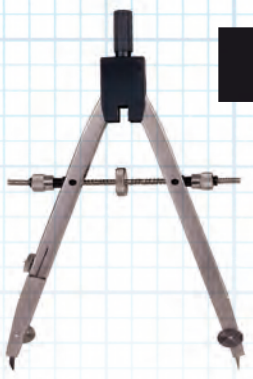
WHEN WILL I EVER NEED MATHS?



Well, you might have to use it in Art...

- Use **transformations** and **symmetry** when creating a wallpaper design or printmaking.
- Use a pair of **compasses** to draw a **circle** and to **divide** it into six when creating a mandala.
- **Measure** lengths accurately when dividing up space or building a model.
- Understand **ratio** when mixing colours together to produce a new shade.
- Be able to draw **lines** accurately and use them to create the illusion of perspective.
- Understand **scale** and **enlargement** when creating a copy of a design.
- Use your knowledge of **nets** to create boxes and containers.
- Use **tessellations** to fill a space with a repeating pattern.

Maths has lots of applications and is a vital asset in many degrees and careers.
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WHEN WILL I EVER NEED MATHS?

Well, you might have to use it in Food Technology...

- Design a **questionnaire** to find out people's views about a new product.
- Calculate the **percentage** of carbohydrate in a product.
- Use your knowledge of **pie charts** to design a meal which follows the advice of the 'eatwell plate'.
- Work with **money** using a **calculator** to compare the prices in three different supermarkets.
- **Substitute** values into a **formula** to work out your body mass index.
- Understand the **ratio** of fat to flour in different pastries.
- **Calculate** the cost per portion for a recipe, **rounding** your answer to a suitable **accuracy**.
- Use **negative numbers** to compare low and high temperature methods of food preservation.
- Use your knowledge of **metric units** to **convert** between grams and kilograms when following a recipe.
- Convert between **metric** and **imperial** units of **weight** and **volume** when using old recipes.

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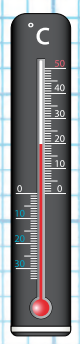

Well, you might have to use it in Geography...

- Use climate **graphs** to describe climate change.
- **Calculate** total annual rainfall.
- Calculate the **population density** of a country.
- Use your knowledge of **percentages** to decide if a household is in a state of poverty.
- Draw **pie charts** to compare sources of water for homes in three different areas.
- Use your understanding of **negative numbers** to compare the temperature ranges in five different cities.
- Use a **map scale** and a **ruler** to work out the total length of roads in a given area defined by grid lines.
- Use a **compound bar chart** to answer questions about changing trends in the timber trade.
- Use a **scatter graph** to test a **hypothesis** like *"Districts with a higher percentage of people with higher qualifications have longer life expectancies."*
- Obtain indicators of development by calculating **compound measures** like number of people per doctor.
- Find your way around a map using **grid references** and **compass directions**.

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Well, you might have to use it in Business Studies...

- Choose a **sampling method** and design a **questionnaire** to test consumers' views of a new soft drink.
- Calculate the **percentage change** in number of employees between two given years.
- Work out the amount of **money** received by workers with **hourly rates** who also work overtime.
- Analyse data from a **line graph** showing the changing **percentage** of households with internet access.
- **Substitute** values into a **formula** to calculate **average** cost.
- Know how to **draw** and **analyse** a break-even graph.
- Use financial information to **calculate** gross profit, net profit and the profit margin.
- **Calculate** missing figures in a cash-flow forecast.
- Analyse a **pie chart** showing market share.
- **Calculate** the **interest** paid on a loan with a given **rate of interest**.
- Use **exchange rates** to **convert** between currencies inside and outside the Eurozone.

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WHEN WILL I EVER NEED MATH?

Well, you might have to use it in ICT...

- Create a logo using a graphics package by **reflecting** and **rotating** a design.
- Use spreadsheet **formulae** to calculate the **cost** of a school field trip.
- Use your knowledge of **angles** to program a robot turtle to draw a **triangle** or other **polygon**.
- Use live data from a sensor to plot a **graph** showing the temperature of melting ice.
- Format **number** or **currency** data to the correct number of **decimal places**.
- **Convert** between pixels and centimetres when comparing **dimensions** of images.
- Work with **timings** and different **speeds** in frames per second when animating in Flash.
- Produce a spreadsheet to use an **iterative formula** which will calculate the **cube root** of a number.
- **Calculate** actual **dimensions** from a **scale diagram** produced by a computer-aided design package.

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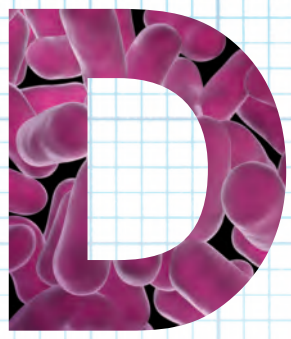
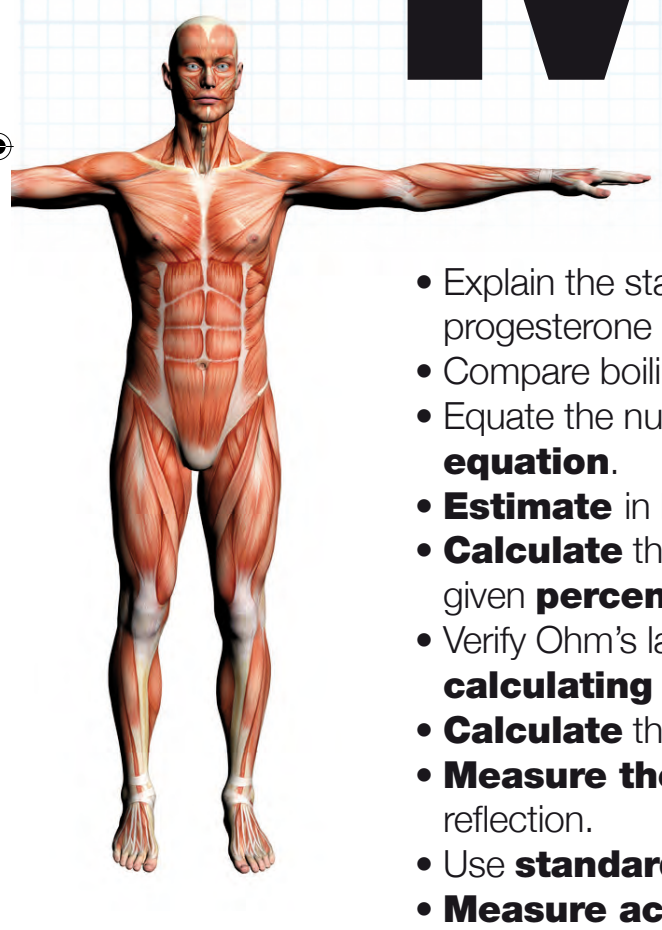
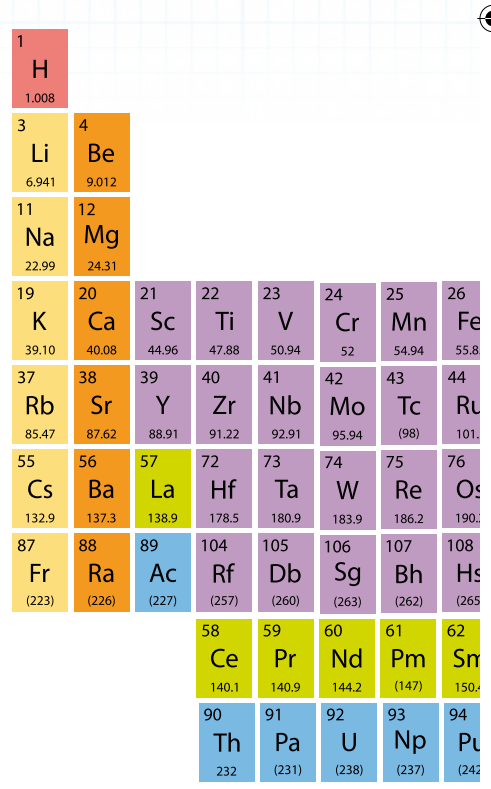




Well, you might have to use it in Science...

- Explain the stages of the menstrual cycle by referring to a **graph** of oestrogen and progesterone levels.
- Compare boiling points of gases using your knowledge of **negative numbers**.
- Equate the numbers of atoms of each element when you **balance** a **chemical equation**.
- **Estimate** in **kilograms** the amount of household waste that a family produces.
- **Calculate** the number of units of alcohol in a certain **volume** of alcoholic drink with a given **percentage** of alcohol.
- Verify Ohm's law by **plotting a graph** of current against voltage and then **calculating** the **gradient**.
- **Calculate** the efficiency of an energy change and give this as a **percentage**.
- **Measure the angle** of incidence for a ray of light to investigate total internal reflection.
- Use **standard form** when comparing the **masses** of the planets in the solar system.
- **Measure accurately** when recording the **heights** of seedlings.
- **Rearrange formulae** to change the subject and then **substitute** in known values.
- **Convert** between **metric** units of **length** or **volume**.



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Well, you might have to use it in Physical Education...

- **Add up** quickly and accurately when keeping score in rugby union.
- **Calculate** a person's body fat content using **percentage** body composition.
- Perform the Harvard step test, **calculate** your score using a **formula** and then find your **score** in a table.
- Plan interval training using the **ratio** of time spent working to the recovery period.
- Study recovery **rates** by recording heart rates in beats per minute.
- **Calculate** cardiac output by **multiplying** heart rate and stroke volume.
- **Measure** and record throws and jumps to a required **accuracy**.
- Perform accurate **timekeeping** and then rank the results for a run or sprint.

Maths has lots of applications and is a vital asset in many degrees and careers. To find out more about where maths is used and maths-related careers visit: www.mathscareers.org.uk

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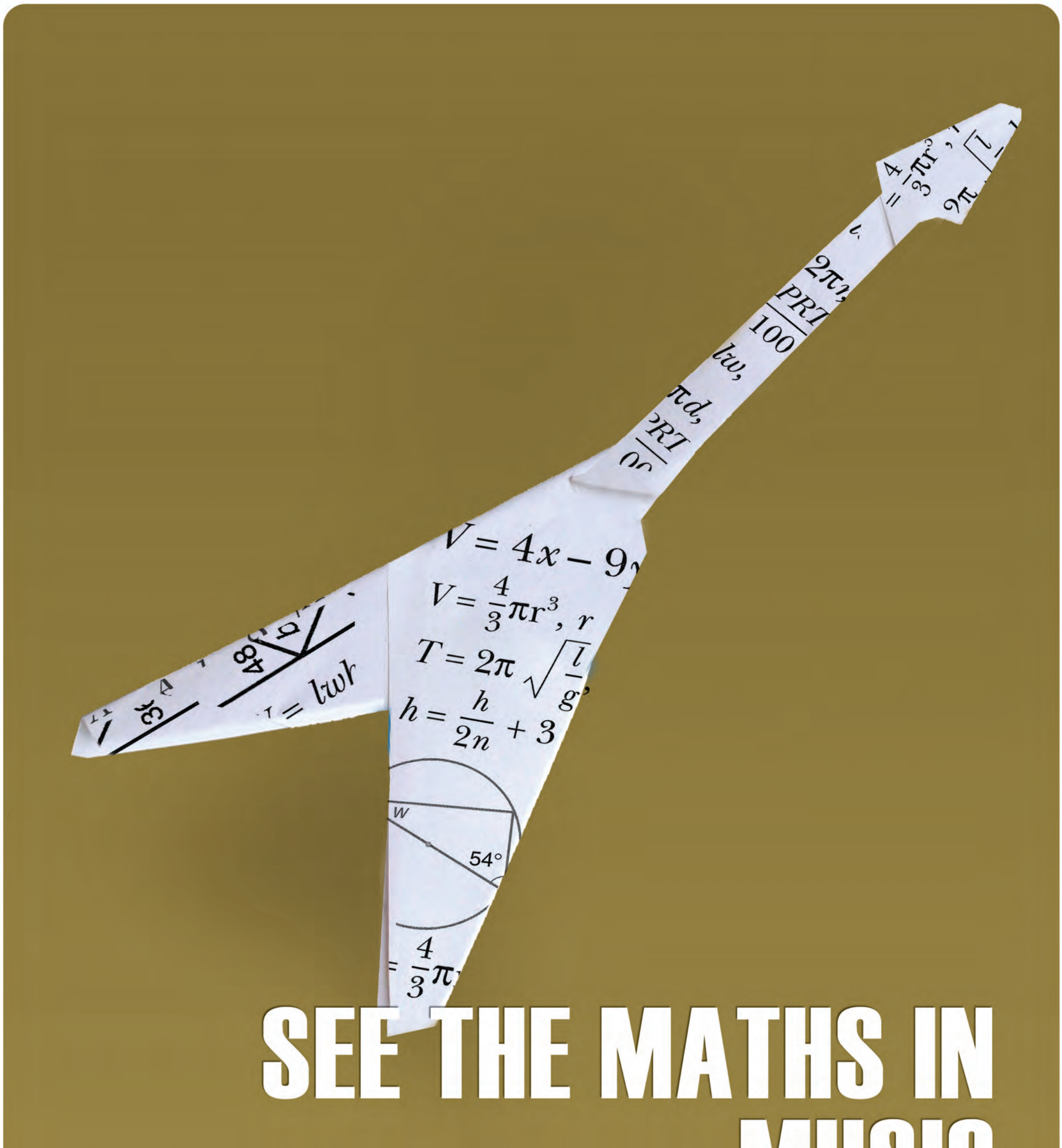

SEE THE MATHS IN MUSIC

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Ever wondered why some songs are so catchy? The theory of tuning and scales can be traced back to Pythagoras who first noticed the ratios of frequency intervals between notes. Symmetries and pattern in the structure of a song also play a role in ensuring that it hits number one, all of which has a firm theoretical grounding in maths!

For more information about the More Maths Grads project or for general enquiries please visit:
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Numeracy Across the Curriculum

ART & DESIGN

Symmetry

A **line of symmetry** is a line which divides a picture into two parts, each of which is the mirror image of the other. Pictures may have more than one line of symmetry.

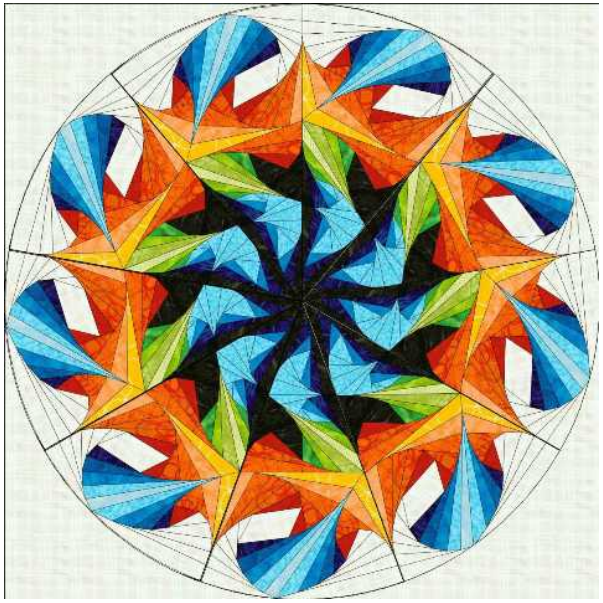
Numeracy Across the Curriculum

ART & DESIGN

Symmetry

The number of positions a figure can be rotated to, without bringing in any changes to the way it looks originally, is called its **order of rotational symmetry**.

Rotational Symmetry Order 3



Rotational Symmetry Order 9

Rotational Symmetry Order 4

Numeracy Across the Curriculum

ART & DESIGN

Ratio

A ratio tells you how much you have of one part compared to another part.
It is useful if you are trying to mix paints accurately and consistently.

<u>An example</u>

You can make different colours of paint by mixing red, blue and yellow in different proportions.

For example, you can make green by mixing 1 part blue to 1 part yellow.

To make purple, you mix 3 parts red to 7 parts blue.

How much of each colour do you need to make 20 litres of purple paint?

..... litres of red and ..... litres of blue

Numeracy Across the Curriculum

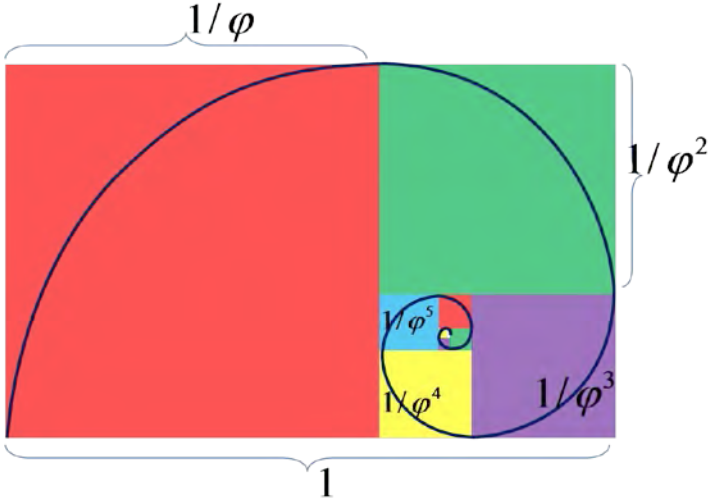
ART & DESIGN

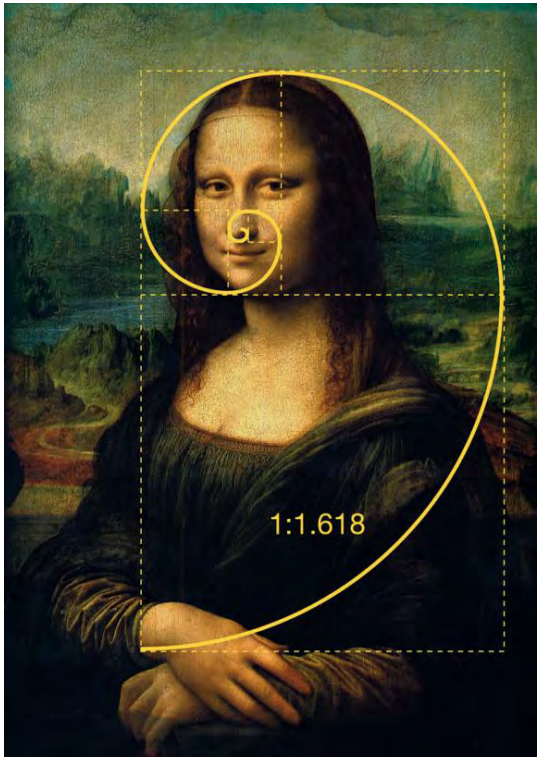
Ratio

Many artists and architects have proportioned their works to approximate the **Golden Ratio** believing this proportion to be aesthetically pleasing. This is sometimes given in the form of the **Golden Rectangle** in which the ratio of the longer side to the shorter side is the golden ratio.

The golden ratio is given by the Greek letter phi (φ) where:

$$\varphi = \frac{1 + \sqrt{5}}{2} = 1.6180339887...$$

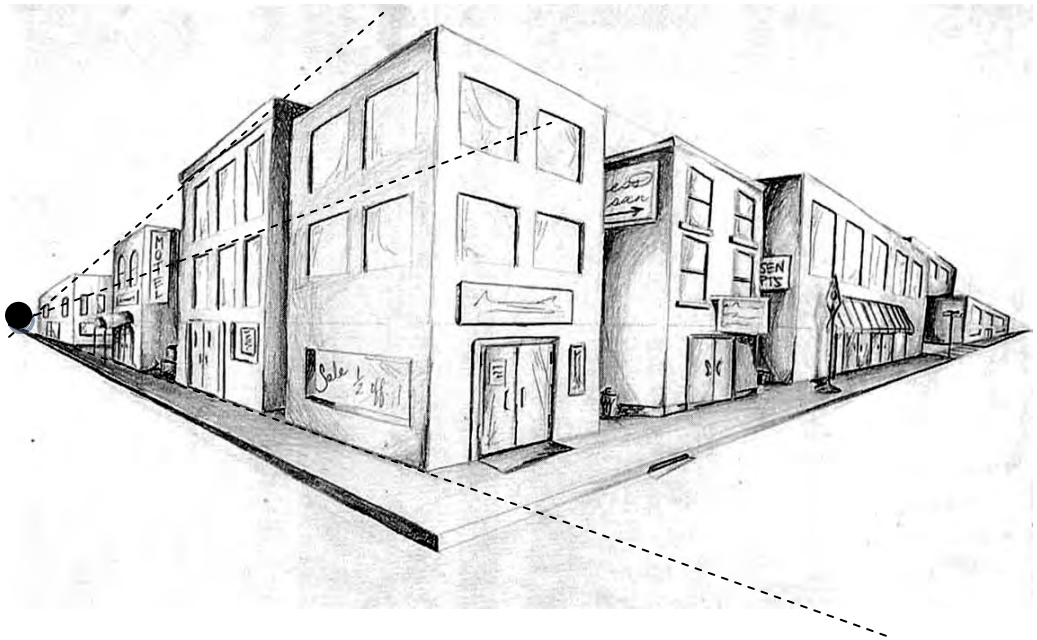




Numeracy Across the Curriculum

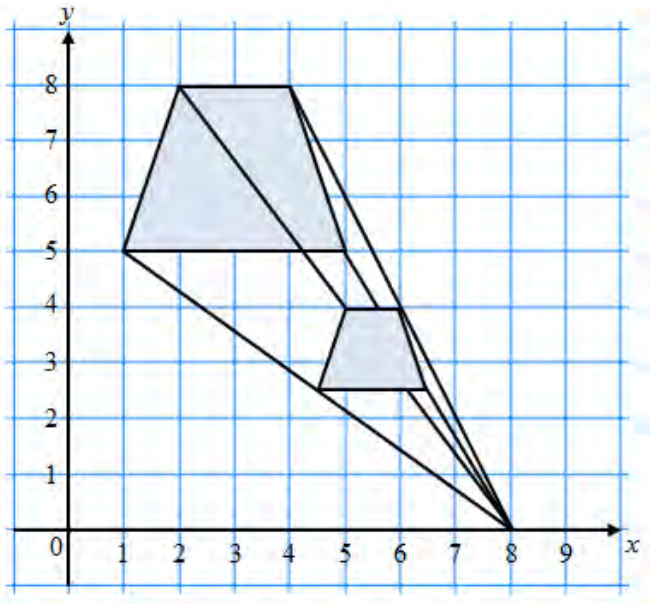
ART & DESIGN

Perspective, Enlargement and Scale Factor



Perspective in art and design is an approximate representation, on a flat surface, of an image as it is seen by the eye.

Lines radiating from a vanishing point are used to draw in detail on the picture.



In maths we use a centre of englargement [(8,0) in this case] and a scale factor [2 in this case] to carry out englargements.

Can you see the similarities and differences in the processes involved?

Numeracy Across the Curriculum

ART & DESIGN

Tessellations

Tessellation is the process of creating a two-dimensional plane using the repetition of a geometric shape with no overlaps and no gaps.

Escher was famous for creating detailed drawings using different tessellations.

Numeracy Across the Curriculum

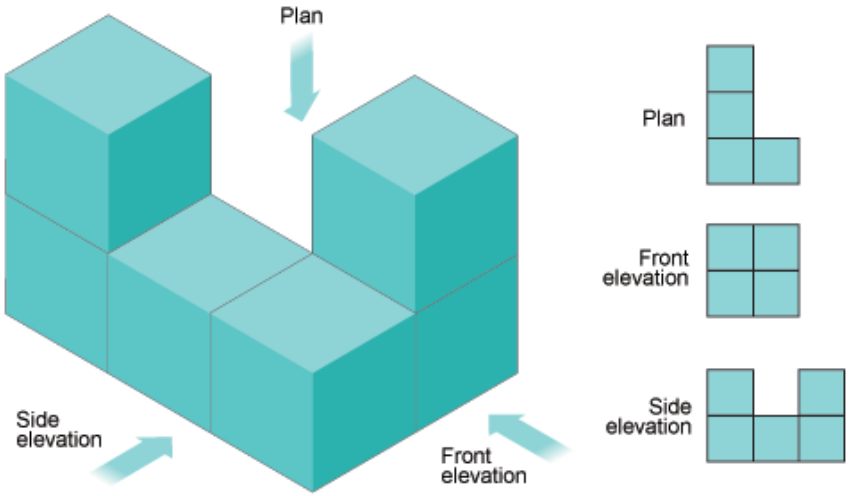
ART & DESIGN

Cubism

George Braque

Violin and Candlestick

1910



Cubism is an early-20th-century avant-garde art movement. In Cubist artwork, objects are analysed, broken up and reassembled in an abstracted form—instead of depicting objects from one viewpoint, the artist depicts the subject from a multitude of viewpoints to represent the subject in a greater context.

In Maths we also draw objects from different viewpoints using plans, elevations or isometric drawing. These are often compared on the same page in order to give a full understanding of what the 3D shape looks like.

How do these mathematical techniques compare with the artistic ones used in Cubism?

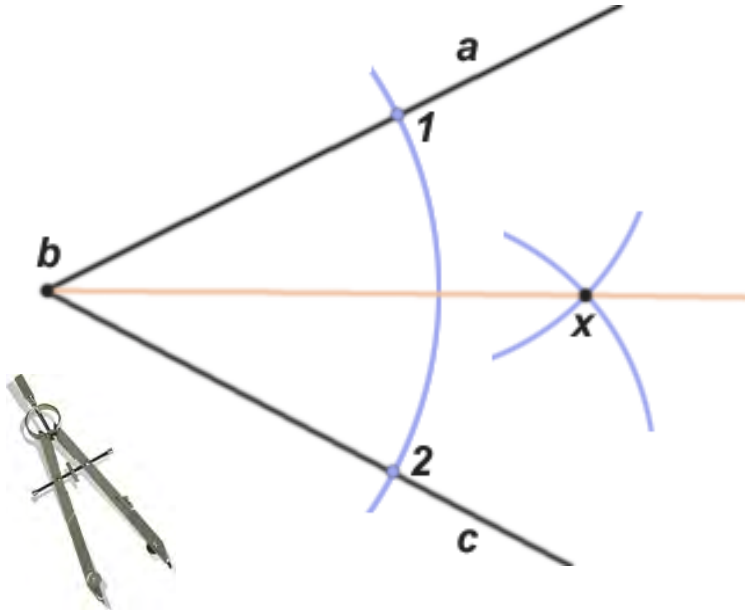
Numeracy Across the Curriculum

ART & DESIGN

Constructions

Construction methods in art are organised techniques, systems, logical practices, planning and design in the creation of structure.

There is also a branch of art called Constructivism that originated in Russia in 1919 and saw art as a practice for social purposes.



In geometry **constructions** refer to the drawing of various shapes using only a compass and straightedge.

No measurement of lengths or angles is allowed.

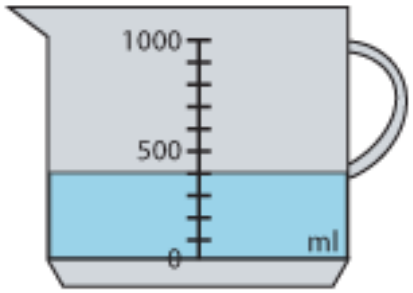
Typical **constructions** include drawing the perpendicular bisector of a line, creating a 60° angle and bisecting an angle (see diagram above). Could you use geometrical constructions in art lessons to support your designs? What would be the advantages and disadvantages of doing this?

Numeracy Across the Curriculum

DESIGN & TECHNOLOGY (FOOD)

Reading Scales

You need to work out how much each division is worth when reading scales.



There are 5 divisions between 0 and 500

Each division is worth

500 ÷ 5 = 100

So the scale reads <u>400 ml</u>

Using the outside scale (g)…

There are 10 divisions between 0 and 50

Each division is worth

50 ÷ 10 = 5

So the scale reads <u>70g</u>

Using the inside scale (oz)…

There are 4 divisions between 0 and 1

Each division is worth

1 ÷ 4 = 0.25

So the scale reads <u>2.5oz</u>

Numeracy Across the Curriculum

DESIGN & TECHNOLOGY (FOOD)

Proportion

You use proportion with recipes in order to work out how much of each ingredient you need to serve a different number of people from the number given in the recipe.

Flapjacks

(Serves: 10)

120g butter

100g dark brown soft sugar

4 tablespoons golden syrup

250g rolled oats

40g sultanas or raisins

How much of each ingredient would you need to serve 25 people?

First work out how much you need to serve 1 person, then multiply it by 25

This recipe is for 10 people.

To find out how much of each ingredient you need for one person, just divide by 10.

For 25 people:

Butter = 120 ÷ 10 x 25

= 300g

Sugar = 100 ÷ 10 x 25

= 250g

Syrup = 4 ÷ 10 x 25

= 10 tablespoons

Oats = 250 ÷ 10 x 25

= 625g etc.

Numeracy Across the Curriculum

DESIGN & TECHNOLOGY (FOOD)

Ratio

Sometimes recipes are given in the form of ratios. This allows you to make as much or as little as you want, as long as the ingredients stay in the same ratio to one another.

Pancakes

For every 100g flour, use 2 eggs and 300ml milk

The ratio of flour (g) to eggs to milk (ml) is

100 : 2 : 300

So to make double the quantity of pancakes, we just double the amount of each ingredient

200 : 4 : 600

That's 200g flour, 4 eggs and 600ml of milk

Numeracy Across the Curriculum

ENGLISH

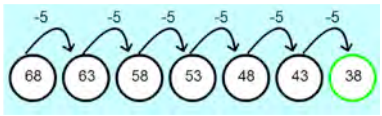
Using mathematical vocabulary correctly

It is important to make sure you can **spell** mathematical words and use them in the correct context.

Here are some of the mathematical words that people often spell incorrectly.

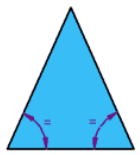
Addition

Sequence

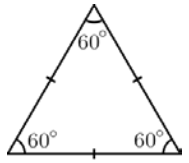


Parallelogram

Isosceles triangle



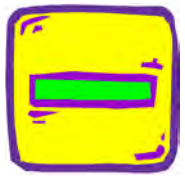
Equilateral triangle



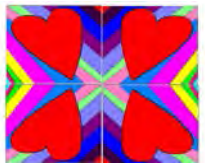
Probability

Trapezium

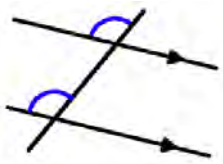
Negative



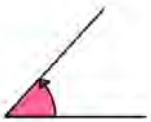
Symmetry



Corresponding angles



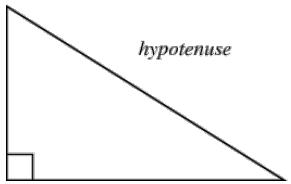
Angle



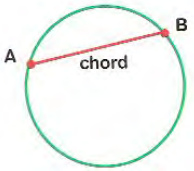
Circumference

Function

Hypotenuse



Chord



Numeracy Across the Curriculum

ENGLISH

Explaining and Justifying Methods and Conclusions

It is important to be able to explain your mathematical thinking to others. This not only helps others understand how you have worked things out, but improves your understanding of what you have done. Look at the example below. The highlighted words are good ones to use in mathematical arguments.

Find the value of the expression $\frac{2y+8}{2}$ when y = 7

If y is equal to 7, **then** 2y must be equal to 14. This is **because** 2y **means** 2 multiplied by y and 2 multiplied by 7 is 14. **Therefore** 2y plus 8 will equal 14 plus 8 which is 22. **It follows that** 2y plus 8 divided by 2 will therefore be 11, since 22 divided by 2 is 11.

Numeracy Across the Curriculum

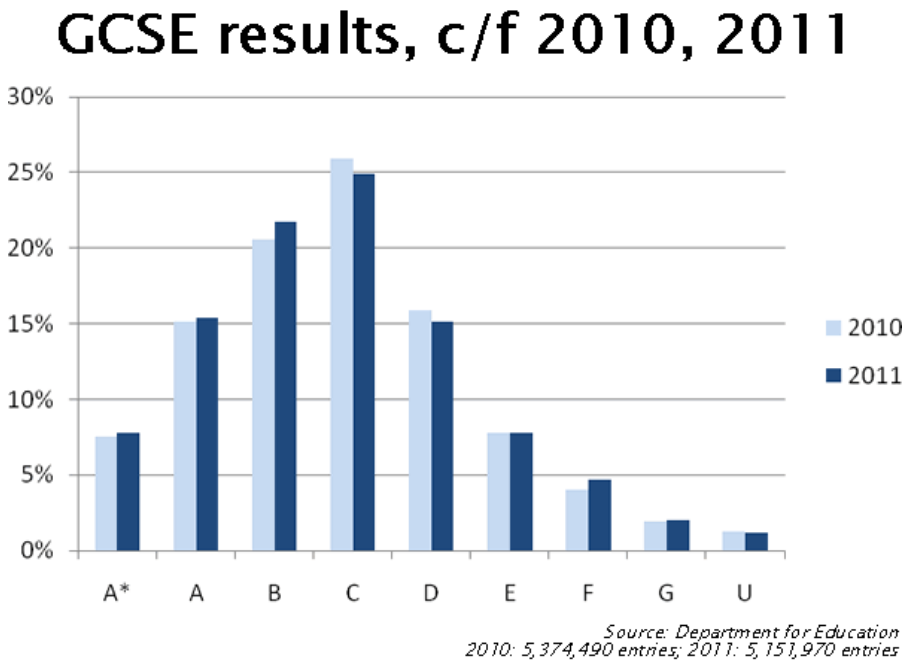
ENGLISH

Interpreting and Discussing Results

An important branch of mathematics is statistics, which involves the collection, presentation and evaluation of data. You can use your skills in English to clearly interpret and discuss results you get from collecting data in your maths lessons.

This graph **compares** the percentage of students achieving different GCSE grades in 2010 with those in 2011.

The **modal** grade for both years was a grade C. In 2011 there was an **increase** in the percentage of students achieving grades A*, A and B and a **decrease** in the percentage of students achieving a Grade C or D.



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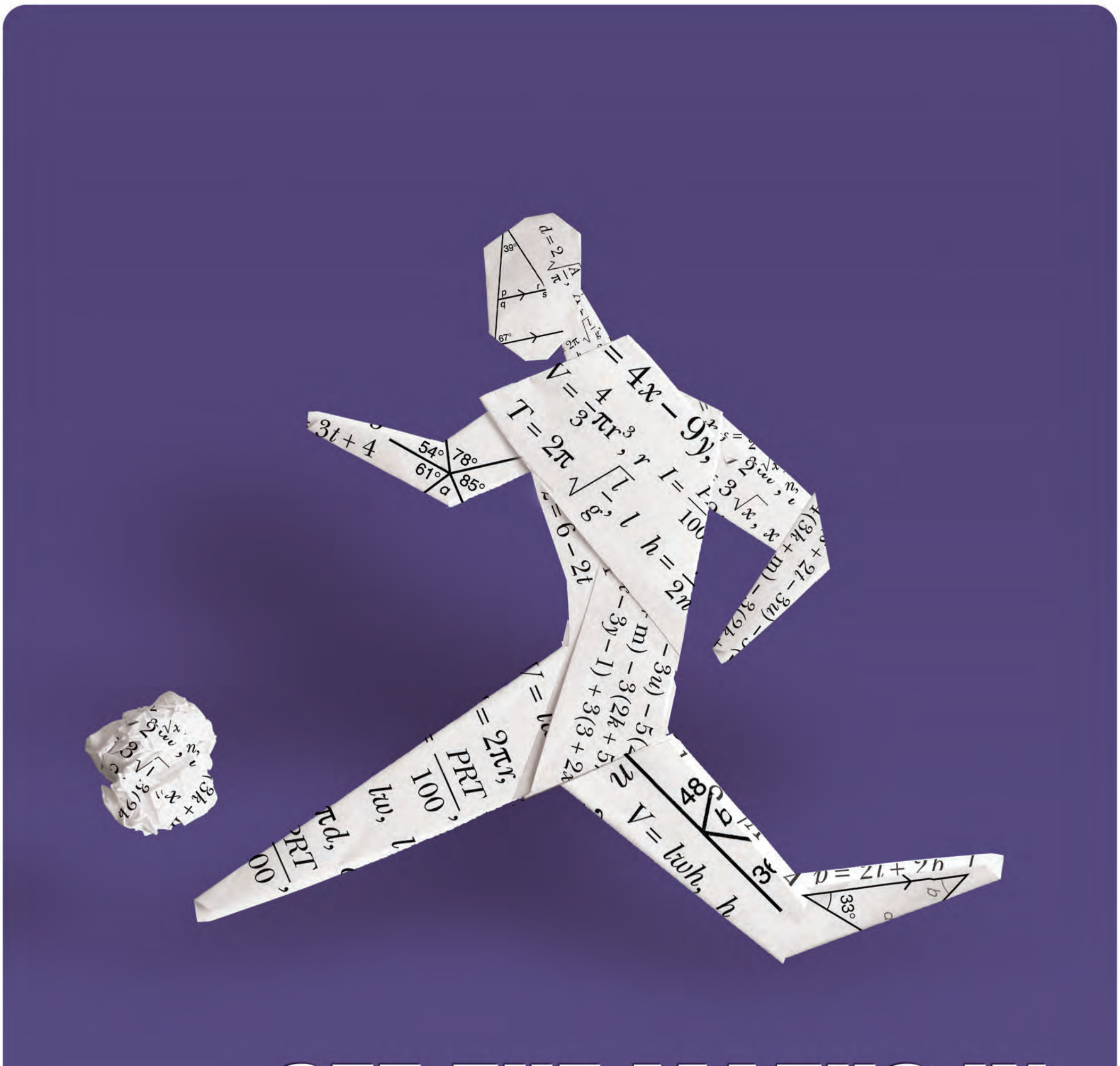

SEE THE MATHS IN SPORT

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An athlete will tell you it's all about pace and timing. In training, the difference between decreasing your lap time by 0.1 or 0.2 of a second can make the difference between a gold medal and a silver medal. A footballer uses instant calculations of angles, speed and distance before scoring – even using quadratic equations to score the perfect goal!

For more information about the More Maths Grads project or for general enquiries please visit:
www.moremathsgrads.org.uk and *www.mathscareers.org.uk*