

Name: _____

Skill Sheet 4.1

Acceleration Problems

This skill sheet will allow you to practice solving acceleration problems. Remember that acceleration is the rate of change in the speed of an object. In other words, at what rate does an object speed up or slow down? A positive value for acceleration refers to the rate of speeding up, and negative value for acceleration refers to the rate of slowing down. The rate of slowing down is also called deceleration. To determine the rate of acceleration, you use the formula:

$$\text{Acceleration} = \frac{\text{Final speed} - \text{Beginning speed}}{\text{Change in Time}}$$

1. Solving acceleration problems

Solve the following problems using the equation for acceleration. Remember the units for acceleration are meters per second per second or m/sec^2 . The first problem is done for you.

1. A biker goes from a speed of 0.0 m/sec to a final speed of 25.0 m/sec in 10 seconds. What is the acceleration of the bicycle?

$$\text{acceleration} = \frac{\frac{25.0 \text{ m}}{\text{sec}} - \frac{0.0 \text{ m}}{\text{sec}}}{10 \text{ sec}} = \frac{25.0 \text{ m}}{10 \text{ sec}} = \frac{2.5 \text{ m}}{\text{sec}^2}$$

2. A skater increases her velocity from 2.0 m/sec to 10.0 m/sec in 3.0 seconds. What is the acceleration of the skater?

3. While traveling along a highway a driver slows from 24 m/sec to 15 m/sec in 12 seconds. What is the automobile's acceleration? (Remember that a negative value indicates a slowing down or deceleration.)

4. A parachute on a racing dragster opens and changes the speed of the car from 85 m/sec to 45 m/sec in a period of 4.5 seconds. What is the acceleration of the dragster?

5. The cheetah, which is the fastest land mammal, can accelerate from 0.0 mi/hr to 70.0 mi/hr in 3.0 seconds. What is the acceleration of the cheetah? Give your answer in units of mph/sec.

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6. The Lamborghini Diablo sports car can accelerate from 0.0 km/hr to 99.2 km/hr in 4.0 seconds. What is the acceleration of this car? Give your answer in units of kilometers per hour/sec.
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7. Which has greater acceleration, the cheetah or the Lamborghini Diablo? (To figure this out, you must remember that there are 1.6 kilometers in 1 mile.) Be sure to show your calculations.
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2. Solving for other variables

Now that you have practiced a few acceleration problems, you can rearrange the acceleration formula so that you can solve for other variables such as time and final speed.

$$\text{Final speed} = \text{Beginning speed} + (\text{acceleration} \times \text{time})$$

$$\text{Time} = \frac{\text{Final speed} - \text{Beginning speed}}{\text{Acceleration}}$$

1. A cart rolling down an incline for 5.0 seconds has an acceleration of 4.0 m/sec^2 . If the cart has a beginning speed of 2.0 m/sec , what is its final speed?
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2. A car accelerates at a rate of 3.0 m/sec^2 . If its original speed is 8.0 m/sec , how many seconds will it take the car to reach a final speed of 25.0 m/sec ?
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3. A car traveling at a speed of 30.0 m/sec encounters an emergency and comes to a complete stop. How much time will it take for the car to stop if its rate of deceleration is -4.0 m/sec^2 ?
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4. If a car can go from 0.0 to 60.0 mi/hr in 8.0 seconds, what would be its final speed after 5.0 seconds if its starting speed were 50.0 mi/hr ?
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