FOCUSED REVIEW

Focused Review: Momentum and Collisions — Algebra-Based

15-minute algebra-based review of momentum and collisions, emphasizing algebraic momentum, impulse, and collision problem solving.

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

After this review, you'll be able to…

calculate momentum and impulse, solve one- and two-dimensional conservation problems, and distinguish elastic, inelastic, and perfectly 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 Algebra-Based 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: Algebra-Based** **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

Signed Momentum

Choose an axis and calculate a momentum component.

A 0.40 kg puck moves at 6.0 m/s west. If east is positive, what is its momentum?

WARM-UP 2

Impulse Calculation

Use $J = F_{avg}\,\Delta t$.

A 150 N average force acts east for 0.080 s. What impulse is delivered?

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

System Momentum

Add the momenta of all objects before the interaction.

A 2.0 kg cart at +3.0 m/s approaches a 1.0 kg cart at -2.0 m/s. What is the total initial momentum?

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

Vector Momentum and Conservation

For each object, $p = mv$. For an isolated system, $\Sigma p_i = \Sigma p_f$. In one dimension, use signed velocity components. In two dimensions, conserve x and y momentum separately.

$$p = mv;\ \Sigma p_i = \Sigma p_f$$

EXAMPLE If external impulse is negligible, the vector sum of momenta is unchanged even though individual object momenta can change.

SENSEI NOTE Write one conservation equation per independent spatial component.

KEY CONCEPT 2

Impulse-Momentum Theorem

Impulse is $J = \Delta p$. For a constant or average force, $J = F_{avg}\,\Delta t$. A force-time graph gives impulse from its signed area.

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

EXAMPLE If a 0.25 kg ball changes velocity from +8.0 to -4.0 m/s, Δp = -3.0 kg·m/s.

SENSEI NOTE Compute final minus initial momentum; the sign of impulse matters.

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

Impulse and Final Velocity

Apply $J = m(v_f - v_i)$.

A 0.50 kg cart initially moves at +2.0 m/s. A +3.0 N force acts for 1.5 s. Find the final velocity.

PRACTICE 2

Perfectly Inelastic Collision

Conserve momentum and use the shared final velocity.

A 1.5 kg cart at +4.0 m/s sticks to a 0.50 kg cart at -2.0 m/s. Find their final velocity.

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

Impulse Sign

Answer without notes and justify the reasoning.

A 0.30 kg object changes velocity from +5.0 to -1.0 m/s. What is the impulse?

CONFIDENCE CHECK 2

Sticking Collision

Answer without notes and justify the reasoning.

Two equal masses move at +4.0 m/s and -2.0 m/s and stick. What is v_f?

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

Use Signed Components

Momentum equations are vector equations; in 1D, signs carry the direction information.

KEY TAKEAWAY 2

Impulse Is Δp

Force and time determine the momentum change, not the final momentum by themselves.

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

Signed Momentum

-2.4 kg·m/s.

WHY IT WORKS $p = mv = (0.40)(-6.0) = -2.4$ kg·m/s.

WARM-UP • ACTIVITY 2

Impulse Calculation

12 N·s east.

WHY IT WORKS $J = F_{avg}\,\Delta t = (150)(0.080) = 12$ N·s, positive for east.

WARM-UP • ACTIVITY 3

System Momentum

+4.0 kg·m/s.

WHY IT WORKS $P_i = (2.0)(3.0) + (1.0)(-2.0) = 4.0$ kg·m/s.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Impulse and Final Velocity

11.0 m/s.

WHY IT WORKS J = 4.5 N·s, so Δv = J/m = 9.0 m/s and v_f = 11.0 m/s.

PRACTICE 2

Perfectly Inelastic Collision

+2.50 m/s.

WHY IT WORKS P_i = 1.5(4.0) + 0.50(-2.0) = 5.0 kg·m/s. Divide by 2.0 kg.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Impulse Sign

-1.8 N·s.

WHY IT WORKS $J = m(v_f - v_i) = 0.30(-1.0 - 5.0) = -1.8$ N·s.

CONFIDENCE CHECK 2

Sticking Collision

+1.0 m/s.

WHY IT WORKS For equal masses, v_f is the average of the signed initial velocities: (4.0 - 2.0)/2 = 1.0 m/s.

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