

# Precalculus · Vectors in the Plane · Test

Common Core N-VM.A.1, N-VM.A.2, N-VM.A.3, N-VM.B.4, N-VM.B.5 · mathovore.fr

Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Score: \_\_\_\_\_

This precalculus vectors test checks vectors in the plane in 45 minutes, with 9 questions for a total of 20 points.

This 45-minute test checks the Precalculus vectors chapter: component form, magnitude and direction angle, vector operations, unit vectors, the dot product, and applications to wind and force. It has 9 questions worth 20 points. Calculators are allowed; show your work.

## Test information

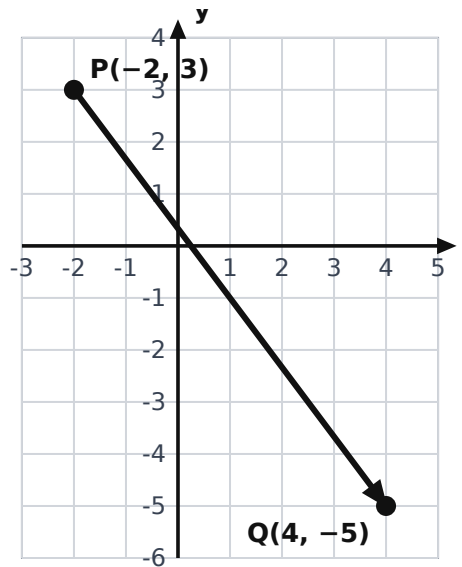
- **Grade:** Precalculus
- **Chapter:** Vectors in the Plane
- **Common Core:** N-VM.A.1, N-VM.A.2, N-VM.A.3, N-VM.B.4, N-VM.B.5
- **Time:** 45 minutes
- **Total:** 20 points (Question 1: 2 pts; Question 2: 2 pts; Question 3: 2 pts; Question 4: 3 pts; Question 5: 2 pts; Question 6: 3 pts; Question 7: 2 pts; Question 8: 2 pts; Question 9: 2 pts)

## Precalculus Vectors Test: questions 1-5

### Question 1: Components and magnitude (2 points)

Points  $P(-2,3)$  and  $Q(4,-5)$  are shown.

- Write  $\overrightarrow{PQ}$  in component form. (1 point)
- Find  $|\overrightarrow{PQ}|$ . (1 point)



Vector from P to Q.

### Question 2: Magnitude and direction (2 points)

Let  $\vec{v} = \langle -3, 3\sqrt{3} \rangle$ .

- Find  $|\vec{v}|$ . (1 point)
- Find the direction angle of  $\vec{v}$  from  $0^\circ$  to  $360^\circ$ . (1 point)

### Question 3: Combining vectors (2 points)

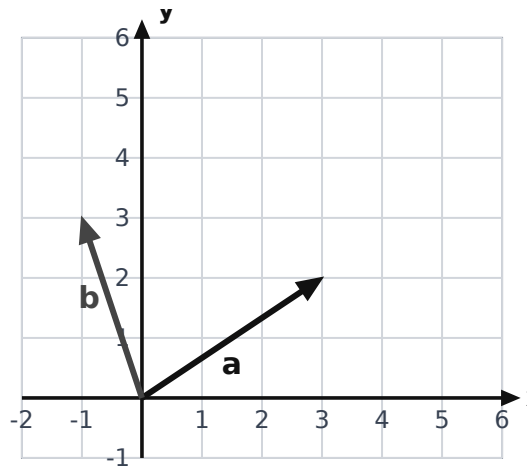
Let  $\vec{u} = \langle 2, -5 \rangle$  and  $\vec{v} = \langle -4, 3 \rangle$ . Find each vector.

- $3\vec{u} + 2\vec{v}$  (1 point)
- $\vec{u} - 2\vec{v}$  (1 point)

### Question 4: Parallelogram rule (3 points)

The figure shows vectors  $\vec{a}$  and  $\vec{b}$  drawn from the origin.

- Read the components of  $\vec{a}$  and  $\vec{b}$ , then find  $\vec{a} + \vec{b}$ . (1 point)
- Find  $\vec{a} - \vec{b}$ . (1 point)
- Find  $|\vec{a} + \vec{b}|$  exactly. (1 point)



Vectors a and b.

### Question 5: Unit vector (2 points)

Let  $\vec{v} = \langle -9, 12 \rangle$ .

- Find  $|\vec{v}|$ . (1 point)
- Find the unit vector in the direction of  $\vec{v}$ . (1 point)

### Precalculus Vectors Test: questions 6-9

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### Question 6: Dot product and angle (3 points)

Let  $\vec{u} = \langle 2, 4 \rangle$  and  $\vec{v} = \langle -1, 3 \rangle$ .

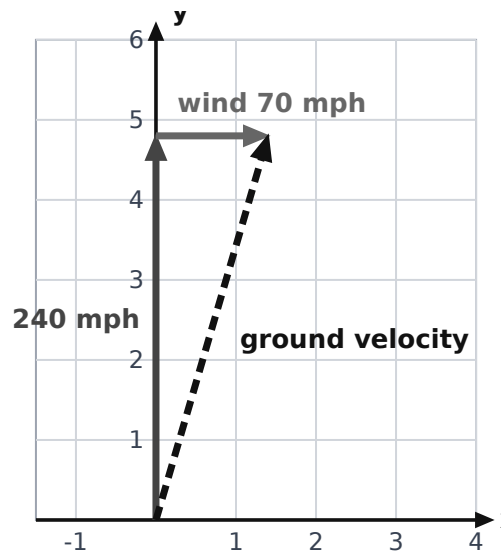
- Find  $\vec{u} \cdot \vec{v}$ . (1 point)
- Find  $|\vec{u}|$  and  $|\vec{v}|$ . (1 point)
- Find the angle between  $\vec{u}$  and  $\vec{v}$ . (1 point)

### Question 7: Perpendicular vectors (2 points)

Find the value of  $k$  for which  $\langle k, 5 \rangle$  is perpendicular to  $\langle 10, -4 \rangle$ . Show that the dot product is 0 for your value.

### Question 8: Airplane and wind (2 points)

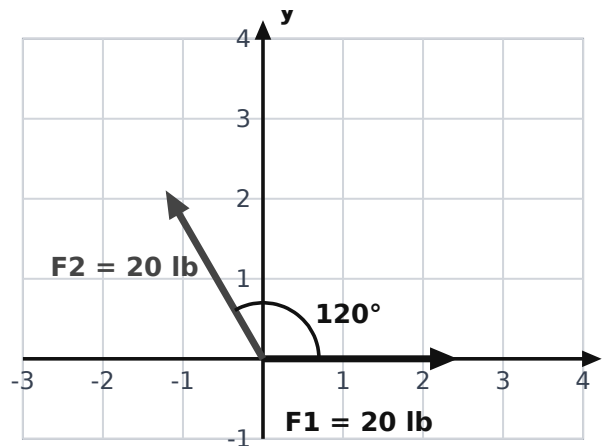
A plane has an airspeed of 240 mph heading due north. A wind blows due east at 70 mph (see figure). Find the plane's ground speed and the direction of its path, measured east of north to the nearest tenth of a degree.



Airspeed and wind vectors.

### Question 9: Two forces (2 points)

Two forces of 20 pounds each act on an object.  $\vec{F}_1$  points along the positive x-axis and  $\vec{F}_2$  is at  $120^\circ$  from it (see figure). Find the magnitude and direction angle of the resultant force.



Two 20-pound forces.

### How to use this precalculus vectors test

Take this precalculus vectors test without notes, then grade it with the test answer key out of 20 points.

