

Name: _____ Date: _____

Student Exploration: Measuring Motion

Vocabulary: distance, speed

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

The **speed** of an animal is how fast it is moving. A speed of 6 m/s (meters per second) means that the animal moves a **distance** of 6 meters every second.

1. How would you measure the speed of an animal? _____

2. What do you think are the fastest animals? _____

Gizmo Warm-up

You have been sent on an African safari by *International Geography* magazine. Your assignment is to find the fastest land animals in the world. Your only tool is a video camera.

The safari is shown in the *Measuring Motion* Gizmo™.

1. On the **Safari Adventure** tab, wait for an animal to pass by. Press the **record** button (●). Press **stop** (●) when the animal has passed by.

A. Which animal did you record? _____

B. Was the animal walking or running? _____



2. Select the **Playback** tab. Practice using some of the different buttons on this tab:

- Use the **Play** (▶) button to replay the simulation.
- Click **Rewind** (◀◀) to go back to the beginning.
- Click **Advance frame** (▶▶) to move forward exactly one second at a time.
- Drag some **arrows** (➡) onto the recording to mark the positions of the animals at different times. (The arrows are on the left side of the Gizmo.)
- Use the **Time** slider to go to a specific time.

Activity A: Estimating speed	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Select the Safari Adventure tab. • Remove all arrows from the screen. • A calculator is recommended for this activity. 	
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Question: How do you measure speed?

1. Run Gizmo: **Record** an animal running. Then switch to the **Playback** tab and watch your recording. Which animal did you record? _____


2. Measure: Click **Rewind** (⏮). Use **Advance frame** (⏭) to advance the recording one second. Mark the animal's position with an **arrow** (➡) and repeat. Estimate the distance the animal traveled in one second. (Note: The trees in the background are 5 meters apart.)
 - A. About how far did the animal travel in 1 second? _____
 - B. How did you make your estimate? _____

3. Calculate: The distance an animal travels each second is its speed. What is the estimated speed of this animal? _____ (Units are meters per second, or m/s.)

4. Measure: You can get a more accurate estimate of distance and time using these steps:
 - Use the **Time** slider to position the animal so that its nose is even with the first tree. Record the current time in the table below as **Time 1**.
 - Position the animal so that its nose is even with the last tree and record **Time 2**.
 - Subtract the first time from the second to get the **Time difference**.
 - Record the **Distance** from the first tree to the last. (The trees are 5 meters apart.)












Time 1	Time 2	Time difference (s)	Distance (m)

5. Calculate: The speed of the animal is equal to the distance divided by the time difference.
 - A. What is the estimated speed of the animal now? _____
 - B. Is this value close to the speed you calculated before? _____

Activity B: Who's fastest?	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Select the Safari Adventure tab. • Remove all arrows from the screen. • A calculator is recommended for this activity. 	
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Question: Which animal is the fastest?

1. Form hypothesis: Watch the **Safari Adventure** tab for a while. Based on your observations, which animals run the fastest? _____
2. Measure: For each animal, measure distance traveled and time using any method you wish. Divide distance by time to calculate speed. Measure running animals only.

Animal/object		Distance (m)	Time (s)	Speed (m/s)
Cheetah				
Eagle				
Elephant				
Gazelle				
Giraffe				
Jeep				
Lion				
Person				
Rhino				
Warthog				
Zebra				

3. Analyze: What is the fastest animal/object? _____ Slowest? _____
4. Convert: There are 1,000 meters in a kilometer, and 3,600 seconds in an hour. You can convert units of meters per second (m/s) into kilometers per hour (km/h) by multiplying by 3,600 and dividing by 1,000. (Hint: That is the same thing as multiplying by 3.6.)
 - A. What is the speed of a cheetah in kilometers per hour? _____
 - B. What is the speed of a person in kilometers per hour? _____