CURRICULUM ALIGNMENT · US COMMON CORE STATE STANDARDS FOR MATHEMATICS

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: Grade 9, typically Algebra I or Integrated Mathematics I (high school standards).

High school standards

Reference	Curriculum content	How the lesson addresses it	Where	Type
A-CED.A.1	*"Create equations and inequalities in one variable and use them to solve problems."*	Students create and solve equations and inequalities to answer real-world questions.	GA, I, A	Core
A-CED.A.2	*"Create equations in two or more variables to represent relationships between quantities"*	Students write linear models relating two quantities in a real context.	GA, I, A, Test	Core
A-CED.A.3	*"Represent constraints by equations or inequalities" … "and interpret solutions as viable or nonviable options in a modeling context."*	Students use linear inequalities to find limits that keep a real-world quantity within a target, and explain what the solutions mean.	A	Core
A-REI.B.3	*"Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters."*	Students form and solve linear equations, including equations with the unknown on both sides, to answer a real-world question.	GA, I, A	Core
A-REI.C.6	*"Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables."*	Students compare two linear models and decide when one option becomes better than the other.	GA, I, A	Applied
F-LE.B.5	*"Interpret the parameters in a linear or exponential function in terms of a context."*	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
N-Q.A.1	*"Use units as a way to understand problems and to guide the solution of multi-step problems"*	Students work with rates and compound units in a real context. Students convert between units before using their models.	GA, HW, B, I, A	Core

Prior knowledge consolidated

Reference	Curriculum content	How the lesson addresses it	Where	Type
8.F.B.4	*"Construct a function to model a linear relationship between two quantities."* Interpret the rate of change and initial value.	Students identify and interpret the initial value and the rate of change of linear models.	GA, I, A	Prior knowledge
8.EE.C.8	Analyze and solve pairs of simultaneous linear equations; *"solve real-world and mathematical problems leading to two linear equations in two variables."*	Students compare two linear models and decide when one option becomes better than the other.	GA, I, A	Prior knowledge
6.G.A.1	Find the area of triangles, special quadrilaterals and polygons by composing or decomposing shapes, in real-world problems	Students find the distance travelled from speed–time graphs by splitting the area under the graph into simple shapes.	GA, HW, B, I, A	Prior knowledge

Core The lesson directly develops or assesses this content. Applied Students use this content in a new, real-world context.
Prior knowledge Content from an earlier year that the lesson consolidates.

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

Standards for Mathematical Practice and wider connections

Mathematical practices

- MP1 Make sense of problems and persevere in solving them
- MP2 Reason abstractly and quantitatively
- MP3 Construct viable arguments and critique the reasoning of others
- MP4 Model with mathematics
- MP6 Attend to precision (units and rounding)

Modeling

Creating Equations (A-CED) and Linear, Quadratic, and Exponential Models (F-LE) are modeling standards (★): students formulate, compute, interpret and validate a model of a real situation.

Cross-curricular links

Physical science (motion, energy) and social studies (energy and the environment).

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Source: Common Core State Standards for Mathematics (2010). Standards are quoted in full or in part.

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