MATHS BASE MAKER

Class 9 CBSE Mathematics | Ganita Manjari

Chapter 7: The Mathematics of Maybe: Introduction to Probability

STUDENT PRACTICE WORKSHEET (concept + question)

PART 1: MASTER CONCEPTS & FORMULAS AT A GLANCE

Definition of Probability	The measure of the chance that a specific event will occur: P(E) = (Number of Favorable Outcomes) / (Total Number of Possible Outcomes)
Theoretical vs Experimental	• Theoretical Probability: Calculated from logical reasoning, assuming all outcomes are equally likely (e.g., Fair coin P(H) = 1/2). • Experimental Probability: Calculated from real observed trials/data: P(E) = (Number of times event occurred) / (Total number of trials conducted)
Key Terminology	• Trial: A repeatable action or experiment producing data. • Outcome: A single specific result of a trial. • Sample Space (S): The complete set of all possible outcomes. • Equally Likely: Outcomes having the identical mathematical chance of occurring. • Unbiased / Fair: Device with no preference or favoritism toward any outcome.
Probability Bounds & Range	• The probability of any event E always satisfies: $0 \leq P(E) \leq 1$ • It can NEVER be negative, and can NEVER exceed 1.
Sure & Impossible Events	• Sure (Certain) Event: Guaranteed to happen => P(E) = 1 (e.g., Rolling a number < 7 on a standard

	die). • Impossible Event: Can never happen => P(E) = 0 (e.g., Rolling a 7 on a standard die).
Complementary Events	For any event E and its non-occurrence 'not E': P(E) + P(not E) = 1 => P(not E) = 1 – P(E)
Deck of 52 Playing Cards	• Total = 52 cards across 4 suits (13 cards each): - 26 Red Cards: 13 Hearts (♥) + 13 Diamonds (♦) - 26 Black Cards: 13 Spades (♠) + 13 Clubs (♣) • Each suit contains: Ace (A), 2 to 10, and 3 Face cards: Jack (J), Queen (Q), King (K) • Total Face Cards = 12 (4 Jacks, 4 Queens, 4 Kings); Total Aces = 4 (2 Red, 2 Black).
Two Dice & Multi-Coin Rules	• Tossing 3 coins: Total outcomes = 2^3 = 8 (HHH, HHT, HTH, HTT, THH, THT, TTH, TTT) • Throwing 2 dice: Total outcomes = 6 × 6 = 36 ordered pairs (1,1) to (6,6).

PART 2: PRACTICE QUESTIONS (WITH FINAL ANSWERS)

Watch the Complete Chapter 7 Video Solutions on YouTube

https://youtu.be/A_E3DGyNqRI

Question 1: Rolling a Die: Non-Prime Numbers

A standard fair die is rolled once. Find the probability of getting a number that is NOT a prime number.

Final Answer: P(Not Prime) = 1/2 (or 3/6)
[Total outcomes = {1, 2, 3, 4, 5, 6} = 6; Non-prime outcomes = {1, 4, 6} = 3; Note that 1 is neither prime nor composite]

Question 2: Lucky Coin: Experimental vs. Theoretical Probability

Ratan believes that his 'lucky coin' gives more Heads than Tails. To test his belief, he tosses the coin 20 times and records 15 Heads and 5 Tails.
(i) Find the experimental probability of getting a Head.
(ii) Assuming the coin is fair, find the theoretical probability of getting a Head.
(iii) Why are the two probabilities different?
(iv) What result do you expect if the coin is tossed 2,000 times?

Final Answer: **(i) Experimental P(Head) = 15/20 = 3/4 (or 0.75)**
(ii) Theoretical P(Head) = 1/2 (or 0.5)
(iii) Reason: Experimental probability is based on a small sample of random trials and subject to fluctuation, whereas theoretical probability represents the mathematical expectation based on equally likely outcomes.
(iv) Law of Large Numbers: As the number of tosses increases to 2,000, the experimental relative frequency will stabilize and get very close to the theoretical probability of 1/2 (~1,000 heads).

Question 3: Birthday Party Food Combinations

At a birthday party, every guest chooses one sandwich and one drink.
Sandwiches: Veg Sandwich, Cheese Sandwich, Paneer Sandwich (3 options)
Drinks: Coffee, Juice (2 options)
Sachin says: 'There are only 5 possible food combinations because 3 + 2 = 5.'
(i) Do you agree with Sachin? Give a mathematical reason.
(ii) Write the sample space of all possible food combinations.
(iii) How many total different food combinations are possible?
(iv) List the outcomes in the event 'Choosing a Paneer Sandwich'.

Final Answer: **(i) No, disagree. By the Fundamental Counting Principle, choices are combined by multiplication, not addition (3 × 2 = 6).**
(ii) Sample Space S = {(Veg, Coffee), (Veg, Juice), (Cheese, Coffee), (Cheese, Juice), (Paneer, Coffee), (Paneer, Juice)}
(iii) Total combinations = 6
(iv) Event outcomes = {(Paneer, Coffee), (Paneer, Juice)} (2 combinations)

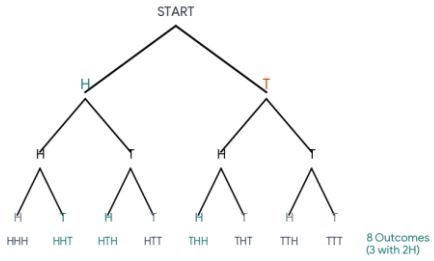
Question 4: Playing Cards: Black Aces & Exclusions

From a well-shuffled standard deck of 52 playing cards, a card is drawn at random. Find:
(i) The probability of drawing a black Ace.
(ii) The probability of drawing neither a Jack nor a Queen.

Final Answer: **(i) P(Black Ace) = 2/52 = 1/26 [2 black aces: Ace of Spades, Ace of Clubs]**
(ii) P(Neither Jack nor Queen) = 44/52 = 11/13 [Total excluded = 4 Jacks + 4 Queens = 8; Favorable = 52 – 8 = 44]

Question 5: Tossing Three Coins Simultaneously

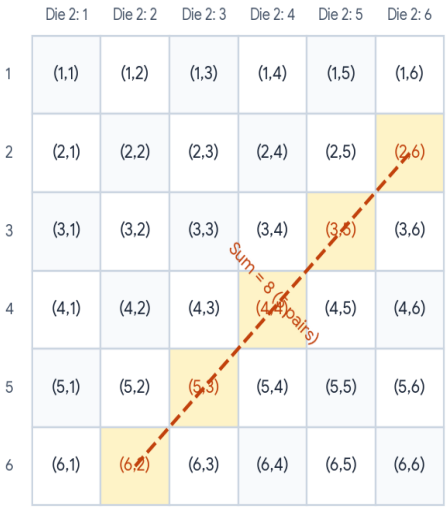
Three fair coins are tossed simultaneously.
(i) Using the given tree diagram, list all 8 possible outcomes in the sample space.
(ii) Find the probability of getting exactly 2 Heads.



Final Answer: (i) S = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT} (Total = 8)
(ii) P(Exactly 2 Heads) = 3/8
[Favorable outcomes with 2H: {HHT, HTH, THH} = 3]

Question 6: Throwing Two Dice: Sum of Numbers is 8

Two fair 6-sided dice are thrown simultaneously.
(i) State the total number of possible outcomes in the sample space.
(ii) From the given 36-outcome grid, find the probability that the sum of the numbers appearing on the two dice is equal to 8.



Final Answer: (i) Total possible outcomes = 6 × 6 = 36
(ii) P(Sum is 8) = 5/36
[Favorable pairs: (2, 6), (3, 5), (4, 4), (5, 3), (6, 2) = 5 outcomes]

Video solution on YouTube

https://youtu.be/A_E3DGyNqRI