FOCUSED REVIEW

Focused Review: Motion in One Dimension

Reinforce the highest-leverage algebraic kinematics skills for signs, graphs, constant acceleration, and free fall.

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

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

use the core constant-acceleration relationships, interpret motion graphs, and confirm readiness for the next study task.

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-U02 — Motion in One Dimension SCOPE: Unit Review PHYSICS LEVEL: Algebra-Based	BEST USED ✓ Before homework on one-dimensional kinematics ✓ Before a quiz or exam ✓ When signs, graphs, or constant-acceleration problems feel uncertain

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

Use displacement—not distance—to calculate average velocity.

A runner moves from x = 5.0 m to x = −7.0 m in 4.0 s. Find the runner's average velocity.

WARM-UP 2

Recall Activity 2

Compare the change in velocity with the elapsed time and keep the sign.

A car traveling at +18 m/s brakes uniformly to +6.0 m/s in 3.0 s. Find its average acceleration.

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Recall Activity 3

Use the signed area under a velocity–time graph to find displacement.

Velocity increases linearly from +2.0 m/s to +8.0 m/s during a 3.0 s interval. Find the displacement during the interval.

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

Position, displacement, velocity, and signs

Choose a coordinate axis first. Position locates an object relative to the origin; displacement is the signed change in position. Average velocity uses displacement, not total distance. Speed is a magnitude and is never negative.

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

EXAMPLE $\Delta x = x_f - x_i$; $v_{avg} = \Delta x/\Delta t$. Example: from $x = +3$ m to $x = -9$ m in 4 s, $\Delta x = -12$ m and $v_{avg} = -3$ m/s.

SENSEI NOTE A negative velocity means motion in the negative coordinate direction. It does not automatically mean the object is slowing down.

KEY CONCEPT 2

Constant acceleration gives a compact kinematics toolkit

When acceleration is constant, velocity changes linearly with time and position changes quadratically. Select the equation that contains the known quantities and the single unknown you need.

$$\Sigma \tau_O = 0 \quad \cdot \quad \tau = Fd\perp$$

EXAMPLE $v = v_0 + at$; $\Delta x = v_0 t + \frac{1}{2}at^2$; $v^2 = v_0^2 + 2a\Delta x$; $\Delta x = \frac{1}{2}(v_0 + v)t$. Example: $v_0 = 5$ m/s, $a = 2$ m/s², $t = 4$ s gives $v = 13$ m/s and $\Delta x = 36$ m.

SENSEI NOTE These shortcut equations require constant acceleration over the interval. If the motion changes stages, reset the initial conditions for each stage.

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

Separate the motion into two time intervals and carry the final velocity of the first interval into the second.

A car travels at 12.0 m/s for 5.0 s, then accelerates uniformly at 3.00 m/s² for 4.00 s. Find the total displacement and final speed.

PRACTICE 2

Guided Problem

Use the constant-acceleration equations once with the stopping condition v = 0.

A bicycle moving at 10.0 m/s brakes with constant acceleration −2.50 m/s². Find the stopping time and stopping distance.

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

Choose the equation that removes time

Identify the equation containing v, v_0, a, and Δx but not t.

An object has v_0 = 4.0 m/s, a = 3.0 m/s², and Δx = 10 m. Which constant-acceleration equation finds the final velocity without first finding time?

CONFIDENCE CHECK 2

Use area on a velocity–time graph

Treat the triangular region under the graph as signed displacement.

A velocity–time graph rises linearly from 0 at t = 0 to +12 m/s at t = 6.0 s. Find the displacement during the interval.

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

Define the axis before the algebra

Signs come from the coordinate choice. Distinguish displacement from distance and velocity from speed before substituting numbers.

KEY TAKEAWAY 2

Match the equation to the model

The standard kinematics equations are powerful because acceleration is constant. Use known quantities to choose the most direct equation.

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

–3.0 m/s.

WHY IT WORKS $\Delta x = x_f - x_i = -7.0 - 5.0 = -12.0$ m. Then $v_{avg} = \Delta x/\Delta t = -12.0/4.0 = -3.0$ m/s.

WARM-UP • ACTIVITY 2

Recall Activity 2

–4.0 m/s².

WHY IT WORKS $a_{avg} = (v_f - v_i)/\Delta t = (6.0 - 18)/3.0 = -4.0$ m/s². The negative sign is consistent with the positive velocity decreasing.

WARM-UP • ACTIVITY 3

Recall Activity 3

15 m.

WHY IT WORKS The signed area is a trapezoid: $\Delta x = \frac{1}{2}(v_i + v_f)\Delta t = \frac{1}{2}(2.0 + 8.0)(3.0) = 15$ m.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Worked Example

Total displacement = 132 m; final speed = 24.0 m/s.

WHY IT WORKS First interval: $\Delta x_1 = (12.0)(5.0) = 60.0$ m. Second interval: $\Delta x_2 = (12.0)(4.0) + \frac{1}{2}(3.00)(4.00^2) = 72.0$ m. Total = 132 m. Final speed is $v = 12.0 + (3.00)(4.00) = 24.0$ m/s.

PRACTICE 2

Guided Problem

Stopping time = 4.00 s; stopping distance = 20.0 m.

WHY IT WORKS Use $0 = 10.0 - 2.50t$ to obtain $t = 4.00$ s. Then $0 = (10.0)^2 + 2(-2.50)\Delta x$ gives $\Delta x = 20.0$ m.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Choose the equation that removes time

$v^2 = v_0^2 + 2a\Delta x$.

WHY IT WORKS It contains the desired final velocity and the given v_0, a, and Δx, but no time.

CONFIDENCE CHECK 2

Use area on a velocity–time graph

36 m.

WHY IT WORKS The displacement is the triangular area under v(t): ½(6.0 s)(12 m/s) = 36 m.

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