters, 3 green counters and 2 yellow counters.

(a) A contestant will win a prize if a yellow counter is picked.

    i. Draw a tree diagram to represent this situation. [2]

    ii. Find the probability that a contestant wins a prize. [2]

    iii. Given that the contestant wins a prize, find the probability that it came from Box A. [2]

(b) The rule of winning a prize has now changed. Each contestant needs to pick two counters, without replacement, instead of one. A contestant will win a prize if both counters picked are yellow. Find the probability that a contestant wins a prize. [2]

Answers

1. (a) 0.21.
    (b) $\frac{30}{139}$.
    (c) 0.0794.

2. (a) 0.67.
    (b) 0.06.
    (c) 0.83, 0.17.

3. (a) 0.85.
    (b) 0.834.
    (c) 0.00602.
    (d) 0.276888.

4. (a) $\frac{2}{3}$.
    (b) 0.09.
    (c) 0.272.

5. (a)   i. $\frac{11}{48}$.
          ii. $\frac{3}{11}$.
    (b) $\frac{55}{1512}$.