

## Probability 2

Q1.

Ana meets her friends once every day. For each day the probability that she is early is 0.05 and the probability that she is late is 0.75. Otherwise she is on time.

- (i) Find the probability that she is on time on fewer than 20 of the next 96 days. [5]
- (ii) If she is early there is a probability of 0.7 that she will eat a banana. If she is late she does not eat a banana. If she is on time there is a probability of 0.4 that she will eat a banana. Given that for one particular meeting with friends she does not eat a banana, find the probability that she is on time. [4]
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Q2.

Fabio drinks coffee each morning. He chooses Americano, Cappuccino or Latte with probabilities 0.5, 0.3 and 0.2 respectively. If he chooses Americano he either drinks it immediately with probability 0.8, or leaves it to drink later. If he chooses Cappuccino he either drinks it immediately with probability 0.6, or leaves it to drink later. If he chooses Latte he either drinks it immediately with probability 0.1, or leaves it to drink later.

- (i) Find the probability that Fabio chooses Americano and leaves it to drink later. [1]
- (ii) Fabio drinks his coffee immediately. Find the probability that he chose Latte. [4]
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Q3.

The people living in two towns, Mumbok and Bagville, are classified by age. The numbers in thousands living in each town are shown in the table below.

	Mumbok	Bagville
Under 18 years	15	35
18 to 60 years	55	95
Over 60 years	20	30

One of the towns is chosen. The probability of choosing Mumbok is 0.6 and the probability of choosing Bagville is 0.4. Then a person is chosen at random from that town. Given that the person chosen is between 18 and 60 years old, find the probability that the town chosen was Mumbok. [5]

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Q4.

Ronnie obtained data about the gross domestic product (GDP) and the birth rate for 170 countries. He classified each GDP and each birth rate as either 'low', 'medium' or 'high'. The table shows the number of countries in each category.

		Birth rate		
		Low	Medium	High
GDP	Low	3	5	45
	Medium	20	42	12
	High	35	8	0

One of these countries is chosen at random.

- (i) Find the probability that the country chosen has a medium GDP. [1]
- (ii) Find the probability that the country chosen has a low birth rate, given that it does not have a medium GDP. [2]
- (iii) State with a reason whether or not the events 'the country chosen has a high GDP' and 'the country chosen has a high birth rate' are exclusive. [2]

One country is chosen at random from those countries which have a medium GDP and then a different country is chosen at random from those which have a medium birth rate.

- (iv) Find the probability that both countries chosen have a medium GDP and a medium birth rate. [3]

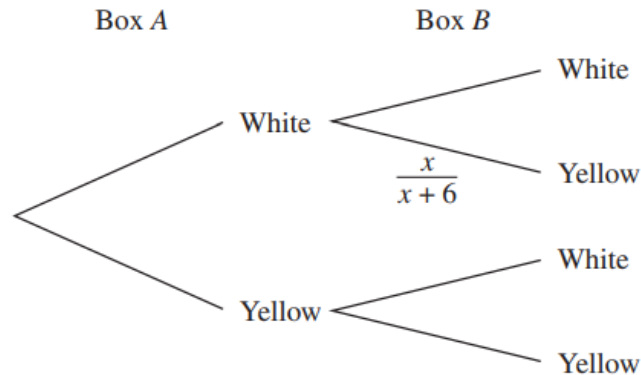
Q5.

- (a) John plays two games of squash. The probability that he wins his first game is 0.3. If he wins his first game, the probability that he wins his second game is 0.6. If he loses his first game, the probability that he wins his second game is 0.15. Given that he wins his second game, find the probability that he won his first game. [4]
- (b) Jack has a pack of 15 cards. 10 cards have a picture of a robot on them and 5 cards have a picture of an aeroplane on them. Emma has a pack of cards. 7 cards have a picture of a robot on them and  $x - 3$  cards have a picture of an aeroplane on them. One card is taken at random from Jack's pack and one card is taken at random from Emma's pack. The probability that both cards have pictures of robots on them is  $\frac{7}{18}$ . Write down an equation in terms of  $x$  and hence find the value of  $x$ . [4]

## Probability 2

Q6.

Box A contains 8 white balls and 2 yellow balls. Box B contains 5 white balls and  $x$  yellow balls. A ball is chosen at random from box A and placed in box B. A ball is then chosen at random from box B. The tree diagram below shows the possibilities for the colours of the balls chosen.



- (i) Justify the probability  $\frac{x}{x+6}$  on the tree diagram. [1]
- (ii) Copy and complete the tree diagram. [4]
- (iii) If the ball chosen from box A is white then the probability that the ball chosen from box B is also white is  $\frac{1}{3}$ . Show that the value of  $x$  is 12. [2]
- (iv) Given that the ball chosen from box B is yellow, find the conditional probability that the ball chosen from box A was yellow. [4]
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Q7.

Rory has 10 cards. Four of the cards have a 3 printed on them and six of the cards have a 4 printed on them. He takes three cards at random, without replacement, and adds up the numbers on the cards.

- (i) Show that  $P(\text{the sum of the numbers on the three cards is } 11) = \frac{1}{2}$ . [3]
- (ii) Draw up a probability distribution table for the sum of the numbers on the three cards. [4]
- Event  $R$  is 'the sum of the numbers on the three cards is 11'. Event  $S$  is 'the number on the first card taken is a 3'.
- (iii) Determine whether events  $R$  and  $S$  are independent. Justify your answer. [3]
- (iv) Determine whether events  $R$  and  $S$  are exclusive. Justify your answer. [1]
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## Probability 2

Q8.

Dayo chooses two digits at random, without replacement, from the 9-digit number 113 333 555.

- (i) Find the probability that the two digits chosen are equal. [3]
  - (ii) Find the probability that one digit is a 5 and one digit is not a 5. [3]
  - (iii) Find the probability that the first digit Dayo chose was a 5, given that the second digit he chose is not a 5. [4]
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Q9.

Playground equipment consists of swings ( $S$ ), roundabouts ( $R$ ), climbing frames ( $C$ ) and play-houses ( $P$ ). The numbers of pieces of equipment in each of 3 playgrounds are as follows.

Playground X	Playground Y	Playground Z
3S, 2R, 4P	6S, 3R, 1C, 2P	8S, 3R, 4C, 1P

Each day Nur takes her child to one of the playgrounds. The probability that she chooses playground X is  $\frac{1}{4}$ . The probability that she chooses playground Y is  $\frac{1}{4}$ . The probability that she chooses playground Z is  $\frac{1}{2}$ . When she arrives at the playground, she chooses one piece of equipment at random.

- (i) Find the probability that Nur chooses a play-house. [4]
  - (ii) Given that Nur chooses a climbing frame, find the probability that she chose playground Y. [4]
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Q10.

Roger and Andy play a tennis match in which the first person to win two sets wins the match. The probability that Roger wins the first set is 0.6. For sets after the first, the probability that Roger wins the set is 0.7 if he won the previous set, and is 0.25 if he lost the previous set. No set is drawn.

- (i) Find the probability that there is a winner of the match after exactly two sets. [3]
  - (ii) Find the probability that Andy wins the match given that there is a winner of the match after exactly two sets. [2]
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