

CBC Grade 10 Mathematics

Step-by-Step Presentation Script

Multiplication Rule

Pre-Class Preparation

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

- Materials Needed:
 - Dice (for demonstrations)
 - Coins (for demonstrations)
 - Calculators
 - Chart paper for displaying formulas
 - Markers
 - Exit tickets (one per student)
- Classroom Setup:
 - Arrange desks for group work (groups of 3-4 students)
 - Prepare board space for formulas and worked examples
 - Display key inquiry question: "How is probability applied in real life situations?"

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 continue our study of probability by learning the multiplication rule. This rule helps us find the probability when TWO or more events happen together."

[ASK] "Can anyone think of a situation where you need to find the probability of multiple things happening at the same time?"

[LISTEN] Allow 2-3 students to share. Examples: getting heads twice in a row, passing two tests, sunny weather for multiple days.

[SAY] "Excellent! The multiplication rule is used everywhere—from quality control in factories to weather forecasting. Let's discover how it works."

[WRITE] On the board: "Multiplication Rule"

[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 work in groups to solve a quality control problem. This is a real situation that factories face every day."

[WRITE] Display the anchor activity on the board:

"A factory produces 90% good items and 10% defective items. A quality check is performed on two randomly selected items."

[WRITE] Questions:

- (a) Find the probability that both items are good.
- (b) Find the probability that at least one item is defective.
- (c) Are these events independent? Explain.

[SAY] "Take 10 minutes to work on this problem. You can use any method—draw diagrams, make lists, or try calculations. Discuss your approaches with your group."

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

- • "What is the probability of selecting one good item?"
- • "How do you find the probability of TWO good items?"
- • "Does selecting the first item affect the second selection?"
- • "What does 'at least one defective' mean?"

[TEACHING TIP] If groups struggle with part (b), guide them to consider: "at least one defective" is the opposite of "both good."

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

[SAY] "Let's share our findings. Group 1, what did you get for part (a)—the probability that both items are good?"

[LISTEN] Expected approaches: Some may list outcomes, others may multiply 0.9×0.9 .

[SAY] "Interesting! Some groups multiplied the probabilities. Why does that work?"

[LISTEN] Guide discussion toward: "We multiply because BOTH events must happen."

[WRITE] $P(\text{both good}) = 0.9 \times 0.9 = 0.81$ or 81%

[SAY] "Excellent discovery! You've just found the multiplication rule. Let's formalize this."

Minutes 17-25: Phase 2 - Structured Instruction

[SAY] "You discovered that when we want TWO events to happen together, we multiply their probabilities. This is called the multiplication rule."

[WRITE] Definition: "Multiplication Rule"

[SAY] "The multiplication rule is used to find the probability of two events happening together—both occurring."

[WRITE] "For Independent Events:"

[SAY] "When two events are independent—meaning one does not affect the other—we use this formula:"

[WRITE] $P(A \text{ and } B) = P(A) \times P(B)$

[SAY] "Let me give you examples of independent events:"

- • Tossing a coin and rolling a die—the coin doesn't affect the die
- • Weather on Monday and Tuesday—usually independent
- • Rolling two dice—one die doesn't affect the other

[WRITE] "For Dependent Events:"

[SAY] "Sometimes the first event DOES affect the second. We call these dependent events. The formula is slightly different:"

[WRITE] $P(A \cap B) = P(A) \times P(B|A)$

[SAY] " $P(B|A)$ means the probability of B happening GIVEN that A has already happened. We call this conditional probability."

[EXAMPLE] "For example, if you draw two cards without putting the first back, the second draw depends on what you drew first."

[SAY] "The key question to ask is: Does the first event affect the second? If NO, events are independent. If YES, events are dependent."

[TEACHING TIP] Create a comparison table on the board showing independent vs. dependent events.

Minutes 25-37: Phase 3 - Practice and Application

[SAY] "Now let's practice applying the multiplication rule to different problems."

[EXAMPLE] Example 1: Die and Coin

[WRITE] "A student rolls a die and tosses a coin. What is the probability of rolling a 4 and getting heads?"

[SAY] "Let's solve this step by step."

[WRITE] Step 1: Identify the events

- Event A: Rolling a 4
- Event B: Getting heads

[WRITE] Step 2: Find individual probabilities

- $P(\text{rolling a 4}) = 1/6$
- $P(\text{getting heads}) = 1/2$

[ASK] "Are these events independent or dependent?"

[LISTEN] Students should say: Independent—the die doesn't affect the coin.

[WRITE] Step 3: Apply multiplication rule

$$P(4 \text{ and } H) = 1/6 \times 1/2 = 1/12$$

[SAY] "The probability is $1/12$ or about 8.33%."

[EXAMPLE] Example 2: Bus Problem

[SAY] "Here's a more complex problem. A person has a 60% chance of catching the first bus and an 80% chance of catching the second bus if they miss the first."

[WRITE] "(a) Find the probability of catching the first bus."

[SAY] "This is straightforward: $P(\text{first bus}) = 0.6$ or 60%."

[WRITE] "(b) Find the probability of missing the first bus but catching the second."

[SAY] "Now we need TWO things to happen: miss first AND catch second."

[WRITE]

- $P(\text{miss first}) = 1 - 0.6 = 0.4$
- $P(\text{catch second} \mid \text{miss first}) = 0.8$
- $P(\text{miss first AND catch second}) = 0.4 \times 0.8 = 0.32$ or 32%

[WRITE] "(c) Find the probability of missing both buses."

[WRITE]

- $P(\text{miss first}) = 0.4$
- $P(\text{miss second} \mid \text{miss first}) = 1 - 0.8 = 0.2$

- $P(\text{miss both}) = 0.4 \times 0.2 = 0.08$ or 8%

[EXAMPLE] Example 3: Anchor Activity Solution

[SAY] "Let's complete the anchor activity solution."

[WRITE] "(a) $P(\text{both good}) = 0.9 \times 0.9 = 0.81$ or 81%"

[WRITE] "(b) $P(\text{at least one defective}) = 1 - P(\text{both good}) = 1 - 0.81 = 0.19$ or 19%"

[SAY] "Notice we used the complement rule here. 'At least one defective' is the opposite of 'both good.'"

[WRITE] "(c) Events are independent because selecting one item doesn't affect the probability for the next item (factory produces many items)."

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

1. Two coins tossed. Find $P(\text{both heads})$
2. Die rolled, coin tossed. Find $P(6 \text{ and tails})$
3. Two seeds, 75% germination each. Find $P(\text{both germinate})$

[DO] Circulate to check understanding and provide support.

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

[SAY] "Excellent work today! To check your understanding, complete this exit ticket individually."

[DO] Distribute exit tickets.

[SAY] "You have 3 minutes. Show your work and include units."

[WRITE] Display exit ticket questions:

4. 1. Coin tossed twice. $P(\text{heads both times})$?
5. 2. Die rolled, coin tossed. $P(6 \text{ and tails})$?
6. 3. 60% sun Monday, 70% sun Tuesday (independent). $P(\text{sun both days})$?
7. 4. Two seeds, 75% germination each. $P(\text{both germinate})$?

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

[DO] Collect exit tickets.

[SAY] "Great work today! You now know how to use the multiplication rule for independent events. Tomorrow we'll explore dependent events in more depth. For homework, find a real-world example where the multiplication rule is used."

Teaching Tips and Strategies

Emphasis Points:

- • Multiply for "and" (both events), add for "or" (either event)
- • Independent: first event doesn't affect second
- • Multiplication makes probabilities smaller (compound events less likely)
- • Convert percentages to decimals before multiplying
- • Use tree diagrams to visualize compound events

Differentiation in Action:

- • For struggling learners: Use tree diagrams, provide formula cards
- • For advanced learners: Introduce three-event problems, dependent events
- • Use concrete manipulatives (coins, dice)
- • Allow calculators for multiplication

Common Student Errors:

- • Adding instead of multiplying probabilities
- • Forgetting to convert percentages to decimals
- • Confusing "and" with "or"
- • Not recognizing when events are independent
- • Misunderstanding "at least one" problems

Engagement Strategies:

- • Use real-world contexts (weather, quality control, sports)
- • Demonstrate with physical experiments
- • Connect to previous knowledge of sample spaces
- • Ask students to create their own compound event problems

Assessment Guidance

Exit Ticket Evaluation Criteria:

- • Correct identification of independent events
- • Proper application of multiplication rule
- • Accurate calculations
- • Appropriate conversion of percentages to decimals
- • Clear working shown

Mastery Indicators:

- • Student can identify when to use multiplication rule
- • Student can distinguish independent from dependent events
- • Student can apply $P(A \text{ and } B) = P(A) \times P(B)$ correctly
- • Student can solve "at least one" problems using complement

Follow-Up for Students Who Struggle:

- • Provide additional practice with tree diagrams

- • Use simpler two-event problems
- • Create formula reference cards
- • Schedule small group intervention

Post-Lesson Reflection Questions

After teaching this lesson, reflect on:

- • Did students distinguish independent from dependent events?
- • Were students able to apply the multiplication rule correctly?
- • What misconceptions emerged?
- • How well did students understand when to multiply vs. add?
- • Did the anchor activity effectively introduce the concept?
- • What percentage demonstrated mastery on the exit ticket?
- • What adjustments would improve this lesson?