

2. The acceleration arrows are still correct even when the tape is reversed. This is because the acceleration is indicating the change in velocity between two different time intervals and will always be opposite a decrease in velocity and in the direction of an increase in velocity.

### ■ USING THE FEATURES

#### www science: The Motion of a Falling Object, p. 389

Students may want to discuss the physics involved in another superhero's actions or the stunts in action movies. You can also discuss how scientists use negative results to better understand a situation or experiment. Links to the physics of superheroes can be found at [www.bscience10.ca](http://www.bscience10.ca).

#### Science Watch: Human Acceleration, p. 390

Discuss methods used to protect passengers from large decelerations during a collision, such as air bags and crumple zones. As well, students could research the "G-suit" which is a Canadian invention used to assist pilots and astronauts during high levels of acceleration. See also the Did You Know on page 400. Links to more information can be found at [www.bscience10.ca](http://www.bscience10.ca).

#### Science Watch Answers

1. The purpose of John Stapp's research was to study the effects of large accelerations on the human body.
2. John Stapp withstood a maximum acceleration of  $46 g$  ( $451 \text{ m/s}^2$ ).
3. John Stapp's research resulted in lap belts and shoulder straps in modern vehicles and the positioning of infant seats to face backward in the rear seat of cars.

### ■ SECTION 9.1 ASSESSMENT, p. 391

#### Check Your Understanding Answers

##### Checking Concepts

1. Students' answers may vary but could include any two of increasing the car's speed, decreasing the car's speed, and changing the direction the car is travelling.
2. (a) Acceleration is rate of change in velocity.  
(b) Deceleration is acceleration opposite the direction of motion.
3. Change in velocity is the final velocity minus the initial velocity,  $\Delta \vec{v} = \vec{v}_f - \vec{v}_i$ .

4. The change in velocity is  $20 \text{ m/s [N]}$ .
5. The direction of the acceleration is the same as the direction of the object's change in velocity.
6. (a) The acceleration is negative.  
(b) The acceleration is zero.  
(c) The acceleration is positive.  
(d) The acceleration is negative.  
(e) The acceleration is positive.

#### Understanding Key Ideas

7. (a)  $+8 \text{ m/s}$ ;  $8 \text{ m/s [N]}$   
(b)  $+4 \text{ m/s}$ ;  $4 \text{ m/s [N]}$   
(c)  $0 \text{ m/s}$   
(d)  $+3 \text{ m/s}$ ;  $3 \text{ m/s [N]}$   
(e)  $-6 \text{ m/s}$ ;  $6 \text{ m/s [S]}$
8. (a) If the acceleration is in the same direction as the velocity, the object's speed increases.  
(b) If the acceleration is opposite the direction of the velocity, the object's speed initially decreases.
9. (a) The car's change in velocity is  $29 \text{ m/s [backward]}$ .  
(b) The direction of the car's acceleration is backward.
10. The softball player in "A" has acceleration opposite the direction she is sliding. The dragster in "B" has acceleration in the forward direction.

#### Pause and Reflect Answer

Students' answers may vary but may include the concept that the amount of time it takes the objects to change their velocity is different and/or that the objects are travelling different directions and therefore the direction of their accelerations is different.

#### Other Assessment Opportunities

- Assessment Checklist 1, Making Observations and Inferences
- Assessment Checklist 4, Laboratory Report
- Assessment Checklist 18, Data Table
- Process Skills Rubric 3, Controlling Variables
- Process Skills Rubric 5, Fair Testing
- Process Skills Rubric 8, Interpreting Data
- Process Skills Rubric 10, Measuring and Reporting
- Assessment Rubric 5, Conduct an Investigation Rubric
- Assessment Rubric 12, Using Tools, Equipment, and Materials Rubric