Answer key: What Is Acceleration? Why It's 180, Not 20

Physics with Tiaotiao 跳跳 · Kinematics · High School Physics
Study sheet for the video "What Is Acceleration?": answer key

Answers and explanations

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

1. B. Everyday "fast" can mean high speed, or velocity changing quickly. High speed does not mean speeding up: the car can move at a constant, very high speed and flash past. So the first "fast" means high speed. Braking from a very high speed to a stop at once means the velocity changes quickly. So the second "fast" means velocity changes quickly.

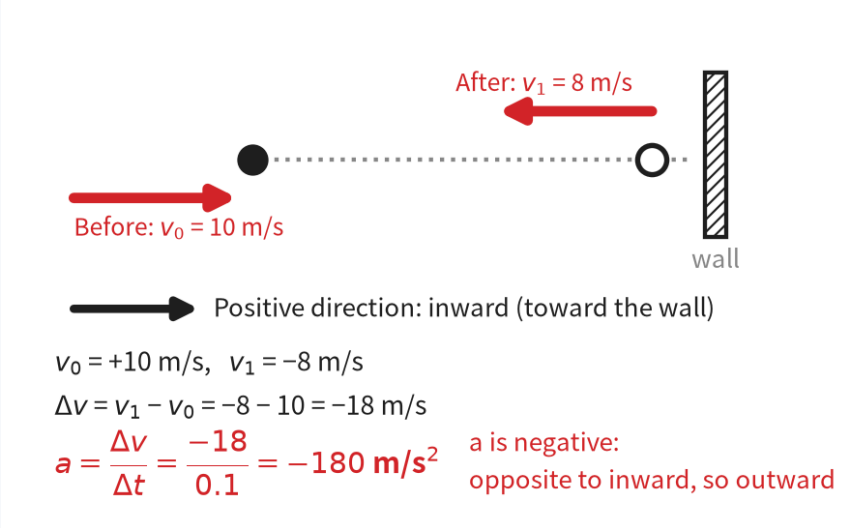
▶ **Watch 14:51, Example 1**

2. C. A is wrong: the speedometer shows only the speed (the magnitude of velocity). Velocity is a vector, and a turning car changes direction, so its velocity changes. B is wrong: the rocket has only an initial velocity of zero. After 0.1 s its velocity may be 100 m/s, and then a = (100 − 0) / 0.1 is not zero. C is correct: hard braking means a large change in velocity in an extremely short time, so the rate of change, a, is large. D is wrong: a maglev train is fast but usually keeps a constant velocity, so a = 0.

A large change does not mean a large rate of change. A large change in an extremely short time does.

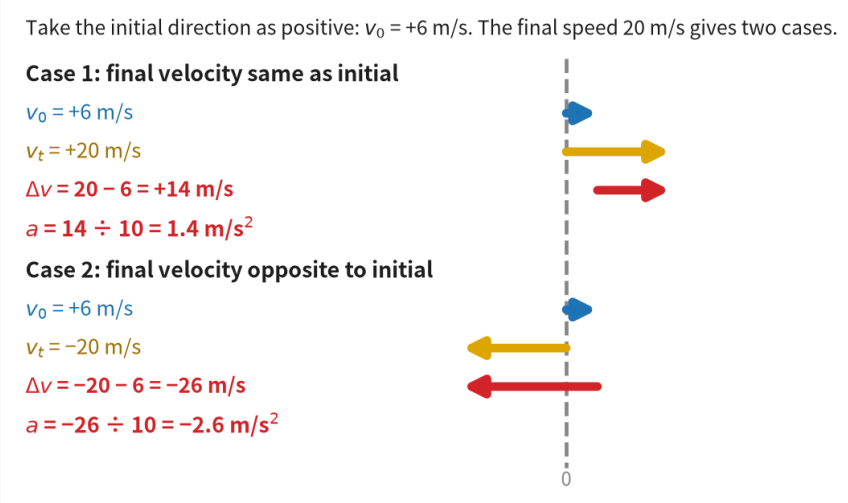
▶ **Watch 16:27, Example 2**

3. D. Take inward (toward the wall) as positive. v_0 = +10 m/s and v_1 = −8 m/s. Δv = −8 − 10 = −18 m/s. a = Δv / Δt = −18 / 0.1 = −180 m/s². The magnitude is 180 m/s². The sign of a is negative, so it is opposite to the positive direction (inward). It points outward.



▶ **Watch 25:48, Example 3**

4. B and D. Take the direction of the initial velocity as positive, so $v_0 = +6$ m/s. Only the magnitude of the final velocity is given, so there are two cases. ① Same direction: $v_t = +20$ m/s, $\Delta v = 20 - 6 = 14$ m/s, $a = 14 / 10 = 1.4$ m/s² (B). ② Opposite direction: $v_t = -20$ m/s, $\Delta v = -20 - 6 = -26$ m/s, $a = -26 / 10 = -2.6$ m/s². The magnitude is 2.6 (D).



The sign of a only shows direction. Compare magnitudes by the number only.

▶ **Watch 27:30, Example 4**