

FULL REVIEW

Full Review: Uniform Circular Motion — Foundational

Review the essential ideas, relationships, and problem-solving tools for Uniform Circular Motion.

 TIME 45–60 minutes	 BEST FOR A complete topic review	 FINISH WITH A readiness check
---	---	--

After this full review, you'll be able to...

recall the essential ideas, apply them to representative problems, and determine what to study next.

HOW TO USE THIS GUIDE

Work through the stages in order. Write directly in the spaces provided, check your work in the Solutions section, and finish by choosing the next resource that matches your confidence.

Choose how you want to review: work through this guide, follow the online review, or watch the video review.

[Start the Review Online →](#)

[Watch the Video Review →](#)

YOU WILL NEED

Pencil or pen • Calculator if needed • Approximately 45–60 minutes

FR-02 • TOPIC ALIGNMENT

Topic Alignment

This bundle is aligned to the approved Physics Sensei topic specification below. Use it to recover the topic structure, reinforce key decisions, and confirm readiness for the next study task.

TEXTBOOK: Independent Physics Sensei Unit Review CHAPTER: Mechanics • MEC-U16 TOPIC: Uniform Circular Motion COURSE LEVEL: Foundational	BEST USED ✓ After learning the unit ✓ Before starting homework ✓ Before a quiz or exam
--	--

Review Prerequisites →

Physics Sensei is an independent educational resource designed to complement independently authored Physics Sensei materials. Physics Sensei content is independently authored and organized under the approved topic architecture.

FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these six stages in order. Each stage builds on the previous one and prepares you for the final readiness check.

6 stages • Approximately 45–60 minutes

1 Warm-Up Check — page 4 Activate prior knowledge.	2 Core Concepts — page 6 Review the essential ideas.	3 Guided Practice — page 8 Apply what you learned.
4 Confidence Check — page 10 Confirm your understanding.	5 Summary — page 12 Review the key ideas.	6 Next Step — page 16 Continue your learning.

PRINTING TIP

For student copies, print double-sided and keep the Solutions section after the student activities so learners attempt each activity before checking their work.

FR-04 • STAGE 1 OF 6

Warm-Up Check

Before you begin, take a moment to see what you already remember. Do not worry about getting everything right. This is only a starting point.

ACTIVITY 1**Recall Activity 1**

Identify directions before using an equation.

A car moves around a circular track at constant speed. Is its acceleration zero?

ACTIVITY 2**Recall Activity 2**

Compare one revolution time.

Two riders move on circles of the same radius. One completes a revolution every 4 s and the other every 8 s. Which is faster?

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Name the real inward interaction.

A ball on a string moves in a horizontal circle. What real force can provide the inward force?

Ready to strengthen your understanding?

You've refreshed what you already know. Next, reinforce the essential concepts that will help you solve problems with confidence.

Continue to Core Concepts — page 6 →

FR-05 • STAGE 2 OF 6

Core Concepts

Let's rebuild the key ideas one step at a time. Focus on understanding the relationships before worrying about solving problems.

KEY CONCEPT 1**Circular kinematics: period, frequency, angular speed, and linear speed**

Uniform circular motion is motion on a circular path at constant speed. Period T is the time for one revolution, frequency f is revolutions per second, and velocity is tangent to the path.

$$f=1/T; \text{ one revolution has circumference } 2\pi r.$$

EXAMPLE A shorter period on the same circular path means a greater speed.

SENSEI NOTE Linear speed and angular speed are related but not identical. Points at different radii can share the same angular speed while having different linear speeds.

KEY CONCEPT 2**Centripetal acceleration: changing direction at constant speed**

An object moving in a circle accelerates even when its speed is constant because the direction of velocity changes. Centripetal acceleration points toward the center.

Acceleration points inward.

EXAMPLE At the top of a circular path, velocity is tangent while acceleration points toward the center.

SENSEI NOTE A statement about how acceleration changes with radius is incomplete unless you also state what is held constant: speed, angular speed, or period.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3**Radial force modeling: the inward net force**

Circular motion requires an inward net force. Tension, friction, gravity, normal force, or combinations of real forces can provide it.

Net force → inward.

EXAMPLE Static friction can turn a car on a flat road; gravity can keep a satellite in a circular orbit.

SENSEI NOTE “Centripetal” describes the required inward net-force direction. It is not the name of an additional physical interaction.

Ready to apply these ideas?

You’ve reinforced the essential concepts. Now put them into practice by working through guided examples and building your problem-solving confidence.

Continue to Guided Practice — page 8 →

FR-06 • STAGE 3 OF 6

Guided Practice

Now it's time to apply what you've reviewed. Work through each activity in order. The examples become gradually more challenging, and each prepares you for the final readiness check.

PRACTICE 1**Worked Example**

Connect period, angular speed, and linear speed; keep units visible.

A runner completes one lap of a circular track in 20 s. What does the 20 s represent?

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Guided Problem

Draw the free-body diagram, identify the inward direction, and then apply the radial equation.

A car rounds a flat curve without slipping. Which real force supplies the inward force?

PRACTICE 3

Independent Problem

Separate vertical balance from radial acceleration.

A mass moves as a conical pendulum. Why can tension affect both vertical balance and circular motion?

Ready to check your understanding?

You've practiced the essential skills with guidance. Now solve a few short problems on your own and confirm you're ready to move forward.

Continue to Confidence Check — page 10 →

FR-07 • STAGE 4 OF 6

Confidence Check

You've rebuilt the key ideas and practiced them with guidance. Now try these short questions on your own to check your understanding before moving on.

QUICK CHECK 1**Direction check**

Answer without drawing a separate centripetal-force arrow.

At the top of a counterclockwise circle, where do velocity and acceleration point?

QUICK CHECK 2**Scaling check**

State what is held constant before giving the factor.

At fixed radius, what happens to inward acceleration when speed doubles?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Force-model check

Name the real interaction and the radial equation.

What force keeps a satellite in a circular orbit?

HOW DID IT GO?

I answered ____ of 3 questions correctly.

Use the Solutions section to check your reasoning, then take one final look at the essential ideas.

You've checked your understanding.

Take one final look at the essential ideas before deciding what to do next.

Continue to Summary — page 12 →

FR-08 • STAGE 5 OF 6

Summary

Before moving on, take one final look at the most important ideas from this review.

KEY TAKEAWAY 1

Connect T , f , ω , and v before calculating

One revolution is 2π radians and a distance $2\pi r$. Use $f=1/T$, $\omega=2\pi/T$, and $v=\omega r$ to translate between cycle, angular, and linear descriptions.

KEY TAKEAWAY 2

Velocity is tangent; acceleration is inward

Constant speed can coexist with nonzero acceleration because velocity direction changes. Use $a_c=v^2/r=\omega^2 r$ and always identify the center first.

KEY TAKEAWAY 3

Model the real forces, then impose the radial requirement

Draw the free-body diagram with actual interactions. Their inward components must satisfy $\Sigma F_r=mv^2/r$; never add a duplicate “centripetal force.”

MY ONE-SENTENCE SUMMARY

In my own words, the most important idea is:

Ready for your next step?

You’ve reviewed the essential ideas one last time. Now choose the resource that best matches how confident you feel.

Continue to Next Step — page 16 →

ANSWER KEY • CHECK AFTER ATTEMPTING

Solutions and Explanations

Use these solutions to check your reasoning—not only your final answer.

WARM-UP • ACTIVITY 1

Recall Activity 1

No.

WHY IT WORKS Constant speed does not mean constant velocity because direction changes.

WARM-UP • ACTIVITY 2

Recall Activity 2

The 4 s rider.

WHY IT WORKS A shorter period means the same circumference is covered in less time.

WARM-UP • ACTIVITY 3

Recall Activity 3

String tension.

WHY IT WORKS The string interaction can point inward.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Worked Example**

The period T .

WHY IT WORKS The period is the time for one complete cycle.

PRACTICE 2**Guided Problem**

Static friction.

WHY IT WORKS The tire-road interaction can provide the horizontal inward force.

PRACTICE 3**Independent Problem**

Tension has both vertical and inward components.

WHY IT WORKS A single angled force can contribute to more than one coordinate direction.

SOLUTIONS • CONFIDENCE CHECK**QUICK CHECK 1****Direction check**

Velocity left; acceleration downward.

WHY IT WORKS Velocity is tangent to the path; centripetal acceleration is radial and inward.

QUICK CHECK 2**Scaling check**

It becomes four times larger.

WHY IT WORKS Use $a_c = v^2/r$ when speed is controlled and $a_c = \omega^2 r$ when angular speed is controlled.

QUICK CHECK 3**Force-model check**

Gravity.

WHY IT WORKS Centripetal force is not an additional interaction; it is the inward net-force requirement.

READINESS GUIDE

3 correct: You're ready to continue. • 2 correct: Review the missed idea, then continue. • 0–1 correct: Revisit Core Concepts or choose more practice.

FR-09 • STAGE 6 OF 6

Next Step: Continue Learning

Great work! You've completed this review. Choose the next resource that best matches how confident you feel.

? I'm Still Unsure Review the key ideas and examples again. Review again: return to Warm-Up Check on page 4.	🕒 I Need More Practice Continue with additional practice for this topic. Go to Practice →	✓ I'm Ready Continue to the next recommended resource. Continue →
---	--	--

RECOMMENDED LINKS

Review again: return to Warm-Up Check on page 4.

Find additional practice →

Choose another type of physics help →

Continue reviewing with these companion resources.

Start the Review Online →

Watch the Video Review →

PHYSICS HELP THAT MAKES SENSE

A Physics Sensei review never ends at the last question. It always guides you toward the next useful step.

PhysicsSensei.com