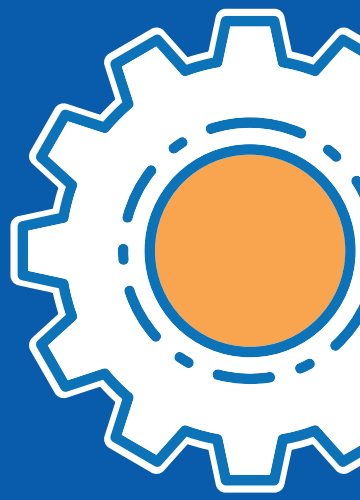


Design a

Car



Can you create a car that rolls farther than the others?

BUILD • ROLL • IMPROVE



CHOOSE

Choose car parts. Pick wheels, axles, and a car body.



BUILD

Build your car. Snap the pieces together and make your design.



TEST

Roll it down the track. Watch carefully! How far does your car travel?



IMPROVE

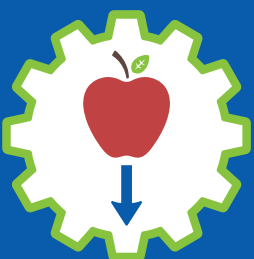
Change **one thing** and test it again.

Engineers test, improve, and try again to make things better!



CONSIDER THIS!

When your car moves down the ramp, different forces affect it.



GRAVITY

An invisible force that pulls objects toward each other. Gravity pulls your car down the ramp.



FRICTION

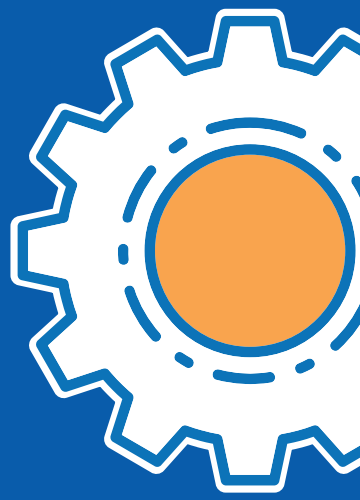
A force created when surfaces rub together. Friction slows the wheels down.



MOTION

A change in position or movement. The shape and weight of your car can change how it moves.

Test it. Learn it. Improve it.



Engineers **design**, **test**, and **improve** things to solve problems

They do not expect their first idea to be perfect!

WHILE TESTING YOUR CAR, ASK YOURSELF:



What **helped** my car move farther?



What **slowed** my car down?



Should I change the **wheels**, **weight**, or **shape**?



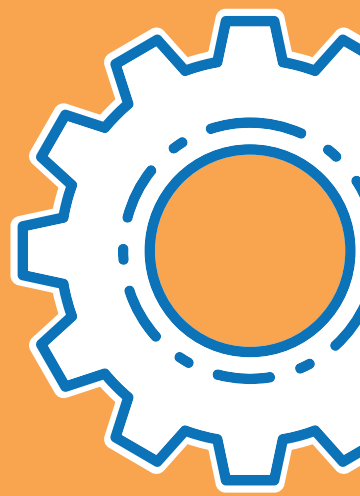
What can I **improve** before the next test?



Real engineers build many versions before finding the **best design.**

Every test helps you **learn** something new!

Build & Test your Circuit



Can you connect the pieces correctly and bring your circuit to life?

Think.Build. Test.
Make it better!



CHOOSE

Choose your parts. Pick from batteries, wires, switches, lights, motors, and buzzers.



BUILD

Build your circuit. Snap the pieces together to create a complete path for electricity.



TEST

Test your design. Does your light turn on? Does the fan spin? What happens?



IMPROVE

Experiment and improve. Try changing the order of the parts, the number of components, or the direction of the circuit.



TEST IT AGAIN!

CONSIDER THIS!

When you build a circuit, electricity moves through connected parts to power devices.



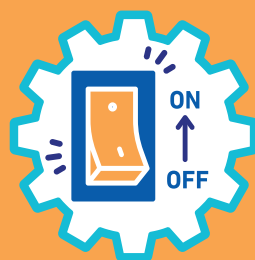
ELECTRICITY

Electricity is a form of energy that can move through wires and power lights, motors, and sounds.



CIRCUITS

A circuit is a complete path that electricity follows. If the path is broken, the electricity cannot flow.



SWITCHES

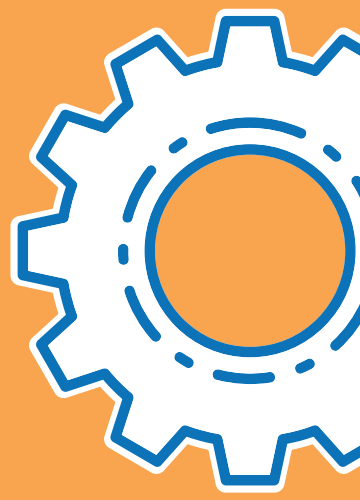
A switch opens or closes the circuit. Closing the switch allows electricity to flow.



ENERGY & MOTION

Electricity can create light, sound, and motion depending on the parts you connect.

Test It. Change It. Try Again.



Electronics technicians **build, test, troubleshoot,** and **repair** electrical devices and systems. They experiment with circuits to make technology work safely and correctly.

WHILE BUILDING AND TESTING YOUR CIRCUIT, ASK YOURSELF:



Can I make **two lights** turn on?



Can I create a **spinning fan**?



What happens if **one piece** is removed?



Which designs **work best**?



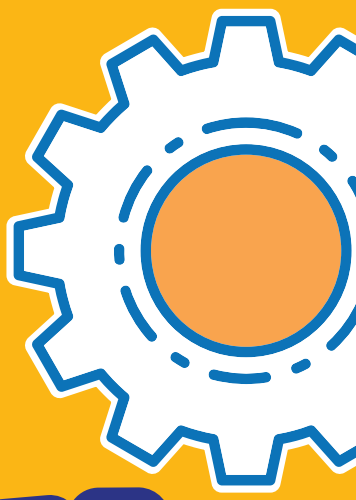
What can I change to **improve** my circuit?



**Real technicians experiment, test,
and improve every day!**

Every test helps you learn something new!

Build It. Test It. Catch The Wind!



What shape will move best?



CHOOSE

Choose your materials. Build a design you think will move well in the wind.

Engineers test many designs to find what works best!



CREATE

Create your object. Think about its size, shape, and balance.



TEST

Test it in the wind tunnel. Watch carefully! How does your design move in the air?



OBSERVE

Observe what happens. Does it spin, wobble, glide, or stay steady?



IMPROVE

Improve your design. Change one thing and test it again.

CONSIDER THIS!

When air moves around an object, forces affect how it travels.



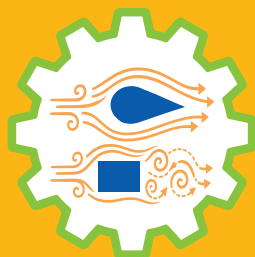
AIR RESISTANCE

Air resistance, also called drag, is the force of air pushing against an object as it moves.



BALANCE

Balanced designs are more likely to stay steady and controlled in strong wind.



SHAPE

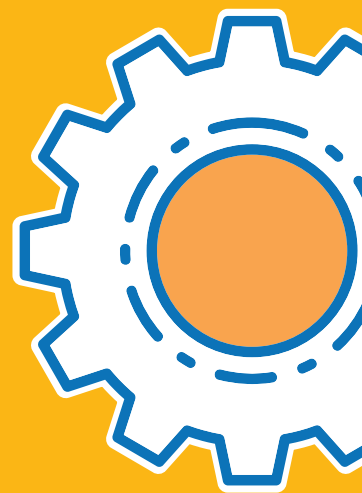
Different shapes move through air differently. Some shapes cut through air smoothly, while others create more drag.



MOTION

The size, weight, and shape of an object can change how it spins, floats, glides, or falls.

Wind Test Specialists



Wind test specialists help engineers study how objects react to moving air. They test designs for airplanes, cars, buildings, sports equipment, and more to make them safer and more effective.

WHILE TESTING YOUR FLYING CREATION, ASK YOURSELF:



Is my design **balanced**?



Does air move **smoothly** around it?



Is it too **heavy** or too **light**?



Will it **spin** or stay **steady**?

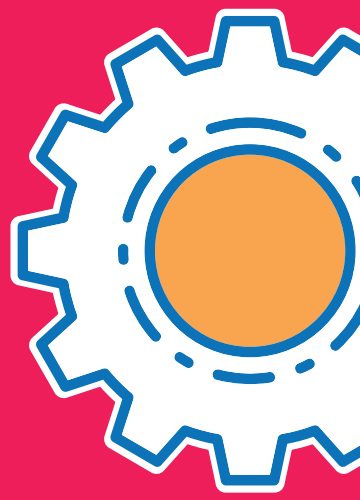


Test. Learn. Improve.

Real engineers test many different designs before finding the best solution.

Every test helps you **learn** something new!

Design It. Test It. Refine It.



Can you design a car that solves a problem?



SELECT

Select a prompt card and read your challenge.



DESIGN

Design a car that solves the challenge using the magnetic car pieces.



MEASURE

Measure and weigh your car design.



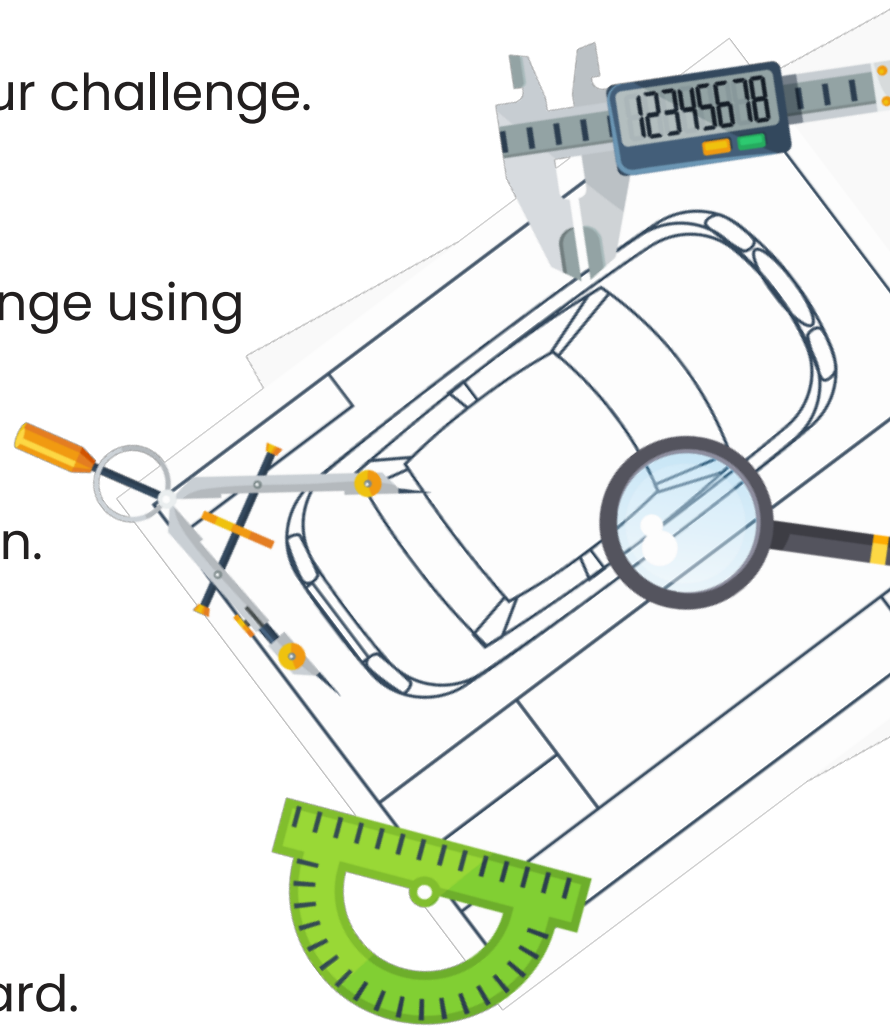
EXPERIMENT

Experiment with alternate designs.



SKETCH

Sketch your final design on the board.



CONSIDER THIS!

When products are made, engineers and technicians work together to make sure they are safe, reliable, and meet specific requirements.



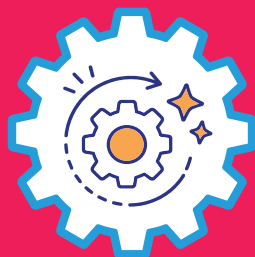
DESIGN REQUIREMENTS

Manufacturers often have goals or rules a product must meet. Engineers use these requirements to guide their design.



PROTOTYPE

A prototype is an early version of a product used to test an idea before the final version is made.



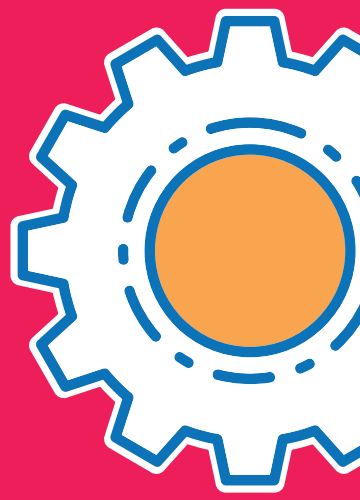
TESTING & IMPROVEMENT

Designs are tested to see how well they perform. Results help engineers find ways to improve the product.



MEASUREMENT & DATA

Measurements and observations help teams compare designs and make decisions based on evidence.



Test. Compare. Improve!

Quality Control Engineers, Engineering Technicians, and Process Engineers help improve products before they are made. They create prototypes, test designs, collect data, and make changes to ensure products meet specific requirements.

WHILE DESIGNING YOUR VEHICLE, ASK YOURSELF:



Does my design meet the **requirements**?



Which **features** work best for my challenge?



How can I **improve** my first design?



What **changes** should I make after testing?



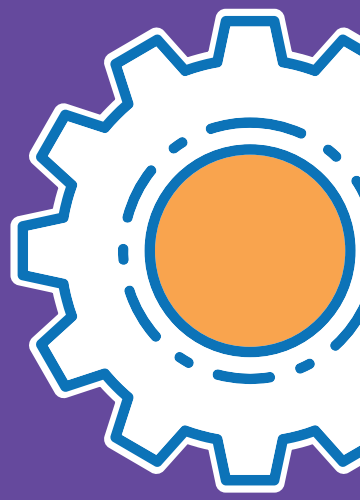
How does my design **compare** to other designs?



Real engineers build, test, and refine many prototypes before creating the final product.

Every design change helps them learn something new and makes the product even better!

Build It. Study It. Improve It!



BUILD & Analyze YOUR Crystal

Can you build a crystal like the ones used to make computer chips?



BUILD

Use the building pieces to create a silicon crystal structure.



FOLLOW THE PATTERN

Use the reference image to guide your design.



OBSERVE

Look for repeating shapes and connections.



COMPARE

Compare your structure to other crystal designs.



IMPROVE

Make adjustments to improve your model.

CONSIDER THIS!

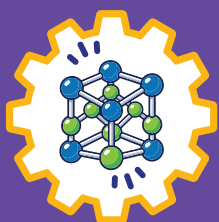


Computer chips start with a material called silicon.
Silicon atoms connect in repeating patterns called crystals.



SILICON

Silicon is one of the most important materials used in semiconductor technology. It is found in sand and is used to make computer chips.



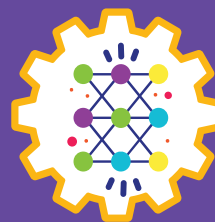
CRYSTAL STRUCTURE

A crystal structure is an organized pattern of atoms. The arrangement of atoms affects how a material behaves.



POLYSILICON

Polysilicon is a special material used to make computer chips. It is made of many tiny pieces of silicon joined together and helps power the technology we use every day.



PATTERNS & PRECISION

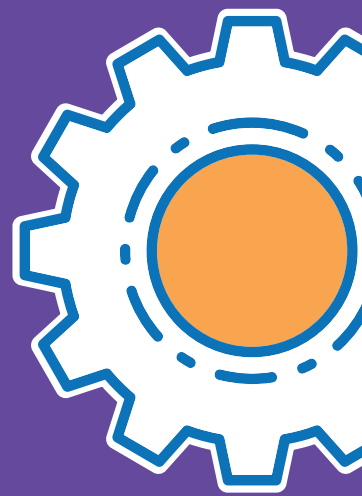
Semiconductor manufacturing requires careful attention to patterns and details. Even small changes can affect performance.



OBSERVATION

Scientists and technicians study structures closely to understand how materials work and how they can be improved.

Observe. Analyze. Solve!

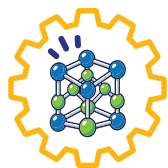


Semiconductor Technicians, Materials Engineers, and Process Engineers help create the tiny computer chips that power phones, vehicles, computers, and other technologies. They study materials, build structures, test processes, and solve problems to make chips work reliable.

WHILE BUILDING YOUR CRYSTAL, ASK YOURSELF:



Does my structure follow the **pattern**?



Are all the **connections** complete?



What shapes **repeat** throughout the crystal?



How is my structure **similar** to or **different** from others?



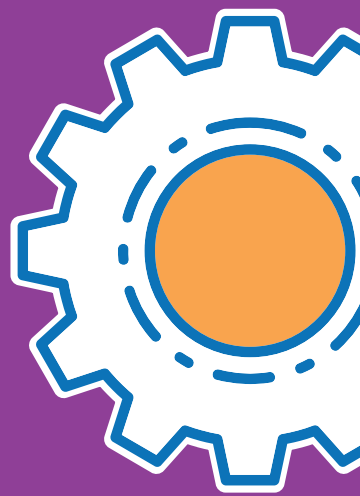
What **changes** make the structure stronger or more accurate?



Real semiconductor professionals use careful observation, testing, and precision to build technologies that power our world.

Every improvement helps create better and more reliable computer chips!

Quality Control



Can you inspect parts like a Quality Control Technician?

ACTIVITY ONE: Sort the Parts



INSPECT

Determine if each part meets the parts requirements on the tabletop card.



SORT

Place "bad" parts in the red area and "good" parts in the green area.



TIME IT

How quickly can you sort the parts?



TRY AGAIN

How quickly can you sort the parts while maintaining accuracy?

ACTIVITY TWO: Measure & Check



SELECT

Select a machine part.



MEASURE

Measure the part using a ruler.



COMPARE

Compare the measurement to the standard size.



TEST

Test the part using the Go / No-Go gauge.



DECIDE

Is the part is GOOD or BAD.



SORT

Put GOOD parts into the green area and BAD parts into the red area.



CHALLENGE YOURSELF

How quickly can you sort the parts while maintaining accuracy?

CONSIDER THIS!

Factories make thousands of parts every day. Quality control professionals inspect parts to make sure they meet important standards.



STANDARDS

A standard is a rule or requirement that a product must meet.



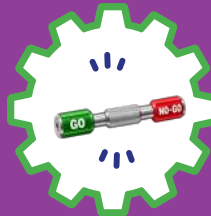
MEASUREMENT

Measurements help inspectors determine whether a part is the correct size.



INSPECTION

Inspection is the process of checking products for quality and accuracy.



GO / NO-GO GAUGE

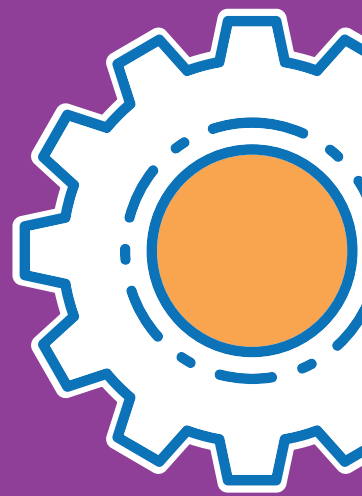
A Go / No-Go gauge is a simple tool used to quickly check whether a part is within an acceptable size range.



QUALITY

Products that meet the requirements are approved for use. Products that do not meet the requirements must be fixed or replaced.

Inspect It. Measure It. Check It!



Quality Control Technicians inspect products to make sure they meet standards before they are used or shipped to customers. They use measuring tools, gauges, and careful observation to identify defects and sort parts into acceptable and unacceptable groups.

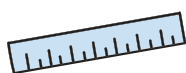
CONSIDER THIS:



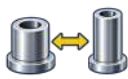
What **clues** can help me decide if this part meets the standard?



Which inspection tool gives me the most useful information?



How can I be sure my measurement is **accurate**?



What makes this part different from the others?



What **evidence** supports my decision?



How can I explain why a part is **GOOD** or **BAD**?



Why is it important for all parts to be made consistently?

**Real Quality Control Technicians inspect
and sort many parts every day.**

Their careful work helps ensure products are **safe,**
reliable, and **made correctly!**