CREST AWARDS | SUPERSTAR

Mewburn Ellis
The forward-looking IP firm

On a shoestring collection

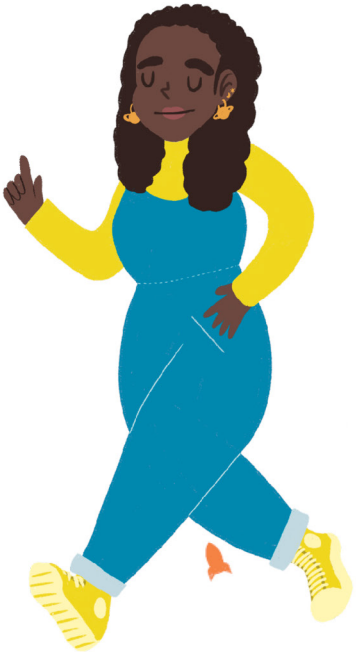
Suitable for
7 to 11-year-olds

This collection of CREST SuperStar activities allows children to explore everyday problems using science. Once they complete at least six challenges, they can receive a CREST SuperStar certificate!

#Investigate #Experiment #Create #Discover

Risk assessment

These hands-on challenges are designed to be interactive and fun for everyone taking part. As with all practical activities, the adult(s) running the investigation should carry out a full risk-assessment beforehand, to ensure that any accidents are avoided. Refer to CLEAPSS for expert advice and guidance, helping to keep you, your children and colleagues safe and ensuring that everyone can enjoy the benefits of hands-on STEM learning (**https://primary.cleapss.org.uk/**).



Start using CREST SuperStar

The activities in this pack have been chosen because they use inexpensive everyday materials. Children need to complete six challenges to achieve a CREST SuperStar Award. If you want, you can mix and match challenges from different packs, as long as children complete at least six SuperStar challenges.

Preparation

1. Start by signing up for a CREST account: **apply.crestawards.org**
2. Print the **SuperStar Passport**
3. Use the Organiser and Activity Cards in this pack to prepare for each challenge.

Run the challenges in this pack

1. Each challenge will take 45 minutes to an hour and involves hands-on investigation, decision making and group discussion. Children can use the Passport to keep track of the challenges they have completed.
2. Once you've completed six activities, log back into your CREST account at: **www.crestawards.org/sign-in**
3. Tell us about the children and the challenges they completed.
4. Finally, complete the delivery and payment details to order your certificates.
5. Congratulations on completing CREST SuperStar!
6. If you want to use your own activities, that's fine! Find out more about what a SuperStar activity should look like here: **help.crestawards.org/portal/en/kb/articles/can-i-use-my-own-activities-for-the-star-and-superstar-awards**

What next?

Why not challenge children further and try a full day project next? A CREST Discovery Day is a one day facilitated project, ideal for ages 10+. You can find out more and download all the resources you need here: **discoverylibrary.crestawards.org**

Encourage others to take part in CREST projects. To get more ideas on how to get started visit: **www.crestawards.org**

CREST SuperStar for Mewburn Ellis schools

"We're immensely proud to be working with the BSA. Our vision is to enable more young people to get into science no matter what their background or circumstances. As a firm we now have a strong focus on diversity and inclusion, but key to a really diverse IP industry will be for a broader range of candidates to come into the jobs market. This has to start with schools and providing greater opportunities and we want to invest in making this a reality." – Richard Clegg, Managing Partner of Mewburn Ellis.

The British Science Association (BSA) is delighted to have formed a partnership with Mewburn Ellis, one of Europe's leading intellectual property firms.

Our partnership focuses on enabling and supporting a wider range of schools and students to engage in science. As a national sponsor of the CREST Awards, Mewburn Ellis is proudly supporting the BSA's work to help young people, no matter what their background, get into science.

CREST is a scheme that inspires young people to think and behave like scientists and engineers, reaching those typically underrepresented in science.

In 2021, funding from Mewburn Ellis supported over 1,500 students from schools in its UK office locations (Bristol, Cambridge, London and Manchester) to achieve CREST Awards. This year, we are seeking to deepen our engagement with schools in these four areas.

We will do this firstly through the development of this pack and the accompanying online training sessions for Primary teachers - to help boost teachers' skills and confidence in delivering CREST with their students.

Secondly, through training several Mewburn Ellis colleagues to support the delivery of CREST Discovery Days; supporting teachers and students on-the-ground, passing on key knowledge and enthusiasm.

Contents

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Bridge Blunder

Organiser's Card

About the activity

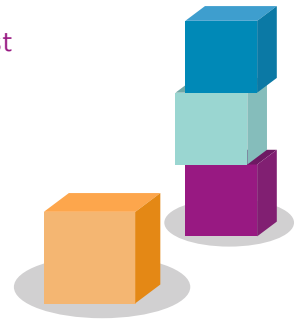
This activity is designed to get children thinking about weights, forces and measures.

Children are set the challenge of helping Star Spans, a design company, fix their bridge and stop it swaying.

Through this activity you will support your group to:

- Build different models of bridges
- Test their different models to see which can hold the most weight and why
- Record and share their results

Kit list



- A4 paper – 12 sheets per team (two for initial exploration, five for their first trial, five for the final bridge). Have a few pieces in reserve. Scrap paper is fine.
- Sellotape – you should restrict this to a short strip per group. Sellotape is only for securing things, not for wrapping round the paper.
- 10 and 100 gram masses, coins, blocks or other equipment to act as 'weights' – bridges can support a surprisingly large mass.
- Play blocks or similar to create the 20 cm gap for the bridge – or gap between chair and tables.
- Pictures of bridges (optional).

What to do

1. Introduce the activity using the story of Star Spans. You may want to show the children some pictures of different shaped bridges.
2. Give out activity cards and equipment to the children.
3. Explain that they will be using the equipment provided to test the best design for a bridge. Give the children a little time to talk together and to try making strong shapes using single sheets of paper. They can fold or cut the paper if they wish.
4. Encourage children to discuss their ideas and how to carry out their investigations. Prompt questions:
   - How many different kinds of bridge do you know?
   - Are some shapes stronger than others?
   - How will they make sure their test is fair?
   - How will they record their results?

5. Now give each group five sheets of paper and a small amount of tape. Tell them they have 10 minutes to try out ideas for how they might make their bridge. This will not be the final bridge. Let each group test their bridge with weights as they go along. You will need to decide together where to put the weights on the bridges to test them.
6. Encourage children to evaluate the design. What do they need to change to make the bridge stronger? Now they will make their final bridge. They will need more paper. Warn them that they are not allowed to use any of the old paper but can use their earlier ideas to help them.
7. Support children to conduct their tests and make their own records of their results. They could also take photographs or make drawings. After children have tested their bridges, provide time for them to talk through what was successful and what didn't work.
8. Ask the children to present their bridge to the rest of the group and test it.

Things to think about

Make sure the weights are placed, not dropped, on the bridges.

You can decide to spread weights evenly across the bridge (like the children in the story) or focus them in the centre. To make fair comparisons between the bridges the same test should be carried out on each one.

Do not fasten the ends of the bridge to the supports. This does strengthen the bridge but if well fastened it can require large weights to make even a single piece of paper collapse.

There are many solutions to this problem. The shape is all important.

The weakest bridge is often a flat sheet of paper. It can be made stronger by flat folding, creating a triangular prism shape or rolling the paper along its length. Walls can add strength as can pillars or arches. Suspending the bridge can also help.

We have used the term 'weights', rather than the more scientifically accurate 'masses', since this is the term that young children are more likely to know.

Keywords

- Construction
- Weights
- Masses
- Suspension
- Support

Take it further

Children could act out a design award to showcase the bridge or bridges that were the strongest.

Children could sketch their bridge and make notes about how it worked.

Watch out!

Avoid weights falling from a height.

If bridges are high, you will need a bucket of sand or cardboard box filled with crumpled paper underneath to catch falling weights.

CREST AWARDS | SUPERSTAR

Bridge Blunder

Activity Card

A sparkling new footbridge has been built in Startown. Class 4 of Startown Primary School were invited to the grand opening. All the children stood on the bridge as their classmate Anil (aged 8) cut the official tape.

Even before the cheers had died down the bridge began to sway and bend. All the children were hastily rushed to one end and the bridge was closed.

Star Spans, the designers of the bridge, looked very red faced.

"We're not sure what went wrong. The bridge was such a beautiful shape. What do we do now? Can anyone help us?"

Your challenge

Can you help Star Spans design a bridge that can be used safely?

When people design bridges they build models. This is what you will need to do.

Discuss

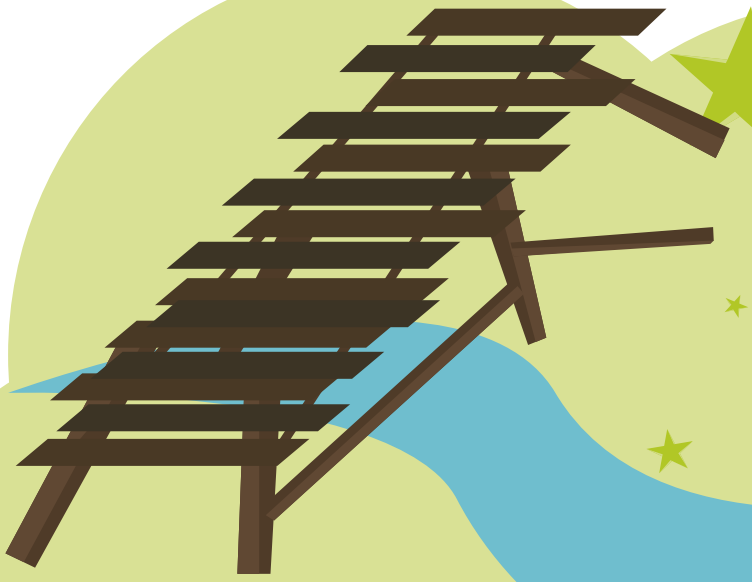
- How many different kinds of bridge do you know?
- Are some shapes stronger than others?

Getting started

Your bridge needs to span 20 cm. Think about which shapes are the strongest.

Try exploring bridge shapes with single pieces of paper. You can cut the paper if you wish.

Why not try rolling, curving and folding the paper?



Test your ideas

Test it with weights.

Does it matter where you put the weights?

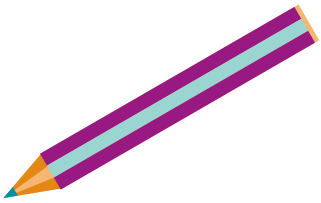
Remember the children were standing across the whole length of the bridge when it started to wobble.

Now make one final model.

You might like to record your results in a table like this:

Bridge	Maximum weight bridge could hold
Bridge #1	
Bridge #2	
Bridge #3	

Share your ideas



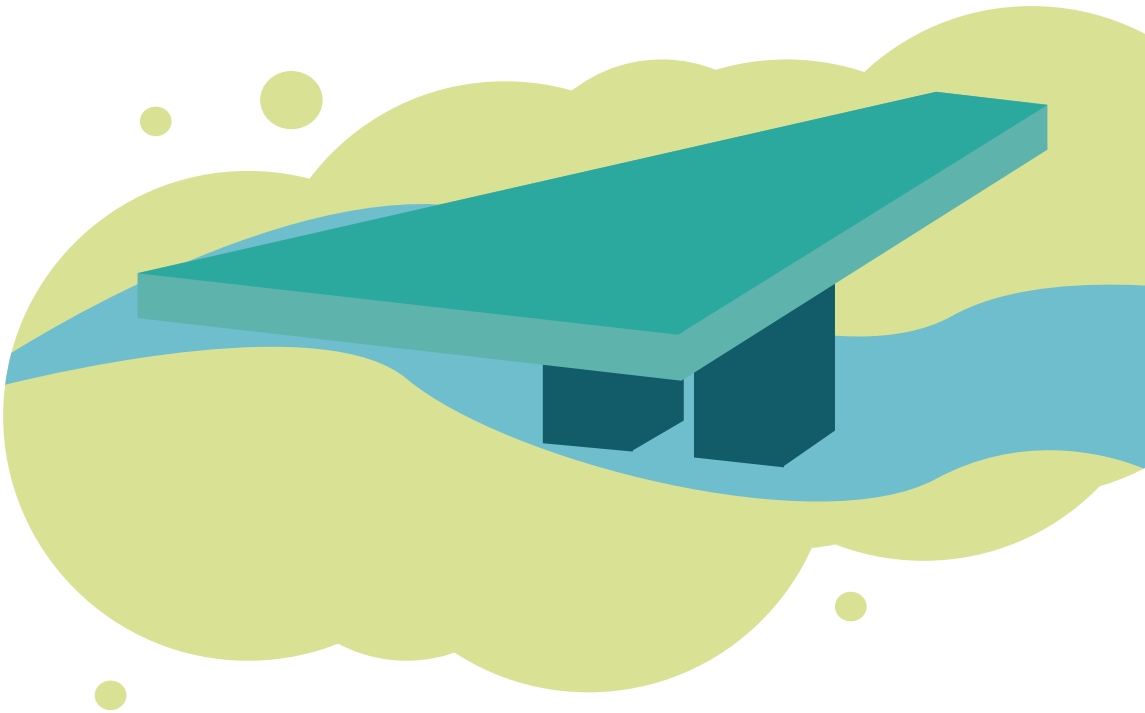
Show your bridge to the rest of the class.
You could take pictures and add notes about what you think might make your bridge stronger and more stable.

Extra things to do

Can you find out about the highest and longest bridges in the world?

What did people in ancient times use to build bridges? How does this compare to bridges built today?

You could find out about different bridges and make models of them to show how they work.



CREST AWARDS | SUPERSTAR

Bumblebee Mystery

Organiser's Card

About the activity

This activity is designed to get children thinking about pollinators and their habitats.

The investigators have been sent a letter asking for help. The Buzzabout family don't see as many bumblebees as they used to and want to do a survey across the country to see where they are.

Through this activity you will support your group to:

- Learn about different kinds of pollinators and how to identify them
- Learn about different kinds of plants that attract pollinators
- Think about the importance of pollination

Kit list

- Pollinator identification key
- Pollinators card sort
- Bumblebee-friendly plants card sort

What to do

1. Introduce the activity using the letter.
2. Give out activity cards and equipment to the children.
3. Explain that they will be surveying the local area for bumblebees.
4. Encourage children to discuss their ideas and how to carry out their investigations.
5. Support children to conduct their investigation and make their own records of their results. They might like to make a tally chart.
6. Ask the children to present their findings to the rest of the group. They can be as creative in their presentation as they want. Children can make a chart of their observations. They can create a plan or guide to show how to make the area more bumblebee friendly.

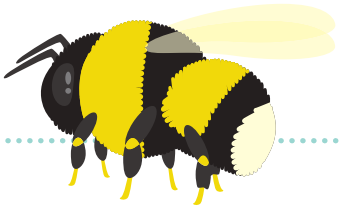
Things to think about

It is possible that you will not find bumblebees, but it is important to let the children find out for themselves if there are any. They can note other pollinators that they find.

Lack of bumblebees leads naturally into designing a more bumblebee-friendly environment. If you are able to make some changes, you can carry out more observations to see if they have had an impact.

Keywords

- Bees
- Pollen
- Pollinators
- Survey



Watch out!

Ensure children do not touch any plants or animals.

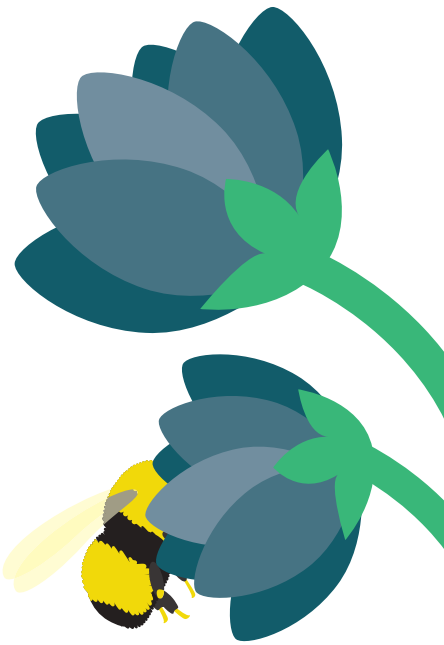
Find out if any children have allergies to bee stings.

Follow your organisation's guidelines for outdoor work.

Find out more

There are about 250 species of bumblebee around the world and 25 in the UK. Six of these are commonly found. The decline of bumblebees seems likely to be due to changes in farming practices, the use of insecticides and the lack of natural habitats. This decline threatens biodiversity, food supplies and human health. A significant proportion of our food relies on pollinators such as bumblebees.

British bumblebees live in many different environments. Most areas should be able to attract them; sometimes they just need some encouragement by planting the right type of plants.



CREST AWARDS | SUPERSTAR

Bumblebee Mystery

Activity Card

Dear Investigators

We think bumblebees are brilliant! They pollinate our flowers and help them to make seeds. We spend all our spare time looking for bumblebees. Our favourite is the great yellow bumblebee, but we haven't seen one yet.

We don't see as many bumblebees as we used to and we are worried because bumblebees are very important. We'd like to do a survey across the country to see where the bumblebees are. Can you help us?

From,

Buzzabout

The Buzzabout family

P.S. We have sent some pictures of pollinators to help you.

Your challenge

Help the Buzzabout family by carrying out a bumblebee survey.

Discuss

Look at the pictures of pollinators.

Sort them into bumblebees and other insects.

Have you seen any of the bumblebees?

Where did you see them?

Getting started

Where will you look for bumblebees? How long will you spend looking?

Start a survey to see what you can find.

Test your ideas

Could you make a tally chart or pictogram to record what you see?

Pollinator	Tally
e.g. wasp	

Share your ideas

Make a plan or a guide to show how to make the area more bumblebee-friendly.

Extra things to do

Look at the bumblebee-friendly plants. Which do you have already and which could you add to your area?

Set up a camera to observe bumblebee activity.

Find out more about why bumblebees are so important.

Bumblebee Mystery Bee friendly plants

Bumblebee Mystery Pollinator

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Bumblebee Mystery
Card Sort

Bee friendly plants card sort

1. Chives
2. Rosemary
3. Daffodils
4. Marigolds
5. Lambs' ears
6. Sedum
7. Geranium
8. Buddleia
9. Clover
10. Runner beans
11. Fuchsia
12. Sage
13. Cornflower
14. Lavender
15. Thyme

Pollinators card sort

1. Peacock butterfly
2. Tachinid fly
3. Red-tailed bumblebee
4. Tree bumblebee
5. Blue bottle fly
6. Red mason bee
7. Beetle
8. Great yellow bumblebee
9. Black solider fly
10. White-tailed bumblebee
11. Bee fly
12. Common carder bee
13. Green lacewing
14. Black arches moth
15. Wasp

BRITISH SCIENCE ASSOCIATION

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Crafty Rafts

Organiser's Card

About the activity

This activity is designed to get children designing and making a raft that floats.

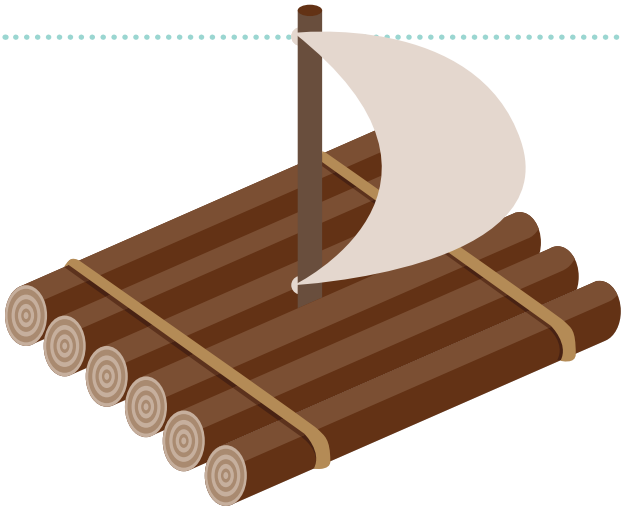
The children have been asked to design a raft. The Cub Scouts and Brownies of Startown are having a problem making a raft that floats.

Through this activity you will support your group to:

- Design and make a model raft using just a piece of paper
- Conduct a fair test to see which raft design can hold the most weight
- Record and present their results

Kit list

- Plastic tanks or bowls of water – one per group
- A square sheet of paper (20 cm x 20 cm) or A4 – six per group plus spare sheets
- Foil (optional as an alternative to paper)
- A set of marbles all the same size – 30 per group plus lots of spares
- Sellotape, masking tape, staplers, or other fasteners – provide the same for each group
- Waterproof coverings if you are working on wooden desks



What to do

1. Introduce the activity using the story.
2. Give out activity cards and equipment to the children.
3. Explain that they will be designing and making rafts, and testing how much weight they can carry before sinking.
4. Encourage children to discuss their ideas and how to carry out their investigations. Give each group access to sheets of paper or foil. Remind them they can only use one piece at a time. Challenge groups to make several rafts of different shapes and sizes. They can do this by folding the paper or foil and securing the corners. Give children time to discuss which shapes might work and to practise ways of folding the paper to make different rafts.
5. Support children to conduct their investigation and make their own records of their results. Set them off on the challenge to build a raft able to hold the largest number of objects before it sinks. They can float their rafts in a container of water and add cubes or marbles until the rafts sink. The raft that carries the greatest number of objects will be the winner.
6. Ask the children to present their findings to the rest of the group. They can be as creative in their presentation as they want.

Things to think about

Make sure that the water is deep enough for the loaded rafts to float and not touch the bottom.

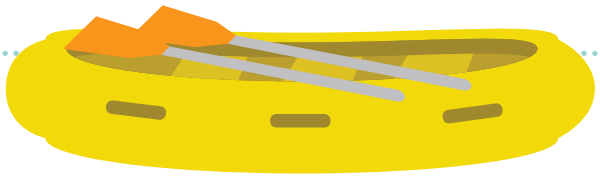
It's best if children use one sheet of paper at a time and are left to experiment with their own raft shapes.

Some children may add the objects to the raft too quickly or unevenly. Let them experiment on their own. They learn more when it goes wrong.

The children will need to agree on how they will know when a raft has officially sunk. This could be when it sinks below the water line or when it lands on the bottom of the container.

An object that is normally unable to float can be made to float by changing its shape. Different shapes will float in different ways. You will find a wide flat raft is very stable when it floats but can tip if it is loaded on one side. If the children are investigating carefully, the best raft is likely to be one with a large base and with sides approximately 1.5 cms deep.

A good raft will hold a surprisingly large number of objects.



Keywords

- Floating
- Buoyancy
- Paper
- Building
- Weights

Watch out!

Mop up water spills quickly and collect escaped marbles to avoid accidents.

CREST AWARDS | SUPERSTAR

Crafty Rafts

Activity Card

Your challenge

Can you help them to decide the best design for a raft?

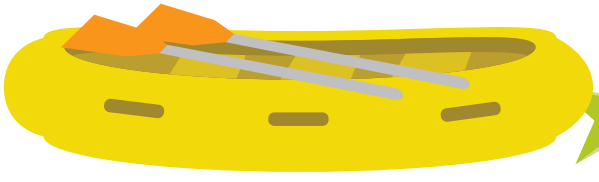
You can make models out of paper. What shape of raft will hold the largest number of objects before it sinks? **You can only use one sheet of paper at a time**.

Discuss

What do you know about rafts?

Have you ever made one?

What shapes do you think might make good rafts?



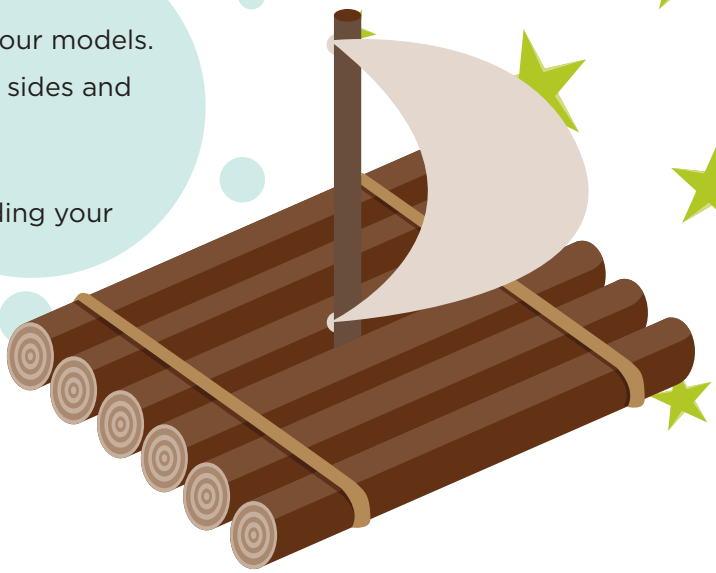
Getting started

You can use sheets of squared or A4 paper to make your models.

You can make the paper into a raft by bending up the sides and folding the corners.

Fasten the corners. Don't cut your paper.

What different shapes and sizes can you make by folding your pieces of paper in different ways?



Test your ideas

Put your raft to the test!

See which shape holds the most objects without sinking. What's the best way to add the objects? Which raft do you think will win and why?

You could record your results in a table like this:

	Picture/ description of raft	Maximum number of marbles before sinking
Raft 1		
Raft 2		
Raft 3		

Share your ideas

You could make a model of your best raft to send to Natty Nodrum.

Extra things to do

Would it matter if you use different types of paper?

Could you make the raft without fasteners?

What other materials can you use to make a raft?

CREST AWARDS | SUPERSTAR

Fantastic Fingerprints

Organiser's Card

About the activity

This activity is designed to get children thinking about fingerprints.

The investigators have been given a news article about fingerprints. Teachers at Startown Primary School are wondering if they can use fingerprints to identify the students. Are the students' fingerprints that different?

Through this activity you will support your group to:

- Collect their fingerprints
- Compare different fingerprints and identify patterns
- Record and present their results

Kit list

- Dust (flour, chalk, talc, cocoa powder)
- Soft pencils
- Blank paper (white paper for pencil and cocoa prints; black paper for white powder prints)
- Other things to investigate e.g. oil or cream (leaves a print on OHT film or plastic), non-permanent markers etc.
- Sellotape
- Scissors
- Hand lenses or magnifying glasses

What to do

1. Introduce the activity using the news article. Ask them if they have taken a fingerprint before.
2. Give out activity cards and equipment to the children.
3. Explain that they will be investigating fingerprints today. Give children time to talk about what they know about fingerprints. Let them look at their own fingerprints with hand lenses or microscopes.
4. Demonstrate how to take a fingerprint.
5. Support the children to design and carry out a test and to make their own records of their results. Draw children's attention to the different patterns found in fingerprints (loops, arches and whorls).
6. Ask the children to present their findings to the rest of the group. They can be as creative in their presentation as they want. The prints could be projected for the entire group to see. The children could try to work out which print belongs to which person. They could draw large images of their fingerprints.

Things to think about

Let the children investigate how to get good prints. Only give advice if they are failing to make any progress.

To obtain a good quality fingerprint, children should wash their hands between prints. They also need to tap off the excess powder. A thin layer is best.

Marker pens and ink-pads can be used but they can be difficult to remove from the children's fingers.

Keywords

- Fingerprints
- Identification
- Forensics

Watch out!

Check if any children have wheat or nut allergies before using flour and cocoa.

Children should be reminded to keep fingers out of their mouths and eyes during this activity and to wash their hands thoroughly at the end of the session.

Do not use permanent markers.

CREST AWARDS | SUPERSTAR

Fantastic Fingerprints

Activity Card


NEWS

Fantastic Fingerprints

Teachers at Startown Primary School are wondering if they can use fingerprints to take registers, log children on to computers and borrow library books.

The fingerprint pad designer told our reporter, "Electronic pads scan the fingerprints. They change the fingerprint pattern into a code. The code is saved on a computer. Children only need to touch a pad to register. The possibilities are endless."

Mrs Teachem, the school's Head told our reporter, "I'm not sure it will work. Are fingerprints really all different? I would like to know what your readers think."

Your challenge

Find out if everyone's fingerprints really are different.

Discuss

How do you think fingerprints are collected?

Look at your fingerprints with a hand lens or microscope.

What do your own fingerprints look like? Are they the same as your partner's prints?

Getting started

You either need to rub pencil onto a piece of paper or you can sprinkle a small amount of dust on a table.

Now put your thumb in the dust or on the pencil rubbing. Place your thumb firmly on the sticky side of a piece of sellotape. Now stick your sellotape onto a piece of paper.

You may need to experiment to get clear prints.

Test your ideas

Look at the prints, do you have any of these patterns?

Compare your prints with other people. Are they all different?

Can you find other ways to collect fingerprints?

Share your ideas

Share all the fingerprints. Can you work out which are yours? You could let Mrs Teachem have copies or drawings of fingerprints.

Extra things to do

Look for fingerprints on surfaces such as glass. Can you identify who made them?

Some people think children's fingerprints should not be used as records in schools. What do you think?

Can you find out other ways of identifying individuals?

CREST AWARDS | SUPERSTAR

Investigating Ink

Organiser's Card

About the activity

This activity is designed to get children thinking about how to identify different inks using chromatography.

Lady Felicity Feline's prize winning Cocker Spaniel has been dog napped and a note has been sent asking for a ransom. Can the investigators work out which one of the four suspects wrote the note based on the type of ink used?

Through this activity you will support your group to:

- Experiment with different ink pens using chromatography
- Design an experiment to help them identify the pen used to write a note
- Share their conclusion and present evidence to support it

Kit list

- Absorbent paper e.g. blotting paper, white filter paper, white coffee filters
- Four pens (not biros) with black water-soluble ink inside, labelled with the suspects' names – it's better to have a set per group
- Additional pen or black ink for the initial exploration – you must check that the colour separates
- Ransom note (written using one of the pens prior to the activity). Don't worry if it spreads a bit.
- Beakers or pots
- Scissors
- Extra non-permanent marker pens in various colours
- Plain paper for wanted posters

What to do

1. In advance prepare the ransom note according to the instructions in the kit list.
2. Introduce the activity by reading the news story together and examining the ransom note with the children. Show the children the suspects' pens.
3. Give the children time to talk about ways of identifying which ink was used to write the ransom note. Give them a black pen or a blob of black ink and some white paper towel to explore the effect of water on ink.
4. Let the children explore the pens and the note. You will need to cut the ransom note into strips so that groups can each try out their tests. Cut more strips than you need to have some spares. You will probably need plenty of them!
5. Some children may need help to examine the different patterns and colours produced by each pen.
6. Give children time to talk about their evidence and decide who they think the culprit is.
7. Children can now create a wanted poster to help detectives track down the criminal they have identified. Encourage them to include all the evidence they have collected.
8. Encourage children to use the evidence from their experiment to justify their decision.

Things to think about

Test the pens/ink prior to the activity by putting marks on pieces of blotting paper and dropping water on them.

Some black inks will separate better than others. You need the criminal's pen to produce a different pattern from the others.

Your ransom note must be written on absorbent paper e.g. blotting paper. Write a large note so there is enough for everyone. Your note could read: Lady Feline. If you want Colin returned safely, put £100,000 in a brown paper bag and leave it under the big oak tree by the town hall at 5:15 pm prompt tomorrow.

Take it further

Ink is made up of a mixture of different colours. Different inks will be made up of different colours even if they look the same. With water-soluble inks you can separate the colours from one another using water (chromatography).

The colour from some other items such as food colouring, jelly beans and other sweets can be separated in the same way.

Chromatography is used to separate and identify all sorts of substances in police work. Drugs can be identified in urine and blood samples, often with the aid of chromatography.

Keywords

- Ink
- Chromatography
- Separation
- Mixture
- Absorbancy
- Water-soluble

Watch out!

Use plastic beakers for this activity.

Any spills should be cleaned up quickly to avoid accidents.

Avoid using permanent marker pens.

CREST AWARDS | SUPERSTAR

Investigating Ink

Activity Card

Your challenge

The four main suspects are:

- Ivor Swagbag
- Robyn Banks
- Kitty Catburglar
- Nick Goods

Help the detectives to match the ink from the ransom note to one of the suspects' pens to find out who has Colin the Cocker Spaniel.

Discuss

What ways could you use to tell the difference between the black pens?
Drop water on black ink and watch what happens.
How might this help to solve the crime?

Getting started

Pens write differently and the colour of the ink can vary. Perhaps you can see these differences if you look closely.

If you have explored what water does to some ink, can you use what you have found out to investigate the suspects' pens? This process is called chromatography.

Test your ideas

One way to test the ink is to drip water onto a sample of the ransom note. Watch what happens. Compare this with blobs of ink from the suspects' pens.

Try to gather as much different evidence as you can.

Can you find out who the dog napper is?

Share your ideas

Why not make a wanted poster which includes all the evidence to help detectives track down the criminal you have identified?

Extra things to do

Is it only black pens that you can test with chromatography?

Are there other things that are coloured that you can test such as jelly beans or food colouring?

Are there other ways of doing chromatography?

CREST AWARDS | SUPERSTAR

Racing Rockets

Organiser's Card

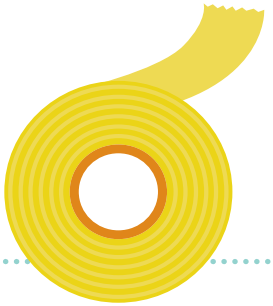
About the activity

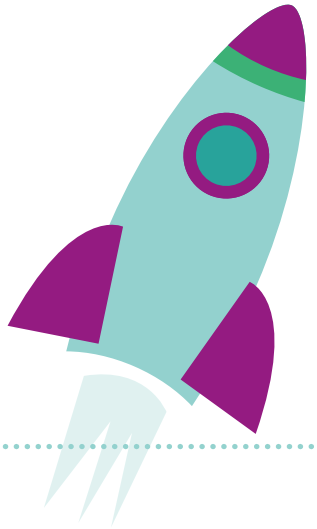
This activity is designed to get the children to think about rocket designs and build a rocket that can go as high as possible.

The children have seen a poster about a new rocket competition inviting them to design and fly a rocket. The competitors need to set their sights high and produce creative ideas.

Through this activity you will support your group to:

- Think about different shapes of rockets
- Test different rocket shapes and sizes
- Share their findings with the rest of the group.





Kit list

- Pencils or dowel to roll the rockets
- Strips of paper or card (cut to 1/4 of an A4 sheet)
- Sellotape
- Scissors
- Plastic straws – one per child
- Metre ruler or tape measure
- Plasticine, Blu-Tack or paperclips to add weight
- Extra card to make fins

What to do

1. Read the activity card to familiarise yourself with the activity.
2. Check the kit list to ensure you have the correct resources.
3. Set the scene using the poster and invite the children to enter the competition.
4. Give children a short time to talk about rockets and share their ideas.
5. Give each team the resources that they will need for the challenge.
6. Let children explore making and flying the basic tube shape. Give support to any groups that seem to be struggling.
7. Once they have the basic shape working, give children plenty of time to experiment to find out what makes a difference to how the rocket flies. They may need to make several versions to compare them.
8. When the time is up, all the children gather to present and test their rockets.
9. Measure the distance that each rocket travels. Test them three times each. It is up to you to decide if children can repair or adjust their rockets after each test.
10. Give points to each rocket according to the distance travelled. You can give extra points for design.
11. Announce the winners of the competition.
12. Encourage children to decide what made a difference to how each rocket flew. They could do a design report for Windy Astralbody.
13. The winning designs can be displayed on a podium.

Things to think about

The rockets will not work very well unless one end is flattened, folded and sealed. Let them explore this for themselves first.

Watch out for children launching rockets by hand rather than blowing.

The children will need to agree on where to launch their rockets from and how the flight will be measured.

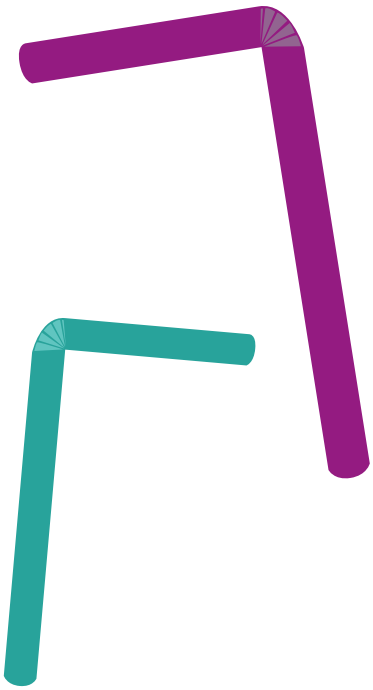
Take it further

Once children have the basic rocket shape there is plenty of scope for investigation such as size, materials and shape. Three important things affect the way rockets fly – aerodynamics, stability and balance.

Flattening and folding one end will help to make the rocket more aerodynamic and prevent air escaping. Children might experiment with trying to make the nose more cone-shaped.

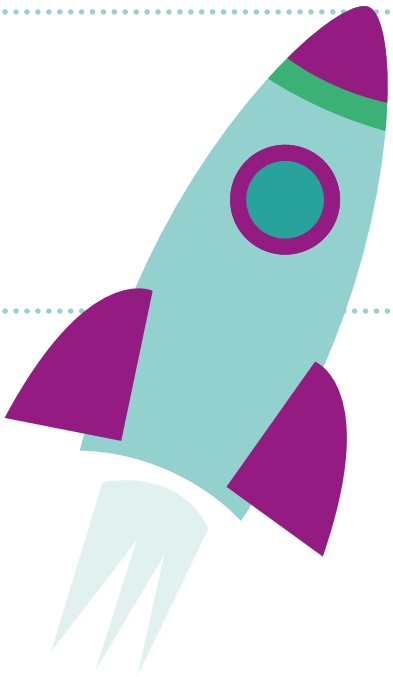
Children can try attaching fins in different positions. This will affect the stability of the rocket. Fins at the tail end tend to be the most stable.

Weight will also affect the flight. A little additional weight at the tail end can help. If it is too heavy it may not fly at all.



Keywords

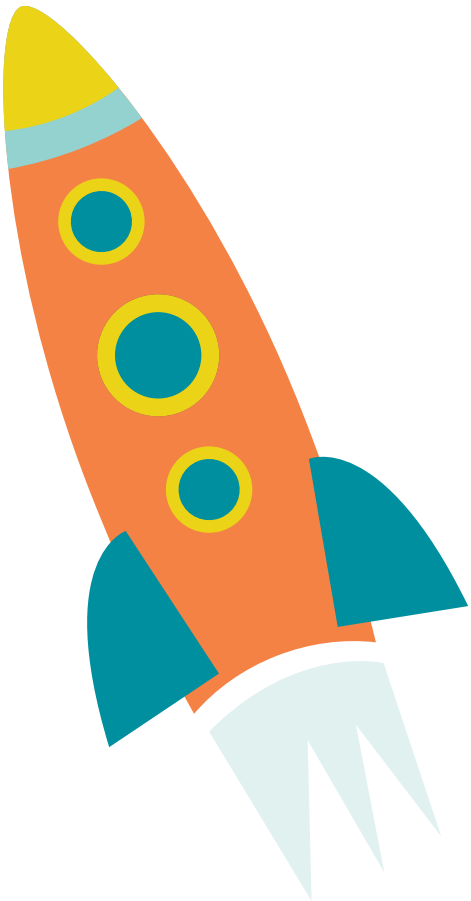
- Aerodynamics
- Flight
- Rocket



Watch out!

Remind children to stand behind the rockets as they are launched. Do not let children swap straws.

Remind children not to over-exert when blowing the rockets.



CREST AWARDS | SUPERSTAR

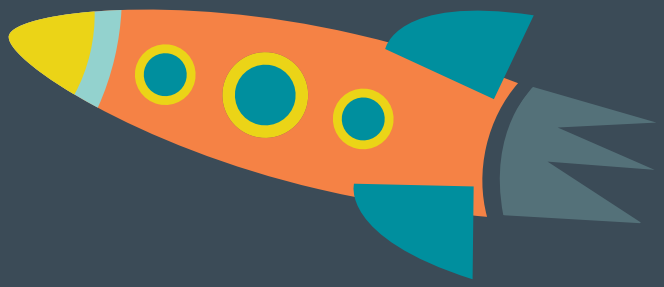
Racing Rockets

Activity Card

You've seen a poster on the noticeboard in town:

Director Windy Astralbody told us, "It's a tall order but we hope competitors will set their sights high and maybe even break some records. We are looking for really creative ideas. Who knows, one day the winners might get to fly into space in a real rocket."

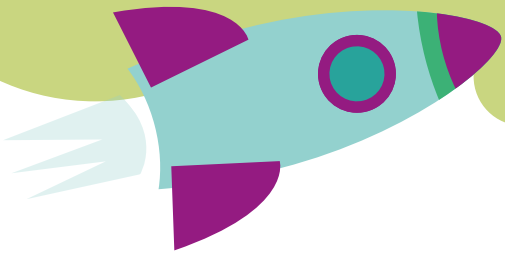
A NEW ROCKET COMPETITION IS BEING LAUNCHED TODAY BY THE SPACE RESEARCH ASSOCIATION, 'RACING ROCKETS'.



The competition invites children to design and fly a rocket.

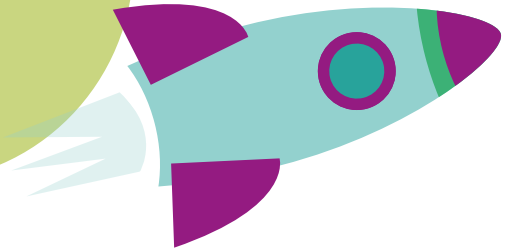
Your challenge

Can you design a rocket that will go the furthest? Building a proper rocket is difficult but you could investigate rocket shapes that might look something like this.



Discuss

Are all rockets the same shape?
What is important about the shape of rockets?
Does everyone agree?



Getting started

This is how you make your basic rocket shape.

Roll a strip of paper or card round a pencil (not too tightly) to make a tube.

Tape it in three places to keep it together, then take the pencil out.

Flatten one end of the tube, fold it over and secure it with tape.

Slide the tube onto a straw.

Blow your rocket across the room and see how far it goes. Don't blow too hard.

Test your ideas

How you can improve its flight?
Do you think fins will help?
Where is the best place to put them?
What shape should they be?
What about the size of the rocket?
Is card better than paper?
Does it help to put some weight in the rocket?
Try different rockets and choose the one that you think is best.

Share your ideas

Hold the 'Racing Rockets' competition. Each team needs to tell everyone else about their rocket design and then measure how far the rockets travel. Test each one three times. You could send your designs to Windy Astralbody and put the winning rockets on a podium.

Extra things to do

What other ways could you make a rocket? Find out what you can from books and the internet, then make and test some.

You could write a consumer report to compare and contrast rockets.

Several countries are trying to use rockets to travel into space.
Can you find out more about them?

CREST AWARDS | SUPERSTAR

Super Spinners

Organiser's Card

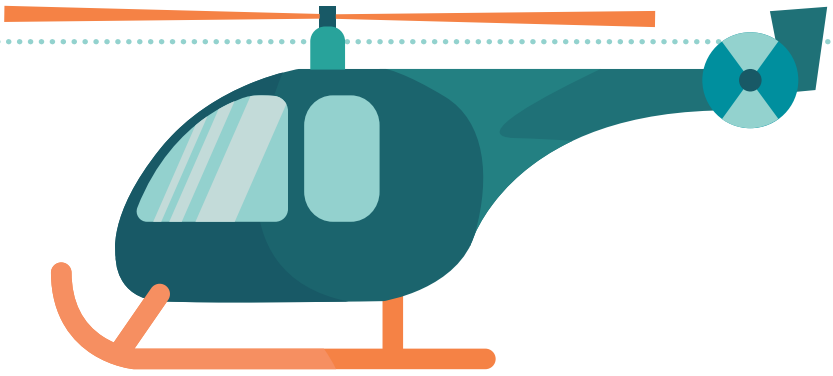
About the activity

This activity is designed to get the children thinking about helicopter blades, and how different blade sizes change the way a paper spinner falls.

Mr Sycamore arrived for work in a helicopter, amazing the students. He's testing which helicopter is best. Can the students help to find out if a longer blade design will make a difference?

Through this activity you will support your group to:

- Think about what makes paper fall in different ways
- Test whether a paper spinner falls in different ways with different blade sizes
- Share their ideas with the group.



Kit list

To make the spinners they will need:

- A4 Paper
- 30 cm ruler
- Metre ruler
- Paperclips or Blu-Tack
- Scissors
- One ready-made spinner to show the children how they work
- Large and small templates for spinners (if you think children will need them) – see following page
- Stopwatches
- Other types of paper and card

What to do

1. Read the **activity card** to familiarise yourself with the activity.
2. Check the kit list, including preparing a spinner and templates if you think that they might be needed.
3. Set the scene by discussing the news story and show the children a spinner falling.
4. Give children time to explore flat and screwed up paper and to think about what might be making a difference to the way that they fall.
5. Encourage the children to make their own large and small spinners. It is important to let them explore their ideas on their own. Have templates available if children need them. Some may need help to work out how to cut and fold the spinners.
6. Now let children try the spinners to see what happens.
7. Remind them about safety, particularly about not climbing to drop the spinners.
8. Give children some time to talk about their observations and ideas. You could show children other spinners with different blade lengths and ask them to predict how they will fall.
9. Children can share their 'best' spinner or they can create a display by sticking their spinners onto paper with advice for Mr Sycamore. Avoid too much writing by composing text message replies.
10. There are extra challenges on the **activity card**. These can be used if there is any spare time or if the children want to try out more ideas at home and earn a bonus sticker.

Things to think about

Encourage children to drop their spinners from the same height. This should be as high as possible so that the spinners can twirl before they hit the ground.

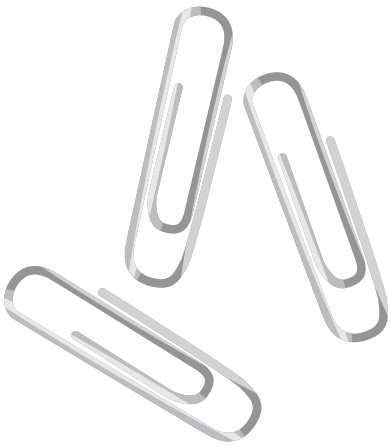
Very large spinners require a long drop to see any effect. You may need to drop them.

If they are too flimsy they will not spin.

Very tiny spinners can spin extremely quickly.

It is difficult timing the spinners if they fall quickly. However, if children want to try timing, you should let them have a go to see if works.

Adding paperclips or Blu-Tack can increase spin speed.



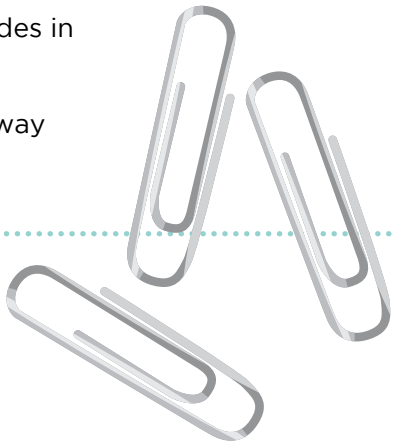
Take it further

In this situation, gravity pulls an object towards the Earth, but air pushes against it. Flat paper falls slower than screwed up paper because there is more air resistance.

Gravity pulls the spinners down. The air resists the movement and pushes on each blade causing the spinners to spin.

Spinners with longer blades will normally spin more slowly. This is because there is more surface area for the air to push against. The material on large spinners needs to be stiff enough to hold the blades in place to allow it to spin.

Sycamore seeds are sometimes called helicopters because of the way they spin as they fall.



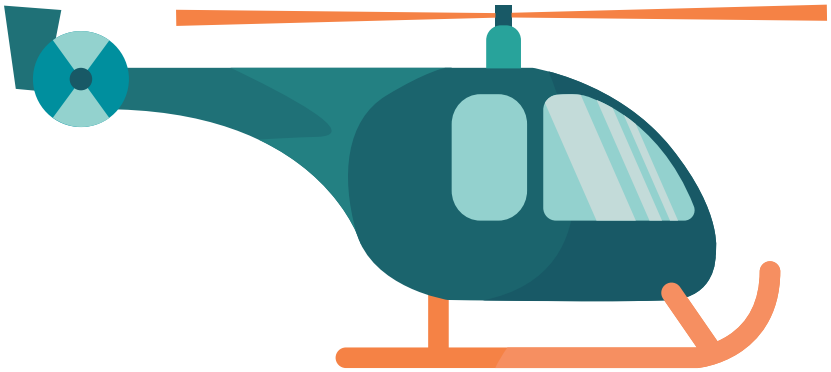
Keywords

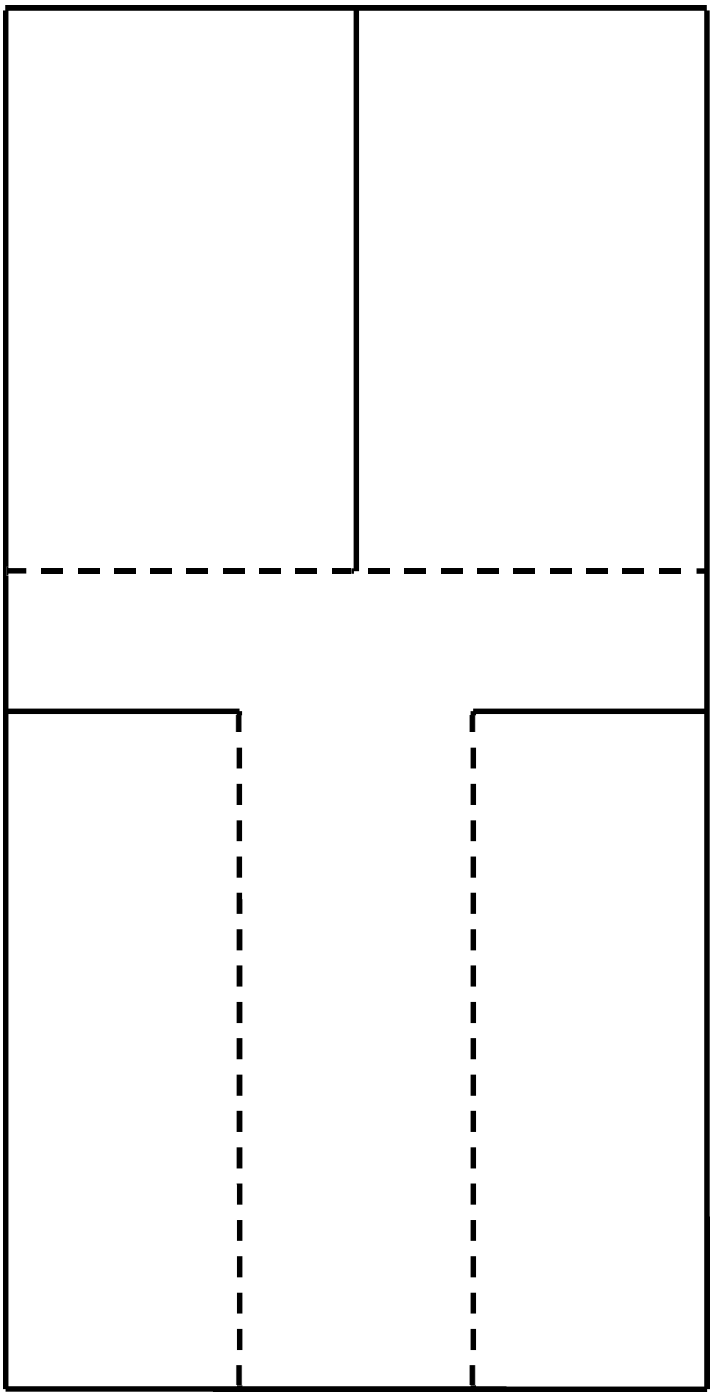
- Flight
- Shape
- Size
- Aerodynamics

Watch out!

It can be useful to drop the spinners from a height greater than a child's height. However, children should not stand on chairs or tables to launch their spinners unless very closely supervised. A library stool or kitchen steps are better.

Children need to handle and carry scissors in a safe manner.

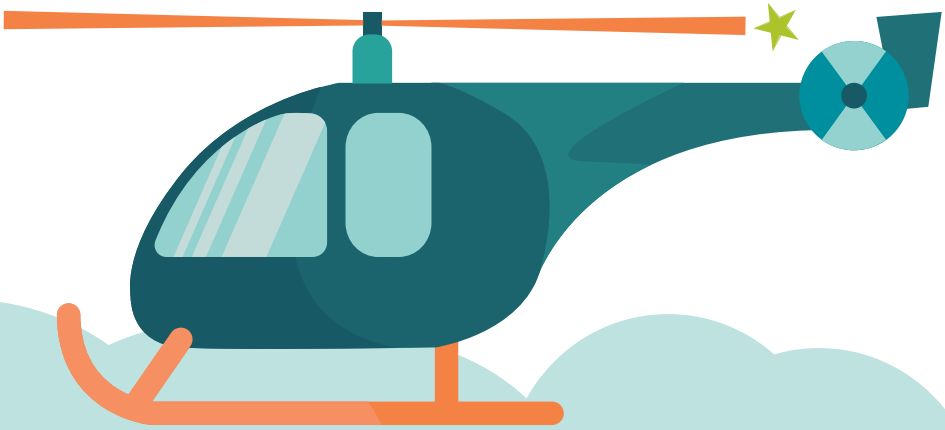




CREST AWARDS | SUPERSTAR

Super Spinners

Activity Card



Mr Sycamore, class 5 teacher at Startown Primary School, amazed pupils and staff when he arrived for work in a helicopter!

"It's a bit of a hobby really," said Mr Sycamore, "I'm flying a different one every day and then I'll buy the one I like the best. This helicopter has a short blade design, I wonder if the size of blade makes a difference? I'll need some Super Spinner test pilots to help me decide!"

Your challenge

Can you help Mr Sycamore decide if the size of the blades makes a difference?

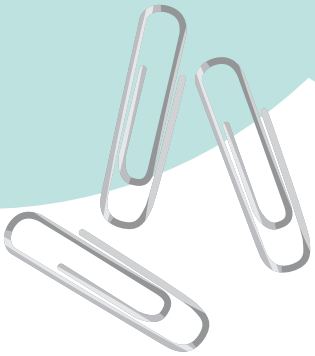
Building full size helicopters is difficult but you can have fun making paper helicopter blades and watching how they fall.

Discuss

What happens if you drop flat and scrunched up paper?
What do you notice about the way that they fall?
What might be making a difference to the way that they fall?

Getting started

You can make paper spinners to use as a model.
You will need to put a paper clip on the bottom to help them to fall properly.
What sizes will you make them?
How big will you make the blades?
How many clips will you add?



Test your ideas

Watch the spinners carefully as they fall.
Can you make them go faster and slower?
You could try landing them on a target and score points for where they land.
Remember to change only one thing at a time.

Share your ideas

You could make a display for Mr Sycamore using your spinners to show him what happened.

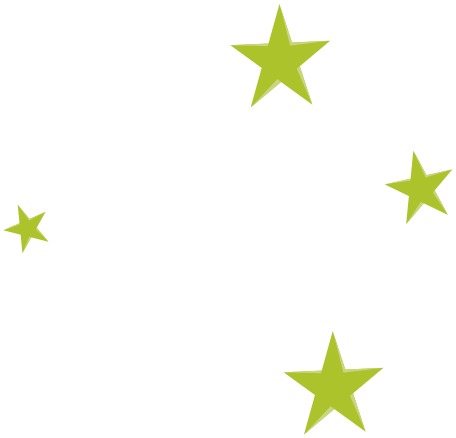
Extra things to do

Does the spinner act differently if you change its shape?

What if you make spinners from different kinds of paper?

What else could you change?

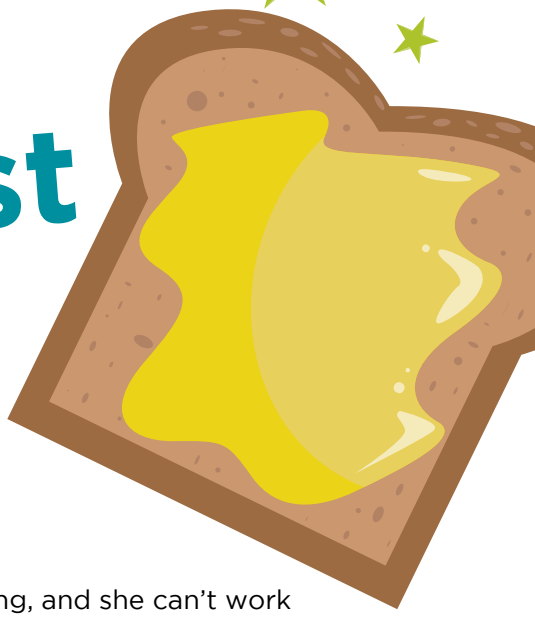
Can you make a bar chart to show your results?



CREST AWARDS | SUPERSTAR

Tumbling Toast

Organiser's Card



About the activity

This activity is designed to get children thinking about probability.

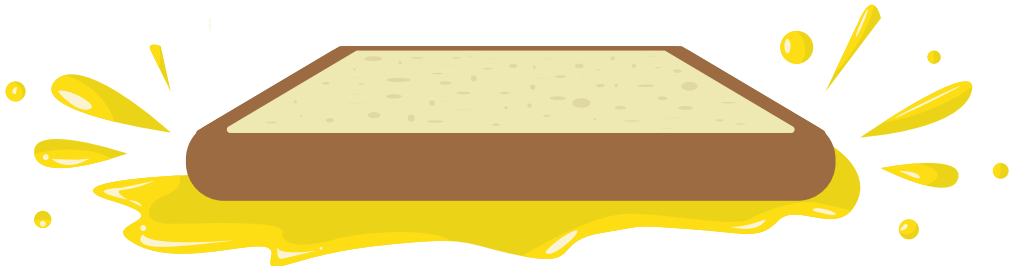
Mayor Quandary seems to drop her toast butter-side down every morning, and she can't work out why. Her secretary Dayley Diary thinks it's Murphy's Law but she's not so sure. Can the investigators help?

Through this activity you will support your group to:

- Think about the world around them from a different perspective
- Investigate and explore what living things they can find outdoors
- Record their thoughts and ideas and present them to share with the group

Kit list

- Bread – supermarkets often sell off sliced bread at the end of the day. Try to get thick and thin slices.
- Toasters (PAT tested), or toast
- Knives
- Butter (cheap margarine is fine)
- Cardboard or plastic plates
- Newspaper as a landing pad
- Jam or other spread (optional)
- Marker pens
- Recording grid with three columns – type of toast, landed butter-side down, landed butter-side up (optional)



What to do

1. Read the **activity card** to familiarise yourself with the activity.
2. Check the kit list to ensure you have the correct resources.
3. Set the scene by discussing Mayor Quandary's problem. Talk a little about Murphy's Law to make sure that the children understand it.
4. Give children time to discuss what they know about Murphy's Law and their experience of dropping toast.
5. Give children time to work out their plan. Tell them that they have limited resources so they need to plan carefully.
6. Remind children about being careful if they make the toast themselves.
7. Get them investigating. Start them off with comparing toast with and without butter. Then let them test other factors such as the height, the size of the bread, other spreads, how they drop it, etc.
8. They may find it helpful to mark the unbuttered toast each side with a marker pen so that they know which side is which.
9. Some children may need a bit of support but let them try things out first.
10. Remind them to keep notes of what is happening.
11. Give children about 20 minutes for their testing.
12. Give them a few minutes when they have cleared up to check their ideas before sharing their findings with the rest of the group.
13. They could make a display of all their toast samples and the outcomes.
14. They could write to Mayor Quandary suggesting what she might do. Encourage them to finish the letter with creative ideas.
15. There are extra challenges on the **activity card**. These can be used if there is any spare time or if the children want to try out more ideas at home and earn a bonus sticker.

Things to think about

In this activity fair testing is important. If children are looking at the size of toast slices, they need to keep the way they drop it the same. If they are looking at the height of the drop, they need to keep the toast slices the same.

To get reliable results each test needs to be repeated several times (20 is often recommended) to avoid the outcome being just chance.

Watch out for fire detectors if you are making toast.

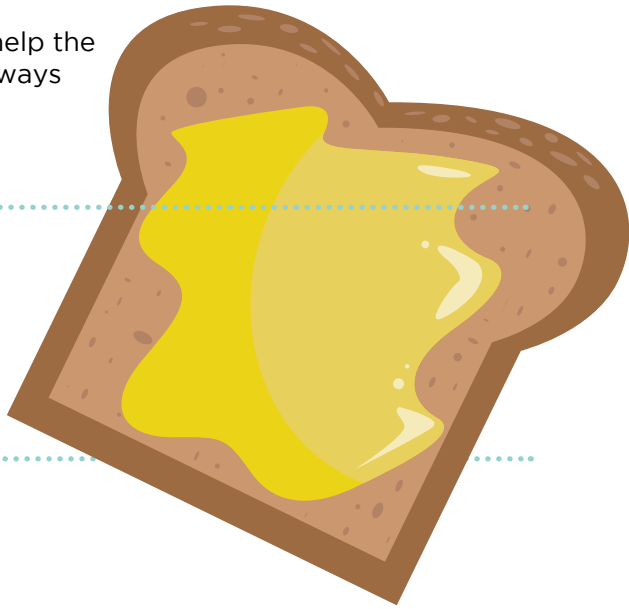
Take it further

The way toast lands has long been of interest. An internet search reveals many investigations looking into this question. It seems that there is a scientific explanation for why it does land on the buttered-side.

It is all to do with how much a piece of bread can rotate as it falls. If the distance is increased, then it can do a complete rotation and land buttered-side up!

It has been suggested that if the slice of toast is very small (less than 3 cm) it is able to complete the rotation before landing.

Encourage the children to come up with some creative ideas to help the Mayor, such as attaching the toast to the back of a cat as they always land right side up!



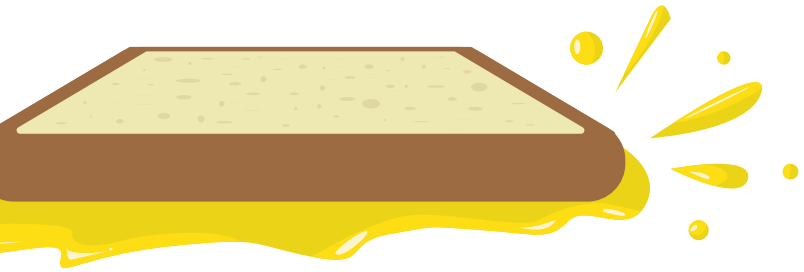
Keywords

- Murphy's Law
- Probability

Watch out!

Remind children not to eat the toast.

Only use toasters under very close supervision otherwise provide pre-made toast.



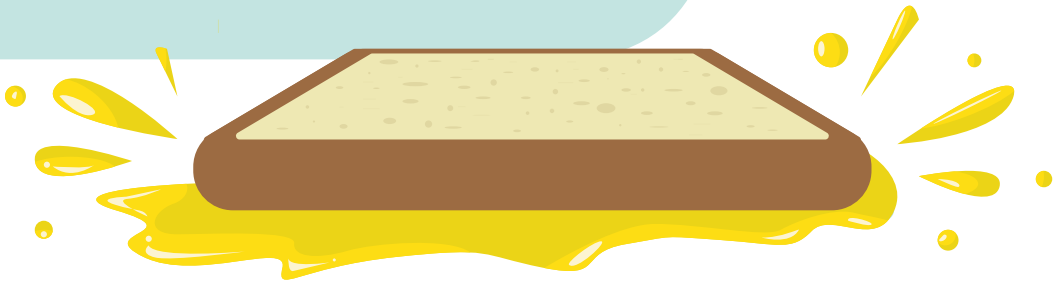
CREST AWARDS | SUPERSTAR

Tumbling Toast

Activity Card

Startown's Mayor, Councillor Imin A Quandary, is calling on all children to settle a dispute she is having with her secretary, Dayley Diary.

"You see, I'm always in a hurry so only have time for a couple of pieces of toast for breakfast. But every day I manage to drop a piece off my plate and onto the floor. The toast always seems to land butter-side down! It is such a nuisance. Dayley tells me it's just Murphy's Law – if something can go wrong, it will go wrong - but I think there's a reason. What do you think? Does toast always land butter-side down? Can you help me?"



Your challenge

Help Mayor Quandary to find out if toast really does always land butter-side down. Is there anything you can do that makes a difference to which way it falls?

Discuss

Have you ever dropped toast?
Which way did it fall?
Have you heard of Murphy's Law about toast?
Do you think that you could find a way to test it?

Getting started

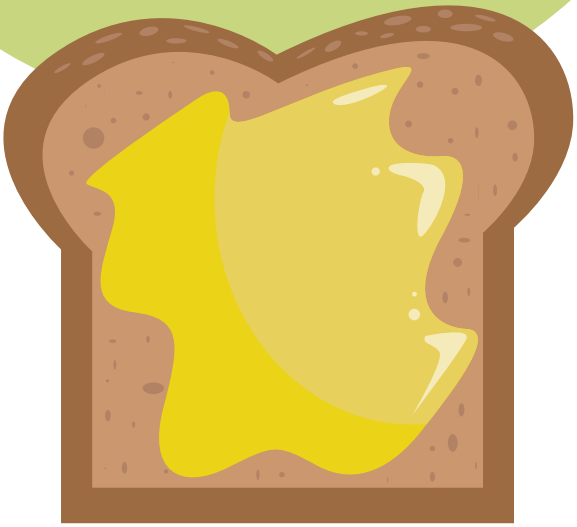
Start by finding out what happens when you drop buttered and non-buttered toast.

Then try other ideas.

Don't forget to try to keep your test fair.

You may need to do each test lots of times.

Will you need to record anything?



Test your ideas

People normally drop toast off a plate.
Does the height make a difference?
What if it is a very small piece?
What if you put anything else on the toast?
What will happen without butter?
Think about your investigation and then get toasting.

Share your ideas

Compare your ideas with other groups. Did you all get the same answer? What advice would you give to Mayor Quandary? You could write her a letter.

Extra things to do

Find out about other people who have tested toast. Did they get the same answer as you?

Find out about other sayings such as 'Red sky at night, shepherd's delight', 'Soaking conkers in vinegar makes them stronger', and 'Putting the milk in first is better when you make a cup of tea' etc.

Try testing some of them.

BONUS STICKERS HERE

Signed _ _ _ _ _ _ _ _ _ _ _ _ _

Date _ _ _ _ _ _ _ _ _ _ _ _ _

BRITISH SCIENCE ASSOCIATION

CREST AWARDS | SUPERSTAR

PASSPORT

Name _ _ _ _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _ _ _ _

Collect stickers for your passport after completing each activity!

Start

your journey here

1

2

3

4

Nearly there!

5

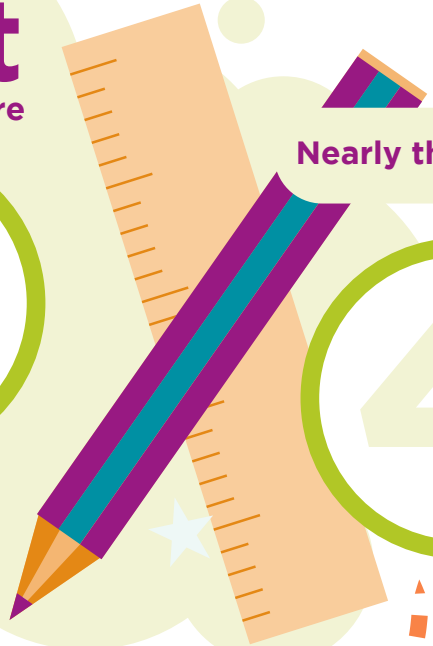
Great job!

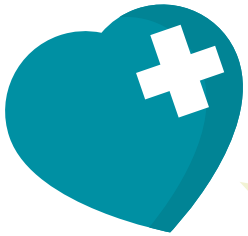
6

7

Having fun?
Take it further!

8





Well done

you have completed your CREST SuperStar Award!

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