

QUICK REVIEW

Quick Review: Projectile Motion — Calculus-Based

Refresh the most important ideas, formulas, and problem-solving strategies for MEC-U15 — Projectile 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...

separate vector components, identify changing directions, and use the correct reference frame 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 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: MEC-U15 TOPIC: MEC-U15 — Projectile Motion COURSE LEVEL: Calculus-based introductory university physics	BEST USED ✓ After reading the chapter ✓ Before starting homework ✓ Before a quiz or exam
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Visit Physics Sensei →

Physics Sensei is an independent educational resource for college physics review and practice.

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 calculus-based model from memory.

1) $a(t) = \underline{\hspace{1cm}}$. 2) $v(t) = \underline{\hspace{1cm}}$. 3) *The apex satisfies* $\underline{\hspace{1cm}}$.

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

Integrate the Vector Model, Then Use the Parameter

Ideal projectile motion starts from $a = \langle 0, -g \rangle$. Integration gives $v(t)$ and $r(t)$; the shared parameter t links the components. Eliminating t gives a parabolic $y(x)$, and derivatives identify the tangent direction and apex.

$$\mathbf{r}(t) = \langle x_0 + v_{0x}t, y_0 + v_{0y}t - \frac{1}{2}gt^2 \rangle; \mathbf{v}(t) = \langle v_{0x}, v_{0y} - gt \rangle.$$

EXAMPLE For $\mathbf{r}(t) = \langle 18.4t, 1.50 + 15.4t - 4.90t^2 \rangle$, the landing root is 3.24 s and the impact velocity is $\langle 18.4, -16.4 \rangle$ m/s.

SENSEI NOTE Keep vector components explicit until the event time is known; then evaluate magnitude and direction.

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

Five-Minute Readiness Check

Answer without notes.

Write $a(t)$, $v(t)$, and $r(t)$ for ideal projectile motion, state the apex derivative condition, and give the reason $y(x)$ is quadratic.

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

1) $\langle 0, -g \rangle$; 2) $\langle v_0x, v_0y - gt \rangle$; 3) $dy/dt = v_y = 0$.

WHY IT WORKS Constant vector acceleration integrates directly to the projectile velocity and position functions.

CONFIDENCE CHECK

CONFIDENCE CHECK

Five-Minute Readiness Check

$a = \langle 0, -g \rangle$; $v = \langle v_0x, v_0y - gt \rangle$; $r = \langle x_0 + v_0x t, y_0 + v_0y t - \frac{1}{2}gt^2 \rangle$; apex: $dy/dt = 0$; $y(x)$ is quadratic because $x \propto t$ and y contains t^2 .

WHY IT WORKS These are the central calculus connections: integration, a shared parameter, and parameter elimination.

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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