Education Destination

DINOSAUR ISLE

Can you outrun a dinosaur?

In this activity we will determine whether a typical child of your age could outrun three of the Isle of Wight's most famous bipedal dinosaurs (those that walk/run on two legs) – Iguanodon, Baryonyx and Hypsilophodon.

Student Introduction

▶ Of course, no-one knows exactly how fast dinosaurs moved, but during their research palaeontologists and scientists have noticed similarities amongst different species which means that we can predict fairly accurately the speeds involved

▶ Scientists have access to proven physical measurable dimensions of dinosaurs through the fossilised bones and skeletons recovered throughout the years

For this activity you will need:

✓ One 20m tape measure (or other means of measuring 20m)
✓ Two course markers (cones, footballs, jumpers, sweaters etc.)
✓ One shorter tape measure (2m)
✓ A stopwatch or time-measuring app
✓ A large open space

Preparation

First we need to calculate YOUR stride length for comparison with the dinosaurs'. Stride length is the distance between two prints made by the same foot when walking or running in a straight line.

This could be done on the beach during your visit, or in any large open space such as a school playing field or playground.

Working as a team, first of all measure and record in the table on page 2 the length of each person's legs (measured from the ground to their hip-bone) in metres.
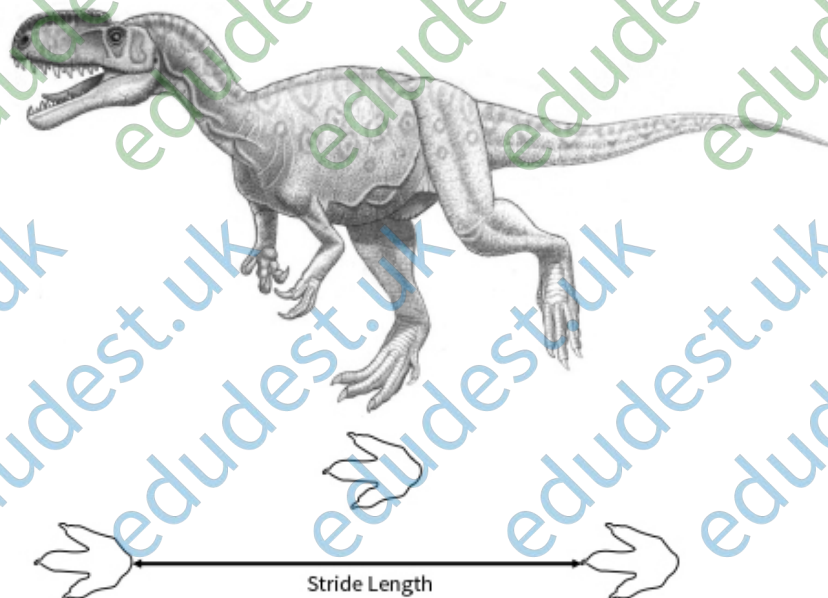
Now measure out a straight 20 metre course.

Take it in turns to measure the time taken and count the number of strides it takes to walk and to sprint across the course.

Record this information in the page 2 table also.

Stride Length

Hint!

Whoever is doing the counting should focus on one foot only. Ensure the runner starts with that foot on the starting line, and count how many times it touches the ground again before the end of the course.

Table

Once all members of your group have completed the task, calculate the average (mean) values

Name	Leg length (m)	Walking Strides per 20m	Time (s)	Sprinting Strides	Time (s)

Average (Mean)	L = _____				
S = Average (Mean) Stride Length (av. strides ÷ 20) in m	n/a		n/a		n/a

To graph the above information would be very difficult because everyone's stride lengths are different, due to their varying leg sizes. Therefore we can use the **relative stride length** instead to represent your group's stride efficiency – or, how much of your stride you are using when running at a certain speed.

This formula is very simple – it is the **average stride length** (S) divided by the **average leg length** (L) from the table:

$$\frac{S}{L} = \text{relative stride length}$$

Calculate:

Your group's walking relative stride length = _____

Your group's sprinting relative stride length = _____

Next we need to take account of the fact that stride length increases as you walk or run faster (as evidenced in your table of results). By doing this we are 'normalising'.

Whilst stride length is affected by leg length (L), speed depends on both leg length (L) and the earth's gravity (g, which is a constant 9.8 m/s^2).

The formula to calculate normalised speed is:

$$\frac{S}{\sqrt{L \times g}}$$

Calculate:

Your group's walking normalised speed = _____

Your group's sprinting normalised speed = _____

On the graph paper supplied, you can now plot two co-ordinates – the relative stride length –vs- normalised speed

Next, fill in the blanks for the three 'local dinosaur

| | | Walking | | | Sprinting | | |
Name	Leg length (m)	Average stride length (m)	Relative stride length	Speed (normalised)	Average stride length (m)	Relative stride length	Speed (normalised)
Iguanadon	2.7	5			8		
Baryonyx	1.5	3			5		
Hypsilophodon	0.8	1.5			3.5		

✓ Calculate the missing values using the same formulae as previously.
✓ Now plot your calculated values as co-ordinates onto the graph.

Could you outrun a dinosaur?

If so, which one?

Extension question: Note that the formulae used in this exercise produce *dimensionless* parameters. Why did we do this?