

PROBABILITY A2

A2 Unit 4: Applied Mathematics B

Section A: Statistics

WJEC Past paper questions: 2010 - 2018

Total marks available 137 (approximately 2 hours 45 minutes)

1. A bag contains 10 sweets, of which 1 is red, 2 are blue, 3 are yellow and 4 are green. Sharon chooses 2 sweets at random from the bag, without replacement. Calculate the probability that
 - (a) both sweets are yellow, [2]
 - (b) both sweets are of the same colour, [4]
 - (c) neither of the sweets is green. [2]

(Jan 10)

2. Alan and Bill play a game with darts in which they throw a dart at the 'bull' on the dartboard alternately, starting with Alan, and the winner is the first to hit the 'bull'. Each time they throw a dart at the 'bull', Alan hits it with probability 0.2 and Bill hits it with probability 0.3. Find the probability that
 - (a) Bill wins the game with his first throw, [2]
 - (b) Bill wins the game with his second throw, [2]
 - (c) Bill wins the game. [4]

(Summer 10)

3. Jean has two fair dice, each in the shape of a regular tetrahedron. The four faces of each dice are numbered 1, 2, 3, 4 respectively. She throws the two dice simultaneously and the score on each dice is defined as the number on the face in contact with the table.
 - (a) Write down the sample space. [2]
 - (b) Calculate the probability that
 - (i) the sum of the scores on the two dice is 6,
 - (ii) the scores on the two dice are consecutive integers. [4]

(Jan 11)

4. David owns a small collection of 12 CDs which he classifies into three types, classical, pop and jazz. He has 6 classical CDs, 4 pop CDs and 2 jazz CDs. One evening, he chooses 3 CDs at random from his collection to play. Find the probability that he chooses
- (a) one of each type, [3]
- (b) all classical, [2]
- (c) all of the same type. [3]

(Jan 11)

5. Cyril buys a bag containing 9 sweets of which 5 are red, 3 are green and 1 is yellow. He allows Gwyneth to choose 3 sweets at random from the bag. Calculate the probability that she chooses
- (a) 1 sweet of each colour, [3]
- (b) no green sweets, [2]
- (c) 3 sweets of the same colour. [3]

(Summer 11)

6. A class contains 8 girls and 6 boys. A sub-committee of 3 members of the class is to be formed and it is decided to select its members at random from the class. Calculate the probability that the sub-committee will contain
- (a) 3 boys, [2]
- (b) more boys than girls. [4]

(Jan 12)

7. A bag contains 9 balls, of which 1 is red, 3 are blue and 5 are white. Ann selects 3 balls at random from the bag without replacement. Calculate the probability that
- (a) no white balls are selected, [2]
- (b) exactly 2 white balls are selected, [2]
- (c) the selection contains 2 balls of the same colour and 1 ball of a different colour. [3]

(Summer 12)

8. Sue and Tim play the following game. They throw a fair dice alternately, starting with Sue, and the winner is the first to obtain a 6.
- (a) Write down the probability that Sue wins with her first throw. [1]
 - (b) Find the probability that Sue wins with her second throw. [2]
 - (c) Write down the first three terms of the infinite geometric series for the probability that Sue wins the game. [2]
 - (d) Hence find the probability that Sue wins the game. [2]

(Summer 12)

9. Bill buys a bag of sweets, of which 6 are red, 4 are green and 1 is blue. He selects 3 sweets at random, without replacement, from the bag. Calculate the probability that his selection contains
- (a) 2 red sweets and another sweet of a different colour, [3]
 - (b) 2 sweets of the same colour and another sweet of a different colour. [5]

(Jan 13)

10. Simon has 3 types of DVDs; 5 war films, 3 cowboy films and 2 horror films. He selects 3 of the DVDs at random to watch one evening. Calculate the probability that he selects
- (a) 1 film of each type, [3]
 - (b) 3 war films, [2]
 - (c) 3 films all of the same type. [3]

(Summer 13)

11. When Mike fires his gun at a target, he hits it with probability 0.7. Successive shots are independent. When he starts to fire his gun at the target, calculate the probability that he hits the target
- (a) for the first time on his fourth shot, [3]
 - (b) for the second time on his third shot. [3]

(Summer 13)

12. Gwyn has three varieties of apples in his fruit bowl, 6 Elstar, 4 Gala and 2 Regent. He decides to select 3 of these 12 apples at random to take to work. Calculate the probability that he selects

- (a) 1 apple of each variety, [3]
 (b) 3 Elstar apples, [2]
 (c) 3 apples all of the same variety. [3]

(Jan 14)

13. When Catrin shoots an arrow at a target, she hits it with probability 0.4. When Rhiannon shoots an arrow at the target, she hits it with probability 0.3. Successive shots are independent. One morning, they decide to shoot arrows alternately at the target, starting with Rhiannon. The winner is the first to hit the target.

- (a) Show that the probability that Catrin wins with her first shot is 0.28. [2]
 (b) Show that the probability that Catrin wins with her second shot can be written in the form $k \times 0.28$, and state the value of k . [2]
 (c) Hence, by summing an infinite geometric series, find the probability that Catrin wins. [3]

(Jan 14)

14. A bag contains 9 coloured balls, of which 3 are red, 3 are blue and 3 are yellow. Huw selects 3 of these balls at random, without replacement. Calculate the probability that he selects

- (a) 1 ball of each colour, [3]
 (b) 2 balls of the same colour and 1 ball of a different colour. [4]

(Summer 14)

15. A bag contains 10 sweets of which 5 are red, 3 are green and 2 are yellow. Ann chooses a sweet at random from the bag and immediately puts it in her pocket so that nobody can see what colour it is. Bethan then chooses a sweet at random from the remaining 9 sweets. Calculate the probability that

- (a) Ann chooses a green sweet, [1]
 (b) Bethan chooses a yellow sweet, [3]
 (c) Ann and Bethan choose sweets of different colours. [3]

(Summer 15)

16. Fred is a cricket player. When he throws a ball at the wicket from a point P , he hits it with probability 0.3 . You may assume that successive throws are independent.
- (a) One morning, he goes out to practise his throwing from the point P . Calculate the probability that he hits the wicket for the first time with his third throw. [2]

George is also a cricket player. When he throws a ball at the wicket from the point P , he hits it with probability 0.2 . You may again assume that successive throws are independent.

- (b) On another morning, Fred and George decide to play a game in which they throw balls, alternately, at the wicket from the point P . The winner is the player who is first to hit the wicket. Given that George throws first, calculate the probability that Fred
- (i) wins the game with his first throw,
 - (ii) wins the game with his second throw,
 - (iii) wins the game. [7]

(Summer 15)

17. The committee of a social club contains 8 members, of which 4 are Welsh, 2 are English and 2 are Irish. A sub-committee of 3 members is to be set up and it is decided to select the 3 members at random.
- (a) Calculate the probability that the sub-committee contains
- (i) no Welsh members,
 - (ii) one member of each nationality. [5]
- (b) Jack is a member of the committee. Find the probability that he is selected for the sub-committee. [2]

(Summer 16)

18. A box contains nine cards of which four are white, three are red and two are blue. Three of these cards are selected at random without replacement. Calculate the probability that
- (a) one card of each colour is selected, [3]
- (b) the three cards selected are all of the same colour. [3]

(Summer 17)

19. Janet is given a ticket for a pop concert and she has to decide which of her two children, Beti or Gwyn, should have the ticket. She therefore puts five white balls and one red ball into a bag and asks the two children to select a ball at random, alternately, starting with Beti. Once a ball is selected, it is not put back into the bag. The child who selects the red ball wins the ticket. Show that Beti and Gwyn are equally likely to win the ticket. [6]

(Summer 18)