

FULL REVIEW

Full Review — Vector Addition and Subtraction — Foundational

Review the essential ideas, relationships, and problem-solving tools for Vector Addition and Subtraction.

 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 [Vectors and Components here →](#)

RESOURCE: Physics Sensei Topic Review TOPIC ID: MEC-U02-T02 TOPIC: Vector Addition and Subtraction PARENT UNIT: MEC-U02 — Vectors and Components COURSE LEVEL: Foundational	BEST USED ✓ After learning the topic ✓ Before starting homework ✓ Before a quiz or exam
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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.

$\vec{A}$ points 4 units east and $\vec{B}$ points 3 units north. Sketch $\vec{A} + \vec{B}$ and describe its direction.

ACTIVITY 2**Recall Activity 2**

Answer before revealing the response.

If $\vec{C}$ points south, which way does $-\vec{C}$ point?

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Recall Activity 3

Answer before revealing the response.

$\vec{A}$ and $\vec{B}$ have equal magnitude and point in opposite directions. What is $\vec{A} + \vec{B}$?

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

Head-to-Tail Vector Addition

A vector can be translated without changing it. Place the tail of each new vector at the head of the previous one. The resultant connects the original starting point to the final endpoint.

$$\vec{R} = \vec{A} + \vec{B}$$

EXAMPLE: A 4 m east displacement followed by 3 m north gives a resultant that closes the triangle from start to finish.

SENSEI NOTE: Do not rotate a vector when moving it into head-to-tail position.

KEY CONCEPT 2

Subtraction Is Addition of an Opposite

The negative of a vector has the same magnitude and the opposite direction. Replace subtraction by addition of that reversed vector, then use the ordinary addition rule.

$$\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$$

EXAMPLE: If $\vec{B}$ is 2 N west, then $-\vec{B}$ is 2 N east; $\vec{A} - \vec{B}$ therefore adds an eastward contribution.

SENSEI NOTE: Reverse the entire vector. A minus sign does not mean "ignore direction."

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Resultants Can Be Checked Geometrically

For perpendicular vectors, the resultant forms the hypotenuse of a right triangle. A scale drawing can also estimate the magnitude and direction before calculation.

$$R^2 = A^2 + B^2 \text{ (perpendicular vectors)}$$

EXAMPLE: A 5 m east vector plus a 12 m north vector has resultant magnitude 13 m.

SENSEI NOTE: Use the right-triangle relationship only when the two vectors are perpendicular.

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**

Sketch first, then calculate.

A student walks 3 m east and 4 m north. Find the resultant displacement magnitude and describe its direction.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Guided Problem

Reverse the vector being subtracted.

$\vec{A}$ is 8 N east and $\vec{B}$ is 3 N east. Find $\vec{A} - \vec{B}$.

PRACTICE 3

Independent Problem

Combine the sequence into one net change.

A hiker goes 5 m east, 12 m north, then 5 m west. Find the final displacement from the starting point.

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**Cancellation Check**

Give magnitude and direction.

What is the sum of 6 N east and 6 N west?

QUICK CHECK 2**Difference Check**

Use addition of the opposite.

$\vec{A}$ is 9 units north and $\vec{B}$ is 4 units north. What is $\vec{A} - \vec{B}$?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Perpendicular Resultant

Find the magnitude.

$\vec{A}$ is 8 units east and $\vec{B}$ is 15 units north. What is $|\vec{A} + \vec{B}|$?

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**Addition Represents Net Change**

Use head-to-tail construction and draw the resultant from the first tail to the last head.

KEY TAKEAWAY 2**Subtraction Reverses a Vector**

$\vec{A} - \vec{B}$ means $\vec{A} + (-\vec{B})$; the opposite vector has equal magnitude and opposite direction.

KEY TAKEAWAY 3**Check Geometry Before Calculating**

Estimate direction first and use right-triangle geometry only when the vectors are perpendicular.

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.

WARM-UP • ACTIVITY 1

Recall Activity 1

The resultant points northeast from the starting tail to the final head.

WHY IT WORKS: The head-to-tail construction shows the net change directly.

WARM-UP • ACTIVITY 2

Recall Activity 2

North, with the same magnitude as $\vec{C}$.

WHY IT WORKS: Multiplying a vector by -1 reverses its direction without changing its magnitude.

WARM-UP • ACTIVITY 3

Recall Activity 3

The zero vector.

WHY IT WORKS: Equal opposite vectors cancel because their directed changes are exact opposites.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Worked Example**

5 m toward the northeast.

WHY IT WORKS: The vectors are perpendicular, so the resultant is the 5 m hypotenuse of a 3–4–5 triangle.

PRACTICE 2**Guided Problem**

5 N east.

WHY IT WORKS: Subtracting 3 N east is equivalent to adding 3 N west.

PRACTICE 3**Independent Problem**

12 m north.

WHY IT WORKS: The 5 m east and 5 m west vectors cancel, leaving only the northward displacement.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Cancellation Check

0 N; the resultant is the zero vector.

WHY IT WORKS: Equal opposite vectors cancel exactly.

QUICK CHECK 2

Difference Check

5 units north.

WHY IT WORKS: Subtracting $\vec{B}$ adds 4 units south to the 9-unit north vector.

QUICK CHECK 3

Perpendicular Resultant

17 units.

WHY IT WORKS: The vectors are perpendicular, so the magnitude follows the 8–15–17 right triangle.

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