

QUICK REVIEW

Quick Review: Simple Harmonic Motion

Refresh the most important ideas, formulas, and problem-solving strategies for simple harmonic 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...

connect the SHM differential equation to $x(t)$, $v(t)$, and $a(t)$, and check energy and small-angle models.

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 bundle is designed to complement the chapter listed below. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

TEXTBOOK: Independent Physics Sensei Unit Review CHAPTER: Mechanics • Unit MEC-U09 TOPIC: MEC-U09 — Simple Harmonic Motion COURSE LEVEL: Calculus-Based	BEST USED ✓ After reading the chapter ✓ Before starting homework ✓ Before a quiz or exam
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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 — page 4 Refresh what you already know.	2 Essential Idea — page 5 Review the most important concept.
3 Confidence Check — page 6 Confirm you're ready to move on.	4 Next Step — page 8 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

Complete the four-part SHM model check from memory.

Write the defining SHM differential equation and the small-angle pendulum equation.

Ready to refresh the essentials?

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

Continue to Essential Idea — page 5 →

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

SHM is restoring acceleration proportional to –displacement

The core equation is $x'' + \omega^2 x = 0$. Sinusoidal $x(t)$, the derivative phase relations, constant ideal energy, and the small-angle pendulum model all follow from this linear equation.

$$x'' = -\omega^2 x; v = dx/dt; a = d^2x/dt^2; \text{small-angle pendulum: } \omega = \sqrt{g/L}$$

EXAMPLE If $x = A \cos \omega t$, then $v = -A\omega \sin \omega t$ and $a = -A\omega^2 \cos \omega t = -\omega^2 x$.

SENSEI NOTE Before using an SHM formula, ask: Is the restoring force linear over this motion? For a pendulum, that means checking the small-angle approximation.

Ready to check your memory?

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

Continue to Confidence Check — page 6 →

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

One-minute SHM check

Answer all parts without notes.

What condition on $U(x)$ near equilibrium leads to approximate SHM?

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.

Continue to Next Step — page 8 →

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

$\ddot{x} + \omega^2 x = 0$; for a small-angle pendulum, $\ddot{\theta} + (g/L)\theta = 0$.

WHY IT WORKS The fastest reliable review is: identify the restoring law, locate the oscillator in its cycle, choose timing or energy, and check the model assumptions.

CONFIDENCE CHECK

CONFIDENCE CHECK

One-minute SHM check

U has a stable local minimum and is approximately quadratic: $U \approx U_0 + \frac{1}{2}k_e x^2$.

WHY IT WORKS A correct response separates equilibrium from turning-point properties and recognizes the linear-restoring-force structure behind all SHM formulas.

READINESS GUIDE

3 correct: You're ready to continue. • 2 correct: Review the missed idea. • 0–1 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: return to Essential Idea on page 5.	🕒 I Need More Practice Continue with additional practice for this topic. Go to Practice →	✓ I'm Ready Continue to the next recommended resource. Continue →
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RECOMMENDED LINKS

Review again: return to Essential Idea on page 5.

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.

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