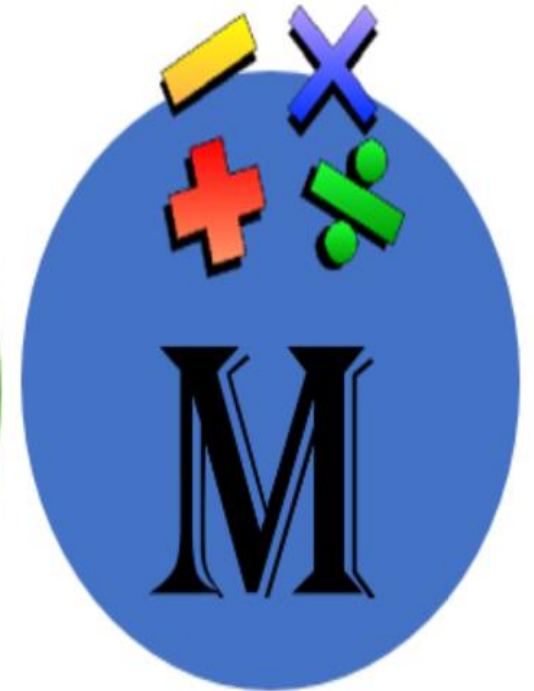
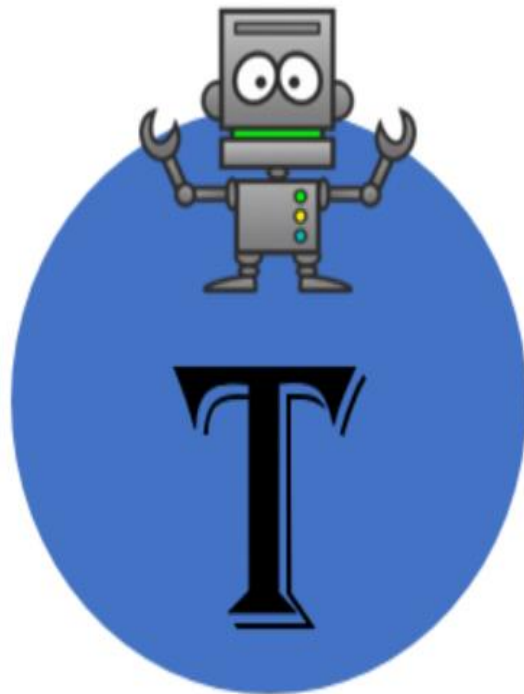
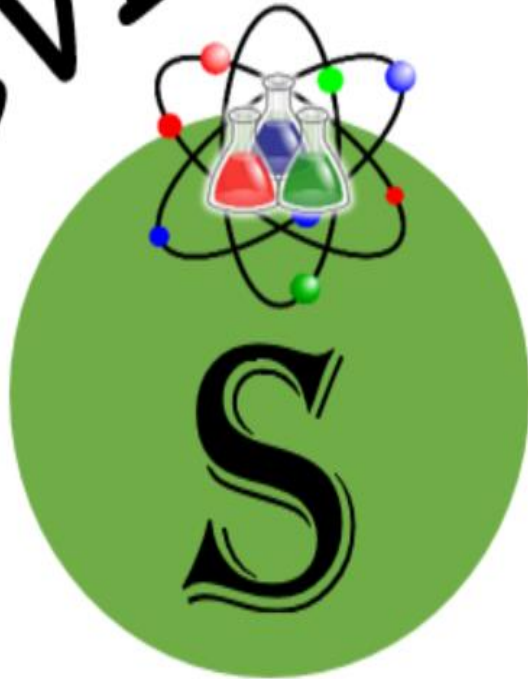


CVES

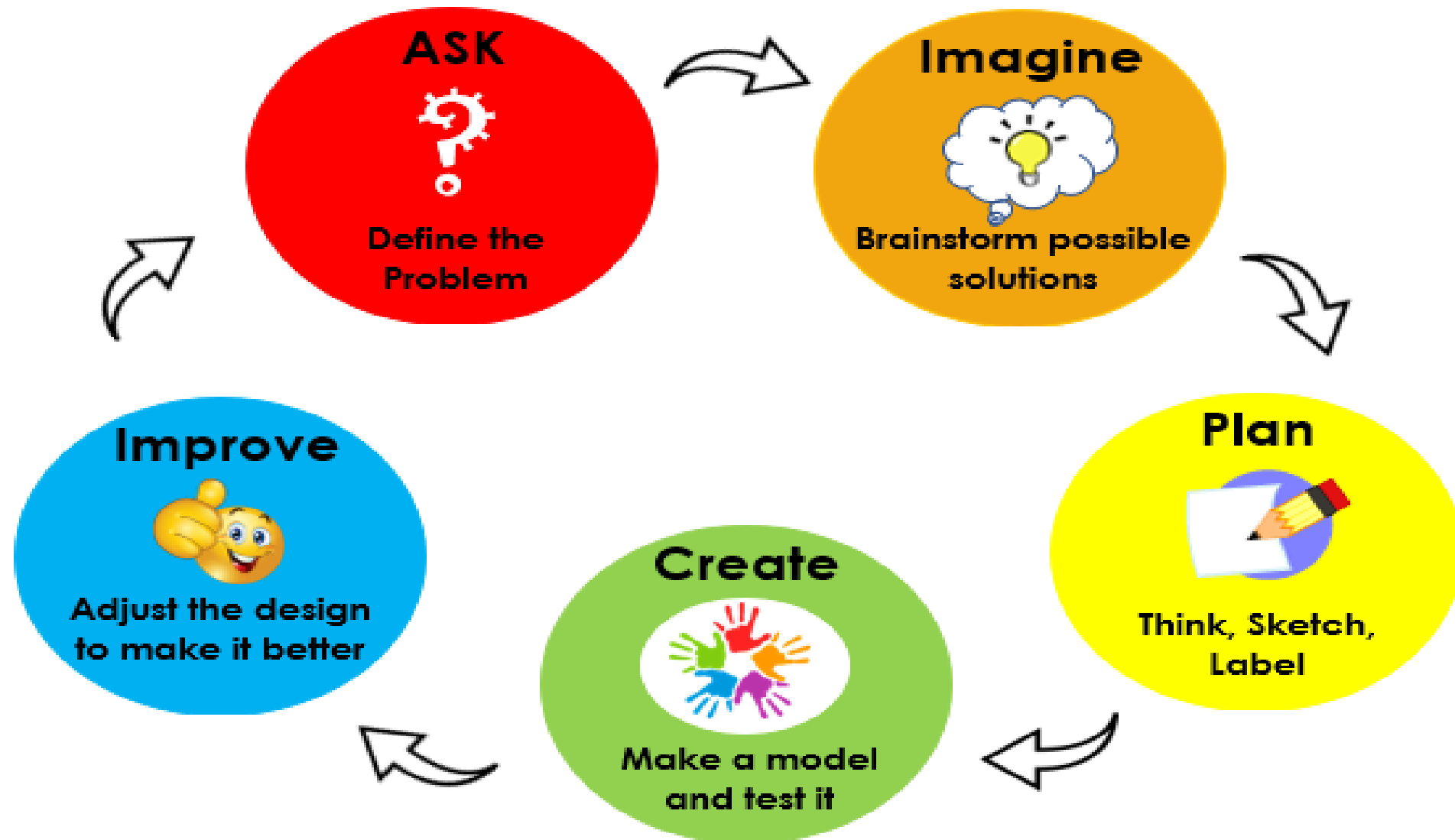


Stem Integration
4th & 5th Grade

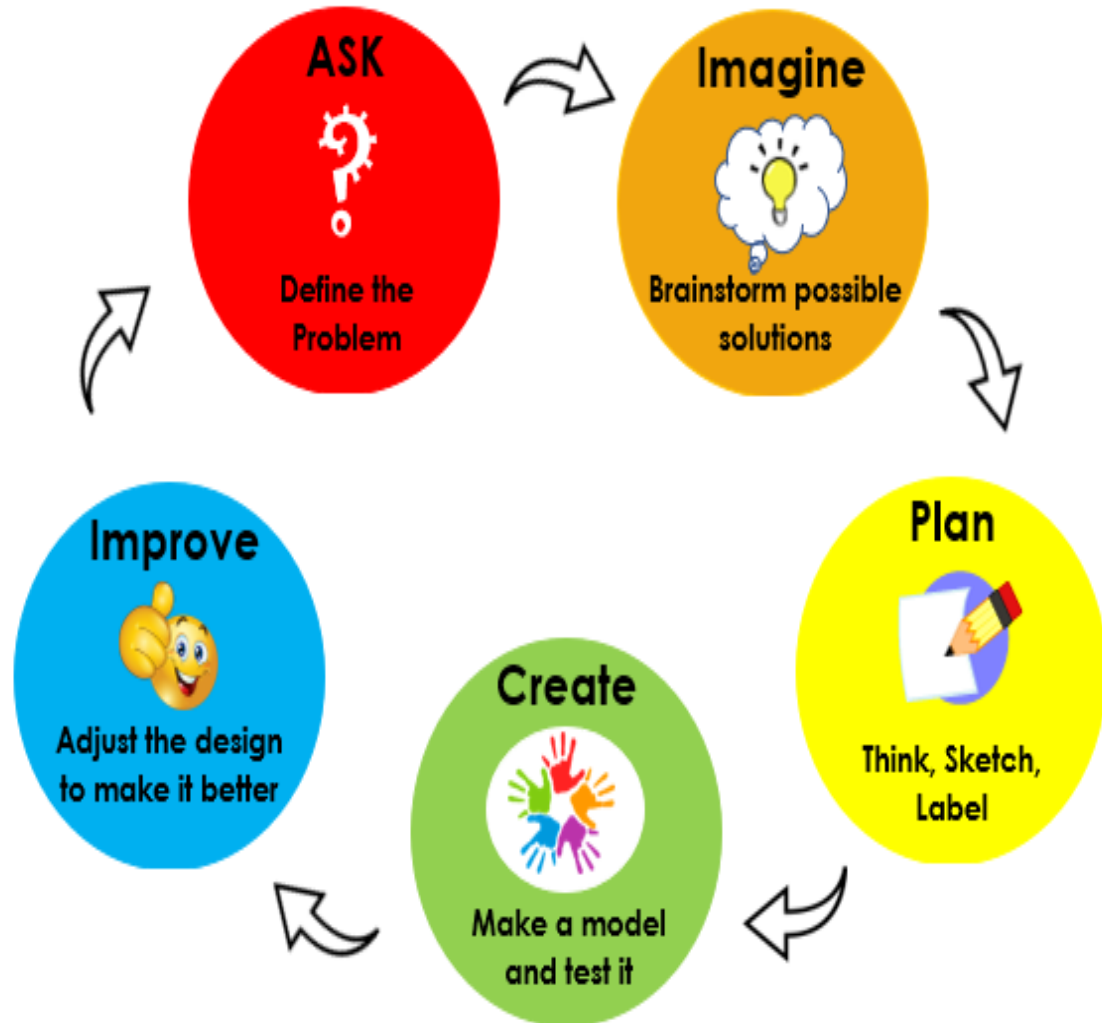
What is STEM?



The Engineering Design Process



The Engineering Design Process



Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Science & Engineering Practices

1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtain, Evaluate, and Communicate

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The Super Bowl is the last game of the season. The NFL has asked for all of the field goal post in each stadium to be replaced next season. Sportsfield Specialties needs help in order to create enough goal posts for every team by next season.

Your job is to work as a team to design a goal post for the company to present to the NFL.

How can I design and create a free-standing field goal post?

A poster for a STEM challenge. The title is "Super Bowl STEM - Field Goal" in green, with "4th Grade STEM Challenge" below it in grey. To the right is a cartoon illustration of a yellow field goal post with a football on top. The poster is set against a white background with green and red borders.

Super Bowl STEM - Field Goal
4th Grade STEM Challenge

Math Standards

MGSE4.NF.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100

MGSE4.NF.6 Use decimal notation for fractions with denominators 10 or 100.

MGSE4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.

Science Standards

S4P3. Obtain, evaluate, and communicate information about the relationship between balanced and unbalanced forces.

a. Plan and carry out an investigation on the effects of balanced and unbalanced forces on an object and communicate the results.

b. *Construct an argument to support the claim that gravitational force affects the motion of an object.*

Next Generation Engineering Standards

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

STEM Careers

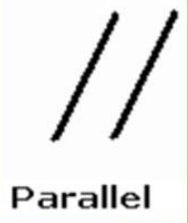
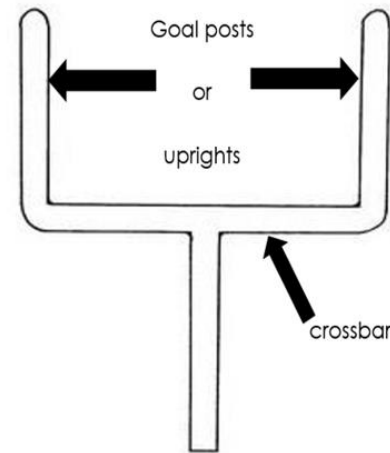
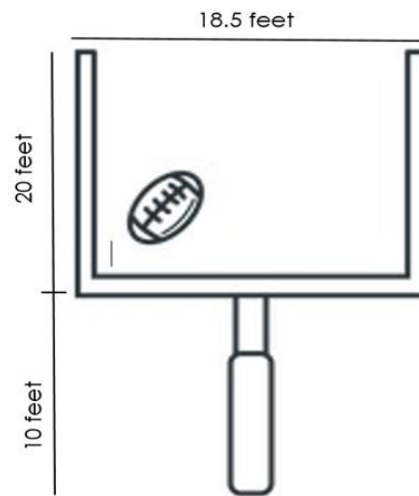
Sportsfield Specialties is the NFL's largest supplier of goalposts, with their product in 23 of the league's 31 stadiums — not to mention countless college and high school fields — and at the company's factory in Delhi, N.Y., approximately 40 metal workers produce a total of 400 to 450 sets of goalposts per year.

The job of the director of sports construction sales for Sportsfield Specialties, in part, is to must make sure the goalposts his company manufactures are doing exactly what they're designed to do: stand up straight, hold up to the elements and only get in the way when they're deflecting slightly errant kicks.

NFL Game Winning Field Goals



Field Goal Post



Plan



Think, Sketch,
Label



Plan: Make a sketch and label your goal post.



Materials

craft sticks

paper

pipe cleaners

straws

tape



Materials

- ___ craft sticks
- ___ straws
- ___ paper
- ___ tape
- ___ pipe cleaners

Test/Improve:

Does your field goal post stand on its own? _____

Are the uprights parallel? _____

Are the uprights and crossbar perpendicular? _____

Is the post at least 10 inches tall? _____

Is the post 8 inches wide? _____

Reflect

How did you improve your design?
What changes did you make?

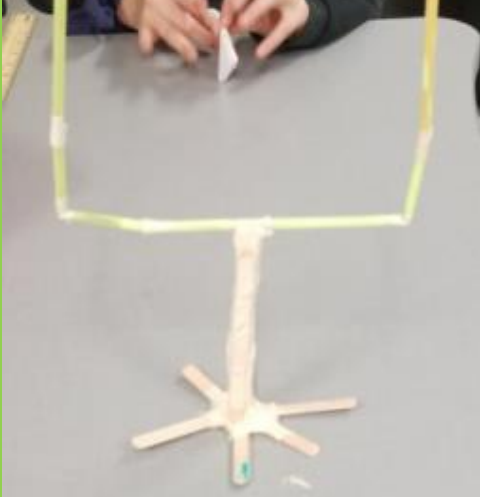
STEM CAREERS

Sports statisticians gather information on sports performances, often in real time, and use math and computer skills to create formulas and computer programs capable of making sports statistics into new data.

Sports Statistical Analyst

If working with numbers is your thing, then becoming a sports statistical analysis may be your cup of tea. This sports-related job helps analyze and predict the performance of an athlete or team. Analysts use mathematical models using data from various sporting events. This information can help teams and players make decisions.





Super Bowl STEM Name _____

Field Goal SCORECARD

You are a field goal kicker. You are going to kick (flip) the football from different locations on the field. Kick (flip) the paper football 10 times from each location and collect your data. Remember, a field goal is worth 3 points.

Distance from goal post	Tally Marks of field goals	Fraction of field goals missed	Percentage of field goals missed	Fraction of field goals made	Percentage of field goals made	Total Points made (3 points each)
5 inches	Missed 	$\frac{6}{10}$	Decimal 0.6	$\frac{4}{10}$	Decimal 0.4	12
	Made 		Percentage 60%		Percentage 40%	
10 inches	Missed 	$\frac{4}{10}$	Decimal 0.4	$\frac{6}{10}$	Decimal 0.6	18
	Made 		Percentage 40%		Percentage 60%	
15 inches	Missed 	$\frac{2}{10}$	Decimal 0.2	$\frac{8}{10}$	Decimal 0.8	24
	Made 		Percentage 20%		Percentage 80%	
20 inches	Missed 	$\frac{4}{10}$	Decimal 0.4	$\frac{6}{10}$	Decimal 0.6	18
	Made 		Percentage 40%		Percentage 60%	

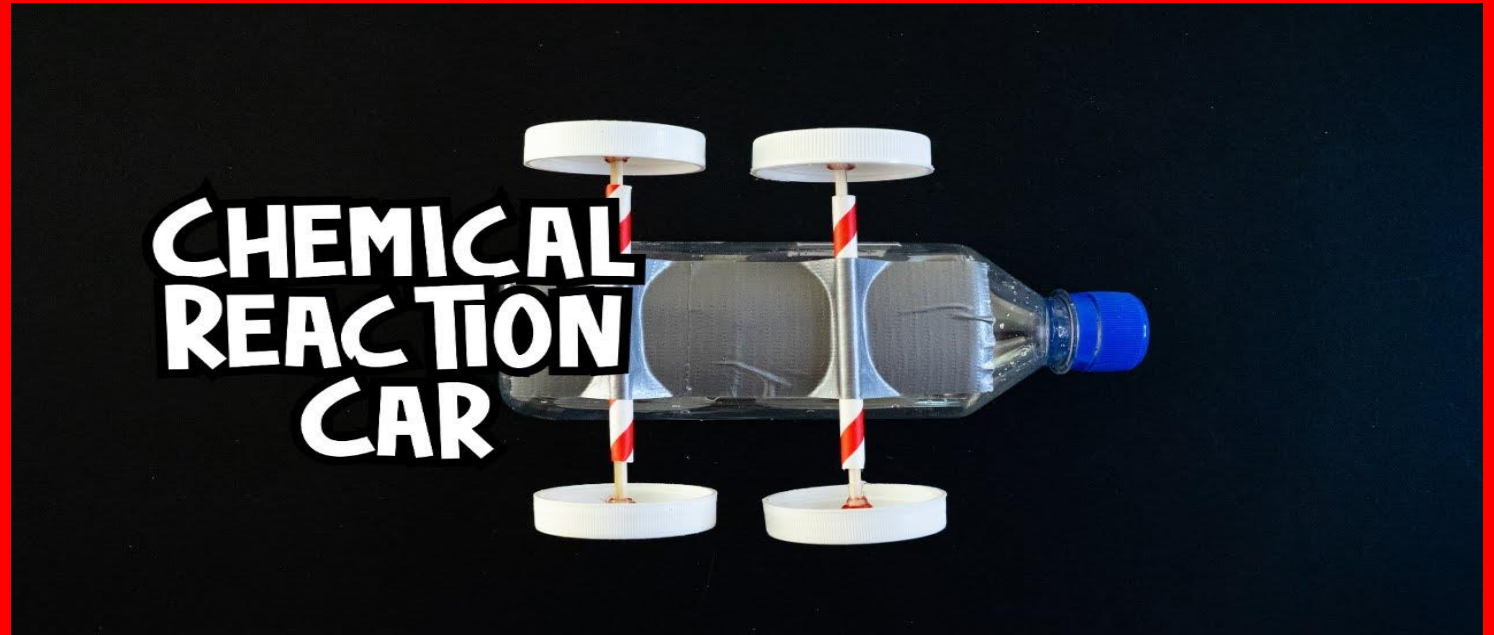
EXAMPLE

What variables (gravity, balanced, unbalanced forces) contributed to your data results?

5th Grade Stem



How can I design a car powered by a chemical reaction?



CHEMICAL REACTION CARS

Science Standards

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change. a. Plan and carry out investigations of physical changes by manipulating, separating and mixing dry and liquid materials.

Social Studies Standards

Describe the cultural developments and individual contributions in the 1920s (the automobile - Henry Ford)

Next Generation Engineering Standards

- 3-5- Define a simple design problem reflecting a need or a want that includes specified criteria for success
- ETS1-1. and constraints on materials, time, or cost.
- 3-5- Plan and carry out fair tests in which variables are controlled and failure points are considered to
- ETS1-3. identify aspects of a model or prototype that can be improved.

Ford Historic Model T

CarDataVideo



0:01 / 7:41



AUTO INDUSTRY ENGINEERS

Industrial Engineer	Processes for making things: plant layouts, assembly lines, efficient work spaces
Mechanical Engineer	Things that move: engines, motors, toys, tools, robot structures, space exploration vehicles
Electrical Engineer	Power grids, computers and parts, cell phones, video game components, lighting

2013 FORD ASSEMBLY LINE TIME LAPSE



THE CHALLENGE: BUILD A MOVING CAR

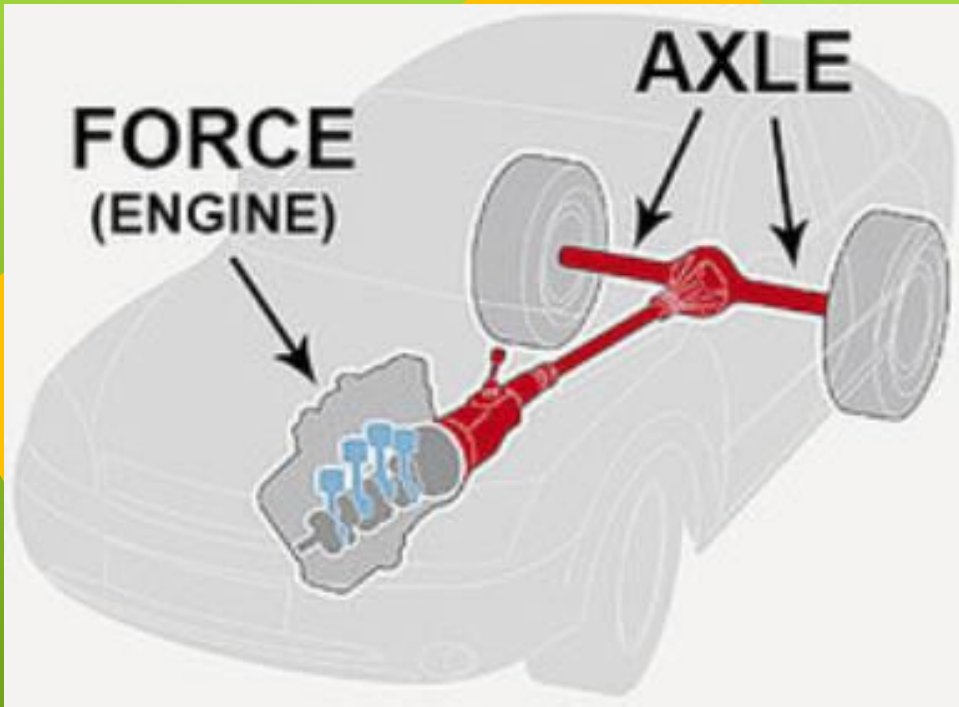


It was important for Henry Ford to design a car that could be made as cheap as possible. He kept his budget low for the Model T car design. Your challenge is to design a moving car. Be sure to stick to a \$20.00 budget. You must only use the available supplies. Use your creative thinking and see if you can make the wheels on your car turn to make it move with a force.

CHEMICAL ENGINEERS

Chemical engineering is the branch of **engineering** that deals with **chemical** production and the manufacture of products through **chemical** processes. This includes designing equipment, systems and processes for refining raw materials and for mixing, compounding and processing **chemicals** to make valuable products.





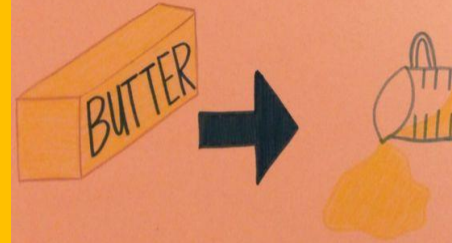
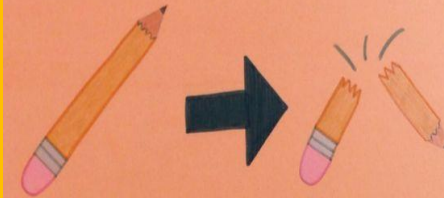
Chemical Reactions—

when bonds between atoms break and form one or more new substances



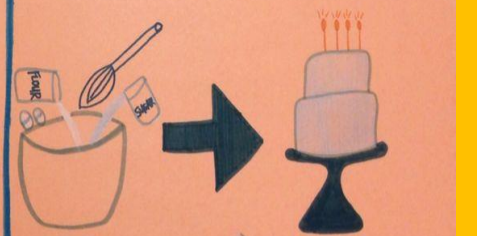
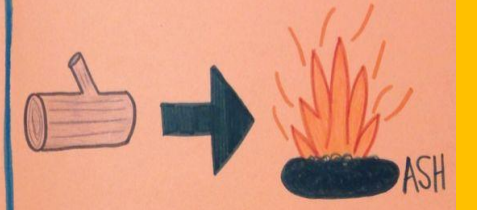
Physical Change

↳ OBJECT REMAINS BUT MAY BE IN A DIFFERENT STATE (MELTED, BROKEN)



Chemical Change

↳ OBJECT HAS NEW PROPERTIES!



Imagine

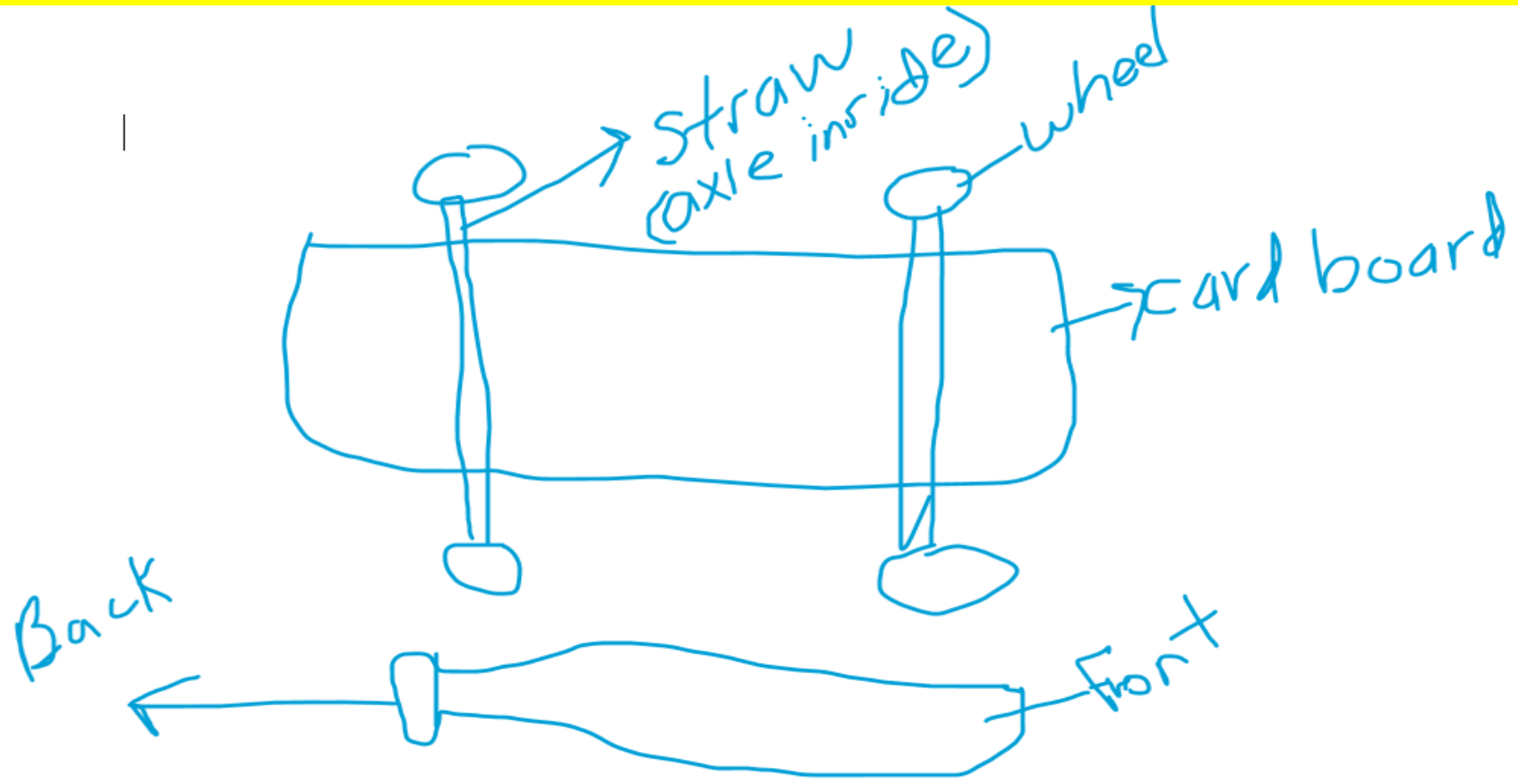


Brainstorm possible solutions

Plan



Think, Sketch,
Label





Video of student testing.

SHARE YOUR PRODUCT

<https://padlet.com/crissywade/stemchallenges>



The image shows a screenshot of a Padlet board. The top bar is green and contains the Padlet logo, the name 'Crissy Wade', and the time '1m'. The board title is 'STEM Challenges' with a subtitle 'Teachers share their STEM Challenge products.' The main area of the board is a large rectangle with a purple-to-pink gradient. A red circular button with a white plus sign is located in the bottom right corner of the board area.

padlet

Crissy Wade • 1m

STEM Challenges
Teachers share their STEM Challenge products.

REMAKE SHARE

+