

AP Precalculus
Vector Operations and Magnitude

Vector Operations and Magnitude | APPC-U04-P11

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for components, components of $u+v$, resultant and endpoint, resultant and final head, squared norms and longer expression and longer derived vector and exact squared norms.

8 PDFs and a README; 97 buyer pages.

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Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Combine the three displacements u, v, and w. Use the expression $u + v + w$. $u = \langle 1, 4 \rangle$ $v = \langle -3, 2 \rangle$ $w = \langle 5, -1 \rangle$ _____ Bank label: _____	Multiply each component by the scalar. Use the expression $3u$. $u = \langle -2, 3 \rangle$ _____ Bank label: _____
Compute the vector obtained by reversing u and multiplying its length by four. Use the expression $-4u$. $u = \langle -1, 2 \rangle$ _____ Bank label: _____	Construct the unit vector preserving the direction. The given vector is $\langle -7, 24 \rangle$. _____ Bank label: _____
Scale the direction to length 5 without rounding. The required magnitude is 5. Use the same direction as the given vector. The given vector is $\langle 12, -5 \rangle$. _____ Bank label: _____	Construct the requested length without changing the downward direction. The required magnitude is 4. Use the same direction as the given vector. The given vector is $\langle 0, -9 \rangle$. _____ Bank label: _____
Undo the subtraction to recover u. Use the equation $u - \langle 2, 7 \rangle = \langle -5, 1 \rangle$. _____ Bank label: _____	Find the missing second summand. Use the equation $u + v = \text{resultant}$. The resultant is $\langle 7, 2 \rangle$. $u = \langle -4, 9 \rangle$ _____ Bank label: _____

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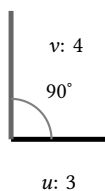
Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

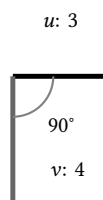
Use the right triangle formed by the two vectors to find the resultant magnitude.

The included angle, in degrees, is 90.

The vector magnitudes are $|u| = 3$ and $|v| = 4$.



One permitted placement



Reflected permitted placement

The two panels show alternative placements of the same data.

No absolute coordinate orientation is specified.

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Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START Vector v points in the same direction as u and has magnitude $2\sqrt{13}$. Find v. The magnitude of v is $2\sqrt{13}$. The relation is v has the same direction as u. $u = \langle 2, -3 \rangle$ Your response: _____	Incoming: $v = \langle 4, -6 \rangle$. Isolate and determine v from the given scaled difference. The given linear combination equals $\langle 1, -14 \rangle$. Use the equation $3u - v = \langle 1, -14 \rangle$. $u = \langle 2, -3 \rangle$ Your response: _____
Incoming: $v = \langle 5, 5 \rangle$. Given $u = 5$, $v = 10$, and $u \cdot v = 20$, determine the smaller angle between the vectors. The dot product $u \cdot v$ is 20. The magnitude of u is 5. The magnitude of v is 10. Your response: _____	Incoming: $\cos \theta = \frac{2}{5}$, so $\theta \approx 66.4^\circ$. Scale the direction to length 9. The required magnitude is 9. Use the same direction as the given vector. The given vector is $\langle -8, -15 \rangle$. Your response: _____
Incoming: $\langle -\frac{72}{17}, -\frac{135}{17} \rangle$ Undo the vector subtraction and verify the recovered minuend. Use the equation $u - v = \langle 4, -7 \rangle$. $v = \langle 2, 5 \rangle$ Your response: _____	Incoming: $u = \langle 6, -2 \rangle$; subtracting v returns $\langle 4, -7 \rangle$. Isolate the unknown vector and check the original equation. Use the equation $2u - v = w$. $v = \langle 1, 5 \rangle$ $w = \langle 7, -3 \rangle$ Your response: _____

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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Determine whether the scalar relationship gives angle 0° or 180° .

$$u = \langle -2, 5 \rangle$$

$$v = \langle -6, 15 \rangle$$

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Full Worked Solutions - excerpt

Worked example

Problem. Solve the two vector equations simultaneously for u and v .

Use these conditions: $u + v = \langle 1, 9 \rangle$, $2u - v = \langle 8, 3 \rangle$.

Answer. $u = \langle 3, 4 \rangle$ and $v = \langle -2, 5 \rangle$.

Explanation and check.

Adding the equations eliminates v and gives $3u = \langle 9, 12 \rangle$; substitution into the sum then determines v .

Worked example

Problem. Construct the unit vector preserving the direction.

The given vector is $\langle -7, 24 \rangle$.

Answer. $\langle -\frac{7}{25}, \frac{24}{25} \rangle$

Explanation and check.

The component pair has norm 25, so divide both entries by 25.