

FULL REVIEW

Full Review — Unit Conversions and Dimensional Analysis — Algebra-Based

Review the essential ideas, relationships, and problem-solving tools for Unit Conversions and Dimensional Analysis.

 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 [Units and Measurements here →](#)

RESOURCE: Physics Sensei Topic Review
TOPIC ID: MEC-U01-T01
TOPIC: Unit Conversions and Dimensional Analysis
PARENT UNIT: MEC-U01 — Units and Measurements
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

Match kilo, milli, micro, and nano with 10^3 , 10^{-3} , 10^{-6} , and 10^{-9} .

ACTIVITY 2

Recall Activity 2

Identify the dimensions of speed, acceleration, and force.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Convert 72 km/h to m/s.

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

Factor-Label Conversion

Write each conversion as a ratio equal to one and let units determine the correct orientation. Multi-step chains are safest when every cancellation is visible.

$$\text{given unit} \times (\text{wanted unit} / \text{given unit}) = \text{wanted unit}$$

$$Q(\text{new units}) = Q(\text{old units}) \times \text{conversion factors}$$

EXAMPLE $2500 \text{ mg} \times (1 \text{ g}/1000 \text{ mg}) = 2.5 \text{ g}$.

SENSEI NOTE Do not cancel units mentally when a chain has several factors.

KEY CONCEPT 2

Compound, Area, and Volume Units

Convert each independent unit factor. If a unit is raised to a power, raise the conversion factor to that same power.

$$(\text{conversion factor})^n \text{ for a unit raised to power } n$$

$$1 \text{ m}^2 = (100 \text{ cm})^2 = 10^4 \text{ cm}^2$$

EXAMPLE $3.0 \text{ m}^2 \times (100 \text{ cm}/\text{m})^2 = 3.0 \times 10^4 \text{ cm}^2$.

SENSEI NOTE A linear factor cannot be used unchanged for an area or volume.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Dimensional Analysis of Equations

Derive dimensions algebraically from definitions and use them to test equations. Added terms must match dimensions, and both sides of an equality must match.

$$[\text{equation term 1}] = [\text{equation term 2}] \text{ in dimensions}$$

$$[v^2] = [a\Delta x] = L^2/T^2$$

EXAMPLE $F = ma$ gives $[M][L/T^2] = [ML/T^2]$.

SENSEI NOTE Dimensional analysis cannot determine a dimensionless constant such as $1/2$.

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**

Worked example: convert 1.20 g/cm^3 to kg/m^3 .

$$1.20 \times (1 \text{ kg}/1000 \text{ g}) \times (100 \text{ cm}/\text{m})^3 = 1200 \text{ kg/m}^3.$$

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2**Guided Problem**

Guided problem: convert 45 m/s to km/h.

Multiply by 1 km/1000 m and 3600 s/1 h; cancel m and s before calculating.

PRACTICE 3**Independent Problem**

Independent problem: convert 2.50 m² to cm² and explain why the factor is squared.

Show the full factor-label setup and calculate the result.

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**Area Conversion**

Answer and justify with units or dimensions.

Convert 5000 cm^2 to m^2 .

QUICK CHECK 2**Derived Dimension**

Answer and justify with units or dimensions.

What are the dimensions of momentum $p = mv$?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Equation Consistency

Answer and justify with units or dimensions.

Is $x = vt + at$ dimensionally valid?

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**Conversion Chains**

Let unit cancellation determine the orientation of every factor.

KEY TAKEAWAY 2**Powered Units**

Square or cube the complete conversion factor when the unit is squared or cubed.

KEY TAKEAWAY 3**Dimensional Checks**

Use dimensions to reject impossible equations before doing detailed algebra.

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**

kilo 10^3 ; milli 10^{-3} ; micro 10^{-6} ; nano 10^{-9} .

WHY IT WORKS The definitions and factors provide the basic vocabulary for the topic.

WARM-UP • ACTIVITY 2**Recall Activity 2**

Speed $[L/T]$, acceleration $[L/T^2]$, force $[ML/T^2]$.

WHY IT WORKS Dimensions identify the physical type of each quantity.

WARM-UP • ACTIVITY 3**Recall Activity 3**

20 m/s.

WHY IT WORKS The unit or dimensional algebra produces the stated result.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Worked Example**

$$1.20 \times (1 \text{ kg}/1000 \text{ g}) \times (100 \text{ cm}/\text{m})^3 = 1200 \text{ kg}/\text{m}^3.$$

WHY IT WORKS A complete setup makes every conversion or dimensional step visible.

PRACTICE 2**Guided Problem**

Multiply by $1 \text{ km}/1000 \text{ m}$ and $3600 \text{ s}/1 \text{ h}$; cancel m and s before calculating.

WHY IT WORKS The checkpoints preserve consistency through the solution.

PRACTICE 3**Independent Problem**

Show the full factor-label setup and calculate the result.

WHY IT WORKS The independent problem uses the same approved principles without scaffolding.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Area Conversion

0.50 m².

WHY IT WORKS This follows directly from the conversion or dimensional rule used in the review.

QUICK CHECK 2

Derived Dimension

[ML/T].

WHY IT WORKS The required dimensions make the expression physically meaningful.

QUICK CHECK 3

Equation Consistency

No. vt has [L], but at has [L/T].

WHY IT WORKS The dimensions of each term determine whether the expression is consistent.

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