

The background of the slide features a dark blue gradient with abstract data visualizations. A bar chart with green bars of varying heights is visible, overlaid with a red line graph showing an upward trend. The word 'EXPLORE' is written in large, white, sans-serif capital letters, with a dot in the center of the 'O'. To the right of 'EXPLORE' are two vertical bars, followed by the words 'DATA SCIENCE' and 'ACADEMY' stacked vertically in a smaller, white, sans-serif font.

EXPLORE || DATA SCIENCE ACADEMY

**Probability Assignment
Model Answers**

Probability Theory Assignment Questions

Question 1

Let the sample space $S = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ denote the possible outcomes of rolling two fair dice. Let this sample space be partitioned into $A = \{2, 3, 4, 5\}$, $B = \{6, 7, 8\}$ and $C = \{9, 10, 11, 12\}$.

Question 1.1

Calculate $P(3)$.

- (A) $1/18$
- (B) $1/24$
- (C) $1/36$
- (D) $1/12$

Answer: A.

Question 1.2

Which of the following statements is/are true?

- (A) $P(A) < P(B)$
- (B) $P(A) = P(B)$
- (C) $P(A) > P(B)$
- (D) $P(A) < P(C)$

Answer: A.

Question 2

From a standard deck of 52 cards, two players are each dealt two cards.

Question 2.1

Evaluate the probability of both players being dealt two aces.

- (A) 1 in 270,725
- (B) 1 in 6,497,400
- (C) 1 in 28,561
- (D) 1 in 2,704

Answer: A.

Question 2.2

Calculate the probability of either player, but not both, having a hand consisting of aces and/or kings only (i.e. two aces, two kings or an ace and a king).

- (A) 0.04172
- (B) 0.04622
- (C) 0.02086
- (D) 0.00052

Answer: A.

Question 2.3

The first player carelessly shows one of her cards, which is an ace, to the second player. Calculate the probability that the second player, who has not yet looked at his own cards, has two aces, conditional on the first player holding one.

- (A) 0.00235
- (B) 0.00471
- (C) 0.00452
- (D) 0.00592

Answer: A.

Question 2.4

The second player has difficulty with his poker face, and struggles to contain his excitement, especially when he has two aces in his hand, when he will show excitement 90% of the time, as opposed to only 10% of the time when he does not have aces. The first player observes that he is excited when he looks at his hand. What should be her best estimate of the probability that he is holding two aces, before looking at her own cards? Hint: use Bayes' Theorem.

- (A) 0.0393
- (B) 0.0081
- (C) 0.1
- (D) 0.9

Answer: A.

Question 3

Ten students of the Explore Data Science Academy are contesting an election for the three-person Student Representative Council. The students who receive the most votes will, in descending order, be elected as Chair, Deputy Chair and Assistant Alternate Deputy Chair. Assuming that each student is equally likely to attract any given vote and ignoring the possibility of tied outcomes:

Question 3.1

Which of these is closest to the number of possible orderings of the candidates in the voting?

- (A) 3.6 million
- (B) 1.3 trillion
- (C) 479 million
- (D) 605,000

Answer: A.

Question 3.2

What is the probability that all three of Andile, Jason and Thandi are elected to the Council?

- (A) 1 in 120
- (B) 1 in 10
- (C) 1 in 220
- (D) 3 in 10

Answer: A.

Question 3.3

What is the probability that one of Andile, Jason and Thandi is elected as Chair?

- (A) 0.3
- (B) 0.2
- (C) 0.476
- (D) 0.025

Answer: A.

2 Cool, you're done :)