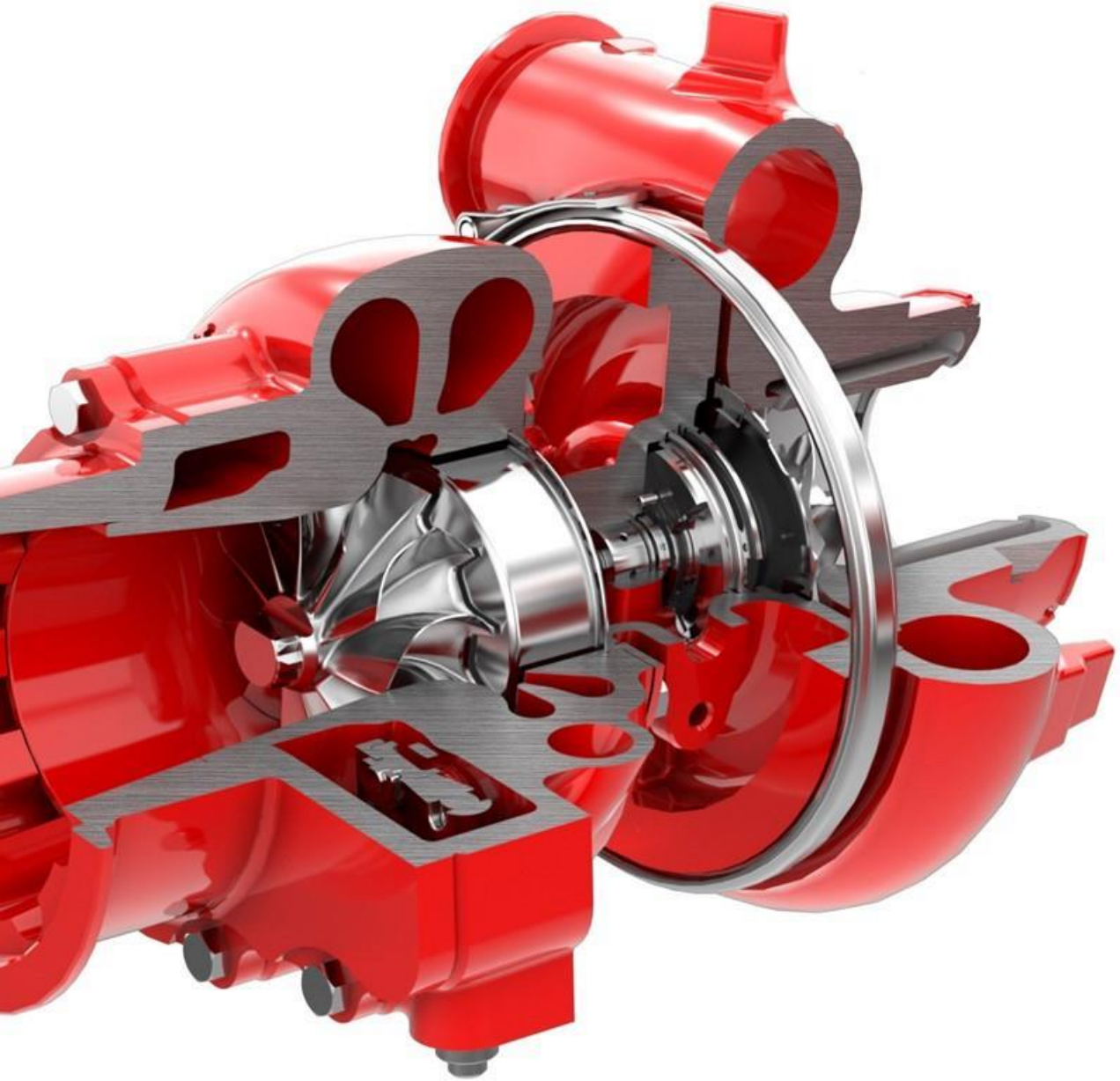


Turbo Technologies

Animal Adaptations and Habitats Activity Pack

Zoe Shai

June 2022

What is a DESIGN?

A sketch, model or plan of something to be made for a specific purpose

Are Designs Natural or Man-Made?

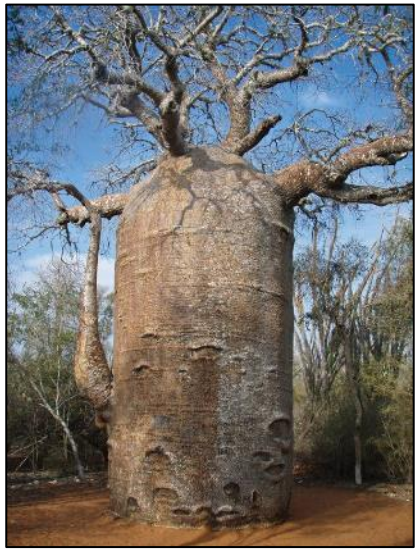
BOTH!

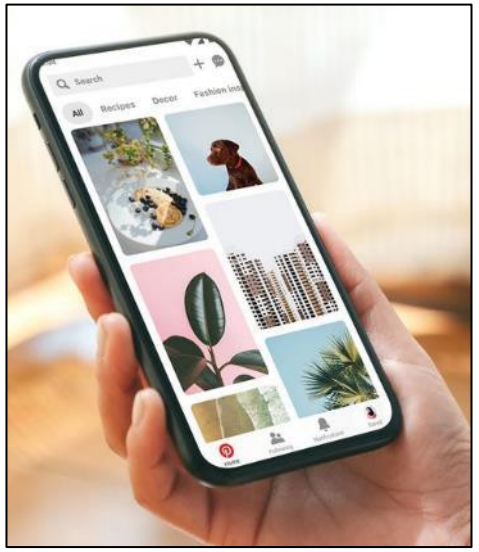
Plants, animals and nature sites are all natural designs. They have been perfected over thousands of years!

Almost all day-to-day objects that we use are man-made designs. Most of these are designed by ENGINEERS!

Are Designs Natural or Man-Made?

Which images are created from man-made designs?



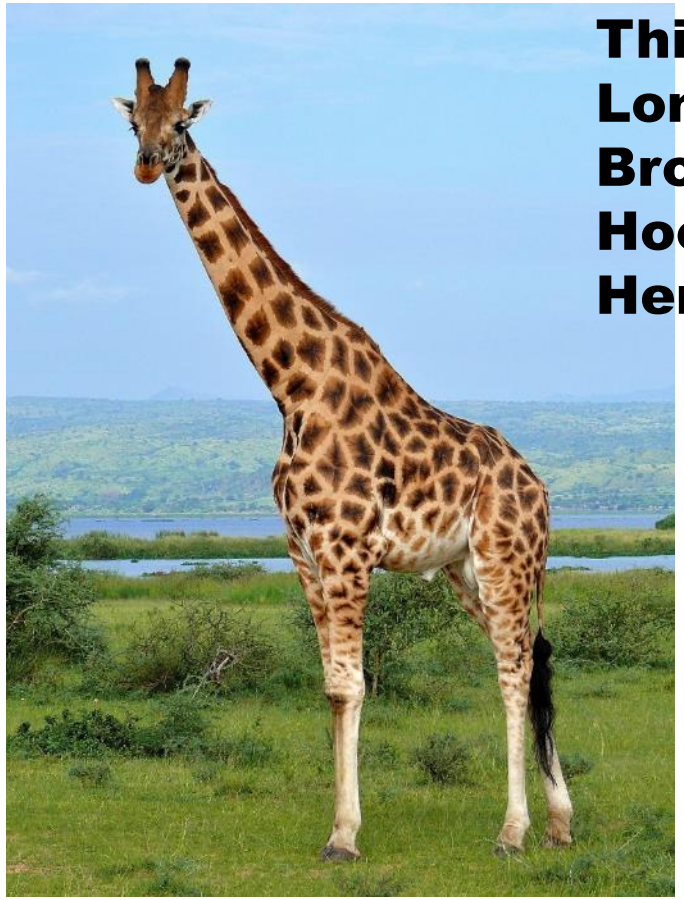


What makes a BAD design?

What makes a GOOD design?

Can you think of any examples of a good design in your home?

What are the differences in design between these two animals?



Long neck
Thin Coat
Long Legs
Brown Pattern
Hooves
Herbivore

White Fur
Thick Coat
Claws on Feet
Carnivore
Fast!

What are the differences in design between these two animals?

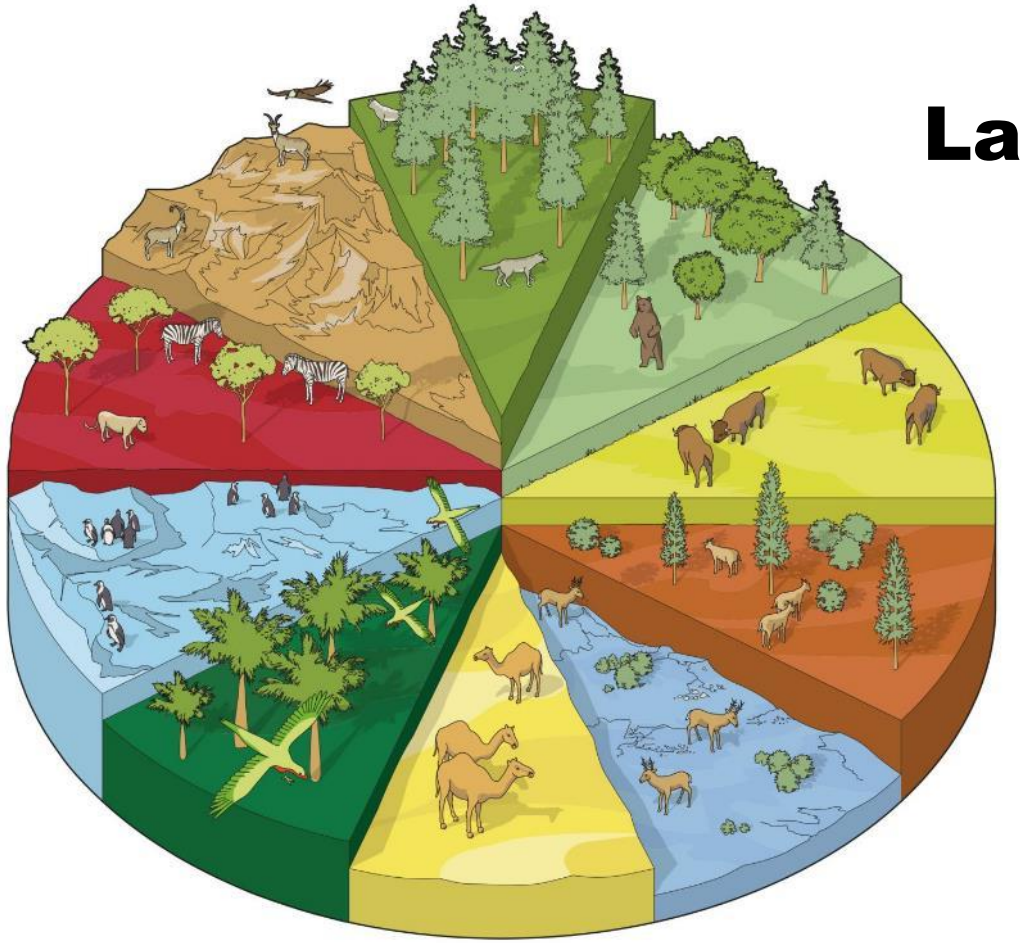
Gills
Blue and Yellow
Fins
Very Small
Eyes on Side
Smooth

Large Beak
Talons
Eyes in Front
Feathers
Large Wings
Fast!

Why are these animals different?

Strong or fast?

Land, Air or Water?

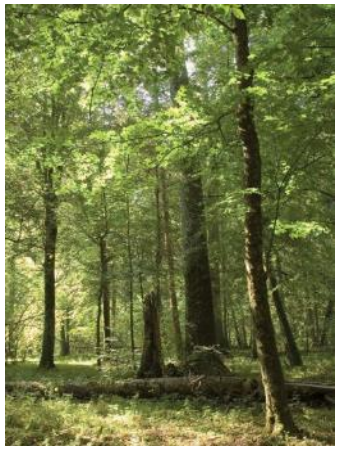
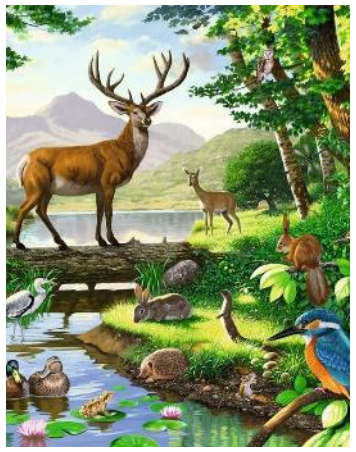


Big or small?

Hot or cold?

Design is affected by the ENVIRONMENT

Environment and Purpose affects design

Animals	Weather	Habitat	Animals Nearby	Food Available	To Survive!
Engineering	Conditions	Setup	Parts Nearby	Fuel Available	To Work Properly!

Environment **Purpose**

Toaster Design

Will be extremely hot inside!

Needs to use electricity to work

Will need buttons and a lever to push bread down

Will need to fit on kitchen counter

PURPOSE: Needs to be able to toast bread!

Engineering

- Conditions
- Setup
- Parts Nearby
- Fuel Available
- To Work Properly!

Environment | **Purpose**

Household Object Design

Medium

ACTIVITY

Just like we did for the toaster, find an object around you (it can be anything you want!) and fill out the sheet below.

My Object: _____

Conditions	
Setup	
Parts Nearby	
Fuel Available	
Purpose	

What is a Turbocharger?

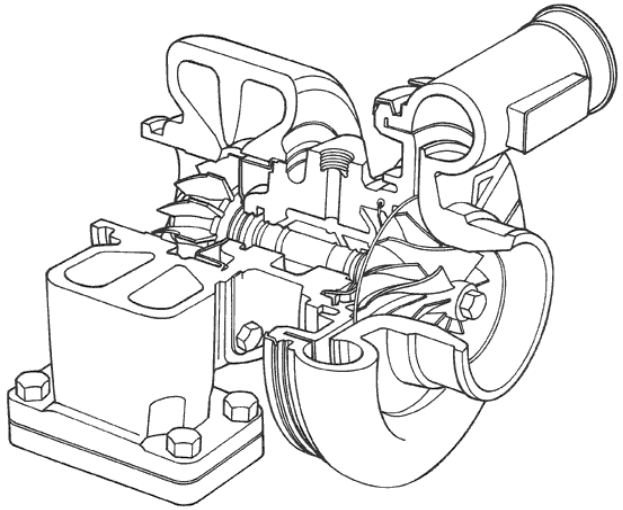
Think about a person walking: they can breathe slowly and feel fine.

Now think about a person running: they need to breathe more air in to keep running!

Just like the running man, a turbocharger brings more air to the engine, so it has more POWER

Not enough oxygen

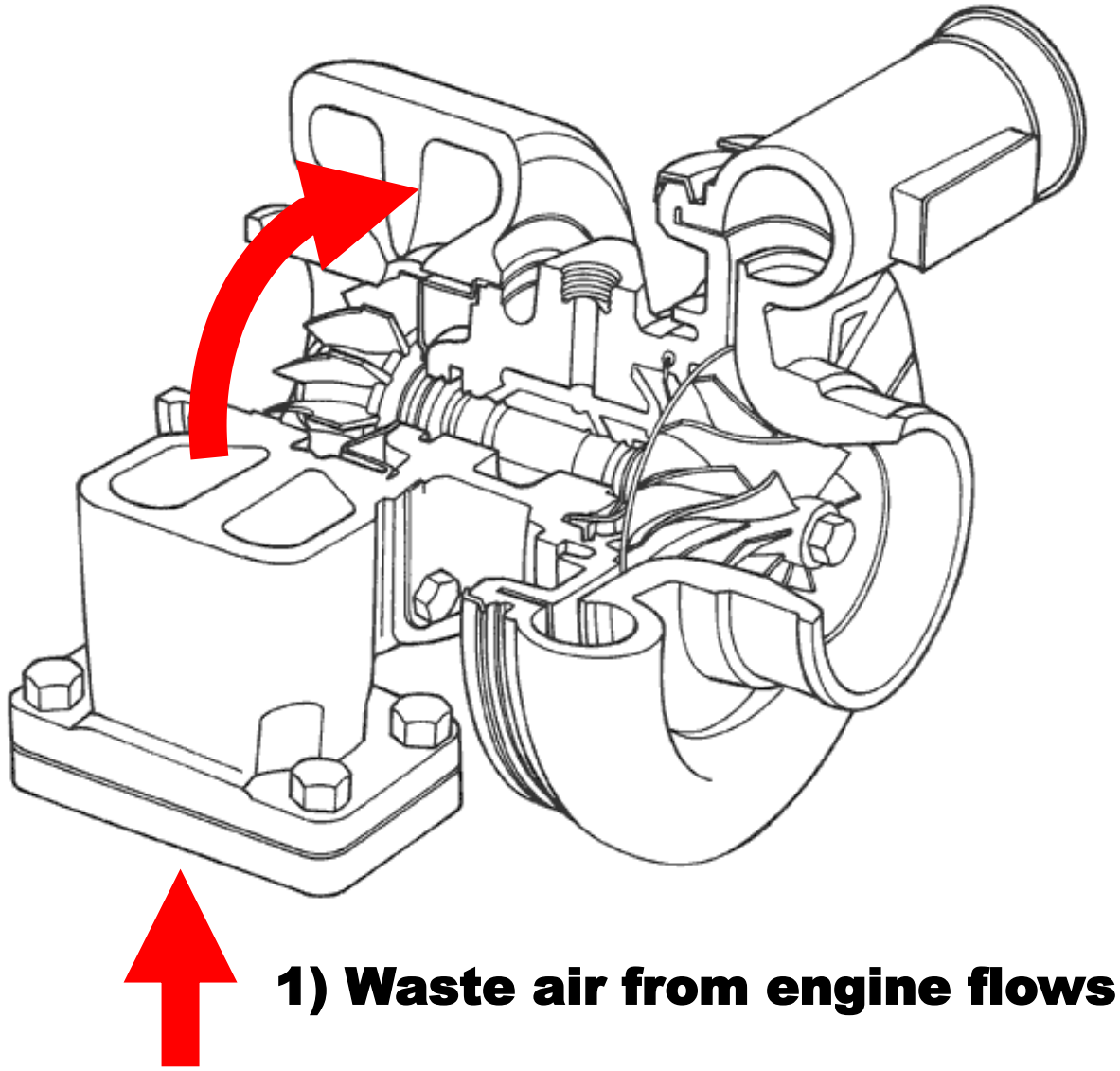
Enough oxygen



Where are our turbochargers used?

What is a Turbocharger?

Hard

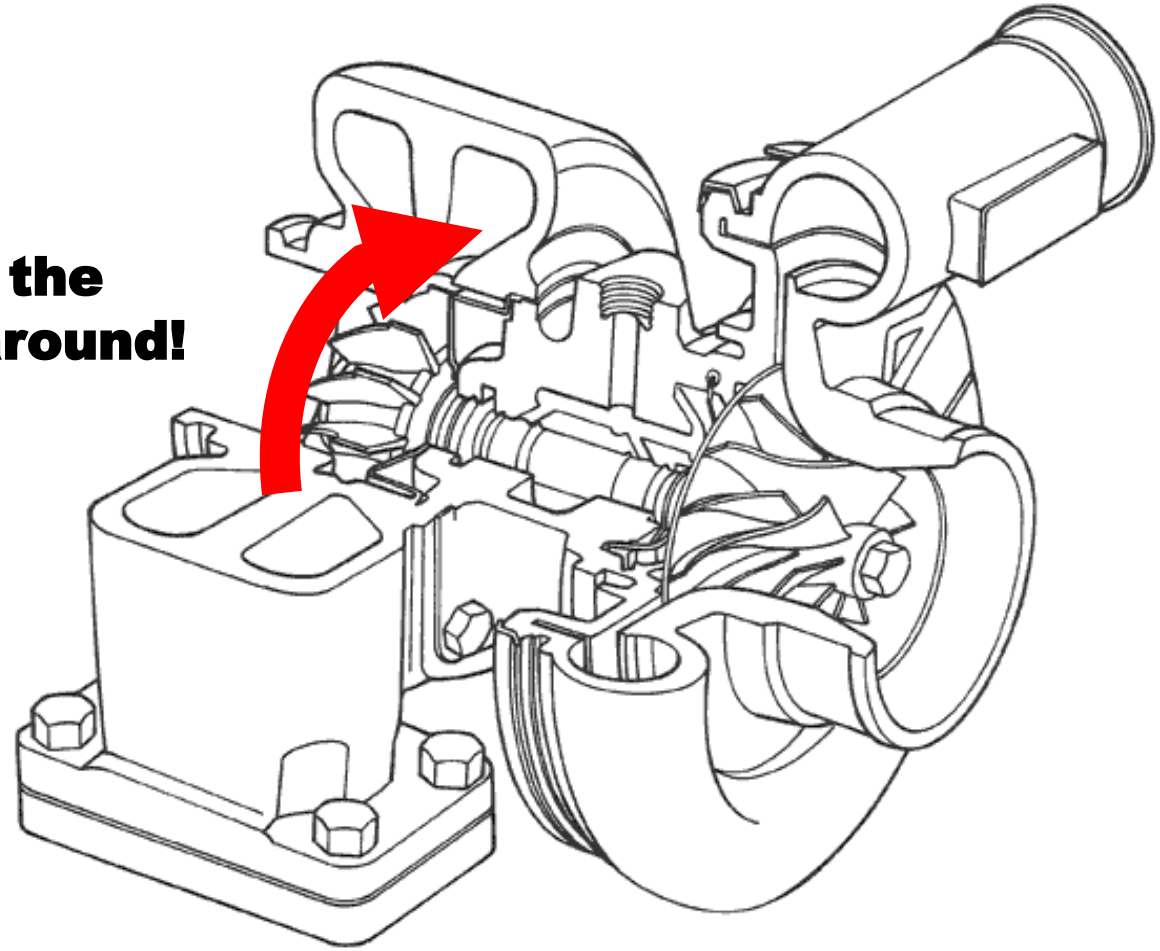


1) Waste air from engine flows to the turbine

What is a Turbocharger?

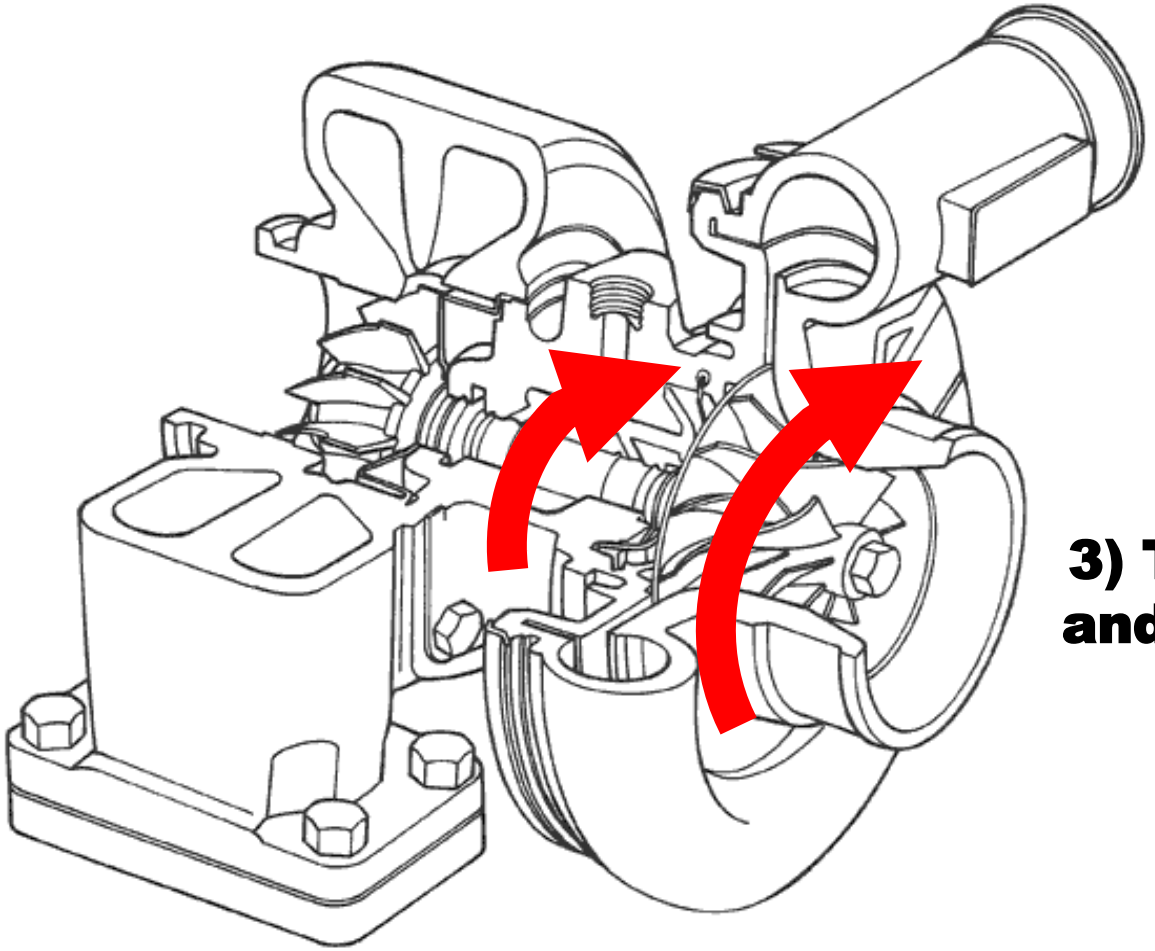
Hard

2) Air causes the turbine to spin around!



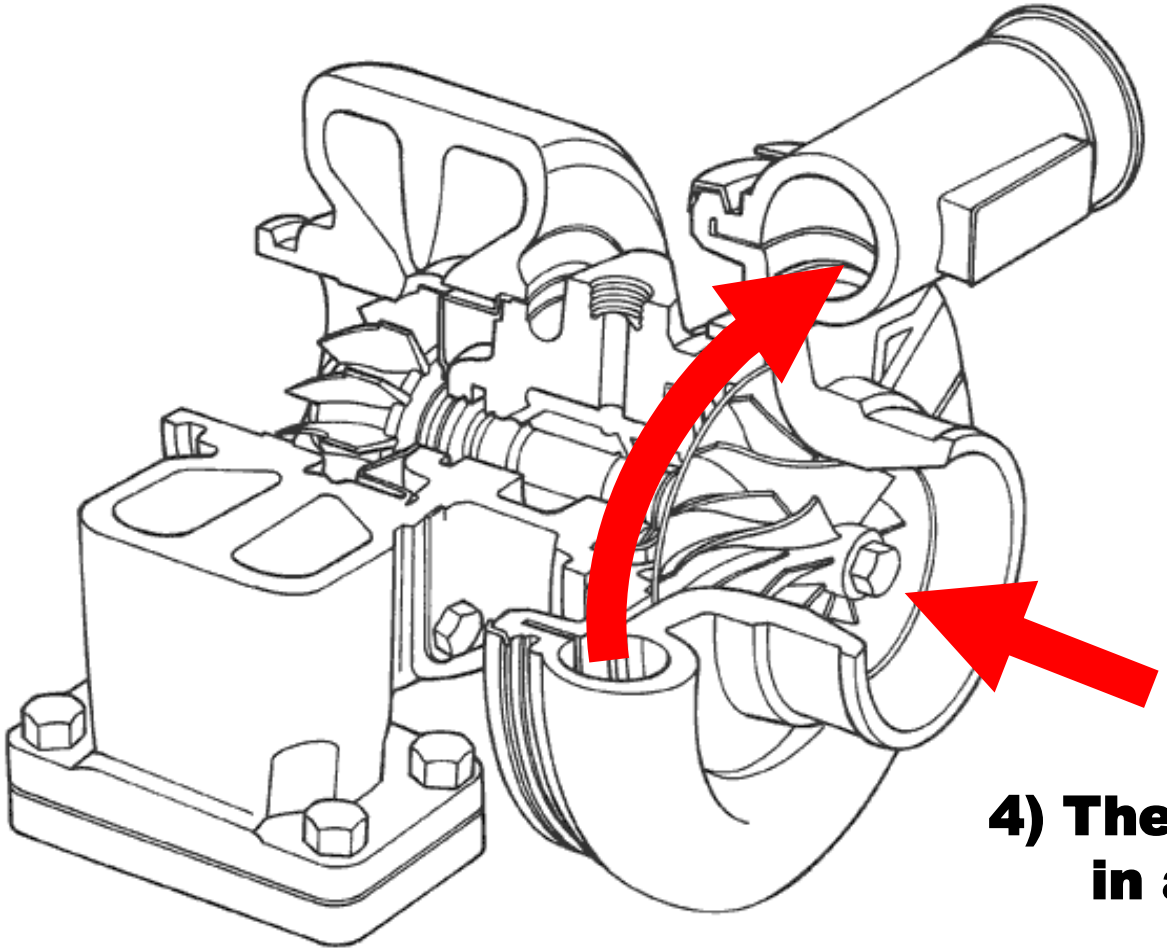
What is a Turbocharger?

Hard



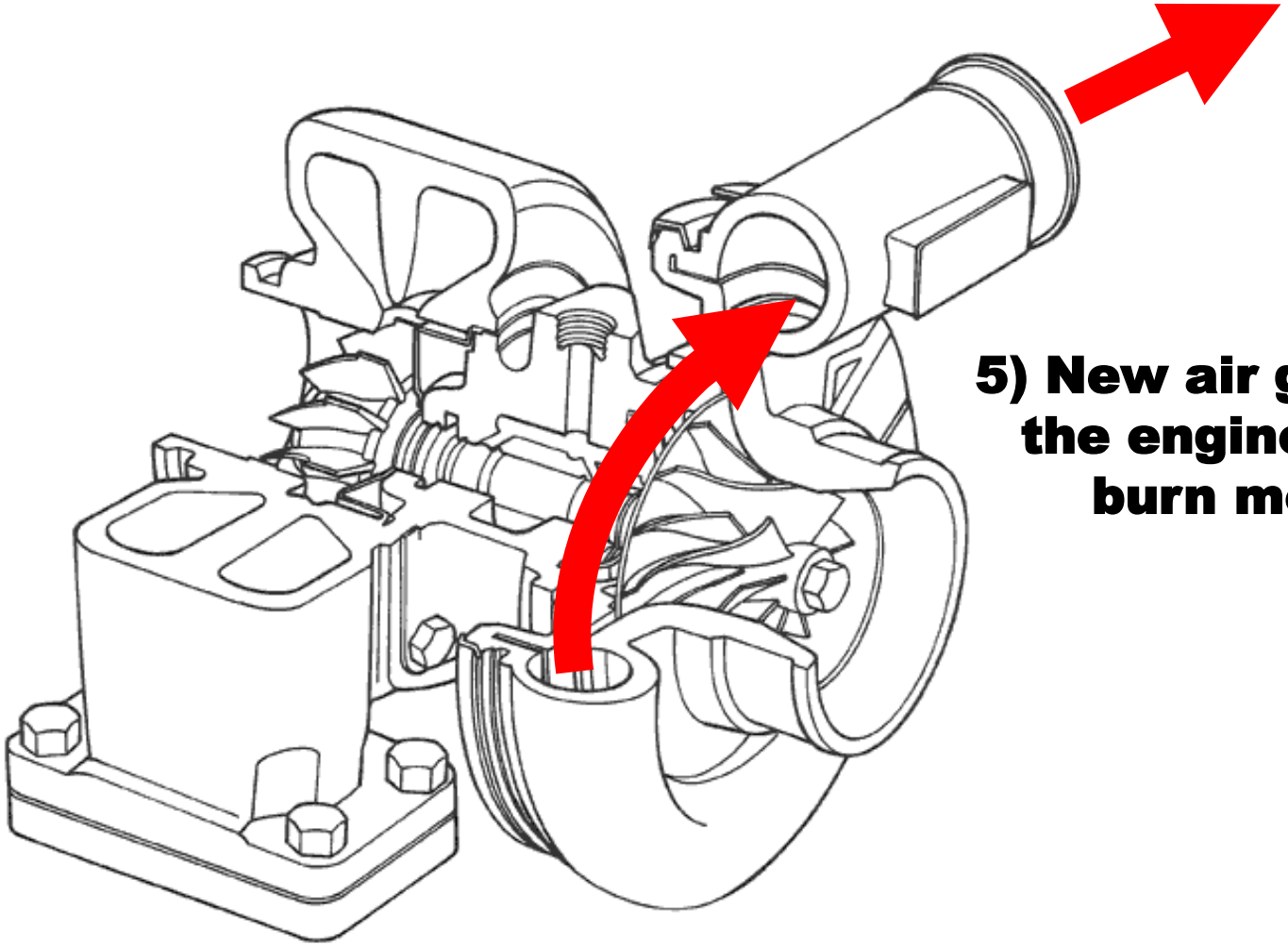
3) This spins the shaft and compressor wheel

What is a Turbocharger?



4) The compressor sucks in air from outside

What is a Turbocharger?



5) New air goes back to the engine, so it can burn more fuel!

Turbocharger Conditions

Turbo Technologies

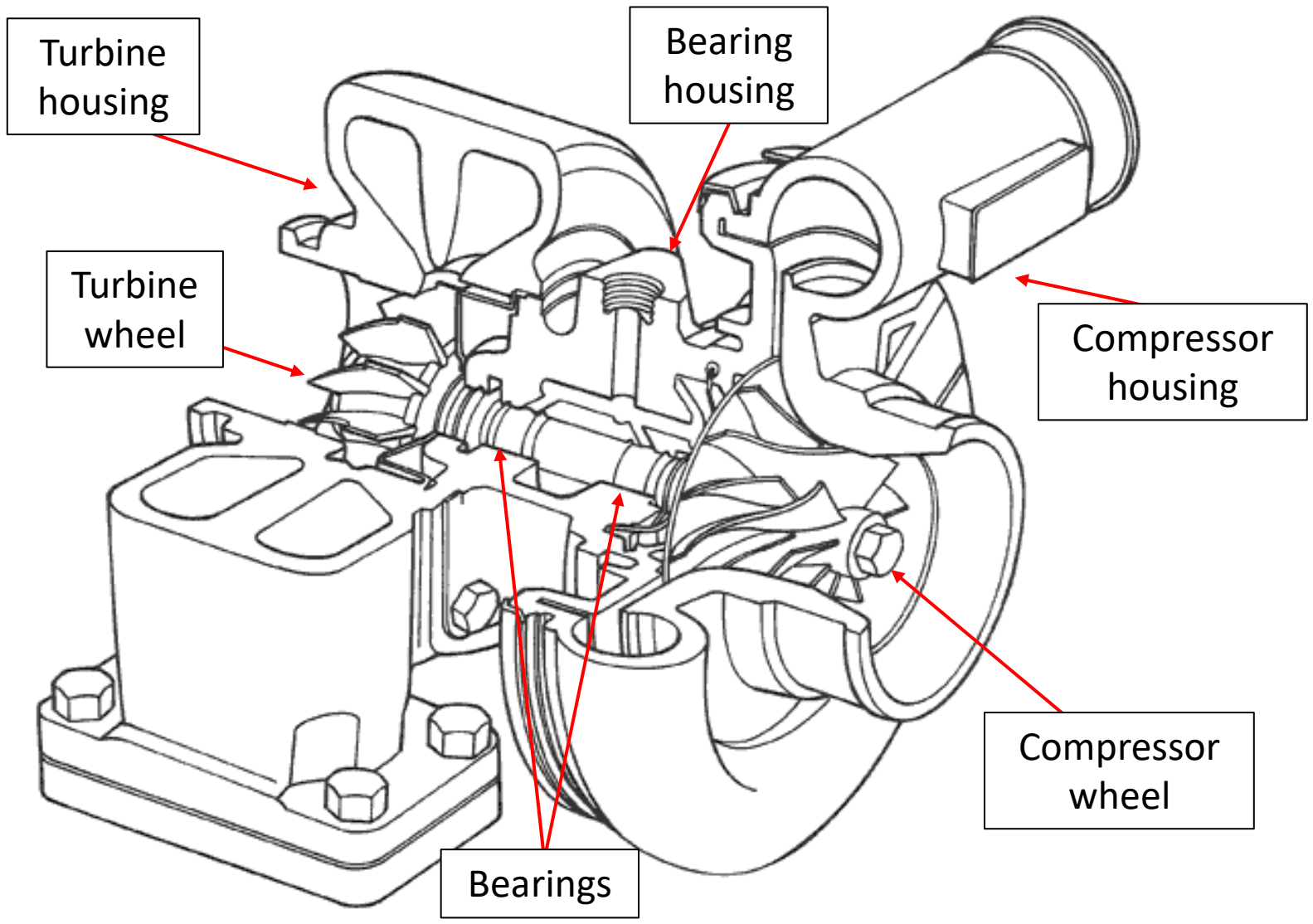
ACTIVITY

Easy

Colour the parts of the turbocharger to show how hot they get.

Use this key:

- **Compressor Housing = purple**
- **Compressor Wheel = dark blue**
- **Bearing Housing = light blue**
- **Bearings = yellow**
- **Turbine Housing = orange**
- **Turbine Wheel = red**



Turbocharger Materials

Turbo Technologies

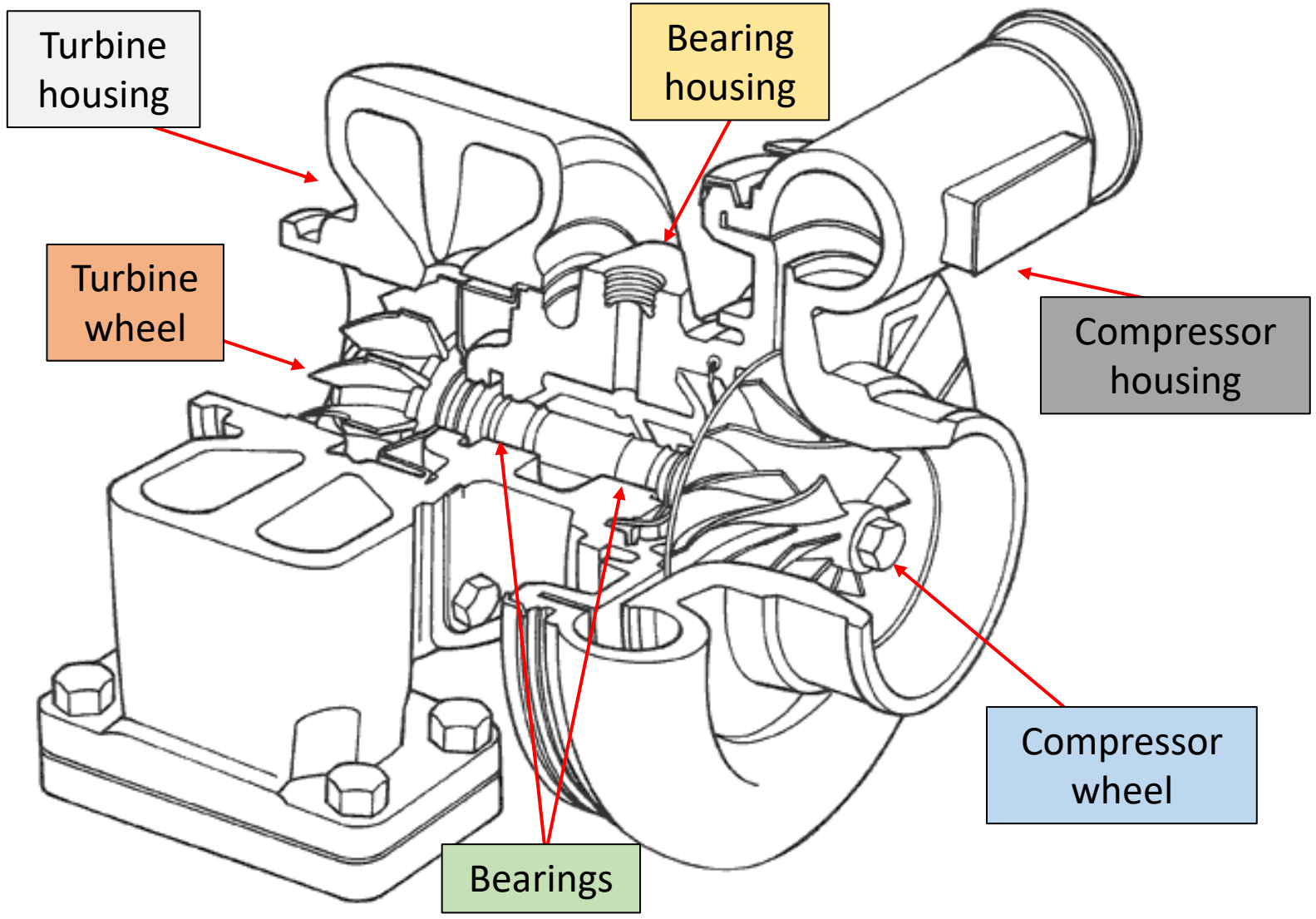
ACTIVITY

Hard

Match the materials to the parts of the turbocharger using the information on the next slide.

Shade the boxes the same colour to show your match.

- High Strength Aluminium
- Ductile Iron
- Bronze
- Grey Iron
- Nickel Alloy
- Aluminium



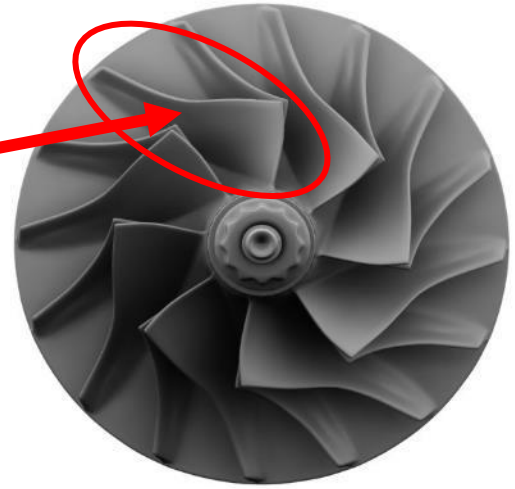
Turbocharger Materials

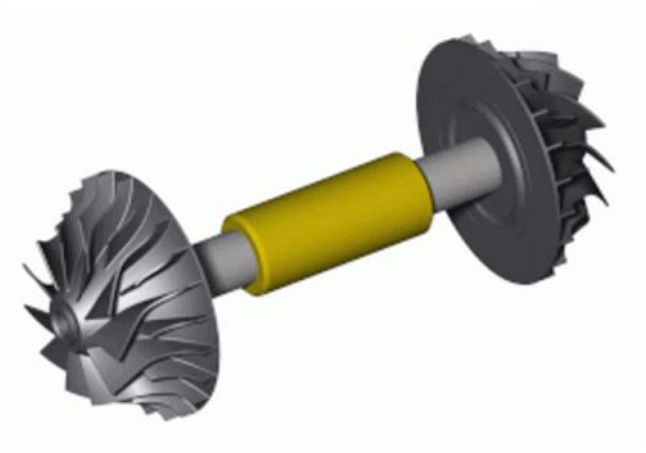
Cummins Turbo Technologies

Material	Facts
High Strength Aluminium	Not very good in hot temperatures. Light weight, strong material. **Good for parts that need to spin.**
Ductile Iron	Stays hard at high temperatures. Heavy material. Bends rather than snaps (ductile).
Bronze	Not very good in hot temperatures. Special properties good for **keeping things in balance when spinning**.
Grey Iron	Stays hard at high temperatures. Snaps rather than bends (brittle). **Can cut very tricky shapes into it.**
Nickel Alloy	Stays hard at high temperatures. Very strong material. Heavy material. **Good for parts that need to spin.**
Aluminium	Not very good in hot temperatures. Light weight material. Bends rather than snaps (ductile).

Shapes in Nature

Helicopter Seeds

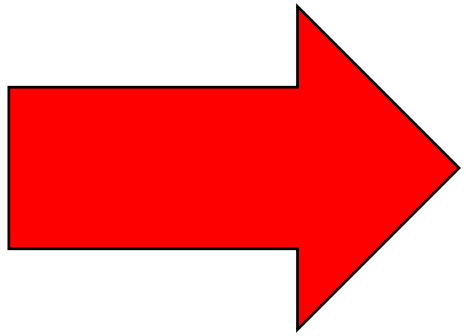




Compressor Wheel

Shapes in Nature

Snail Shell

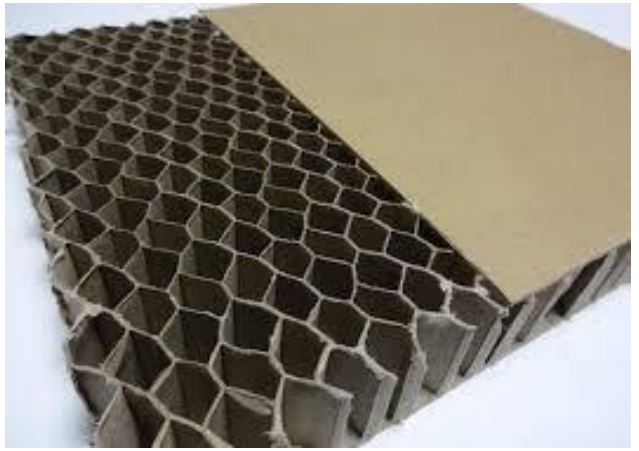


Turbo Housing

Shapes in Nature

Honeycomb

Buildings

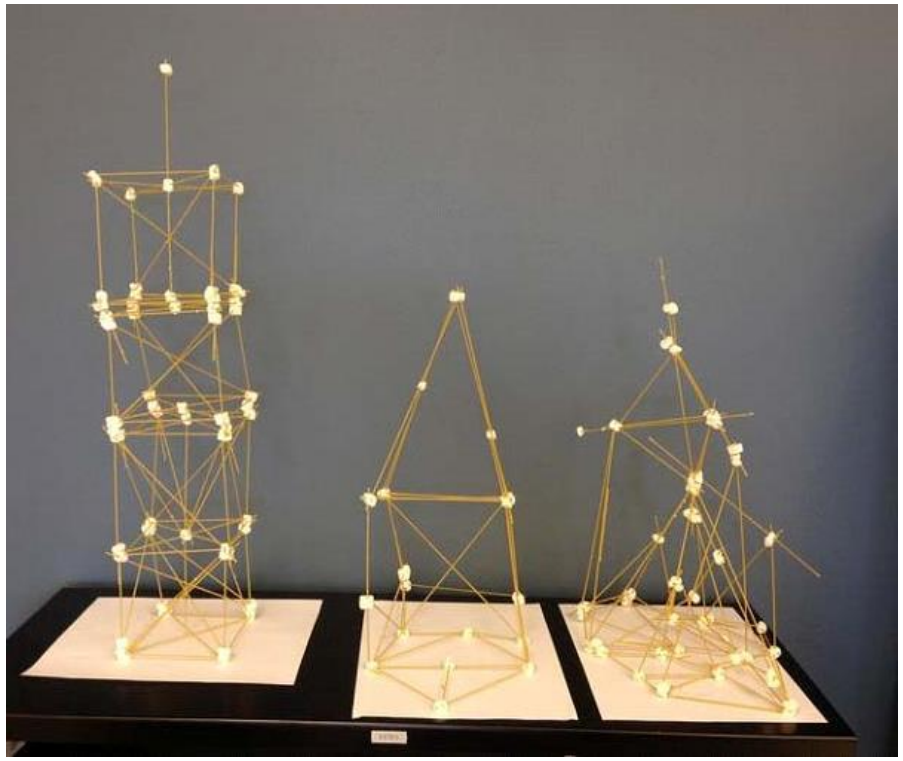


Cardboard

Strong Spaghetti Structures

ACTIVITY

Build the tallest, strongest structure that you can – using only spaghetti and marshmallows!



SOURCE: https://www.madaboutscience.com.au/shop/science-extra/post/spaghetti-and-marshmallow-tower

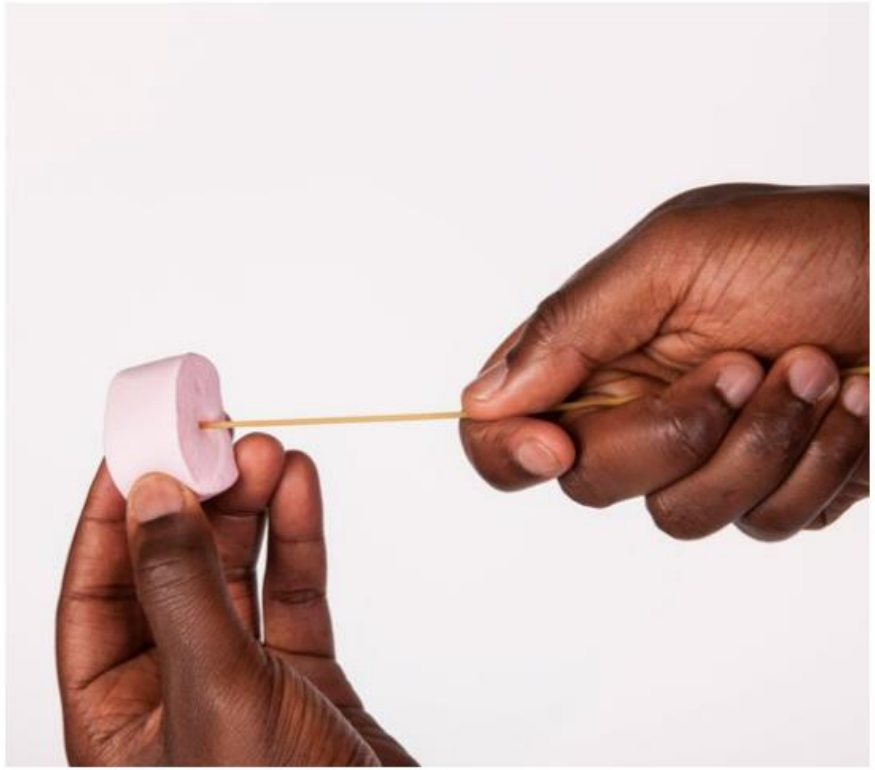
Strong Spaghetti Structures

ACTIVITY

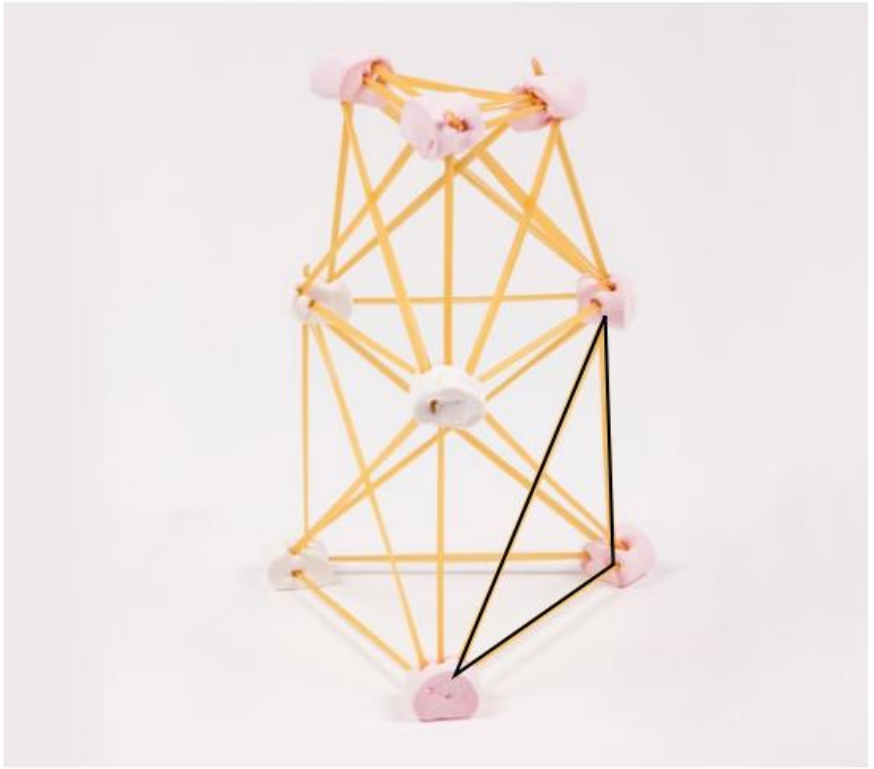
SOURCE: Science Museum Group

Strong Spaghetti Structures

ACTIVITY



1 Start building your structure by pushing a piece of spaghetti deep inside a marshmallow.

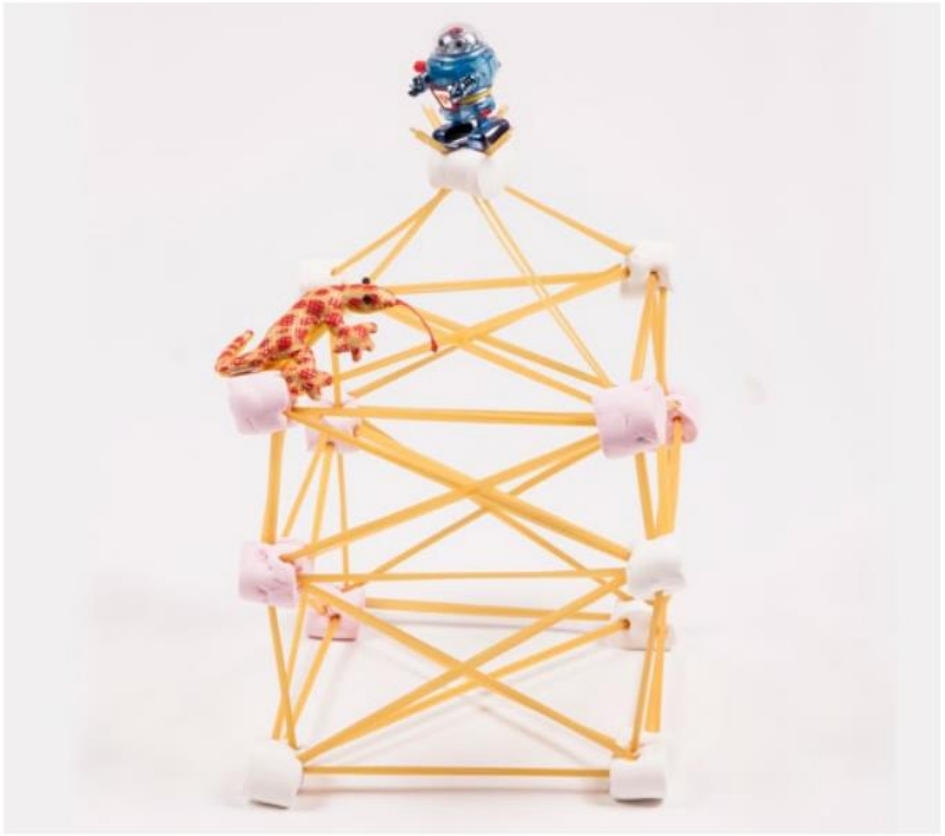


2 Keep adding spaghetti and marshmallows to build a structure however you want. But remember that triangle shapes are very strong.

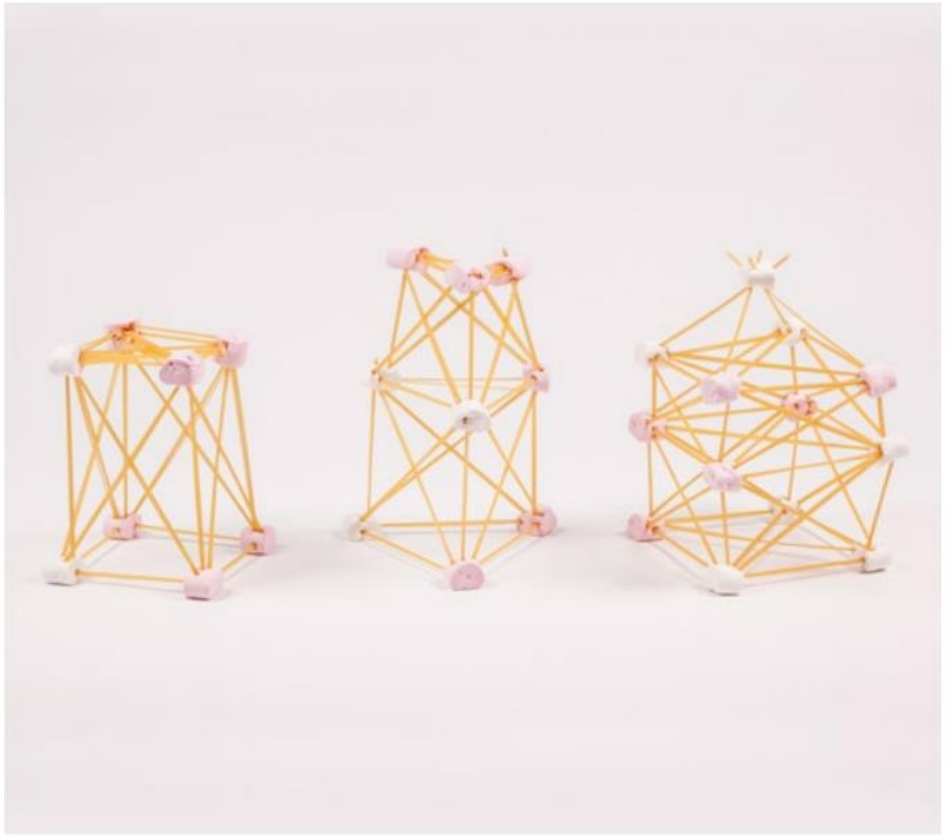
SOURCE: Science Museum Group

Strong Spaghetti Structures

ACTIVITY



3 Test your structure's strength by balancing objects on top of it.



4 Try making structures that have different shapes, and see which one is strongest.

SOURCE: Science Museum Group

Strong Spaghetti Structures

ACTIVITY

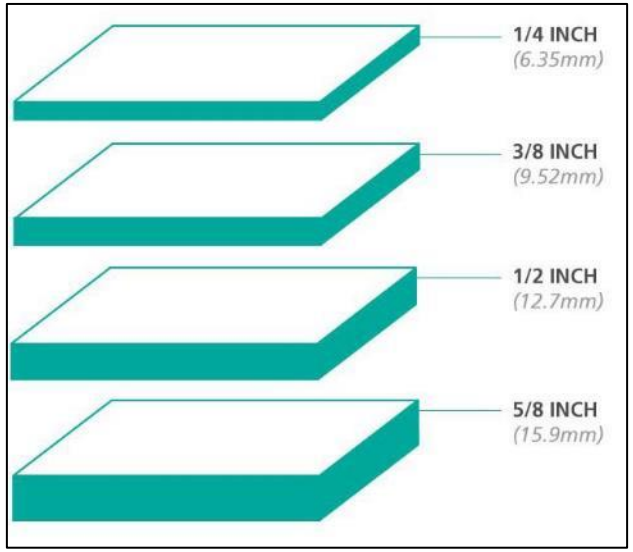
Questions to think about:

1. What happens to the strength of the tower when you use 2 spaghetti sticks at a time instead of 1? ***Gets stronger***
2. What shapes did you use in your tower? What shapes would be even stronger? ***Triangle is a very strong shape***
3. Can you make your tower stronger by replacing the spaghetti with a different material? ***Try using pencils or toothpicks***
4. What happens when we use ONLY right angles between pieces of spaghetti? ***Should be stronger as it is structured evenly***

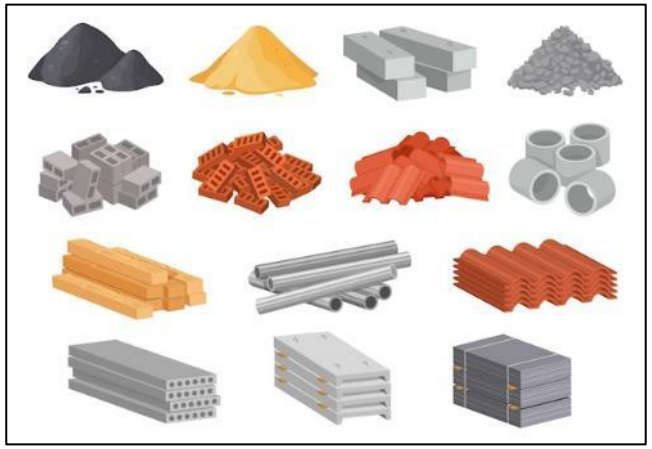
SOURCE: Science Museum Group

Improving Designs

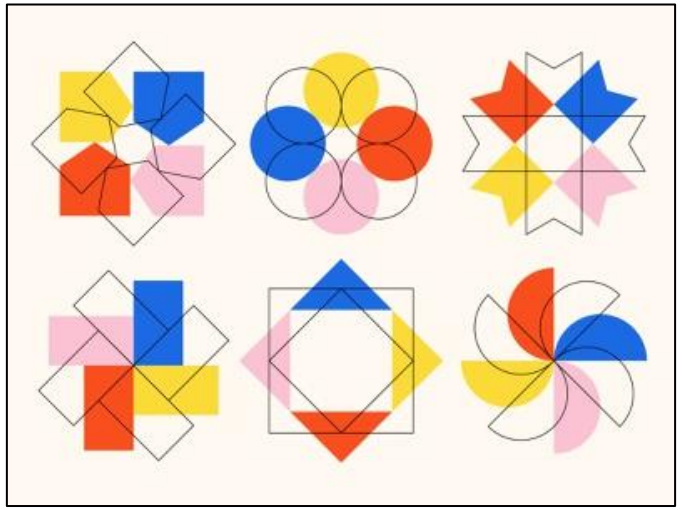
Here are some ways engineers improve designs:



Thickness



Material

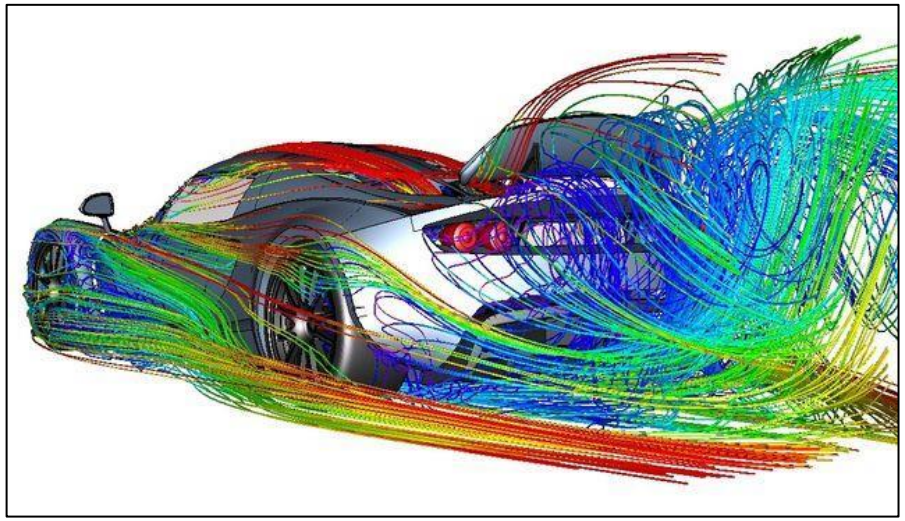


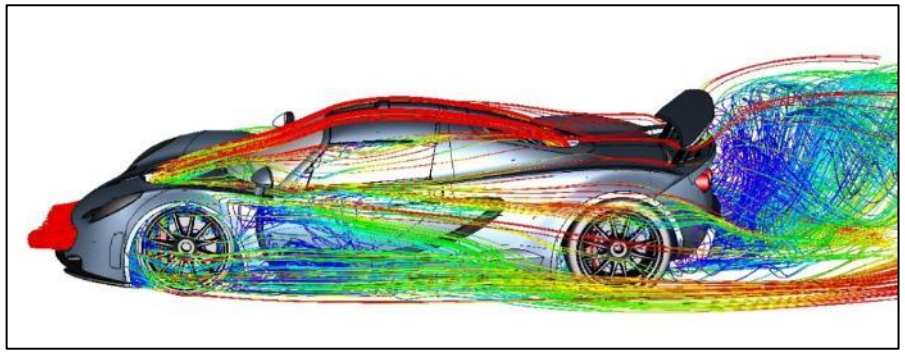
Shape

Manufacturing (How is it made?)

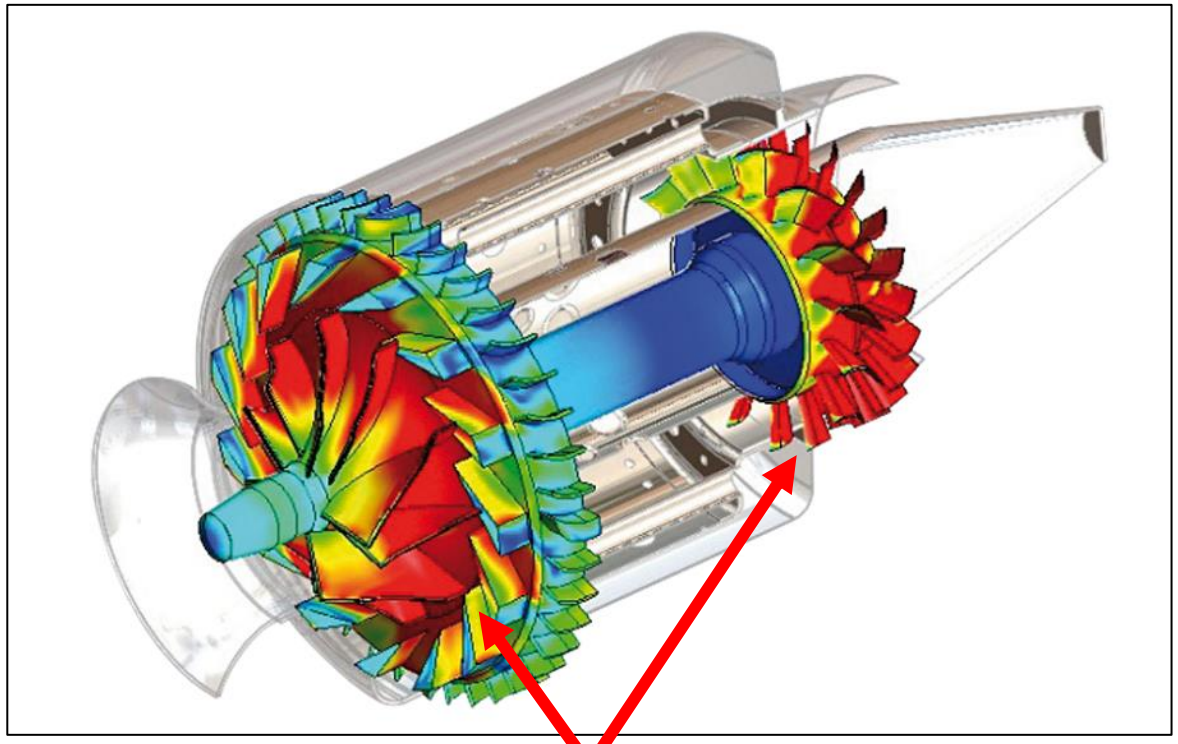
Engineering Simulations

Engineers use computer simulations to see if designs work properly





We can see how the air moves around a really fast car!

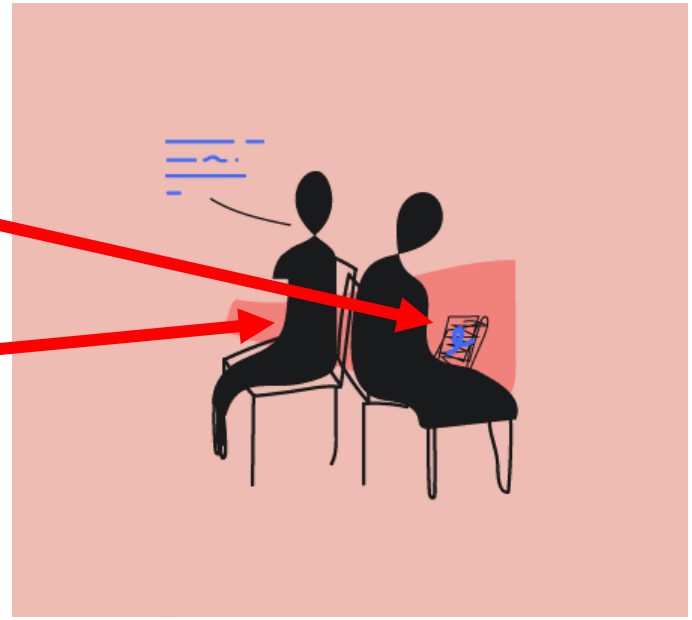


We can see which part of the turbo is under the most stress (in red) - these parts are likely to break first!

Back-to-Back Drawing Experiment

ACTIVITY

1. **Find a partner and sit back-to-back**
2. **Partner 1 will have a picture in front of them**
3. **Partner 2 must draw the picture ONLY listening to their partner (you can't look!)**



Try using these phrases to communicate:

To the right of… Underneath… On top of…

This is smaller than… This is thinner than…

The line is smooth… The line is spiky… The line curves until…

Back-to-Back Drawing Experiment

ACTIVITY

Questions to think about for partner 1:

1. Which part of the drawing did you find hard to describe?

2. Were there phrases you found most useful?

3. Which is best for communication – pictures or words?

Questions to think about for partner 2:

1. What part of the drawing did you get most accurate?

2. What did you wish your partner had said to make it clearer?

3. Which is best for communication – pictures or words?

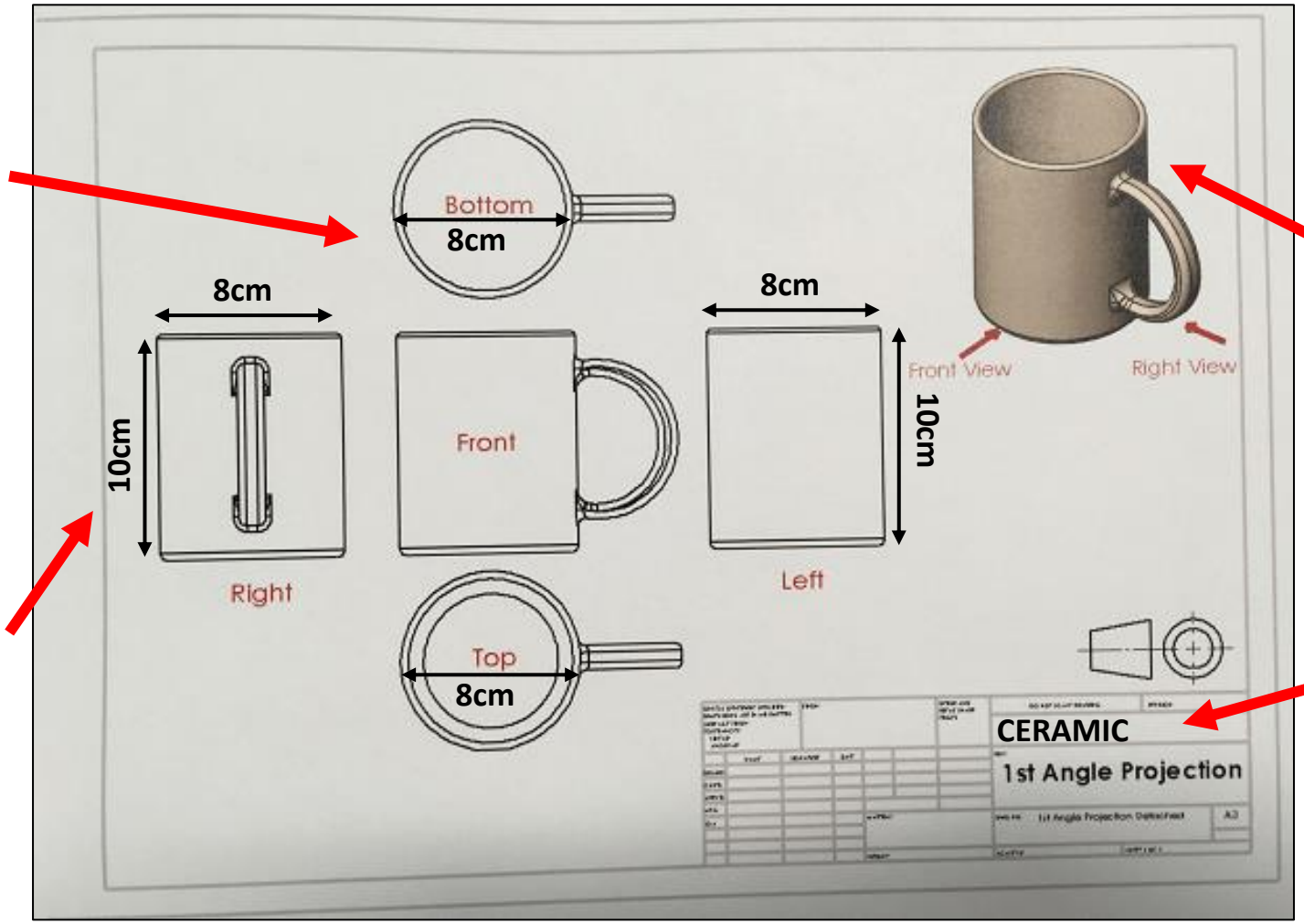
Children should find that pictures are better at describing things!

How do Engineers Communicate?

Engineers use pictures!

Engineers use 2D Drawings to show each VIEW

Engineers use measurements to show its exact size



Engineers use 3D Models to show how it looks altogether

Engineers show the material it is made from

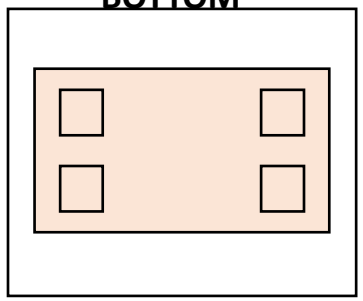
Table Engineering Drawing

Hard

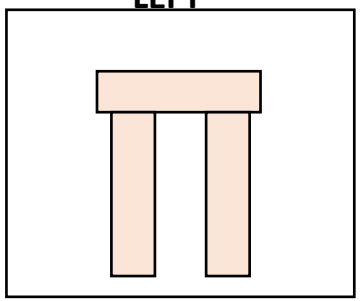
ACTIVITY

Make your own engineering drawing of this table!

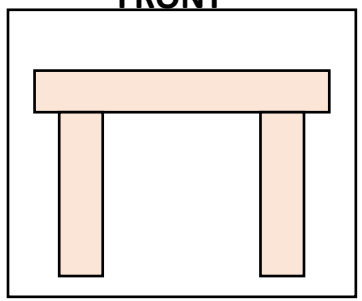
BOTTOM



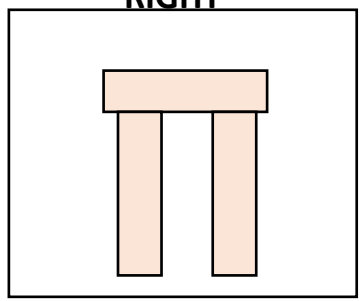
LEFT



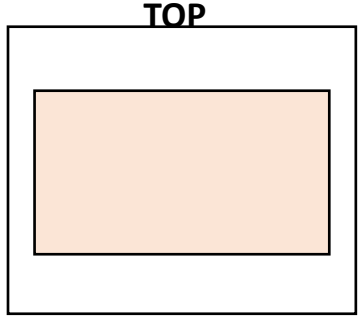
FRONT

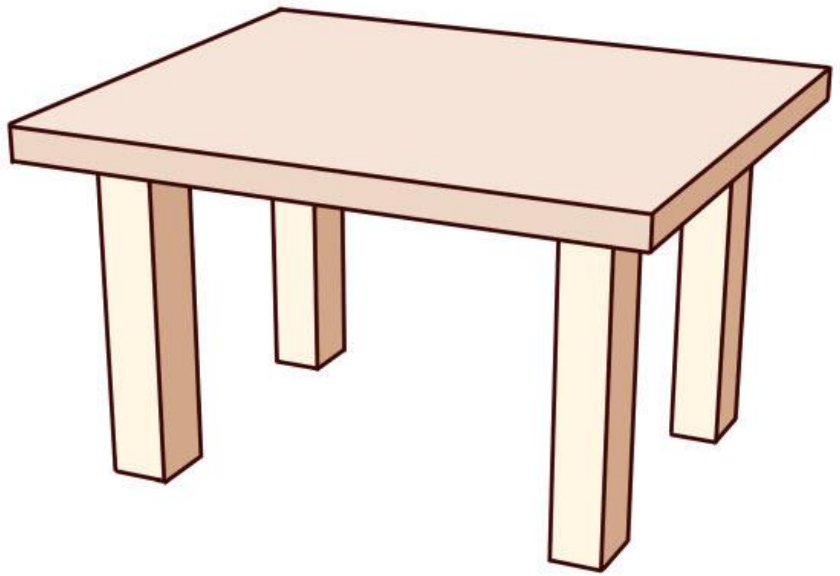


RIGHT



TOP





OBJECT:	MADE BY:
MATERIAL:	DATE:

Could you be an engineer?

Engineering is all about creating a great design, and then communicating it so it can be made AGAIN and AGAIN!

There are no limits to what you can create!