

FULL REVIEW

Full Review — Position, Displacement, and Velocity — Algebra-Based

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: Algebra-Based introductory physics

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**

Write the core relationships.

State Δx and $\bar{v}$ for an interval from (t_1, x_1) to (t_2, x_2) .

ACTIVITY 2**Recall Activity 2**

Check a return trip.

A particle leaves $x = 0$, moves 6 m right, then 6 m left. What are distance and displacement?

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Interpret a negative slope.

What does a negative slope on an $x-t$ graph mean?

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**Position and displacement are algebraic quantities**

Position x is a coordinate relative to a chosen origin. Displacement is the signed difference between final and initial position. A multi-leg path can have large distance while its displacement is small or zero.

$$\Delta x = x_2 - x_1$$

EXAMPLE $x_1 = -3$ m and $x_2 = +7$ m gives $\Delta x = +10$ m.

SENSEI NOTE Never erase coordinate signs before evaluating final minus initial.

KEY CONCEPT 2**Average velocity is net rate of position change**

Average velocity over a finite interval divides displacement by elapsed time. On an x - t graph, it is the secant slope through the two interval endpoints.

$$\bar{v} = (x_2 - x_1)/(t_2 - t_1)$$

EXAMPLE From (2 s, 5 m) to (8 s, -7 m), $\bar{v} = -2$ m/s.

SENSEI NOTE Average velocity can be zero even when the object moves throughout the interval.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3**Instantaneous velocity is local x - t slope**

When an x - t graph is curved, velocity can change during the interval. Instantaneous velocity is represented by the slope of the tangent line at a particular time; for a straight segment, instantaneous and average velocity are the same.

instantaneous velocity = tangent slope of the x - t graph

EXAMPLE If the tangent rises 6 m for a 2 s run, the instantaneous velocity represented by that tangent is +3 m/s.

SENSEI NOTE Do not calculate a long-interval secant slope when the question asks for velocity at one instant.

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**

Compute interval quantities.

At $t_1 = 1 \text{ s}$ a particle is at $x_1 = +4 \text{ m}$; at $t_2 = 5 \text{ s}$ it is at $x_2 = -8 \text{ m}$. Find Δx , Δt , and $\bar{v}$.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Guided Problem

Separate distance and displacement.

A cart moves 10 m right, 4 m left, then 2 m right. It starts at $x = -1$ m. Find final position, distance, and displacement.

PRACTICE 3

Independent Problem

Analyze an x - t graph segment.

Position changes linearly from -6 m at 2 s to $+14$ m at 7 s. Find the velocity and predict the position 1 s later if the same velocity continues.

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**Signed average velocity**

Calculate carefully.

A particle moves from +9 m at 3 s to -3 m at 9 s. Find $\bar{v}$.

QUICK CHECK 2**Return trip**

Compare distance and displacement.

A particle travels 20 m but finishes exactly where it started after 8 s. What is its average velocity?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Graph reading

Use the slope.

An x - t tangent at one instant has slope -5 m/s. What does that say about the instantaneous velocity?

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**Displacement is final minus initial**

Signed coordinates determine Δx ; path length determines distance.

KEY TAKEAWAY 2**Average velocity is a secant slope**

Use $\bar{v} = \Delta x / \Delta t$ for a finite time interval.

KEY TAKEAWAY 3**Instantaneous velocity is a tangent slope**

On an x - t graph, velocity at one instant is represented by the local 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

$$\Delta x = x_2 - x_1; \Delta t = t_2 - t_1; \bar{v} = \Delta x / \Delta t.$$

WHY IT WORKS Using matching final-minus-initial differences gives the correct signed rate of change.

WARM-UP • ACTIVITY 2

Recall Activity 2

Distance = 12 m; displacement = 0 m.

WHY IT WORKS Distance accumulates path length; displacement compares endpoints.

WARM-UP • ACTIVITY 3

Recall Activity 3

Velocity is negative.

WHY IT WORKS Position decreases as time increases, so motion is in the negative coordinate direction.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Worked Example

$$\Delta x = -12 \text{ m}; \Delta t = 4 \text{ s}; \bar{v} = -3 \text{ m/s}.$$

WHY IT WORKS Use final minus initial for both x and t , then divide.

PRACTICE 2

Guided Problem

Final position = +7 m; distance = 16 m; displacement = +8 m.

WHY IT WORKS The signed moves sum to +8 m, while distance adds $10 + 4 + 2 = 16 \text{ m}$.

PRACTICE 3

Independent Problem

Velocity = +4 m/s; at 8 s, $x = +18 \text{ m}$.

WHY IT WORKS The straight-line slope is $20 \text{ m}/5 \text{ s} = 4 \text{ m/s}$; one more second adds 4 m.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Signed average velocity

–2 m/s.

WHY IT WORKS $\Delta x = -12$ m and $\Delta t = 6$ s.

QUICK CHECK 2

Return trip

0 m/s.

WHY IT WORKS Average velocity uses zero displacement, not the 20 m distance.

QUICK CHECK 3

Graph reading

It is –5 m/s.

WHY IT WORKS The tangent slope at that instant is the instantaneous velocity.

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