CURRICULUM ALIGNMENT · UK GCSE MATHEMATICS (ENGLAND)

# Are Electric Cars Really Cleaner?

Grade 9 · Two 60-minute lessons · SDG 13 Climate Action · SDG 11 Sustainable Cities and Communities

Are electric cars always better for the environment than gasoline cars? In this lesson, students use real-world data and mathematical models to investigate the question, and discover that the answer depends on more than they might expect. Along the way, they work with speed–time graphs, linear equations and inequalities, and use their results to discuss how mathematics can support better decisions for people and the planet.

**Curriculum level:** Year 10 in England (Key Stage 4), first year of the GCSE course. References follow the numbering of the DfE *GCSE mathematics subject content* (2013), as used in awarding body specifications (e.g. AQA 8300).

## Subject content

| Reference | Curriculum content | How the lesson addresses it | Where | Type |
|---|---|---|---|---|
| **A2** | *"substitute numerical values into formulae and expressions, including scientific formulae"* | Students substitute values into formulas to make estimates in a real context. | GA, B, I, A | Core |
| **A10** | *"identify and interpret gradients and intercepts of linear functions graphically and algebraically"* | Students build linear models of a real situation and interpret the meaning of the intercept and the gradient in context. | GA, I, A, Test | Core |
| **A17** | *"solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation)"* | Students form and solve linear equations, including equations with the unknown on both sides, to answer a real-world question. | GA, I, A | Core |
| **A21** | *"translate simple situations or procedures into algebraic expressions or formulae"*; derive an equation, solve it and interpret the solution | Students translate a real situation into algebraic models, solve the resulting equations and interpret the solutions. | GA, I, A, Test | Core |
| **A22** | *"solve linear inequalities in one"* variable; represent the solution set | Students use linear inequalities to find limits that keep a real-world quantity within a target, and explain what the solutions mean. | A | Core |
| **A15 (Higher)** | *"calculate or estimate gradients of graphs and areas under graphs"* and interpret results, e.g. velocity–time graphs | Students find the distance travelled from speed–time graphs by splitting the area under the graph into simple shapes. This statement is Higher tier content. | GA, HW, B, I, A | Core |
| **A14** | *"plot and interpret graphs"* … in real contexts, including simple kinematic problems involving distance, speed and acceleration | Students read and interpret speed–time graphs of a journey. | GA, HW, B, I, A | Applied |

| Reference | Curriculum content | How the lesson addresses it | Where | Type |
|---|---|---|---|---|
| **A19** | *"solve two simultaneous equations in two variables (linear/linear" ...)* algebraically | Students compare two linear models and decide when one option becomes better than the other. | GA, I, A | Applied |
| **R14** | *"interpret the gradient of a straight line graph as a rate of change"* | Students interpret the gradient of a linear model as a rate of change in a real context. | GA, WCD, Test | Core |
| **R11** | *"use compound units such as speed, rates of pay, unit pricing, density and pressure"* | Students work with rates and compound units in a real context. | GA, HW, B, I, A | Applied |
| **N13** | *"use standard units of mass, length, time, money and other measures"* (including compound measures) | Students convert between units before using their models. | B, I, A | Applied |

Core The lesson directly develops or assesses this content. Applied Students use this content in a new, real-world context.

**GA** Guided Activity (teacher-led) · **B / I / A** Differentiated group activity: Base, Intermediate, Advanced · **HW** Homework · **WCD** Whole-Class Discussion · **Test** Pre-/Post-test

## Assessment objectives and wider connections

### AO1 Use and apply standard techniques

Area calculations, substitution, solving linear equations and inequalities.

### AO2 Reason, interpret and communicate mathematically

Interpreting models in context; explaining and comparing results.

### AO3 Solve problems within mathematics and in other contexts

Building a model of a real situation, using it to compare options and evaluating whether the results make sense.

### Cross-curricular links

GCSE Physics / Combined Science (motion and velocity–time graphs), Geography (energy and climate change).

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Source: Department for Education, *Mathematics: GCSE subject content and assessment objectives* (2013). Statements are quoted in part; "Higher" marks content assessed only at Higher tier.

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