LESSON MAKER PRO

Vector Motion Lab

Combine velocity vectors by matching components.

HIGH SCHOOL · MA.912.NSO.3.3

MA.912.NSO.3.3 "Solve mathematical and real-world problems involving velocity and other quantities that can be represented by vectors."

NAME _____ DATE _____

COMBINE COMPONENTS

To add vectors, add the x-components and add the y-components. To subtract vectors, subtract matching components. A negative component means motion opposite the chosen positive direction.

WORKED EXAMPLE

A kayak has velocity <6,-2> m/s, and the current has velocity <-3,5> m/s. Find the kayak's resultant velocity.

1. Add the x-components: 6 + (-3) = 3.
2. Add the y-components: -2 + 5 = 3.
3. Write the resultant vector: <3,3> m/s.

Answer: <3,3> m/s

PRACTICE 6 problems

1 Find <8,7> + <-1,4>.

ANSWER _____

2 Find <12,-7> - <8,1>.

ANSWER _____

3 Velocity A is <11,-1> m/s, and velocity B is <4,7> m/s. Find A - B.

ANSWER _____

4 Find the resultant displacement: <-9,11> + <1,-4>.

ANSWER _____

5 Multiply the force vector <-1,7> by 4.

ANSWER _____

6 Find the magnitude of the velocity vector <8,-15> m/s.

ANSWER _____

APPLY IT Show your work

1 In a racing game, a character's running velocity is <11,-1> m/s. A moving platform adds velocity <-4,8> m/s. What is the character's net velocity?

WORK SPACE

ANSWER _____

2 East and north are positive. A drone has an intended air velocity of <12,7> m/s and an observed ground velocity of <4,11> m/s. What is the wind velocity?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A robotics team wants its robot's total velocity to be <14,11> cm/s. The robot's motor creates velocity <8,11> cm/s, and a moving floor contributes velocity <-1,-4> cm/s. What adjustment vector must be added?

WORK SPACE AND ANSWER

ANSWER KEY

Vector Motion Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find <8,7> + <-1,4>.	**<7,11>**
2	Find <12,-7> - <8,1>.	**<4,-8>**
3	Velocity A is <11,-1> m/s, and velocity B is <4,7> m/s. Find A - B.	**<7,-8> m/s**
4	Find the resultant displacement: <-9,11> + <1,-4>.	**<-8,7>**
5	Multiply the force vector <-1,7> by 4.	**<-4,28>**
6	Find the magnitude of the velocity vector <8,-15> m/s.	**17 m/s**

PART 2 · APPLY IT

1. **<7,7> m/s** Add the matching components: 11 + (-4) = 7 and -1 + 8 = 7.
2. **<-8,4> m/s** Ground velocity equals air velocity plus wind velocity. Subtract the air velocity from the ground velocity: <4,11> - <12,7> = <-8,4>.

CHALLENGE

<7,4> cm/s

Accept angle brackets or ordered-pair notation for component vectors. For the magnitude item, accept 17 m/s only, since the magnitude is positive.