

Animal Adaptations and Habitats Activity Pack

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Public

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!

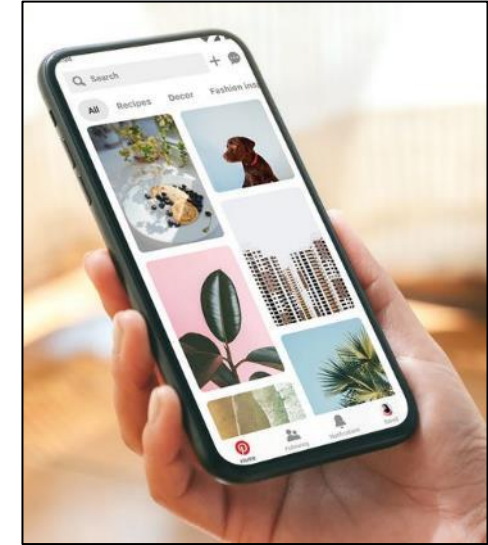
Plants, animals and nature sites are all **natural designs**. They have been perfected over thousands of years!



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?



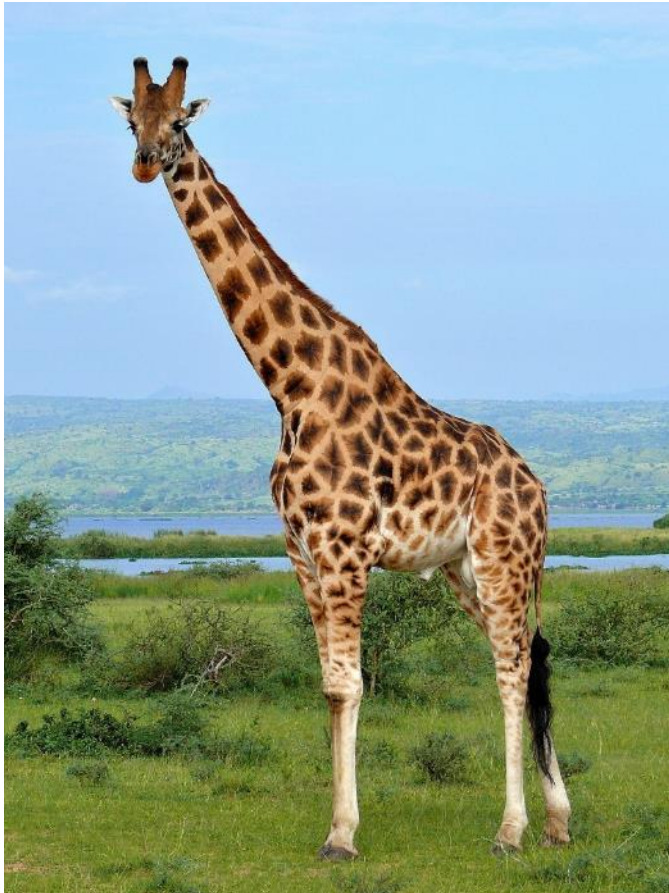
What makes a GOOD design?



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



What are the differences in design between these two animals?



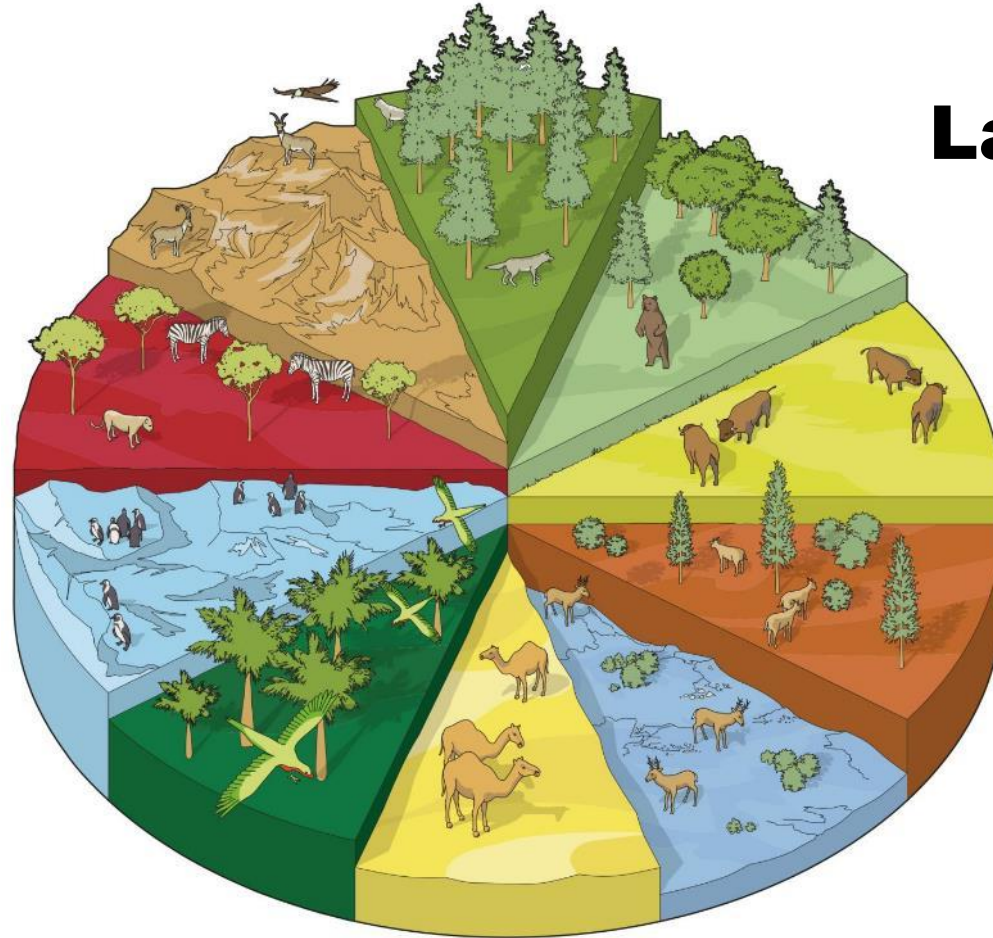
What are the differences in design between these two animals?



Why are these animals different?

Strong or fast?

Land, Air or Water?

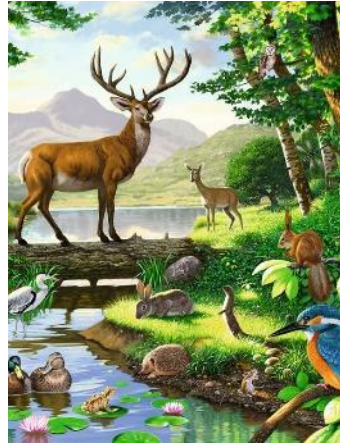


Big or small?

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**

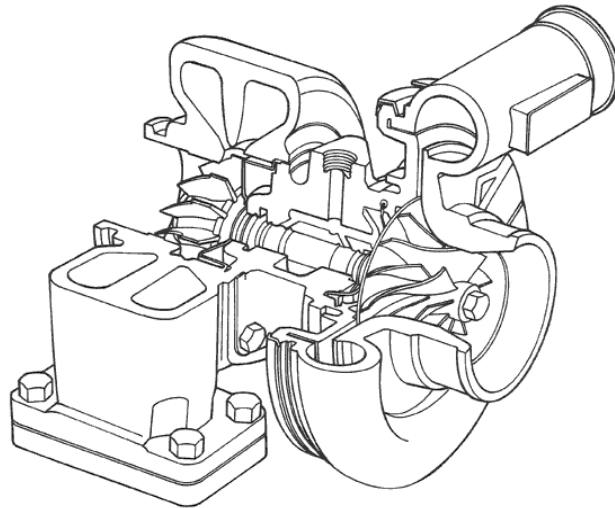
Purpose

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!

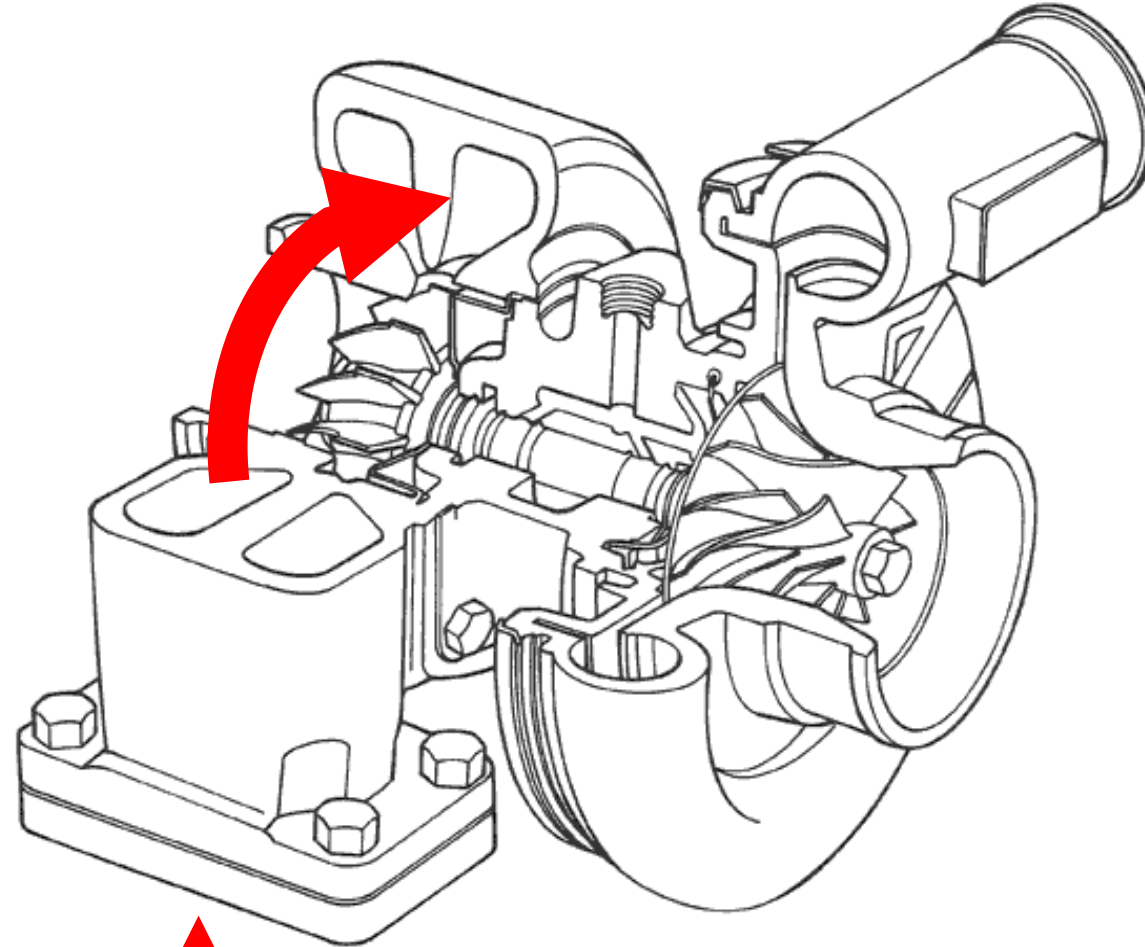
Just like the running man, a turbocharger brings more air to the engine, so it has more **POWER**



Where are our turbochargers used?



What is a Turbocharger?

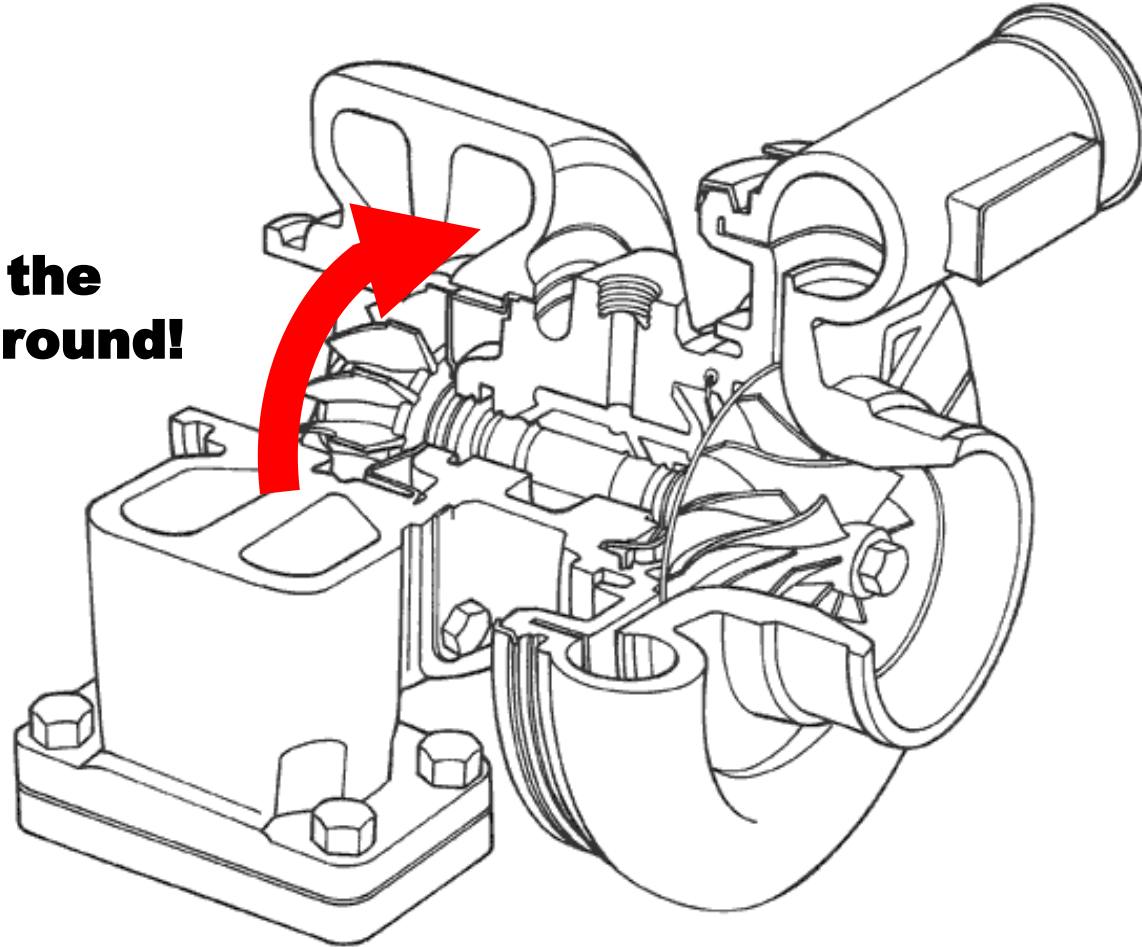


1) Waste air from engine flows to the turbine

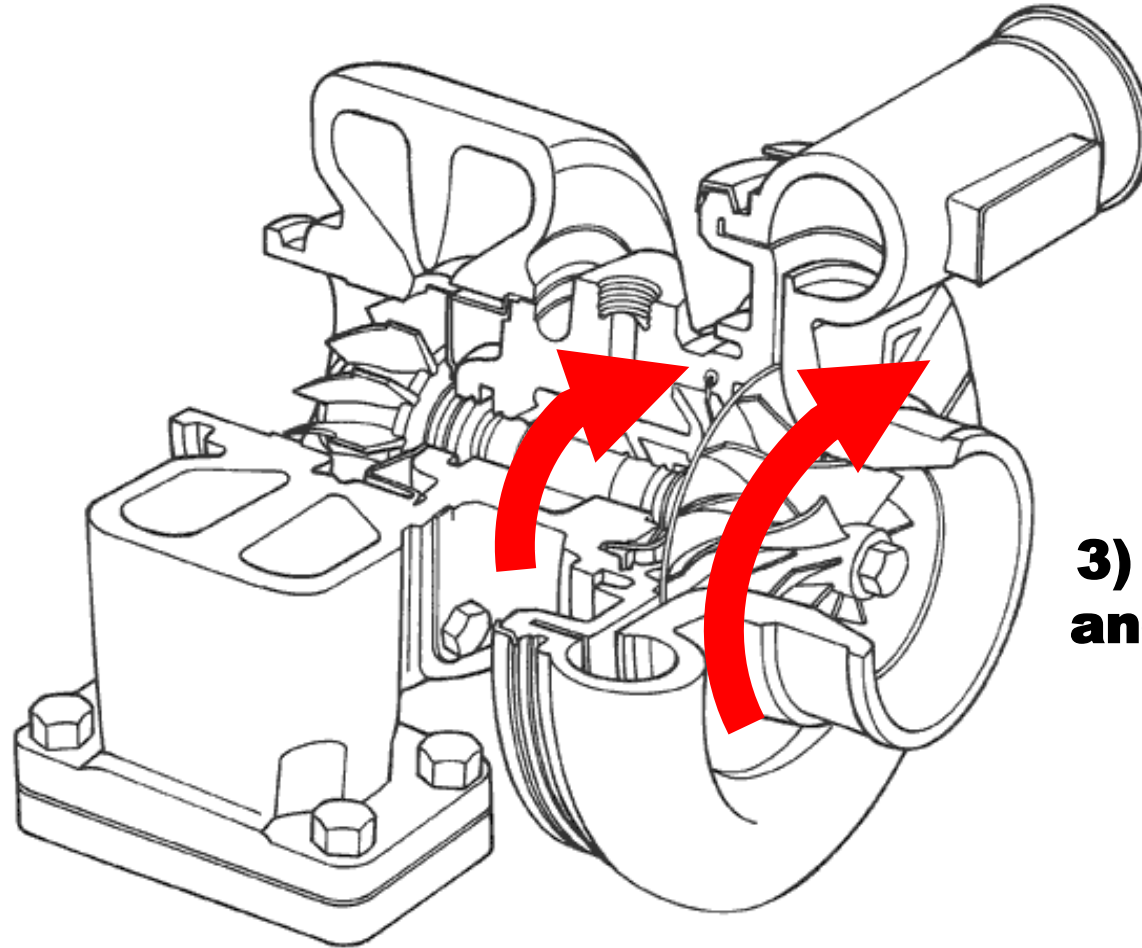
What is a Turbocharger?



2) Air causes the turbine to spin around!



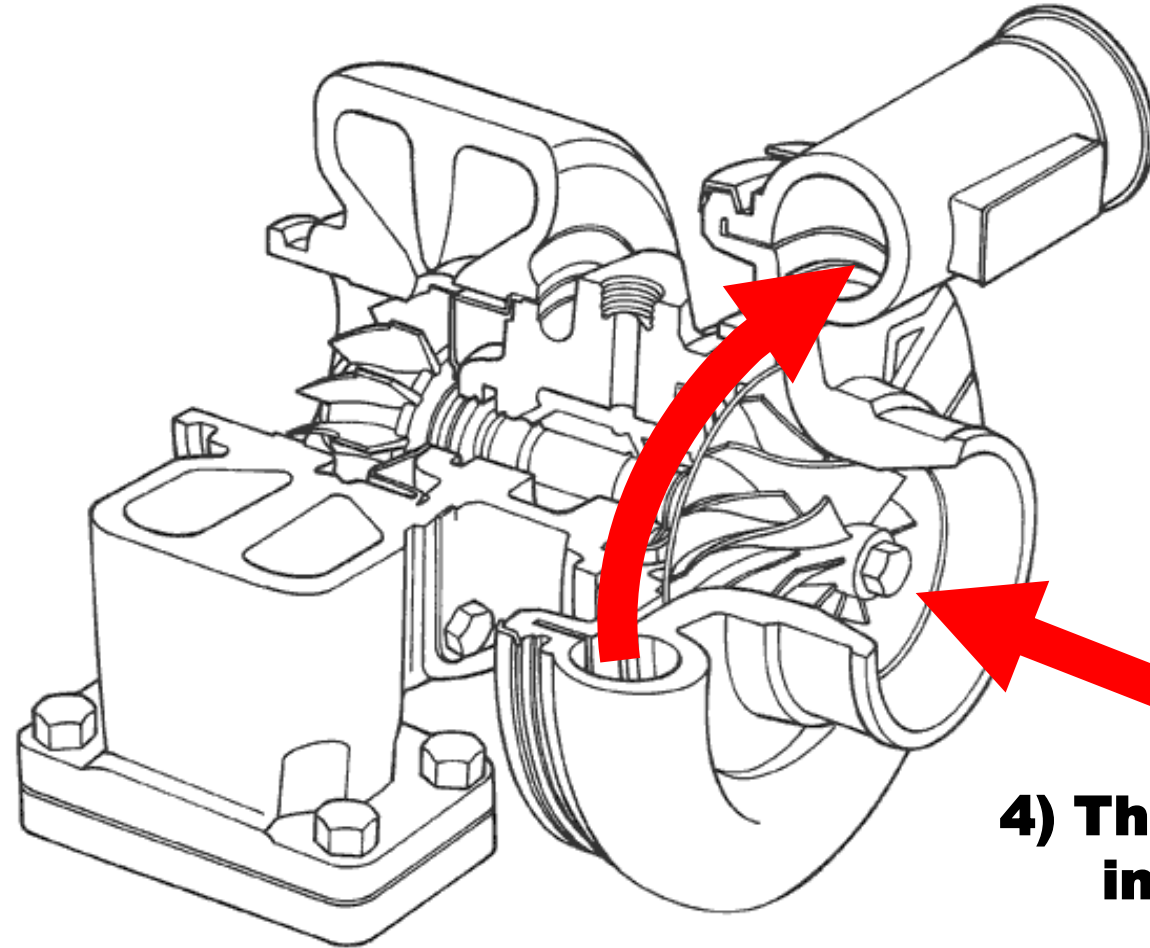
What is a Turbocharger?



3) This spins the shaft and compressor wheel

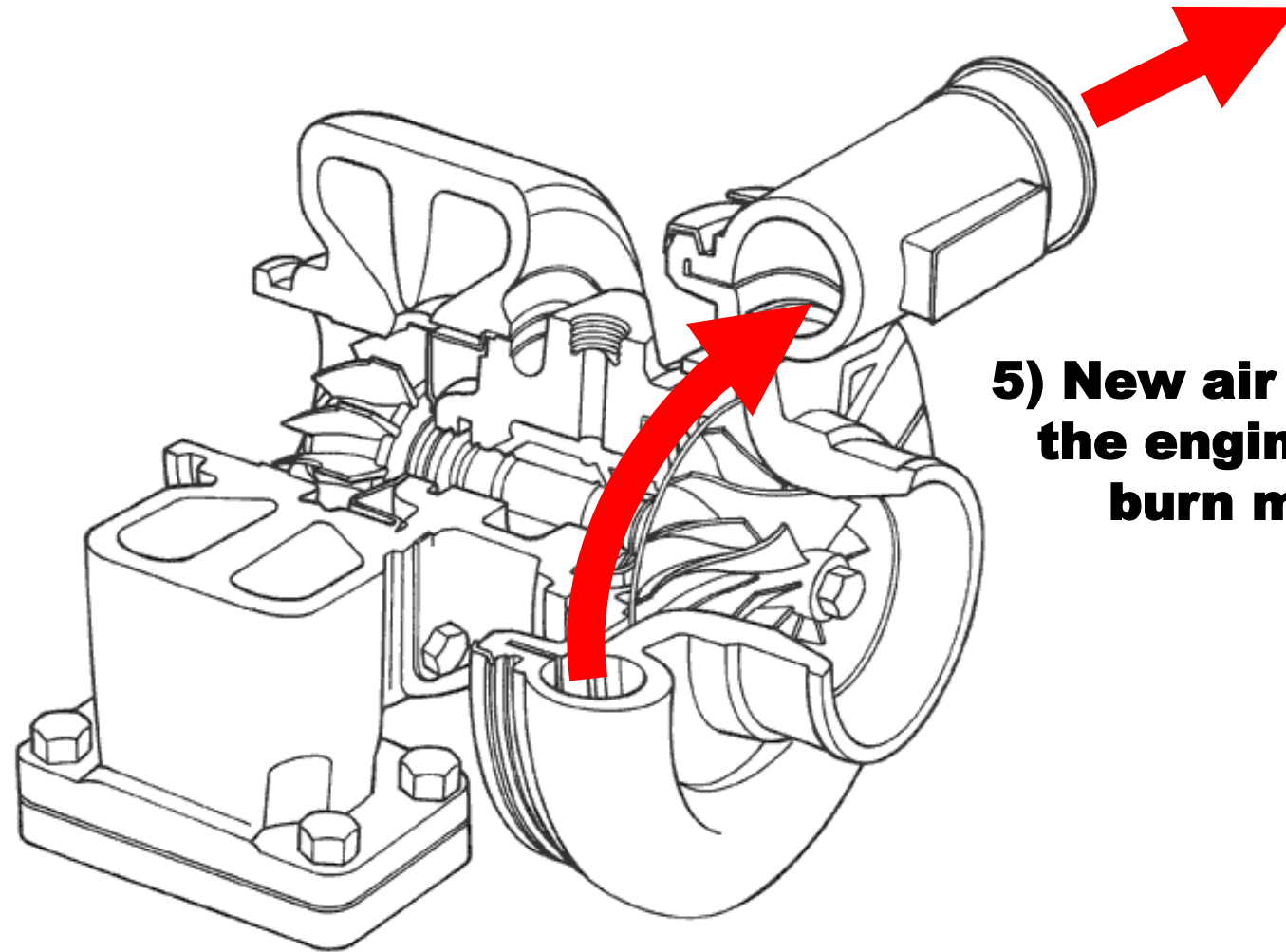


What is a Turbocharger?



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

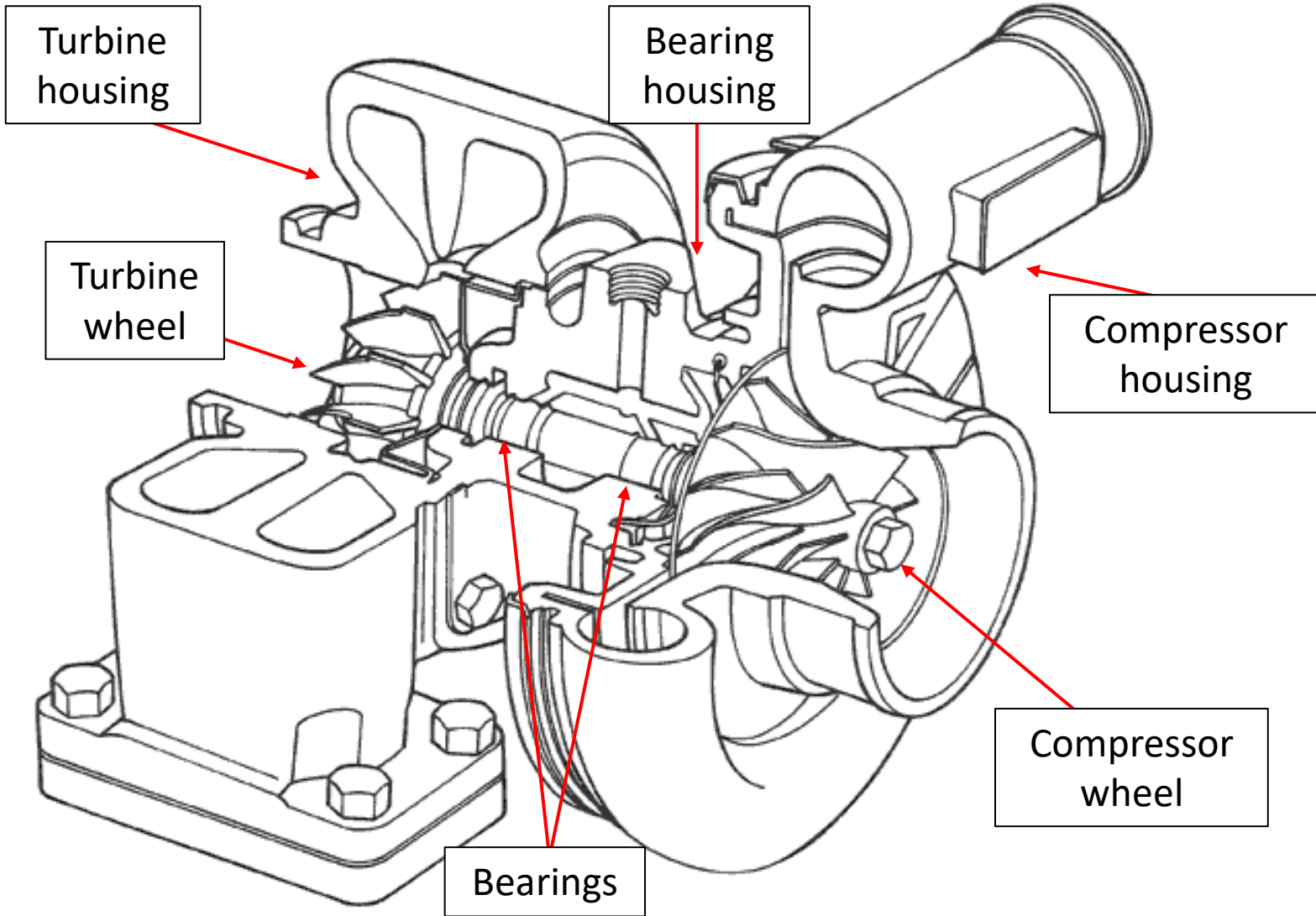
★ ACTIVITY



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**



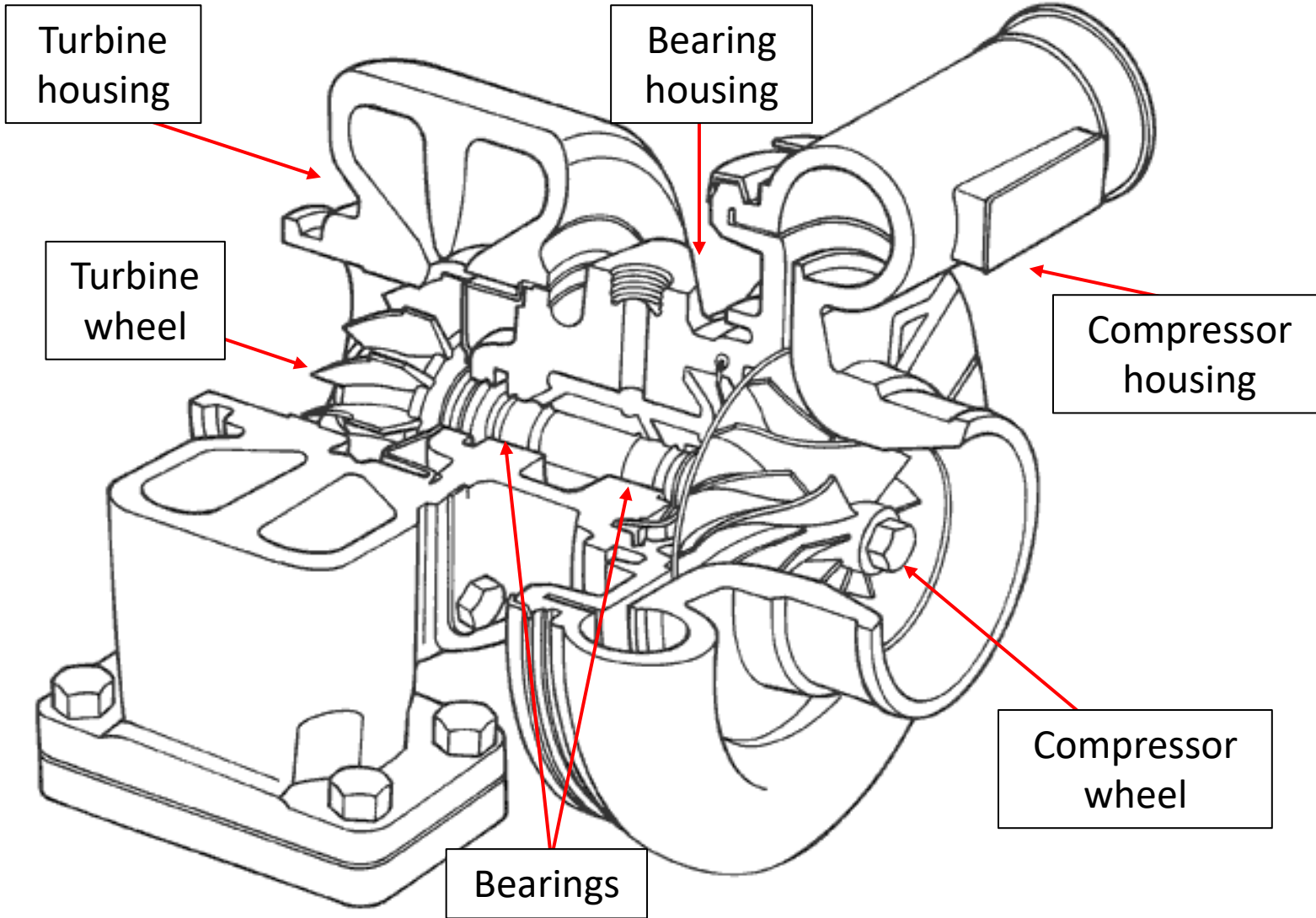
Turbocharger Materials

★ ACTIVITY



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

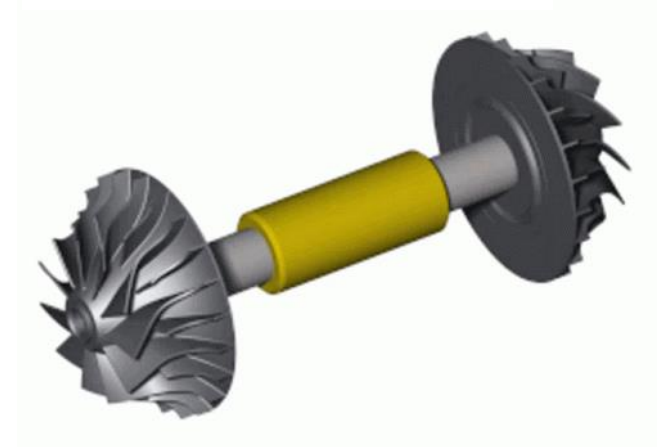
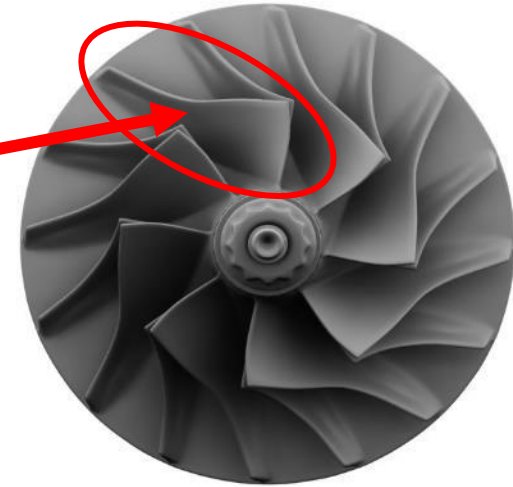
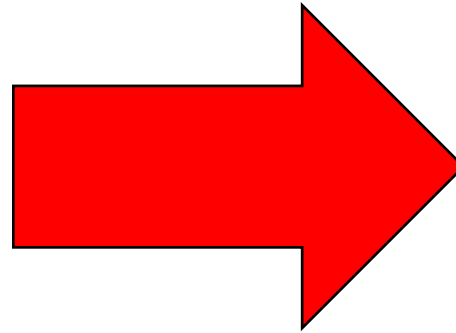


Material	Facts
High Strength Aluminium	Not very good in hot temperatures. Light weight, strong material. Good for parts that need to spin.
Ductile Iron	Stays hard at high temperatures. Heavy material. Bends rather than snaps (ductile).
Bronze	Not very good in hot temperatures. Special properties good 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

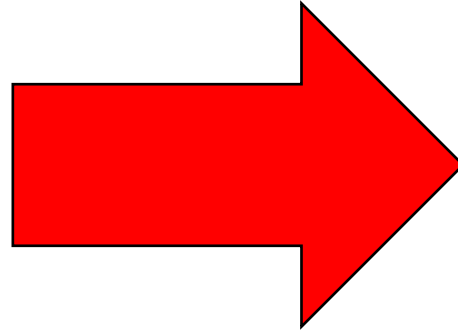


Compressor Wheel

Shapes in Nature



Snail Shell

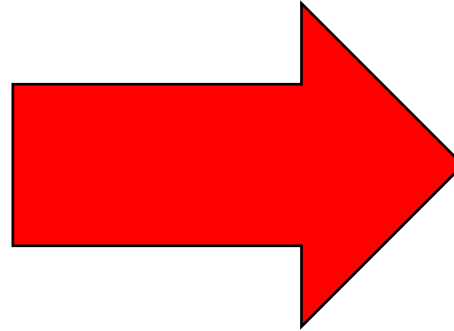


Turbo Housing

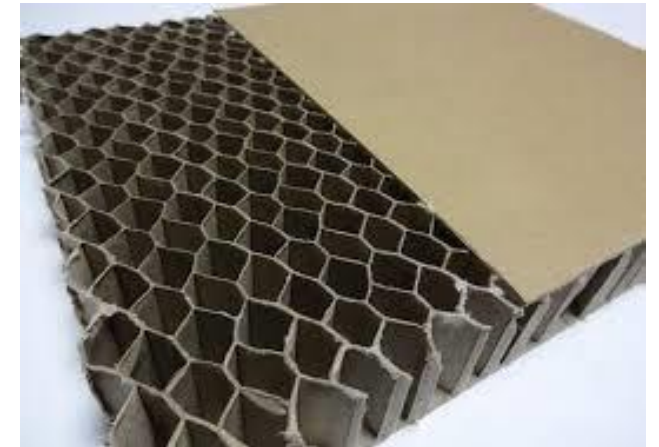
Shapes in Nature



Honeycomb



Buildings

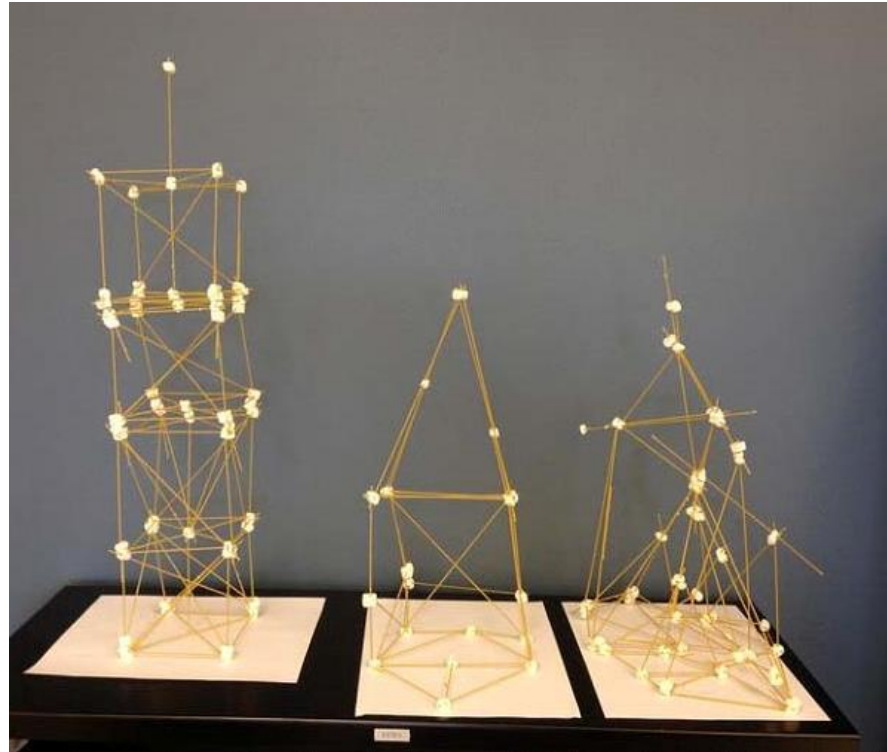


Cardboard

Strong Spaghetti Structures

★ ACTIVITY

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



Strong Spaghetti Structures

★ ACTIVITY

You will need...



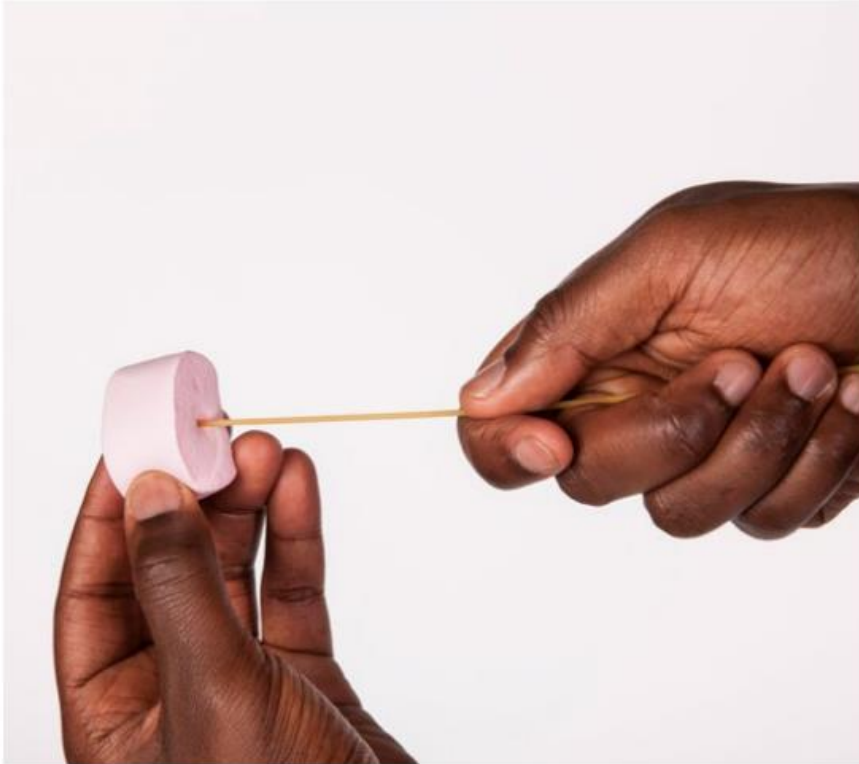
Uncooked spaghetti



Marshmallows

Strong Spaghetti Structures

★ ACTIVITY



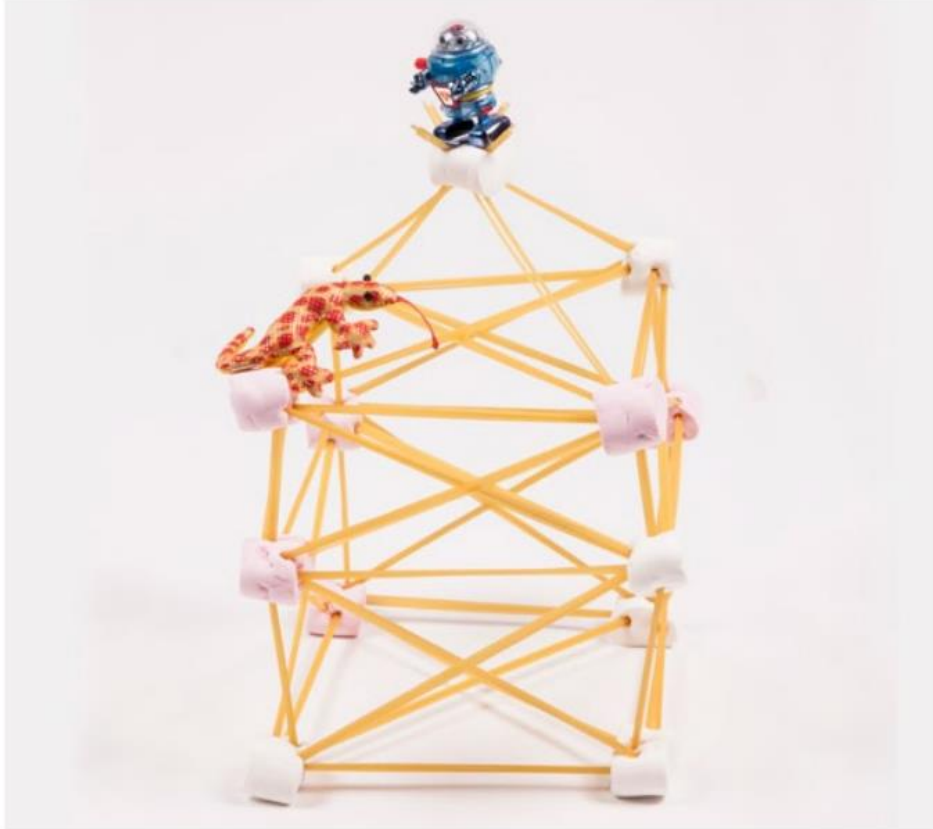
1 Start building your structure by pushing a piece of spaghetti deep inside a marshmallow.



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

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.

Strong Spaghetti Structures

ACTIVITY

Questions to think about:

☆☆☆
Easy

1. What happens to the strength of the tower when you use 2 spaghetti sticks at a time instead of 1?

☆☆☆
Medium

2. What shapes did you use in your tower? What shapes would be even stronger?

☆☆☆
Medium

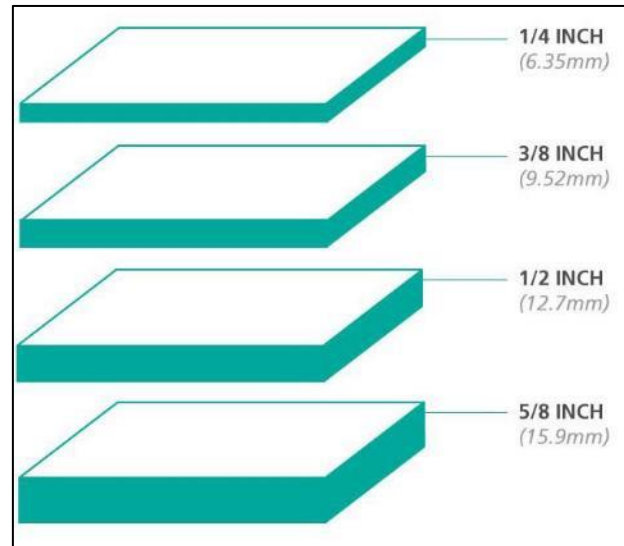
3. Can you make your tower stronger by replacing the spaghetti with a different material?

☆☆☆
Hard

4. What happens when we use **ONLY** right angles between pieces of spaghetti?

Improving Designs

Here are some ways engineers improve designs:



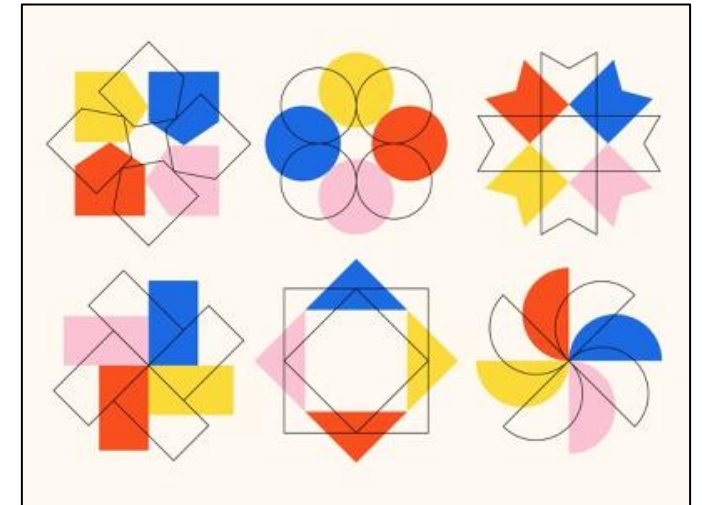
Thickness



Material



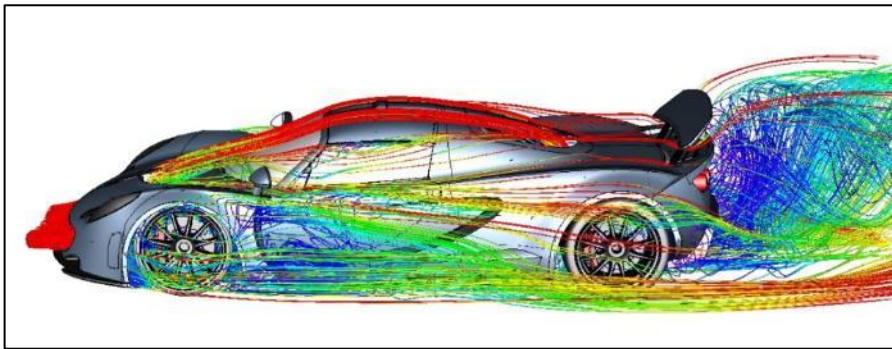
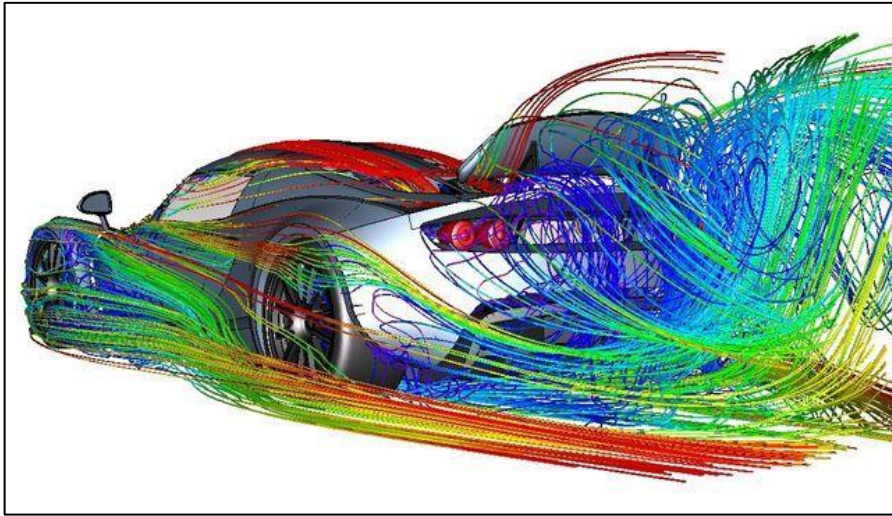
Manufacturing (How is it made?)



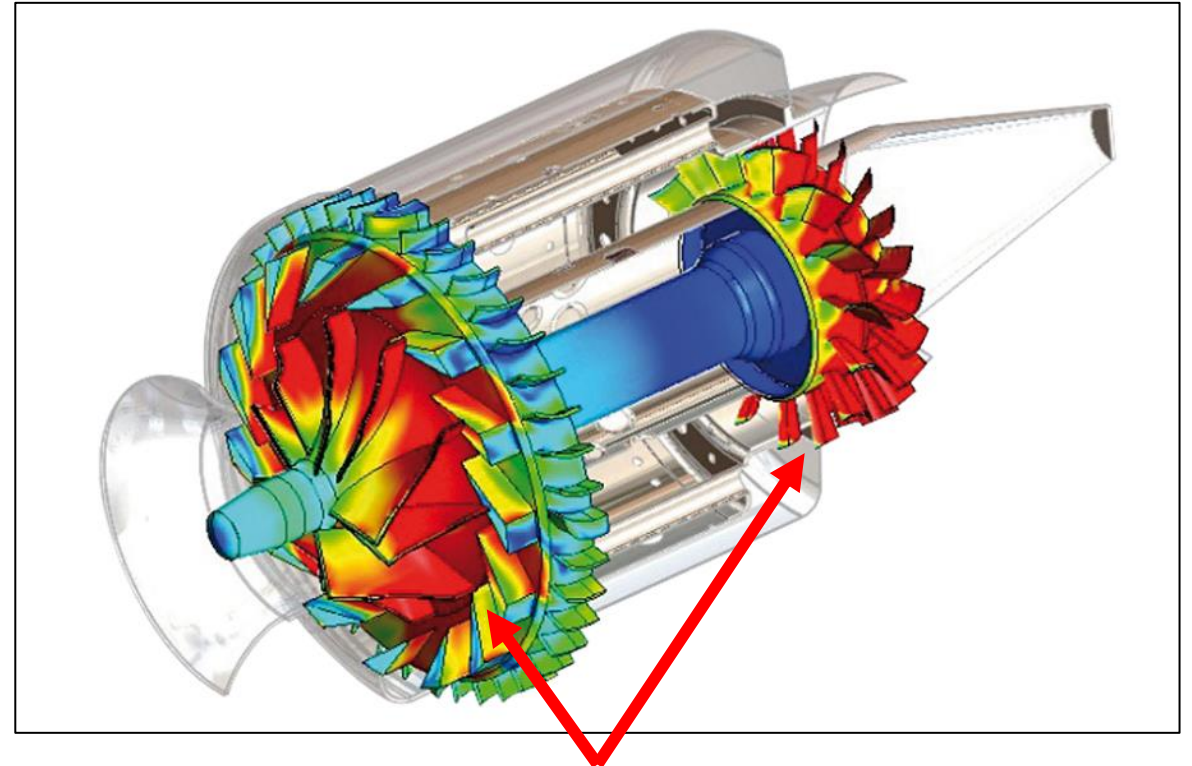
Shape

Engineering Simulations

Engineers use computer simulations to see if designs work properly



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

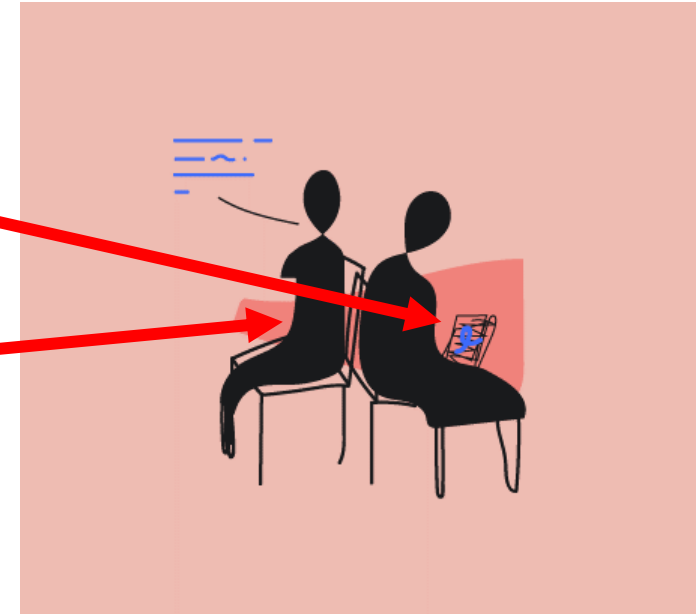


We can see which part of the turbo is under the most stress (in red) - these parts are likely to break first!

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?



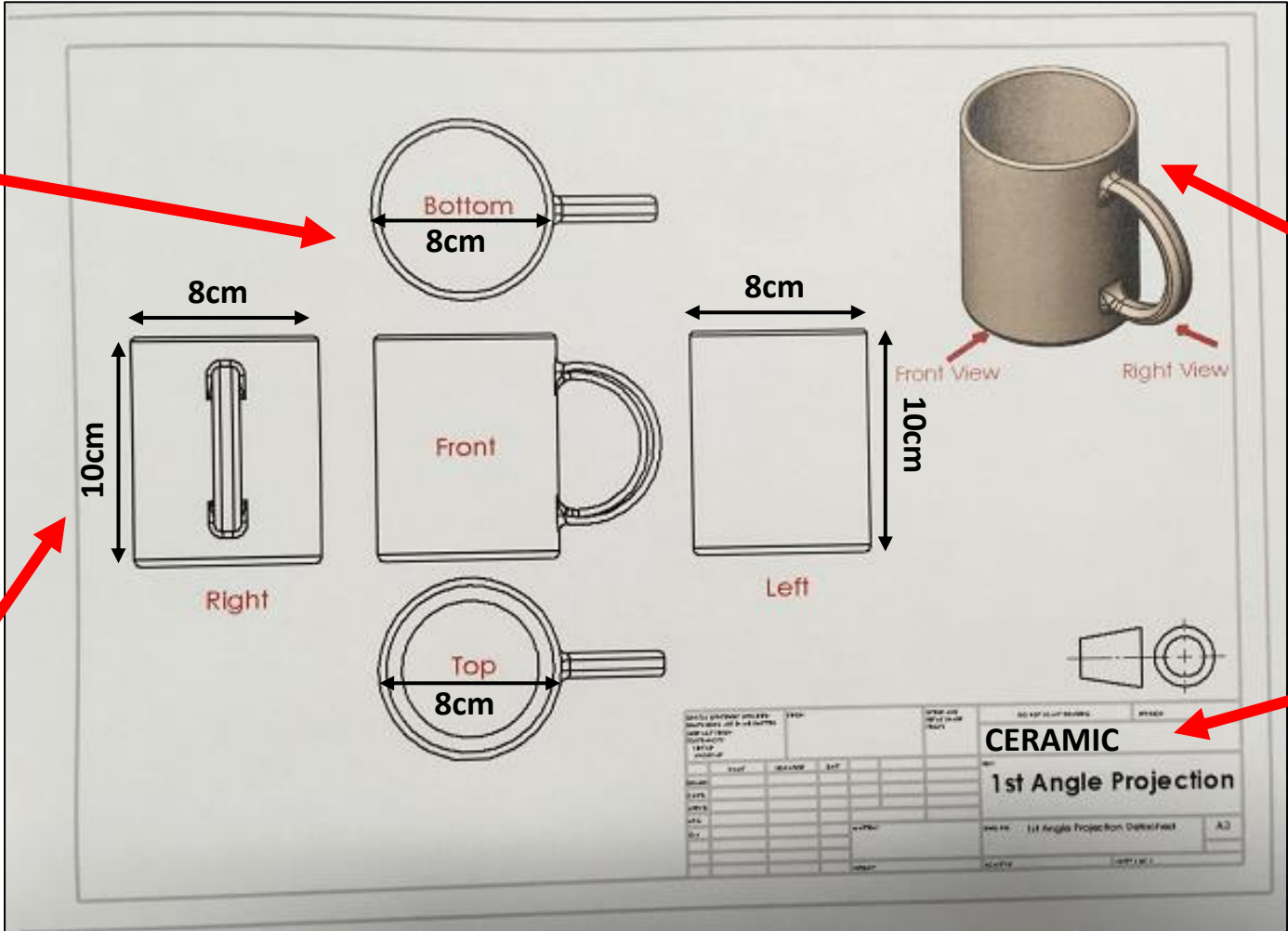
3. Which is best for communication – pictures or words?

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

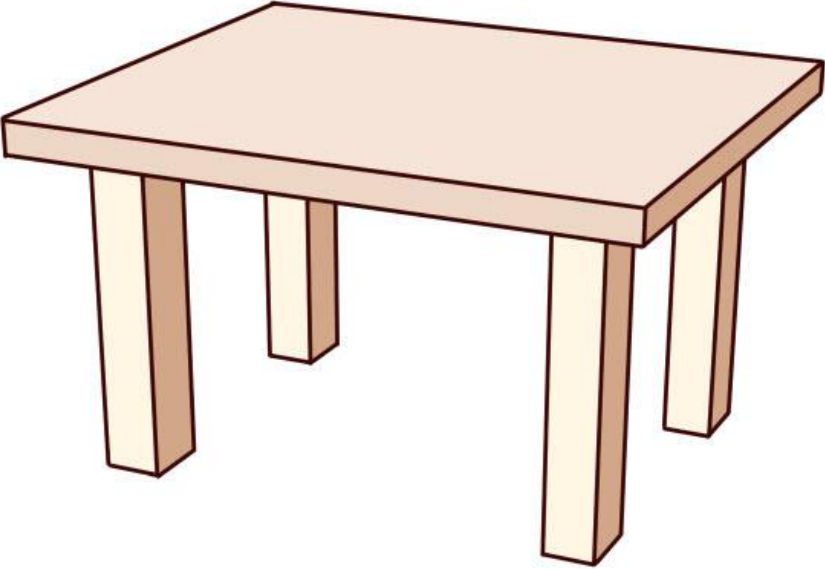
Engineers show the **material** it is made from

Table Engineering Drawing



★ ACTIVITY

Make your own engineering drawing of this table!

<p>BOTTOM</p>		<p>RIGHT</p>	
<p>LEFT</p>	<p>FRONT</p>		
<p>TOP</p>		<p>OBJECT:</p>	<p>MADE BY:</p>
		<p>MATERIAL:</p>	<p>DATE:</p>

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!

