Parachute Project

NATIONAL ARMY MUSEUM

FUN FACT- During the Second World War (1939-45), some British paratroopers were accompanied by dogs - mostly German shepherds - trained to parachute alongside them. They were used for mine-detecting, guard and patrol duties.

Learning brought to life

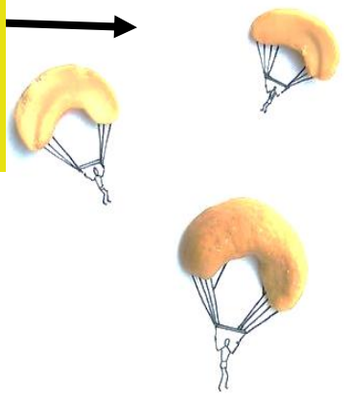
Art Challenge 1:

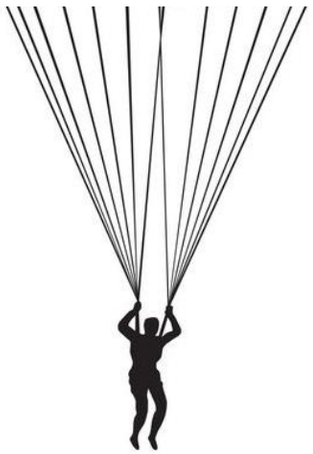
1

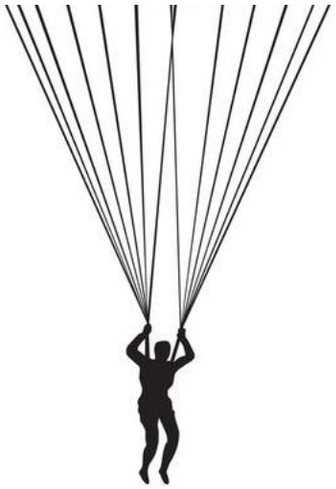
Think outside of the box! (Part A)

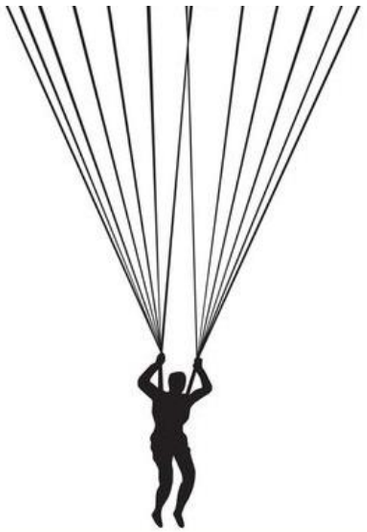
Task: Thinking about shape, find objects from around the house and place them on the images to represent a parachute. Experiment with objects below. Photograph your creations.

Extra challenge: Place down objects and draw your own parachuting team around them.









Which are more successful and look effective? Why?

_____

_____

_____

Artist: Jesuso Ortiz

Utilising flowers, buttons, office supplies, and more, the Spain-based artist is able to create all kinds of clever images, turning everyday objects into completely new types of art. He keeps his drawn additions simple, so that the objects he uses in his pieces stand out. He sees the unexpected potential in everyday objects.

STEAM

Art Challenge 1:

Think outside of the box! (part b)

Task: Try your experiments on a larger scale. Rather than using one single object, can you layer objects to create the shape and create an illusion of a parachute? Take a photograph of your favourite creation!

Extra challenge: Can you use a range of colours to create a pattern?

Top tip: Draw out the shape of your parachute first, lightly in pencil before adding objects!

NATIONAL ARMY MUSEUM

A parachute needs to be light (to carry), foldable (for packing) and flexible (for steering), but also strong and tear-resistant (for safety). It also has to be carefully folded - or packed - to ensure that it will open reliably. If a parachute is not packed properly it can result in a malfunction where the main parachute - or canopy - fails to deploy correctly or fully.

STEAM

Science Challenge 1:

3

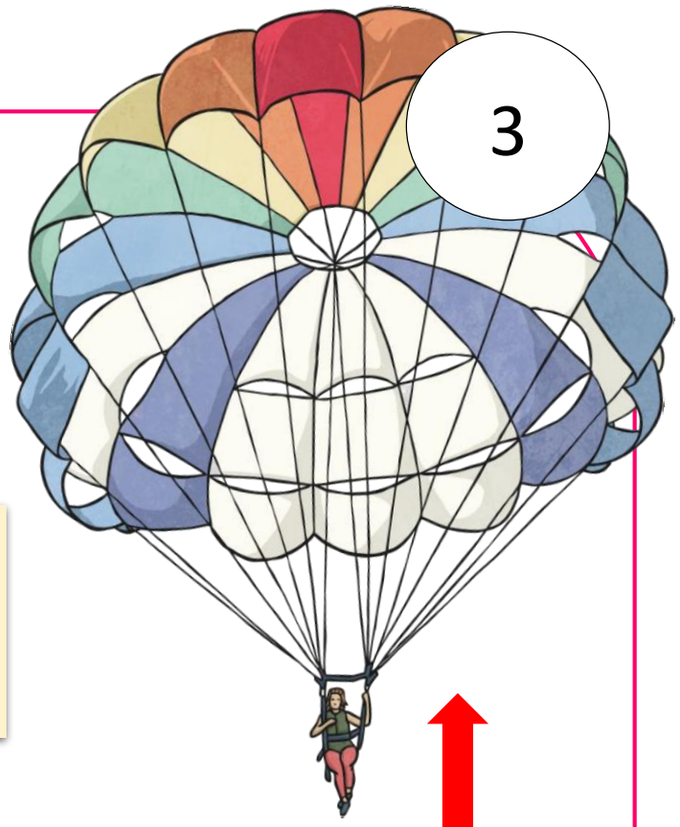
LO: To know how the amount of surface area affects air resistance.

- Air resistance is a type of friction.
- Moving objects will always experience air resistance.
- Air resistance is a pushing force.

Every time an object moves, it will experience air resistance. This is a **pushing** force. You can feel it push your hair back and make your clothes ripple as you run or ride your bike. If you fan your face with your hand you can feel the air moving towards you.

Parachutes

It is a parachute's job to cause as much air resistance as possible by trapping as much air as it can.



The air resistance causes the parachute to fully open and become as big as possible.

AIR

In which direction does air resistance act in each of the following scenarios?

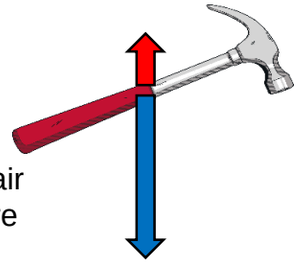
Use and arrow to show the direction of air resistance

List as many items as you can that experience air resistance.

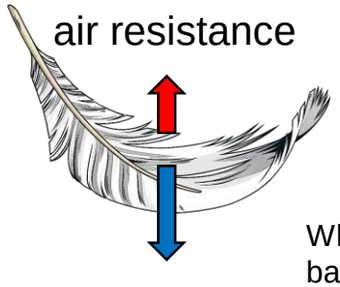
The Feather and the Hammer

On Earth, the air around us slows down objects as they fall through it. This is called **air resistance**. **Air resistance** is affected by the mass and surface area of an object.

air resistance



air resistance



At the start of the fall, the force of air resistance is small. Both objects are accelerating.

When the forces on the feather become balanced, it falls at a constant speed. At this point, the hammer is still accelerating due to its larger downward force.

The Shape of my Parachute

What is the most common shape used for parachutes and why?

What different types of shapes can be used for parachutes? What shapes work and what shapes don't work and why?

Shape	Would it work as a parachute and why?
Square	
Triangle	
Circle	
Rectangle	
Trapezium	
Kite	
Pentagon	
Hexagon	
Octogon	

Technology Challenge 1:

Selecting the material for your parachute is an important decision as it will affect air resistance.

Material properties
What properties do you think are needed for the material used for the parachute?

Task: Write the properties with the correct material. properties may be used more than once.

Properties

Thin
flexible
Breathable
Durable
Strength
Water repellent
Absorbency
Lightweight
Waterproof
Range of colours
Can stretch

Polyethylene bag

Fabric/textile/old T-shirt

Tissue paper or kitchen roll

Look around your home. Find items that fall into the material categories: plastic, paper an textiles. Write them down here:

Task: I will make my parachute out of.....
.....
.....

Extra challenge
because it is
.....
.....
.....
.....
.....
.....
.....
.....

STEPS TO SUCCESS-How do I improve my work and skills?

Bronze	I can match up most a few of the properties with the correct materials. I can state what qualities a parachute needs
Silver	I can match up the properties with the material and add my own. I can research what qualities would be good for a parachute
Gold	I can match up all of the properties with the material. I can define what is finite and infinite resources
Platinum	I can match up all of the properties with no errors. I can define finite. I can list what materials are finite and infinite. I can define what is a sustainable source. I can decide what material do use and explain why.

Technology challenge 2:

Knowing where your material comes from can help you make more environmentally friendly decisions

Match up the descriptions with the correct pictures

Made from virgin and recycled paper pulp

Made from crude oil

Made from plants (wool/cotton)
Made from man made material (polyester/acrylic)

Polyethylene bag

Fabric/textile/old T-shirt

Tissue paper or kitchen roll

Virgin paper comes from trees that are cut (felled) down

Cotton comes from plants
Wool comes from sheep

Tress can be planted again so this is a **sustainable material**

Recycled paper involves paper products being turned into new paper

Plastic is a by product of oil. Oil comes from the ground and will **run out**.
This is a finite resource

Trees can be replanted this make this **resource infinite, it wont run out.**

What does FINITE mean?

……
……
……
……
……
……

What does INFINITE mean?

……
……
……
……
……
……

From the material you could use which ones are SUSTAINABLE?

Plastic bag
textile
tissue paper

Explain why

……
……
……
……
……
……

STEPS TO SUCCESS-How do I improve my work and skills?

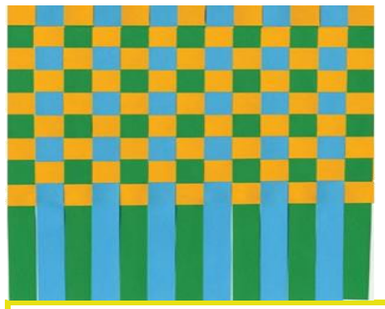
Bronze	I can match up most a few of the properties with the correct materials. I can state what qualities a parachute needs
Silver	I can match up the properties with the material and add my own. I can research what qualities would be good for a parachute
Gold	I can match up all of the properties with the material. I can define what is finite and infinite resources
Platinum	I can match up all of the properties with no errors. I can define finite. I can list what materials are finite and infinite. I can define what is a sustainable source. I can decide what material do use and explain why.

Weaving (Part A)

Task: Create a small sample of paper weaving. Follow the visual guide to learn how to weave. Use paper, magazines, newspaper or old letters.

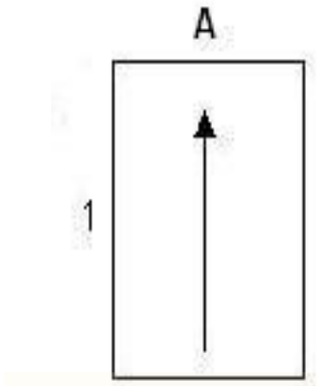
Extra challenge: Can you use 2 different colours or different papers to create contrast.

Weaving Paper Sample

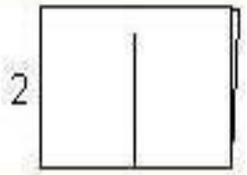


Sample 1
Stick here

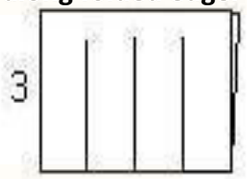
If you are able to access the internet, please use this video tutorial.
https://www.youtube.com/watch?v=sOmYCURzd7Y



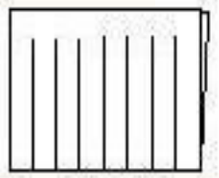
Fold paper in half.



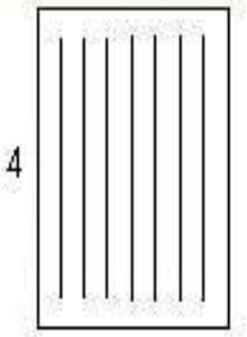
Cut along folded edge.



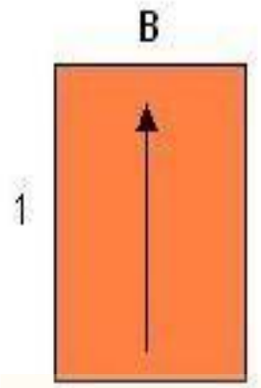
Cut even strips.



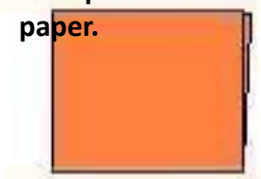
Ensure strips stay attached.



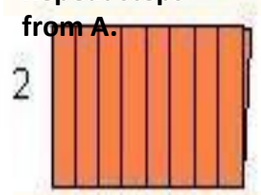
Unfold paper and reveal even slits cut from top to bottom.



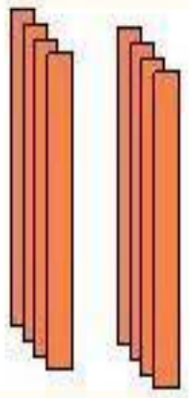
New piece of paper.



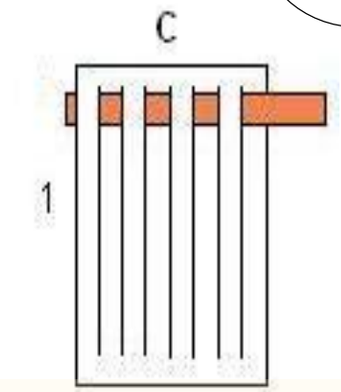
Repeat steps from A.



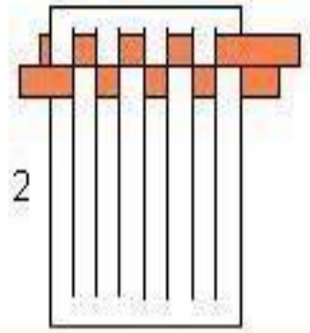
Make these even.



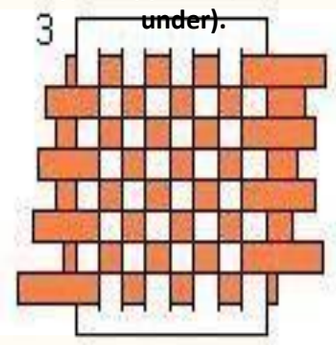
Ensure these are NOT attached. You should have loose strips of paper.



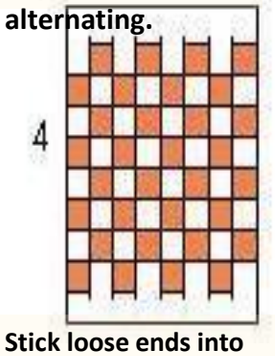
Insert strip and go under and over.



Repeat opposite (over and under).



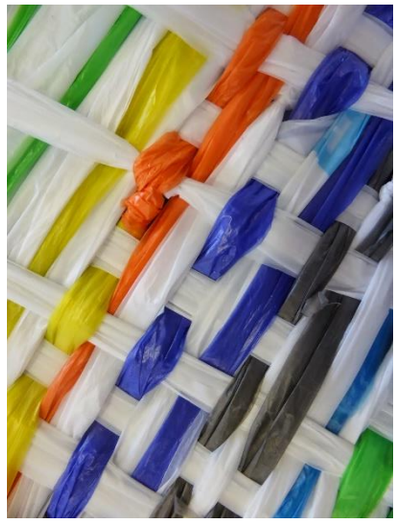
Repeat alternating.



Stick loose ends into place and trim into a neat shape.

Art Challenge 2:

Weaving (Part B)



Task: Now you have learnt the technique, try experimenting with materials. Create 3 samples showing your new weaving skills using unusual materials. Cut strips of plastic bags, crisp packets, labels from bottles, old clothes, kitchen roll, use anything from around the house.

Extra challenge: Consider the parachute and what materials you would use to make this? Can you weave those materials?

STEPS TO SUCCESS-How do I improve my work and skills?

Bronze
- Woven with gaps showing limited control.
- Use of limited/basic materials.
- Edges are left loose and have not been neatened.
- Minimal pattern has been created.

Silver
- Parts are secure.
- Tightly woven with some gaps showing good control.
- Use of some unusual materials.
- Edges are stuck into place.
- A consistent pattern has been created.

Gold
- Tightly woven with minimal gaps showing careful and accurate control of materials.
- Combines materials.
- Edges are refined and neat.
- Colour and sequence have been considered in the pattern.

Platinum
- Able to identify successful materials that are suitable for weaving.
- Experiments with sequence and the weaving process.
- Independently explores unfamiliar materials.
- Successfully merges and layers materials.

Weaving plastic materials sample

Sample 1
Stick over this box

Try weaving with plastic based materials. This could include cutting strips of plastic bags, crisp packets, labels from bottles, straws, freezer bags.

Use tape to stick your weaving into place. This will help you weave over and under.

Weaving scrap fabrics materials Sample

Sample 2
Stick over this box

Try weaving with fabric materials. You could cut up an old sock that has holes in, an old t-shirt, ribbons, canvas bag. Find anything old and unused that could be recycled in this project.

Weaving materials from nature Sample

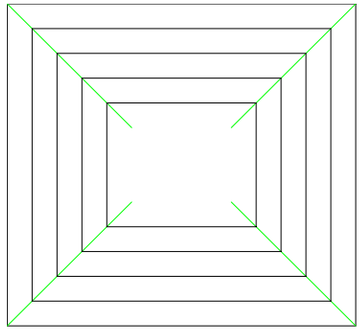
Sample 3
Stick over this box

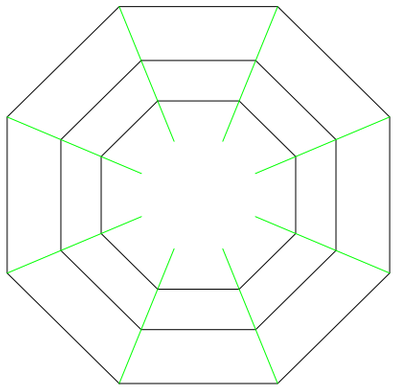
Try weaving with materials you find from outside. You could use long weeds, leaves, long pieces of grass, twigs. Use your imagination.

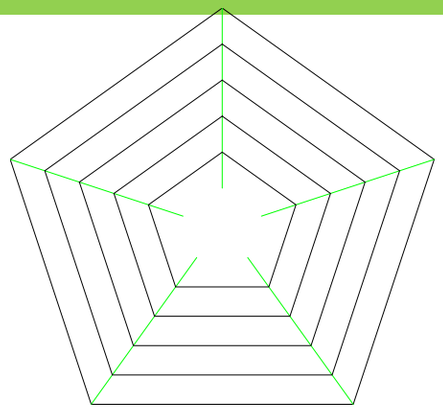
Engineering Challenge 1:

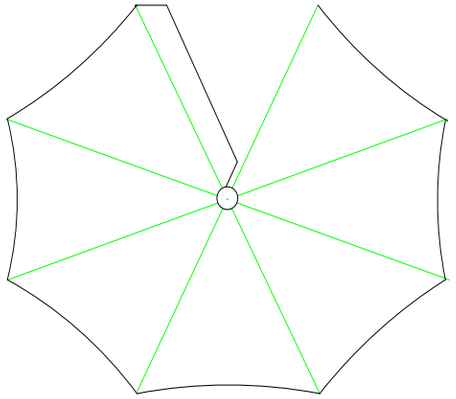
You will need:

- A ball of plastercine/small action figure/lego man/
- String/dental floss/ wool
- Different types of material, e.g. paper towel, writing paper, plastic bag/old t-shirt
- Scissors
- Tape





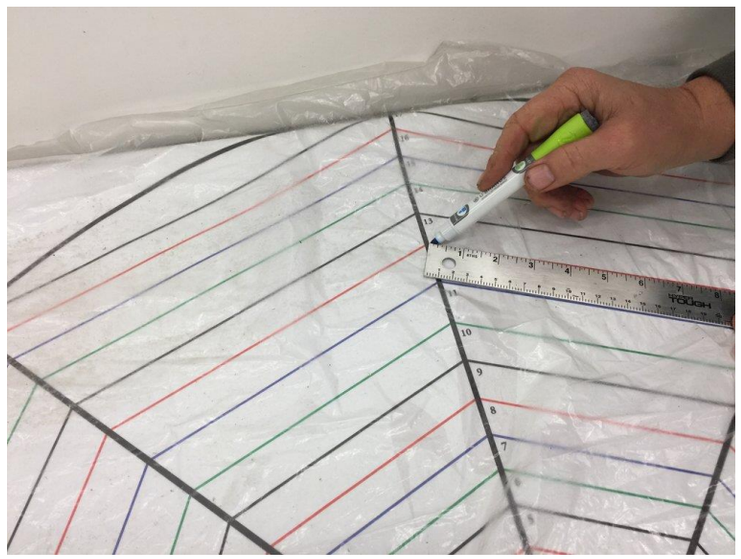




Task:

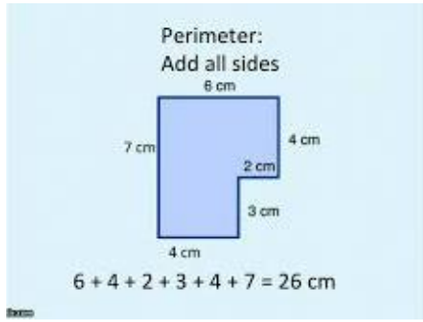
1. Select a template from- a square, octagon or a pentagon
2. Cut out the template shape
3. Put your chosen parachute material on a flat surface
4. Place the template on top and draw around it
5. Cut out your parachute shape
6. You will need to **put holes in the corners** of each shape along the green lines

Extra challenge: How big will you make your parachute? How will you join material to make a mega parachute?



Bronze	I have selected a template. I can use the correct tools to cut out my chosen template. Cutting does not follow the lines. Holes for string inconsistent quality. Transfer onto chosen material may have errors, messy cutting, some errors
Silver	Template cut out accurately with little white space. Cutting kept close to the black line. Fold lines under defined. Holes for string in the right place and string can hang freely. Transfer on to chosen material successful. Accurate cutting, few errors
Gold	I have cut out more than one template and thought about which parachute will be more successful. I have folded the crease line using a straight edge (ruler) I have tried out 2 templates and chosen 1 based on how well in travelled in the testing stage. The string rests in the holes with room to move. Transfer onto chosen material complete with attention to detail, little or n errors
Platinum	Able to select 2 templates, trailed both and select the more successful parachute template. Used a tool to create holes for the string and secured string to the weight the correct material with room for the string to move when in flight. Transfer of chosen template onto material completed with precision. No errors

The Size of my Parachute



Shape	Formula
Square s	Area=s^2
w Rectangle l	Area=lw
Triangle h b	Area= $\frac{bh}{2}$
Circle r	Area=3.14$(r)^2$

What shape am I using for my parachute?

What are the dimensions of my parachute?

What is the perimeter of my parachute?

What is the area of my parachute?

If I make my parachute twice as big, what happens to my area and perimeter? Calculate the area and perimeter of the bigger parachute.

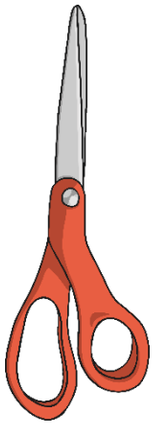
CHALLENGE QUESTION

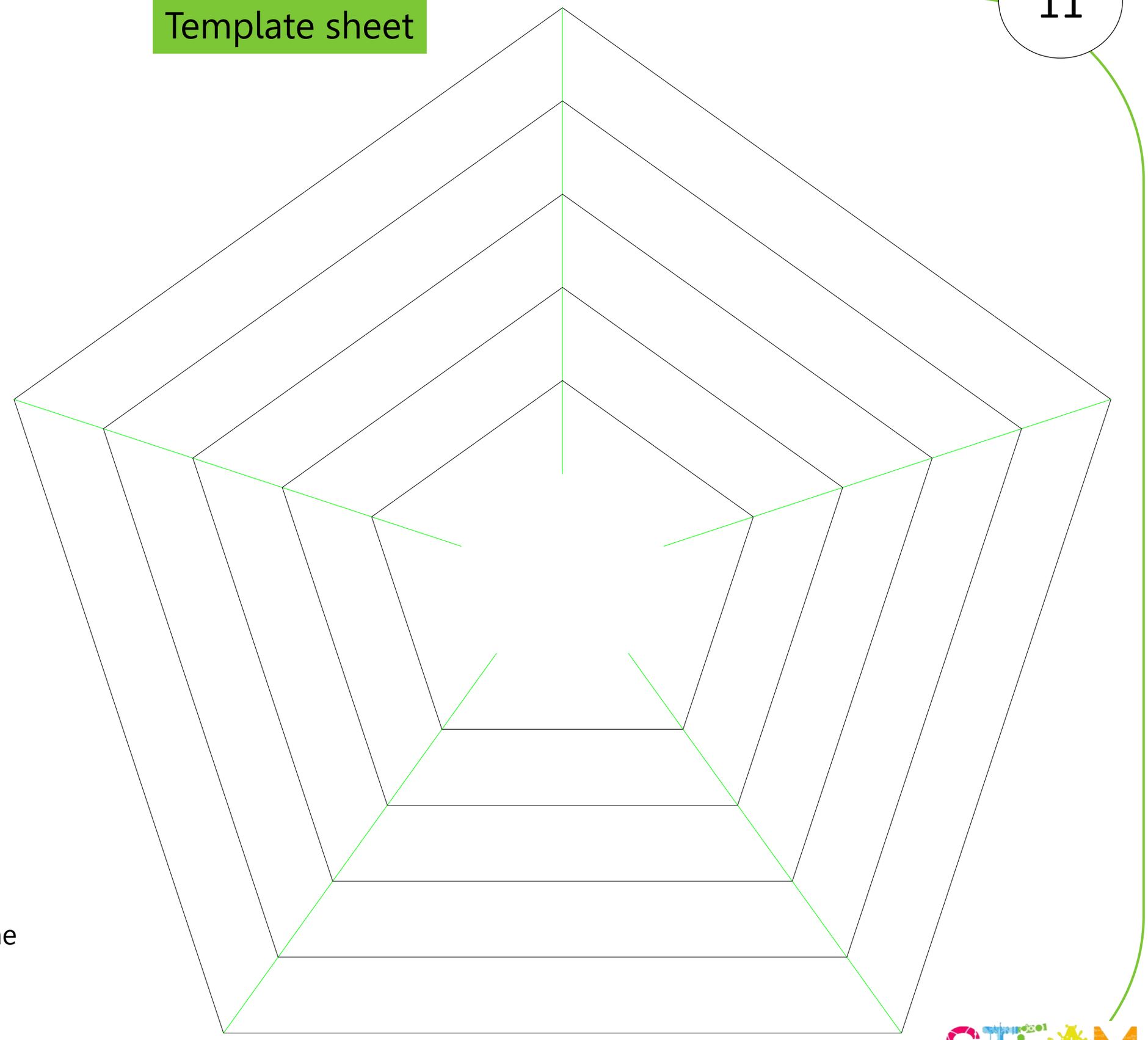
What measurements do I need to work out the area of the landing spot.

Calculate the area of the landing spot. (PAGE 17)

Engineering Challenge 1:

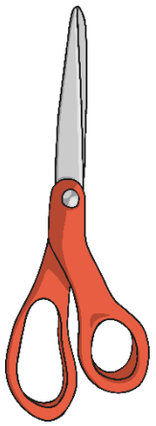
Template sheet

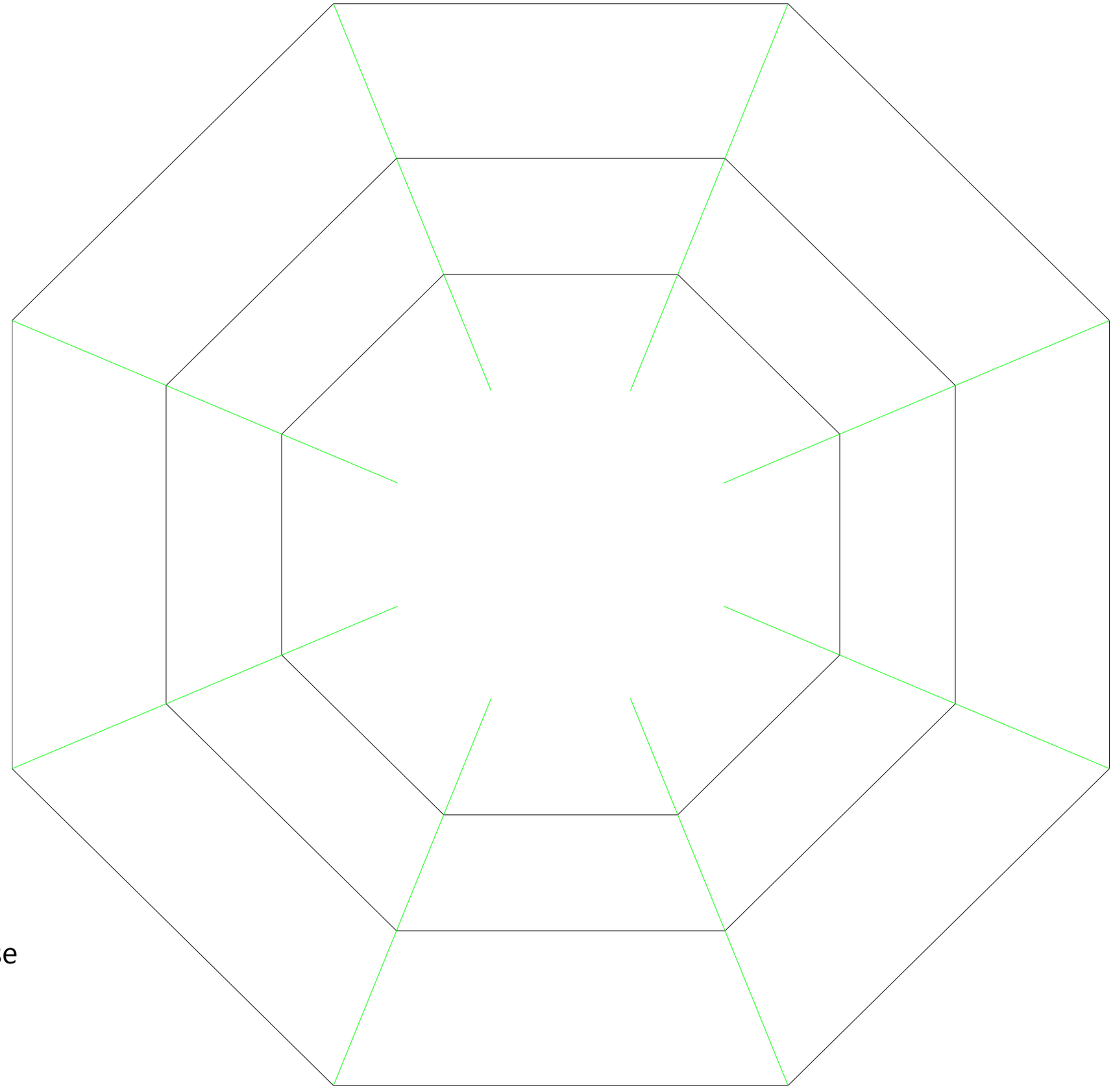




Key
Green- fold/crease line
Black- cut

Template sheet

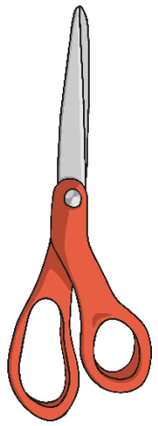


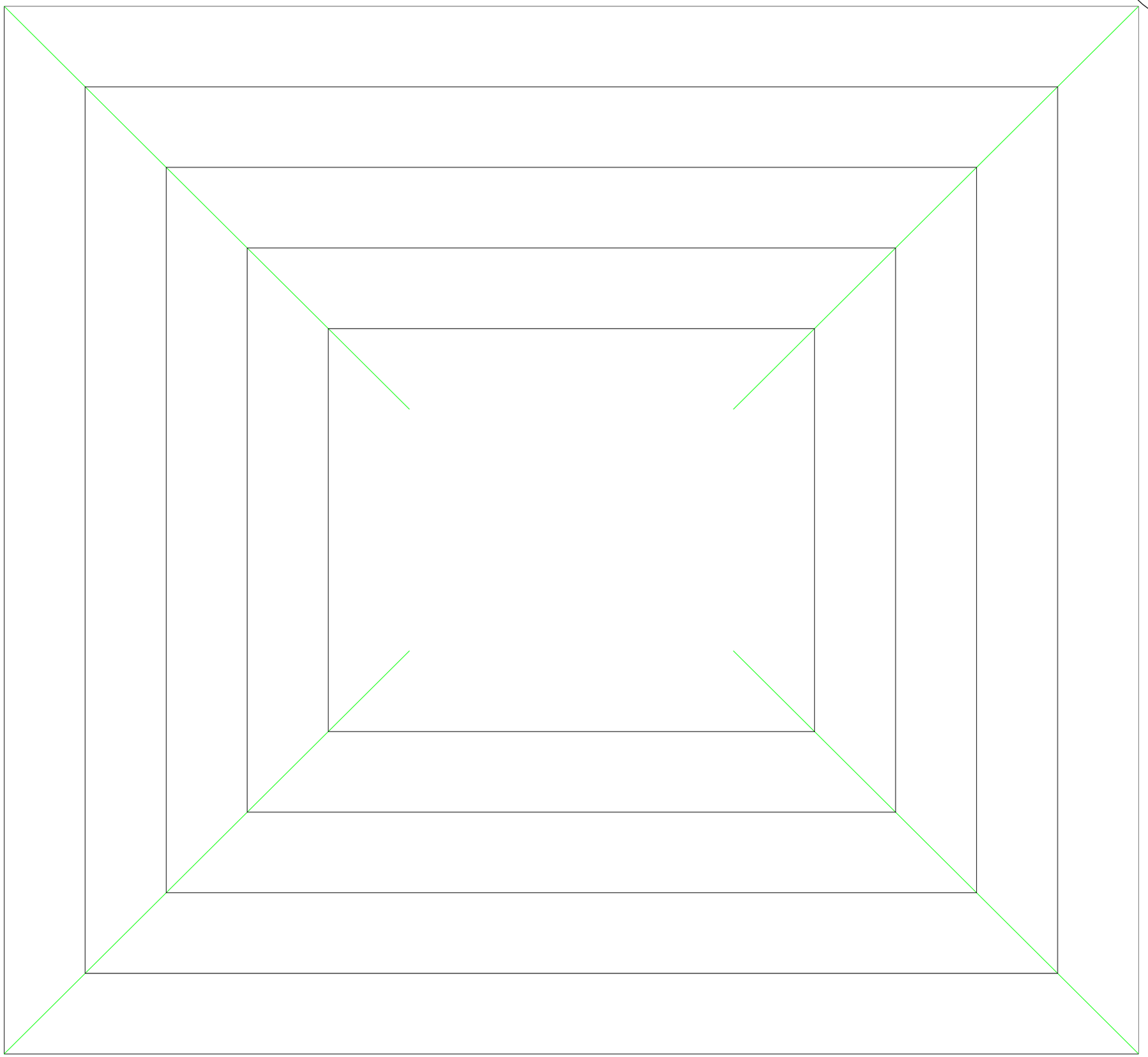


Key
Green- fold/crease line
Black- cut

Engineering Challenge 1:

Template sheet

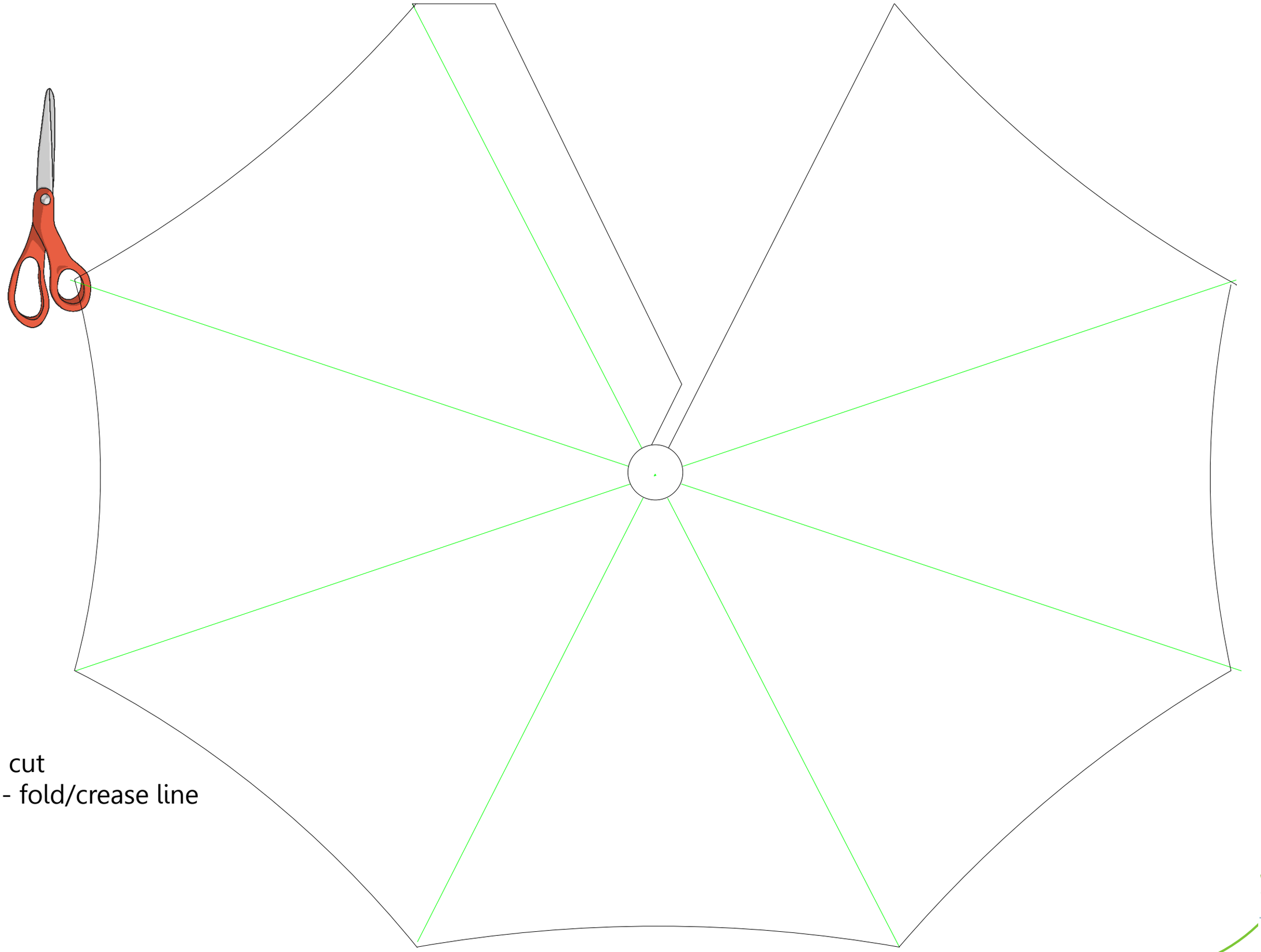




Key
Black- cut
fold/crease
line

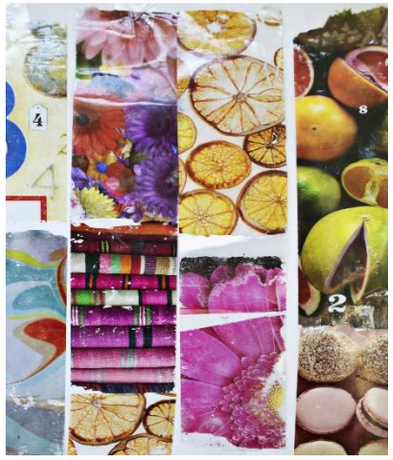
Engineering Challenge 1:

Template sheet



Key
Black- cut
Green- fold/crease line

Art Challenge 3:



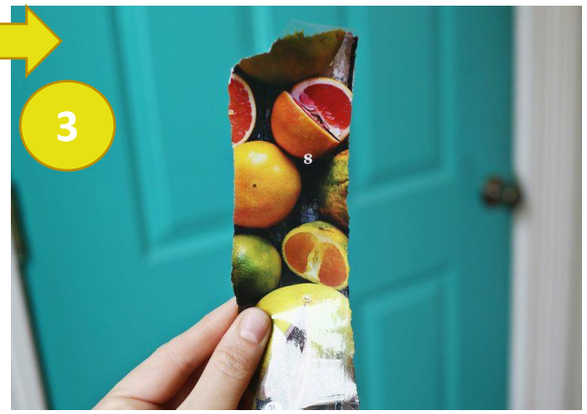
Sellotape Transfer Printing

Task: Try creating your own material to work with. Use this sellotape transfer method to create strips of imagery that you like. For example you could transfer images of cars from a magazine. Once you have created strips, try weaving them together. If you do not have access to sellotape, please cut strips of interesting patterns out of found materials.

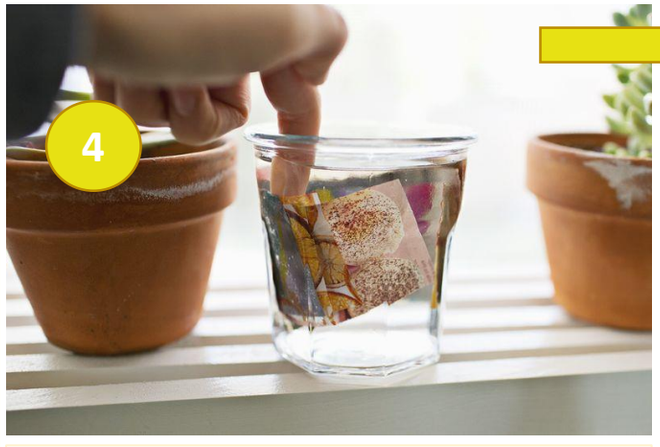
Extra challenge: Create a theme for your woven outcome. E.g sports, food, nature.

You will need:
Sellotape, magazines, newspaper, or printed imagery and water.

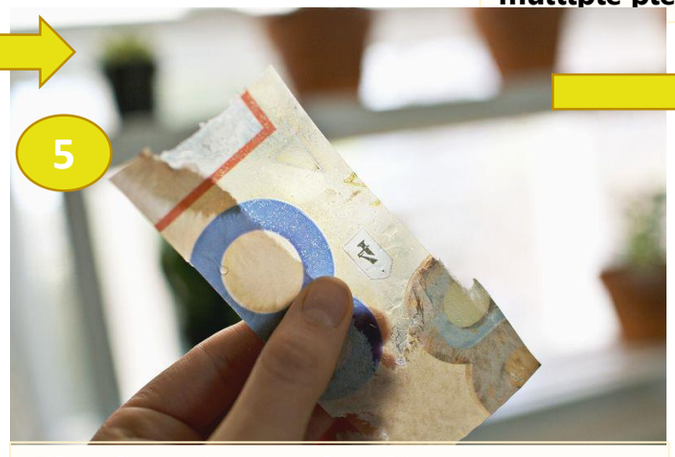
Stick a piece of tape to a magazine page. Cover any area you want to transfer. For larger surfaces, use multiple pieces of tape.



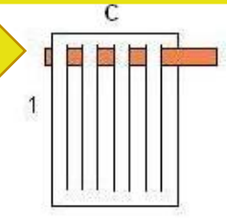
Remove the paper around the piece of tape. I usually just rip any excess away, creating imperfect edges.



Soak your tape in a cup of water for five minutes. This is the easiest way I've found to remove the paper quickly.

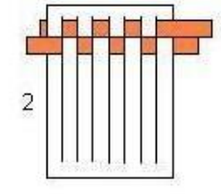


After five minutes of soaking, use your fingers to rub the paper away from the tape. It will peel off, leaving a beautiful, imperfect transfer.

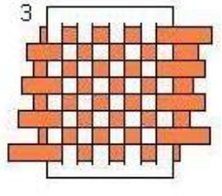


Weave your pieces of tape together.

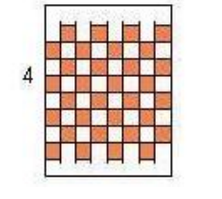
Place strips vertically and tape in place at the top so that they do not move



Follow the weaving technique under and over and alternate each time you add a strip.



Keep weaving your pieces of tape using the alternating method. Over and under. Under and over. Over and under....



Tape edges together and trim into a neat shape.

Think about all of the techniques and materials you have used so far. What would be the most suitable to use for a parachute? Why? Which would you most like to use going forward? Which are the most visually appealing? Which are the most practical?

Art Challenge 4:

Block pattern (Part A)
Task: read the information about famous designer Cath Kidston and answer the following questions.
Extra challenge: Explain and justify your answers, explaining why. Can you independently research who she is?

Cath Kidston MBE is an English fashion designer, businesswoman and author whose company, Cath Kidston Limited sells home furnishings and related goods. She is particularly known for her nostalgic floral patterns and has also published a number of books.
Kidston has worked with Milletts to design tents, Nokia/ Carphone Warehouse mobile phones (2006), she collaborated with Tesco to produce shopping bags made from plastic bottles which were sold to raise almost £500,000 for Marie Curie Cancer Care and saved about six million plastic bottles from landfill.

What is Cath Kidston famous for?

Do you like her work? Why?

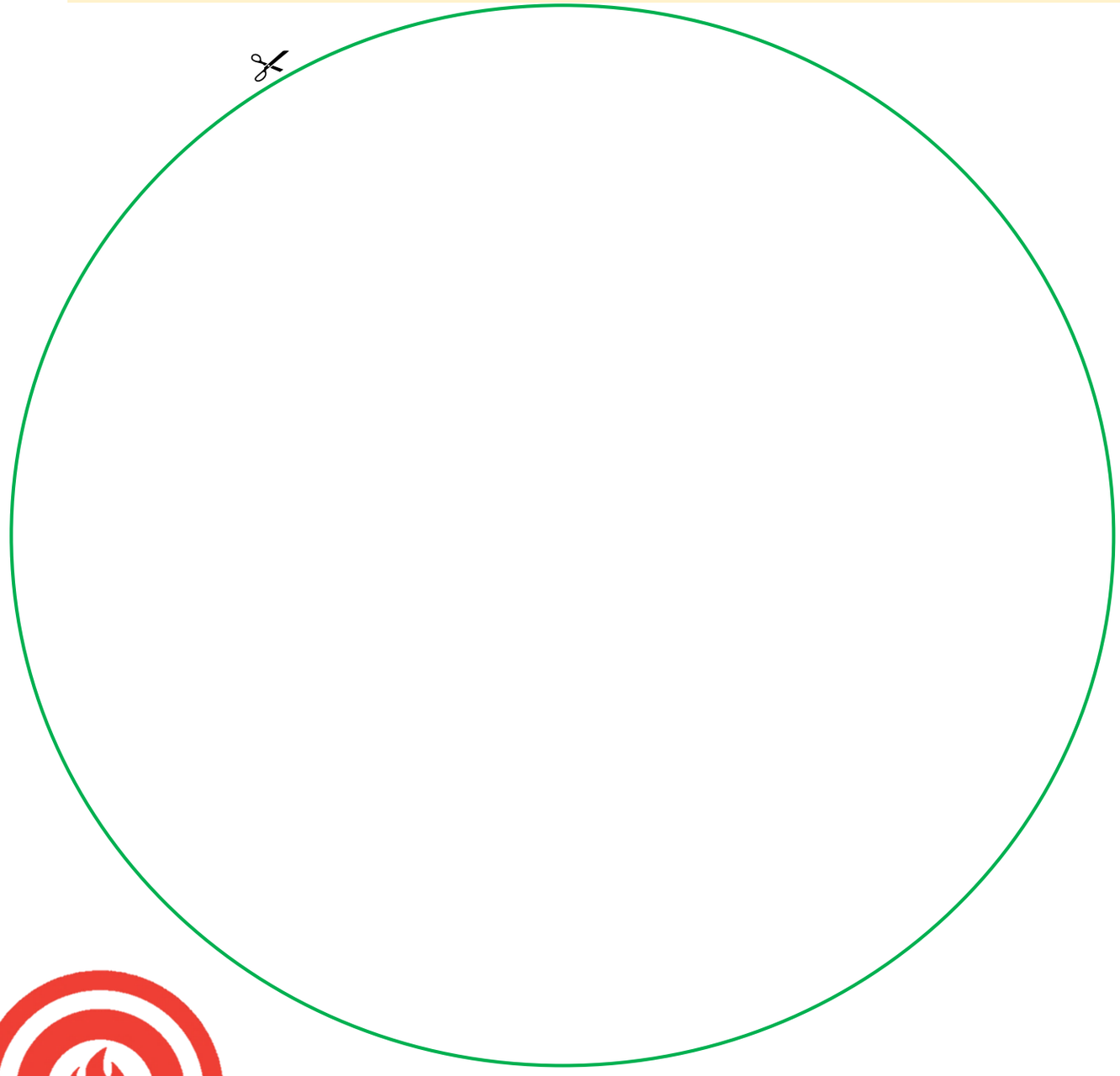
What is successful about her work?

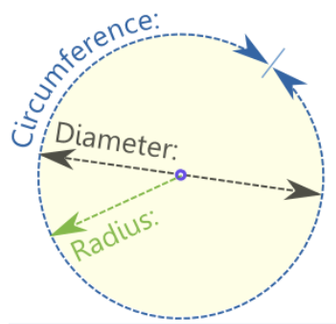
How has she applied her design to products?

How could you use her work as inspiration for your parachute design?

Art Challenge 4 & Mathematics challenge 3:

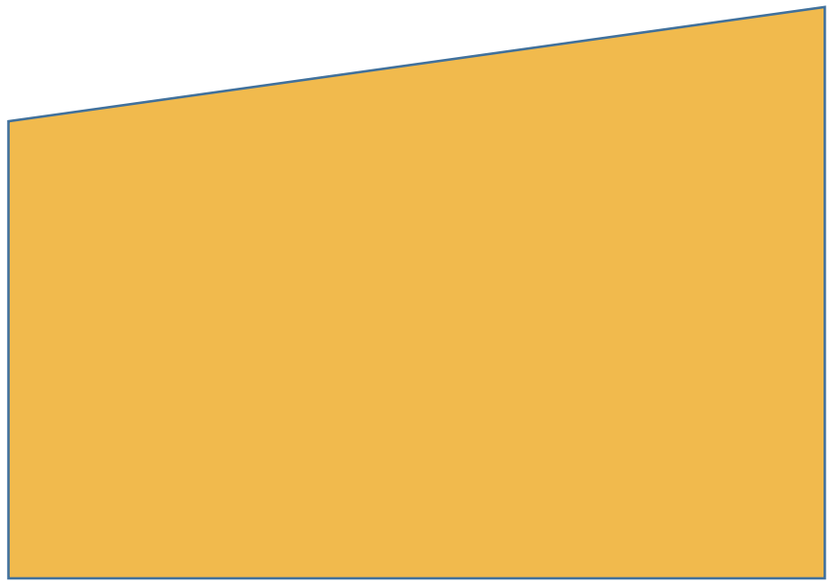
Design Using the pattern creating you have learn before, design a landing spot for your parachute





Area =

What is the total area of your landing pad. Show your working out



The experiment

- A ball of plastercine/small action figure/lego man/
- String/dental floss/ wool
- e.g. paper towel, writing paper, plastic bag/old t-shirt
- Scissors
- Tape
- Stopwatch

Preparing Your Parachutes

1. Select a template and cut it out of your chosen material (plastic, paper, fabric

2. Make holes on the corners of your parachute

3. Cut four lengths of string 30cm in length.

4. Secure the string through the holes of the paprachute

5. Action figure/something heavy

6. Repeat for squares with sides of 25cm, 20cm and 15cm.

Collecting Your Data

1. Drop your parachute from a height and start the stopwatch.

2. Stop the stopwatch when the parachute hits the ground.

3. Repeat three times from the same height.

4. Repeat for the other parachute sizes.

The experiment

Results Table

Length of Parachute Side (_____)	Time Taken to Drop (_____)			
	Repeat 1	Repeat 2	Repeat 3	Mean
30				
25				
20				
15				

To calculate the mean (average) time taken, you need to add the times for the three repeats and divide by three.

Conclusion

As the length of the parachute side decreased, the time taken for the parachute to fall _____.

When the length of the parachute side was _____ cm the time taken to fall was _____s, and when the length of the side was _____ cm the time taken to fall was _____s. This shows a decrease of _____s.

This is because _____

_____

_____

Key words

surface area air particles air resistance force

Evaluation

A **control variable** is one which may, in addition to the **Independent variable**, affect the outcome of the investigation and therefore must be kept constant.

The control variables were: _____

_____

Conclusion

As the length of the parachute side decreased, the time taken for the parachute to fall _____.

When the length of the parachute side was _____ cm the time taken to fall was _____s, and when the length of the side was _____ cm the time taken to fall was _____s. This shows a decrease of _____s.

This is because _____

_____

_____

Key words

surface area air particles air resistance force

Evaluation

A **control variable** is one which may, in addition to the **Independent variable**, affect the outcome of the investigation and therefore must be kept constant.

The control variables were: _____

_____

NATIONAL ARMY MUSEUM

'Para Dogs' went into action on D-Day (6 June 1944). One dog, called 'Bing', landed in a tree where he remained until his handler could rescue him the next morning!

STEAM

Maths Challenge 3:

Table of results

Attempt	Height	Distance from landing spot	Drop Time

Did the height affect the distance from the landing spot? If so, how?

What is the average distance from the landing spot?

NATIONAL ARMY MUSEUM

Special Air Service (SAS) troops serving in Afghanistan (2001-14) sometimes parachuted into action with German shepherd dogs strapped to their chests. They were fitted with video cameras to help soldiers search buildings for enemies.

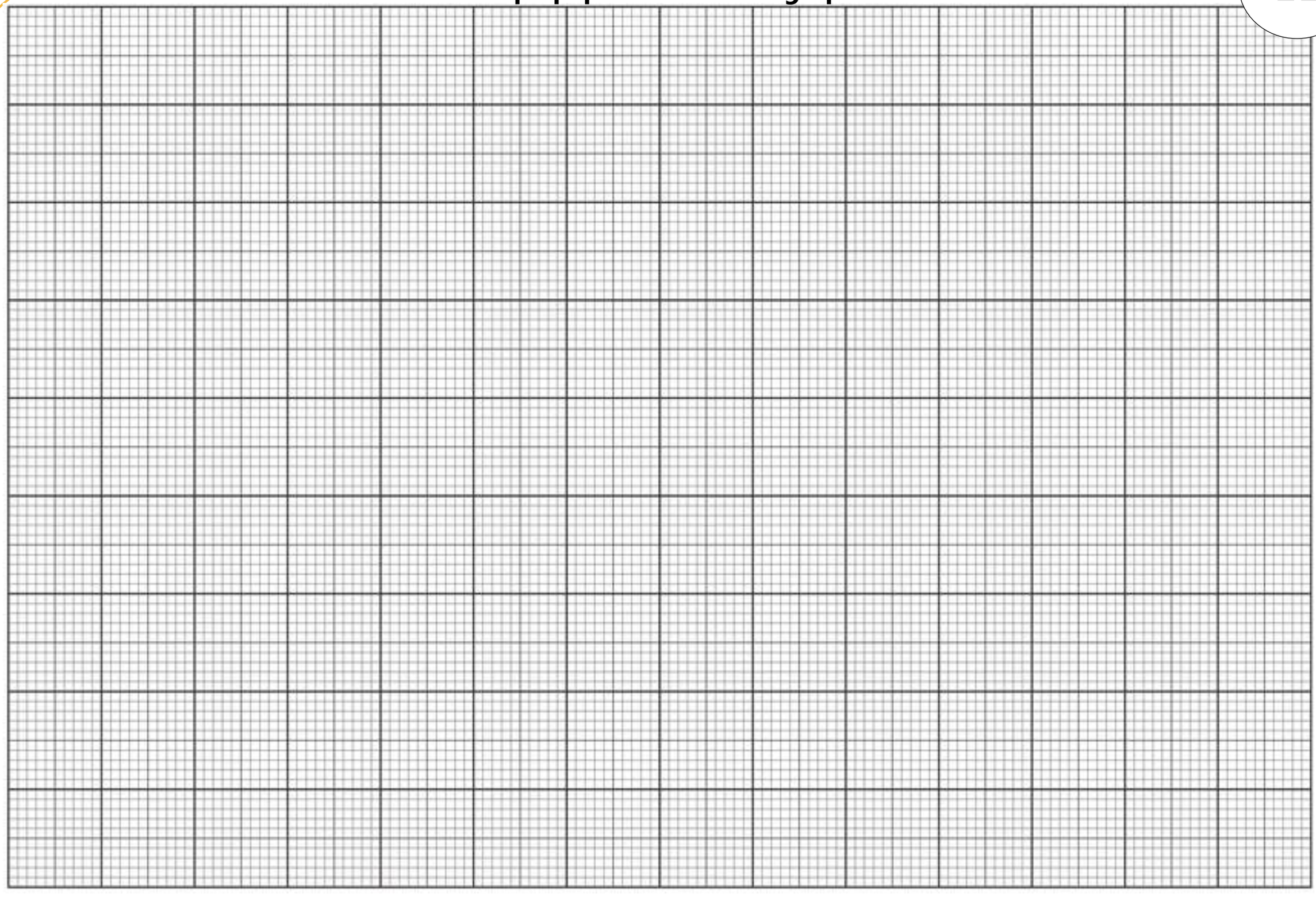
Did the height affect the time it took to drop to the ground? If so how?

Plot a scatter graph for the data you have collected and draw a line of best fit.

Can you see a trend? If so what is it?

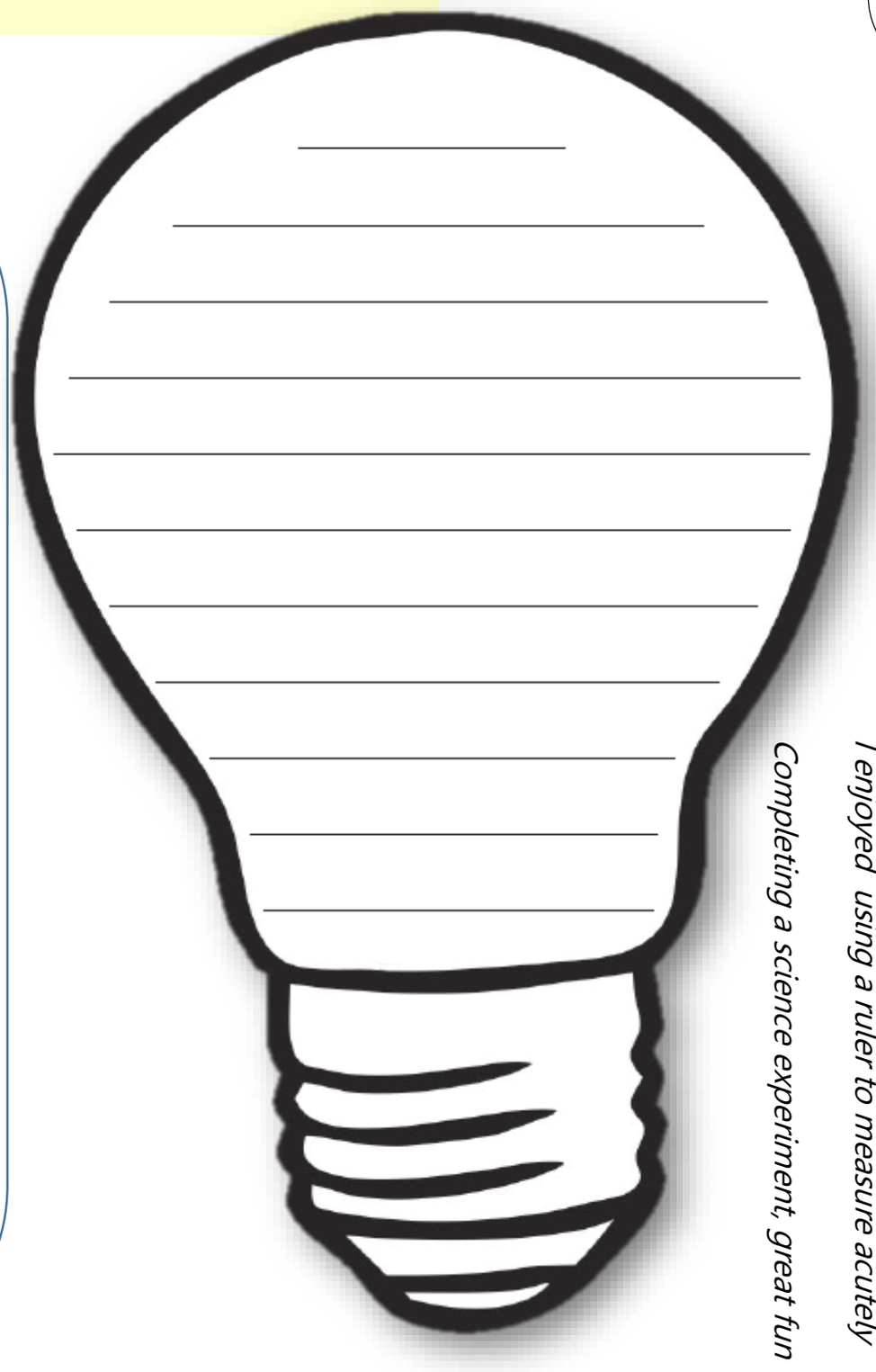
STEAM

Graph paper- results and graphs



Task- I can explain how air resistance affects moving objects

- Was there a link between the sizes of the parachutes and the time it took them to fall to the ground?
- Did you manage to keep it a fair test?
- If you did the same experiment, what would you change or keep the same?
- Could you test another variable if you did it again?



I enjoyed assembling my parachute

I enjoyed creating patterns and printing

I enjoyed using a ruler to measure acutely

Completing a science experiment, great fun

What did you learn while working on the parachute project?
What are you most proud of?
What would you like to try again?

Parachute project- success criteria

Teachers assessment of the project

	Bronze	Silver	Gold	Platinum
S	I can set up the experiment	I can select a variable and conduct the experiment accurately	I can sleect a variable, time each drop and record the result on a clear table	I can conduct and experiment and complete a conclusion explaining my findings
T	I can match up most a few of the properties with the correct materials. I can state what qualities a parachute needs	I can match up the properties with the material and add my own. I can research what qualities would be good for a parachute	I can match up all of the properties with the material. I can define what is finite and infinite resources	I can match up all of the properties with no errors. I can define finite. I can list what materials are finite and infinite. I can define what is a sustainable source. I can decide what material do use and explain why.
E	I have selected a template. I can use the correct tools to cut out my chosen template. Cutting does not follow the lines. Holes for string inconsistent quality. Transfer onto chosen material may have errors, messy cutting, some errors	Template cut out accurately with little white space. Cutting kept close to the black line. Fold lines under defined. Holes for string in the right place and string can hang freely. Transfer on to chosen material successful. Accurate cutting, few errors	I have cut out more than one template and thought about which parachute will be more successful. I have folded the crease line using a straight edge (ruler) I have tried out 2 templates and chosen 1 based on how well in travelled in the testing stage. The string rests in the holes with room to move. Transfer onto chosen material complete with attention to detail, little or n errors	Able to select 2 templates, trailed both and select the more successful parachute template. Used a tool to create holes for the string and secured string to the weight the correct material with room for the string to move when in flight. Transfer of chosen template onto material completed with precision. No errors
A	Woven with gaps showing limited control. Use of limited/basic materials. Edges are left loose and have not been neatened. Minimal pattern has been created.	Parts are secure. Tightly woven with some gaps showing good control. Use of some unusual materials. Edges are stuck into place. A consistent pattern has been created.	Tightly woven with minimal gaps showing careful and accurate control of materials. Combines materials. Edges are refined and neat. Colour and sequence have been considered in the pattern.	Able to identify successful materials that are suitable for weaving. Experiments with sequence and the weaving process. Independently explores unfamiliar materials. Successfully merges and layers materials.
M	I can see which shapes would work as parachutes and which wouldn't.	I can calculate the area and perimeter of my parachute.	I can analyse and make judgements based on my table of results.	I can create a scatter graph and identify a trend in my data.

Name:	Tutor:	Date:	Teacher comments
Effort	Behaviour	Pathway	

Main Project	✓ Date
ART- Thinking outside of the box	
SCIENCE- Air resistance	
MATHS- Shape	
TECHNOLOGY- Materials	
TECHNOLOGY- Material origins	
ART-Weaving exploration	
ENGINEERING-Creating a template	
MATHS- Parachute sizes, perimeter and area	
ART- sellotape transfer	
ARTS & MATHS- Design and Area	
SCIENCE experiment	
MATHS- Experiment results	
MATHS- graphs	
Evaluation-	
Health and Safety	
Scissors	
Hole punch	
Tape	
Pencils	
Other tools used please state:	