



Llywodraeth Cymru
Welsh Government

Narrative – Weighing dinosaurs

Year group and curriculum area	Year 9 or 10. Science/physics/mathematics.
Activity	Establishing a strategy for estimating the weight of different types of dinosaur, by selecting organising and processing given information. This is a problem-solving exercise.
Topic	Pressure, force and area – either as an application or revision of the topic.
Possible strategy/solution	<p>Requirements</p> <ul style="list-style-type: none">• Activity sheet ‘Weighing dinosaurs’.• Squared paper with a scale to support a possible method of calculating the area of a foot. <p>Learners are introduced to the question/problem ‘How can we use information from the past to estimate the weight of an extinct species by using knowledge and understanding from science and mathematics lessons?’.</p> <ol style="list-style-type: none">1. Learners are presented with the data/clues and the problem. They work either individually or in groups to produce a strategy to solve the problem. They outline the strategy through a series of steps, explaining how each step advances towards a solution. (The process of arriving at a solution is as important as the solution itself.)2. Learners apply their strategy.3. Learners arrive at a solution.4. Learners evaluate their strategy and solution. <p>Possible strategy</p> <p>Rearrange equation</p> <p>pressure = force (weight) ÷ area to give</p> <p>weight = pressure ÷ area</p>

	<p>Next possible step: Use the data given about depth of footprint from fossil remains to arrive at a value for pressure.</p> <p>Next possible step: The area of the feet of the dinosaur can be found using the footprint of the various dinosaurs – directly from the squared sheet or by dividing the footprint into shapes and calculating the area of each shape and then adding them together.</p> <p>Next possible step: Decide on how many legs the dinosaur stands and multiply the area by two or four.</p> <p>Next possible step: Substitute values into equation and calculate the answer.</p> <p>Extension</p> <p>When the learners evaluate their strategies, teachers should ask them how effective was it and how can they tell.</p> <p>Teachers should remind learners that this is an estimate. Ask them how reasonable is their estimate and how do they know it is a reasonable answer.</p> <p>Learners evaluate their steps and likely sources of information and their reliability against known research on the topic from a reliable source. Ask them the question 'What is a reliable source?'. These and other questions are part of the learning process.</p> <p>N.B. This is not a prescriptive solution only an example of the kind of thinking strategy that will arrive at a solution.</p>
Links with the LNF	<p>Skills</p> <ul style="list-style-type: none"> • Generating and using a strategy to solve problems. • Working collaboratively to solve a problem. <p>Numeracy component</p> <p>Strand: Developing numerical reasoning (Year 9/10)</p> <p>Element: Identify processes and connections (Year 9/10)</p> <p>Learners are able to:</p> <ul style="list-style-type: none"> • transfer mathematical skills across the curriculum in a variety of contexts and everyday situations • select, trial and evaluate a variety of possible approaches and break complex problems into a series of tasks • prioritise and organise the relevant steps needed to complete the task or reach a solution • choose an appropriate mental or written strategy and know when it is appropriate to use a calculator

- use a scientific calculator to carry out calculations effectively and efficiently using the available range of function keys
- identify, measure or obtain required information to complete the task
- identify what further information might be required and select what information is most appropriate
- select appropriate mathematics and techniques to use
- estimate and visualise size when measuring and use the correct units.

Element: Represent and communicate (Year 9/10)

Learners are able to:

- explain results and procedures precisely using appropriate mathematical language
- refine methods of recording calculations
- use appropriate notation, symbols and units of measurement, including compound measures
- select and construct appropriate charts, diagrams with suitable scales.

Element: Review (Year 9/10)

Learners are able to:

- select and apply appropriate checking strategies
- interpret answers within the context of the problem and consider whether answers, including calculator, analogue and digital displays, are sensible
- verify and justify results or solutions, including discussion on risk and chance where relevant
- interpret mathematical information; draw inferences from graphs, diagrams and data, including discussion on limitations of data
- draw conclusions from data and recognise that some conclusions may be misleading or uncertain.

Strand: Using number skills (Year 9)

Element: Calculate using mental and written methods (Year 9)

Learners are able to:

- use efficient written methods to add and subtract numbers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places
- multiply and divide whole numbers and decimals
- use the order of operations including brackets and powers.

Element: Estimate and check (Year 9)

Learners are able to:

- make and justify estimates and approximations of calculations
- choose the appropriate degree of accuracy to present answers.

Strand: Using measuring skills (Year 9)**Element: Area and volume, Angle and position (Year 9)**

Learners are able to:

- find areas of circles
- apply understanding of bearings and scale to interpret maps and plans, and to create plans and drawings to scale.

Literacy component**Strand: Reading across the curriculum (Year 9)****Element: Responding to what has been read (Year 9)****Aspect: Comprehension (Year 9)**

Learners are able to:

- read with concentration texts, on-screen and on paper, that are new to them, and understand the information in them
- follow up and use additional material in texts to extend understanding
- gain a full understanding of texts using inference, deduction and analysis
- compare and contrast themes and issues across a range of texts
- research a wide range of sources to develop a full understanding of a topic or issue.

Aspect: Response and analysis (Year 9)

Learners are able to:

- identify different interpretations of facts and information and evaluate their relative merits
- evaluate the usefulness and reliability of texts.

Strand: Writing across the curriculum (Year 10)**Element: Organising ideas and information (Year 10)****Aspect: Meaning, purposes, readers (Year 10)**

Learners are able to:

- construct responses that connect and develop ideas to fully cover the topic.

	<p>Aspect: Structure and organisation (Year 10)</p> <p>Learners are able to:</p> <ul style="list-style-type: none"> • improve the content, structure and accuracy of their writing through independent review and editing • write independently in an appropriate form with increasing confidence, ensuring content is organised, detailed and relevant, <i>e.g. how best to present opinions, information and explanations</i> • organise writing in an appropriate form, ensuring content is detailed within and between paragraphs or sections. <p>Element: Writing accurately (Year 10)</p> <p>Aspect: Grammar, Punctuation, Spelling, Handwriting (Year 10)</p> <p>Learners are able to:</p> <ul style="list-style-type: none"> • use the full range of punctuation in order to vary pace, clarify meaning, avoid ambiguity and create deliberate effects • use a variety of strategies and resources to accurately spell an increasing range of familiar, unfamiliar and subject-specific words • present their handwritten or on-screen work effectively, choosing form, images and graphics to enhance meaning • Welsh-medium statement: write grammatically accurate sentences ensuring that the verb tense and person is correct in context • Welsh-medium statement: use a range of mutations correctly (soft, nasal and aspirate mutations) in context.
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