

CBC Grade 10 Mathematics

Step-by-Step Presentation Script

Probability Spaces

Pre-Class Preparation

Before students arrive, ensure the following materials and setup are ready:

- Materials Needed:
 - Coins (one per group)
 - Recording sheets/paper for tally charts
 - Dice (for demonstrations)
 - Chart paper for displaying sample spaces
 - Markers
 - Exit tickets (one per student)
- Classroom Setup:
 - Arrange desks for group work (groups of 3-4 students)
 - Prepare board space for recording sample spaces
 - Display key inquiry question: "How is probability applied in real life situations?"
 - Have tally chart templates ready

Lesson Overview (40 Minutes)

Phase	Duration
Phase 1: Problem-Solving and Discovery	0-15 minutes
Phase 2: Structured Instruction	15-25 minutes
Phase 3: Practice and Application	25-37 minutes
Phase 4: Assessment (Exit Ticket)	37-40 minutes

Minute-by-Minute Presentation Guide

Minutes 0-2: Introduction and Engagement

[SAY] "Good morning, class! Today we begin an exciting new topic: probability. Probability helps us understand chance and uncertainty in our daily lives."

[ASK] "Who can give me an example of probability in real life?"

[LISTEN] Allow 2-3 students to share. Examples might include: weather forecasts, sports outcomes, games.

[SAY] "Excellent examples! Probability is everywhere—from predicting rain to determining your chances of winning a game. Today, we'll learn about probability spaces, which are the foundation of understanding probability."

[WRITE] On the board: "Probability Spaces"

[WRITE] Key inquiry question: "How is probability applied in real life situations?"

Minutes 2-17: Phase 1 - Anchor Activity (Discovery)

[DO] Organize students into groups of 3-4.

[SAY] "You will now conduct a probability experiment. Each group will receive a coin. Your task is to toss the coin 20 times and record your results."

[WRITE] Display the anchor activity instructions on the board:

- 1. Toss a coin 20 times
- 2. Record heads and tails using a tally chart
- 3. Discuss: What is the sample space?
- 4. Compare sample spaces with other groups

[DO] Distribute coins and recording sheets to each group.

[SAY] "Make sure one person tosses, one person calls out the result, and one person records. Take turns so everyone participates."

[DO] Circulate among groups (Minutes 2-12). Observe their work and ask probing questions:

- • "How many heads have you gotten so far?"
- • "What are ALL the possible outcomes when you toss a coin?"
- • "Can the coin land on anything other than heads or tails?"
- • "Will another group get exactly the same number of heads as you?"

[TEACHING TIP] Some students may confuse the actual results (e.g., "12 heads, 8 tails") with the sample space. Guide them to see that sample space is about what CAN happen, not what DID happen.

[DO] At minute 12, bring the class together for sharing.

[SAY] "Let's share our findings. Group 1, how many heads and tails did you get?"

[LISTEN] Record several groups' results on the board.

[POINT] "Notice that each group got different numbers! Group 1 got 12 heads, Group 2 got 9 heads, Group 3 got 11 heads."

[ASK] "Even though your results are different, what are ALL the possible outcomes when tossing a coin?"

[LISTEN] Guide students to say: Heads and Tails.

[SAY] "Exactly! No matter how many times we toss or what results we get, there are only two possible outcomes: heads or tails. This list of all possible outcomes is called the sample space."

[WRITE] Sample Space = {Heads, Tails} or $S = \{H, T\}$

Minutes 17-25: Phase 2 - Structured Instruction

[SAY] "You've just discovered an important concept in probability. Let's formalize what you learned."

[WRITE] Definition: "Random Experiment"

[SAY] "A random experiment is a process that can be repeated and has possible outcomes, but we cannot predict with certainty which outcome will occur. Tossing a coin is a random experiment."

[ASK] "Can you think of other random experiments?"

[LISTEN] Examples: rolling a die, drawing a card, spinning a spinner.

[WRITE] Definition: "Sample Space"

[SAY] "The sample space is a set containing ALL possible outcomes of a random experiment. We use the symbol S or the Greek letter omega (Ω) to represent it."

[WRITE] For coin toss: $S = \{H, T\}$

[SAY] "Notice we use curly brackets $\{ \}$ to show it's a set. We list each possible outcome once."

[WRITE] Definition: "Outcome"

[SAY] "An outcome is a single result from one trial. When you toss a coin once, getting heads is one outcome."

[WRITE] Definition: "Event"

[SAY] "An event is a collection of outcomes. It can be one outcome or several outcomes grouped together."

[EXAMPLE] "For example, when rolling a die, the event 'getting an even number' includes three outcomes: 2, 4, and 6."

[SAY] "Here are important facts about probability:"

[WRITE]

- • Probability is always between 0 and 1
- • All probabilities add up to 1
- • Probability of an event = sum of probabilities of its outcomes

[TEACHING TIP] Emphasize that sample space lists what CAN happen (possibilities), not what DID happen (actual results).

Minutes 25-37: Phase 3 - Practice and Application

[SAY] "Now let's practice identifying sample spaces for different experiments."

[EXAMPLE] Example 1: Rolling a Die

[WRITE] "Consider rolling a 6-sided die. What is the sample space?"

[ASK] "What are all the possible outcomes?"

[LISTEN] Students should list: 1, 2, 3, 4, 5, 6.

[WRITE] $S = \{1, 2, 3, 4, 5, 6\}$

[SAY] "Good! Now, suppose we want to identify the event 'rolling an even number.' Which outcomes are in this event?"

[LISTEN] Students should say: 2, 4, 6.

[WRITE] Event $A = \{2, 4, 6\}$

[SAY] "The probability of this event is 3 out of 6, which equals $\frac{1}{2}$ or 50%."

[EXAMPLE] Example 2: Ballgum Selection

[SAY] "Here's a practical problem: Mutuse's bag contains 3 red ballgums, 2 blue ballgums, and 1 green ballgum. If one ballgum is drawn at random, what is the sample space?"

[ASK] "What are the possible colors you could draw?"

[LISTEN] Students should say: Red, Blue, Green.

[WRITE] $S = \{\text{Red, Blue, Green}\}$

[POINT] "Notice we list each color once, even though there are multiple ballgums of some colors. The sample space shows the different types of outcomes, not how many of each."

[EXAMPLE] Example 3: Two Dice

[SAY] "Let's look at a more complex example. When rolling two dice, we write outcomes as ordered pairs like (2, 5)."

[WRITE] "Sample space includes: (1,1), (1,2), (1,3), ... (6,6)"

[SAY] "There are 36 possible outcomes total. If we want the event 'both dice show the same number,' we list: (1,1), (2,2), (3,3), (4,4), (5,5), (6,6)."

[DO] Give students 5 minutes (minutes 32-37) to work on individual practice problems:

1. List the sample space for rolling a die and the event "prime number"
2. A spinner has Red, Blue, Green sections. What is the sample space?
3. Drawing a card from {1, 2, 3}. What is the sample space?

[DO] Circulate to check understanding and provide support.

[TEACHING TIP] Encourage students to use set notation { } when writing sample spaces.

Minutes 37-40: Phase 4 - Assessment (Exit Ticket)

[SAY] "Excellent work today! To check your understanding, you'll complete a short exit ticket individually."

[DO] Distribute exit tickets to each student.

[SAY] "You have 3 minutes to complete these questions. For each situation, write the sample space using set notation."

[WRITE] Display exit ticket questions on the board:

1. Day of the week randomly selected—sample space?
2. Restaurant main course: chicken, fish, or vegetarian—sample space?
3. Traffic light colors—sample space?
4. T-shirt sizes: small, medium, large—sample space?
5. Spinner with A, B, C, D—sample space?

[DO] Students work silently on exit tickets (minutes 37-40).

[DO] Collect exit tickets as students finish.

[SAY] "Thank you for your excellent work today! You now understand what sample spaces are and how to identify them. Tomorrow we'll learn how to calculate probabilities using sample spaces. For homework, think of three random experiments from your daily life and write their sample spaces."

Teaching Tips and Strategies

- Emphasis Points:
 - Distinguish between what CAN happen (sample space) and what DID happen (actual results)
 - Use set notation { } consistently
 - Emphasize that sample space stays the same across trials
 - Connect to real-world examples students can relate to

- • Use physical experiments to make concepts concrete
- Differentiation in Action:
 - • For struggling learners: Start with simple experiments, use manipulatives, provide sentence frames
 - • For advanced learners: Introduce compound experiments (two coins, two dice)
- • Use visual aids and diagrams
- • Allow students to draw outcomes before writing sets
- Common Student Errors to Watch For:
 - • Confusing actual results with sample space
 - • Listing outcomes multiple times (e.g., {Red, Red, Red, Blue, Blue, Green})
 - • Forgetting to use set notation { }
 - • Thinking sample space changes based on results
 - • Missing outcomes (incomplete sample space)
- Engagement Strategies:
 - • Use hands-on experiments with coins, dice, spinners
 - • Connect to games students play
 - • Ask students to create their own experiments
 - • Discuss real-world applications (weather, sports, lotteries)

Assessment Guidance

Exit Ticket Evaluation Criteria:

- • Correct identification of all possible outcomes
- • Proper use of set notation { }
- • Complete sample space (no missing outcomes)
- • No duplicate outcomes listed

Mastery Indicators:

- • Student can distinguish between outcomes and sample space
- • Student can list complete sample spaces for various experiments
- • Student uses set notation correctly
- • Student understands that sample space is fixed, not variable

Follow-Up for Students Who Struggle:

- • Provide additional hands-on experiments
- • Use visual representations (tree diagrams, lists)
- • Practice with simple experiments before complex ones
- • Create reference cards with common sample spaces

Post-Lesson Reflection Questions

After teaching this lesson, reflect on the following:

- • Did students successfully distinguish between actual results and possible outcomes?

- • Were students able to list complete sample spaces?
- • How well did students understand set notation?
- • What misconceptions emerged, and how were they addressed?
- • Did the coin toss experiment effectively introduce the concept?
- • What percentage of students demonstrated mastery on the exit ticket?
- • What adjustments would improve this lesson for next time?