FOCUSED REVIEW

Focused Review: Momentum and Collisions — Foundational

15-minute foundational review of momentum and collisions, emphasizing physical meaning, system choice, vector direction, and conservation reasoning.

◷	◎	✓
TIME	**BEST FOR**	**FINISH WITH**
15 minutes	Focused Review	Greater confidence

After this review, you'll be able to…

explain momentum and impulse, choose a system, reason with momentum conservation, and distinguish elastic from inelastic collisions.

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 minutes

FR-02 • UNIT ALIGNMENT

Unit Alignment

This Physics Sensei Unit Review covers MEC-U07 — Momentum and Collisions using the Foundational treatment. Use it to reinforce the unit, prepare for homework, or review before a quiz or exam.

UNIT ID: MEC-U07 **UNIT: Momentum and Collisions** **TREATMENT: Foundational** **RESOURCE: Unit Review**	**BEST USED** ✓ After reading the chapter ✓ Before starting homework ✓ Before a quiz or exam

Explore Momentum and Collisions Online →

Physics Sensei Unit Reviews use independent organization, wording, examples, and explanations.

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 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

Momentum Has Direction

Use mass, speed, and direction to reason about momentum.

A cart moves east. What two changes could increase the magnitude of its momentum?

WARM-UP 2

Impulse Changes Momentum

Connect force and interaction time to a momentum change.

If the same average force acts for twice as long, how does the impulse change?

WARM-UP 3

Choose the System

Decide when total momentum can be treated as conserved.

Two carts collide on a nearly frictionless track. What external influence must be negligible during the collision for the two-cart momentum to be conserved?

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

Momentum and System Choice

Linear momentum is a vector: p = mv. Total system momentum is the vector sum of the momenta of all objects in the chosen system. Momentum conservation is a statement about a system, not about one object.

$$p = mv; \quad P = \Sigma p$$

EXAMPLE A heavier cart and a lighter cart can have the same momentum if the lighter cart moves faster.

SENSEI NOTE State the system before writing a conservation equation.

KEY CONCEPT 2

Impulse and Momentum Change

An impulse changes momentum. For a nearly constant net force, $J = F_{avg}\,\Delta t = \Delta p$. On a force-versus-time graph, the area under the curve is the impulse.

$$J = F_{avg}\,\Delta t = \Delta p$$

EXAMPLE A smaller force acting for a longer time can produce the same impulse as a larger force acting briefly.

SENSEI NOTE Impulse explains why increasing stopping time can reduce average force without changing the required momentum change.

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

Direction Check

Track signs and directions rather than treating momentum as a scalar.

A 0.50 kg cart moves east at 3.0 m/s and a 0.30 kg cart moves west at 2.0 m/s. Which direction is the total momentum?

PRACTICE 2

Sticking Collision

Use conservation of momentum for a perfectly inelastic collision.

A 1.0 kg cart moving right at 4.0 m/s sticks to a 3.0 kg cart initially at rest. What is their final speed and direction?

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

Momentum Direction

Answer without notes and justify the reasoning.

Can an object have negative momentum? Explain.

CONFIDENCE CHECK 2

Collision Accounting

Answer without notes and justify the reasoning.

Is momentum conserved in a perfectly inelastic collision? Is kinetic energy?

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

Choose the System First

Momentum conservation depends on a clearly defined system and negligible external impulse.

KEY TAKEAWAY 2

Impulse Connects Force and Momentum

Interaction force and interaction time combine to determine the momentum change.

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

WARM-UP • ACTIVITY 1

Momentum Has Direction

Increase the cart mass or increase its speed; reversing direction changes the direction of momentum.

WHY IT WORKS Momentum is a vector with magnitude $p = mv$, so mass and speed set its magnitude while velocity sets its direction.

WARM-UP • ACTIVITY 2

Impulse Changes Momentum

The impulse doubles, so the momentum change doubles.

WHY IT WORKS Impulse equals average force times interaction time and also equals the change in momentum.

WARM-UP • ACTIVITY 3

Choose the System

The net external impulse on the two-cart system must be negligible.

WHY IT WORKS Internal collision forces occur in equal-and-opposite pairs and redistribute momentum inside the chosen system.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Direction Check

East. The eastward momentum is 1.5 kg·m/s and the westward momentum is 0.60 kg·m/s, leaving 0.90 kg·m/s east.

WHY IT WORKS Choose east as positive and add signed momenta.

PRACTICE 2

Sticking Collision

1.0 m/s to the right.

WHY IT WORKS Initial momentum is 4.0 kg·m/s right. The combined mass is 4.0 kg, so v_f = 1.0 m/s right.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Momentum Direction

Yes. The sign represents direction relative to the chosen positive axis; momentum is a vector.

WHY IT WORKS A negative component is directional information, not “less momentum.”

CONFIDENCE CHECK 2

Collision Accounting

Momentum is conserved for an isolated system; kinetic energy is not.

WHY IT WORKS The objects can transform kinetic energy into thermal energy, sound, and deformation while total system momentum remains fixed.

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.	Build confidence with additional practice problems.	Continue to the next topic or learning 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