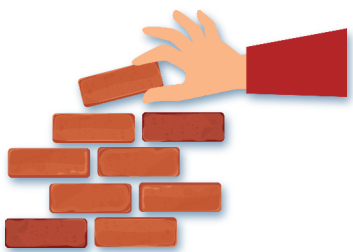


A **guide** to getting started with 'Building for a Greener Future'

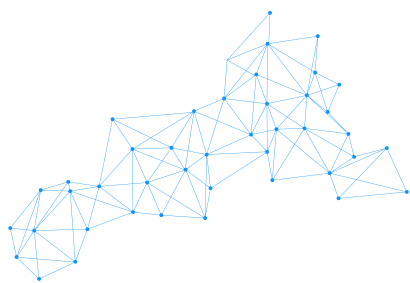


There are eight mini projects (see table below) each with independent activities related to the common overarching theme - **'Building for a Greener future'**. We are planting the seeds in which ideas can grow and flourish. This series of complimentary cross curricular activities aims to develop students' knowledge and understanding of critical global themes. The activities will get students thinking and problem-solving about their environment, making positive changes towards a sustainable world and how maths is integral to understanding the complexities of these themes.



Building a wall

We explore being a bricklayer, how bricks could be arranged and build walls.



Rigidity in a structure

What is the best shape for the structures within a building to make it strong? Have you ever built a geodesic dome?



Building a town

Making nets of buildings with the challenge of reconstructing a mini model town somewhere local to you.



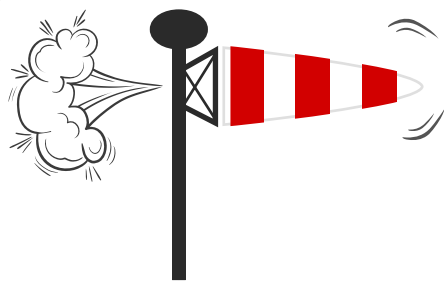
Aesthetically pleasing to the eye

Symmetry, tessellations and pattern in patios and tiles in and around buildings - design your own tessellations.



Waste management

What do we consider as waste? Is it necessary to throw everything in general waste?



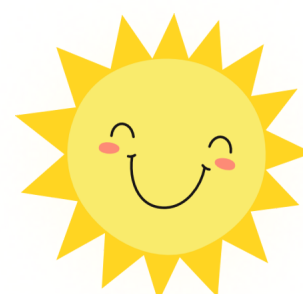
Energy in the wind

We look at what William Kamkwamba, from Malawi, achieved at 14 years old.



Water as power

People have a long history of using the force of water flowing in streams and rivers, we try to recreate a watermill.



Solar power

We explore how to use the sun's rays to cook!

How to integrate the resources:

These resources provide a flexible framework guide for teachers/parents to run a range of projects over the summer term. The rich tasks are low threshold high ceiling (LTHC) and each activity can be integrated effectively as individual stand-alone activities or as part of the wider project in school or at home:

- ▶ Use a mini project with new class on transition day
- ▶ Enrichment activities post-SATS
- ▶ Integrate the materials with maths scheme of work units. Either to enrich or potentially provide opportunities for depth. Eg. White Rose Y4 Summer term units on geometry and properties of shape.
- ▶ Transition project over a period of time with Year 6 pupils to help them with the move from primary to secondary school
- ▶ STEM Project week in school
- ▶ STEM Project afternoons - each teacher could specialise in one and students rotate each afternoon
- ▶ Start the project in school then set as homework/after school activity
- ▶ Summer camp project
- ▶ Use in STEM or ECO club

How to use the guides

Introducing the ideas with some facts to stimulate curiosity. This could be a class or group discussion on some of the things mentioned.



Waste Management



We all create waste. We often buy new things we don't need, throw away things that still work and even leave food because we are full. A lot of our rubbish goes to landfills. High levels of methane gas and CO2 are generated by the rotting rubbish in the ground. These are greenhouse gases, which contribute greatly to the process of global warming. We should try to avoid, or at least reduce rubbish that we send to landfills. Living a zero-waste lifestyle means you strive to use as little single-use plastic as possible, instead opting for sustainable and reusable alternatives. In short, it means you send as little as possible to landfills.



Do we think carefully about how we dispose of it all?

Context

Waste timeline. The diagram shows the length of time it takes to decompose.

Item	Decomposition Time
Teabag	1 month
Banana Peel	6 weeks
Apple Core	2 months
Woolen Sock	1 year
Plastic Bag	20 years
Magazine	50 years
Plastic Bottle	450 years
Mobile Phone	1000 years

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Aesthetically pleasing to the eye



Tessellations and symmetry of regular polygons are found in and around many buildings through the construction of patios outside to tiling within a building.

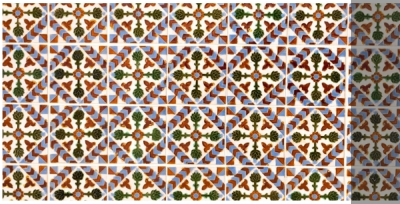


Context

A regular polygon is a shape where each side is the same length and each angle the same size.



Tessellations are where regular polygons interact with each other; this is called tiling the plane. It's the way to cover a surface with a repeating pattern of flat shapes so there are no overlaps or gaps.



The term plane means a two dimensional flat surface that extends in all directions.

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Context

To relay some key facts and knowledge. This is to start the conversation and gain interest. Find out what the students know and share any thoughts and ideas they have. How could they find out more?

Have you ever thought?

This section starts the questioning, there are a few questions to get students thinking and talking.
Don't be surprised when the students start to ask further questions.
Asking students to create their own questions has a powerful impact on learning as well - what do they want to find out?



Activity - Aesthetically pleasing to the eye02

Have you ever thought...

Do all polygons tessellate?
How many different polygons is it possible to have in one pattern?
Is it helpful to know the interior angle of a regular polygon to construct tessellation? Why?
Why do bees use hexagons for honeycombs?

Take a look

At tiling or patio patterns around you. Identify the polygons used. Take a photo.
A regular tessellation is a pattern made only using one polygon repeatedly, it is where all the shapes meet at each vertex following the same pattern of shapes.

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Activity - Solar power02

Context

Solar energy is clean and free. There is enough for everyone. Some toys, lights and calculators use solar cells instead of batteries.

Have you ever thought...

How do we use solar energy day to day?
What is solar power?
What happens when there is no Sun at night?

Take a look

Have you got any solar collectors/panels in your area? Often positioned on roofs.
Do you have any gadgets at home that run off solar power?
The rising energy costs are a major concern for everyone right now. Have a think about how you use electricity each day.
Are there some cost-saving activities you could do at school or at home? For example, turning the light off when you leave a room.

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Have a look

Now the students get involved practically. In this section the student is asked to do something, find something, try something, to get them actively thinking about the theme. This could be within class time or after school. Planning in time to share what they found out or did will make this a much richer task.



Investigate

Activity - Rigidity in a Structure 03

Investigate...

Which shapes are **rigid**?

Rigid Non-Rigid

Which is the **strongest shape**?

Using cocktail sticks and marshmallows or straws and pipe cleaners or geostrips, make different 2D shapes and test them by giving the shape a gentle push. How can you be sure the gentle push is the same each time?

There are always question prompts to help support and guide the activity

There are suggestions on what to do and use but we are sure students will have their own ideas as well.

The rich activities/questions in the Investigate, Explore and Challenge sections have been structured so they can be dipped into individually or followed through consecutively. They are open ended to allow autonomy and inclusivity.

The investigate section is all about 'digging into', inquiring and probing whether that be research in books / google/ talking to people or practically carrying out investigations.

Explore

The explore section involves being inquisitive, spotting patterns, making connections, trying out ideas and finding new ways of looking at things. Students get the opportunity to play with ideas, draw pictures, have the courage to experiment and ask good questions



Activity - Aesthetically pleasing to the eye 04

Semi-regular Tessellation

Tessellation

Triangles and Squares

Three 3-sided shapes and two 4-sided shapes

Size of the angle

60°, 60°, 60°, 90°, 90°

TOTALS 360°

What do you notice about the size of the angles for each tessellation?

Explore

A **pentomino** is a shape made up of five squares. Choose two of the following pentominoes and try to make a tessellation with each one. Do each of your pentominoes make a tessellation? Explain why or why not.

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Challenge

This is the concluding section, bringing all the skills and knowledge together. The previous activities have prepared students to get to this point to take on the ultimate challenge. Are you up for the CHALLENGE?



Activity - Energy in the wind 03

Explore

Design a wind turbine or windmill.

What will you use as wind?

What resources will you use?

Challenge

Make a wind powered machine that can lift a weighted cup off the ground

[Practicalaction.org - Wind Power challenge](#)

Here are materials to reinforce a lesson on renewable energy, focusing on wind power. Students then explore how life for people in the rural mountainous regions of Peru is different as they live without access to mains electricity. They learn how small scale wind turbines have changed people's lives, as with a supply of electricity people are able to light their homes, their school and run small businesses.

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Did you know?

Here you can read interesting facts related to the theme.
What other facts can students find out? Create a list of top ten facts!



Activity - Rigidity in a Structure05

Did you know?

Domes are the strongest human shelter ever conceived. The even distribution of weight is how domes efficiently distribute stress along the entire structure. They are the world's highest earthquake resistant structures and domes are aerodynamic. They can withstand hurricane winds of even 320 km/h.

The Millenium Dome, now known as the O2 in London, is one of the largest of its type in the world. Externally, it appears as a large white marquee with twelve 100-metre-high yellow support towers, one for each month of the year, or each hour of the clock face, representing the role played by Greenwich Mean Time.



The Mathematics

The students through the investigation and exploration activities will use the mathematics vocabulary and properties associated with a range of polygons. They will be involved in a wide range of problem-solving, recording, describing, conjecturing and justifying to support and develop their mathematical thinking.



This is the first activity in the Summer Challenge.
Go to <https://www.whizz.com/summer-challenge-2022/> to access the full set of activity packs

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The Mathematics

The complimentary cross curricular activities are **STEM** focussed. Here we define some of the mathematics involved.

The activities are also linked to the **United Nations Sustainable Development Goals (7, 9, 11, 13)** to keep the challenges topical and purposeful.