FOCUSED REVIEW

Focused Review: Projectile Motion — Algebra-Based

Review the most important ideas, reinforce the essential skills, and confirm you're ready to move on.

◷ TIME	◎ BEST FOR	✓ FINISH WITH
15–20 minutes	Focused review	Greater confidence

After this focused review, you'll be able to…

use component methods for projectile motion, interpret circular acceleration, and combine frame-labeled velocities.

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 15–20 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: Algebra-based introductory college physics

BEST USED

- ✓ After reading the chapter
- ✓ Before starting homework
- ✓ Before a quiz or exam

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 six focused stages in order. Each stage reinforces your understanding and prepares you for a final confidence check.

6 stages • Approximately 15–20 minutes

1 **Warm-Up Check — page 4** Refresh key ideas.	2 **Core Concepts — page 6** Reinforce the essentials.	3 **Guided Practice — page 7** Strengthen key skills.
4 **Confidence Check — page 8** Confirm your understanding.	5 **Summary — page 10** Remember the essentials.	6 **Next Step — page 14** Choose your next step.

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 minute to reactivate what you already know. This quick warm-up will help you focus on the most important ideas before moving on.

WARM-UP 1

Key Ideas

Resolve a launch vector.

A projectile launches at 20.0 m/s and 30.0°. Find v_0x and v_0y.

WARM-UP 2

Common Mistakes

Update the components after a known time.

If v_0x = 12.0 m/s and v_0y = 18.0 m/s, find v after 1.50 s.

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

Check the condition for a shortcut.

When may $R = v_0^2 \sin(2\theta)/g$ be used?

Ready to strengthen your understanding?

You've refreshed the most important ideas. Now reinforce the concepts you'll use most often.

Continue to Core Concepts — page 6 →

FR-05 • STAGE 2 OF 6

Core Concepts

Let's reinforce the most important concepts you'll need to solve problems with confidence. Focus on the ideas that appear most often in homework, quizzes, and exams.

KEY CONCEPT 1

Resolve, Then Use One Shared Time

Resolve v_0 into x and y components. Use $x = x_0 + v_0x\ t$ because $a_x = 0$, and use constant-acceleration equations vertically with $a_y = -g$. The same t must satisfy both axes.

$$v_0x = v_0 \cos\theta;\ v_0y = v_0 \sin\theta;\ x = x_0 + v_0x\ t;\ y = y_0 + v_0y\ t - \tfrac{1}{2}gt^2.$$

EXAMPLE For 24.0 m/s at 40.0° from $y_0 = 1.50$ m, the vertical equation gives t = 3.24 s and the horizontal range is 59.6 m.

SENSEI NOTE Never use v_0 where an x or y component is required.

KEY CONCEPT 2

Shortcuts Versus the General Model

Equal-height launches allow direct formulas for flight time, range, and height. For different launch and landing heights, solve the general vertical quadratic for time and then use that time horizontally.

$$\text{Equal heights: } T = 2v_0 \sin\theta/g;\ R = v_0^2 \sin(2\theta)/g.\ \text{General: } y\_f = y_0 + v_0y\ t - \tfrac{1}{2}gt^2.$$

EXAMPLE A 28.0 m/s, 35.0° level launch has T = 3.28 s and R = 75.2 m. A rooftop launch requires the general vertical equation instead.

SENSEI NOTE The equal-height range formula is a conditional shortcut, not the definition of range.

Ready to apply these ideas?

You've reinforced the essential concepts. Now strengthen your problem-solving skills by working through a few guided examples.

Continue to Guided Practice — page 7 →

FR-06 • STAGE 3 OF 6

Guided Practice

Now apply the key concepts you've just reviewed. Work through these focused practice activities to reinforce your problem-solving skills before the final confidence check.

PRACTICE 1

Guided Example

Use equal-height formulas.

A ball launches from level ground at 28.0 m/s and 35.0°. Find T and R.

PRACTICE 2

Independent Check

Use the general vertical equation.

A ball launches from 1.50 m above ground at 24.0 m/s and 40.0°. Find flight time and range.

Ready for a confidence check?

You've reinforced the essential skills through focused practice. Now confirm your understanding with two short questions.

Continue to Confidence Check — page 8 →

FR-07 • STAGE 4 OF 6

Confidence Check

You've reinforced the key concepts and practiced the essential skills. Now confirm you're ready to move forward by completing these short confidence checks.

CONFIDENCE CHECK 1

Shortcut Check

State the assumption.

Can the equal-height range formula be used for a rooftop launch to street level?

CONFIDENCE CHECK 2

Apex Components

State velocity and acceleration.

What are v_y and a_y at the apex?

HOW DID IT GO?

I answered ____ of 2 questions correctly.

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

You've confirmed your understanding.

Take one final look at the essential ideas before choosing your next step.

Continue to Summary — page 10 →

FR-08 • STAGE 5 OF 6

Summary

Before moving on, take one final look at the essential ideas you'll want to remember.

KEY TAKEAWAY 1

Resolve the Launch

Use v_0x and v_0y, not the full speed, in the component equations.

KEY TAKEAWAY 2

Match the Model to the Heights

Use equal-height shortcuts only when their symmetry assumption is actually satisfied.

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 14 →

ANSWER KEY • CHECK AFTER ATTEMPTING

Solutions and Explanations

Use these solutions to check your reasoning—not only your final answer. Use each answer and explanation to check both the setup and the physical interpretation.

WARM-UP • ACTIVITY 1

Key Ideas

17.3 m/s and 10.0 m/s.

WHY IT WORKS Use cosine for the horizontal component and sine for the vertical component.

WARM-UP • ACTIVITY 2

Common Mistakes

<12.0, 3.30> m/s.

WHY IT WORKS v_x is constant and $v_y = 18.0 - 9.80(1.50)$.

WARM-UP • ACTIVITY 3

Quick Application

When launch and landing heights are equal in the ideal model.

WHY IT WORKS The shortcut follows from symmetric vertical motion and does not apply to unequal-height launches.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

T = 3.28 s; R = 75.2 m.

WHY IT WORKS Use $v_0y = v_0 \sin 35°$ and the equal-height formulas.

PRACTICE 2

Independent Check

t = 3.24 s; range = 59.6 m.

WHY IT WORKS Solve $0 = 1.50 + 15.4t - 4.90t^2$ for the positive root, then use $x = 18.4t$.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Shortcut Check

No.

WHY IT WORKS Launch and landing heights differ.

CONFIDENCE CHECK 2

Apex Components

$v_y = 0$ and $a_y = -g$.

WHY IT WORKS The vertical velocity reverses direction, but gravity remains constant.

READINESS GUIDE

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

FR-09 • STAGE 6 OF 6

Next Step: Continue Learning

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

?	◎	✓
I'm Still Unsure	**I Need More Practice**	**I'm Ready**
Review the focused review again to strengthen the essential concepts.	Build confidence with additional practice problems.	Continue to the next topic or learning resource.
Review again: return to Warm-Up Check on page 4.	**Go to Practice →**	**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