

FULL REVIEW

Full Review: Static Equilibrium and Stability

Review the essential ideas, relationships, and problem-solving tools for static equilibrium and stability.

 TIME 45–60 minutes	 BEST FOR A complete topic review	 FINISH WITH A readiness check
---	---	--

After this full review, you'll be able to...

recall the equilibrium and stability framework, apply it to multi-step rigid-body problems, and evaluate readiness at the foundational level.

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 Unit Review is an independent learning resource. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

RESOURCE: Physics Sensei Unit Review
UNIT ID: MEC-U23
TOPIC: Static Equilibrium and Stability
COURSE LEVEL: Foundational

BEST USED

- ✓ After learning the unit
- ✓ 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**Key Ideas**

Define static equilibrium, torque, center of mass, and base of support.

Define static equilibrium, torque, center of mass, and base of support.

ACTIVITY 2**Common Mistakes**

Which statement is wrong? A) Zero net force alone guarantees static equilibrium. B) A low center of mass usually improves stability. C) A wider support base usually improves stability.

Which statement is wrong? A) Zero net force alone guarantees static equilibrium. B) A low center of mass usually improves stability. C) A wider support base usually improves stability.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Quick Application

A tall cabinet and a short cabinet have the same base width. Which is usually harder to tip, and why?

A tall cabinet and a short cabinet have the same base width. Which is usually harder to tip, and why?

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

Two Conditions for Static Equilibrium

An object is in static equilibrium only when its forces balance and its turning effects balance. These are separate requirements: one prevents sliding or accelerating, the other prevents rotation.

$$\Sigma F = 0 \quad \bullet \quad \Sigma \tau = 0$$

EXAMPLE A sign hanging motionless from two supports has balanced forces and balanced turning effects.

SENSEI NOTE Check both balance conditions; "not moving" is the result, not the calculation.

KEY CONCEPT 2

Stability and the Center of Mass

A stable object tends to return after a small displacement. A wider support base and lower center of mass usually improve stability. Tipping starts when the line of action of the weight moves beyond the support edge.

$$\Sigma F = 0 \quad \bullet \quad \Sigma \tau = 0$$

EXAMPLE A wide, low stool is generally more stable than a narrow, tall stool of similar mass.

SENSEI NOTE Think about the weight line relative to the support edge, not simply how heavy the object is.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3**Support Forces and Load Placement**

Support forces adjust so that both force balance and turning-effect balance are satisfied. Moving a load closer to one support usually increases that support's share of the load.

$$\Sigma F = 0 \quad \bullet \quad \Sigma \tau = 0$$

EXAMPLE If a person walks toward the right end of a supported board, the right support force increases while the left support force decreases.

SENSEI NOTE Equal support forces occur only for symmetric loading.

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**

Solve the problem systematically and show the key equilibrium steps.

A 300 N person stands at the center of a light horizontal board supported equally at both ends. Find each upward support force.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2**Guided Problem**

Solve the problem systematically and show the key equilibrium steps.

A box is slowly tilted to the right. Describe the critical condition at which it is just about to tip.

PRACTICE 3**Independent Problem**

Solve the problem systematically and show the key equilibrium steps.

A 400 N crate rests 1.0 m from the left end of a 4.0 m light board supported at both ends. Find the support forces using balance of force and turning effect.

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

Balanced or Not?

Decide whether the situation can be static equilibrium.

Two equal opposite horizontal forces act at different heights on a box.

QUICK CHECK 2

More Stable Design

Choose the better design.

For the same mass, which is more stable: A) narrow base, high center of mass or B) wide base, low center of mass?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Tipping Threshold

State the condition.

What geometric condition marks the instant a rigid object begins to tip about an edge?

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

Two balances are required

Static equilibrium requires both zero net force and zero net turning effect.

KEY TAKEAWAY 2

Stability depends on geometry

A wider base and lower center of mass generally make tipping less likely.

KEY TAKEAWAY 3

Support forces depend on position

Load placement changes the torque balance and therefore changes how supports share the load.

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. Focus on the method and the physical meaning of each result.

WARM-UP • ACTIVITY 1

Key Ideas

Static equilibrium: no linear or rotational acceleration. Torque: turning effect of a force. Center of mass: effective point where weight acts. Base of support: area bounded by contact points.

WHY IT WORKS The answer follows from the defining conditions for equilibrium and stability.

WARM-UP • ACTIVITY 2

Common Mistakes

A is wrong. Zero net force does not guarantee zero net turning effect.

WHY IT WORKS The answer follows from the defining conditions for equilibrium and stability.

WARM-UP • ACTIVITY 3

Quick Application

The short cabinet, because its center of mass is generally lower, so a larger tilt is needed before the weight acts beyond the support edge.

WHY IT WORKS The answer follows from the defining conditions for equilibrium and stability.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Worked Example**

The two supports share the load equally, so each support force is 150 N.

WHY IT WORKS A correct solution satisfies both the force and torque requirements, or the stated stability criterion.

PRACTICE 2**Guided Problem**

It is at the tipping threshold when the vertical line through the center of mass passes through the right edge of the support base.

WHY IT WORKS A correct solution satisfies both the force and torque requirements, or the stated stability criterion.

PRACTICE 3**Independent Problem**

Taking turning effects about the left support gives the right support force as 100 N. Force balance then gives the left support force as 300 N.

WHY IT WORKS A correct solution satisfies both the force and torque requirements, or the stated stability criterion.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Balanced or Not?

No. The net force may be zero, but the separated forces create a net turning effect.

WHY IT WORKS The result follows from the equilibrium equations, torque geometry, or energy-stability test.

QUICK CHECK 2

More Stable Design

B. A wider base and lower center of mass increase the tilt needed before the weight line passes beyond the support edge.

WHY IT WORKS The result follows from the equilibrium equations, torque geometry, or energy-stability test.

QUICK CHECK 3

Tipping Threshold

The line of action of its weight passes through the pivot edge; beyond that edge, gravity produces a tipping tendency.

WHY IT WORKS The result follows from the equilibrium equations, torque geometry, or energy-stability test.

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 →
--	---	---

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