Grade 10 Mathematics Lesson Plan

Addition Rule

Strand:	**Statistics and Probability**
Sub-Strand:	Probability 1: Addition Rule
Specific Learning Outcome:	Apply the laws of probability in different situations
Duration:	40 minutes
Key Inquiry Questions:	How is probability applied in real life situations?
Learning Resources:	CBC Grade 10 textbooks, playing cards, Venn diagram templates, chart paper

Phase 1: Problem-Solving and Discovery (15 minutes)

Anchor Activity: Passing Mathematics or English

Objective: Students work in groups to explore the addition rule for probability, discovering how to calculate the probability of "either/or" events.

Work in groups to solve the following problem:

The probability that a student passes Mathematics is 75% and the probability that they pass English is 60%. If the probability of passing both is 50%, find the probability that the student passes either Mathematics or English.

Compare answers with other groups.

Discussion prompts for teachers:

- What method did your group use to solve this problem?
- Did you add the two probabilities? Why or why not?
- What does "passing both" mean in this context?
- Can a student pass both subjects at the same time?
- If we just add 75% + 60%, what do we get? Is that the correct answer?
- What might we be counting twice if we just add the probabilities?

Phase 2: Structured Instruction (10 minutes)

Key Takeaways

1. The Addition Law

The addition law is used to find the probability of either one event or another occurring.

2. For Mutually Exclusive Events

When events cannot happen at the same time:

$P(A \cup B) = P(A) + P(B)$

P(A or B) = P(A) + P(B)

Note: Since mutually exclusive events cannot happen at the same time, $P(A \cap B) = 0$

- Example: Drawing a heart OR a club from a deck (a card cannot be both)

3. For Non-Mutually Exclusive Events

When events CAN happen at the same time, we must subtract the overlap to avoid double counting:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

P(A or B) = P(A) + P(B) - P(A and B)

Why subtract? When we add P(A) and P(B), we count the overlap twice. We subtract P(A and B) once to correct this.

- Example: Passing Math OR English (a student can pass both)

4. Decision Guide

- Ask: Can both events happen at the same time?
- If NO → Mutually exclusive → Use P(A or B) = P(A) + P(B)
- If YES → Non-mutually exclusive → Use P(A or B) = P(A) + P(B) - P(A and B)

Phase 3: Practice and Application (15 minutes)

Worked Example 3.2.18 (Mutually Exclusive)

Problem: A standard deck has 52 cards, with 13 hearts and 13 clubs. What is the probability of drawing either a heart or a club?

Solution:

Step 1: Identify if events are mutually exclusive

Can a card be both a heart AND a club? No! So these are mutually exclusive events.

Step 2: Calculate individual probabilities

P(Heart) = 13/52

P(Club) = 13/52

Step 3: Apply the addition rule for mutually exclusive events

P(Heart or Club) = P(Heart) + P(Club)

= 13/52 + 13/52

= 26/52

= 1/2

Answer: The probability of drawing either a heart or a club is 1/2 or 50%

Anchor Activity Solution (Non-Mutually Exclusive)

Problem: P(pass Math) = 75%, P(pass English) = 60%, P(pass both) = 50%. Find P(pass Math or English).

Solution:

Step 1: Identify if events are mutually exclusive

Can a student pass both subjects? Yes! So these are non-mutually exclusive events.

Step 2: Identify the given probabilities

P(Math) = 0.75

P(English) = 0.60

P(Math and English) = 0.50

Step 3: Apply the general addition rule

P(Math or English) = P(Math) + P(English) - P(Math and English)

= 0.75 + 0.60 - 0.50

= 0.85

Answer: The probability that a student passes either Mathematics or English is 0.85 or 85%

Why subtract? If we just added 0.75 + 0.60 = 1.35, we would count students who pass both subjects twice!

Phase 4: Assessment (5 minutes)

Exit Ticket

1. A student can get an A, B, C, D, or F in a class. What is the probability that the student gets an A or a B?

2. A die is rolled. What is the probability of rolling a 1 or a 6?

3. In a class of 30 students, 15 students like math, 10 students like chemistry, and 5 students like both math and chemistry. What is the probability that a randomly chosen student likes math or chemistry?

4. A bag contains 8 blue marbles and 5 yellow marbles. What is the probability of drawing a blue marble or a yellow marble?

5. In a class of 25 students, 12 play soccer, 10 play basketball, and 5 play both. What is the probability that a randomly chosen student plays soccer or basketball?

6. A bag contains letters of the word MATHEMATICS. What is the probability of selecting a vowel or the letter M?

7. A number is chosen between 1 and 10. What is the probability that it is a 3 or a 7?

8. A day of the week is chosen at random. What is the probability that it is a Saturday or a Sunday?

Differentiation Strategies

For Struggling Learners:

- Use Venn diagrams to visualize overlapping events.
- Provide decision flowchart: "Can both happen?" → Yes/No → Which formula?
- Start with mutually exclusive examples before non-mutually exclusive.
- Use concrete materials: actual playing cards for hands-on practice.
- Provide formula cards with both versions of the addition rule.

- Work in pairs with peer support.
- Color-code mutually exclusive (blue) vs non-mutually exclusive (red) problems.

For Advanced Students:

- Explore three or more events: P(A or B or C).
- Investigate complementary events: P(A or B) = 1 - P(not A and not B).
- Combine addition rule with multiplication rule in complex problems.
- Research real-world applications in insurance, quality control, or medical testing.
- Create their own word problems involving both types of events.
- Prove why the formula works using set theory or Venn diagrams.

Extension Activity: Venn Diagrams and the Addition Rule

Scenario: Use Venn diagrams to visualize and verify the addition rule.

Tasks:

1. Draw a Venn diagram with two overlapping circles labeled A and B.
2. Shade the region representing "A or B" (the union).
3. Label the three regions: "Only A", "Both A and B", "Only B".
4. If P(A) = 0.6, P(B) = 0.5, P(A and B) = 0.3, fill in the probabilities for each region.
5. Calculate P(A or B) by adding the three regions: P(only A) + P(both) + P(only B).
6. Verify using the formula: P(A or B) = P(A) + P(B) - P(A and B) = 0.6 + 0.5 - 0.3 = 0.8.
7. Question: Why do we subtract P(A and B)? Use the diagram to explain.
8. Extended challenge: Create a Venn diagram for three events A, B, and C. How would you calculate P(A or B or C)?