8

Lesson Exemplar for Science

Quarter 4

Lesson

3

IMPLEMENTATION OF THE MATATAG K TO 10 CURRICULUM

Lesson Exemplar for Science Grade 8
Quarter 4: Lesson 3 of 8 (Week 3)
SY 2025-2026

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SCIENCE (PHYSICS)/4th QUARTER/ GRADE 8

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	1. Forces cause objects to accelerate. 2. An object is accelerating if the magnitude and/or direction of its velocity changes. 3. Kinetic energy is the energy of movement, and potential energy is stored energy. 4. As an object falls from a height its energy is conserved because its potential energy is transformed to kinetic energy. 5. The resources of the Philippines provide many benefits to its people and their activities.
B. Performance Standards	*By the end of the Quarter,* learners demonstrate understanding of the technical meaning of acceleration and apply their understanding to everyday situations involving motion. They represent and interpret acceleration in distance-time and velocity-time graphs to make predictions about the movement of objects. Learners link motion to kinetic energy and potential energy and explain transformations between them using everyday examples. Learners relate understanding of kinetic energy and potential energy to an appreciation of the hydro-electric resources of the Philippines for the generation of electricity for use in homes, communities, and industries. They use scientific investigations to explore the properties of light and apply their learning to solving problems in everyday situations.
C. Learning Competencies and Objectives	***Learning Competency 1:*** The learners identify that forces cause objects to accelerate, and that acceleration of an object is its rate of change of velocity. ***Lesson Objective 1***: The learners will be able to explain when an object in motion is accelerating. ***Learning Competency 2:*** The learners observe and describe examples of accelerating objects at school and in the local community, including objects that show uniform circular motion. The learners will be able to: ***Lesson Objective 1***: Identify real-life scenarios or examples that exhibit uniform circular motion. ***Lesson Objective 2***: Describe uniform circular motion. ***Lesson Objective 3***: Define tangential velocity, centripetal acceleration, and centripetal force. ***Lesson Objective 4:*** Calculate centripetal acceleration and centripetal force in problems involving uniform circular motion.
D. Content	**Uniform Circular Motion** ▪ Uniform Circular Motion is the motion of an object traveling at a constant (uniform) speed on a circular path. ▪ The period T is the time required for the object to travel once around the circle. ▪ The speed v of the object is related to the period and the radius r of the circle by the equation $v = \frac{2\pi r}{T}$.

	▪ An object in uniform circular motion experiences an acceleration, known as centripetal acceleration. ▪ The magnitude ac of the centripetal acceleration is given by equation $a_c = \frac{v^2}{r}$, where v is the speed of the object and r is the radius of the circle. ▪ The direction of the centripetal acceleration vector always points toward the center of the circle and continually changes as the object moves. ▪ To produce a centripetal acceleration, a net force pointing toward the center of the circle is required. This net force is called the centripetal force, and its magnitude F_c is given by equation $F_c = \frac{mv^2}{r}$, where m and v are the mass and speed of the object, and r is the radius of the circle. ▪ The direction of the centripetal force vector, like that of the centripetal acceleration vector, always points toward the center of the circle.
E. Integration	Values Integration: Having a clear center or purpose in life helps individuals stay focused and balanced, guiding them through life's challenges and changes.

II. LEARNING RESOURCES

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<table>
<tr><th colspan="2">III. TEACHING AND LEARNING PROCEDURE</th><th>NOTES TO TEACHERS</th></tr>
<tr><td>A. Activating Prior Knowledge</td><td>DAY 1
1. Short Review
Activity 3.1: Uniformly Accelerated Motion (10 minutes)
Instructions: Identify whether the scenarios below exhibit uniformly accelerated motion or not.
1. A ball rolling down a slope.
2. A skydiver jumping out of a plane.
3. A car slows down and increases speed again.
4. A bicycle engages its brakes and steadily slows down

Guide Questions:
1. When can we say that an object is accelerating?
2. When can we say that an object exhibits uniformly accelerated motion?
3. Among the example situations, which exhibits uniform acceleration, and which does not?

KEY to Guide Questions:
(1) An object is accelerating when (a) its speed changes, (b) its direction changes, or (c) both.
(2) An object is uniformly accelerating when its velocity changes at a constant rate, i.e., equal change in velocity in an equal interval of time.
(3) Among the examples given, only numbers 1, 2, and 4 exhibit uniform acceleration. Most typical examples of uniform acceleration are free-falling objects, valid for number 2. In the case of example number 4, there is a steady change in speed over a period. On the other hand, there is no constant change in speed in example number 3.</td><td>Start the lesson by presenting situations exhibiting uniform and non-uniform acceleration. Ask the learners to identify whether the situations exhibit uniformly accelerated motion or not.

Discuss the answers in class. Ask them to state their reason for saying so.

KEY to Activity 3.1
(1) The ball rolling down a slope exhibits uniform acceleration if we assume the slope is uniform and there is no significant air resistance or friction. The ball will accelerate due to gravity at a constant rate.
(2) Initially, this scenario can exhibit uniformly accelerated motion when the skydiver jumps out of the plane and accelerates downward due to gravity. However, once air resistance builds up, the acceleration will decrease until terminal velocity is reached.
(3) The car in the situation is not uniformly accelerating since it slowed down and increased its speed again. The instance that the car decelerated and accelerated means no uniform acceleration.
(4) The bicycle engaged its brakes and uniformly slowed down, which meant it decelerated uniformly.</td></tr>
<tr><td>B. Establishing Lesson Purpose</td><td>1. Lesson Purpose
Activity 3.2: I Know a Circular Motion When I See One (10 minutes)</td><td>In this part, introduce the topic of Uniform circular motion by asking the students whether they have</td></tr>
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<tr><td></td><td>Observe the following pictures and answer the questions given.
Use the learning activity sheet for this activity (see pages 3 -4).

KEY to Activity 3.2 Guide Questions
(1) The objects or events in the picture all exhibit circular motion.
(2) Yes, the speed can be constant/uniform while changing direction following a circular path.
(3) There is an inward force which allows the objects to follow a circular path while maintaining speed.
(4) Wheels of a car, Planets revolving around the sun, spinning tops, centrifuge, etc.

There are countless more objects following circular motion around us. Let us understand the physics behind uniform circular motion together!

2. Unlocking Content Area Vocabulary
Activity 3.3. Cross Word Puzzle (10 minutes)
Use the learning activity sheet for this activity (see page 5).

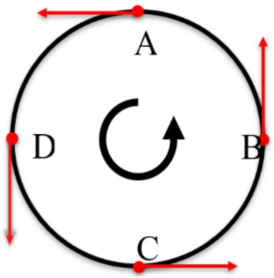
KEY to Activity 3.3 Guide Questions
(1) Centrifugal - moving or tending to move away from the center
(2) Centripetal - moving or tending to move toward the center
(3) Acceleration - change in speed, change in direction, or both
(4) Velocity - a vector quantity that has a direction and magnitude, which is the speed
(5) Tangent - a straight line that touches a curve or curved surface at a single point but, if extended, does not cross it at that point</td><td>experienced riding a Ferris Wheel or have tried riding a vehicle that turned a curved road. Explain the concept of Uniform Circular motion in Ferris Wheels and motion along curved roads.

The pictures show examples of objects in a uniform circular motion. This means that their acceleration is also constant. What makes them in uniform acceleration? That we are going to find out.
Make sure to state the objectives of the lesson.

In this activity, these are the words that the students must unlock because they will encounter them throughout the lesson.</td></tr>
<tr><td>C. Developing and Deepening Understanding</td><td>1. Explicitation
Objects moving in uniform circular motion move at a constant speed with constantly changing direction due to the curve or circular path. They exhibit uniformly accelerated motion when the net force that keeps them in circular motion is maintained at a constant value.

Activity 3.4: Describing Uniform Circular Motion (25 minutes)
Ask the students to perform this simple experiment in groups. Each member of the group must assume a role such as a leader, secretary, timer, and supplier or in-charge of the materials.</td><td>Let the students perform Activity 3.4 in groups of 4 to 5 members. Note: Assign students to bring materials to be used and their groupings a day before the activity.

Before experimenting, go through the procedure emphasizing safety precautions and scientific skills needed, like observing, recording observations, and coming up with</td></tr>
</table>

	Use the learning activity sheet for this activity (see pages 6-7). ***Safety Precautions:*** • *Perform this activity in an open area.* • *Maintain a safe distance from the person twirling the string.* **KEY to Guide Questions**  1. At each point (A, B, C, D), the velocity vector is tangent to the circle and directed in the direction the object is moving at that point, as shown in the diagram below. 2. The object follows a circular path because of the centripetal force exerted by the tension in the string. This force constantly pulls the object toward the center of the circular path, causing it to continuously change direction and move in a circle. 3. Yes, the string is applying a force on the object. This force is directed towards the center of the circle. This inward force is called the centripetal force, which keeps the object moving in a circular path. 4. The magnitude of the object's velocity remains constant if it is in uniform circular motion. However, the direction of the velocity is continuously changing, always tangent to the circular path at any given point. 5. Yes, the object in uniform circular motion exhibits uniform acceleration when the force that keeps it in circular motion is kept constant. **DAY 2** **2. Worked Example** **Think-Pair-Share Activity (10 minutes):** 1. Have you experienced riding a Ferris wheel? How about a merry-go-round or a carousel? 2. What was the feeling of being spun around in a circle? Was it fun?	generalizations. In the experiment, the leader must assign a member who will twirl the object and members who will observe where the object will go after releasing the string. *Emphasize that the direction of the velocity or the velocity vector is always tangent to a point in the circumference of the circular path. It is called* ***TANGENTIAL VELOCITY****.* **Class Discussion (55 minutes):** Picture link: https://medium.com/@clairejoycordobasiobal/ferris-wheel-3c49410be54d Start the class discussion by introducing the Think-Ink-Share activity to connect the lesson to their experiences. Elicit several responses from your students. **Possible Answers to Think-Pair-Share**

3. While riding the Ferris wheel or carousel, are you accelerating? Explain.

Video Presentation (10 minutes): Uniform Circular Motion and Centripetal Force by Professor Dave

Guide questions:

1. Describe uniform circular motion.
   Uniform Circular Motion:
   - It refers to the motion of an object traveling at a constant speed along a circular path.
   - Even though the speed is constant, the direction of the velocity vector is continually changing, meaning the object is accelerating.
2. What is centripetal force?
   Centripetal Force
   - Centripetal force is the net force that acts on an object to keep it moving along a circular path.
   - This force is always directed towards the center of the circle.
3. Define centripetal acceleration.
   Centripetal Acceleration:
   - Centripetal acceleration is the acceleration experienced by an object moving in a circular path, directed towards the center of the circle.
4. Describe tangential velocity.
   Tangential Speed
   - Tangential speed refers to the speed of an object moving in circular motion. It is called tangential because the object's direction of motion is always tangent to the circular path.

Class Discussion (30 minutes): Describing Uniform Circular Motion
TANGENTIAL SPEED
The speed of the plane is the magnitude of the velocity vector, which is constant, as shown in the arrows at different points in its circular path.
The period T is the time required to travel once around the circle—that is, to make one complete revolution. There is a relationship between period and speed

1. Yes/no.
2. Riding these rides in the amusement park will always be fun and intense. It feels like you are being pushed away from the center of the circular path.
3. Yes, I am accelerating due to changes in directions; thus, the motion is circular, not straight.

Before discussing the uniform circular motion concepts, show the YouTube video Uniform Circular Motion and Centripetal Force.

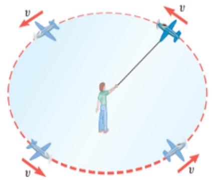
You may use the link or the QR code below to access the video on YouTube:

SCAN ME

https://bit.ly/4aBAEQn

If a projector or TV is not available, you may proceed to the discussion of the concepts.

Recall scalar and vector quantities from the Grade 7 lesson. Scalar quantities give the magnitude, size, or amount of something without indicating direction. In contrast, vector quantities give the since speed v is the distance traveled (which is the circumference of the circle = 2πr) divided by the period T:



$$v = \frac{2\pi r}{T}$$

Figure 1. The motion of a model airplane at a constant speed on a horizontal circular path (Cutnell & Johnson, 2012, p.130)

CENTRIPETAL ACCELERATION

The centripetal acceleration of an object moving with a speed v on a circular path of radius r has a magnitude a_c given by the formula:

$$a_c = \frac{v^2}{r}$$

The centripetal acceleration vector always points toward the center of the circle.

CENTRIPETAL FORCE

We have learned in Grade 7 that an object changes its motion, either speed, direction, or both, due to an unbalanced force. Thus, an unbalanced force must be in a uniform circular motion to produce the centripetal acceleration. This unbalanced force or the net force causing the centripetal acceleration is called the ***centripetal force*** $\vec{\mathbf{F}}_c$ and points in the same direction as the acceleration—that is, toward the center of the circle.

The centripetal force is the name given to the net force required to keep an object of mass m, moving at a speed v, on a circular path of radius r. It has a magnitude given by the formula:

$$F_c = \frac{mv^2}{r}$$

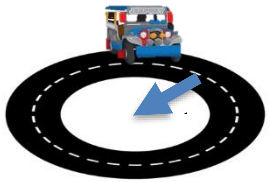
measurement's magnitude and direction. Speed and distance are scalar quantities. On the other hand, velocity, acceleration, and force are vector quantities. Vectors are usually represented using arrows, with the arrow's length representing the magnitude while the arrowhead points to the direction of the vector quantity. The symbols of vector quantities are either written in bold or with an arrow on top. For example, acceleration is symbolized as **a** or **a.**

Conduct an interactive discussion with your students to describe uniform circular motion using the basic concepts of speed, velocity, acceleration, and force.

In uniform circular motion, even if the speed is not changing or constant, the object in uniform circular motion is accelerating because it continuously changes direction as it follows the circular path. This continuous change in the direction of the tangential velocity is a key characteristic of uniform circular motion.

In the discussion, present the formulas to compute the values of tangential speed, centripetal force, and acceleration. Inform students that this lesson requires them to compute, so they must prepare a calculator.

To make learning more meaningful, always relate the situations and problems to their lives by asking them

	If centripetal acceleration, is given, the centripetal force formula can be written as $\mathbf{F_c} = m\mathbf{a_c}$.  ***Sample Problem:*** A jeepney has a mass of 8000 kg and moves at a constant speed along a rotunda with a radius of curvature of 17 m. Compute for its centripetal force and acceleration if it turns at a) 36 km/h and b) 54 km/h.	if they have experienced similar situations. Review the System International (SI) units of quantities involved in the computations.

Given:	**Required:**	**Formula:**
m = 8000 kg r = 17 m a) v = 36 km/h b) v = 54 km/h	$\mathbf{F_c}$ at a) v = 36 km/h and b) v = 54 km/h	$a_c = \frac{v^2}{r}$ $F_c = ma_c$

Solution	
Convert the speed from km/h to m/s. a) $v = 36\,\frac{km}{h} \times \frac{1000\,m}{1\,km} = 36\,000\,\frac{m}{h}$ $36\,000\,\frac{m}{h} \times \frac{1\,h}{3600\,s} = 10$ m/s	b) $v = 54\,\frac{km}{h} \times \frac{1000\,m}{1\,km} = 54\,000\,\frac{m}{h}$ $54\,000\,\frac{m}{h} \times \frac{1\,h}{3600\,s} = 15$ m/s
Centripetal acceleration: a) $a_c = \frac{(10\frac{m}{s})^2}{17\text{ m}} = \frac{100\frac{m}{s^2}^2}{17\text{ m}}$ $\mathbf{a_c} = 5.88\ m/s^2$ **Centripetal Force:** $\mathbf{F_c}$ = 8 000 kg x 5.88 m/s² $\mathbf{F_c}$ = 47 040 kg•m/s² or 47 040 N	**Centripetal acceleration:** b) $a_c = \frac{(15\frac{m}{s})^2}{17\text{ m}} = \frac{225\frac{m}{s^2}^2}{17\text{ m}}$ $\mathbf{a_c} = 13.24\ m/s^2$ **Centripetal Force:** $\mathbf{F_c}$ = 8 000 kg x 13.24 m/s² $\mathbf{F_c}$ = 105 920 kg•m/s² or 105 920 N
Answer/s:	

Quantity	Symbol	SI unit
Mass	m	Kilogram
Speed	v	Meter/ second (m/s)
Centripetal acceleration	$\mathbf{a_c}$	Meter/ second² (m/s²)
Radius	r	Meter (m)
Centripetal force	$\mathbf{F_c}$	kilogram• meter/ second² (kg•m/s²) or Newtons (N)

Conversion is required if the units are not SI units or not in meters, seconds, or kilograms. For example, speed in km/h needs to be converted to m/s using dimensional analysis.

Before answering the sample problem, ask the students to predict at which given speed the car experiences greater acceleration and requires a bigger centripetal force. How about when the radius of the circular path increases?

The formulas show that centripetal acceleration and force are directly

a. At a speed of 36 km/h, the jeepney accelerates at 5.88 m/s^2 with a centripetal force of 47 040 N.
b. At a speed of 54 km/h, the jeepney accelerates at 13.24 m/s^2 with a centripetal force of 105 920 N.

Centripetal vs. Centrifugal Force

	Centripetal Force	Centrifugal Force
Definition	Centripetal force is the real, physical force that acts on an object moving in a circular path, directing it towards the center of the circle.	Centrifugal force is not a real force but rather a perceived force that appears to act on an object moving in a circular path when observed from a rotating reference frame. It acts outwardly away from the center of rotation.
Direction	Always points towards the center of the circular path.	Always points away from the center of the circular path.
Nature	This force is necessary to keep an object moving in a curved path, as it provides the required centripetal acceleration.	It is considered a pseudo-force because it arises due to the inertia of the object when observed from a non-inertial (rotating) frame of reference. When in a rotating reference frame, the object's inertia makes it feel as though it is being pushed outward, even though no physical force is acting in that direction.
Examples	○ The gravitational force acting on planets orbiting the sun. ○ The tension in a string when swinging an object around. ○ The frictional force between the tires and the road when a car makes a turn.	○ The sensation of being pushed outward when a car turns sharply. ○ Water pushing against the walls of a spinning bucket.

DAY 3

3. Lesson Activity

Activity 3.5. Problem-solving about Uniform Circular Motion (25minutes)

Use the learning activity sheet for this activity (see pages 8-9).

proportional to the square of the object's speed. With the same radius of the circular path, the faster the speed, the greater the centripetal acceleration and force required to keep an object in uniform circular motion. Given the same mass and speed, the bigger the radius of the circular path, the smaller the centripetal acceleration and force required to keep an object in uniform circular motion.

Give two word problems for students to compute centripetal acceleration and force. Guide them in answering these problems.

You may choose to have any of the following strategies for the problem-solving activity:

Option 1. Give the problems to the students for them to solve individually.

Option 2. Give 1 problem for each group to solve. And then ask them to present their answers to the class.

KEY to Activity 3.5 Problem Solving

Word Problem #1

Given:	**Required:**	**Formula:**
m = 1000 kg v = 15 m/s a) r = 50 m b) r = 100 m	a_c = ?	$a_c = \frac{v^2}{r}$

Solution: **Centripetal acceleration:** $a)\ a_c = \frac{(15\frac{m}{s})^2}{50\text{ m}} = \frac{225\frac{m}{s^2}^2}{50\text{ m}}$ a_c = 4.5 m/s^2	$b)\ a_c = \frac{(15\frac{m}{s})^2}{100\text{ m}} = \frac{225\frac{m}{s^2}^2}{100\text{ m}}$ a_c = 2.25 m/s^2

Answer: When the radius of the circular path is 50 m, the centripetal acceleration is 4.5 m/s^2. When it is doubled to 100 m, the centripetal acceleration becomes 2.25 m/s^2, which is one-half of 4.5 m/s^2.

Word Problem #2

Given:	**Required:**	**Formula:**
m = 0.10 kg v = 4 m/s r = 0.5 m	F_c = ?	$F_c = \frac{mv^2}{r}$

Solution:

Centripetal force:

$$F_c = \frac{(0.10\ kg)(4\frac{m}{s})^2}{0.5\text{ m}} = \frac{(0.10\ kg)(16\frac{m}{s^2}^2)}{0.5\text{ m}}$$

F_c = 0.32 N

Answer: The centripetal force that keeps the object in its uniform circular motion is 0.32 N.

Activity 3.6. Real-Life Applications of Uniform Circular Motion: Problem Solving Mania (30 minutes)

Use the learning activity sheet for this activity (see pages 10-11).

KEY to Activity 3.6 Problem Solving

Word Problem #1

Given:	**Required:**	**Formula:**
v = 30 m/s r = 50 m	$\mathbf{a_c}$ = ?	$a_c = \frac{v^2}{r}$

Solution:

Centripetal acceleration:

$$a_c = \frac{(30\frac{m}{s})^2}{50\text{ m}} = \frac{900\frac{m}{s^2}^2}{50\text{ m}}$$

$\mathbf{a_c}$ = 18 m/s^2

Answer: The car's centripetal acceleration is 18 m/s^2.

Word Problem #2

Given:	**Required:**	**Formula:**
m = 50 kg v = 8 m/s r = 24 m	$\mathbf{F_c}$ = ?	$F_c = \frac{mv^2}{r}$

Solution:

Centripetal acceleration:

$$a)\ F_c = \frac{(50\ kg)(30\frac{m}{s})^2}{24\text{ m}} = \frac{(50\ kg)(900\frac{m}{s^2}^2)}{24\text{ m}}$$

$\mathbf{F_c}$ = 1 875 N

Answer	The car's centripetal force is 1 875 N.

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D. Making Generalizations

DAY 4

1. **Learners' Takeaways**
   Activity 3.7. Understanding Check (10 minutes)
   Use the learning activity sheet for this activity (see pages 12).

Possible answers to Activity 3.7 Guide Questions

(1) An object is said to be moving in a uniform circular motion when it travels along a circular path with a constant speed.

<table>
<tr>
<td></td>
<td>(2) The velocity vector of an object in uniform circular motion is always tangent to the circular path. The centripetal force and acceleration vector always point toward the center of the circular path.
(3) A common example is a car turning in a circular path.

2. Reflection on Learning
In uniform circular motion, the centripetal force is crucial for keeping the object on its path. Similarly, what keeps you centered in your life? What are the values, goals, or relationships that provide you direction and stability?</td>
<td>Reflection on Learning
What keep me centered in my life guiding me every step of the way are my faith in God, my family, and dreams in the future.</td>
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</table>

<table>
<tr>
<th colspan="2">IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION</th>
<th>NOTES TO TEACHERS</th>
</tr>
<tr>
<td>A. Evaluating Learning</td>
<td>1. Formative Assessment

I. TRUE or FALSE. Write TRUE if the statement is correct and FALSE if it is not.
1. In uniform circular motion, the velocity vector is always tangent to the circular path.
2. The centripetal acceleration in uniform circular motion is always directed towards the center of the circle.
3. The centrifugal force is a real force that acts on an object undergoing uniform circular motion.
4. The period of revolution in uniform circular motion is independent of the mass of the object.
5. In uniform circular motion, the centripetal force acting on an object is always directed towards the center of the circle.

II. MULTIPLE CHOICE. Write the letter of the BEST answer.
1. What force is responsible for keeping bodies moving in circular motion?
a. Centripetal force   c. Force of gravity
b. Centrifugal force   d. Reaction force
2. The mathematical expression for centripetal force is:
a. $\mathbf{F_c} = mv^2/r$ c. $\mathbf{F_c} = v^2/r$
b. $\mathbf{F_c} = mv/r$ d. $\mathbf{F_c} = mv^3/r$
3. A body of mass 10-kg is moving with a velocity of 5 m/s in a circle of radius 5 m. What is the centripetal acceleration of the body?
a. 0.5 m/s^2 c. 25 m/s^2
b. 5 m/s^2 d. 50 m/s^2
4. Which of the following quantities remains constant in uniform circular motion?</td>
<td>Key:
I. TRUE or FALSE
1. TRUE
2. TRUE
3. FALSE
4. TRUE
5. TRUE

II. Multiple Choice
1. A
2. A
3. A
4. A
5. B

III. Problem Solving
Given:
m = 40 kg
r = 38 m
v = 5.0 m/s
Required:
a) $\mathbf{a_c}$ = ?
b) $\mathbf{F_c}$ = ?</td>
</tr>
</table>

a. Acceleration
b. Force
c. Speed
d. Velocity

5. A 2-kg object is moving in a circular path of radius 5 m with a constant speed of 10 m/s. What is the centripetal force acting on the object?

a. 20 N
b. 40 N
c. 80 N
d. 100 N

III. Problem-Solving. Solve the problem below and provide what is being asked. Provide complete solution.

A 40-kg boy is riding a Ferris wheel with a radius of 38 m. The tangential speed of the boy is 5.0 m/s. What is the magnitude of his centripetal force and acceleration?

Rubric:

Excellent (4)	Correct given values, unknown, and formula to use are identified; Correct and complete solution is shown; Correct final answer is given. (5 points)
Proficient (3)	Given values, unknown, and formula to use are identified but one of these is incorrect; Correct and complete solution is shown; Correct final answer is given. (4 points)
Satisfactory (2)	Incomplete given values, unknown, and formula to use are identified; Correct solution is shown; Correct final answer is given; Some units are lacking or incorrect. (3 points)
Developing (1)	Incomplete given values, unknown, and formula to use are identified; Incorrect solution is shown; Incorrect final answer is given; Some units are lacking or incorrect. (2 points)
Beginning (0)	No attempt to answer (0 points)

Formula:

a) $\boldsymbol{a_c} = \frac{v^2}{\mathrm{r}}$

Solution:

$$\boldsymbol{a_c} = \frac{(5.0\,\frac{m}{s})^2}{38\text{ m}} = \frac{25.0\,\frac{m}{s^2}^2}{38\text{ m}}$$

$\mathbf{a_c}$ = 0.66 m/s^2

b) $\boldsymbol{F_c} = \frac{\boldsymbol{mv^2}}{\mathrm{r}}$

$$\boldsymbol{F_c} = \frac{(40\,kg)(5.0\,\frac{m}{s})^2}{38\text{ m}}$$

$$\boldsymbol{F_c} = \frac{(40\,kg)\,(25.0\,\frac{m}{s^2}^2)}{38\text{ m}}$$

$$\boldsymbol{F_c} = \frac{1000\,kg\,\frac{m}{s^2}^2}{38\text{ m}}$$

$\mathbf{F_c}$ = 26.32 kg•m/s^2
or 26.32 Newtons

Another solution using $\mathbf{F_c}$ = m$\mathbf{a_c}$:

$\mathbf{F_c}$ = (40 kg)(0.66 m/s^2)

$\mathbf{F_c}$ = 26.4 N

Due to rounding off the centripetal acceleration, there is a slight difference in the final answer.

B. Teacher's Remarks

Note observations on any of the following areas:	**Effective Practices**	**Problems Encountered**
strategies explored		
materials used		
learner engagement/ interaction		
others		

The teacher may take note some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement and other related stuffs. They may also suggest ways to improve the different activities explored/ lesson exemplar.

C. Teacher's Reflection	*Reflection guide or prompt can be on:* ▪ *<u>principles behind the teaching</u>* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* ▪ *<u>students</u>* *What roles did my students play in my lesson?* *What did my students learn? How did they learn?* ▪ *<u>ways forward</u>* *What could I have done differently?* *What can I explore in the next lesson?*	*Teacher's reflection in every lesson conducted/ facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC sessions.*