FOCUSED REVIEW

Focused Review: Motion in Two Dimensions

Reinforce the most important vector, component-motion, projectile, and relative-velocity ideas.

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

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

interpret the most important signs and graph relationships and decide whether your physical reasoning is ready to move forward.

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 • UNIT ALIGNMENT

Unit Alignment

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

ARCHITECTURE: Physics Sensei Independent Mechanics UNIT: MEC-U03 — Motion in Two Dimensions SCOPE: Unit Review PHYSICS LEVEL: Foundational	BEST USED ✓ Before work with vectors or projectile motion ✓ When components or trajectories feel confusing ✓ When you want to understand the physics before calculating

Review Prerequisites →

Physics Sensei is an independent educational resource. This review is independently authored and organized under the approved Physics Sensei mechanics architecture.

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

Recall Activity 1

Separate a path from the net displacement vector.

A student walks 6 m east and then 8 m north. What are the displacement magnitude and total distance traveled?

WARM-UP 2

Recall Activity 2

Identify perpendicular velocity components.

A drone moves east while also climbing. Which velocity components are positive if +x is east and +y is up?

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Recall Activity 3

Recognize independent component motion.

In ideal projectile motion, which velocity component stays constant and which changes?

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

Vectors describe position and displacement in a plane

A position vector locates an object relative to an origin. Displacement is the vector from initial to final position; distance is the total path length.

$$\Sigma F_x = 0 \quad \bullet \quad \Sigma F_y = 0$$

EXAMPLE $\Delta\vec{r} = \langle \Delta x, \Delta y \rangle$. A displacement $\langle 6, 8 \rangle$ m has magnitude 10 m and points 53° above +x.

SENSEI NOTE Define both axes before interpreting component signs.

KEY CONCEPT 2

Velocity and acceleration are vectors with components

Velocity is tangent to the path; acceleration describes how the velocity vector changes. Analyze x and y components independently, then recombine them.

$$\Sigma \tau\_O = 0 \quad \bullet \quad \tau = Fd\perp$$

EXAMPLE A velocity $\langle 3,4 \rangle$ m/s has speed 5 m/s. If acceleration is $\langle 0,-9.8 \rangle$ m/s², only the vertical velocity component changes.

SENSEI NOTE A negative component indicates axis direction; a vector magnitude is never negative.

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

Worked Example

Combine perpendicular displacements as vectors.

A student walks 6 m east and 8 m north. Find the displacement magnitude and direction.

PRACTICE 2

Guided Problem

Distinguish vertical from horizontal motion at the top.

At the top of an ideal projectile path, describe v_x, v_y, and acceleration.

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

Identify a constant component

Use the acceleration direction.

For ideal projectile motion, which velocity component remains constant?

CONFIDENCE CHECK 2

Combine vector components

Use the Pythagorean theorem.

A velocity has components 6 m/s east and 8 m/s north. What is its speed?

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

Components describe direction

Define perpendicular axes; component signs then describe vector direction.

KEY TAKEAWAY 2

Treat component motions independently

The x and y equations are linked by a common time, not by forces between the components.

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. Compare your setup, signs, units, and interpretation with the explanations below.

WARM-UP • ACTIVITY 1

Recall Activity 1

10 m displacement; 14 m distance.

WHY IT WORKS The displacement magnitude is $\sqrt{(6^2+8^2)}=10$ m. Distance follows the path: 6+8=14 m.

WARM-UP • ACTIVITY 2

Recall Activity 2

$v_x > 0$ and $v_y > 0$.

WHY IT WORKS East is +x and upward is +y, so both stated velocity components are positive.

WARM-UP • ACTIVITY 3

Recall Activity 3

v_x stays constant; v_y changes because of gravity.

WHY IT WORKS Ideal projectile motion has $a_x=0$ and $a_y=-g$.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Worked Example

10 m at 53° north of east.

WHY IT WORKS Combine ⟨6,8⟩ m: magnitude 10 m and direction $\tan^{-1}(8/6)=53°$.

PRACTICE 2

Guided Problem

$v_y=0$ momentarily; v_x remains nonzero; $\vec{a}$ points downward.

WHY IT WORKS Gravity changes vertical velocity but not horizontal velocity.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Identify a constant component

The horizontal component v_x.

WHY IT WORKS With $a_x=0$, horizontal velocity does not change.

CONFIDENCE CHECK 2

Combine vector components

10 m/s.

WHY IT WORKS $\sqrt{(6^2+8^2)}=10$ m/s.

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.	Continue with additional practice for this unit.	Continue to the next recommended 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