

Precalculus - Vectors in the Plane - Test Answer Key

Common Core N-VM.A.1, N-VM.A.2, N-VM.A.3, N-VM.B.4, N-VM.B.5 · maths-pdf.fr/en/

Worked solutions and scoring notes for the 9-question vectors test. Use the scoring line under each solution to award partial credit.

Precalculus · Common Core State Standards: **N-VM.A.1, N-VM.A.2, N-VM.A.3, N-VM.B.4, N-VM.B.5**

Question 1 - Component form and magnitude [2 pts]

$\langle 2 - (-3), -8 - 4 \rangle = \langle 5, -12 \rangle$. Magnitude $\sqrt{25 + 144} = 13$.

$\langle 5, -12 \rangle$; 13

Scoring: 1 point each.

Question 2 - Magnitude and direction [2 pts]

$\sqrt{25 + 25} = 5\sqrt{2} \approx 7.07$. Quadrant II with reference angle 45° : 135° .

$5\sqrt{2}$; 135°

Scoring: 1 point each.

Question 3 - Vector arithmetic [2 pts]

$\langle 8, -2 \rangle - \langle -6, 9 \rangle = \langle 14, -11 \rangle$.

$\langle 14, -11 \rangle$

Scoring: 1 point for each component.

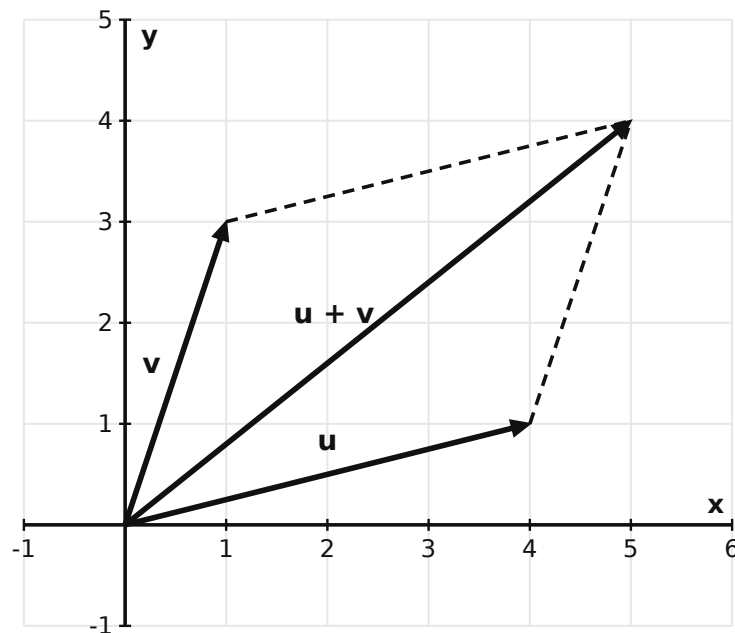
Question 4 - Unit vector [2 pts]

Magnitude 13.

$\left\langle -\frac{5}{13}, \frac{12}{13} \right\rangle$

Scoring: 1 point for the magnitude, 1 point for the vector.

Question 5 - Sum of two vectors [3 pts]



The sum is the diagonal.

(a) $\vec{u} = \langle 4, 1 \rangle$, $\vec{v} = \langle 1, 3 \rangle$. (b) $\langle 5, 4 \rangle$. (c) $\sqrt{25+16} = \sqrt{41} \approx 6.40$.

$\langle 4, 1 \rangle, \langle 1, 3 \rangle; \langle 5, 4 \rangle; 6.40$

Scoring: 1 point for each part.

Question 6 - Perpendicular vectors [2 pts]

$12 - 6k = 0$, so $k = 2$.

$k = 2$

Scoring: 1 point for the dot product, 1 point for k .

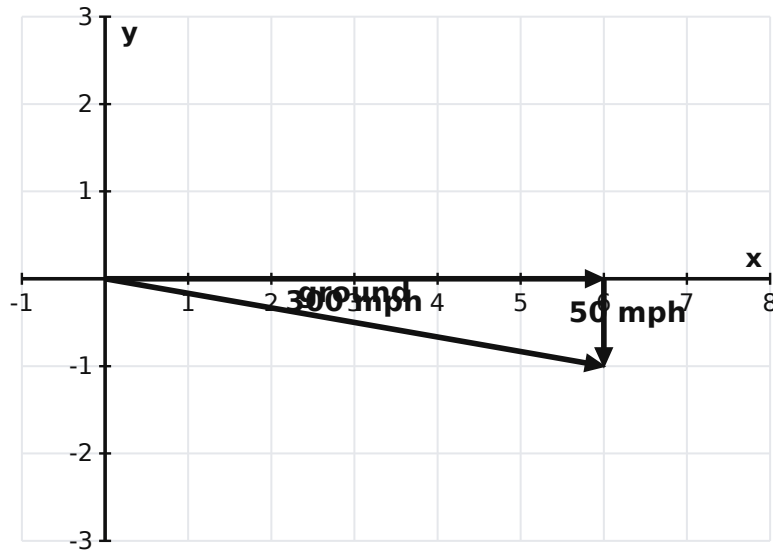
Question 7 - Angle between vectors [2 pts]

Dot product $-2 + 12 = 10$. $|\langle 2, 3 \rangle| = \sqrt{13}$, $|\langle -1, 4 \rangle| = \sqrt{17}$. $\cos \theta = \frac{10}{\sqrt{221}}$, $\theta \approx 47.73^\circ$.

47.73°

Scoring: 1 point for the dot product and magnitudes, 1 point for the angle.

Question 8 - Airplane and wind [3 pts]



Ground velocity $\langle 300, -50 \rangle$.

(a) $\langle 300, -50 \rangle$. (b) $\sqrt{90000+2500} \approx 304.1$. (c) $\arctan \frac{50}{300} \approx 9.5^\circ$ south of east.

$\langle 300, -50 \rangle$; 304.1 mph; 9.5°

Scoring: 1 point for each part.

Question 9 - Work [2 pts]

$$20(4)+15(3)=80+45.$$

125 joules

Scoring: 1 point for the dot product, 1 point for the value.

Total

20 points