



TEKS 6.8C *Calculate* average speed using distance and time measurements.

TEKS Lesson 6.8C: Calculating Average Speed

How do you calculate average speed?

A measurement of distance can tell you how far an object travels. A cyclist, for example, might travel 30 kilometers. An ant might travel 2 centimeters. If you know the distance an object travels in a certain amount of time, you can calculate the speed of the object. Speed is a type of rate. A *rate* tells you the amount of something that occurs or changes in one unit of time. So, the **speed** of an object is the distance the object travels per unit of time.

Using the Equation for Speed To calculate the speed of an object, divide the distance the object travels by the amount of time it takes to travel that distance. This relationship can be written as an equation.

$$\text{Speed} = \text{Distance/Time}$$

The speed equation consists of a unit of distance divided by a unit of time. If you measure distance in meters and time in seconds, you express speed in meters per second, or m/s. (The slash is read as “per.”) If you measure distance in kilometers and time in hours, you express speed in kilometers per hour, or km/h. For example, a cyclist who travels 30 kilometers in 1 hour has a speed of 30 km/h. An ant that moves 2 centimeters in 1 second is moving at a speed of 2 centimeters per second, or 2 cm/s.

Calculating Average Speed The speed of most moving objects is not constant. Cyclists, for example, change their speeds many times during a race. They might ride at a constant speed along flat ground, but move more slowly as they climb hills. Then, they are likely to move more quickly as they come down hills.

Although a cyclist does not have a constant speed, the cyclist does have an average speed throughout a race. To calculate **average speed**, divide the total distance traveled by the total time. For example, suppose a cyclist travels 32 kilometers during the first 2 hours. Then, the cyclist travels 13 kilometers during the next hour. The average speed of the cyclist is the total distance divided by the total time.

$$\text{Total distance} = 32 \text{ km} + 13 \text{ km} = 45 \text{ km}$$

$$\text{Total time} = 2 \text{ h} + 1 \text{ h} = 3 \text{ h}$$

$$\text{Average speed} = 45 \text{ km}/3 \text{ h} = 15 \text{ km/h}$$

The cyclist’s average speed is 15 kilometers per hour.

**1. Review** How do you calculate average speed?**What is instantaneous speed?**

Calculating the average speed of a cyclist during a race is important. However, it is also useful to know the cyclist's instantaneous speed. **Instantaneous speed** is the rate at which an object is moving at a given instant in time. The diagram below shows an electronic device called a *cyclometer*. A cyclometer can calculate both average and instantaneous speed.

**Lesson Check****1. Define** What is speed?

2. Describe What do you know about the motion of an object that has an average speed of 1 m/s?

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3. **Calculate Average Speed** A train travels 230 km from City A to City B in 3 hours. Then, the train travels 400 km from City B to City C in 4 hours. Calculate the train's average speed for the entire trip.

4. **Calculate Average Speed** A bicyclist travels 15 km over 2.0 hours of travel. Calculate the bicyclist's average speed in km/h.

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5. **Calculate Average Speed** On a leisurely walk to school, a student takes half an hour to walk 1.0 km. Calculate the student's average speed in km/h.