

FOCUSED REVIEW

Focused Review: Rotational Motion — Algebra-Based

15-minute algebra-based review of rotational motion, emphasizing algebraic rotational kinematics, torque, inertia, energy, and angular momentum problem solving.

 TIME 15 minutes	 BEST FOR Focused Review	 FINISH WITH Greater confidence
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After this review, you'll be able to...

calculate rotational kinematics, torque, moment of inertia, rotational energy, and angular momentum using algebraic models and consistent signs.

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-U08 — Rotational Motion using the Algebra-Based treatment. Use it to reinforce the unit, prepare for homework, or review before a quiz or exam.

UNIT ID: MEC-U08 UNIT: Rotational Motion TREATMENT: Algebra-Based RESOURCE: Unit Review	BEST USED ✓ After reading the chapter ✓ Before starting homework ✓ Before a quiz or exam
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[Explore Rotational Motion 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**Angular Acceleration**

Use signed angular quantities.

A wheel changes from 4.0 to 10.0 rad/s in 3.0 s. Find constant α .

WARM-UP 2**Torque Magnitude**

Use the perpendicular lever arm.

A 12 N force acts perpendicular to a 0.25 m radius. Find torque magnitude.

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Rotational Energy

Use $K_{\text{rot}} = \frac{1}{2}I\omega^2$.

A rotor has $I = 0.40 \text{ kg}\cdot\text{m}^2$ and $\omega = 5.0 \text{ rad/s}$. Find K_{rot} .

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

Rotational kinematics and angular-linear links

Choose a sign convention, convert angles to radians, and use constant- α equations only when α is constant. Convert angular motion to tangential quantities with radius.

$$\omega_f = \omega_i + \alpha t; \Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2; v_t = r\omega; a_t = r\alpha.$$

SENSEI NOTE The signs of ω and α determine speeding up or slowing down.

KEY CONCEPT 2

Torque, moment of inertia, and conservation

Compute each signed torque about one axis, compute I about the same axis, then apply $\Sigma\tau = I\alpha$. Use energy or angular momentum when those models are more direct.

$$\tau = rF \sin\phi; \Sigma\tau = I\alpha; K_{\text{rot}} = \frac{1}{2}I\omega^2; L = I\omega.$$

SENSEI NOTE Angular momentum conservation requires negligible external torque.

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

Constant- α Rotation

Work the problem and justify the model.

A wheel starts at 4.0 rad/s and accelerates at 2.0 rad/s^2 for 3.0 s . Find ω_f and $\Delta\theta$.

PRACTICE 2

Torque and Angular Acceleration

Work the problem and justify the model.

A rigid body has $I = 0.50 \text{ kg}\cdot\text{m}^2$ and net torque $1.5 \text{ N}\cdot\text{m}$. Find α .

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

Lever Arm

Answer without notes and justify the reasoning.

A 20 N force acts at $r=0.30$ m and 30° to the radius. Find τ .

CONFIDENCE CHECK 2

Angular Momentum Change

Answer without notes and justify the reasoning.

A skater reduces I from 4.0 to 2.0 kg·m² with negligible external torque. If ω starts at 1.5 rad/s, find final ω .

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

Signs and radians come first

Use one rotational sign convention and radians before selecting kinematics equations.

KEY TAKEAWAY 2

Torque and inertia share an axis

$\Sigma \tau = I\alpha$ is meaningful only when both sides refer to the same chosen axis.

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**Angular Acceleration**

2.0 rad/s².

WHY IT WORKS 2.0 rad/s².

WARM-UP • ACTIVITY 2**Torque Magnitude**

3.0 N·m.

WHY IT WORKS 3.0 N·m.

WARM-UP • ACTIVITY 3**Rotational Energy**

5.0 J.

WHY IT WORKS 5.0 J.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Constant- α Rotation**

$$\omega_f = 10.0 \text{ rad/s}; \Delta\theta = 21 \text{ rad.}$$

WHY IT WORKS The result follows from the rotational model identified in the activity.

PRACTICE 2**Torque and Angular Acceleration**

$$\alpha = 3.0 \text{ rad/s}^2.$$

WHY IT WORKS The result follows from the rotational model identified in the activity.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Lever Arm

$$\tau = rF \sin 30^\circ = 3.0 \text{ N}\cdot\text{m}.$$

WHY IT WORKS This checks the core rotational decision rather than a memorized keyword.

CONFIDENCE CHECK 2

Angular Momentum Change

$$I_i \omega_i = I_f \omega_f; \omega_f = 3.0 \text{ rad/s}.$$

WHY IT WORKS This checks the core rotational decision rather than a memorized keyword.

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 Review the focused review again to strengthen the essential concepts. Review again: return to Warm-Up Check on page 4.	🕒 I Need More Practice Build confidence with additional practice problems. Go to Practice →	✓ I'm Ready Continue to the next topic or learning resource. Continue →
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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