FOCUSED REVIEW

Focused Review: Mechanical Waves and Wave Speed

Review the most important ideas, reinforce the essential skills, and confirm you're ready to move on.

TIME	BEST FOR	FINISH WITH
15–20 minutes	Focused review	Greater confidence

After this focused review, you'll be able to…

calculate wavelength, frequency, period, and speed; analyze waves on strings; and distinguish wave motion from medium motion.

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 15–20 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This bundle is designed to complement the chapter listed below. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

TEXTBOOK: OpenStax University Physics Volume 1
CHAPTER: Volume 1, Chapter 16
TOPIC: Mechanical Waves and Wave Speed
COURSE LEVEL: Algebra-based introductory college physics

BEST USED

- ✓ After reading the chapter
- ✓ Before starting homework
- ✓ Before a quiz or exam

Read the OpenStax Chapter →

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 15–20 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

Key Ideas

Recall the component definitions of velocity and acceleration.

A wave travels at 24 m/s with wavelength 3.0 m. Find its frequency.

WARM-UP 2

Common Mistakes

Identify the relationship that controls the wave quantity.

A 5.0 Hz oscillator drives a wave. What is the period?

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

Distinguish circular speed from circular velocity.

If string tension increases by a factor of 4 while μ is unchanged, how does the wave speed change?

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

Wave Variables and Traveling-Wave Speed

A periodic mechanical wave is described by amplitude A, wavelength λ, frequency f, and period T. Frequency is set by the source. The medium determines the propagation speed. Once v and f are known, λ follows from v = fλ.

$$T=\frac{1}{f};v=f\,\lambda$$

EXAMPLE A 15 Hz wave traveling at 45 m/s has λ = 3.0 m.

SENSEI NOTE When a wave enters a new medium, frequency remains tied to the source while speed and wavelength can change.

KEY CONCEPT 2

Wave Speed on a Stretched String

For a stretched string, the wave speed increases with tension F_T and decreases with linear mass density μ = m/L. This gives a direct algebraic model for how the physical properties of the medium control propagation.

$$\mu=\frac{m}{L};v=\sqrt{\frac{F_T}{\mu}}$$

EXAMPLE For F_T = 100 N and μ = 0.040 kg/m, v = √(2500) = 50 m/s.

SENSEI NOTE Use tension in newtons and μ in kilograms per meter before applying the square root.

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

Guided Example

Use independent components connected by one elapsed time.

A wave has f = 12 Hz and travels at 36 m/s. Find λ and T.

PRACTICE 2

Independent Check

Add the velocities in a common coordinate system.

A 0.80 kg string is 20 m long and held at 72 N tension. Find the wave speed.

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

Wave Relationship Check

Identify velocity and acceleration at the top of the path.

A string-wave speed is 30 m/s. If the tension is multiplied by 9 at the same μ, what is the new speed?

CONFIDENCE CHECK 2

Circular and Relative Directions

State both directions explicitly.

A 20 Hz source sends waves into two strings. The second string supports twice the wave speed. Compare their wavelengths.

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 the Source–Medium Separation

The source fixes frequency; the medium fixes wave speed; wavelength adjusts through $v = f\lambda$.

KEY TAKEAWAY 2

Connect String Properties to Speed

On a stretched string, $v = \sqrt{(F_T/\mu)}$: more tension raises speed, while greater linear density lowers it.

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

Key Ideas

$f = v/\lambda = 24/3.0 = 8.0$ Hz.

WHY IT WORKS Use $v = f\lambda$ and solve for the unknown wave quantity.

WARM-UP • ACTIVITY 2

Common Mistakes

$T = 1/f = 0.200$ s.

WHY IT WORKS Frequency and period are reciprocals.

WARM-UP • ACTIVITY 3

Quick Application

The speed doubles.

WHY IT WORKS For a string $v = \sqrt{(F_T/\mu)}$, so v scales with the square root of tension.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

λ = 36/12 = 3.0 m; T = 1/12 = 0.0833 s.

WHY IT WORKS Use v = fλ for space and T = 1/f for time.

PRACTICE 2

Independent Check

μ = 0.80/20 = 0.040 kg/m; v = √(72/0.040) = 42.4 m/s.

WHY IT WORKS Compute the linear mass density first, then use the string-speed relation.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Wave Relationship Check

90 m/s.

WHY IT WORKS $v \propto \sqrt{F_T}$, so multiplying tension by 9 multiplies speed by 3.

CONFIDENCE CHECK 2

Circular and Relative Directions

The second wavelength is twice as large.

WHY IT WORKS The source frequency stays 20 Hz, so $\lambda = v/f$ is proportional to wave speed.

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