4.3 Probability

Question Paper

Course	DP IB Maths
Section	4. Statistics & Probability
Topic	4.3 Probability
Difficulty	Medium

Time allowed: 90

Score: /71

Percentage: /100

Question 1

The lengths, in cm, of 120 adult platypuses are recorded in the following table:

Length, l (cm)	Frequency (female)	Frequency (male)
$39 \leq l < 42$	14	0
$42 \leq l < 45$	29	0
$45 \leq l < 48$	12	7
$48 \leq l < 51$	6	21
$51 \leq l < 54$	3	19
$54 \leq l < 57$	1	5
$57 \leq l < 60$	0	2
$60 \leq l < 63$	0	1

One platypus is chosen at random. Find the probability that the platypus is:

(i) male

(ii) less than 51 cm long

(iii) a male less than 45 cm long

(iv) a female between 45 and 54 cm long.

[4 marks]

Question 2

Two fair spinners each have three sectors numbered 1 to 3. The two spinners are spun together and then the product of the numbers indicated on each spinner is recorded.

Find the probability of the product indicated by the spinners being

(i) exactly 6

(ii) less than 4

(iii) an odd number.

[4 marks]

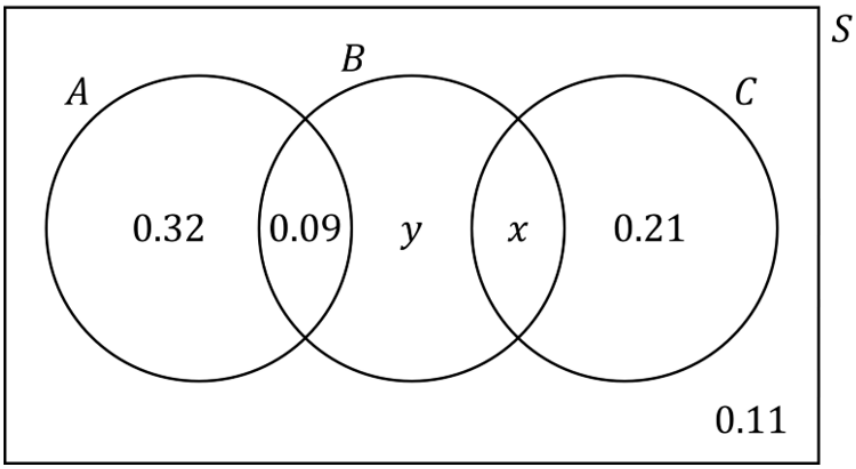
Question 3a

The Venn diagram below shows the probabilities of members of an exotic sports society participating in various activities.

A represents the event that the member participates in aerial yoga.

B represents the event that the member participates in bog snorkelling.

C represents the event that the member participates in cheese rolling.



Given that the probability of a member participating in cheese rolling is 0.44,

(a) determine the values of

(i) x

(ii) y.

[3 marks]

Question 3b

(b) Determine the probability that a member of the society

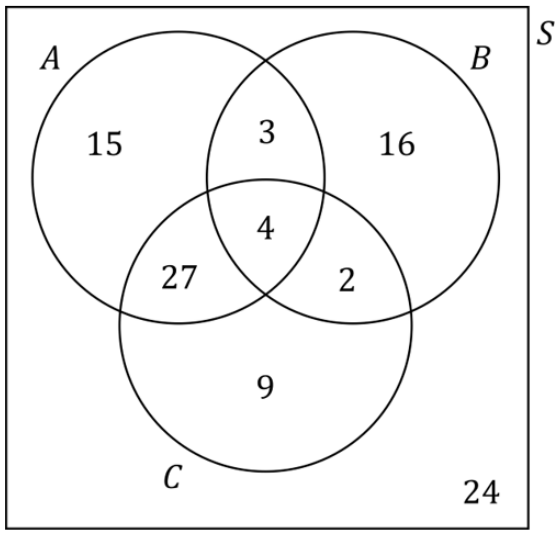
(i) participates in at least one of the three activities

(ii) participates in exactly one of the three activities.

[2 marks]

Question 4a

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). 100 adults were polled in total.



(a) 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]

Question 4b

(b) Find the following probabilities:

(i) $P(A \cap C)$

(ii) $P(A \cup C)$

(iii) $P(C|B)$

(iv) $P(B')$

[4 marks]

Question 5

On any given day the probability that Radigast has a lichen smoothie with his lunch is 0.4, and the probability that he has a wild mushroom wrap is 0.8. Given that the probability of him having both those items is 0.35, find the probability that Radigast has:

(i) a wild mushroom wrap but not a lichen smoothie

(ii) neither a wild mushroom wrap nor a lichen smoothie.

[4 marks]

Question 6a

(a) A and B are two events such that $\mathrm{P}(A) = 0.35$, $\mathrm{P}(B) = 0.25$ and $\mathrm{P}(A \cup B) = 0.6$. State, with a reason, whether A and B are mutually exclusive.

[2 marks]

Question 6b

(b) C and D are two events such that $\mathrm{P}(C) = 0.2$, $\mathrm{P}(D) = 0.4$ and $\mathrm{P}(C \cap D) = 0.18$. State, with a reason, whether C and D are independent.

[2 marks]

Question 7a

A bag contains 13 yellow tokens and 7 green tokens. Two tokens are drawn from the bag without replacement.

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

[3 marks]

Question 7b

(b) Find the probability that the two tokens drawn are the same colour.

[3 marks]

Question 8a

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

(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 8b

(b) Find:

(i) $\mathrm{P}(A' \cap C')$

(ii) $\mathrm{P}\big((A \cap B') \cup C\big)$

(iii) $\mathrm{P}(A' \cup (B \cap C)')$

[6 marks]

Question 9a

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

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

[4 marks]

Question 9b

(b) Find:

(i) $\mathrm{P}(B|A)$

(ii) $\mathrm{P}(A|B')$

(iii) $\mathrm{P}\big(A|(B \cup C)\big)$

[6 marks]

Question 10a

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

(a) (i) $\mathrm{P}(A \cup B)$

(ii) $\mathrm{P}(B|A)$

[4 marks]

Question 10b

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

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

[2 marks]

Question 11a

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 11b

(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 11c

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

[4 marks]