

FULL REVIEW

Full Review — Work and the Work–Energy Theorem — Algebra-Based

Review the essential ideas, relationships, and problem-solving tools for Work and the Work–Energy Theorem.

 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 [Work, Energy, and Power here →](#)

RESOURCE: Physics Sensei Topic Review
TOPIC ID: MEC-U06-T01
TOPIC: Work and the Work–Energy Theorem
PARENT UNIT: MEC-U06 — Work, Energy, and Power
COURSE LEVEL: Algebra-Based

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**

Answer before revealing the response.

Write the work formula for a constant force at angle θ to the displacement.

ACTIVITY 2**Recall Activity 2**

Answer before revealing the response.

Explain why the normal force often does zero work on an object moving horizontally.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Answer before revealing the response.

A 35 N force acts over 4 m at 60° . Find the work done.

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**Work as a Dot Product**

For a constant force, work is the dot product of force and displacement. The cosine factor automatically gives positive, zero, or negative work based on the angle between the vectors.

$$W = F d \cos \theta$$

EXAMPLE A 10 N force over 5 m at 120° does -25 J of work.

SENSEI NOTE The angle belongs between force and displacement, regardless of how the diagram is oriented.

KEY CONCEPT 2**The Work–Energy Theorem**

The sum of the work done by all forces equals the change in kinetic energy. This theorem packages the combined effect of forces over a displacement into an energy equation.

$$W_{net} = \Delta K$$

EXAMPLE If the total work is +45 J, kinetic energy increases by 45 J.

SENSEI NOTE Net work means the algebraic sum of the work by all forces.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Kinetic Energy Connects Work to Speed

Kinetic energy depends on mass and speed squared. Combining its expression with the work–energy theorem lets you solve for an unknown initial or final speed.

$$K = \frac{1}{2} m v^2$$

EXAMPLE For a 2.0 kg object with 36 J of kinetic energy, the speed is 6.0 m/s.

SENSEI NOTE Keep units consistent: joules for energy, kilograms for mass, meters per second for speed.

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 work for an angled constant force.

A rope pulls with 80 N at 25° above horizontal while a crate moves 10 m horizontally. Find the work done by the rope.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Guided Problem

Use the theorem to find final kinetic energy.

A 3.0 kg cart moving at 4.0 m/s experiences +30 J of net work. Find its final kinetic energy.

PRACTICE 3

Independent Problem

Use kinetic energy to determine speed after a known net work.

Continue the previous problem and find the cart's final speed.

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**Negative Work**

Solve independently before checking the solution.

A 40 N force acts through 3 m at 150° . Is its work positive or negative, and what is its value?

QUICK CHECK 2**Net-Work Update**

Solve independently before checking the solution.

An object with 22 J of kinetic energy experiences -7 J of net work. What is its final kinetic energy?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Speed from Energy

Solve independently before checking the solution.

A 2.0 kg object has 49 J of kinetic energy. What is its speed?

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

Work Is Direction-Sensitive

The dot product makes work depend on both magnitudes and the angle between force and displacement.

KEY TAKEAWAY 2

Net Work Equals the Kinetic-Energy Change

Add the work of all forces and set that total equal to the change in kinetic energy.

KEY TAKEAWAY 3

Energy Gives Speed

Use kinetic energy with the theorem to move efficiently between work and speed.

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. Replace each placeholder with a concise answer and the essential explanation.

WARM-UP • ACTIVITY 1

Recall Activity 1

$$W = Fd \cos \theta.$$

WHY IT WORKS The cosine factor is the dot-product geometry.

WARM-UP • ACTIVITY 2

Recall Activity 2

The normal force is perpendicular to the horizontal displacement, so its work is zero.

WHY IT WORKS Perpendicular vectors have a zero dot product.

WARM-UP • ACTIVITY 3

Recall Activity 3

$$70 \text{ J because } (35)(4)\cos 60^\circ = 70.$$

WHY IT WORKS At 60° , only half the force contributes along the displacement.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Worked Example**

About 725 J: $(80)(10)\cos 25^\circ$.

WHY IT WORKS The horizontal component of the rope force transfers energy along the motion.

PRACTICE 2**Guided Problem**

Initial kinetic energy is 24 J; final kinetic energy is 54 J.

WHY IT WORKS Net work adds directly to the initial kinetic energy.

PRACTICE 3**Independent Problem**

6.0 m/s, obtained from 54 J of kinetic energy for a 3.0 kg cart.

WHY IT WORKS Solve the kinetic-energy expression for speed.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Negative Work

Negative, about -104 J: $(40)(3)\cos 150^\circ$.

WHY IT WORKS An obtuse angle gives a negative cosine.

QUICK CHECK 2

Net-Work Update

15 J.

WHY IT WORKS Negative net work reduces kinetic energy.

QUICK CHECK 3

Speed from Energy

7.0 m/s.

WHY IT WORKS Rearranging kinetic energy gives the speed.

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