EDEXCEL INTERNATIONAL A LEVEL · S1 STATISTICS 1

S1 Probability: exam questions

10 questions · 29 marks · full mark schemes

Name _____ Date _____ Score / 29

- Venn diagrams, tree diagrams, mutually exclusive vs independent events, conditional probability P(A|B).
- Try every question before you look at the mark schemes. They start after the questions: M marks for method, A marks for accuracy, B marks for a correct result on its own.
- Online, with more practice: alevelmathrevision.com/alevel-frontend/units/s1/probability-questions

1. **2 marks · warm-up**

Events C and D are independent. Given that $P(C) = 0.2$ and $P(D) = 0.6$, find $P(C \cap D)$.

2. **3 marks · warm-up**

A group consists of 60 boys and 40 girls. 15 of the boys are left-handed, and 5 of the girls are left-handed. A student is chosen at random. Find the probability that the student is left-handed, given that they are a boy.

3. **3 marks · standard**

Given that $P(A) = 0.5$, $P(B) = 0.6$, and $P(A \cup B) = 0.85$, find $P(A \cap B)$.

4. **3 marks · standard**

A bag contains 3 red balls and 4 blue balls. Two balls are drawn at random without replacement. Find the probability of drawing one ball of each colour.

5. **3 marks · standard**

In a class of 50 students, 20 study History, 30 study Geography, and 15 study both. A student is chosen at random. Find the probability that they study neither History nor Geography.

6. **3 marks · standard**

Two fair six-sided dice are rolled. Find the probability that the sum of the scores is exactly 8, given that the score on the first die is 3.

7. **3 marks · standard**

The probability that it rains on a given day is 0.4. If it rains, the probability that Alice takes the bus is 0.8. If it does not rain, the probability that she takes the bus is 0.3. Find the probability that Alice takes the bus on a randomly chosen day.

8. 3 marks · standard

Events A and B are independent. $P(A) = 0.25$ and $P(B) = 0.4$. Find $P(A' \cap B')$.

9. 3 marks · standard

In a Venn diagram showing three events A, B, and C, write down the set notation for the region representing "Event A and Event B occur, but not Event C".

10. 3 marks · harder

Given $P(A|B) = 0.5$, $P(B) = 0.4$, $P(A) = 0.3$, find $P(B|A)$.

Answers and worked solutions

Question 1

2 marks

1. M1 for using the multiplication rule for independent events: $P(C \cap D) = P(C) \times P(D)$.
2. A1 for evaluating $0.2 \times 0.6 = 0.12$.

Question 2

3 marks

1. M1 for restricting the sample space to only the boys (60 students).
2. M1 for identifying the number of successful outcomes in this restricted space (15 left-handed boys).
3. A1 for the conditional probability $\frac{15}{60} = \frac{1}{4}$ or 0.25.

Question 3

3 marks

1. M1 for using the general addition rule: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
2. M1 for substituting the known values: $0.85 = 0.5 + 0.6 - P(A \cap B)$.
3. A1 for solving to find $P(A \cap B) = 1.1 - 0.85 = 0.25$.

Question 4

3 marks

1. M1 for identifying the two successful mutually exclusive outcomes: (Red, Blue) and (Blue, Red).
2. M1 for calculating the probability of one of these outcomes, e.g., $P(R, B) = \frac{3}{7} \times \frac{4}{6} = \frac{2}{7}$.
3. A1 for multiplying by 2 (or summing both probabilities) to get $\frac{4}{7}$.

Question 5

3 marks

1. M1 for finding the number of students who study at least one subject: $20 + 30 - 15 = 35$.
2. M1 for subtracting from the total to find those who study neither: $50 - 35 = 15$.
3. A1 for stating the probability as $\frac{15}{50}$ or 0.3.

Question 6

3 marks

1. M1 for identifying the restricted sample space where the first die is 3, which has 6 equally likely outcomes.
2. M1 for identifying that only one of these outcomes gives a sum of 8: $(3, 5)$.
3. A1 for concluding the conditional probability is $\frac{1}{6}$.

Question 7

3 marks

1. M1 for drawing a tree diagram or identifying the two paths: (Rain and Bus) or (No Rain and Bus).
2. M1 for calculating the probability of each path: $0.4 \times 0.8 = 0.32$ and $0.6 \times 0.3 = 0.18$.
3. A1 for summing these probabilities to get $0.32 + 0.18 = 0.5$.

Question 8

3 marks

1. M1 for recognising that if A and B are independent, then A' and B' are also independent.
2. M1 for finding $P(A') = 0.75$ and $P(B') = 0.6$.
3. A1 for calculating $0.75 \times 0.6 = 0.45$.

Question 9

3 marks

1. M1 for identifying the intersection of A and B: $A \cap B$.
2. M1 for including the restriction that it must not be in C: intersecting with C'.
3. A1 for the correct set notation: $A \cap B \cap C'$ (or equivalent).

Question 10

3 marks

Answer: $\frac{2}{3}$

$P(A \cap B) = P(A|B)P(B) = 0.5 \times 0.4 = 0.2$ **M1**

$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.2}{0.3}$ **M1**

$= \frac{2}{3}$ **A1**

Answer: $\frac{2}{3}$

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