Answer key: Vectors vs Scalars

Physics with Tiaotiao 跳跳 · Kinematics · High School Physics
Study sheet for the video "Scalars vs Vectors Explained": answer key

Answers and explanations

Tap a blue time to jump to the part of the video that explains the question.

1. **(1) V** **(2) V** **(3) S** **(4) S** **(5) S** **(6) V**
Velocity, force and displacement have both magnitude and direction, so they are vectors. Mass, volume and temperature have magnitude only, so they are scalars.
▶ **Watch 1:03, Example 1**

2. (a) x_{OA} = **+3 m**; x_{OB} = **−2 m**.
O to A points right (positive) and is 3 m long, so +3 m. O to B points left (negative) and is 2 m long, so −2 m.
(b) No. A 2D vector has endless directions, and + and − can only show two. Only 1D vectors can be written as a signed number.
▶ **Watch 3:26, Example 2**

3. **(1) R** **(2) F** **(3) N** **(4) F**
Velocity: "37.5° south of east" sounds fine, so the direction is real. Current: it sounds odd, so the direction is fake. Mass has no direction at all. A score of 90 is called a direction, but you can't say east, west, south or north.
Current: its direction is fake (positive to negative pole, not a direction in space). A scalar can have a fake direction. Only vectors have real directions, so current is a scalar.
▶ **Watch 7:07, Example 3**

4. **(a) 3** **(b) 2** **(c) 1**
(a) The poles of a battery are just two names, + and −: two values of one property. (b) The sign shows direction: opposite to the positive direction. (c) The sign shows order of size.
▶ **Watch 9:36, Example 4**

5. (a) $\mathbf{F_1 = +3\ N}$ (same direction as +), $\mathbf{F_2 = -10\ N}$ (opposite to +).
(b) F_2 is bigger. When comparing vectors, ignore the sign and compare the numbers: 10 N > 3 N.
▶ **Watch 10:05, Example 5**

6. **(1) F** **(2) F** **(3) T** **(4) F** **(5) F** **(6) T**
(1) A battery's poles and temperatures have signs too, and they are not vectors. (2) A sign need not show size, e.g. a battery's poles. (4) A scalar's direction is always fake. (5) Only 1D vectors. (6) Compare the numbers: 10 N is more than 3 N.
▶ **Watch 12:33, Example 6**