Case Study 3

Case Study Scenario:

The Science Museum souvenir shop has a unique way of giving out discounts. At the billing counter, there is a large transparent jar filled with 50 glass marbles. These marbles are used for a "Discount Experiment." Before paying, a customer reaches into the jar and picks one marble. The color of the marble determines the discount percentage the customer receives on their total bill.

The jar contains 10 Gold marbles (representing a 50% discount), 15 Silver marbles (representing a 20% discount), and the remaining marbles are Black (representing a 5% discount). The shop manager, Mrs. Kapoor, wants to make sure that the probability of giving away a 50% discount is low enough to keep the shop profitable, while the 5% discount should be the most likely outcome. To analyze this, the Grade 7 students visiting the museum are asked to define the sample space and calculate the probabilities of various events. They must also determine the likelihood of "favorable outcomes" for the customers versus the "favorable outcomes" for the shop's revenue.

Multiple Choice Questions

1. Based on the information provided, how many Black marbles are present in the jar?

   (a) 20
   (b) 25
   (c) 30
   (d) 15

   Answer: (b) 25
   Solution: Total marbles = 50. Gold = 10, Silver = 15. Black marbles = $50 - (10 + 15) = 50 - 25 = 25$.

2. What is the probability that a customer will pick a Gold marble and receive a 50% discount?

   (a) 1/5
   (b) 1/10
   (c) 1/2
   (d) 1/4

   Answer: (a) 1/5
   Solution: Number of Gold marbles = 10. Total marbles = 50. Probability = 10/50 = 1/5.

3. What is the probability of a customer picking a marble that is NOT Silver?

   (a) 35/50
   (b) 15/50
   (c) 25/50
   (d) 7/10

   Answer: (d) 7/10
   Solution: Number of Silver marbles = 15. Number of marbles that are not Silver = $50 - 15 = 35$. Probability = 35/50. Dividing both by 5, we get 7/10.

4. If "Event A" is picking a Gold or Silver marble, and "Event B" is picking a Black marble, which statement is true?

(a) Event A is more likely than Event B.

(b) Event B is more likely than Event A.

(c) Both events are equally likely.

(d) Event A is an impossible event.

Answer: (c) Both events are equally likely.
Solution: $P(\text{Event A}) = (10 + 15)/50 = 25/50 = 0.5$. $P(\text{Event B}) = 25/50 = 0.5$. Since the probabilities are equal, the events are equally likely.

5. The manager decides to add 10 more Black marbles to the jar. What will be the new total number of outcomes in the sample space?

(a) 50

(b) 40

(c) 60

(d) 70

Answer: (c) 60
Solution: Original total = 50. Adding 10 more marbles makes the new total $50 + 10 = 60$.