

FULL REVIEW

Full Review — Position, Displacement, and Velocity — Foundational

Review the essential ideas, relationships, and problem-solving tools for Position, Displacement, and Velocity.

 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-T01 TOPIC: Position, Displacement, and Velocity PARENT UNIT: MEC-U03 — Motion in One Dimension COURSE LEVEL: Foundational introductory physics	BEST USED ✓ After learning the topic ✓ Before starting homework ✓ Before a quiz or exam
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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

Define the coordinate system.

What must be specified before a position value such as $x = -4$ m can be interpreted?

ACTIVITY 2

Recall Activity 2

Compare position and displacement.

A car starts at $x = -6$ m and ends at $x = +2$ m. Which number is the final position and which number is the displacement?

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Read velocity direction.

On a position-versus-time graph, what does an upward trend mean about velocity?

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**Reference frame, position, and displacement**

One-dimensional motion begins with a coordinate axis. Position x gives location relative to the origin. Displacement compares two positions and is signed, so it tells both the magnitude and direction of the net change.

$$\Delta x = x_2 - x_1$$

EXAMPLE From -6 m to $+2$ m, $\Delta x = +8$ m.

SENSEI NOTE Write final minus initial every time; reversing the order reverses the physical direction.

KEY CONCEPT 2**Average velocity describes net position change**

Average velocity is displacement divided by elapsed time. Because elapsed time is positive, the sign of average velocity matches the sign of displacement. A return to the starting position gives zero average velocity even if the object traveled a long distance.

$$\text{average velocity} = \Delta x / \Delta t$$

EXAMPLE A $+15$ m displacement during 5 s gives $+3$ m/s.

SENSEI NOTE Do not use total distance in the numerator when the question asks for average velocity.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Position-time graphs encode velocity

On an $x-t$ graph, the slope tells how position changes with time. Upward slope means positive velocity, downward slope means negative velocity, and a horizontal segment means zero velocity. A steeper slope corresponds to a larger speed.

$$x-t \text{ slope} = \text{change in position} \div \text{change in time}$$

EXAMPLE A straight line from 0 m at 0 s to 12 m at 4 s has slope +3 m/s.

SENSEI NOTE A high position on the graph does not mean high velocity; slope, not height, describes velocity.

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**

Track endpoints first.

A student walks from $x = -2 \text{ m}$ to $x = +6 \text{ m}$ in 4 s . Find displacement and average velocity.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Guided Problem

Separate path length from net change.

A robot moves from $x = 0$ m to $x = +5$ m, then to $x = +1$ m. Find the total distance and displacement.

PRACTICE 3

Independent Problem

Use a graph slope.

A position-time graph rises linearly from $x = -4$ m at $t = 1$ s to $x = +8$ m at $t = 5$ s. Find the average velocity over that interval.

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**Zero net change**

Answer using endpoints.

A runner starts and ends at $x = 10\text{ m}$ after 20 s . What is the average velocity?

QUICK CHECK 2**Sign check**

Calculate final minus initial.

A cart moves from $x = +3\text{ m}$ to $x = -9\text{ m}$ in 6 s . What is its average velocity?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Graph interpretation

Use slope, not graph height.

An x - t graph is horizontal for 3 s. What is the velocity during that interval?

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**Position needs a reference**

Position is a coordinate measured from an origin along a chosen positive direction.

KEY TAKEAWAY 2**Displacement is signed endpoint change**

Use $\Delta x = x_2 - x_1$; the path length does not determine displacement.

KEY TAKEAWAY 3**Velocity comes from position change**

Average velocity is $\Delta x / \Delta t$, and an x - t graph shows velocity through its slope.

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. Use each answer and explanation to check both the setup and the physical interpretation.

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

An origin and a positive direction.

WHY IT WORKS Position is coordinate-dependent, so its sign is meaningful only after the axis is defined.

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

Final position = +2 m; displacement = +8 m.

WHY IT WORKS Position is a coordinate; displacement is the difference between final and initial coordinates.

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

Velocity is positive during an upward trend.

WHY IT WORKS Increasing position with increasing time corresponds to motion in the positive direction.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Worked Example**

$\Delta x = +8$ m; average velocity = +2 m/s.

WHY IT WORKS Endpoints give the signed displacement; dividing by the interval gives the average velocity.

PRACTICE 2**Guided Problem**

Distance = 9 m; displacement = +1 m.

WHY IT WORKS Distance adds path segments: 5 m + 4 m. Displacement compares only the final position $x_2 = +1$ m with the initial position $x_1 = 0$ m.

PRACTICE 3**Independent Problem**

Displacement = +12 m; elapsed time = 4 s; average velocity = +3 m/s.

WHY IT WORKS For a straight x - t segment, the slope equals the velocity over the interval.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Zero net change

0 m/s.

WHY IT WORKS The displacement is zero because the endpoints are the same.

QUICK CHECK 2

Sign check

$\Delta x = -12$ m, so average velocity = -2 m/s.

WHY IT WORKS The negative sign records motion in the negative coordinate direction.

QUICK CHECK 3

Graph interpretation

0 m/s.

WHY IT WORKS A horizontal x - t segment has zero slope, so position is not changing with time.

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