

Learn about

Engineering



INTERNATIONAL WOMEN
In ENGINEERING DAY

23 June

To celebrate International Women in Engineering Day

WITH

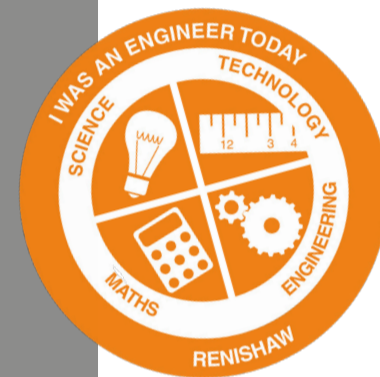
RENISHAW
apply innovation™

Renishaw is a local Engineering company and we are hoping that you will join us to celebrate International Women in Engineering Day.

We had planned to invite some Girlguiding groups to a STEM event at our Headquarters on Saturday 27th June but unfortunately this has sadly had to be postponed because of Covid -19.

In the spirit of carrying on, we have collated a pack of STEM (Science, Technology, Engineering & Maths) activities so you can still participate from home.

There is lots to keep you busy and if you send your leader pictures as evidence that you have completed at least 3 activities, then you will earn the Renishaw STEM Brownie badge!



Activities

1. Find out more about female inventors
2. Make your own bunting and raise the profile of this special day
3. Build a Mini rocket and launch safely from your home or garden
4. Find out how Gromitronic was made
5. Solve some Maths problems
6. Build a Robo Hand and try picking things up with it

Good luck and enjoy!

About Renishaw

Renishaw is one of the world's leading engineering and scientific technology companies, with expertise in precision measurement and healthcare. The company employs over 4,500 people worldwide and supplies products for use in applications as diverse as jet engine and wind turbine manufacture, through to 3D printing, dentistry and brain surgery.

#sheinnovates

A career in engineering is rewarding:

Make a difference to people's lives

Work on exciting new technology and products

Be creative and solve problems

Have a varied career path

Earn a good salary

Have fun!

Learn about

Female Inventors

To celebrate International Women in Engineering Day

What is the difference between an engineer and an inventor?

An engineer is a trained professional in a specialised area of engineering. There are lots of types of engineering, including: mechanical, electrical, industrial, chemical, civil and software. Some engineers can be inventors but not all inventors are engineers. An inventor observes the world around them and looks for solutions to the problems they see and design possible solutions, they often need help from engineers to get their inventions to work. Many of the greatest inventors were also well educated engineers, such as Nikola Tesla.

Ada Lovelace

Ada was the first person to recognise the full potential of computers and invented the first computer programme.

Also her dad was the famous poet Lord Byron.



Nancy Johnson

She invented the ice cream maker, it could even make two flavours at once.



Shirley Jackson

She invented Caller ID, so you know who's phoning you and whether or not you want to answer.



Mary Anderson

She was having trouble seeing when trying to drive in the snow, so invented windscreen wipers.

Josephine Cochrane

She found that her favourite plates were getting chipped when they were washed in the sink so invented the dishwasher.



Lillian Gilbreth

She invented lots of useful kitchen gadgets, the pedal bin and the electric food mixer.

She was also a mother to 12 children.



Katherine Blodgett

She invented non-reflecting glass, which revolutionised glasses, telescopes, cameras, and microscopes.



Hedy Lamarr

During World War II she drafted a secret communications system. This technology is still used today in mobile phone networks, Blue tooth gadgets and Wi-Fi.

She was also a famous Hollywood actress.



Try and imagine a day without all the things women invented, no WiFi, no apps, no ice cream!

Do you have any ideas for inventions of your own?

Make

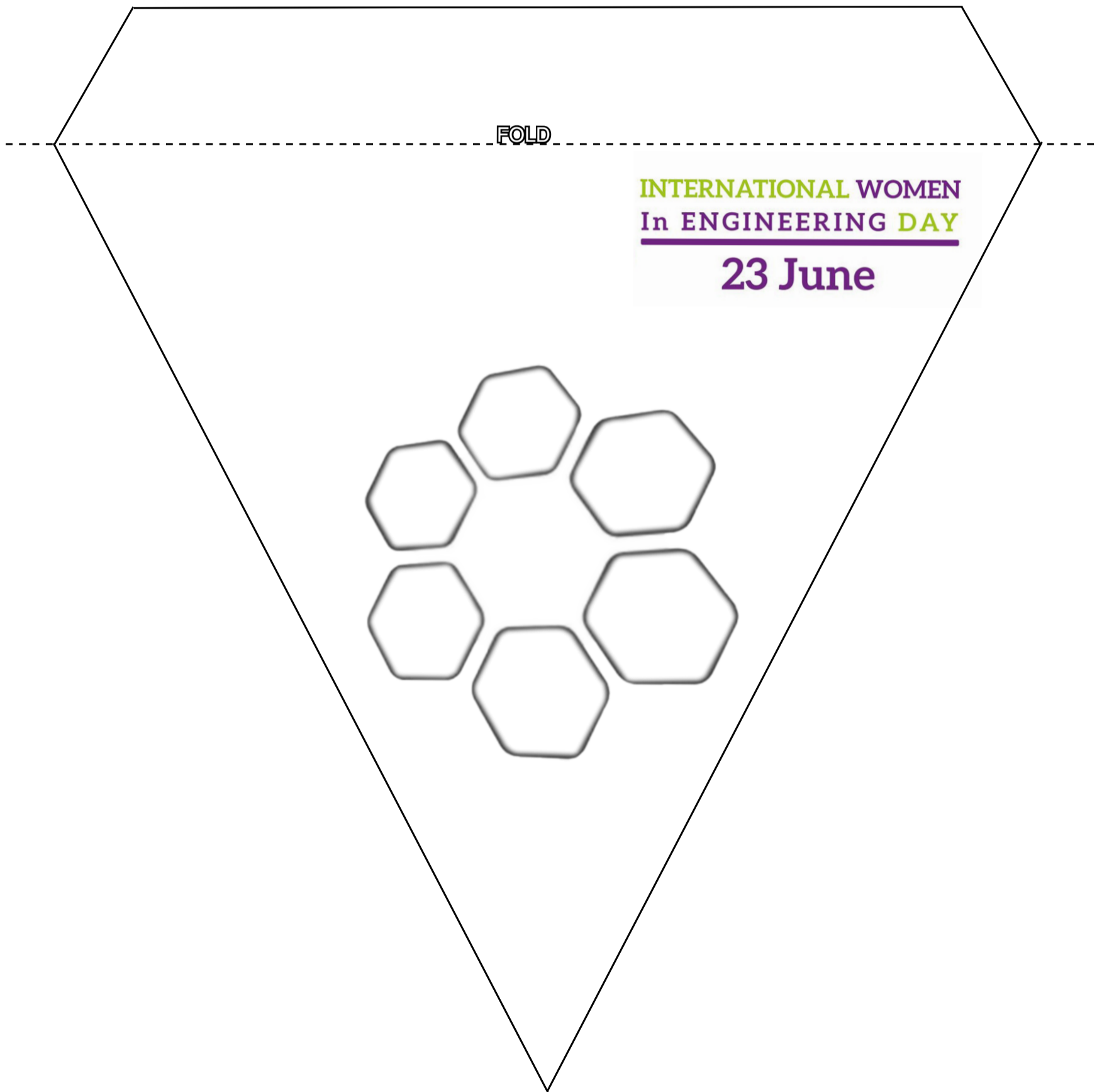
Bunting

For



INWED 2020

Help us celebrate this important day by making your own bunting, using the template below, print out and colour in the INWED logo, string together and hang in your window!



MAKE

MINI ROCKETS

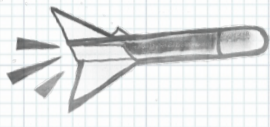
What you need:



Don't have Post-it notes?
Cut some paper to replace the large post-its and paper or card can be used to replace the small ones.

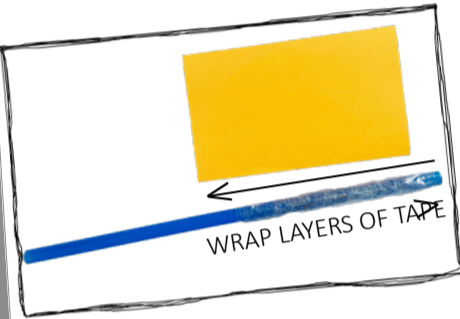
Don't have ear plugs?
Cut something soft like foam or sponge.

+ scissors & sticky tape

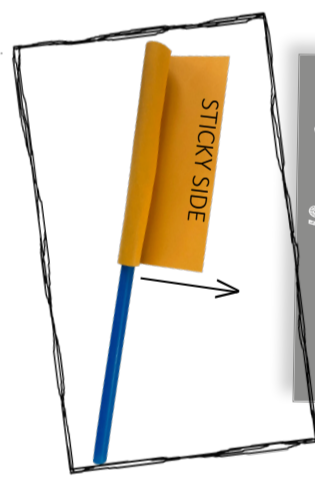


1 - Create your "tube former"

Wrap some sticky tape around a straw the same length as your large Post-it to create your 'tube former', it has to be bigger than the straw you will use later.



2 - Make your rocket body

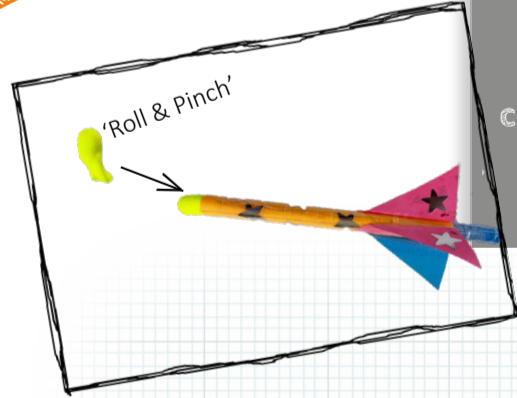
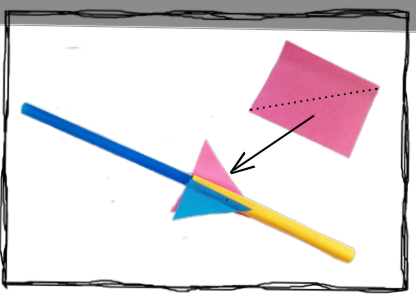


a) Roll the large Post-it tightly around your 'tube former' keeping the sticky side away from you facing upwards so you are rolling towards it.
b) Secure with an extra piece of tape.



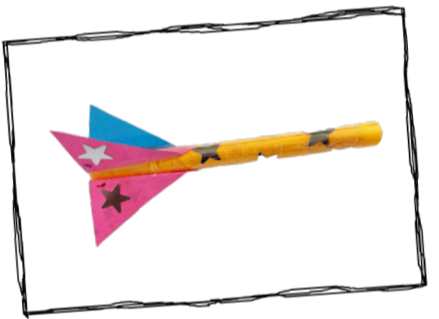
3 - Make your rocket fins

a) Cut the small Post-it's diagonally across to create 3 even triangles.
b) Place the 3 triangles on the base of your rocket body at 120° intervals.
c) Reinforce with sticky tape.



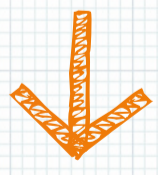
4 - Decorate

Decorate your rocket by colouring it in or adding stickers.



5 - Add your rocket nose

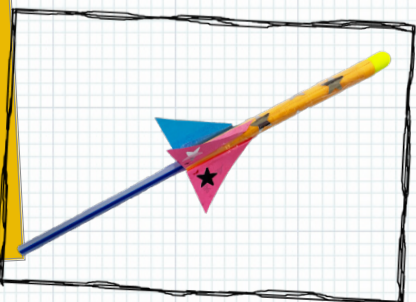
a) Roll and pinch the flat end of the ear plug to reduce its diameter.
b) Slide the rocket off the former and place the flat end of the ear plug inside the tube.
c) Wait for it to expand inside the tube. If you are using another material make sure it's secured with tape.



6 - Ready for lift off

Place your finished rocket on to the end of a straw and blow hard into other end and watch it fly!

Ensure your rocket is aimed away from people before firing!



MINI ROCKETS

Health & Safety



Scissors safety

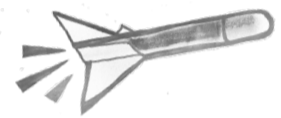
When using scissors, you must always do so safely. Parents or guardians should supervise young children.

Remember:

- Always cut in the direction away from you
- Sit down while cutting
- Hold the paper tightly

Learn to launch safely

Ensure your rocket is aimed away from people, pets and anything fragile before firing! Why not make a target out of something soft like a cushion.

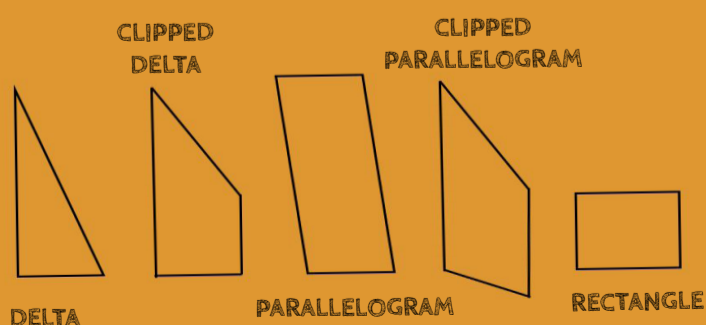


MINI ROCKETS

Activity add-ons & Learning Points

Have fun with fins

When you have finished why not make another rocket and try different fins. The number of fins, the material you use, the size and shape will change the aerodynamics. Which works best and will have your rocket flying furthest?
Names of different fin types:



Fun with forces

Force is the energy it takes to move something. When you push or pull an object it takes energy to get an object to move.

Push - A force to move objects away from you.

Pull - A force to move something closer to you.

Gravity - A force that brings an object towards the earth.

Friction - A force that slows or stops motion when two objects rub together.

Question time

What is making the rocket move?

How could we make it go further?

Why does it slow down?

What force is pulling it down to the ground?

What would happen if we took the ear plug out? Why?

Learn about

GROMITRONIC

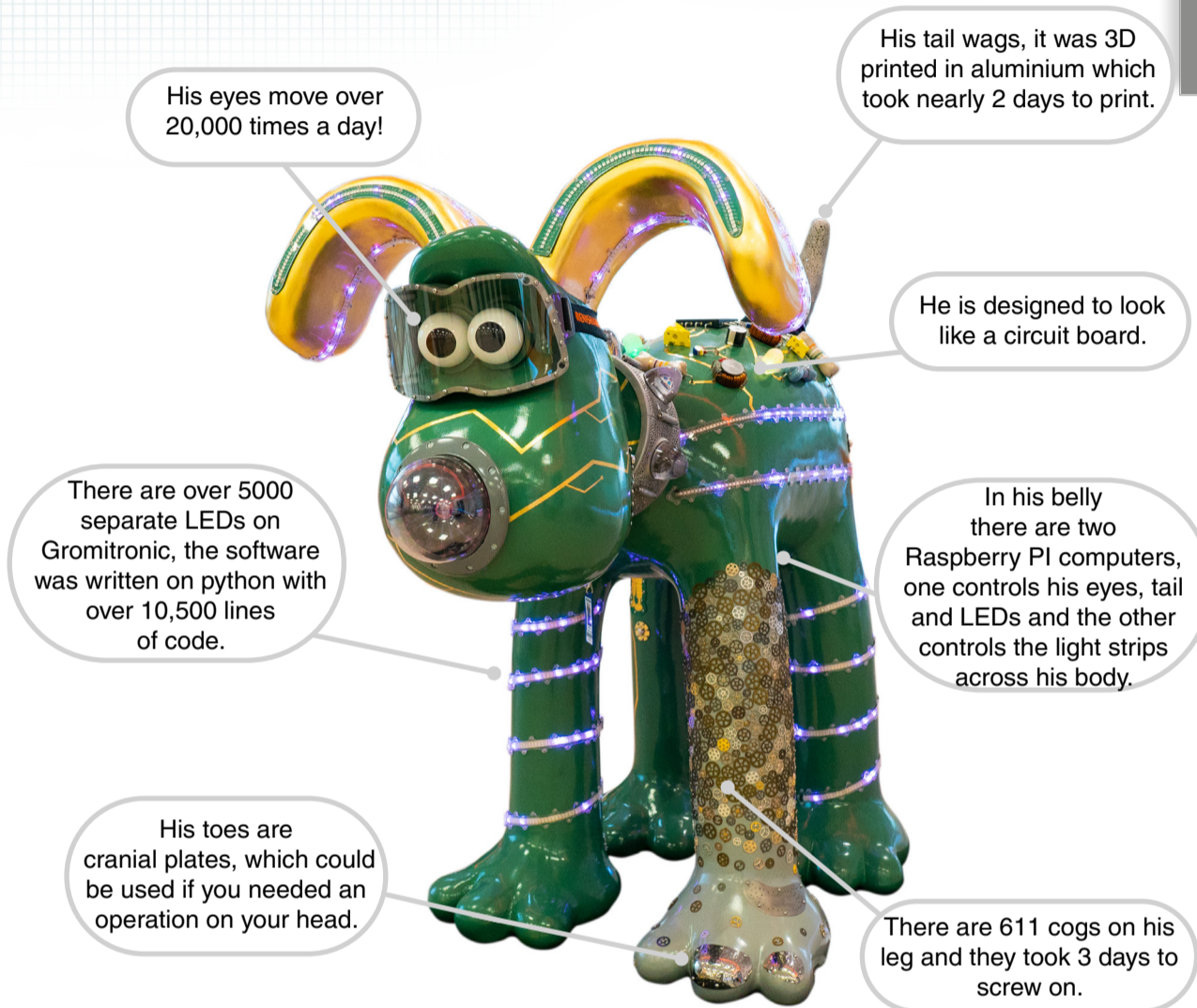
Meet Gromitronic

In 2018 a team of young engineers, made up of 4 boys and 5 girls, made Gromitronic for the 'Gromit Unleashed 2 trail' for The Grand Appeal to help raise money for the Bristol Children's Hospital.

Our Gromit is interactive, you can touch his plasma ball nose, press buttons on his back that control his lights. He also has a moving tail and eyes. The collar has Bristol landmarks in the studs, such as the Clifton Suspension Bridge and Bristol Cathedral, they are 3D printed in metal using additive manufacturing made from titanium and aluminium powder.

Here is a link to a video about the making of him.

Some cool facts about Gromitronic

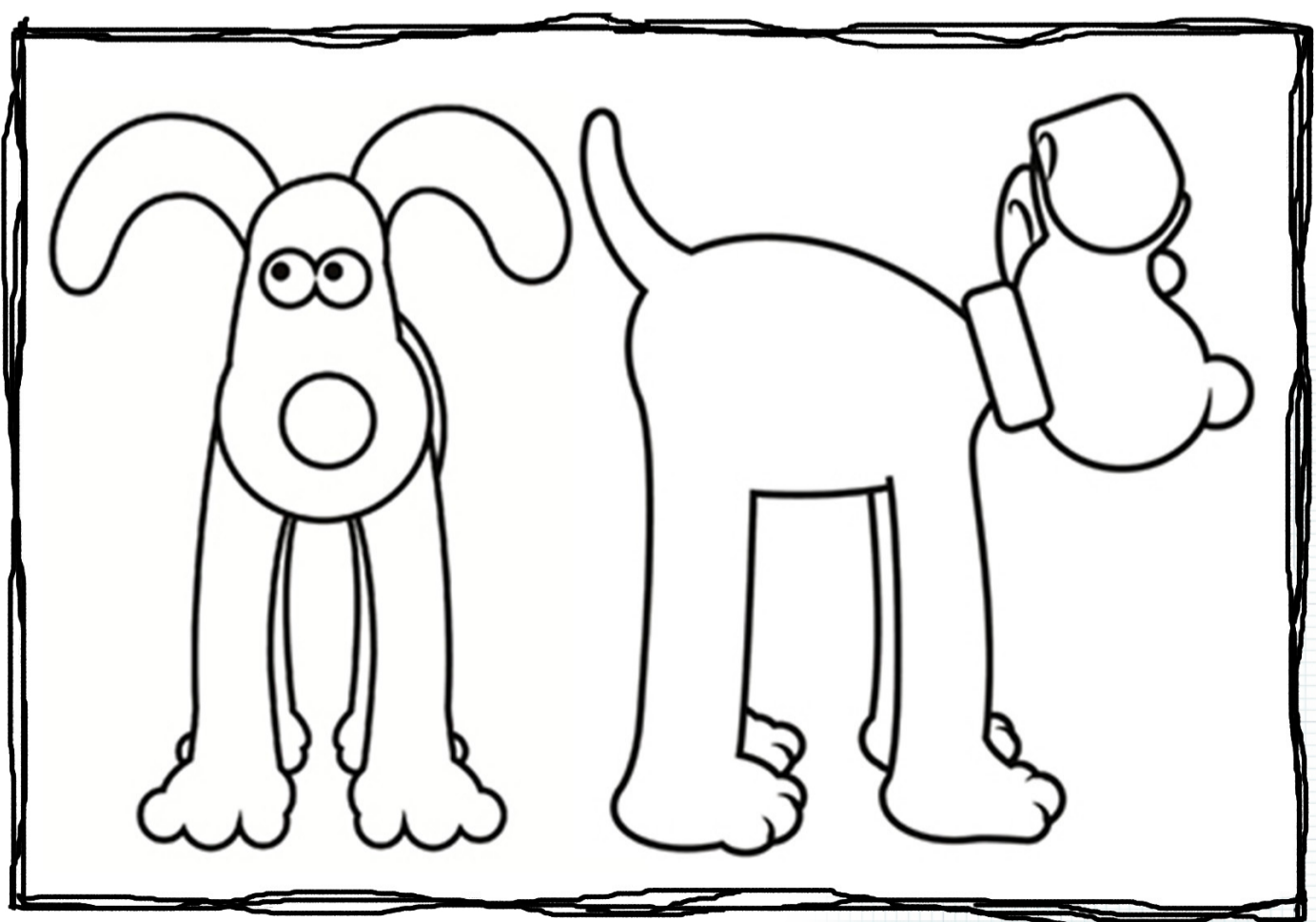


Gromitronic Word Search

T	R	A	I	L	B	L	A	Z	E	R	N	S	T	U
L	A	A	N	V	C	U	I	I	A	D	C	F	I	S
K	O	K	S	A	N	J	P	L	O	I	Y	L	M	M
S	C	T	D	B	E	Q	U	V	N	S	P	S	O	L
L	E	D	S	D	E	M	C	O	C	T	L	V	R	X
Q	N	Y	E	I	I	R	R	O	Z	E	A	M	G	Z
S	B	H	G	N	R	T	R	X	G	M	S	I	M	L
H	S	O	I	S	E	B	E	Y	Z	S	M	E	I	J
M	N	U	L	S	F	X	E	A	P	E	A	X	E	D
P	M	U	E	I	P	O	W	K	T	I	B	C	R	Z
A	O	E	W	A	H	S	I	N	E	R	A	P	M	E
Q	H	G	D	M	D	T	D	M	J	P	L	A	Q	R
C	M	G	O	D	R	G	F	P	E	I	L	P	Z	U
G	L	T	U	V	M	R	H	T	O	X	M	W	K	D

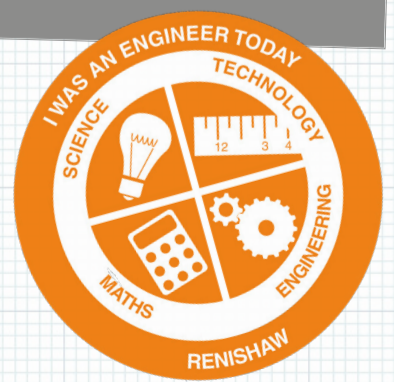
ALUMINIUM	GROMIT	RASBERRY PI
BRISTOL	LEDS	RENISHAW
CHEESETRONICS	MSHED	STEM
COGS	PLASMABALL	TRAILBLAZER

Help our engineers design a friend for Gromitronic



Would your Gromit have any cool interactive features?

What name would you give your Gromit?

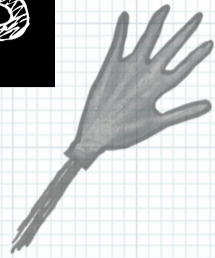


MAKE

ROBO HANDS

WITH

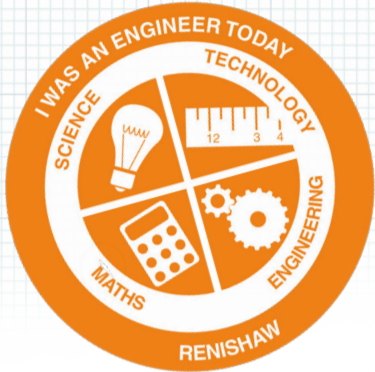
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What you need:

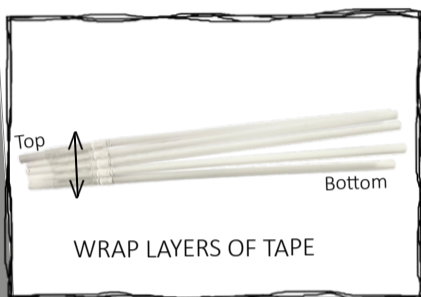


+ scissors, sticky tape & a marker pen



1 - Create your hand

Place five flexi straws together, then wrap tape around to secure, on the top end just above the 'flex'.



2 - Draw your joints

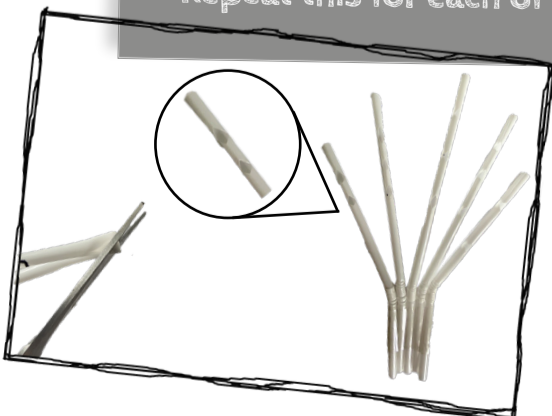


- a) Place the straws over one of your hands.
- b) Spread the straws out so they are aligned with your fingers and thumb.
- c) Using a marker pen, draw where each of the joints on your fingers and thumb would be on the straw.

3 - Cut your diamonds

At the place where you have marked a joint pinch it inwards, then bend it in half, cut diagonally across the corner, leaving a diamond shaped cut out.

Repeat this for each of the joints.



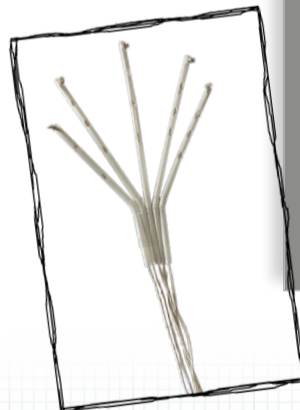
4 - Snip your tips

Cut a 5mm slit in the bottom (not flex end) of each of the straws.



5 - Thread the string

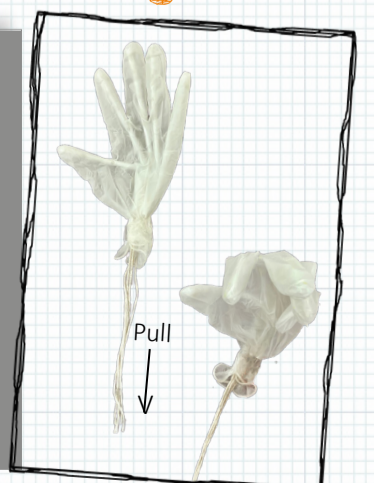
- a) Cut 5 '30mm' lengths of string, tie a small knot in the end.
- b) Thread the lengths of string down each straw.
- c) Secure the knots with the slits and tape.



6 - Flex your fingers

Now put the glove on over the straws with each straw being in each finger and thumb space.

Tape the glove around the 'wrist' to secure. Pull the strings at the bottom and see your fingers flex.



ROBO HANDS

Health & Safety

Scissors safety

When using scissors, you must always do so safely. Parents or guardians should supervise young children.

Remember:

- Always cut in the direction away from you
- Sit down while cutting
- Hold the straw tightly
- Be careful when cutting out the diamonds as they will ping in different directions, make sure to protect your eyes



ROBO HANDS

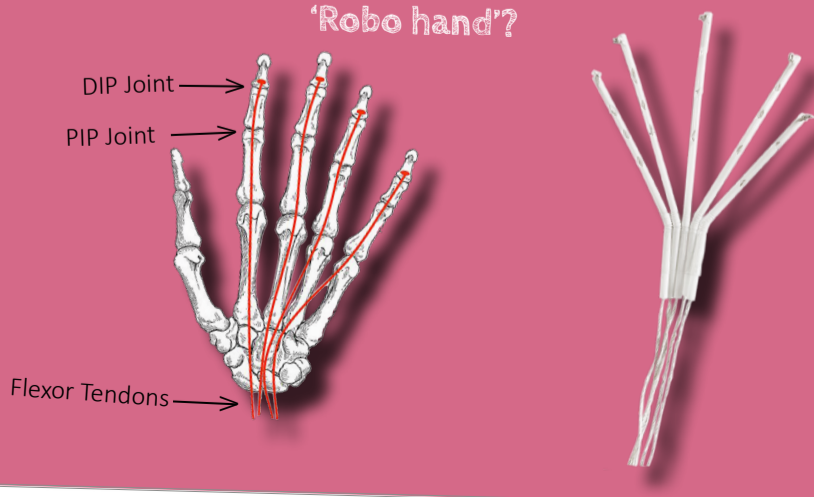
Activity add-ons & Learning Points

Flexure joints

Many of the mechanisms used in the human body have been copied and used by engineers in machines they build.

When we cut the straws, we created flexures, modelled on the joints in the human hand. When the strings (tendons) are pulled, the straws will fold as they cannot transmit the force through the weakened point. A flexure joint has the advantage of being inexpensive, lightweight and low friction; they are often used as hinges for lids of plastic containers. However, they are limited in the range of motion they can achieve and the loads they can support.

Can you see the similarity in construction and operation between the diagram of the real hand and 'Robo hand'?



Bowden cable

The Bowden cable was invented in the early 1900s by Sir Frank Bowden. He used it to operate the brakes of the Rayleigh bicycles he produced. Bowden cables are still used in bicycles today.

A Bowden cable is a flexible cable used to transmit motion, by the movement of an inner cable relative to a hollow outer cable housing. The outer is generally made of a plastic-coated helical steel wire construction, lined with nylon, to reduce friction. The inner is a small steel cable.

In the "Robo hand" the strings through the straws are comparable to Bowden cable.

Example of a Bowden cable:



Cup game

See if you can use your 'Robo hand' to pick up a plastic or paper cup, if you and your friends or family have made more than one hand, why not see how many times you can pass around a cup before dropping it.

