



Stylish Speed

(3rd-5th Grade)

AMERICA'S CAR MUSEUM CURRICULUM GUIDE

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Program Overview:

Students will make connections between car design and speed. During a guided tour, they will see how car shapes and colors have changed over time and learn how certain car designs reflect our society's history and culture. Students will also hypothesize about the relationship between car shape and aerodynamics.

Guiding Questions:

Why are car bodies designed in certain ways? What makes a car aerodynamic? How have car designs changed over time and how are they a reflection of the time period in which they were created?

Key Concepts/Themes:

- Two and three-dimensional shapes
- Primary and secondary colors
- Chronological order
- Cause and effect
- Compare and contrast
- Surface area
- Center of gravity
- Friction
- Aerodynamics

Suggested School Program Schedule:

- 9:45am: Arrive at the museum. Lead teacher will check-in.
- 10:00-10:15am (10 minutes): Welcome and introduction to program. Students break into smaller groups of approximately 10 students and are matched with a museum educator for the guided tour.
- 10:15-11:45am (90 minutes): Guided Tour with hands-on gallery activities.
- 11:45-11:50am (5 minutes): Return to lobby.

If booked in advance for an additional fee, school groups may also participate in hands-on workshops and enjoy a test run on either the racing simulator or slot car track in the Speed Zone. Indoor space to eat lunch may also be available, if booked in advance.

How to Prepare for your museum visit:

This curriculum guide includes background information, pre- and post-visit lesson plans, a glossary of terms, and additional resources to help enhance your museum experience. Each lesson corresponds to Essential Academic Learning Requirements (EALRs) and Common Core Standards (CCSS). Please modify these lessons as you see appropriate. Feel free to let us know if we can provide you with additional resources to better integrate your field trip into your classroom curriculum.

In addition to familiarizing yourself with this *Curriculum Guide*, please review the *Field Trip Guide* included in your confirmation letter. This includes detailed information for all chaperones.

ACM Background Information

Significance of Car Design



Possible cars that will be highlighted:

1937 Chrysler

Airflow: This is considered the first streamlined car. It was a flop when it debuted in 1934 because it was considered “too modern.” However, its innovative aerodynamics left a mark on every car since.

1951 Studebaker: The “bullet nose” on this car is a classic example military-inspired design.

1959 Chrysler 300 E:

The “fins” on this car provide the impression of flight.

2012 No. 5 Farmers Insurance Chevrolet:

Enumclaw native Kasey Kahne drives this type of car.

Images of these cars can be found near the end of this curriculum guide.



As consumers contemplate their options when buying a car, often the style of the vehicle is just as important as the technology in swaying their decision. The engineers at car manufacturing companies put much thought into the function as well as the aesthetics of car bodies. Automotive designs are often chosen to appeal to a very specific audience and culture. For example, early vehicles, such as the “horseless carriages,” were designed to look similar to modes of transportation that already existed. However, as time went on, cars designs evolved. Studying the style and materials used in a car body can reveal much about the growth of science and technology, the desires and fears of everyday people, as well as, the impact of major events throughout history.

Scientific Factors: When comparing vehicles throughout history, one can see major changes in the overall height and shape of the car frame, as well as the quality of the materials used in construction. Cars from the 1890s-1920s were generally tall and boxy. Several features were separate from the car body including the headlights, hubcaps, trunk, and bumper, among others. The grill was also quite large. All of these factors led to poor aerodynamics because they increased drag and reduced velocity. In addition, many early cars had a high center of gravity. While tall, thin wheels made it easier to drive through fields or avoid sinking completely in muddy, unpaved roads, they also made it easier to topple over if going fast around a curve. By the 1930s, many new innovations were included in car designs. For example, cars began to be built using uni-body construction and metal frames replaced wood frames. Rumble seats went out of style and more rounded edges came into style. Hubcaps and headlights became connected to the main car body and windshields became curved. The center of gravity was lowered and wheels became smaller and wider. Many of these changes provided less resistance for air particles moving around the vehicle and thus increased efficiency.

Cultural Factors: Gender preferences and stereotypes, as well as historical events, influenced the way cars are designed and advertised. At the beginning of the twentieth century, many people believed that women couldn’t or shouldn’t drive at all. The cars that were marketed to women, mainly electric cars, contrasted with louder, supposedly more “masculine” gasoline-powered cars. Safety and comfort features were also seen as more appealing to women than men. The post-WWII economic boom, the creation of highways and suburbs, and even the later feminist movement encouraged the two-car family mindset and the belief that everyone should be able to own and drive a car. This affected the availability of various paint colors and interior fabric and pattern options. There was also excitement of no longer having to substitute paint for chrome, due to the war effort. As the Cold War heated up, new “masculine” features could be found on cars that resembled airplanes, guns, missiles, and bullets. Cars continue to be designed and marketed today to represent the desired image of the future car owner while simultaneously being impacted by political, environmental, and economic factors.



ACM Pre-Visit Lesson Plan

Car Classification

Learning Objective:

In this lesson, students will identify car characteristics and sort various car images using a Venn diagram.

Materials:

- ❑ Butcher paper or poster board
- ❑ Markers
- ❑ White board/dry erase markers
- ❑ Images of cars from LeMay-America's Car Museum
- ❑ Glue
- ❑ Scissors
- ❑ Optional: toy cars or models

Activity:

1. Review the definition of a Venn diagram as one that uses circles to represent sets, with the position and overlap of the circles indicating the relationships between the sets. Draw an example on the board and have students practice filling it in based on the age of their siblings. Fill in the left circle with names of students with older siblings. Fill in the right circle with names of students with younger siblings. Fill in the overlapping space with students that have both younger and older siblings.
2. Divide students into small teams of 3-4. Give each team a piece of poster board or butcher paper. Ask them to draw a Venn diagram with 2 circles and leave space for a title. Older grades can draw 3 intersecting circles.
3. Give each team a set of car images. You may want to use the ones included in this curriculum guide as well as some that you may find on your own. Ideally, no team will have the exact same set of images. You can also do this activity using toy cars or models.
4. Tell each team that their task is to arrange the cars in their Venn diagram according to characteristics of their choice.
 - a. Encourage younger grades to sort the car images based on colors, three-dimensional shapes, size, materials used, number of wheels/doors/windows, etc.
 - b. Encourage older grades to also sort car images based on car type/purpose (ex- racing or family car), likely time period when built, height/width of wheels, height of car, likely type of fuel, etc.





Learning Objective:

In this lesson, students will reflect on their museum visit and review the key concepts from the guided tour.

Materials:

- ❑ Lined paper
- ❑ Pencils
- ❑ White board and dry erase makers
- ❑ Optional: modeling clay/play dough and block of wood
- ❑ Optional: drawing paper and drawing/coloring utensils



ACM Post-Visit Lesson Plan

Museum Reflection

Activity:

1. Discuss the following questions or have students respond to them as writing prompts:
 - What was your favorite thing about your museum visit?
 - What was your least favorite thing about your museum visit?
 - Which car was your favorite and why?
 - What did you learn about car design from the museum visit?
 - How are cars designed to be aerodynamic?
 - How have car shapes, colors, and styles changed over time?
 - Give an example of a car that is designed to reflect the culture of its time period.

Optional Art Extension Activities:

1. Illustrate a “car for the future” and describe the inspiration behind your design. Be specific about how it is an improvement over current vehicles. Use car drawing guides for assistance.
2. Just like a real car designer, make a car model by molding clay/play dough over a block of wood.



Image found at: http://s2.hubimg.com/u/6576429_f520.jpg



ACM Extension Activity

Area of Toy Car

Learning Objective:

In this lesson, students will determine the area of different shapes of a custom designed toy car.

Materials:

- ❑ Recycled materials to make custom designed toy car
- ❑ Rulers/measuring tape
- ❑ Paper and pencils
- ❑ Copies of “Guide to Area” (one per student)
- ❑ Optional: calculators

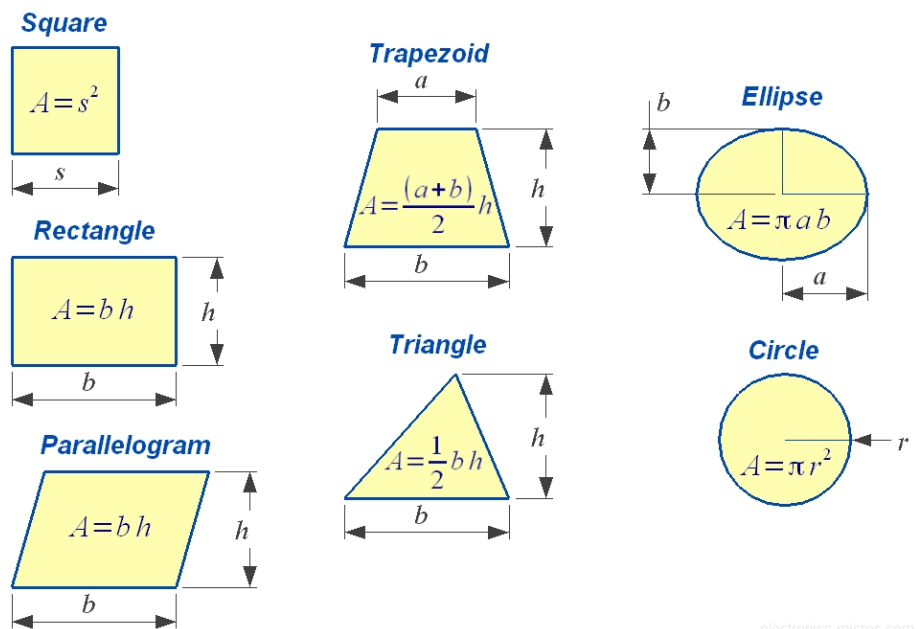
Activity:

1. Using recycled materials, allow students to create a custom designed toy car.
2. Ask students to make a list of all the basic shapes that they used on their car design.
3. Using the “Guide to Area,” students will determine the area of each shape used to create their car during the museum’s design workshop. They should begin with circles from the wheels.

Optional:

4. Students may determine the total surface area of the body of their car by adding the area of each shape used. Allow students to compare and contrast their cars.

Guide to Area:



electronics-micros.com

Image located at: <http://www.electronics-micros.com/img/maths/areas-of-simple-shapes1.jpg>





Standards Addressed

The following standards are addressed through the museum visit, pre-visit lesson plans, post-visit lesson plans, and extension activities:

<u>Common Core State Standards (CCSS):</u>	<u>Essential Academic Learning Requirements:</u>
<p>English Language Arts and Literacy in History/Social Studies and Technical Subjects:</p> <p><u>Writing:</u></p> <ul style="list-style-type: none"> 2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, and analysis of content. 3. Write narratives to develop real or imagine experiences or events using effective technique, well-chosen details, and well-structured event sequences. <p><u>Speaking and Listening:</u></p> <ul style="list-style-type: none"> 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. <p><u>Language:</u></p> <ul style="list-style-type: none"> 1. Demonstrate command of the conventions of Standard English grammar and usage when writing or speaking. 4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. 6. Acquire and use accurately a range of general academic and domain-specific words or phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level, demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression. 	<p>Math:</p> <p><u>Grade 3:</u> (3.1, 3.2, 3.3, 3.4, 3.6) Addition, Subtraction, and Place Value; Concepts of Multiplication and Division; Fraction Concepts; Geometry; Reasoning, Problem Solving, and Communication.</p> <p><u>Grade 4:</u> (4.1, 4.2, 4.3, 4.5) Multi-digit Multiplication; Fractions, Decimals, and Mixed Numbers; Concept of Area; Reasoning, Problem Solving, and Communication.</p> <p><u>Grade 5:</u> (5.3, 5.4, 5.6) Triangles and Quadrilaterals; Representation of Algebraic Relationships; Reasoning, Problem Solving, and Communication.</p> <p>Reading:</p> <ol style="list-style-type: none"> The student understands and uses different skills and strategies to read. The student understands the meaning of what is read. The student reads different materials for a variety of purposes. <p>Writing:</p> <ol style="list-style-type: none"> (1.5) The student understands and uses a writing process. (2.1, 2.2, 2.3) The student writes in a variety of forms for different audiences and purposes. (3.1, 3.2, 3.3) The student writes clearly and effectively. <p>Social Studies:</p> <ol style="list-style-type: none"> (3.2) Geography- Understand human interaction with the environment. (4.1, 4.2) History- Understands historical chronology. Uses history to understand the present and plan for the future.



<u>Common Core State Standards (CCSS), continued:</u>	<u>Essential Academic Learning Requirements, continued:</u>
<p>Mathematics:</p> <p>Grade 3:</p> <ul style="list-style-type: none"> • Operations and Algebraic Thinking. • Number and operations in Base Ten. • Number and Operations. • Measurement and Data. • Geometry. <p>Grade 4:</p> <ul style="list-style-type: none"> • Operations and Algebraic Thinking. • Number and Operations in Base Ten. • Numbers and Operations- Fractions. • Measurement and Data. • Geometry. <p>Grade 5:</p> <ul style="list-style-type: none"> • Operations and Algebraic Thinking. • Number and Operations in Base Ten. • Number and Operations- Fractions. • Measurement and Data. • Geometry. 	<p>Communication:</p> <ol style="list-style-type: none"> 1. (1.1, 1.2) Student uses listening and observation skills and strategies to gain understanding. 2. (2.1, 2.2, 2.3) The student uses communication skills and strategies to interact/work effectively with others. 3. (3.1, 3.2, 3.3) The student uses communication skills and strategies to effectively present ideas and one's self in a variety of situations. <p>The Arts:</p> <ol style="list-style-type: none"> 1. (1.1, 1.2) The student understands and applies arts knowledge and skills in visual arts. 2. (2.1, 2.2, 2.3) The student uses the artistic process of creating, performing/presenting, and responding to demonstrate thinking skills in dance, music, theatre, and visual arts. 3. (3.1, 3.2) The student communicates through the arts. 4. (4.2, 4.3, 4.4, 4.5) The student makes connections within and across the arts to other disciplines, life, cultures, and work.
<p><u>Next Generation Science Standards</u></p> <p>3-PS2-2: Make observations/measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.</p> <p>4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.</p> <p>3-5- ETS1-1: Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost.</p>	<p>Science:</p> <p>2-3 SYS: Role of Each Part in a System.</p> <p>2-3 INQ: Conducting Investigations.</p> <p>2-3 APP: Solving Problems.</p> <p>2-3 PS1: Force Makes Things Move.</p> <p>2-3 PS2: Properties of Materials.</p> <p>2-3 PS3: Forms of Energy.</p> <p>4-5 SYS: Complex Systems.</p> <p>4-5 INQ: Planning Investigations.</p> <p>4-5 APP: Different Technologies.</p> <p>4-5 PS1: Measurement of Force and Motion.</p> <p>4-5 PS3: Heat, Light, Sound, and Electricity.</p>





Glossary

The following terminology is addressed through the museum visit, pre-visit lesson plans, and post-visit lesson plans:

2-D or two-dimensional: an object that is flat—having height and width.

3-D or three-dimensional: an object that has height, width, and depth and can be viewed from multiple points of view. For example: cone, sphere, hemisphere, cube, cylinder, rectangular prism, square pyramid, hexagonal prism, and triangular prism.

Acceleration: the measure of how much the velocity of an object changes over a period of time.

Aerodynamic: designed with rounded edges to reduce wind drag. An aerodynamic vehicle will have increased fuel efficiency.

Airflow: the pattern of air movement around a moving vehicle. Airflow is invisible, unless studied under special conditions in a wind tunnel.

Area: measurement of surface.

Automobile: a passenger vehicle designed for use on ordinary roads and typically having four wheels and a gasoline or diesel internal-combustion engine. “Auto” means “self”, “mobile” means “moving.”

Axle: the pin, bar, shaft, or the like, on which or by means of which a wheel or pair of wheels rotates.

Battery: supplies the initial electrical power that starts the engine. It is made up of two lead plates plus a mixture of acid and water. This combination creates electricity that triggers the starter motor.

Biofuel: a type of fuel, made without petroleum (such as sugar cane and vegetable oil), that can be used in an ordinary internal combustion engine.

Car: a motor vehicle with four wheels; usually propelled by an internal combustion engine.

Centripetal Force: bends motion around into a curve.

Center of Gravity: the point where the weight of an object appears to be concentrated, usually near its middle. Cars with a high center of gravity are more likely to topple over when they go around corners.

Characteristics: a feature that helps to identify or describe an object.

Chronological: in order of time or occurrence.

Classify: to organize objects based on similar or differing characteristics.

Color: what the eye sees when a wavelength of light is reflected from a surface.



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Glossary, continued...

The following terminology is addressed through the museum visit, pre-visit lesson plans, and post-visit lesson plans:

Distance: the amount of space between two points.

Design: a plan for an object or work of art.

Downforce: the force that pushes down on an aerodynamically shaped vehicle when air moves rapidly over it; opposite of lift.

Efficiency: the fraction of the energy that a machine uses effectively compared with how much is put in. A typical gasoline engine is 30% efficient, so it uses 30% of the energy in the gasoline to move the car forward and wastes the other 70%, mostly as heat.

Electric Motor: a machine that uses electricity and magnetism to power an axle.

Emphasis: use of contrasts (color, size, shapes) to place greater attention on specific parts of artwork.

Energy: a source of usable power, such as petroleum or coal; usable heat or power; the capacity of a physical system to do work. Living systems (plants and animals) also need energy to function; ability of a system to do work.

Engine: a machine that turns energy into mechanical force or motion.

Force: push or pull that gives energy to an object, causing it to start moving, stop moving, or change its motion; a force is that can cause an object with mass to accelerate.

Form: a three-dimensional object that has height, width and depth.

Fraction: a part of a whole.

Friction: a force that is trying to stop the motion of an object; the resistance encountered when one body is moved in contact with another; surface resistance to relative motion; observed when an object sliding or rolling.

Fuel: something consumed to produce energy. For example, a material such as wood, coal, gas, or oil burned to produce heat or power. Animals use food as fuel. Plants use energy from the sun to complete their energy process.

Fuel Cell: an electrical device powered by fuel from a tank that makes energy through a chemical reaction (similar to large battery).

Gasoline: A volatile (evaporates easily) mixture of flammable liquid hydrocarbons that mostly comes from crude petroleum and used as a fuel for internal-combustion engines.



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Glossary, continued...

The following terminology is addressed through the museum visit, pre-visit lesson plans, and post-visit lesson plans:

Gravity: the force of attraction between all masses in the universe; especially the attraction of the earth's mass for bodies near its surface; the natural force of attraction exerted by a celestial body, such as Earth, upon objects at or near its surface, tending to draw them toward the center of the body.

Heat: a form of energy released by atoms and molecules moving around randomly.

Horsepower: a measurement of the amount of power a car engine can produce. In metric units, 1 horsepower = 746 watts- roughly the power produced by twelve 60-watt light bulbs.

Hybrid car: cars with two sources of energy: an ordinary gasoline engine, powered by a fuel tank, and an electric motor, powered by batteries.

Inclined Plane: slanted surface used to raise an object.

Inertia: tendency of objects to remain in motion or stay at rest unless acted upon by an unbalanced force

Integer: a number expressible in the form of a or $-a$ for some whole number a .

Kinetic Energy: the energy that a moving object has due to its motion; energy of motion.

Kinetic Friction: friction that resists motion of an object that's already in motion.

Load: something taken up and carried.

Machine: any device that transmits or modifies power, forces, or motion to do work.

Mass: the amount of something there is (amount of matter in an object).

Momentum: tendency of a moving object to keep moving; mass times its velocity.

Motion: change in the relative position of the parts of anything; action of a machine with respect to the relative movement of its parts; the act or process of moving from one place to another.

Oil: refined or crude petroleum; motor oil is used to lubricate an internal combustion engine.

Pattern: repeating sequence of lines, shapes, or colors.

Petroleum: a thick, flammable, yellow-to-black mixture of gaseous, liquid, and solid hydrocarbons that occurs naturally beneath the earth's surface.



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Glossary, continued...

The following terminology is addressed through the museum visit, pre-visit lesson plans, and post-visit lesson plans:

Pi ("π"): mathematical constant that is the ratio of a circle's circumference to its diameter; is approximately equal to 3.14159.

Potential energy: energy stored in an object due to its position.

Power: the energy or motive force by which a physical system or machine is operated.

Probability: a number between 0 and 1 used to quantify likelihood for processes that have uncertain outcomes.

Pythagorean Theorem: in any right-angled triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle). $a^2 + b^2 = c^2$

Rational number: a number expressible in the form a/b or $-a/b$ for some fraction a/b . The rational numbers include the integers.

Shape: a 2-dimensional, enclosed space.

Speed: the rate or a measure of the rate of motion; distance traveled divided by the time of travel; how fast an object moves.

Static friction: friction on an object that resists making it move.

Streamlined: having a contour designed to offer the least possible resistance to a current of air, water, etc.; optimally shaped for motion or conductivity.

Surface area: sum of all the areas of all the shapes that cover the surface of the object.

Tire: a ring or band of rubber placed over the rim of a wheel to provide traction and resistance to wear

Torque: A measurement of force.

Transportation: the act of moving something from one location to another; an object that moves something from one place to another.

Vehicle: something that transports people or objects from one place to another.

Velocity: the speed of the object moving in a specific direction.

Volume: quantity of three-dimensional space enclosed by some closed boundary.



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Glossary, continued...

The following terminology is addressed through the museum visit, pre-visit lesson plans, and post-visit lesson plans:

Weight: response of mass to the pull of gravity.

Wheel: a simple machine consisting of a circular frame with spokes (or a solid disc) that can rotate on a shaft or axle (as in vehicles or other machines).

Wheel and axle: a simple machine consisting of a grooved wheel turned by a cord or chain with a firmly attached axle (as for winding up a weight) together with supports.

Whole number: the numbers 0, 1, 2, 3...



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1937 Chrysler Airflow



1951 Studebaker



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1959 Chrysler 300 E



2012 No. 5 Farmers Insurance Chevrolet



1954 Pontiac Chieftan Deluxe Eight



1921 Ford Model T



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2005 Momentum



1930 Duesenberg Model J



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1983 DeLorean DMC 12



1994 Flintmobile George Barris Kustom

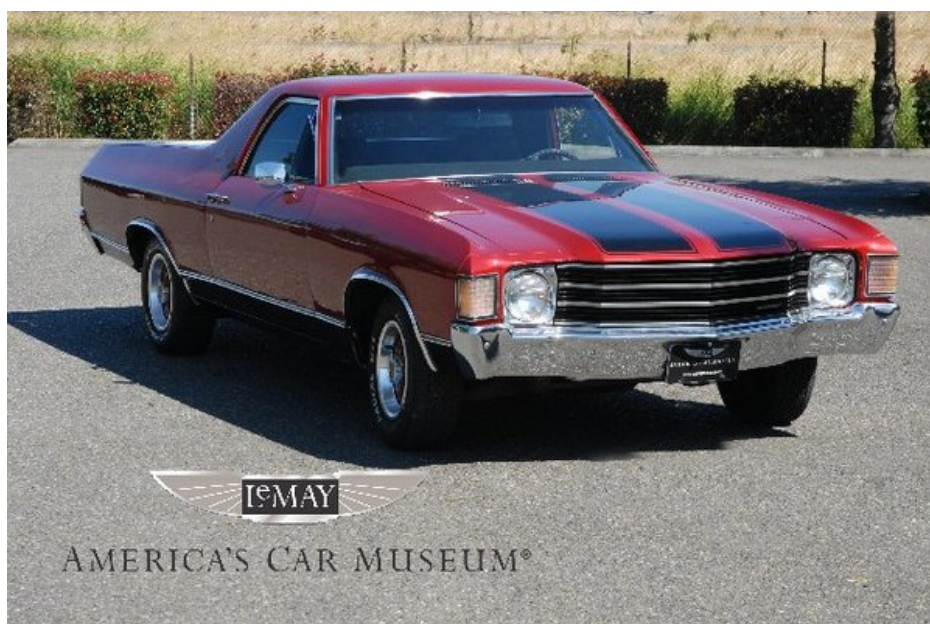


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1986 Owasso Pulse



1972 Chevrolet El Camino



1969 Chevrolet Camaro SS



1963 Chevrolet Corvette Sting Ray



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1960 Rambler Ferrambo



1946 Ford ½ Ton



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1956 Messerschmitt KR200



1942 Chevrolet Blackout



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1939 Packard Super 8



1937 Fiat Topolino



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1932 Ford Sedan Delivery



1906 Cadillac Model M



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