LESSON MAKER PRO

Vector Direction Lab

Scale vectors without losing their direction.

HIGH SCHOOL · MA.912.NSO.3.7

MA.912.NSO.3.7 "Compute the magnitude and direction of a vector scalar multiple."

NAME _____ DATE _____

MAGNITUDE AND DIRECTION

When a vector has magnitude m, the scalar multiple kv has magnitude |k| x m. A positive scalar keeps the direction, a negative scalar reverses the direction, and a zero scalar produces a zero vector with no direction.

WORKED EXAMPLE

Vector a has magnitude 8 units and points northwest. Find the magnitude and direction of -3a.

1. The scalar has absolute value 3.
2. Multiply magnitudes: 3 x 8 = 24.
3. Because -3 is negative, reverse northwest to southeast.

Answer: 24 units, southeast

PRACTICE 6 problems

1 Vector p has magnitude 6 units and points east. Find the magnitude and direction of 2p.

ANSWER _____

2 Vector q has magnitude 9 units and points south. Find the magnitude and direction of -2q.

ANSWER _____

3 Vector r has magnitude 7 units and points northeast. Find the magnitude and direction of (1/2)r.

ANSWER _____

4 Vector s has magnitude 16 units and points west. Find the magnitude and direction of (-1/4)s.

ANSWER _____

5 Vector t has magnitude 18 units and points southeast. Find the magnitude and direction of (-5/6)t.

ANSWER _____

6 Vector h has magnitude 11 units and points southwest. Find the magnitude and direction of 0h.

ANSWER _____

APPLY IT Show your work

1 A school robotics team programs a camera cart to move along vector c, which has magnitude 14 meters north. During a test, the cart uses displacement (-1/2)c. What are the magnitude and direction of the test displacement?

WORK SPACE

ANSWER _____

2 In a game design club, a character's dash vector d has magnitude 15 screen units and direction southwest. A debug setting applies (-2/5)d. What are the magnitude and direction of the new dash?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Vector m has magnitude 22 units and points east. First form (-2/7)m. Then multiply that new vector by (-7/4). What are the final magnitude and direction? Explain how the signs determine the direction.

WORK SPACE AND ANSWER

ANSWER KEY

Vector Direction Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Vector p has magnitude 6 units and points east. Find the magnitude and direction of 2p.	**12 units, east**
2	Vector q has magnitude 9 units and points south. Find the magnitude and direction of -2q.	**18 units, north**
3	Vector r has magnitude 7 units and points northeast. Find the magnitude and direction of (1/2)r.	**7/2 units, northeast**
4	Vector s has magnitude 16 units and points west. Find the magnitude and direction of (-1/4)s.	**4 units, east**
5	Vector t has magnitude 18 units and points southeast. Find the magnitude and direction of (-5/6)t.	**15 units, northwest**
6	Vector h has magnitude 11 units and points southwest. Find the magnitude and direction of 0h.	**0 units, no direction**

PART 2 · APPLY IT

1. **7 meters, south** The magnitude is (1/2) x 14 = 7 meters. The negative scalar reverses north to south.
2. **6 screen units, northeast** The magnitude is (2/5) x 15 = 6 screen units. The negative scalar reverses southwest to northeast.

CHALLENGE

11 units, east. The two negative scalars make an overall positive scalar of 1/2, so the final vector points in the same direction as m.

Accept equivalent compass-direction wording, such as "opposite of west" for east. For the zero scalar, accept "undefined direction" or "no direction."