

# Discovering Dinosaurs

## THE SPEED OF DINOSAURS

### Grades:

4+

### Objective

Students will calculate the relative speed of a dinosaur based on a formula and a trackway.

### Materials

- "Walking, Trotting, or Running?" reproducible, duplicated for each pair of students
- Metric ruler
- Stride length diagram



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Source: <https://www.amnh.org/learn-teach/curriculum-collections>. Retrieved 02.04.22



# Activity: Relative Speed of Dinosaurs

## Introduction

Students will interpret three trackways and use measurements and a formula to try to infer the relative speed of dinosaurs.

## Objective

Students will:

- calculate the relative speed of a dinosaur based on a formula and a trackway.

## Time Frame

40 minutes

## Materials

- *Walking, Trotting, or Running?* reproducible, duplicated for each pair of students
- Metric ruler
- Stride length diagram

## Procedure

### Prior Knowledge

1. Tell students that scientists analyze trackways to determine whether a dinosaur was walking, trotting, or running. Explain that the speed is calculated using footprint length, hip height, and stride length. Display the stride length diagram. Point out the difference between a step and a stride: a step is moving from one foot to the other; a stride is two steps. To demonstrate, ask a volunteer to walk, trot, and then run across the room. Ask students to watch the volunteer's stride length as he/she walks, trots, and runs. Point out to students that when running, the body is at some point totally off the ground. A trot is in between a run and a walk. Ask: When was the stride length the shortest? (Answer: when the volunteer walked.) When was it the longest? (Answer: when the volunteer ran.)



## Activity: Relative Speed of Dinosaurs

### Exploration

- Write footprint length, hip height, and stride length on the board. Ask students how they would determine footprint length. (Answer: measure the length of the footprint.) Remind students that in a fossil trackway, scientists only have footprint evidence (and no bones), so hip height must be calculated using a formula. In general, hip height can be calculated by multiplying the footprint length by 4. Stride length is the distance between two successive placements of the same foot. Students should measure between equal points of the foot, such as the tip of the middle toe.
- Have students work with a partner. Distribute the *Walking, Trotting, or Running?* to each pair. Explain to students that the three trackways show the movements of three different dinosaurs. They are to calculate which dinosaur is walking, which is trotting, and which is running. Go over the calculation section with students. Give students 30 minutes to do the calculations.

### Wrap-Up

- When students have completed the assignment, discuss their answers with them.

### Extension:

Students working in small groups can use the formula to calculate their own speeds over a given distance. This can be easily accomplished on an outdoor running track or in a dirt or sandy area—any place where footprints can be easily imprinted. Have students measure the length of their footprints, calculate their hip height, and then measure their stride length. Students can also use a stop watch to measure their speed, then evaluate the accuracy of their formula.

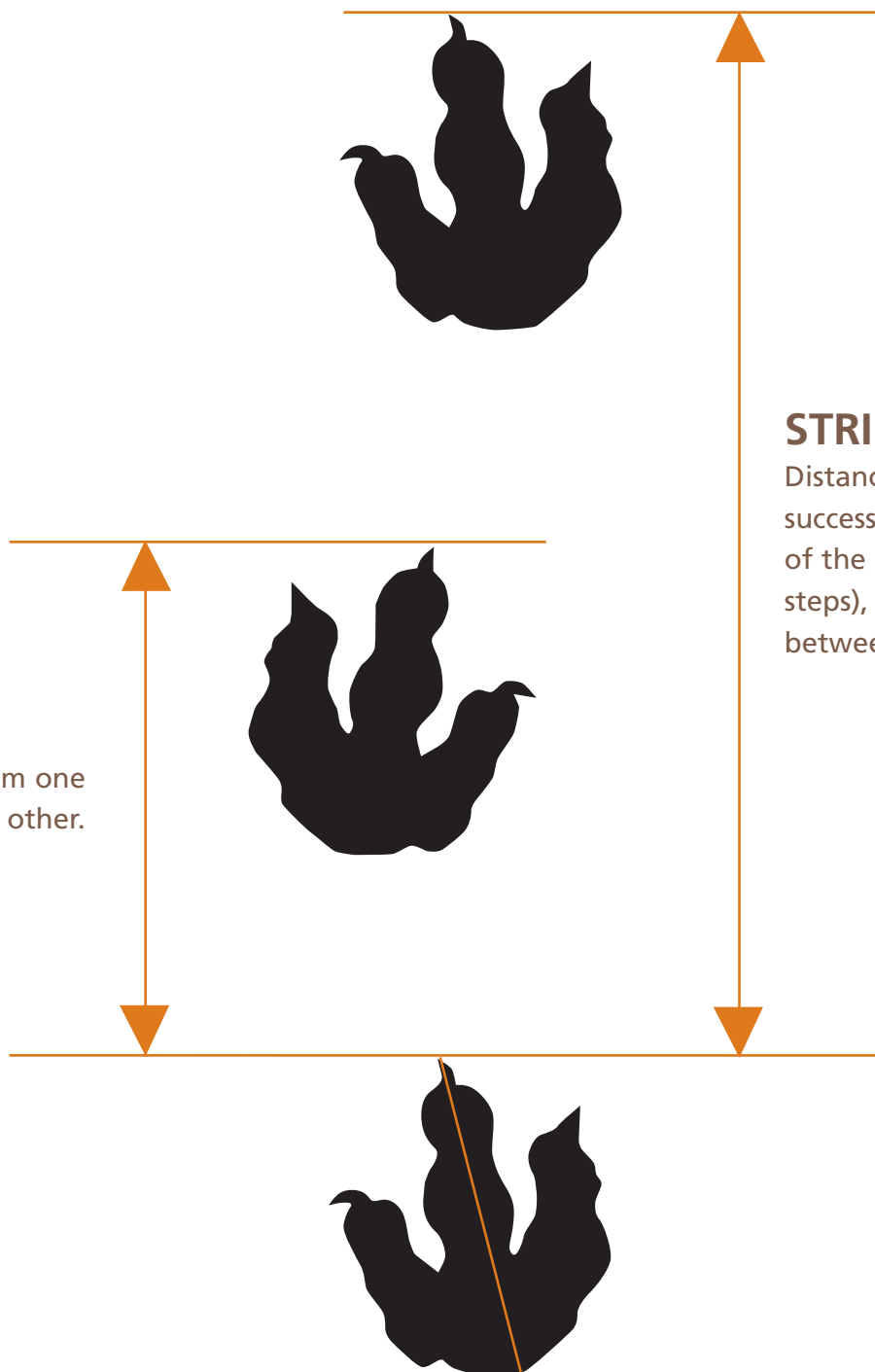
### ANSWER KEY to *Walking, Trotting, or Running?*

Trackway	FP Footprint length (cm)	HH Hip height (cm) HH = 4 x FP	LS Length of stride (cm)	LS/HH ratio	Walking Trotting Running
A	0.8 cm	3.2 cm	4.9 cm	1.5	Trotting
B	1.5 cm	6 cm	5 cm	0.8	Walking
C	1 cm	4 cm	8.7 cm	2.2	Running

# Stride Length Diagram

## STEP

Moving from one foot to the other.



## STRIDE LENGTH

Distance between two successive placements of the same foot (two steps), measuring between equal points.

## FOOT LENGTH

Straight line from the tip of longest toe to the back of the foot.



# Walking, Trotting, or Running?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Determine whether the dinosaurs are walking, trotting, or running by measuring their foot length (straight line from the tip of longest toe to the back of the foot) and stride length (distance between two successive placements (two steps) of the same foot, measuring between equal points), and using the formula below.

A



B



C



Trackway	FP Footprint length (cm)	HH Hip height (cm) HH = 4 x FP	LS Length of stride (cm)	LS/HH ratio	Walking Trotting Running

If the LS/HH ratio is less than 1.0, the dinosaur was WALKING.

If the LS/HH ratio is between 1.0 and 1.9, the dinosaur was TROTting.

If the LS/HH ratio is 2 or above, the dinosaur was RUNNING.