

3.2 Further Probability (A Level only)

Question Paper

Course	OCR A Level Maths: Statistics
Section	3. Probability
Topic	3.2 Further Probability (A Level only)
Difficulty	Medium

Time allowed: 60

Score: /53

Percentage: /100

Question 1

A, B and C are three events with $P(A) = 0.2$, $P(B) = 0.25$, $P(C) = 0.6$ and $P(B \cap C) = 0.08$.

- (a) Given that events A and C are mutually exclusive, and that events A and B are independent, draw a Venn diagram to illustrate the probabilities.

[4 marks]

Question 1

(b) Find:

- (i) $P(A' \cap C')$
- (ii) $P((A \cap B') \cup C)$
- (iii) $P(A' \cup (B \cap C)')$

[3 marks]

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Question 2

240 students are surveyed regarding their belief in supernatural creatures. 144 say they believe in unicorns (U). 75 say they believe in vampires (V). Of those who believe in vampires, 27 also believe in unicorns.

(a) Draw a two-way table to show this information.

[2 marks]

Question 2

(b) One student is chosen at random. Find:

- (i) $P(U')$
- (ii) $P(U' \cap V')$
- (iii) $P(U|V)$
- (iv) $P(V|U)$

[4 marks]

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Question 3

(a) A and B are two events with $P(A) = 0.47$ and $P(B) = 0.31$. Given that A and B are independent, write down

- (i) $P(A|B)$
- (ii) $P(B|A')$

[2 marks]

Question 3

(b) A group of middle and senior school students were asked whether they preferred vinegar or ketchup as a topping on their chips. The following two-way table shows the results of the survey:

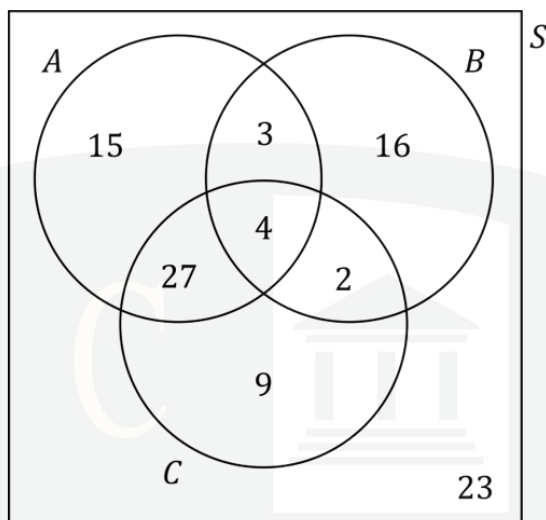
	vinegar	ketchup	total
middle	49	21	70
senior	63	27	90
total	112	48	160

- (i) Find $P(\text{ketchup}|\text{middle})$ and $P(\text{middle}|\text{ketchup})$.
- (ii) Use your results from part (b)(i) to show that for the students in the sample 'is in middle school' and 'prefers ketchup on chips' are independent events.

[4 marks]

Question 4

The following Venn diagram shows the number of adults in a poll who said they enjoy watching action films (A), Bollywood musicals (B), and crime thrillers (C).



One of the adults who was polled is selected at random. Given that the adult chosen enjoys watching at least one of those three genres of film, find the probability that the adult enjoys watching:

- (i) Bollywood musicals
- (ii) only one of the three genres of film
- (iii) exactly two of the three genres of film.

[3 marks]

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Question 5

Three events, A , B and C , are such that B and C are mutually exclusive and A and C are independent. $P(A) = 0.3$, $P(B) = 0.45$ and $P(C) = 0.1$.

- (a) Given that $P((A \cup B \cup C)') = 0.43$, draw a Venn diagram to show the probabilities for events A , B and C .

[4 marks]

Question 5

(b) Find:

- (i) $P(B|A)$
- (ii) $P(A|B')$
- (iii) $P(A|(B \cup C))$

[3 marks]

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Question 6

Given that $P(A) = 0.27$, $P(B) = 0.39$ and $P(A \cap B) = 0.21$, find:

- (a) (i) $P(A \cup B)$
- (ii) $P(B|A)$

[4 marks]

Question 6

The event C has $P(C) = 0.19$. The events A and C are mutually exclusive.

- (b) Given that $P(B \cap C) = 0.04$, find $P(A \cup B \cup C)$.

[2 marks]

Question 7

A bag contains 15 blue tokens and 27 yellow tokens. A token is taken from the bag and its colour is recorded, but it is not replaced in the bag. A second token is then taken from the bag and its colour is recorded.

- (a) Draw a tree diagram to represent this information.

[3 marks]

Question 7

(b) Find the probability that:

- (i) the second token selected is blue
- (ii) both tokens selected are blue, given that the second token selected is blue.

[4 marks]

Question 8

Ichabod is a keen chess player who plays one game of chess online every night before going to bed. In any one of those games, the probabilities of Ichabod winning, drawing, or losing are 0.4, 0.27 and 0.33 respectively. Following each game, the probabilities of Ichabod sleeping well after winning, drawing or losing are 0.7, 0.9 and 0.2 respectively.

(a) Draw a tree diagram to represent this information.

[3 marks]

Question 8

(b) Find the probability that on a randomly chosen night

- (i) Ichabod loses his chess game and sleeps well
- (ii) Ichabod sleeps well.

[4 marks]

Question 8

(c) Given that Ichabod sleeps well, find the probability that his chess game did not end in a draw.

[4 marks]

