

QUICK REVIEW

Quick Review: Rolling Motion

Refresh the most important ideas, formulas, and problem-solving strategies for rolling motion in just a few minutes.

 TIME 5–10 minutes	 BEST FOR A rapid refresh	 FINISH WITH Key ideas refreshed
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After this quick review, you'll be able to...

quickly recall the essential concepts, formulas, and problem-solving strategies needed to move forward with confidence.

HOW TO USE THIS GUIDE

Work through the four stages in order. Write directly in the spaces provided, check your work in the Quick Answers 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 5–10 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This Physics Sensei Unit Review is an independent learning resource. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

RESOURCE: Physics Sensei Unit Review **UNIT ID:** MEC-U22
TOPIC: Rolling Motion **COURSE LEVEL:** Foundational

BEST USED

- ✓ After learning the unit
- ✓ Before starting homework
- ✓ Before a quiz or exam

FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these four stages to quickly refresh the essential ideas and confirm you're ready to continue.

4 stages • Approximately 5–10 minutes

1 Quick Recall Refresh what you already know.	2 Essential Idea Review the most important concept.
3 Confidence Check Confirm you're ready to move on.	4 Next Step Continue your learning.

PRINTING TIP

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

FR-04 • STAGE 1 OF 4

Quick Recall

Let's quickly refresh what you already know. This short recall activity will bring the most important ideas back to mind before you review them.

QUICK RECALL

Recall Activity

Recall the meaning of rolling without slipping and the two kinds of motion present in a rolling object.

1. Rolling combines translation of the center of mass with rotation about the center. 2. For rolling without slipping: $v_{cm} = \omega R$. 3. Total kinetic energy has translational and rotational parts. 4. Static friction prevents slipping when friction is needed.

Ready to refresh the essentials?

Great! Now review the most important idea you'll want to remember.

Review the Essential Idea →

FR-05 • STAGE 2 OF 4

Essential Idea

Take one last look at the most important concept from this topic. If you remember this idea, the rest will come back much more easily.

ESSENTIAL IDEA

Rolling Without Slipping

A rolling object moves forward while rotating. In pure rolling, the point touching the surface is momentarily at rest relative to that surface, so the translation and rotation are linked by $v_{\text{cm}} = \omega R$. The object's kinetic energy is shared between motion of its center of mass and rotation about its center.

$$v_{\text{cm}} = \omega R \quad ; \quad K = \frac{1}{2} M v_{\text{cm}}^2 + \frac{1}{2} I \omega^2$$

EXAMPLE For the same center-of-mass speed, a rolling hoop has more rotational kinetic energy than a solid disk because more of its mass is farther from the axis.

SENSEI NOTE Static friction does not automatically oppose the center-of-mass motion. Its direction depends on what tendency to slip must be prevented.

Ready to check your memory?

You've refreshed the essential idea. Now see how much you remember before moving on.

Start the Confidence Check →

FR-06 • STAGE 3 OF 4

Confidence Check

You've refreshed the essential idea. Now answer this quick confidence check to confirm you're ready to move on.

CONFIDENCE CHECK

Which Object Wins?

Choose the object that reaches the bottom first when both roll without slipping down the same incline.

A solid cylinder and a hoop start from rest at the same height. Which reaches the bottom first? Explain using how their mass is distributed.

Ready for your next step?

Great work! You've refreshed the essential idea. Now choose the resource that best matches what you'd like to do next.

Choose Your Next Step →

QUICK ANSWERS • CHECK AFTER ATTEMPTING

Quick Answers and Explanations

Use these concise answers to check your recall and confidence—not only your final response.

QUICK RECALL**Recall Activity**

Rolling without slipping links translation and rotation: $v_{\text{cm}} = \omega R$. The kinetic energy is $K = \frac{1}{2} M v_{\text{cm}}^2 + \frac{1}{2} I \omega^2$.

WHY IT WORKS The no-slip condition couples the two motions, while the moment of inertia determines how much energy goes into rotation.

CONFIDENCE CHECK**CONFIDENCE CHECK****Which Object Wins?**

The solid cylinder reaches the bottom first.

WHY IT WORKS A solid cylinder has a smaller moment-of-inertia factor than a hoop, so less of its gravitational energy is tied up in rotation and more produces center-of-mass speed.

READINESS GUIDE

1 correct: You're ready to continue. • 0 correct: Revisit the Essential Idea or choose more practice.

FR-07 • STAGE 4 OF 4

Next Step: Continue Learning

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

? I'm Still Unsure Review the essential idea again. Review Again →	🎯 I Need More Practice Continue with additional practice for this topic. <u>Go to Practice →</u>	✓ I'm Ready Continue to the next recommended resource. Continue →
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RECOMMENDED LINKS

[Review this topic again →](#)

[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