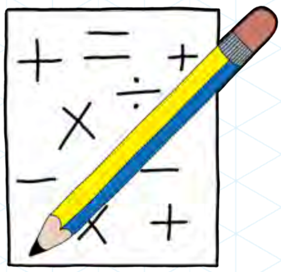
Maths Week Scotland

Maths Trail

Teacher's Notes



Welcome to the Maths Week Scotland trail exploring the National Museum of Scotland.

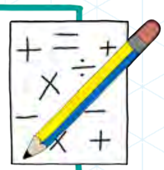
Practical Points:

- Aimed at pupils between the ages of 7 and 13.
- The full trail takes approximately one and a half hours.
- The trail is not sequential and can be completed in any order.
- If time is short, there's no need to complete it all – just pick out the activities which are most useful for your class.
- Pupils will need pencils. A sheet of scrap paper may also be useful when doing calculations.
- The teacher's notes contain extension and extra activities to do with your class if you have time.

This trail is part of Maths Week Scotland, a week of focal activity with special events throughout the year. To find more resources and events suitable for your class head to www.mathsweek.scot or follow on Twitter @MathsWeekScot

Level 1 – *Animal World*

Your pupils have been asked to find the African elephant standing inside a blue whale's jawbone and work out how many elephants would have the same mass as a blue whale.



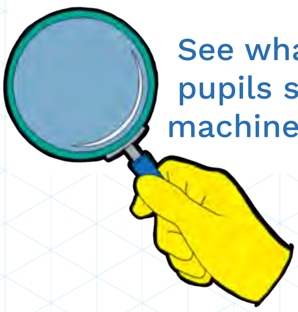
Answer:

The mass of the blue whale is 200 tonnes and that of the African elephant is 6 tonnes. To find the solution, divide the mass of the blue whale by that of the African elephant.

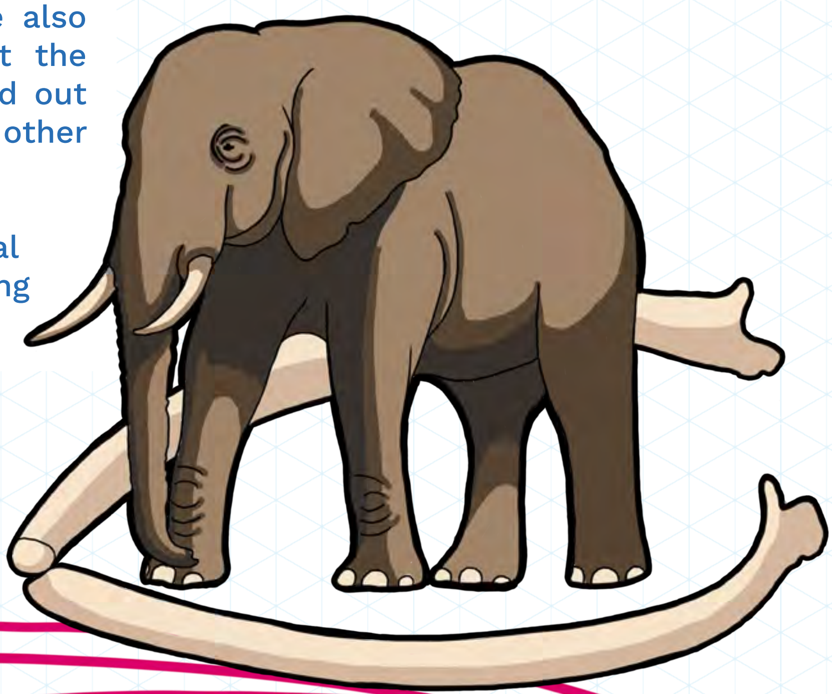
The mass of the blue whale is equal to that of 33.3 elephants.

Experiences and Outcomes: I have explored the contexts in which problems involving decimal fractions occur and can solve related problems using a variety of methods. MNU 2-03b

Extension activity: The pupils were also invited to step on the scales at the weighing station interactive and find out how their mass compares to that of other animals.



See what happens if several pupils stand on the weighing machine.



Did you know?

Although most of us talk about the weight of objects, mathematically the correct term is mass, as this is measured in kilograms and weight is a measurement of force, measured in Newtons.

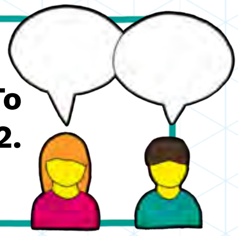
The blue whale is the largest animal ever to have lived on earth. At 200 tonnes it is heavier than even the heftiest of dinosaurs. Not only does it have a tongue with the mass equal to that of an African elephant, it also has a heart the size of a small car.

Not surprisingly, an enormous animal like this needs a lot of food. However, its diet consists of very tiny crustaceans, called krill, of which it consumes up to 4 tonnes per day.

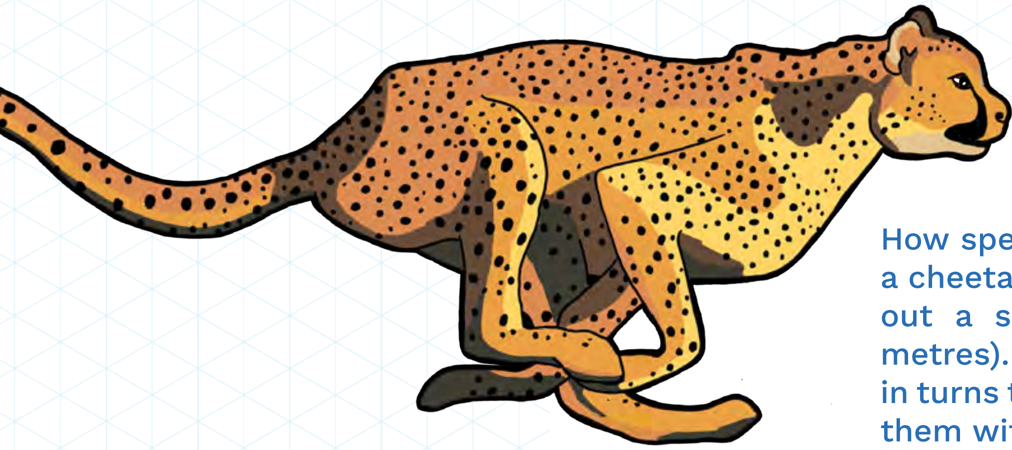
Level 1 – *Animal World*

The cheetah is the world's fastest land animal. Pupils are told that it can run at a speed of 112 km/h. From this they can calculate how many kilometres it could cover in 30 minutes.

Answer: A cheetah would be able to run 56km in 30 minutes. To reach this answer, simply divide the speed given for one hour by 2.



Experiences and Outcomes: I have investigated the everyday contexts in which simple fractions, percentages or decimal fractions are used and can carry out the necessary calculations to solve related problems. MNU 2-07a



Extension activity:

How speedy is your class compared to a cheetah? In the playground measure out a set distance (for example 50 metres). Pupils work in pairs, taking it in turns to run while their partner times them with a stopwatch. Multiply the time by 20 to get the speed in km/h.

Did you know?

It takes a cheetah just three seconds to reach its top speed – that's faster than a sports car! Its body has evolved for speed, with powerful legs, an elongated spine, adapted claws to grip the ground and a long tail for balance.

Cheetahs are vulnerable in the wild due to habitat loss and human activities such as poaching.

Extra activity: Count how many ninety degree turns you make as you move from the cheetah to the Europa iii satellite launcher.

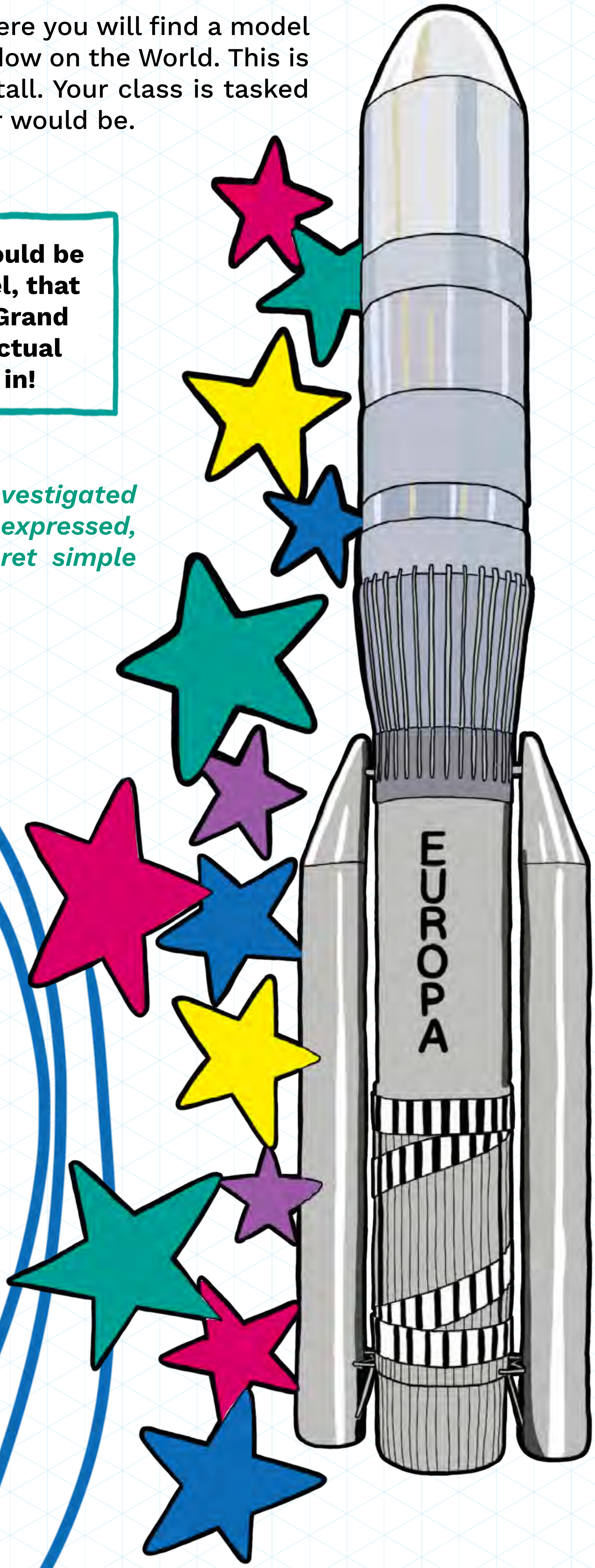
E and O: I have investigated angles in the environment, and can discuss, describe and classify angles using appropriate mathematical vocabulary. MTH 2-17a

Level 1 – *Grand Gallery*

Next head back into the *Grand Gallery* where you will find a model of Europa iii satellite launcher on the Window on the World. This is at a scale of 1mm:10mm and is 3630mm tall. Your class is tasked with finding out how tall the real launcher would be.

Answer: The actual launcher would be ten times as tall as the model, that is 36300mm or 36.3m. The Grand Gallery is only 24m tall so the actual launcher wouldn't be able to fit in!

Experiences and Outcomes: Having investigated where, why and how scale is used and expressed, I can apply my understanding to interpret simple models, maps and plans. MTH 2-17d



Did you know?

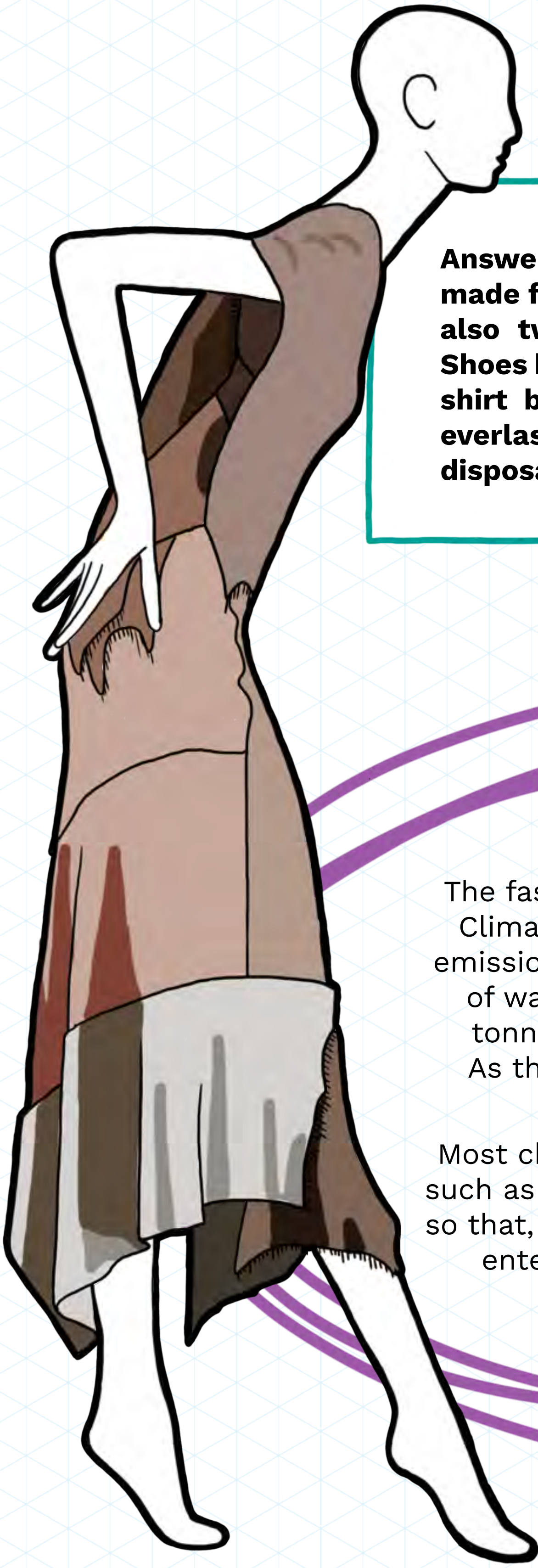
A satellite is an object that revolves around a larger object in space. For example, the moon is a satellite of planet Earth. Artificial satellites have been developed for many different purposes, including finding out about space, helping with communications, weather forecasting and spying.

The Europa iii satellite launcher was the third stage of a programme, begun in the 1960s by Britain and France. It was part of a plan to develop a European Space programme but was never built.

Trials had been unsuccessful, causing the British Government to abandon the project

Level 1 – Fashion and Style

Extension Activity: Head to the Fashion and Style Gallery and look for the bandage dress by Maison Martin Margela. Ask the pupils to look for other items within the gallery made from recycled materials.



Answer: In the gallery there is a pair of shoes made from recycled rubber tyres. There are also two garments of interest – Iceberg Shoes by WXY and "Sculpture look", a man's shirt by Craig Green which contrasts the everlasting with the idea of clothes being disposable.

Did you know?

The fashion industry is a massive contributor to the Climate Emergency, producing around 10% of CO_2 emissions annually and using up to 1.5 trillion gallons of water. In the UK alone approximately 350,000 tonnes of clothing are sent to landfill each year. As these degrade they release methane, another powerful greenhouse gas.

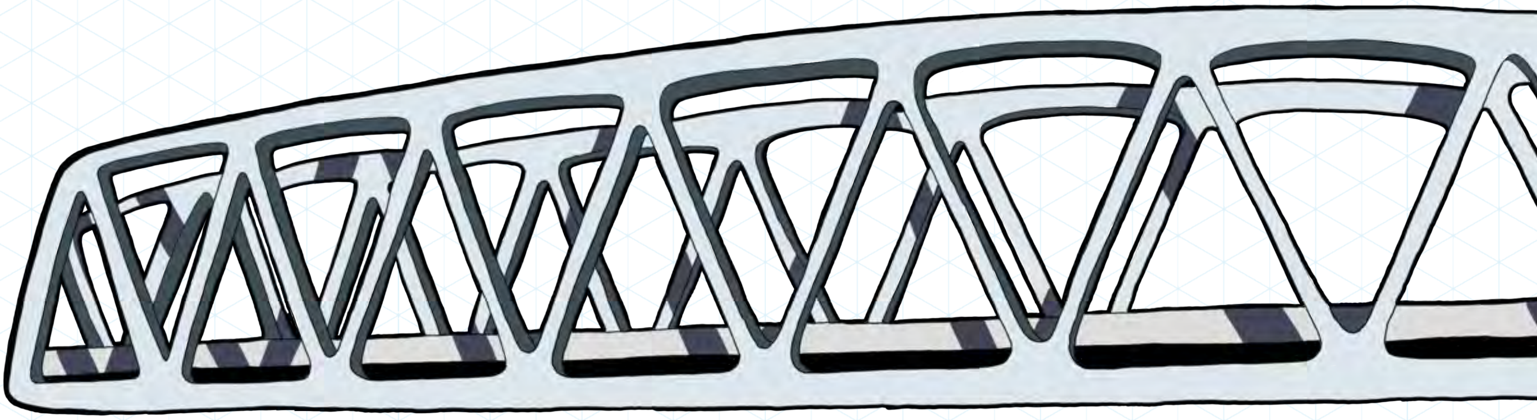
Most cheap clothes are made of synthetic materials, such as polyester or nylon. These are forms of plastic so that, when the garments are washed, microplastics enter the ocean, causing great harm to marine ecosystems.

Level 3 – *Technology by Design*

Head up the stairs in the *Grand Gallery* and follow the balcony round to *Technology by Design* to find the model of the Warren Girder Bridge.

Answer: The shape used in the Warren Girder Bridge is the triangle. Behind the model is an image of the Forth Rail Bridge, which is also almost completely made up of triangles.

Experiences and Outcomes: Having explored a range of 3D objects and 2D shapes, I can use mathematical language to describe their properties, and through investigation can discuss where and why particular shapes are used in the environment. MTH 2-16a



Extension activity: Try this bridge building challenge with your class.

What you need:

- One lego base plate, with two opposing walls built up.
- Small objects for testing the bridge's strength eg model cars or plastic animals
- 1 sheet of A4 scrap paper per child

What to do:

- Give each child a piece of paper and ask them to construct a bridge that will fit over the lego walls and which is strong enough to support a weight.
- The strongest bridge design involves folding the paper lengthwise, as if making a paper fan or a concertina. When it spans the walls it makes a very strong bridge able to support a considerable weight.
- Explain that this zig-zag bridge is really a lot of triangles joined together, just like the bridges in the gallery.

Did you know?

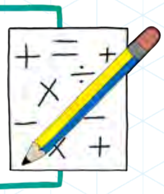
Equilateral triangles are very strong shapes because any force applied to them is evenly spread through the sides.

Level 3 – *Communicate*

Continue round the balcony to the *Communicate* gallery.
There are many different ways in which we communicate with others. Your pupils have been told to find out as many ways as they can to communicate with people far away.

Answer: There are lots of examples of long-distance communication devices, ranging from post boxes, telephones and telegraph equipment right through to the latest computer-based technology.

Building these communications networks uses complex mathematics. Your pupils have been asked who they have communicated with to get them thinking about being part of a network.



Extension activity: Could your class come up with a way of messaging each other without the need for electronic devices? Perhaps they could think up a code and transmit it.

Did you know?

People have been communicating over long distances well before the development of electronic devices. You can see some of these technologies in the gallery.

Ships used flag-signalling to message other ships or people on shore. This is an international code created in 1855, consisting of 26 flags, each one representing a letter of the alphabet. There are also 10 pennants, standing for numbers 0-9. The flags are very bright and colourful so that they can easily be seen in bad weather.

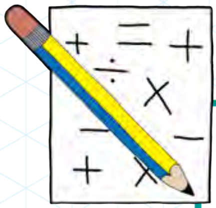
Sometimes communications were sent using codes, such as Morse, where each letter is represented by a pattern of dots and dashes. This was especially useful for signalling in the dark and signal lamps were designed to transmit messages in Morse, with short and long flashes for dots and dashes.

Extra activity: Estimate how long it will take you to walk to the next object. Ask a friend to time you. How close were you?

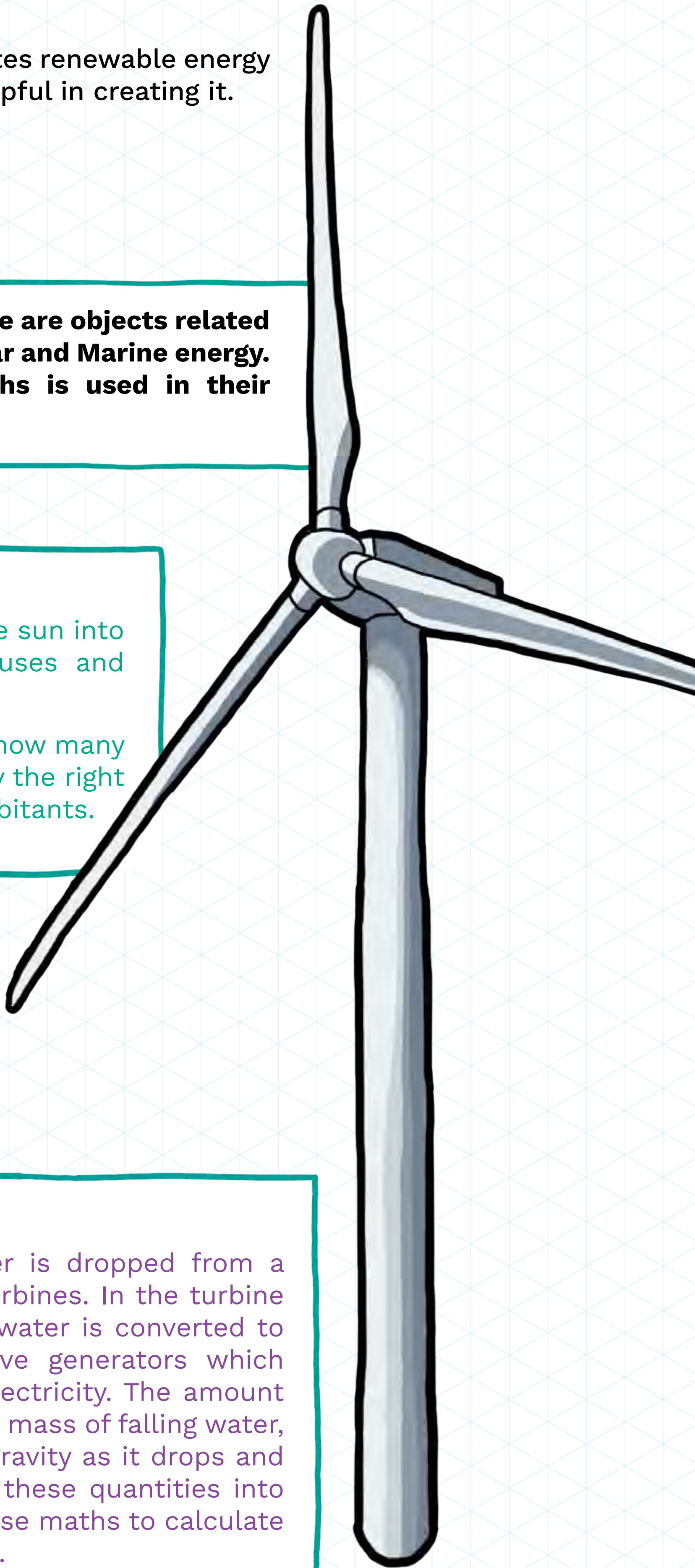
E and O: I can carry out practical tasks and investigations involving timed events and can explain which unit of time would be most appropriate to use. MNU 2-10b

Level 5 – *Energise*

In the *Energise* gallery your class investigates renewable energy technologies and how maths has been helpful in creating it.



Answers: In the gallery there are objects related to Hydroelectric, Wind, Solar and Marine energy. Some ways in which maths is used in their development include:



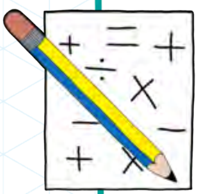
Solar:
Solar panels convert light energy from the sun into electricity. These are connected to houses and businesses.

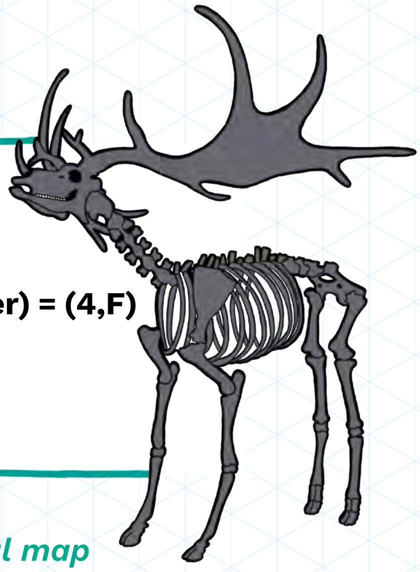
Solar engineers need maths to calculate how many panels are needed on a building to supply the right amount of electricity required by its inhabitants.

Hyrdoelectric:
In order to generate electricity, water is dropped from a high-level loch or reservoir to drive turbines. In the turbine the kinetic (or moving energy) of the water is converted to mechanical energy. The turbines drive generators which convert the mechanical energy into electricity. The amount of electricity produced depends on the mass of falling water, the acceleration of the water due to gravity as it drops and the height of the reservoir. Taking all these quantities into account, Engineers in power stations use maths to calculate how much electricity can be produced.

Level 5 – *Grand Gallery Balcony*

Head to the balcony overlooking the *Grand Gallery*. Your pupils are asked to look down to the *Grand Gallery* and, using the grid provided, write down the coordinates of three of the objects in the *Grand Gallery* below.

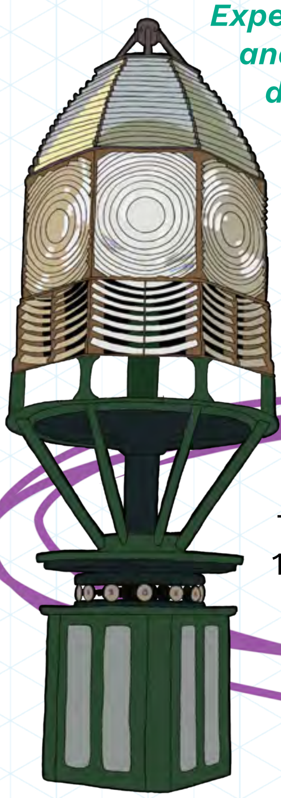




Answers:

- **Inchkeith Lighthouse Lens = (2,C)**
- **Cockcroft-Walton Voltage Multiplier (Atom Smasher) = (4,F)**
- **Giant Deer Skeleton = (2,K)**

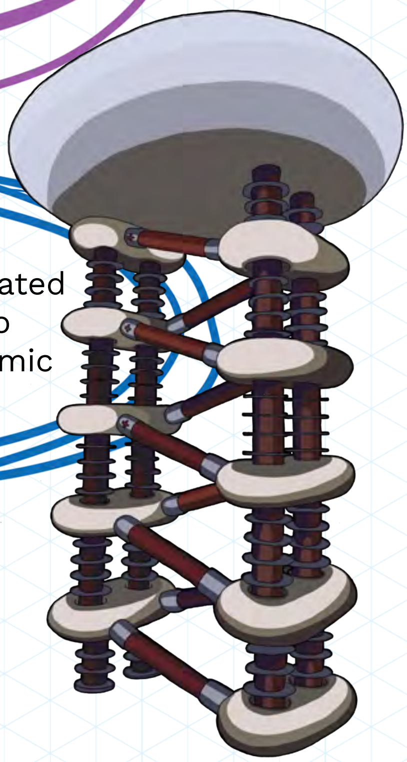
Experiences and Outcomes: To extend my mental map and sense of place, I can interpret information from different types of maps and am beginning to locate key features within Scotland, UK, Europe or the wider world. SOC 2-14a



Extension activity: Find other large objects in the Grand Gallery and add their coordinates to the grid.

Did you know?

The Inchkeith Lighthouse lens was built in 1889 and protected shipping in the Firth of Forth.



The atom smasher (1950) generated the high voltages required to investigate atoms and sub-atomic particles.

The Giant Deer or Irish elk lived 12,300 years ago. It was one of the largest ever species of deer, with enormous antlers up to 4ms across.