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|  | **FOSSIL DETECTIVES** | | |
| Pupils will need to know about how sedimentary rocks are formed so it would be useful to have completed Rock Detectives first. This activity introduces students to body fossils and trace fossils and links are made to historical evidence and the traces that we are currently leaving behind (eg. Landfill sites and buildings as well as archaeological burial sites). | | | |
| **Key Stage 2** | **Timing: 2 Lessons** | **Science, Mathematics** | |
| **ACTIVITY** | | **LEARNING OUTCOMES** | **RESOURCES** |
| **Starter:**  Look at some examples of fossils from all over the world, including some Jurassic Coast fossils (pictures are provided if you cannot get access to some real examples). Archaeopteryx, Diplodocus, Gryphea, Belemnites, Dinosaur footprints, trace fossil pictures, brachiopods, bivalves, crinoids, ferns, fish etc. Ask pupils to put their fossils into categories. Q&A about how the pupils have chosen to categorise their fossils.  **Main Activities:**  Explain that fossils are formed when organisms are buried as sedimentary rocks are formed under particular conditions. Geologists categorise fossils into trace fossils, where a trace of the activity of an organism is preserved, and body fossils, where part of the organism itself is fossilised. Give pupils a list of present-day organisms (e.g. ones you might find in your garden…worms, snails, slugs, ladybirds, frogs, birds, cats, mice) and ask them which ones they think would be most likely to become fossils if the conditions were right, and which parts they would be most likely to see? (Geologists often use comparison with the present day to help them understand what might have happened in the past).  **Dinosaur footprint activity**. In this activity, pupils measure the stride of a dinosaur to find out how fast it could travel! They can then compare their own stride (See Worksheet 2)  **Solve a footprint mystery:**  Give pupils Worksheet 3, which shows a trace fossil puzzle, and ask them to decide on their own what they think might have been happening. Pair them up and get them explain their ideas to each other and compare them. How similar are their ideas? Is there a right or wrong answer? Could they convince each other of their interpretation? | | * Recognise and identify * Make simple observations * Select basic but appropriate information * Use simple scientific vocabulary * Describe observations * Compare and contrast * Reason * Use basic scientific skills with some judgement * Communicate views and opinions appropriately * Make simple explanations for observations | Worksheet 1: Fossil pictures & any examples of fossils you can get your hands on  More fossil images can be found on [Jurassic Coast Fossil Finder](http://jurassiccoast.org/fossilfinder/)  Worksheet 2: Can you run as fast as a dinosaur?  *This activity has been adapted for UK schools from a worksheet produced by the American Museum of Natural History (www.amnh.org)*  Worksheet 3: Trace fossils |

**Worksheet 1: Jurassic Fossils**

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| **Archaeopteryx**  Archaeopteryx_lithographica_(Eichstätter_Specimen)  © H.Raab (CC-BY-2.0.) |
| **Diplodocus skeleton**  http://i2.cdn.turner.com/cnnnext/dam/assets/150129132013-diplodocus-skeleton-1-super-169.jpg |

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| **Gryphea**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Molluscs/Bivalves/L.1973.14-15.jpg | **Belemnite**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Molluscs/Cephalopods/Belemnites/BRPMG1166.jpg |
| **Iguanodon footprints from Portland**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Trace_fossils/DCM_G.00126.jpg | |
| **Trace fossil of a leaf**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Wood_and_plants/SWNTB.1992.56-lowres.jpg | |

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| **Brachiopods (Sea shells)**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Brachiopods/BRPMG8461-8459.jpg |
| **Bivalves (Sea shells)**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Molluscs/Bivalves/DCM_G.09920.jpg |

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| **Fossil fish from the Jurassic Coast**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Vertebrates/Fish/L.2013.11.jpg |
| **Crinoid fossil (Sea lily) from the Jurassic Coast**  Crinoid |

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| **Fossilised Fern**  **Pecopteris_arborescens** |
| **Ichthyosaur**  http://jurassiccoast.org/fossilfinder/wp-content/themes/fossilfinder/images/fossils-database/Vertebrates/Reptiles/Ichthyosaurs/L.2006.72.jpg |

**Worksheet 2**: **Dinosaur Trackways Activity**

**Topic:** How can the size of a dinosaur’s footprints and the length of its stride be used to show how big it was and how fast it was moving?

**Age range of pupils:** KS2

**Time needed to complete activity**: 60 mins + preparation time several days beforehand

**Resource list:**

* one or more cardboard or plywood ‘footprints’, scaled up from the diagram above
* a tape measure
* access to a grassy area or a stretch of loose sand, such as a long jump pit
* paper; pencils; clipboards for pupils use

**Outline of Activity**

1. Explain to the pupils that footprints preserved in the rocks are just as much a type of fossil as the remains of the beast itself and can be used to gain valuable information. In the case of *Iguanodon*, we know that the hip height of the animal (i.e. the height of the hip joint above the ground) is approximately four times the length of the hind feet. We can also use the length of the animal’s stride to find out whether it was walking, trotting or running. These calculations are shown in **Figure 1**.
2. Using a tape measure, help the pupils to measure the size of the footprints and also the stride length. Pupils should enter their data into the table provided.
3. Pupils need to calculate the **average** stride length before trying to use the formula to calculate whether the dinosaur was walking, trotting or running.
4. Pupils 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 pupils measure the length of their footprints, calculate their hip height, and then measure their stride length. Pupils can also use a stopwatch to measure their speed, then evaluate the accuracy of their formula.

**Pupil learning outcomes:**

Pupils can:

* measure distances outdoors on open ground, and calculate the average result;
* use a formula to calculate how an animal might have moved in the past
* appreciate that such calculations can only give an approximation;
* use their imagination to visualise what could have happened in the geological past.

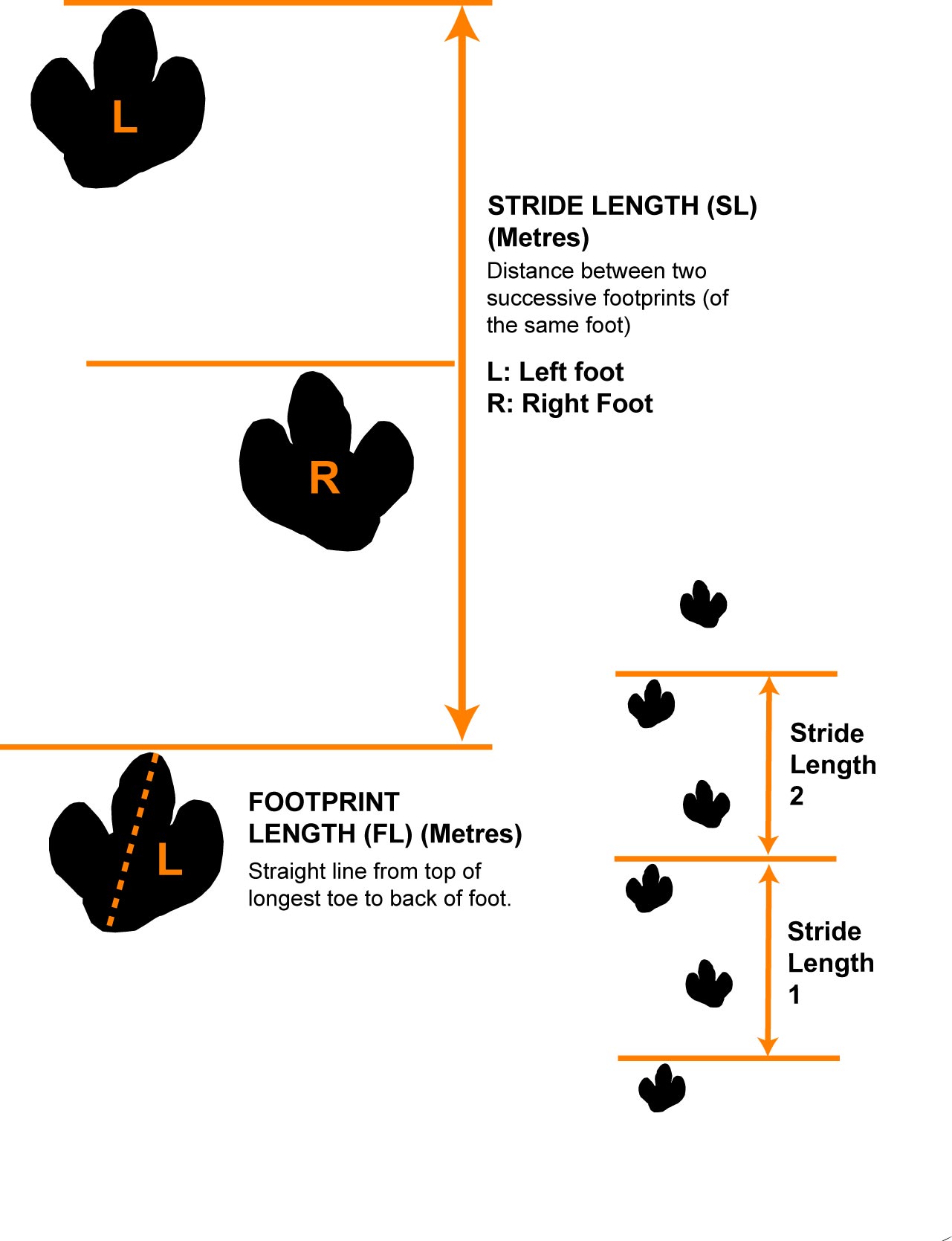
**Context:** The lesson introduces the concept that an imprint (trace fossil) is just as much a fossil as the remains of the actual body – and can sometimes give very valuable information on the lifestyles of organisms. It provides useful links between physics, mathematics and geology.

**Following up the activity:**

* The ‘trackway’ can be varied to simulate different speeds of movement of the dinosaur.
* Pupils can determine the ratio of their own hip height to the length of their own feet.
* Pupils can test the relationship between the above factors and their own speed of movement across a sandy area.

**WORKSHEET 2: Figure 1**

**WHAT DO I MEASURE?**

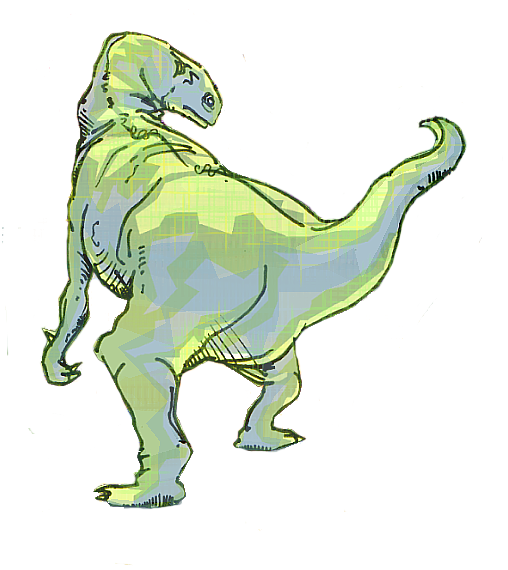


**WORKSHEET 2:**

**HOW IS THE IGUANODON TRAVELLING?**

Where does your answer fit?

|  |  |
| --- | --- |
| **ASL ÷ HH = YOUR ANSWER** | **GAIT** |
| < 2.0 | Walking |
| >2.0 and <2.9 | Trotting |
| > or equal to 2.9 | Running |





**DATA RECORDING SHEET: IGUANODON TRACKWAY**

|  |  |
| --- | --- |
| **IGUANODON** | |
| **Stride Length Number** | **Stride Length Measurement (SL) (Metres)** |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| **Calculate the** **AVERAGE STRIDE LENGTH (ASL) (Metres)** | |
| **SUM of SL MEASUREMENTS ÷ NUMBER OF STRIDES =** | |

|  |
| --- |
| **FOOTPRINT LENGTH (FL) (Metres)**  **HOW IS IGUANODON MOVING:**  **Calculate: ASL ÷ HH =** |
|  |
| **Calculate the HIP HEIGHT MEASUREMENT (HH) (Metres)** |
| **4 x FL=** |

**DATA RECORDING SHEET: PUPIL TRACKWAY**

|  |  |
| --- | --- |
| **PUPIL NAME:** | |
| **Stride Length Number** | **Stride Length Measurement (SL) (Metres)** |
| **1** |  |
| **2** |  |
| **3** |  |
| **4** |  |
| **5** |  |
| **6** |  |
| **7** |  |
| **8** |  |
| **Calculate the AVERAGE STRIDE LENGTH (ASL) (Metres)** | |
| **SUM of SL MEASUREMENTS ÷ NUMBER OF STRIDES =** | |

|  |
| --- |
| **FOOTPRINT LENGTH (FL) (Metres)**  **HOW FAST ARE YOU MOVING:**  **Calculate: ASL ÷ HH =** |
|  |
| **Calculate the HIP HEIGHT MEASUREMENT (HH) (Metres)** |
| **4 x FL=** |

**Worksheet 3: Trace Fossils**



Fossilised tracks from dinosaurs such as Iguanodon and Megalosaurus have been found in some rocks on the Jurassic Coast at Portland.

Geologists can use these sorts of fossils to make educated guesses about the animals that made the traces. For example, they might work out how heavy the animal was, or how fast it was moving.

Sometimes we can find amazing fossils that show how animals might have been interacting (see this picture of one fossil fish having been eaten by another)

Often, we can’t be certain about what happened in the past, which is why we make **inferences.** You are going to decide what you think might have happened to make the trace fossil shown in the picture below:



Describe what you think happened?