

FULL REVIEW

Full Review — Acceleration and Constant-Acceleration Motion — Foundational

Review the essential ideas, relationships, and problem-solving tools for Acceleration and Constant-Acceleration Motion.

 TIME 45–60 minutes	 BEST FOR A complete topic review	 FINISH WITH A readiness check
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After this full review, you'll be able to...

recall the essential ideas, apply them to representative problems, and determine what to study next.

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 45–60 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This Physics Sensei Topic Review is an independent learning resource. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

Related Unit Review: If you need to review the complete unit material, review [Motion in One Dimension here →](#)

RESOURCE: Physics Sensei Topic Review
TOPIC ID: MEC-U03-T02
TOPIC: Acceleration and Constant-Acceleration Motion
PARENT UNIT: MEC-U03 — Motion in One Dimension
COURSE LEVEL: Foundational

BEST USED

- ✓ After learning the topic
- ✓ Before starting homework
- ✓ Before a quiz or exam

FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these six stages in order. Each stage builds on the previous one and prepares you for the final readiness check.

6 stages • Approximately 45–60 minutes

1 Warm-Up Check Activate prior knowledge.	2 Core Concepts Review the essential ideas.	3 Guided Practice Apply what you learned.
4 Confidence Check Confirm your understanding.	5 Summary Review the key ideas.	6 Next Step Continue your learning.

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 moment to see what you already remember. Do not worry about getting everything right. This is only a starting point.

ACTIVITY 1**Recall Activity 1**

State the meaning in words.

What does an acceleration of -3 m/s^2 tell you about how velocity changes each second?

ACTIVITY 2**Recall Activity 2**

Check the sign logic before calculating.

A cyclist has $v > 0$ and $a < 0$. Is the cyclist necessarily moving backward? Explain.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Estimate the direction of change first.

A ball moving upward has positive velocity. Just before it reaches its highest point, what is the direction of its acceleration?

Ready to strengthen your understanding?

You've refreshed what you already know. Next, reinforce the essential concepts that will help you solve problems with confidence.

Continue to Core Concepts →

FR-05 • STAGE 2 OF 6

Core Concepts

Let's rebuild the key ideas one step at a time. Focus on understanding the relationships before worrying about solving problems.

KEY CONCEPT 1**Acceleration and Sign**

Acceleration measures the rate at which velocity changes. Its sign indicates the direction of the velocity change, not whether an object is automatically speeding up or slowing down.

$$a = \Delta v / \Delta t$$

EXAMPLE A velocity change from +10 m/s to +4 m/s over 3 s gives a negative average acceleration.

SENSEI NOTE Always define the positive direction before interpreting signs.

KEY CONCEPT 2**Constant Acceleration**

When acceleration is constant, velocity changes by equal amounts in equal time intervals. Position does not change by equal amounts because the velocity itself is changing.

$$v = v_0 + at$$

EXAMPLE Starting from rest with $a = +2 \text{ m/s}^2$ gives velocities 0, 2, 4, 6 m/s after 0, 1, 2, 3 s.

SENSEI NOTE Constant acceleration does not mean constant velocity.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Motion Graphs under Constant Acceleration

For constant acceleration, the velocity–time graph is a straight line. The slope tells you acceleration, and the area between the velocity graph and the time axis gives displacement.

$$\Delta v = a\Delta t$$

EXAMPLE A horizontal v – t line means zero acceleration; an upward-sloping line means positive acceleration.

SENSEI NOTE On a v – t graph, crossing $v = 0$ can indicate a change in direction.

Ready to apply these ideas?

You've reinforced the essential concepts. Now put them into practice by working through guided examples and building your problem-solving confidence.

[Continue to Guided Practice →](#)

FR-06 • STAGE 3 OF 6

Guided Practice

Now it's time to apply what you've reviewed. Work through each activity in order. The examples become gradually more challenging, and each prepares you for the final readiness check.

PRACTICE 1**Worked Example**

Work from the words and signs before using numbers.

A scooter moves at $+4 \text{ m/s}$ and accelerates at $+1.5 \text{ m/s}^2$ for 4 s . Find its final velocity.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Guided Problem

Use the velocity relation and interpret the sign.

A car moving at $+12 \text{ m/s}$ slows with constant acceleration -3 m/s^2 . How long does it take to reach $+3 \text{ m/s}$?

PRACTICE 3

Independent Problem

Read the graph information as slope and signed area.

A $v-t$ graph rises uniformly from $+2 \text{ m/s}$ at $t = 0$ to $+8 \text{ m/s}$ at $t = 3 \text{ s}$. Find the acceleration and describe the motion.

Ready to check your understanding?

You've practiced the essential skills with guidance. Now solve a few short problems on your own and confirm you're ready to move forward.

Continue to Confidence Check →

FR-07 • STAGE 4 OF 6

Confidence Check

You've rebuilt the key ideas and practiced them with guidance. Now try these short questions on your own to check your understanding before moving on.

QUICK CHECK 1**Velocity Change**

Calculate the acceleration.

Velocity changes from -2 m/s to -8 m/s in 3 s. What is the average acceleration?

QUICK CHECK 2**Speeding Up or Slowing Down**

Decide using signs, not position.

At one instant $v = +5$ m/s and $a = -2$ m/s². Is the object speeding up or slowing down?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Graph Interpretation

Use the slope of the velocity–time graph.

A straight v – t line drops from $+6$ m/s to 0 in 2 s. What is the acceleration?

HOW DID IT GO?

I answered ____ of 3 questions correctly.

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

You've checked your understanding.

Take one final look at the essential ideas before deciding what to do next.

Continue to Summary →

FR-08 • STAGE 5 OF 6

Summary

Before moving on, take one final look at the most important ideas from this review.

KEY TAKEAWAY 1**Read the Signs**

Acceleration describes the direction and rate of velocity change. Compare the signs of v and a to decide whether speed increases or decreases.

KEY TAKEAWAY 2**Constant Means Equal Velocity Changes**

For constant acceleration, velocity changes linearly with time. Use a consistent sign convention from start to finish.

KEY TAKEAWAY 3**Graphs Tell the Same Story**

For a velocity–time graph, slope gives acceleration and signed area gives displacement. Use graph shape and signs together.

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 →

ANSWER KEY • CHECK AFTER ATTEMPTING

Solutions and Explanations

Use these solutions to check your reasoning—not only your final answer.

WARM-UP • ACTIVITY 1**Recall Activity 1**

Velocity changes by -3 m/s each second.

WHY IT WORKS Acceleration is velocity change per unit time.

WARM-UP • ACTIVITY 2**Recall Activity 2**

No. Positive velocity means it is still moving in the positive direction; negative acceleration means its velocity is decreasing.

WHY IT WORKS Direction of motion comes from velocity; acceleration describes how that velocity changes.

WARM-UP • ACTIVITY 3**Recall Activity 3**

Downward. Gravity remains downward even while the ball is still moving upward.

WHY IT WORKS Acceleration due to gravity does not reverse at the top of the path.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Worked Example

$$v = 4 + (1.5)(4) = +10 \text{ m/s.}$$

WHY IT WORKS Constant acceleration changes velocity by $a\Delta t$.

PRACTICE 2

Guided Problem

$$3 = 12 - 3t, \text{ so } t = 3 \text{ s.}$$

WHY IT WORKS The negative acceleration reduces the positive velocity by 3 m/s each second.

PRACTICE 3

Independent Problem

$a = (8 - 2)/3 = +2 \text{ m/s}^2$. Velocity stays positive and increases, so the object moves in the positive direction and speeds up.

WHY IT WORKS The graph's constant positive slope is the acceleration, while positive velocity shows the direction of motion.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Velocity Change

$$a = [-8 - (-2)]/3 = -2 \text{ m/s}^2.$$

WHY IT WORKS The velocity becomes 6 m/s more negative in 3 s.

QUICK CHECK 2

Speeding Up or Slowing Down

Slowing down.

WHY IT WORKS Velocity and acceleration have opposite signs, so speed decreases at that instant.

QUICK CHECK 3

Graph Interpretation

$$a = (0 - 6)/2 = -3 \text{ m/s}^2.$$

WHY IT WORKS The acceleration is the constant slope of the line.

READINESS GUIDE

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

FR-09 • STAGE 6 OF 6

Next Step: Continue Learning

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

 I'm Still Unsure Review the key ideas and examples again. Review Again →	 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 this topic again →](#)[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