

## Topic Y5 Probability and proof (Pre-TT) [42]

1.

- (i) Kathryn is allowed three attempts at a high jump. If she succeeds on any attempt, she does not jump again. The probability that she succeeds on her first attempt is  $\frac{3}{4}$ . If she fails on her first attempt, the probability that she succeeds on her second attempt is  $\frac{3}{8}$ . If she fails on her first two attempts, the probability that she succeeds on her third attempt is  $\frac{3}{16}$ . Find the probability that she succeeds. [3]
- (ii) Khaled is allowed two attempts to pass an examination. If he succeeds on his first attempt, he does not make a second attempt. The probability that he passes at the first attempt is 0.4 and the probability that he passes on either the first or second attempt is 0.58. Find the probability that he passes on the second attempt, given that he failed on the first attempt. [3]

(Total 6 marks)

2.

- (i) A bag contains 12 red discs and 10 black discs. Two discs are removed at random, without replacement. Find the probability that both discs are red. [2]
- (ii) Another bag contains 7 green discs and 8 blue discs. Three discs are removed at random, without replacement. Find the probability that exactly two of these discs are green. [3]
- (iii) A third bag contains 45 discs, each of which is either yellow or brown. Two discs are removed at random, without replacement. The probability that both discs are yellow is  $\frac{1}{15}$ . Find the number of yellow discs which were in the bag at first. [4]

(Total 9 marks)

3.

- (i) Kayden claims that

$$3^x \geq 2^x$$

Determine whether Kayden's claim is always true, sometimes true or never true, justifying your answer.

(2)

- (ii) Prove that  $\sqrt{3}$  is an irrational number.

(6)

(Total 8 marks)

4.

Each of the 30 students in a class plays at least one of squash, hockey and tennis.

- 18 students play squash
- 19 students play hockey
- 17 students play tennis
- 8 students play squash and hockey
- 9 students play hockey and tennis
- 11 students play squash and tennis

(i) Find the number of students who play all three sports. [3]

A student is picked at random from the class.

(ii) Given that this student plays squash, find the probability that this student does not play hockey. [1]

Two different students are picked at random from the class, one after the other, without replacement.

(iii) Given that the first student plays squash, find the probability that the second student plays hockey. [4]

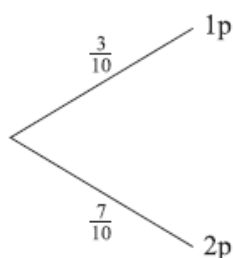
(Total 8 marks)

5.

A bag contains three 1p coins and seven 2p coins. Coins are removed at random one at a time, **without** replacement, until the total value of the coins removed is **at least** 3p. Then no more coins are removed.

(i) Copy and complete the probability tree diagram. [5]

First coin



Find the probability that

- (ii) exactly two coins are removed, [3]
- (iii) the total value of the coins removed is 4p. [3]

(Total 11 marks)