☐ Reading and Questions

Read pages 12-15 of the book, *The Quest for Personal Best: Individual Sports*, by Lisa Greathouse. Answer these questions:

1. Why does a racing bike need to be lighter than a mountain bike?

_____

_____

2. Use what you have learned about mass and cycling to answer this question. Why will a golf ball accelerate more quickly than a race car?

_____

_____

_____

Activities

☐ Activity 1: Calculating Acceleration

In the last lesson you learned that speed describes how fast an object is moving. Today you will investigate velocity and acceleration. Note that the definitions for velocity and acceleration given in your book are not entirely accurate. **Velocity** is speed with a direction. A speed might be 15 miles per hour, but a velocity would be 15 miles per hour to the north **Acceleration** is a change in velocity. This means that a car can accelerate by changing its speed or by changing its direction, or both.

Complete the "Accelerate!" activity page. Ask a parent which option you should choose.

<u>Option 1</u>
The "Accelerate!" (Option 1) page provides the equations that you will need to use.

<u>Option 2</u>
Option 2 is more challenging since you will have to create your own equations.

Accelerate!

You know how to calculate the speed of a person or an object. But what happens when its speed or direction changes? This is called acceleration. Acceleration can tell how fast an object speeds up or slows down; acceleration can also tell how an object changes direction.

In order to find the acceleration, you have to measure the velocity at two different points and compare them. When working with acceleration, meters per second (m/s) is usually used instead of miles per hour.

$$\frac{\text{FINAL VELOCITY} - \text{FIRST VELOCITY}}{\text{TIME}} = \text{ACCELERATION}$$

Directions: Determine the acceleration of the following bicycle riders.

Rider 1: (10 meters per second – 5 meters per second) ÷ 5 seconds = _____ m/s

Rider 2: (20 meters per second – 3 meters per second) ÷ 12 seconds = _____ m/s

Rider 3: (14 meters per second – 13 meters per second) ÷ 2 seconds = _____ m/s

Which rider is accelerating the fastest? _____

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Directions: Use the following word problems to figure out the acceleration of each rider.

When a bicycle racer leaves the start line, she is traveling at 2 meters per second. When she passes the second race marker, she has sped up to 15 meters per second. It took her 10 seconds to travel between the two markers. What is her acceleration?

If she continues accelerating at the same pace, what will her final speed be after 10 more seconds?

What about using acceleration to describe a rider who is slowing down? Can you use the same formula to determine the acceleration of a rider going 25 meters a second who 10 seconds later is traveling at 10 meters per second?

Reading and Questions (Answers)

1. Why does a racing bike need to be lighter than a mountain bike?
    - A racing bike needs to go faster than a mountain bike, and lighter bikes speed up more quickly than heavier bikes.
2. Use what you have learned about mass and cycling to answer this question. Why will a golf ball accelerate more quickly than a race car?
    - Objects with less mass speed up more quickly because it takes less force to move them. A lighter golf ball speeds up more quickly than a heavy race car.

Activities

Activity 1: Calculating Acceleration

Your child will calculate acceleration using an activity page. Option 1 provides the equations while Option 2 is more challenging because your child will create her own equations. She can use a calculator with either option. Tell her which option she should complete.

Option 1

Answer Key:

- Rider 1: 1 meters/second^2
- Rider 2: 1.42 meters/second^2
- Rider 3: 0.5 meters/second^2
- Which rider is accelerating the fastest: Rider 2

Option 2

Answer Key:

- Problem 1: 1.3 meters/second
- Problem 2: 28 meters/second
- Problem 3: −1.5 meters/second