



# LOOK



I'm an Engineer

Try these exciting projects



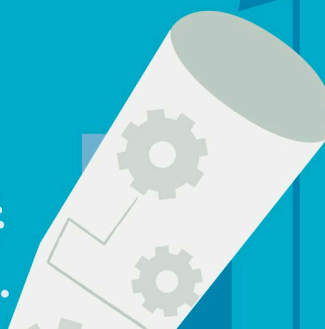
Make!



Tinker!



Build!





LOOK

I'm an Engineer





# For the grown-ups

This book is full of hands-on activities that will tap straight into your child's natural scientific curiosity and engineering creativity. Each activity is designed to let your child play and learn with all their senses. Together, you can grow their love of science, their engineering ingenuity, and their understanding of the world.

## Here are a few tips to help you along the way:

Your child should be supervised at all times when conducting these experiments, but try to give them time and space to lead the direction of play. The questions in this book are suggestions. Let your child ask their own questions, and try out their own ideas.

Involve your child in the preparation of each activity. Let them follow the instructions but also let them try out their own ideas and explore the investigations in ways that they find interesting. You never know what they might discover!

**Adult Alert** stars show where your child will need extra grown-up help.

Protect the area where your child will be playing and encourage them to wear old clothes. Being prepared lets your child enjoy themselves to their fullest. Making a mess is part of the fun and learning!



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House

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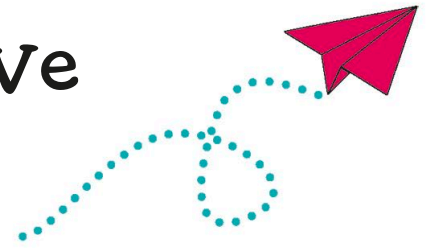


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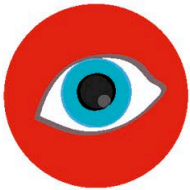




# Little minds have big ideas!



You don't need **safety boots, a yellow hard hat, and fancy tools** to be an awesome engineer. You already have everything you need: **your brain** and **your amazing senses!**



## Curious questions

By asking yourself engineering questions, you create better things. Here are some questions to ask yourself as you play.

- Why am I creating this?
- How can I try making it a different way?
- What can I hear, smell, see, taste, and feel?
- How can I make this even better?



# Your engineering senses



## Hearing

There are so many noises to listen to! What can you hear?



## Smell

Use your nose to find smelly clues!



## Brain

Your brain is not one of your senses, but it gathers information from them all and tries to understand it.



## Sight

Awesome engineers use their eyes to see how things work.



## Taste

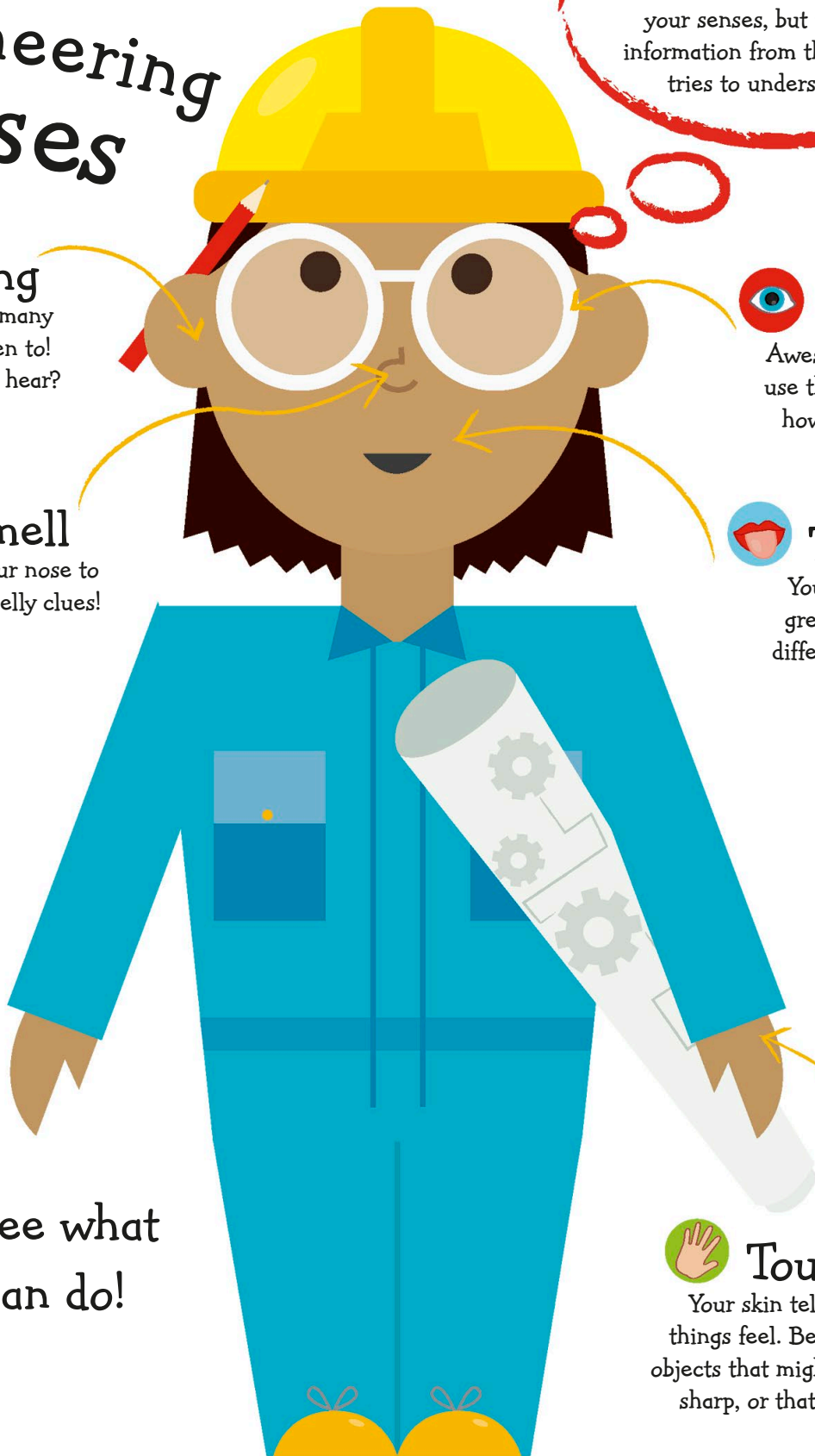
Your tongue is great at tasting different flavours.



## Touch

Your skin tells you how things feel. Be careful with objects that might be hot, cold, sharp, or that might hurt.

Let's see what  
we can do!







# Painting gravity

Gravity is the thing that **pulls** your feet back to the **ground** when you **jump**. Make this awesome **paint pendulum** to prove that **gravity** really is there.

You might want to do this outside as it can get messy!

## You will need:

paint mixed with a little water



sticky putty



ADULT ALERT!



scissors

plastic bottle with the bottom cut off



## Set your pendulum up like this

broom handle



sticky putty (to keep broom in place)

string threaded through two holes

string  
plastic bottle

sticky putty (to keep broom in place)

chairs

paint

large sheet of paper

Open the bottle cap and...



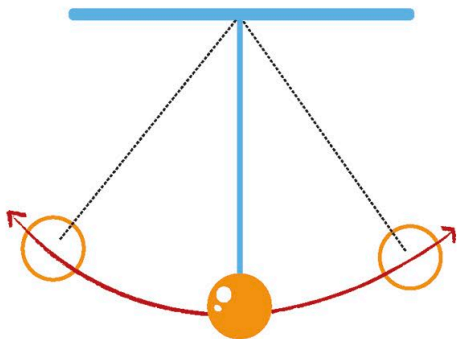
Swish!

Try changing the **colour of paint** in the bottle to make really interesting **patterns**.

...swing your pendulum!

## What's a pendulum?

A pendulum is a **heavy** thing at the end of a string. If you **push** it, it **swings** away. It then **swings back**, because **gravity pulls** it. Your push and gravity's pull make it **swing**.



## EXPLORE engineering



How will you display your beautiful design?



Can you feel gravity pulling you down? Why or why not?



What happens if you make your string shorter?





# Parachute launch

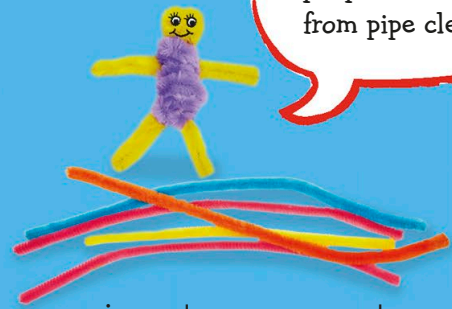
**Gravity** pulls everything back to **Earth**, and parachutes are a great way to get **safely** back to the ground. Which of these parachutes works the **best**?

## You will need:



same-sized squares

three squares of different materials  
(we are using shopping bag plastic, fabric, and a napkin)



pipe cleaner people  
or little toys



scissors



string

Use little toy people or make me from pipe cleaners.

# 1

Snip a **small hole** in each corner of your squares of material and **tie a piece of string** to each hole.



# 2

Tie the other ends of the **string** to your little people. Then **drop** them from a height.



The slowest parachute is the safest!



air resistance

string

**Floating up**  
Parachutes use **air resistance** to slow their fall. Air resistance pushes the parachute up, while **gravity** pulls it down.

**Swish**

square of material

Can you count how many seconds I take to fall?



Which **parachute** will take the **longest** to fall?

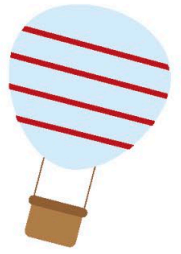
Grab two friends and each drop a parachute from the same height, at the same time. This makes it a fair test.







# Floating in the air



You may not always be able to **feel** the **air** around you, but it can be very strong. Make this **toy** that **uses air** from your **lungs** to push a ball up!

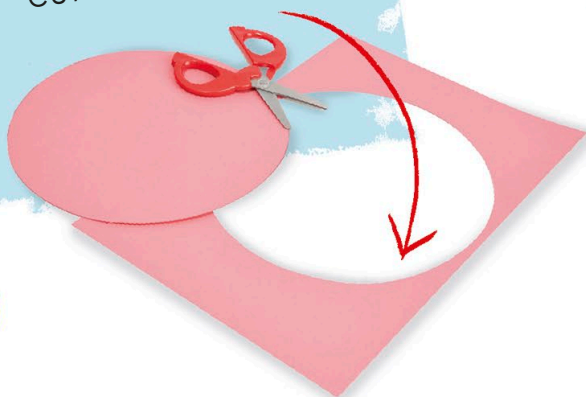


**You will need:**

- glue and brush
- scissors
- straw
- plate or something circular
- sticky tape
- pom-poms (you could also use tinfoil balls or a table tennis ball)

# 1

Draw **around a plate** on card and cut out the **circle**.



# 2

Fold the card in half and half again.

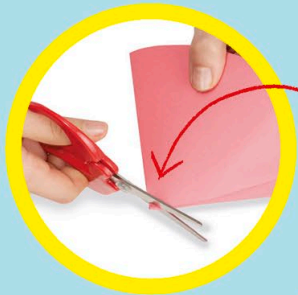


# 3

Cut away one segment.



Make the remaining segments into a cone shape, and glue together.



Snip a tiny hole in the cone.

# 4






Poke the straw **through the hole** and tape in place. Put the ball in the cone and **blow!**

Blowing fast into the straw makes a kind of mini wind called air resistance.

hole

You can decorate your cone to look like a monster!

## EXPLORE engineering

-  How high can you make your ball float?
-  Can you hear the air flowing through your straw?
-  Why does the ball fall back down after floating up?

### Blow as hard as you can!



straw





# Best



# paper plane

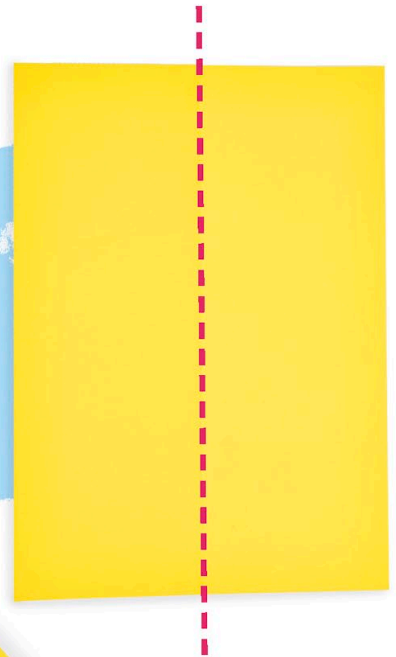
There are lots of ways to make a **paper plane**, but this is our favourite. Welcome aboard!

You will need:

paper  
rectangles

# 1

Fold the paper **in half** lengthways to get a fold line down the **middle**. Open it up again.



# 2

Fold down the **top corners** to meet the middle line.





# 3

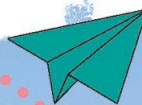


Fold down the **top corners** again to meet the middle line as shown.



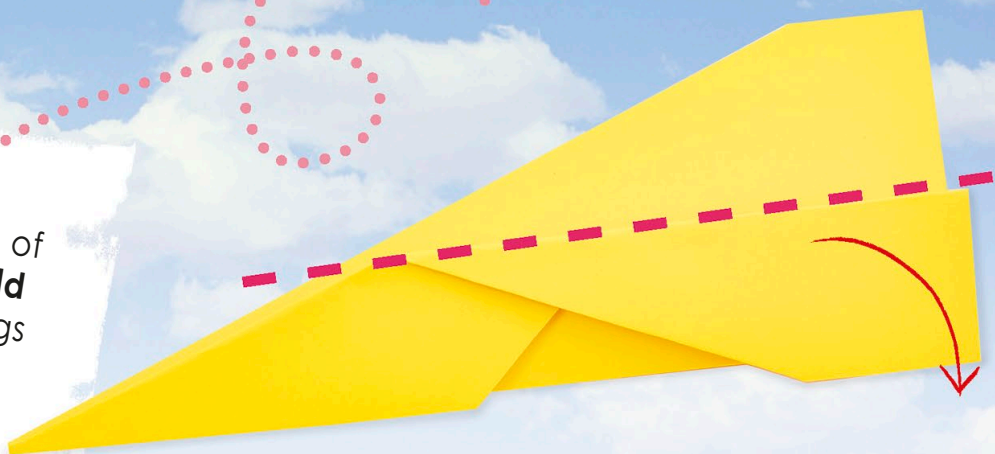
# 4

Fold the plane **in half** along the middle line.



# 5

On each side of the plane, **fold down** the wings as shown.



## EXPLORE engineering



Would paper be a good material to build a real plane? Why or why not?



Why do you think your plane falls to the ground?



Can you hear your plane flying through the air? Can you hear real planes outside?

Making your plane **heavier** could actually make it **go further!** Glue **buttons** to it and see what happens.

This plane has the same number of buttons on each wing. Why do you think this is important?



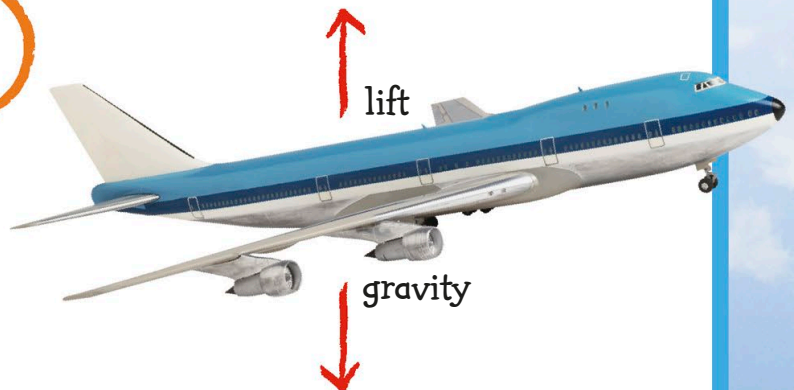




## How do planes take off?

When a plane moves **forwards** quickly, air rushes over the wings creating a force called **lift**. This is stronger than the **pull** of **gravity**, so the plane can take off.

Test your paper plane by throwing it and measuring how far it travels.





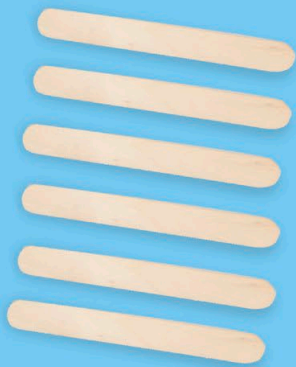
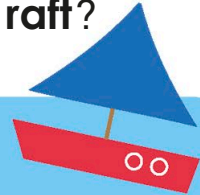
# Make a rescue raft



Your toys are **stranded** on a desert island! Can you rescue them by making the best **floating raft**?



You will need:



lolly sticks  
or twigs



paint



sticky putty



fabric



glue and brush



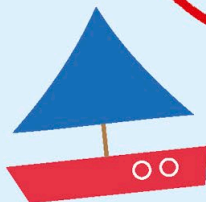
scissors

# 1

Glue three lolly sticks together to make a **frame**. Cover the frame in glue then lay more sticks **across** it.

Stick  
down...

...in a row.





# 2



## Wind power

A real sailing boat catches the wind in its sail to move forwards.



# 3

Decorate your boat with a sail by gluing **fabric** to a lolly stick. Stick it to the raft with putty.

Land ahoy! You can make toy sailors like us out of corks.

Make a **cardboard** raft from an egg box. The egg holes can be **seats** for your toys.



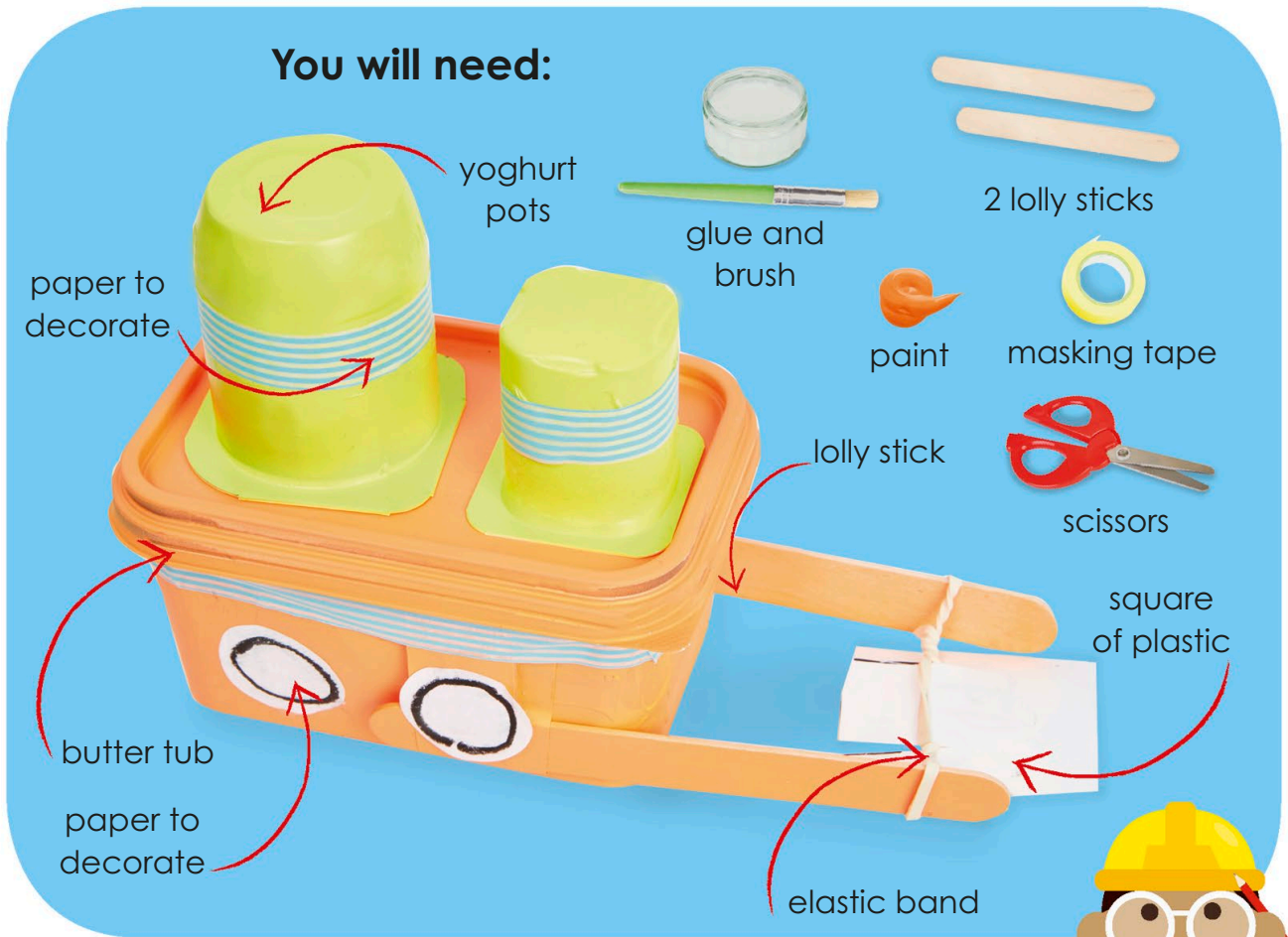




# Build a boat that goes



Lots of real boats have **propellers** that **spin** in the water to **move** them **forwards**. Make your own boat that really moves!



**1**

Make your boat by **taping** a lolly stick to **each side** of a butter tub with **masking tape**.



# 2

Paint and decorate your boat. You can also **glue** yoghurt pots to the lid for **funnels**.

Decorate...



...your brilliant boat!



# 3

## Make a propeller

Stretch the **elastic band** around both sticks. Cut out a **square of plastic** from the lid of another butter tub and snip **two notches** into it to make your propeller. Slide it onto the elastic band.



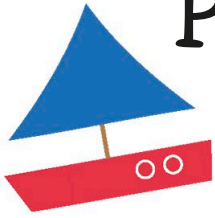
Wind the propeller round and round.

## Elastic power

By **winding** the **elastic band** on your propeller, you stretch it and give it **energy**. Then when you let it go, it releases all that energy, spins the propeller, and makes your boat **go**.







# Put your boats to the test



All aboard! It's time to find out which **raft or boat is best** for **rescuing** your toys from the desert island.

Test the **boats** to see if they **float!**

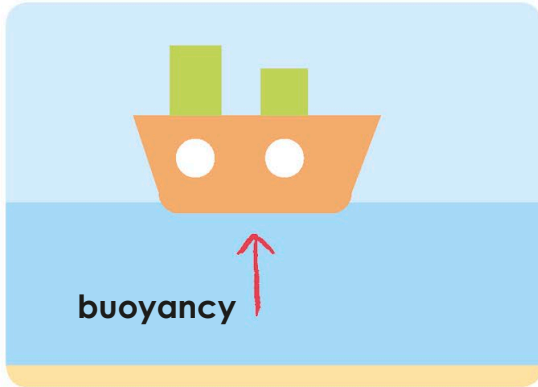
Which **material** is best for making a boat that **floats**? A **plastic** butter tub, a **cardboard** egg box, or **wooden** lolly sticks? Put them in water to find out!

The butter tub boat is a box **filled with air**. This makes it **light for its size** and extra good at **floating**.





## How do boats float?


A special force called buoyancy pushes things up in water so that they float.



## EXPLORE engineering

 Which boat can hold the most toys without sinking?

 Which boat feels the lightest and which feels the heaviest?

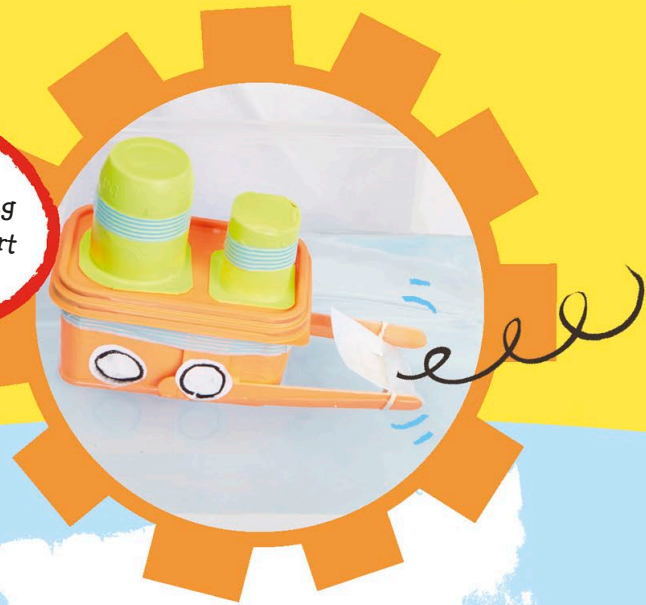
 Have you ever been on a boat before? What type of boat was it?

Can *you* make your  
boats *move*?



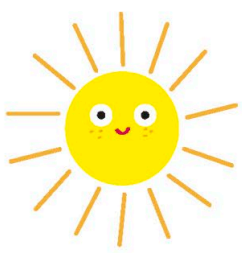
*I thought we were going to be stuck on that desert island forever!*

**Blow** on the sail – does this make the raft move?  
What happens to the raft if you **splash** in the water?



This boat is **powered** by the **propeller**. The more you twist up the elastic propeller, the **faster** it will go.





# Sunny, funny cooker



Our **Sun** is a huge ball of **burning gas** that gives off lots of **heat**. It gives our planet **light** and **warmth**. You can use the heat from the Sun to make some **yummy treats**.



**1** Draw three lines of a **square** onto the box lid and carefully cut these to make a **flap**.





# 2

Glue kitchen foil to the **inside of the flap**. Make sure the **shiniest side** is facing out.



Stick it down.



foil

sticky tape



cling film

# 3

Open the box lid and **tape cling film** to the inside of the square you've cut.

# 4

Put black paper inside the box. Place your **marshmallows** and **biscuits** on top of the paper.



## Dark or shiny?

**Dark** coloured things **absorb heat**. That means they get hot quickly. **Shiny things** do the opposite – they push light and heat away from them. **Heat and light** from the Sun will **bounce** off the shiny foil towards your food. The dark paper will absorb the heat. Together they **warm up** your food.



5

Prop the lid open...



ruler

...with a ruler or a stick.

Do this outside on a warm, sunny day.

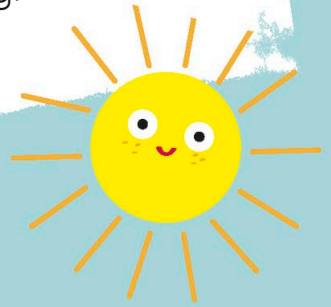


6

Carefully **turn** your cooker so that the **sun** is **shining** straight into it.



Wait for your yummy treats to be ready.



This might take a little while depending on how hot and sunny it is.







This heat is making me all gooey inside.

Mmm! Yummy, it's all ready to eat!



melted top



## EXPLORE engineering



How did your treats taste?



Can you feel the Sun's heat on your skin?



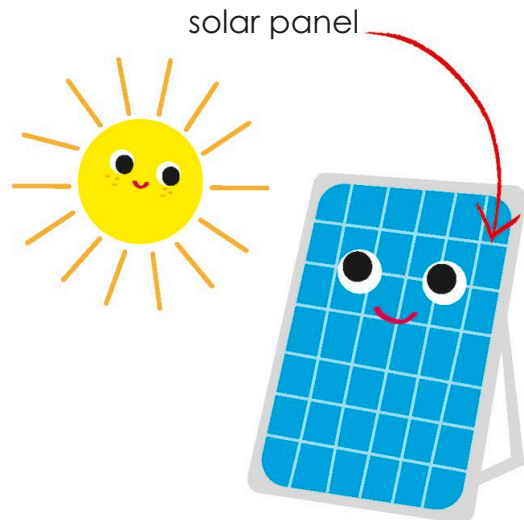
What other foods could you cook with the Sun?

Help! He is going to eat us!



## Green energy

The light we get from **the Sun** is a **renewable energy**, or green energy. That means it doesn't harm the planet and it will not get used up. **Solar panels** use the **Sun's energy** to make **electricity**. Some people put solar panels on their roofs to **power** their homes.



# Magical



# woodland den

Whether you are creating this **little home** for a **fairy** or a **gnome**, make it **super strong** and safe with the **magic** of **engineering**.



You will need:



sticks



ribbons



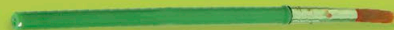
leaves and twigs



string



toys  
(optional)



paintbrush



paint

# 1

Choose **two sticks** that are the same length and **tie them together** with a piece of string.

Tie a knot.



two sticks



# 2



Add a **third stick** and cross it over at the top. Tie it in place to make a **tripod**.



This den is called a teepee.

Carefully balance the sticks in place.



# 3



Tie a fourth stick in place and **stand** the teepee up.



## Triangles

Triangles are shapes with **three straight sides**. These strong shapes are used a lot in **engineering**. How many triangles can you **spot** in your den so far?





Wrap pretty ribbon around  
some of the twigs.

Decorate your den.

Paint a stick.

4

leaves

Add leaves, mud,  
and decorated sticks  
to your teepee to  
make walls and  
to stop the rain  
from coming in.


peek inside...

Head to the woods with a  
friend (and an adult) to make  
a human-sized den!

...this giant woodland den!







Which *magical*  
*creatures* live  
in *your* den?

Put down leaves  
to make a comfy  
floor for us!

## Weatherproof

**Mud** is a great **building material** because it's hard and strong when it dries. Build the den in a **sheltered spot** to protect it from the rain and wind.

Wow!



# Minibeast homes

Make your **garden** or **windowsill** the perfect place for **minibeasts to hang out** and be **happy!**

Who knows what might **come to visit?**

## Bee house

Bees love to have **little holes to sleep in**. Make this easy bee house by **filling a plant pot** full of sticks. Bamboo sticks are best, but any sticks will work.

plant pot

bamboo sticks

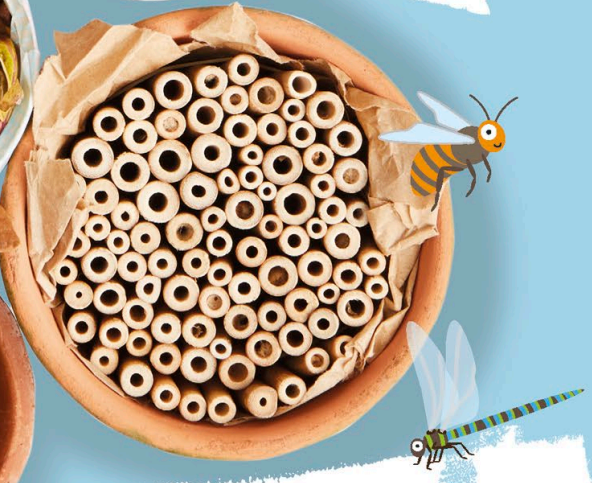
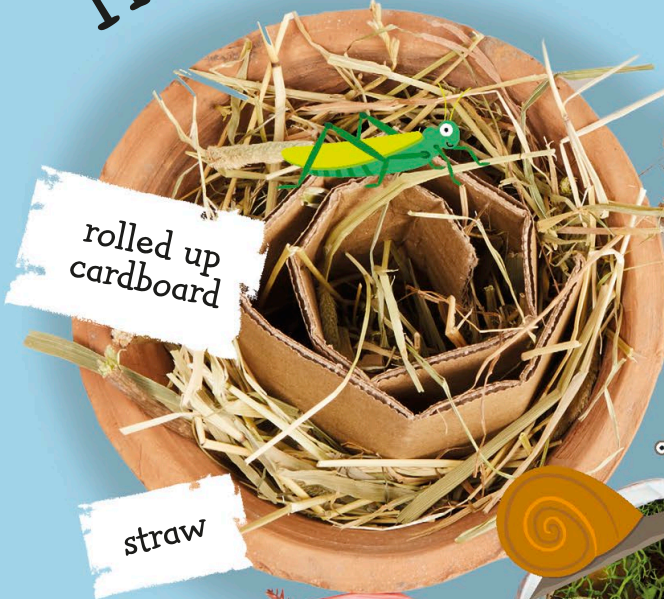


Tie string around your pot.

Hang your special insect home **from a tree** ready for the bees.



# How many minibeasts can you find?



**Bees are super important**

Bees are **pollinators**. That means that when they fly from **flower to flower** they help make more plants grow! Place your bee home **close to flowers** to help them.

What time is check in?

**Minibeast hotel**

Make a minibeast hotel with lots of rooms! Fill plant pots with **different natural materials** to attract all sorts of creepy-crawlies. Carefully **stack the pots** up like a multi-storey hotel.



# Building bridges

Bridges are great to get **over obstacles**, but building a **long** and **strong** bridge can be tricky! Can you play with **shapes** to engineer the **strongest paper bridge**?

You will need:



paper strips  
(different sizes)



sticky putty



building blocks



toy cars

## Simple beam

A **beam bridge** is the **simplest** bridge. To make one, secure a short paper strip with sticky putty between blocks.



Which bridge...



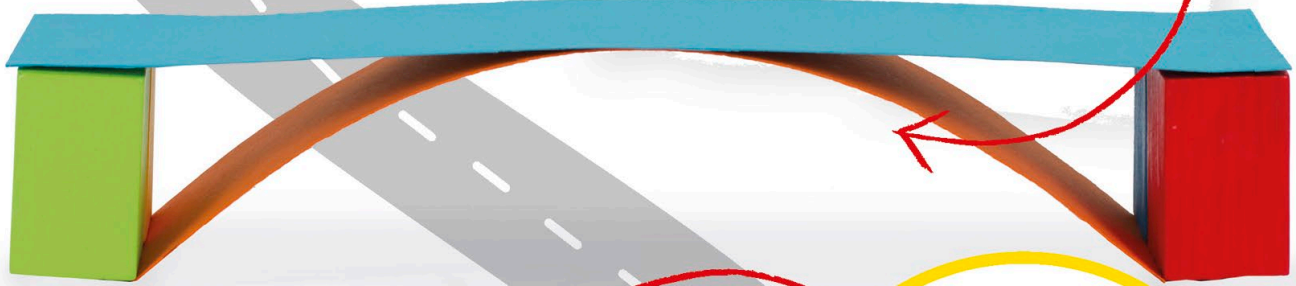
## Long beam

Sometimes you need a long bridge to go further. Can you make a **longer beam bridge**?



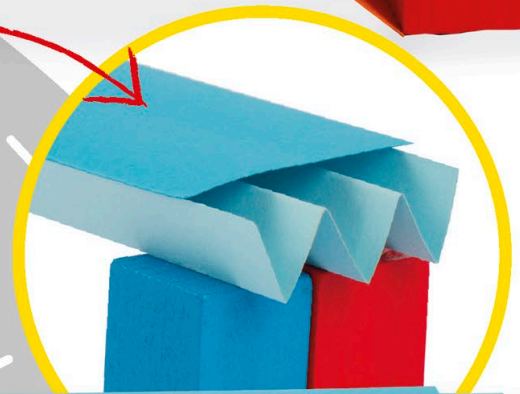
## Curvy arch

To make an **arch bridge**, start with a beam bridge and carefully slot a **curved** strip of paper underneath.



## Zigzag triangles

Fold a strip of paper to make a **zigzag shape**. Put it under a beam to make a **truss bridge**.



...is strongest?

Use toy cars to test the strength...



...of your  
**bridges**



**Long beam bridge**  
Gravity is pulling this car down and bending the bridge.

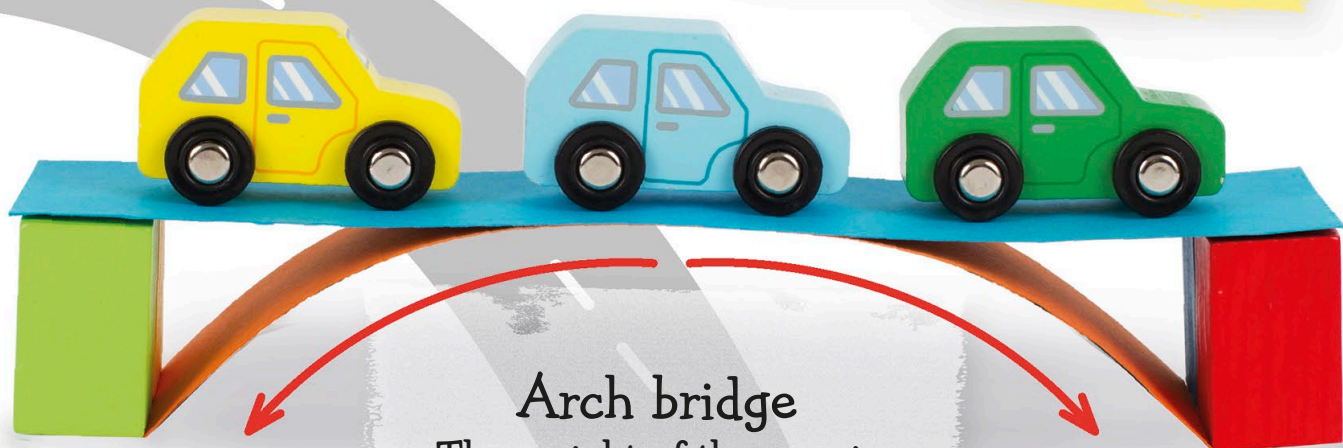
Gravity is a force that pulls objects down. Bridges need to be strong to hold against gravity.



How many cars can your bridges hold without bending?

### Bridge testing

The **strength** of a bridge depends on how it spreads out **weight**. Look at the arrows to see how weight is **spread** out in each bridge.



**Arch bridge**  
The weight of the cars is spread through the arch.



Short beam bridges work fine if they don't carry anything too heavy.

## EXPLORE engineering



Can you see the bridges bend under the cars' weight?



Can you feel the weight of the cars in your hand?



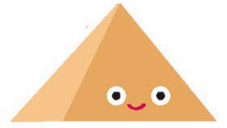
What materials do you think real bridges are made from?



**Truss bridge**  
Weight is spread out along the triangle zigzags.



# Sweet pyramid



A pyramid is a **pointy** shape with **triangular sides**.

The Ancient Egyptians built stone **pyramids** for their **kings** and **queens**. You can make a little one with **sugar cube bricks**.

## You will need:



warm water



icing sugar



lots of sugar cubes

Spoon some icing sugar into a bowl and add water until you get a thick, sticky paste.



# 1

Build a **square base** with sugar cubes. Make sure each side has the same number of cubes.

spoon



Builders use mortar to stick bricks together. Our mortar is sugar! We don't know if the Egyptians used mortar to build the pyramids.





# 2

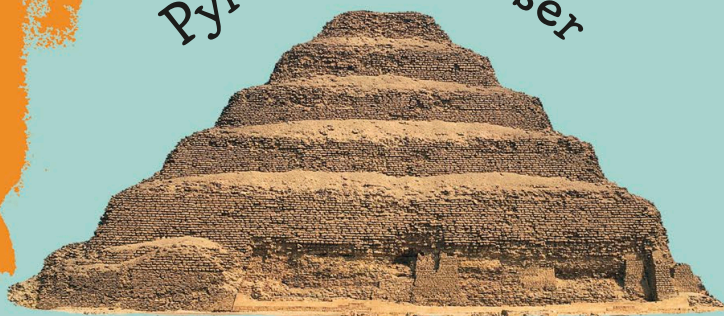
Build up your pyramid by adding **layers** of smaller squares with some **sticky mortar** between each layer.

last cube



The **Ancient Egyptians** built pyramids thousands of years ago, with no machines to help. Lots of them are still there. Most pyramids have **smooth sides**, but the very first ones had **steps**, just like yours.

Sprinkle brown sugar.



## Pyramid of Djoser

## EXPLORE engineering



How does your pyramid taste?



How do you think the Egyptians made their pyramids?

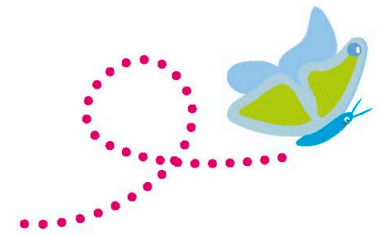


Try prodding or shaking your pyramid when the icing sugar has set. How stable is it?

Lick your pyramid to find out how it tastes but don't eat it!



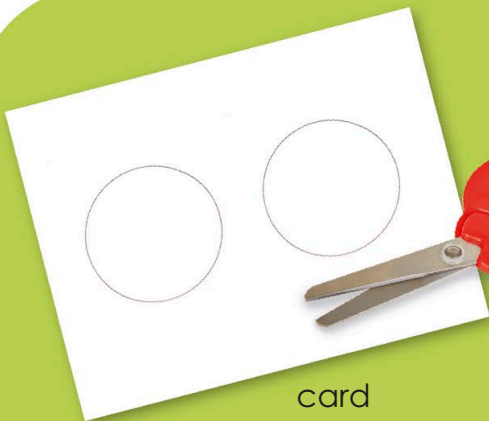
# Moving pictures



Way before we had cinemas, TVs, and tablets, people used little **pictures** to make stories that **moved**. What picture will you bring to life?



## You will need:



card



scissors



double-sided sticky tape



pencil

1

Cut out two **card circles**. Draw a **flower** on one side and a **butterfly** on the other side.





# Stick!



# 2

Using double-sided sticky tape, **stick** the drawings back to back with the **pencil** between them.



# 3

Roll the pencil **quickly** between your hands. What do you **see**?



If you spin the pencil fast enough, your eyes get tricked into seeing the two pictures merge together as one.

Spin! Spin! Spin!



## Cartoons

Some **cartoons** you see on TV are really made up of lots of **still drawings**. Each drawing is slightly different so when they're **put together** it looks like the characters are moving.



# Rainbow lights

This really cool toy is a **kaleidoscope**. Make your own kaleidoscope to see how **light** bounces off **shiny** things.

## You will need:



crisps tube with a clear lid



kitchen foil



cling film



card rectangles



small colourful things, like glitter, beads, and sequins



glue and brush



sticky tape



**Glue** the not-so-shiny side of the **kitchen foil** onto the card.



# 2

Fold the card into three (lengthways) as shown. **Tape the edges** together, then **slide** the folded card into the tube.

You can decorate your crisp tube with colourful paper if you want to.



## Shiny things

Things that are shiny **reflect light**. Light bounces off them and this makes it look like there are two of the same thing – the real thing and its **reflection**. In your kaleidoscope, there are **three shiny mirrors**, so it looks like there are lots of the same objects.

The word kaleidoscope means “look at all the beautiful shapes” in Ancient Greek.







# 3

Place lots of **small, pretty things** inside the lid. You can **glue** some bits and leave others loose.

# 4

Cover the inside of the lid with cling film. Put the lid back on the **tube**, with the cling film **stretched tightly**.



# 5

Cut off the excess cling film from around the **edges**.







**6** Carefully use scissors to poke an **eye hole** into the other end of the tube.

## EXPLORE engineering



Someone has to eat the crisps before you can use the tube!  
How did they taste?



What happens when you spin your kaleidoscope around?



What other reflective things can you find?

Look towards the window and spin the tube to see all the pretty shapes and colours!



# Rocket engineering

Make your very own, super simple, tiny **rockets**.

What **planet** are you heading to, engineer?



paper



felt tips



scissors



sticky tape



straws

# 2

Cut a strip of paper and **tape** the long sides together to make a tube. Your straw should **slide** through this.



# 1

**Draw** a small rocket with your felt tips and **cut it out**. Don't make it too big or it'll struggle to lift off.

Make lots of rockets so you and your friends can have a rocket race!



# 3

**Tape** one side of tube shut by **fixing it** to the rocket. Leave an **opening** to slip the tube onto the straw.

# 4

**Place** the rocket on the straw. Time for **lift off!**

3... 2... 1...

# BLOW!

## Rocket science

Real rockets burn lots of **fuel** to launch. As it burns, the fuel makes gas. This **bursts out** of the rocket and it's so strong that the rocket **shoots away**. It's really the same as your rocket, only much bigger!

The air you blow into your launching pouch makes the rocket shoot forwards.

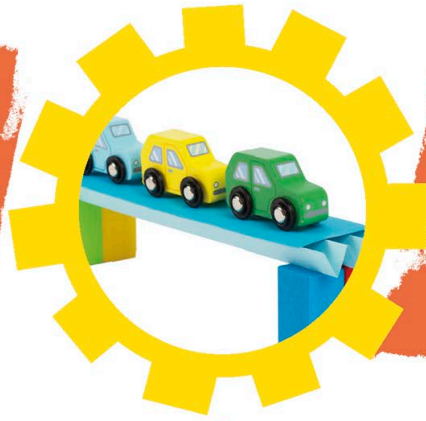
# Look, you're an engineer!

Awesome **engineers** (like you) use their **brains**, their **creativity**, and all their **senses** to **invent** amazing things that make the **world** a little **happier**.



## How cool is this?

Engineers use their **brains** to make **really clever**, exciting things that they can **play** with. It's all about having **fun** and being **creative**.



## How useful is this?

Making a cool thing is **even better** when it's **useful** and it **helps people**. If you think of something that needs **fixing** or **inventing**, get engineering!

## Can I make it work?

Once you've decided what you're going to make, work out **how** to make it. Think about what **designs** and **materials** will work best and **try them out**.



## Don't give up!

When you create something **new**, it won't always work the first time... or the second time... or the third time... it might take **a while!** But you can **learn** each time and **make it better**.

There are lots of different engineers! From building rockets, to houses, to computers, each engineer does something they love.







Well done!

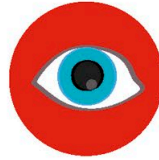
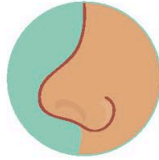


.....

(Write your name here.)

**is an engineer!**





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