Case Study 2

Case Study Scenario:

The Grade 7 Hobby Club is developing a new board game called "Path to Victory." To move their pieces on the board, players must perform two actions. First, they spin a circular spinner divided into 8 equal sectors. The sectors are numbered from 1 to 8. Second, they draw a single card from a special deck of 20 cards. These cards are numbered from 1 to 20. The movement of the player's piece is determined by the probability of landing on specific numbers.

The students want to ensure the game is challenging. They define a "Power Move" as an event where a player spins an even number on the spinner or draws a card that is a multiple of 5. To balance the game, they are also looking at "Penalty Zones," which occur if a player draws a prime number from the deck of cards. Understanding the difference between possible outcomes and specific events is crucial for the club members to write the rulebook accurately. They need to calculate the simple probability of these events to decide how many "Power Move" tokens to include in the box.

Multiple Choice Questions

1. What is the probability of the spinner landing on a number that is a factor of 8?

   (a) 1/2
   (b) 3/8
   (c) 5/8
   (d) 1/4

   Answer: (a) 1/2
   Solution: The numbers on the spinner are {1, 2, 3, 4, 5, 6, 7, 8}. The factors of 8 are {1, 2, 4, 8}. There are 4 favorable outcomes. Probability = $4/8 = 1/2$.

2. In the card draw (cards 1 to 20), what is the probability of drawing a "Penalty Zone" card (a prime number)?

   (a) 7/20
   (b) 8/20
   (c) 9/20
   (d) 2/5

   Answer: (b) 8/20
   Solution: Prime numbers between 1 and 20 are {2, 3, 5, 7, 11, 13, 17, 19}. There are 8 such numbers. Probability = 8/20 (which simplifies to 2/5).

3. Regarding the spinner, which of the following events has a probability of 0.5?

   (a) Landing on a number greater than 4
   (b) Landing on a number less than 4
   (c) Landing on a number 6 or 7
   (d) Landing on the number 8

   Answer: (a) Landing on a number greater than 4
   Solution: Numbers greater than 4 are {5, 6, 7, 8}. There are 4 outcomes. Probability = $4/8 = 0.5$. (Option B is 3/8, Option C is 2/8, Option D is 1/8).

4. If a player draws a card from the deck of 20, what is the probability that the card is a multiple of 5?

   (a) 1/4
   (b) 1/5
   (c) 1/10
   (d) 4/20

   Answer: (b) 1/5
   Solution: Multiples of 5 between 1 and 20 are {5, 10, 15, 20}. There are 4 favorable outcomes. Probability = 4/20 = 1/5.

5. Which of the following is a "Certain Event" for the spinner experiment?

   (a) Landing on a number between 1 and 8 inclusive
   (b) Landing on an odd number
   (c) Landing on a number greater than 0
   (d) Both (a) and (c)

   Answer: (d) Both (a) and (c)
   Solution: A certain event has a probability of 1. Since all numbers on the spinner are between 1 and 8, and all are greater than 0, both descriptions cover all possible outcomes in the sample space.