

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 $|k| \times m$. 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: $3 \times 8 = 24$.
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

CHALLENGE

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.

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

- 7 meters, south** The magnitude is $(1/2) \times 14 = 7$ meters. The negative scalar reverses north to south.
- 6 screen units, northeast** The magnitude is $(2/5) \times 15 = 6$ 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."