Grade 10 Mathematics Lesson Plan

Rotation in Real-Life

Strand:	Measurement and Geometry
Sub-Strand:	Rotation in Real-Life
Specific Learning Outcome:	Appreciate the application of rotation in real-life situations
Key Inquiry Question:	How is Rotation applied in Real-life situations?
Learning Resources:	CBC Grade 10 textbooks, Everyday rotating objects, Chart paper, Markers
Duration:	40 minutes
Class:	Grade 10

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

Anchor Activity

Group activity: Rotation is used in many everyday tools and machines to make work easier and more efficient. In this activity, you will explore how rotation is applied in real-life situations.

(a) Identify Three Everyday Rotating Objects

Identify three everyday objects that use rotation to function (for example, a steering wheel, a water tap, or a screwdriver). For each object:

- Describe how the object rotates
- Identify the axis or fixed point of rotation
- Explain the purpose of the rotation

(b) Analyze Speed and Direction Changes

Choose one rotating object and discuss how changing the speed or direction of rotation would affect its use. Give a real-life example to support your explanation.

(c) Discuss Efficiency Through Rotation

Many machines use rotating parts to reduce effort or save time. Discuss how rotation improves efficiency in one machine used at home, school, or in the community.

Teacher's Role:
- Circulate among groups, asking guiding questions about rotation axes and purposes
- Encourage students to think of diverse examples from daily life
- Surface student thinking by asking groups to share their discoveries

● Bridge from hands-on exploration to formal concepts

Phase 2: Structured Instruction (10 minutes)

Key Takeaways

Centre of Rotation in Practical Situations:

In practical situations, the centre of rotation is usually a physical feature such as:

● A hinge on a door
● An axle in a wheel
● A shaft in a machine

This fixed point or axis allows the object to rotate smoothly and in a controlled manner.

Applications in Engineering and Science:

Engineers use these ideas to design efficient machines:

● Simple mechanisms: door hinges, bicycle gears
● Complex systems: car engines, industrial machinery

Scientists rely on rotational concepts to explain natural phenomena:

● Rotation of the Earth
● Motion of planets in space

Understanding both the centre of rotation and the angle through which an object turns is essential in many fields.

Phase 3: Practice and Application (15 minutes)

Worked Examples

Example 1: Ferris Wheel Rotation

Problem: Suppose a Ferris wheel completes one full rotation every 4 minutes. If a passenger gets on at the bottom, through what angle will they have rotated after exactly 1 minute?

Solution:

● A full rotation is 360°
● The time for a full rotation is 4 minutes
● The angle of rotation per minute is 360°/4 = 90°

Answer: After 1 minute, the passenger has rotated through an angle of 90°

Example 2: Interlocking Gears

Problem: Suppose Gear A has 10 teeth and is interlocked with a larger Gear B, which has 30 teeth. If Gear A is rotated one full turn (360°) in the clockwise direction, what is the angle and direction of rotation for Gear B?

Solution:

Direction: Interlocking gears always rotate in opposite directions. Since Gear A rotates clockwise, Gear B must rotate counter-clockwise.

Angle: Gear B is larger and has 3 times as many teeth as Gear A (30/10 = 3). Gear B will only complete 1/3 of a rotation for every full rotation of Gear A.

- Angle of rotation for Gear B = 360°/3 = 120°

Answer: Gear B rotates 120° in a counter-clockwise direction

Phase 4: Assessment (Exit Ticket)

1. A driver in a matatu turns the steering wheel one and a half times to navigate a sharp corner on a narrow road. Calculate the total angle of rotation in degrees.

2. A classroom door is opened from a closed position until it rests flat against the wall next to it. Assuming the wall is completely flush with the door frame, what is the angle of rotation, and what physical part of the door acts as the centre of rotation?

3. A water pump wheel at a farm completes 5 full rotations every minute. How many degrees does a single point on the edge of the wheel rotate in exactly 12 seconds?

Differentiation Strategies

For Struggling Learners:
- Provide physical rotating objects to manipulate
- Use visual aids showing rotation angles
- Start with simple whole rotation examples (1 turn = 360°)
- Allow calculators for all calculations

For Advanced Learners:
- Explore complex gear systems with multiple interlocking gears
- Calculate angular velocity (degrees per second)
- Investigate rotational symmetry in architecture and nature
- Research careers that use rotation concepts

Extension Activity
Design a Simple Rotating Machine:

- Students work in groups to design a simple machine that uses rotation
- Draw a diagram showing the centre of rotation and direction
- Calculate angles of rotation for different time periods or gear ratios

- Explain how the machine reduces effort or saves time
- Present designs to the class with calculations