

QUICK REVIEW

Quick Review — Two-Dimensional Kinematics with Components — Calculus-Based

Refresh the most important ideas, formulas, and problem-solving strategies for Two-Dimensional Kinematics with Components in just a few minutes.

 TIME 5–10 minutes	 BEST FOR A rapid refresh	 FINISH WITH Key ideas refreshed
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After this quick review, you'll be able to...

quickly recall the essential concepts, formulas, and problem-solving strategies needed to move forward with confidence.

HOW TO USE THIS GUIDE

Work through the four stages in order. Write directly in the spaces provided, check your work in the Quick Answers 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 5–10 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 [Motion in Two Dimensions here →](#)

RESOURCE: Physics Sensei Topic Review TOPIC ID: MEC-U04-T01 TOPIC: Two-Dimensional Kinematics with Components PARENT UNIT: MEC-U04 — Motion in Two Dimensions COURSE LEVEL: Calculus-Based	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 four stages to quickly refresh the essential ideas and confirm you're ready to continue.

4 stages • Approximately 5–10 minutes

1 Quick Recall Refresh what you already know.	2 Essential Idea Review the most important concept.
3 Confidence Check Confirm you're ready to move on.	4 Next Step Continue your learning.

PRINTING TIP

For student copies, print double-sided and keep the Quick Answers section after the student activities so learners attempt each activity before checking their work.

FR-04 • STAGE 1 OF 4

Quick Recall

Let's quickly refresh what you already know. This short recall activity will bring the most important ideas back to mind before you review them.

QUICK RECALL

Recall Activity

A velocity has magnitude 20 m/s at 30° above +x. Resolve it into x- and y-components, then state the calculus relationship that connects velocity to position.

Ready to refresh the essentials?

Great! Now review the most important idea you'll want to remember.

Review the Essential Idea →

FR-05 • STAGE 2 OF 4

Essential Idea

Take one last look at the most important concept from this topic. If you remember this idea, the rest will come back much more easily.

ESSENTIAL IDEA

Resolve components before using vector calculus

Two-dimensional kinematics uses the same physical components at every course level. Write $\mathbf{r}(t) = \langle x(t), y(t) \rangle$ and resolve any magnitude-angle vector into signed x- and y-components first. Then use derivatives or integrals component by component over the same time variable. Calculus changes how the components evolve; it does not replace component decomposition.

$$\mathbf{v}_x = v \cos \theta; \quad \mathbf{v}_y = v \sin \theta; \quad \mathbf{v}(t) = d\mathbf{r}/dt = \langle dx/dt, dy/dt \rangle$$

EXAMPLE For $v = 20$ m/s at 30° above $+x$, $\mathbf{v} = \langle 17.3, 10.0 \rangle$ m/s. These are the components that would appear in $\mathbf{v}(t) = d\mathbf{r}/dt$.

SENSEI NOTE Resolve the geometry first. Vector calculus operates on the resulting components; it does not change what those components mean.

Ready to check your memory?

You've refreshed the essential idea. Now see how much you remember before moving on.

[Start the Confidence Check →](#)

FR-06 • STAGE 3 OF 4

Confidence Check

You've refreshed the essential idea. Now answer this quick confidence check to confirm you're ready to move on.

CONFIDENCE CHECK

Velocity after component acceleration

Use component integration over one shared time interval.

Initial velocity is $v(0)=\{4, 3\}$ m/s and constant acceleration is $a=\{2, -1\}$ m/s². Find $v(2\text{ s})$.

Ready for your next step?

Great work! You've refreshed the essential idea. Now choose the resource that best matches what you'd like to do next.

Choose Your Next Step →

QUICK ANSWERS • CHECK AFTER ATTEMPTING

Quick Answers and Explanations

Use these concise answers to check your recall and confidence—not only your final response.

QUICK RECALL

Recall Activity

$\mathbf{v} = \langle 17.3, 10.0 \rangle$ m/s; also $\mathbf{v}(t) = d\mathbf{r}/dt = \langle dx/dt, dy/dt \rangle$.

WHY IT WORKS With θ measured from $+x$, the component magnitudes are $v \cos \theta$ and $v \sin \theta$. Those signed components are the entries of the velocity vector.

CONFIDENCE CHECK

CONFIDENCE CHECK

Velocity after component acceleration

$\mathbf{v}(2) = \langle 8, 1 \rangle$ m/s.

WHY IT WORKS Integrating the constant acceleration gives $\mathbf{v}(t) = \mathbf{v}(0) + \mathbf{a}t$, applied independently to x and y .

READINESS GUIDE

1 correct: You're ready to continue. • 0 correct: Revisit the Essential Idea or choose more practice.

FR-07 • STAGE 4 OF 4

Next Step: Continue Learning

Great work! You've completed this quick review. Choose the next resource that best matches how confident you feel.

? I'm Still Unsure Review the essential idea 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.

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