

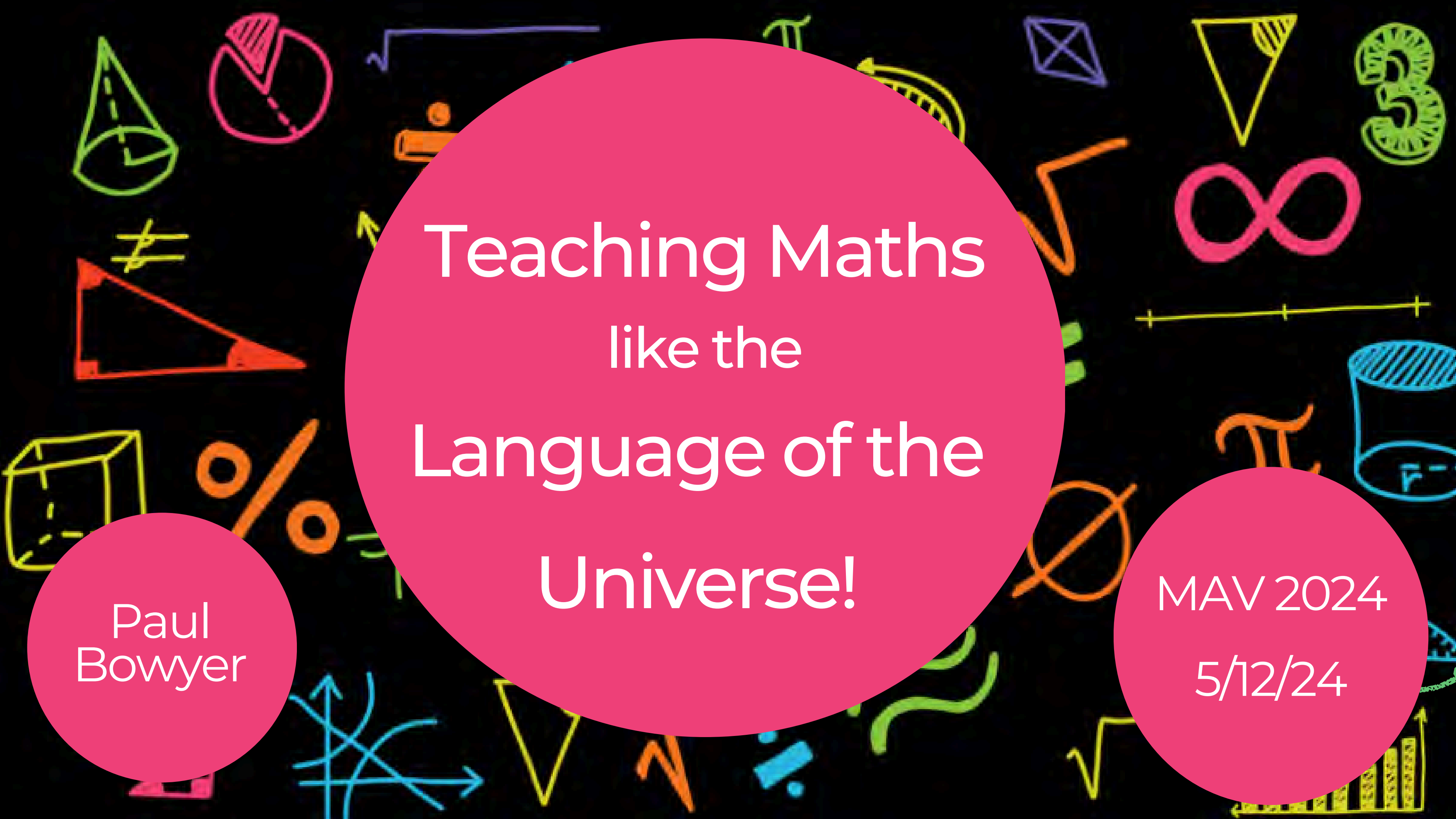
CURRICULUM, PEDAGOGY AND BEYOND

Paul Bowyer



THE MATHEMATICAL
ASSOCIATION OF VICTORIA

MAV24
CONFERENCE



Teaching Maths
like the
Language of the
Universe!

Paul
Bowyer

MAV 2024
5/12/24

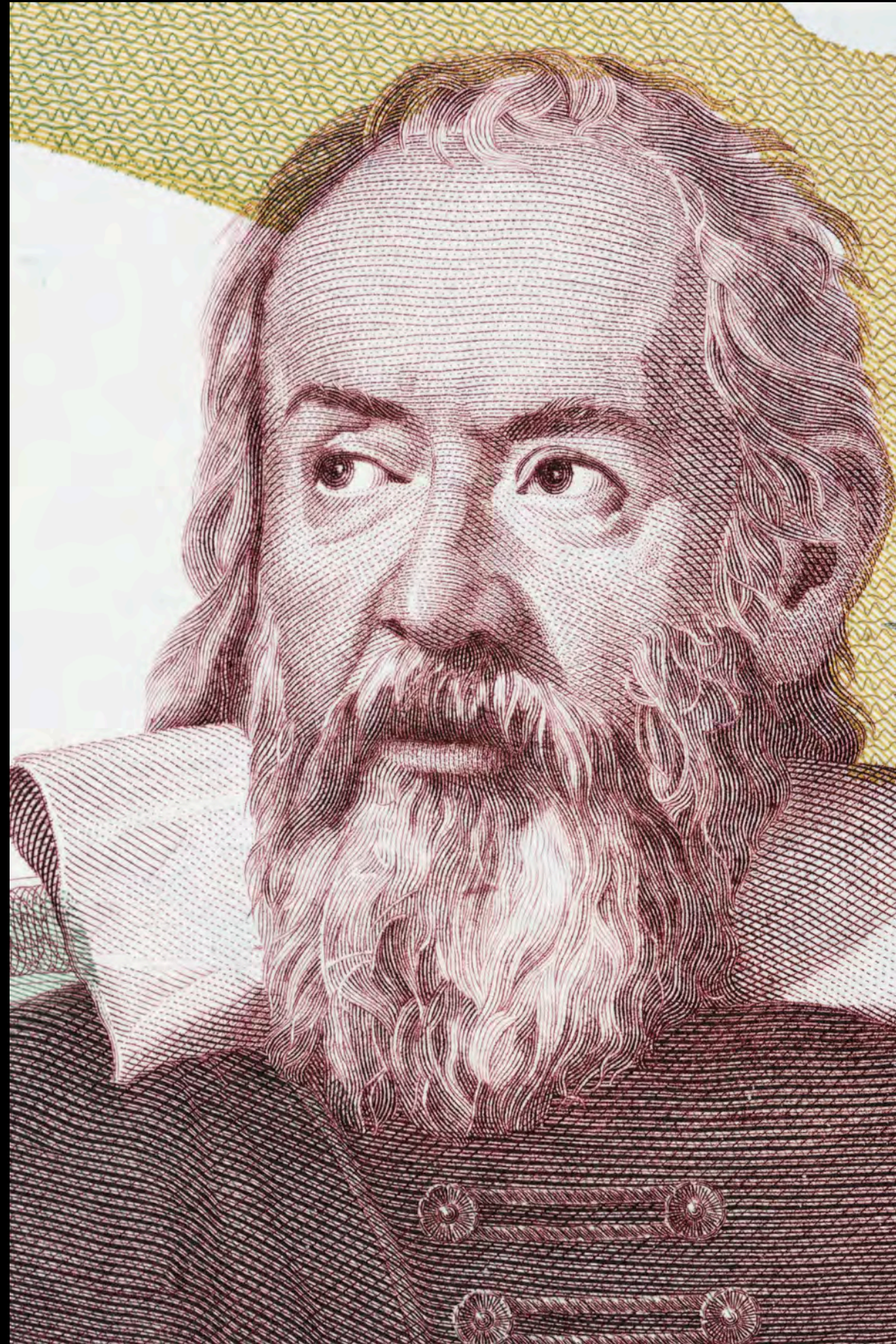
A solid pink circle is located in the top-left corner of the slide.

Introduction

Paul Bowyer
Language teacher

Galileo

**Mathematician,
astronomer**



Galileo

Mathematician,
astronomer

**Mathematics is
the language
with which God
has written the
Universe.**

Galileo Galilei

Maths

is the

**Language of the
Universe!**



Maths

is the

**Language of the
Universe!**

Because it's everywhere!

Maths is everywhere!



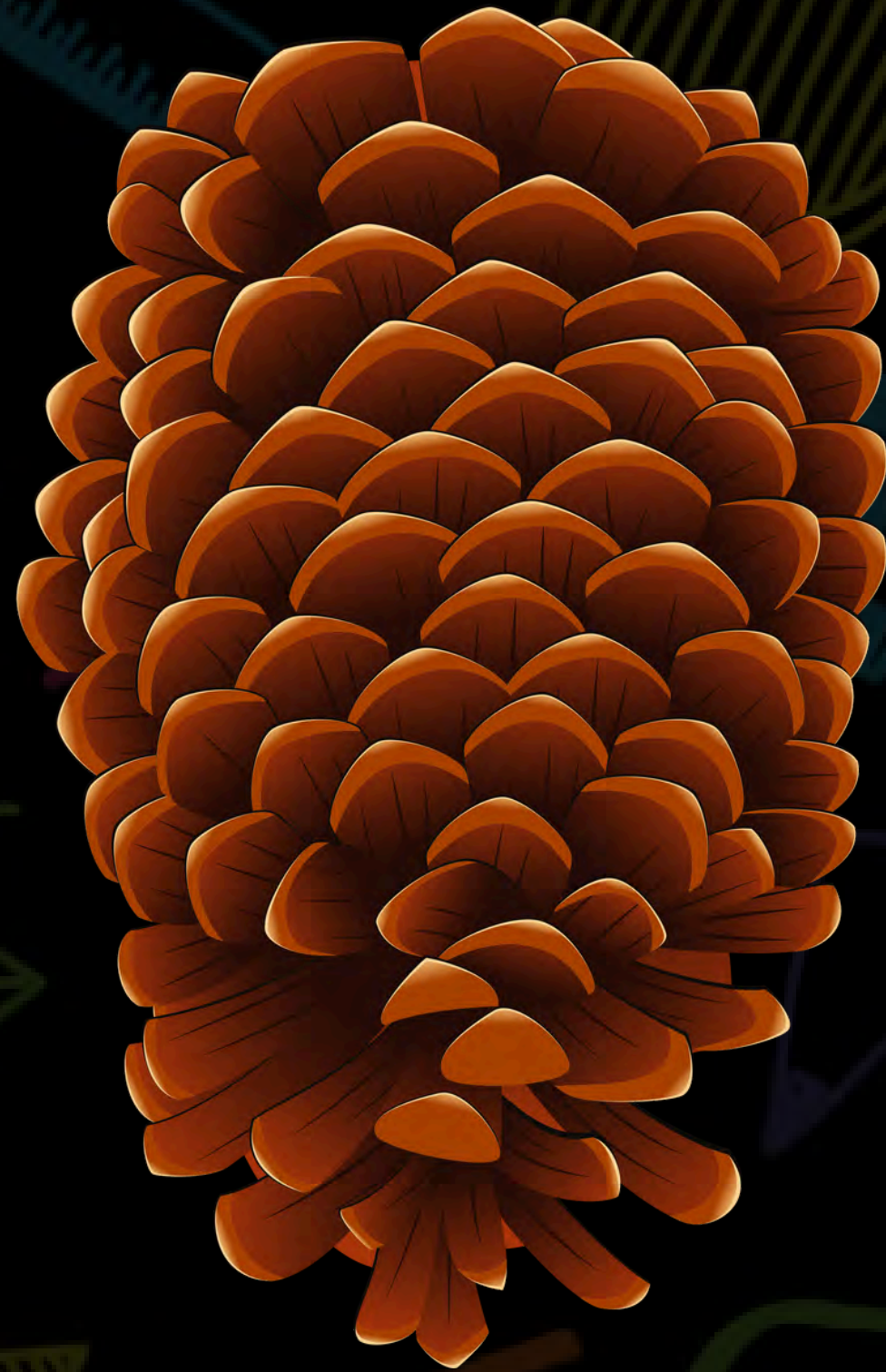
the rainbow

Maths is everywhere!



Flowers

Maths is everywhere!



Pine cones

Maths is everywhere!



Buildings

Maths is everywhere!



Bridges

Maths is everywhere!



Computers

Maths is everywhere!



Phones

Maths is everywhere!



Shadows

Maths is everywhere!

In space

Maths is everywhere!

**In every other school
subject**

Maths is everywhere!

Even English

Maths is everywhere!

Macbeth

Maths is everywhere!

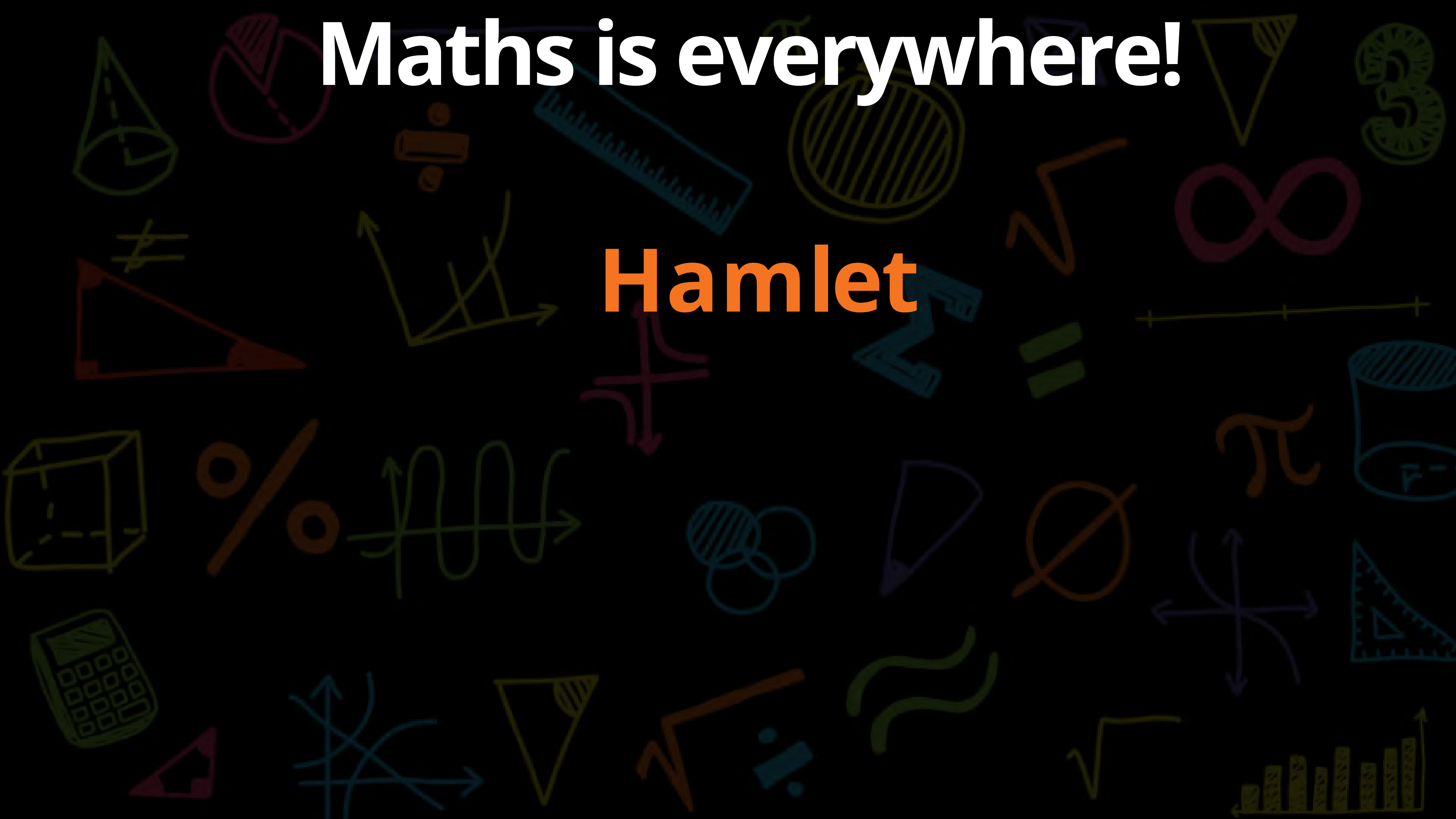
Macbeth
cbe

Maths is everywhere!

Macbeth
cbe

Maths is everywhere!

Hamlet



Maths is everywhere!

Ham t

le

Maths is everywhere!

Ha t

le m

Maths is everywhere!

H t

le ma

Maths is everywhere!

H

le mat

Maths is everywhere!

le math

Maths is everywhere!

le math
el

MATHS
IS IN EVERYTHING!

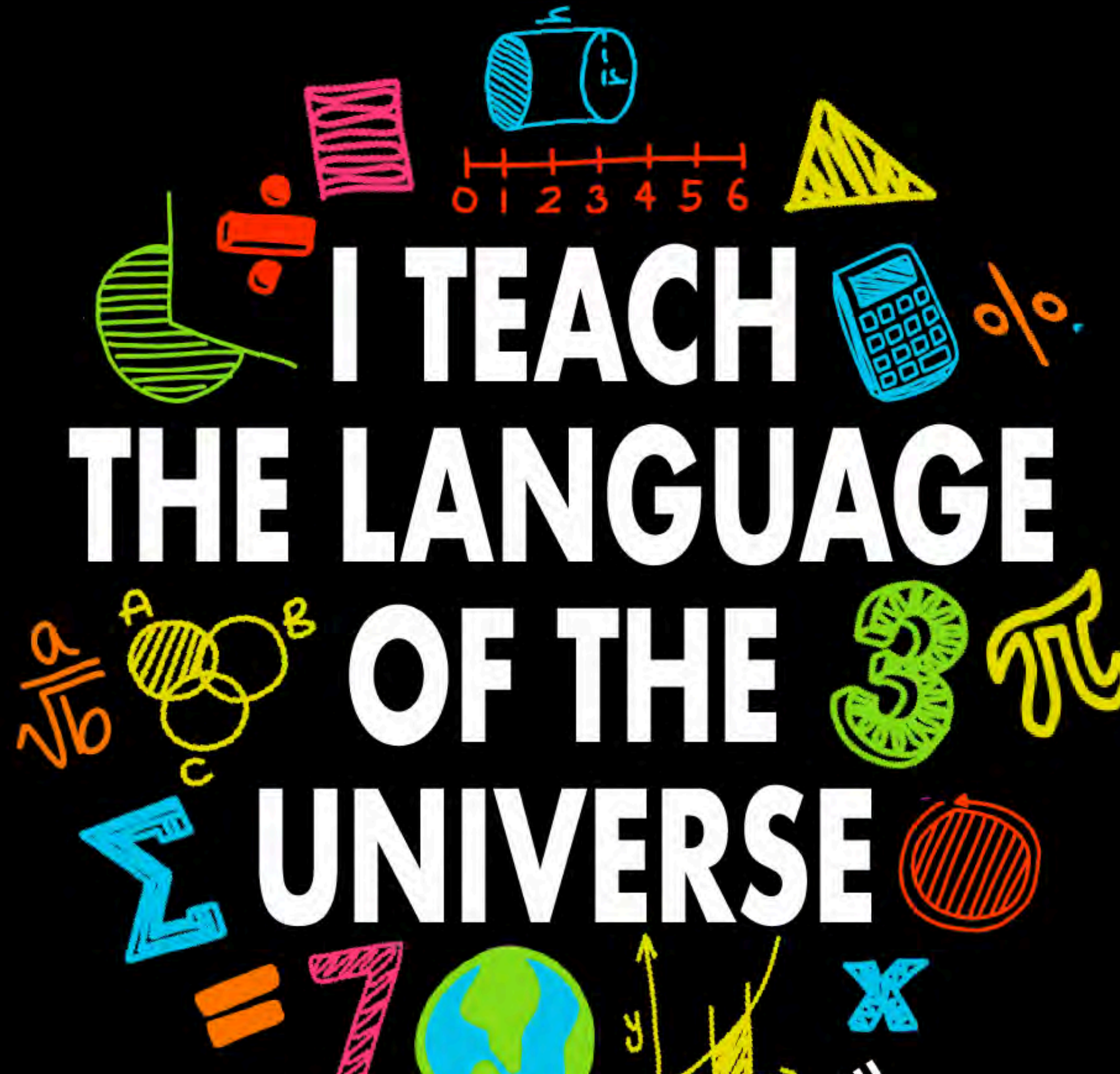
That's why it's the
Language of the Universe!

And you

are teachers

of that Language!

We're all **Language** teachers!!!



I TEACH
THE LANGUAGE
OF THE
UNIVERSE

mathematicalendar.com.au

When your students
are doing Maths

they're speaking

that Language!



I SPEAK
THE LANGUAGE
OF THE
UNIVERSE

mathematicalendar.com.au



What a powerful thing

for them to be able to say!

AGENDA

AGENDA

1. Blow their Minds!
2. Bring the universe to the classroom
3. Go into the Universe
4. Get Personal
5. A prism to view the world
6. Celebrate!



1. Blow their minds!

**Mathematics has
an extraordinary
way of leading us
to enlightenment
by subverting our
intuitions.**

Eugene Wigner

The maths syllabus is full of MBM....

Mind-Blowing Maths



Mind-Blowing Maths



Often hidden in plain sight!

Mind-Blowing Maths



Once you start looking for it,
you see it everywhere!

Mind-Blowing Maths

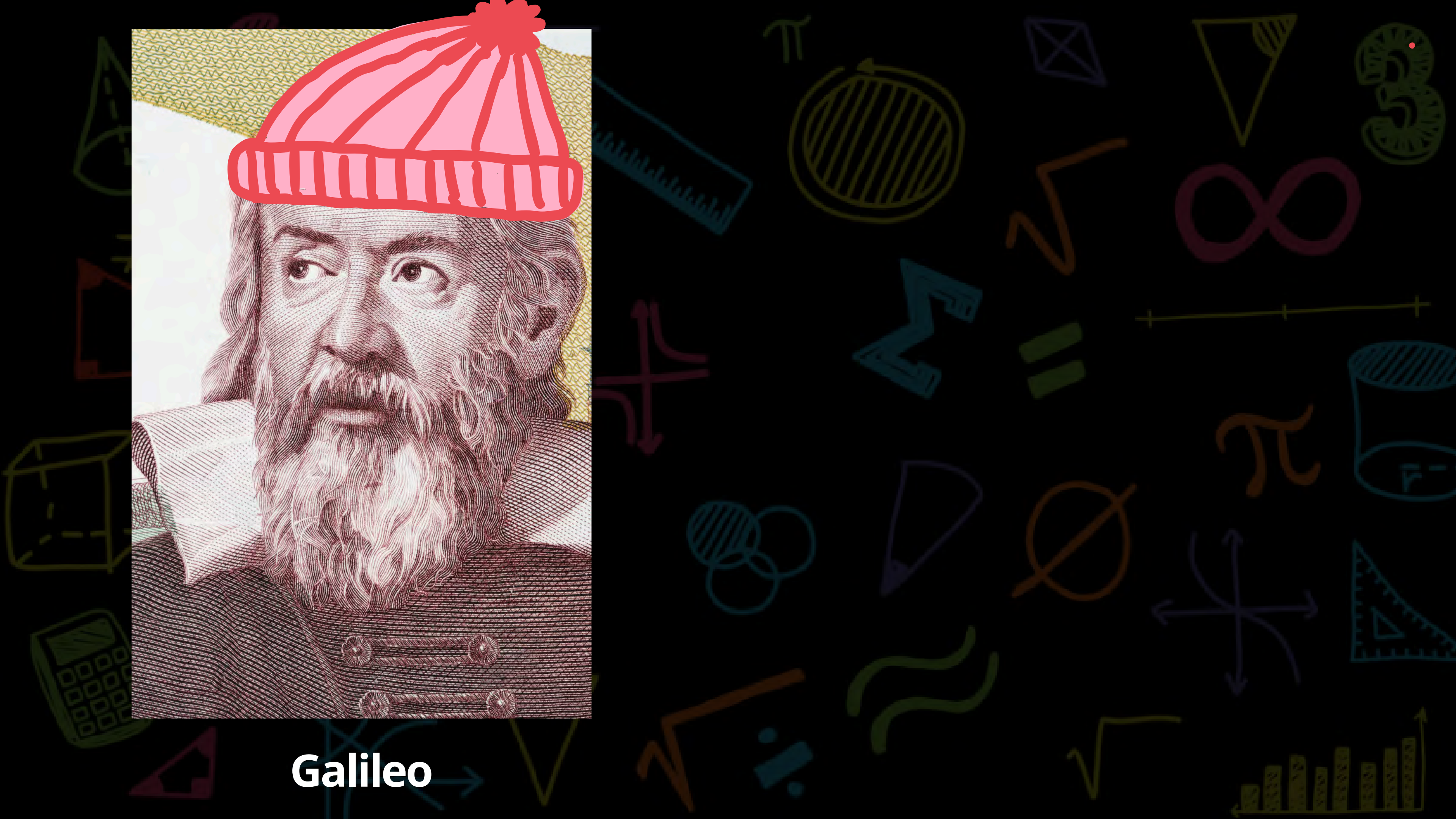
Get your beanie
out!



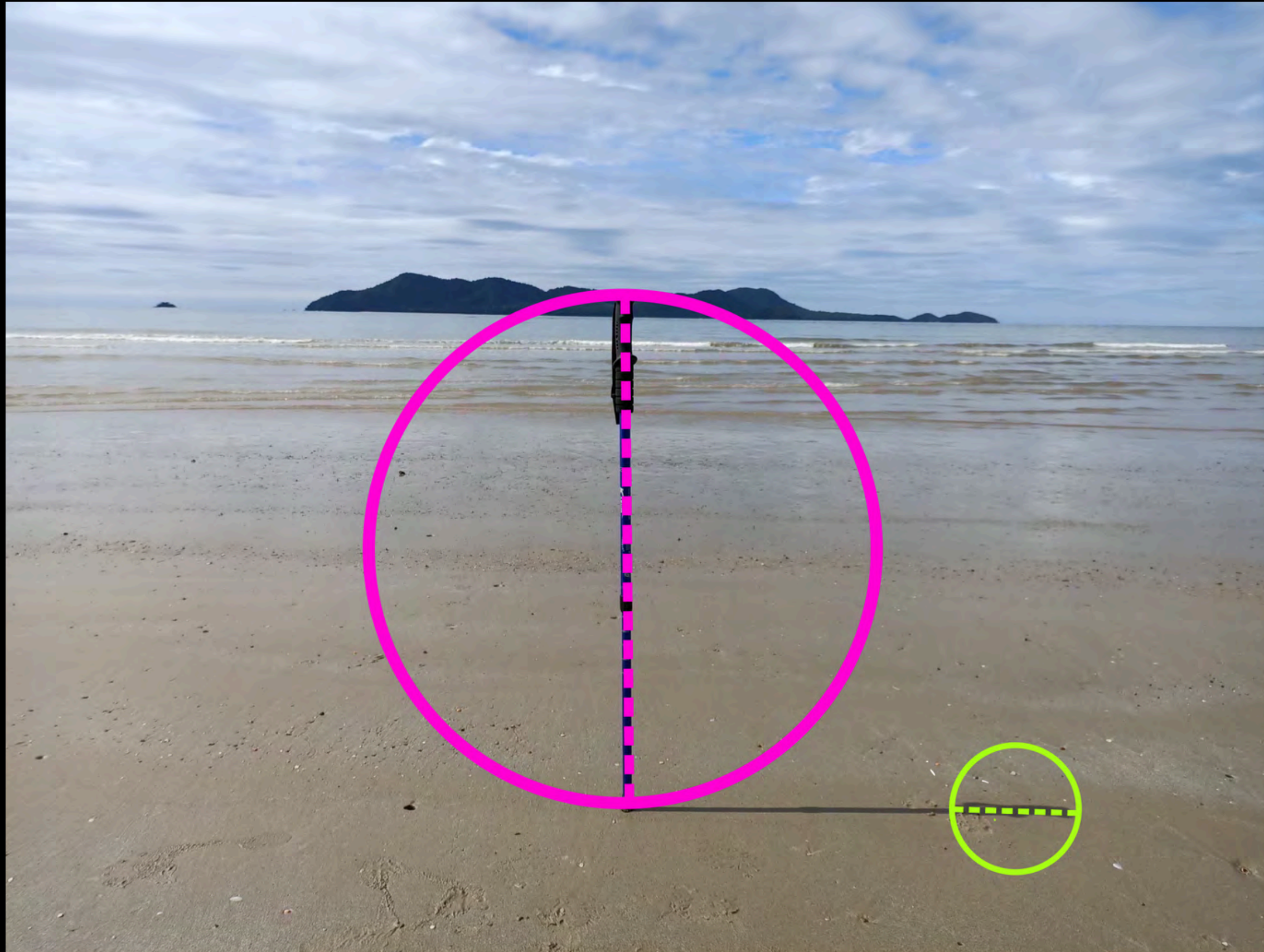
Once you start looking for it,
you see it everywhere!

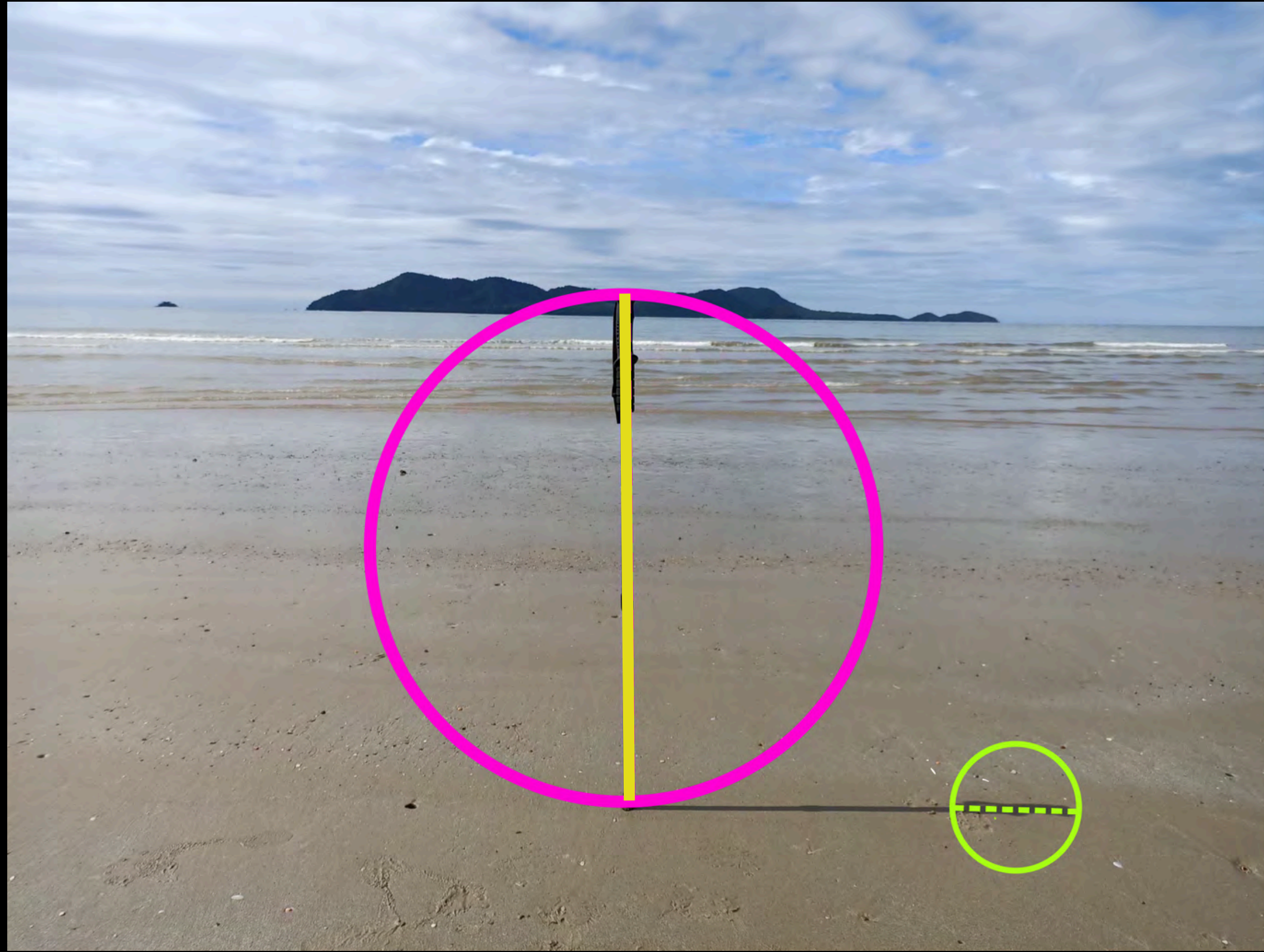


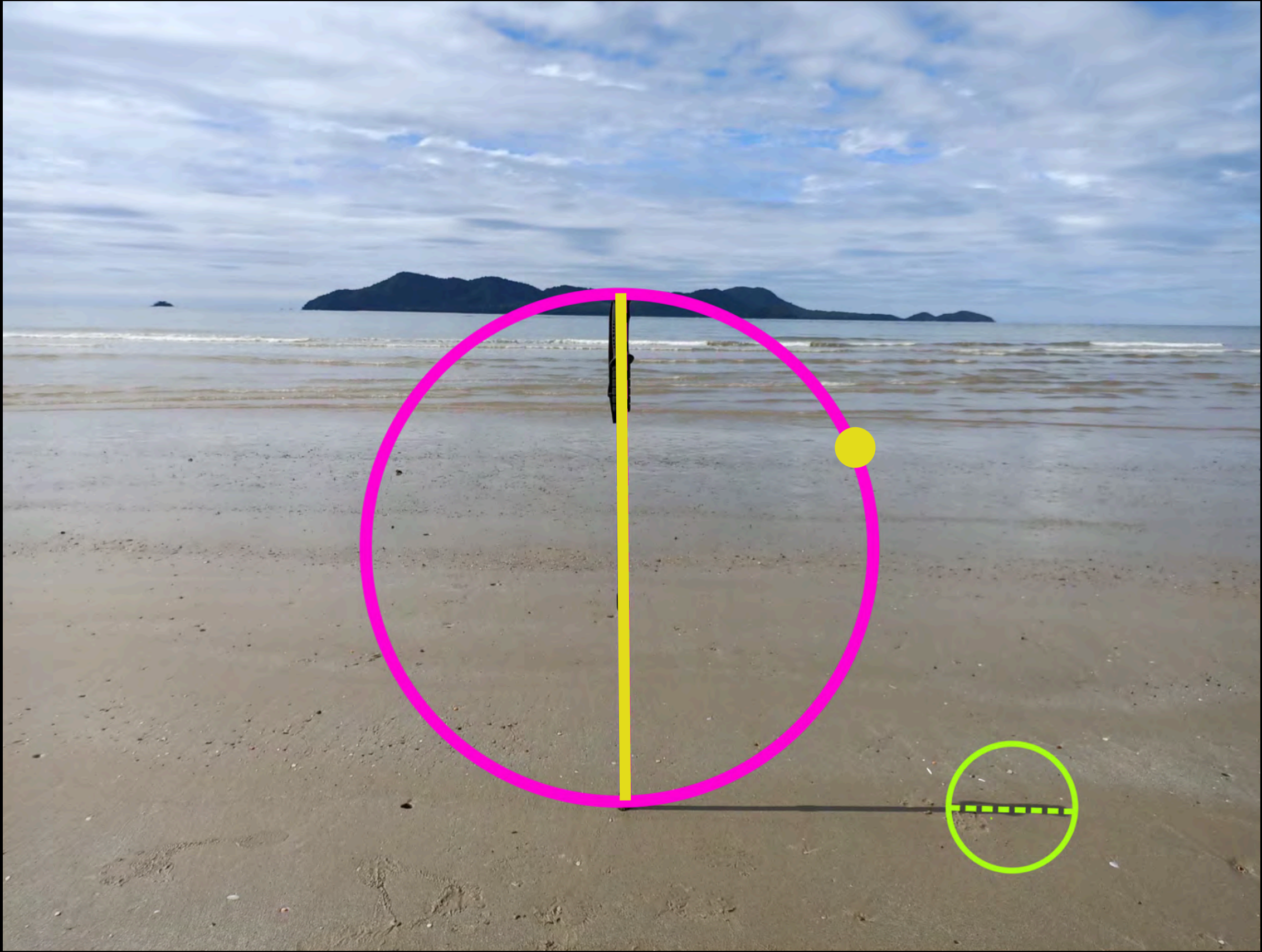
Galileo

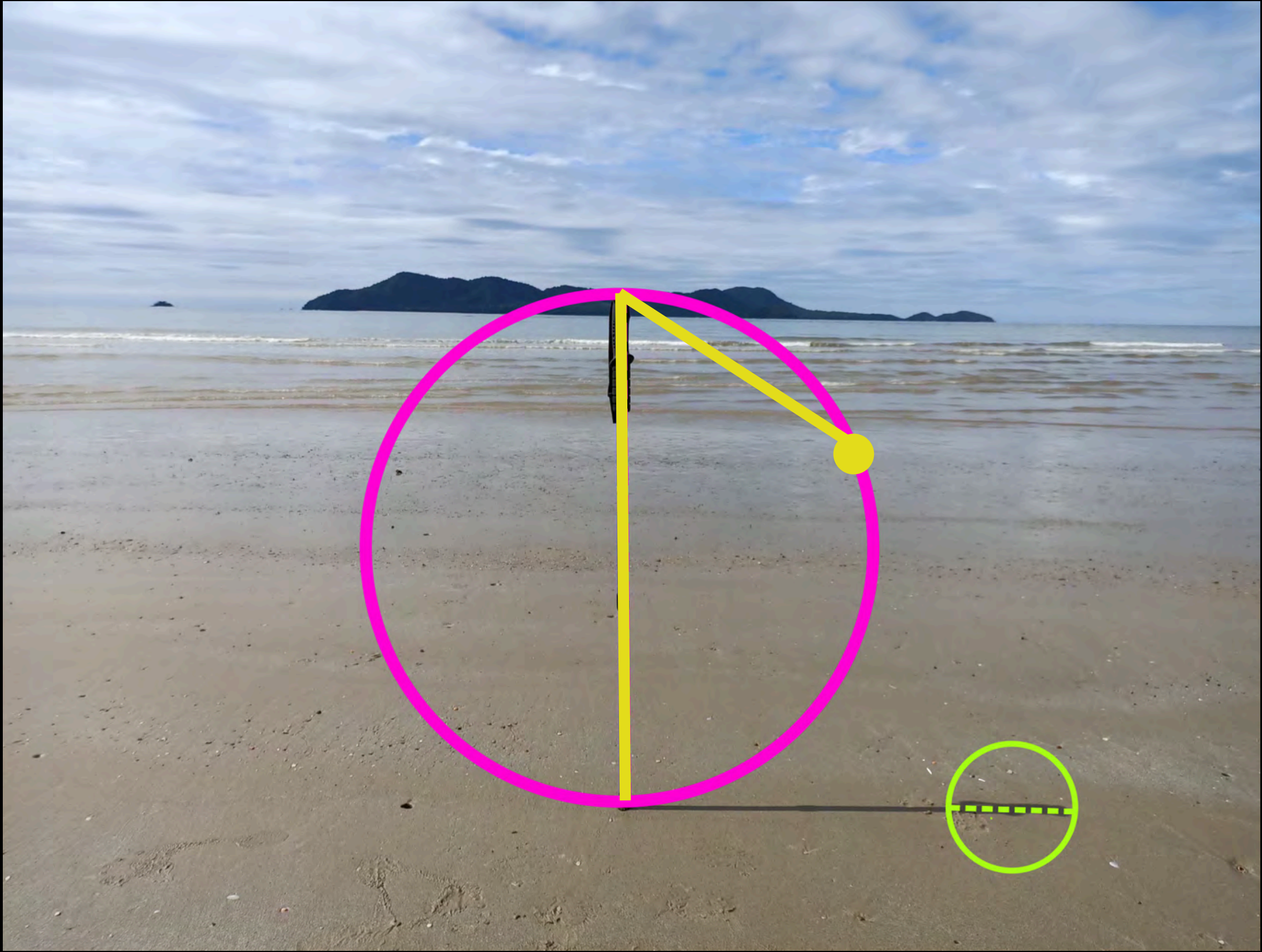


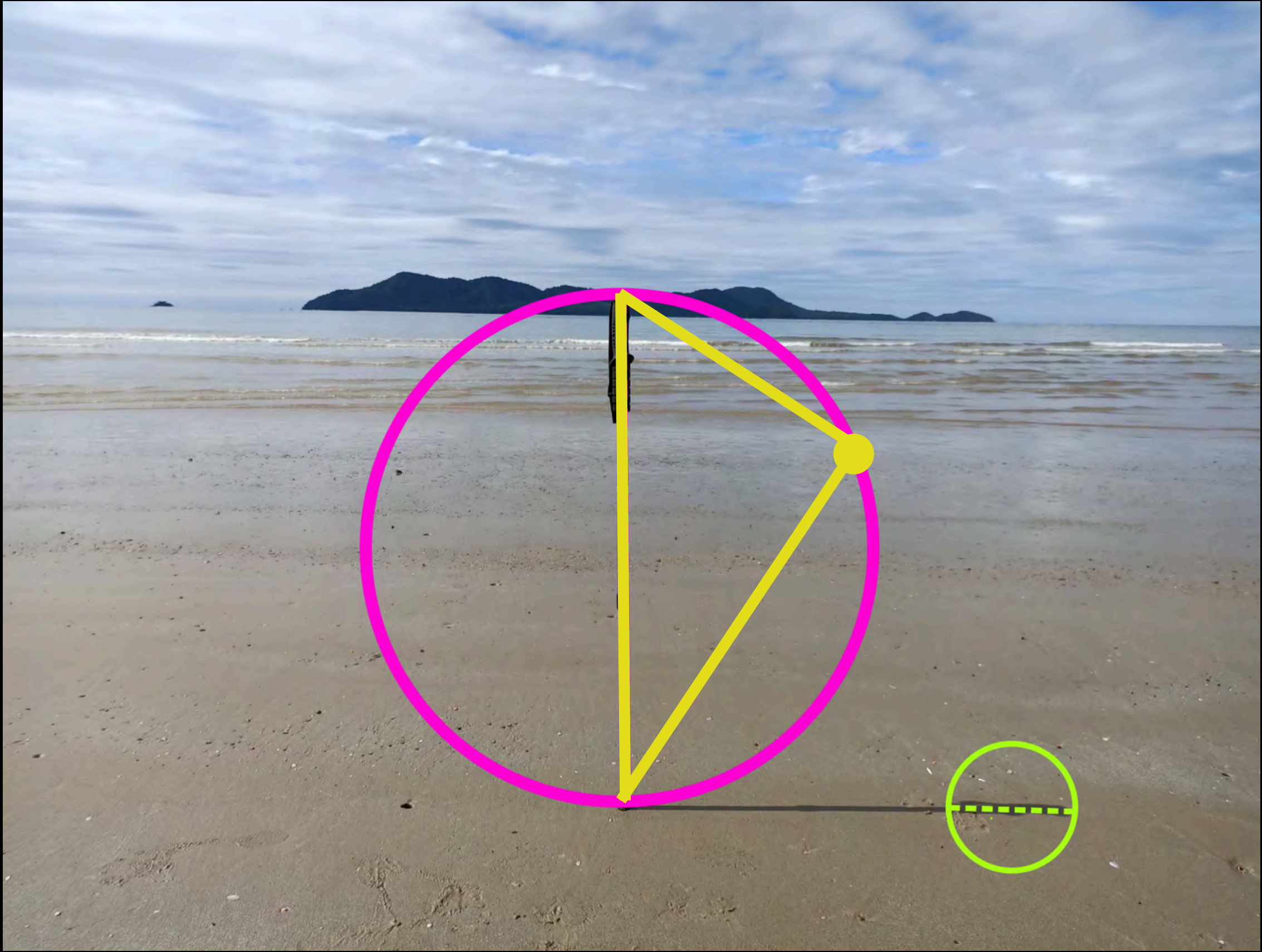
π

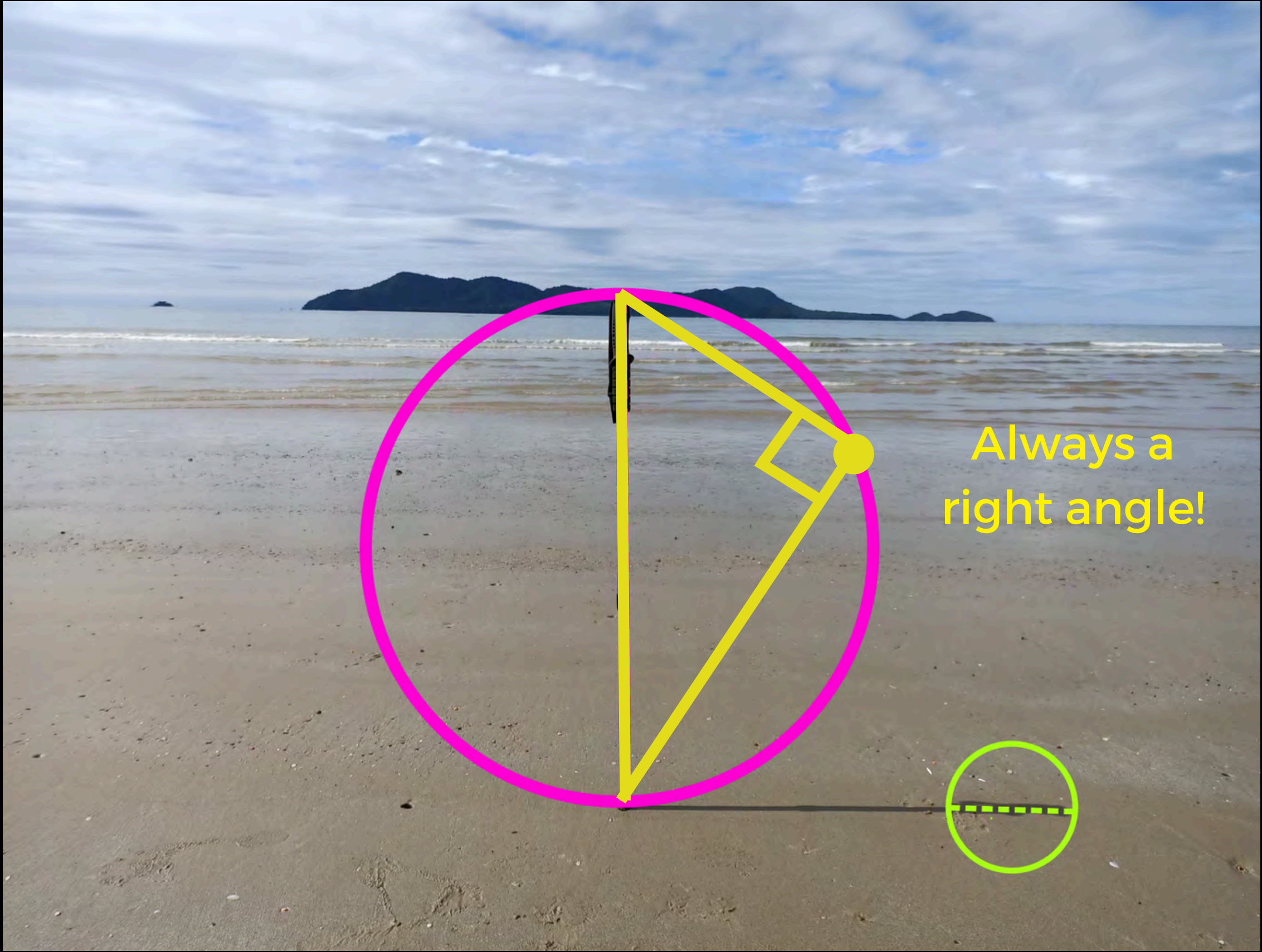




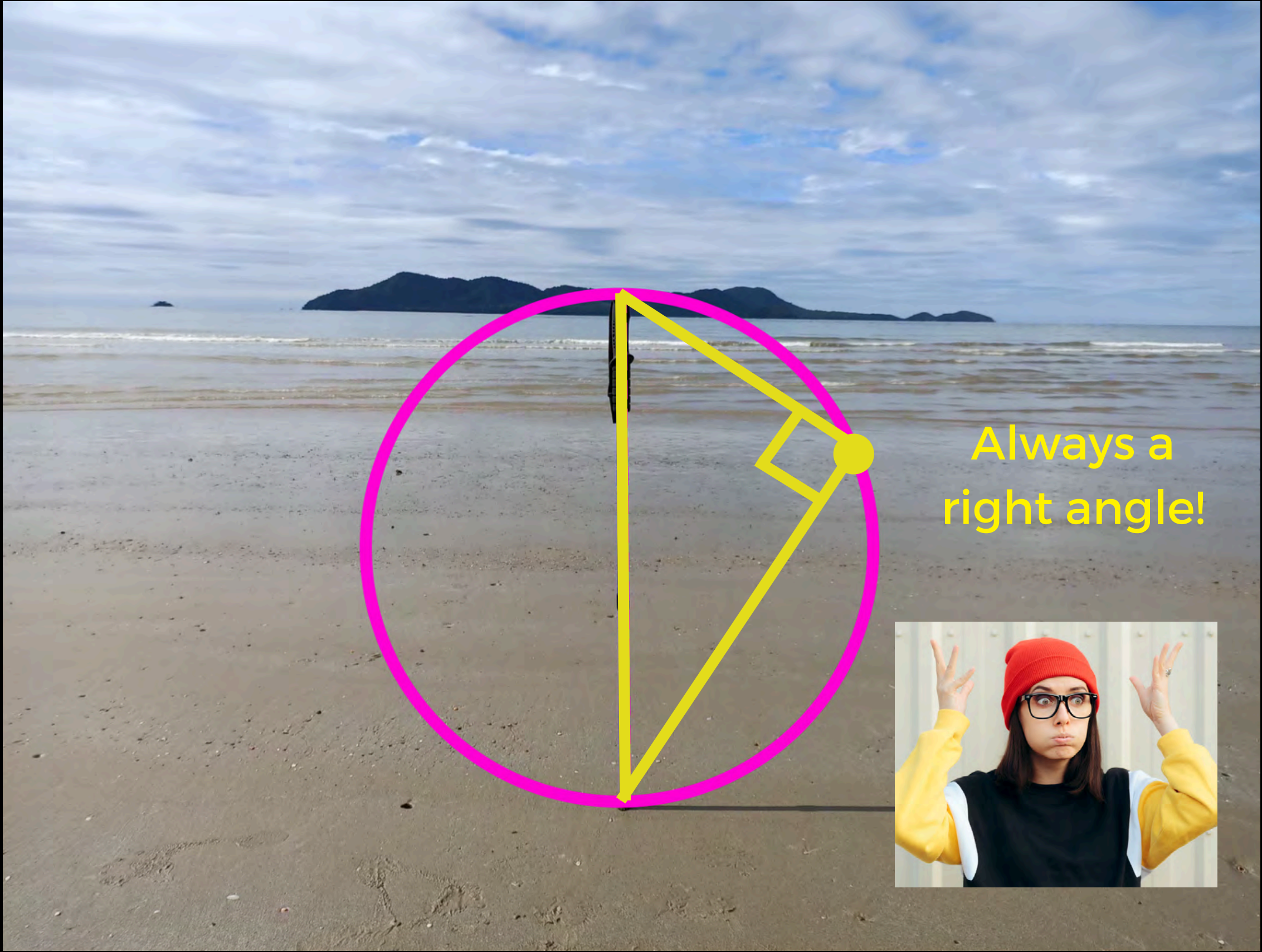






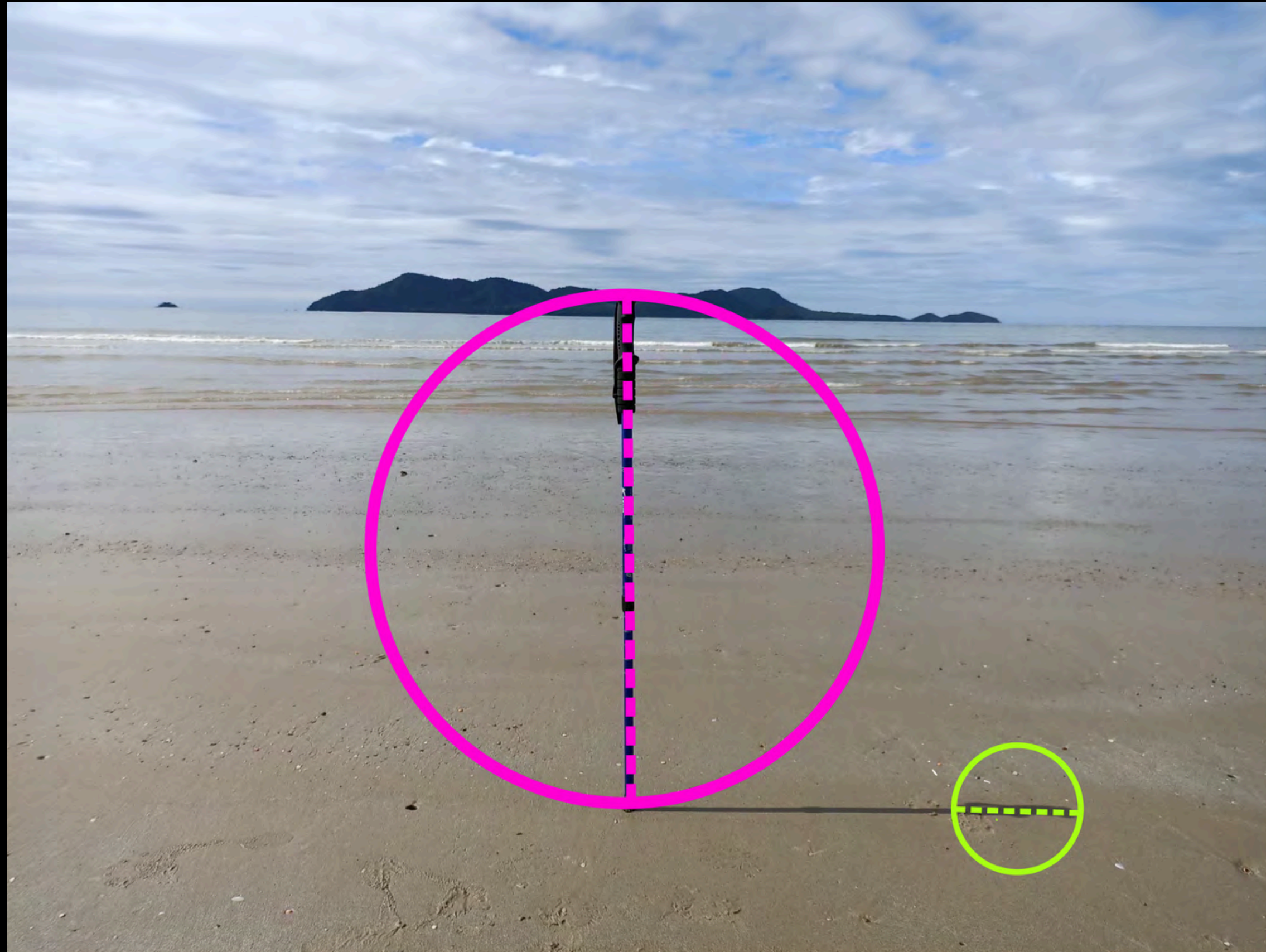


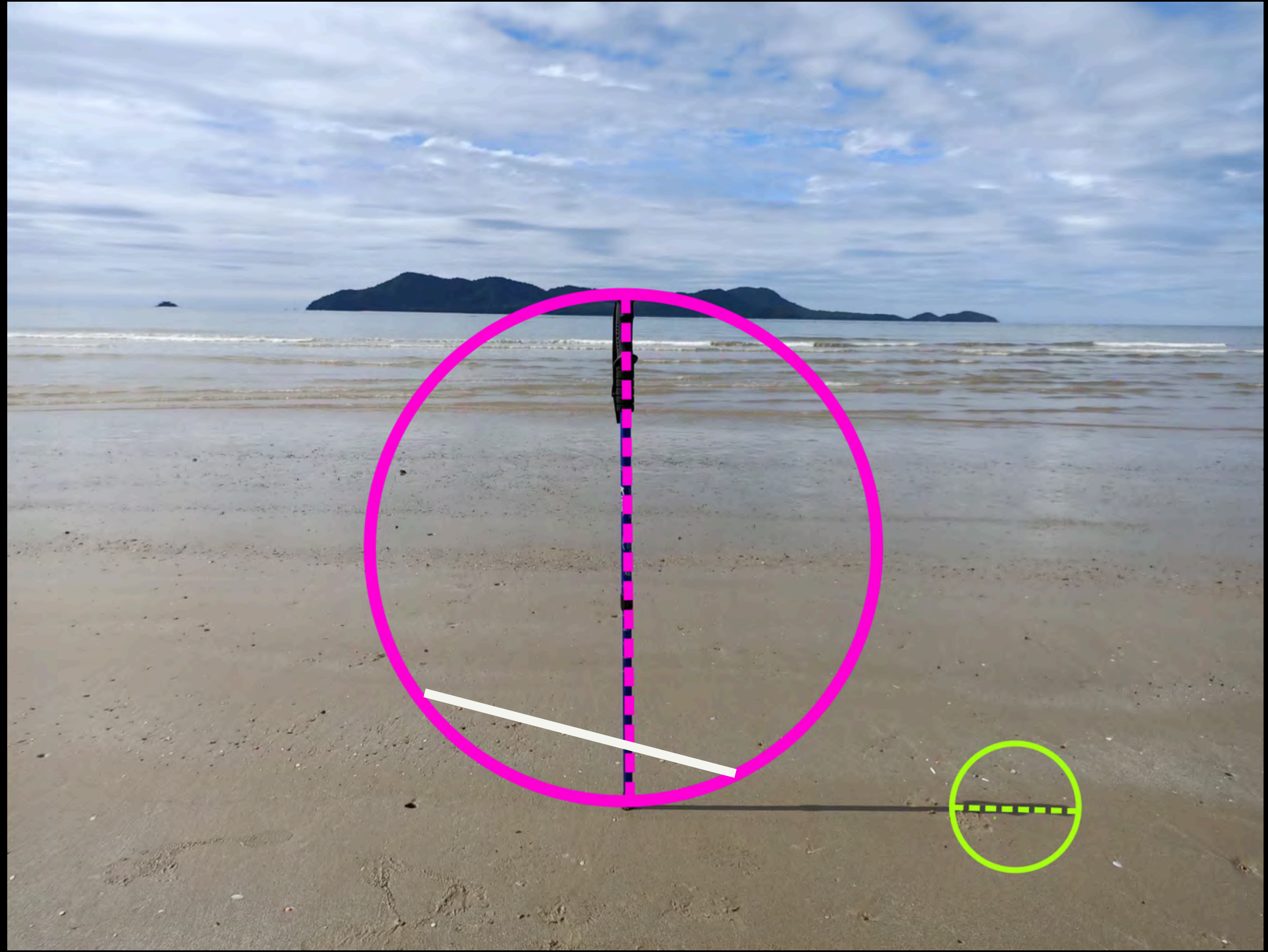
Always a
right angle!

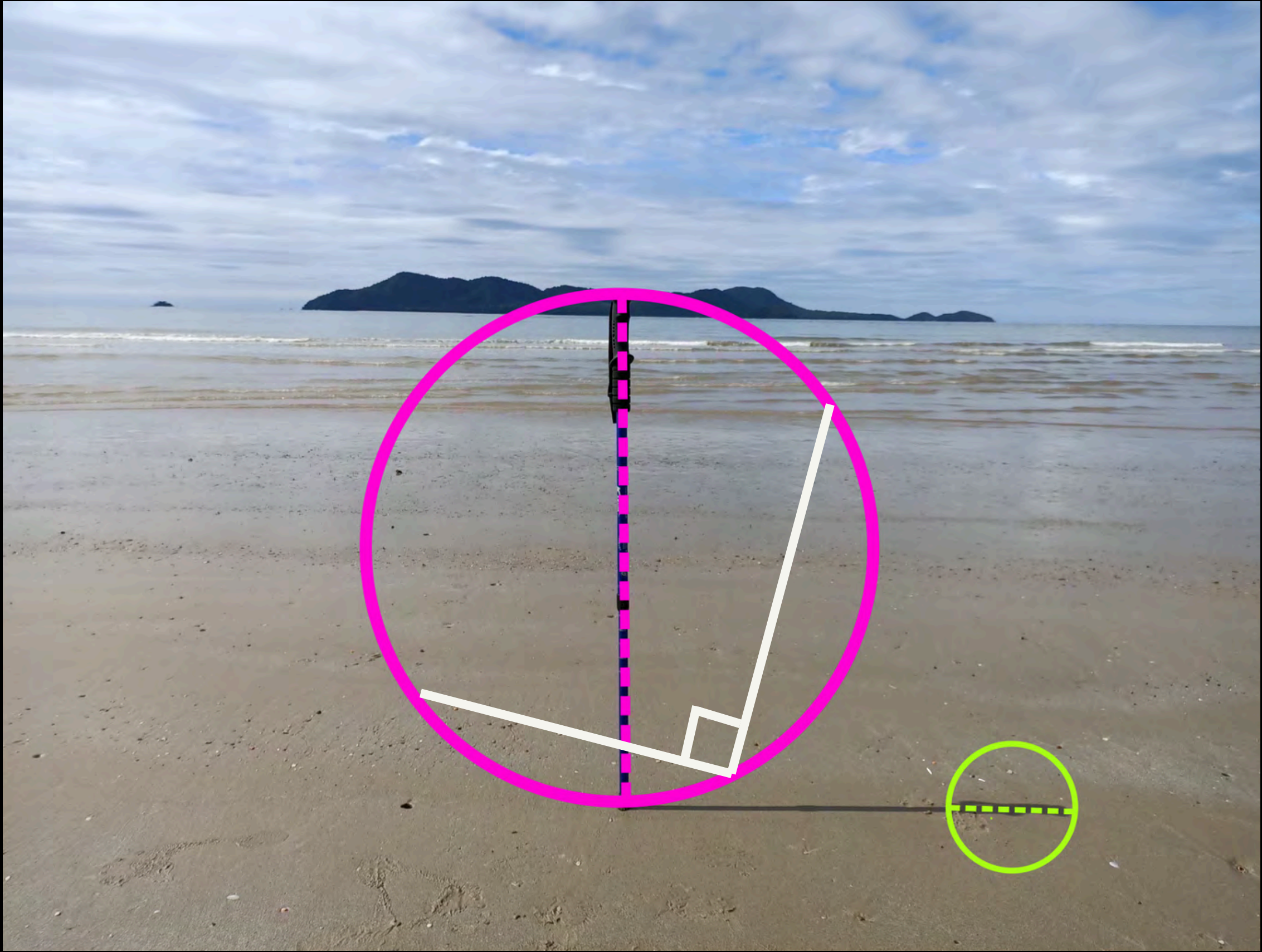


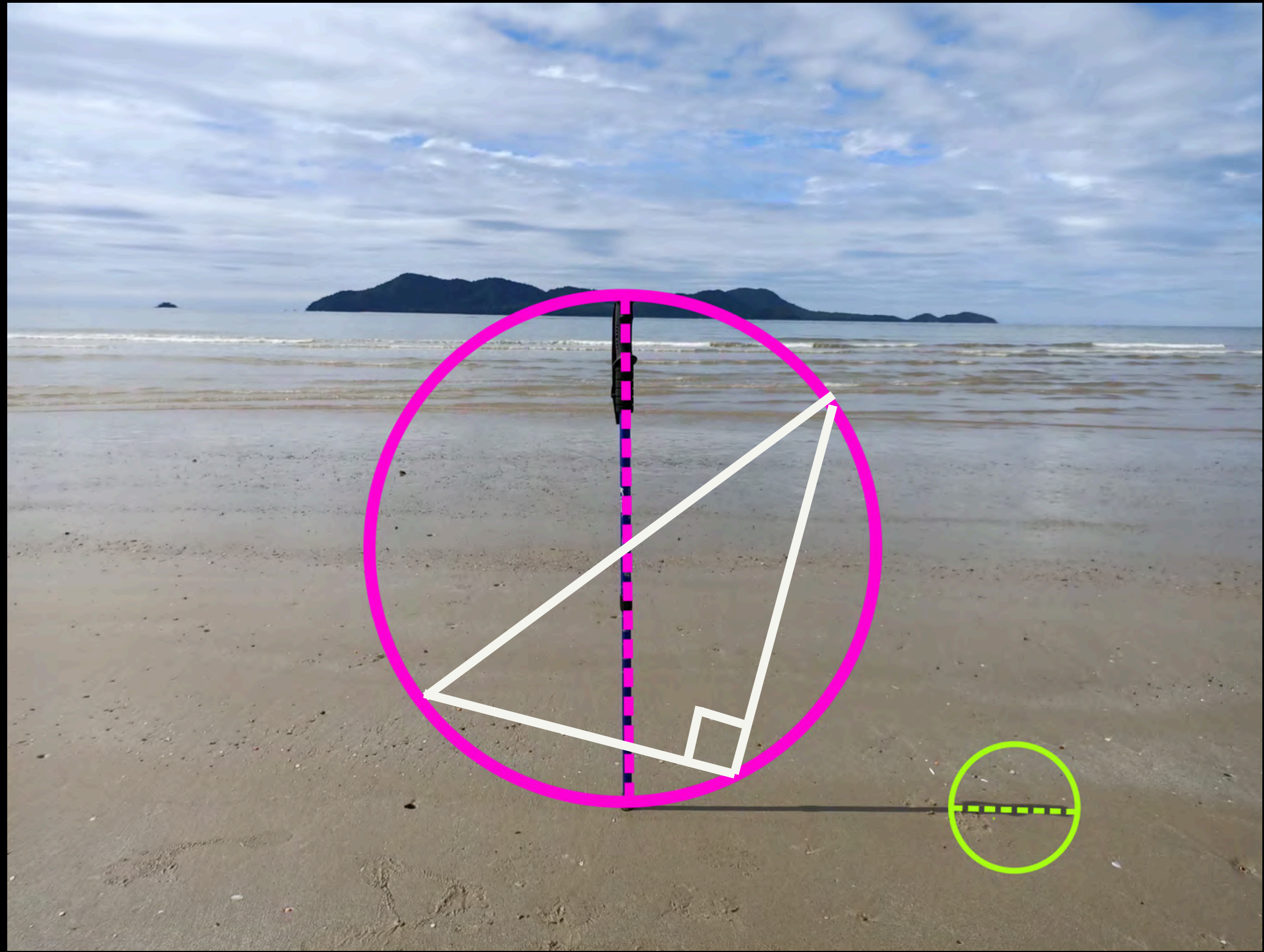
Always a right angle!

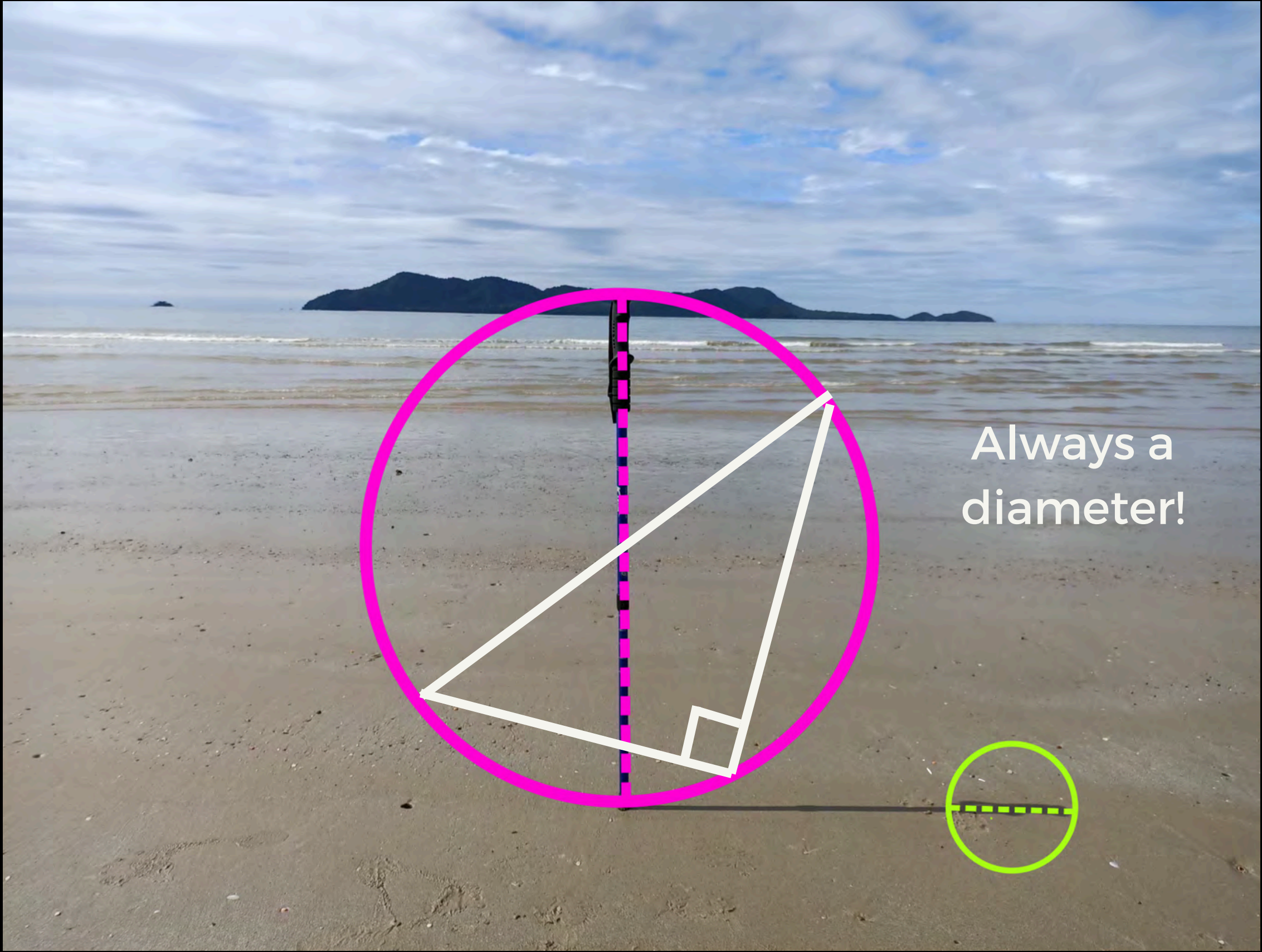




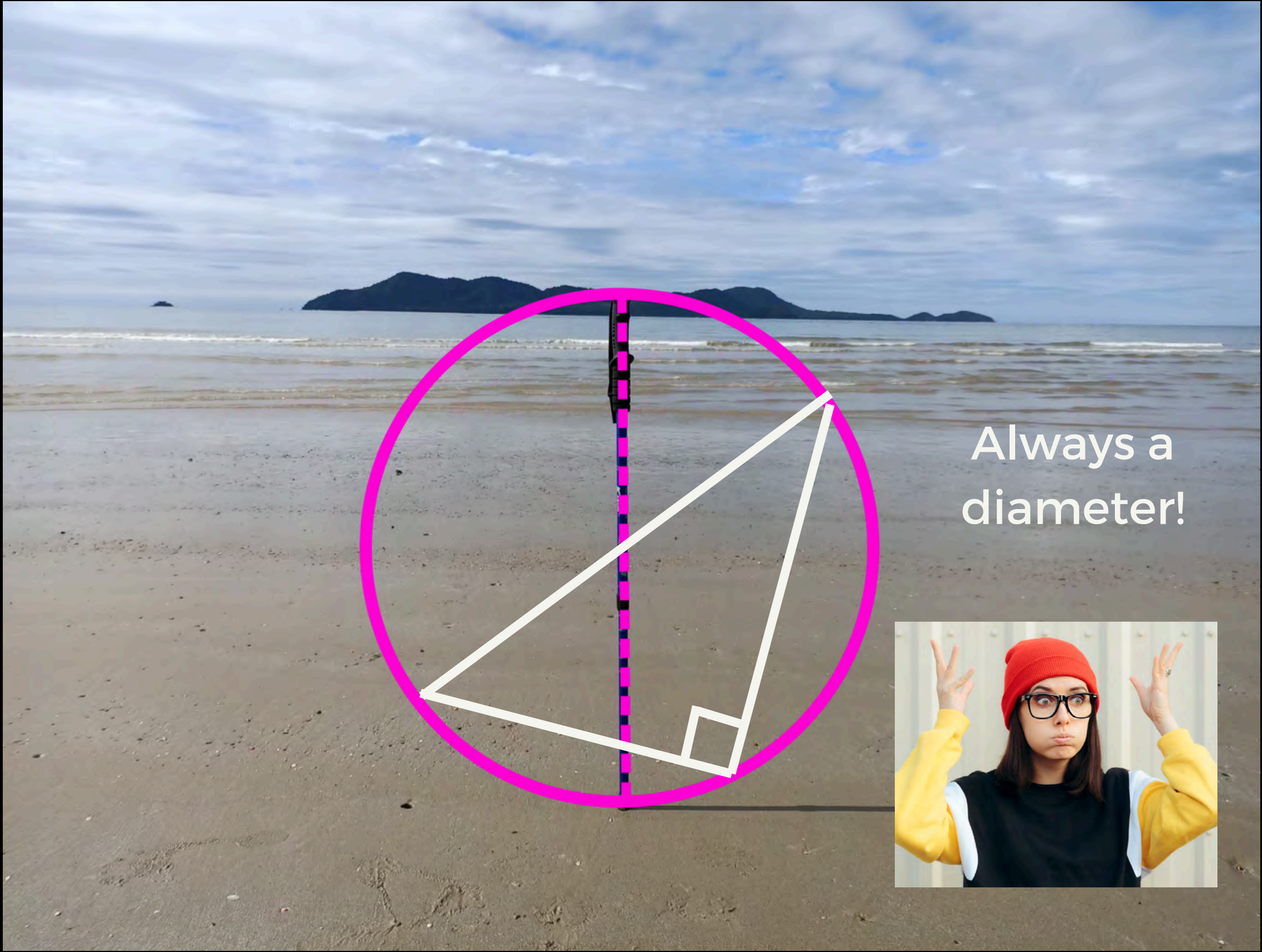








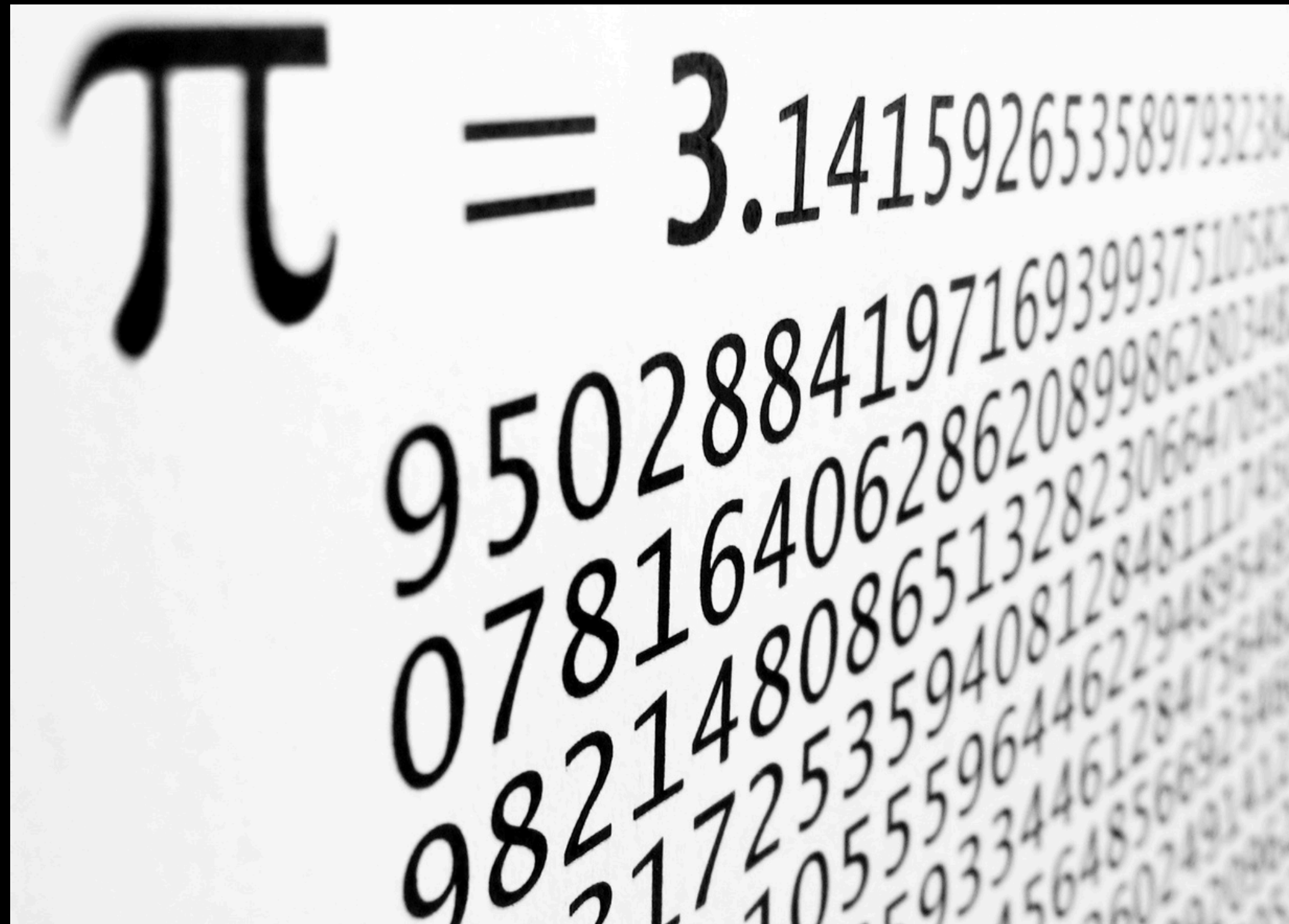
Always a diameter!



Always a diameter!



Pi has an infinite number of decimal places



$\pi = 3.1415926535897932384626433832795028841971693993751058207816406286208998628034825342117077981697998412848111745021480865132823066470938446096511753905314463955217759853699125607071726346869791452614376270709176602727131696419086801764784886420754660967322012690468728235440895161754459246973217260057628562561962629674266266722161562402498107683816214685989614928665966230669792481161770917361$

Pi has an infinite number of
decimal places

So you can find most numbers
somewhere in pi

Pi has an infinite number of
decimal places

So you can find most numbers
somewhere in pi

For example, today is 5/12/24

Pi has an infinite number of
decimal places

So you can find most numbers
somewhere in pi

For example, today is 5/12/24

And the number 51224 first begins at the

Pi has an infinite number of
decimal places

So you can find most numbers
somewhere in pi

For example, today is 5/12/24

And the number 51224 first begins at the
194,233rd decimal place!

Pi has an infinite number of
decimal places

So you can find most numbers
somewhere in pi

For example, today is 5/12/24

And the number 51224 first begins at the

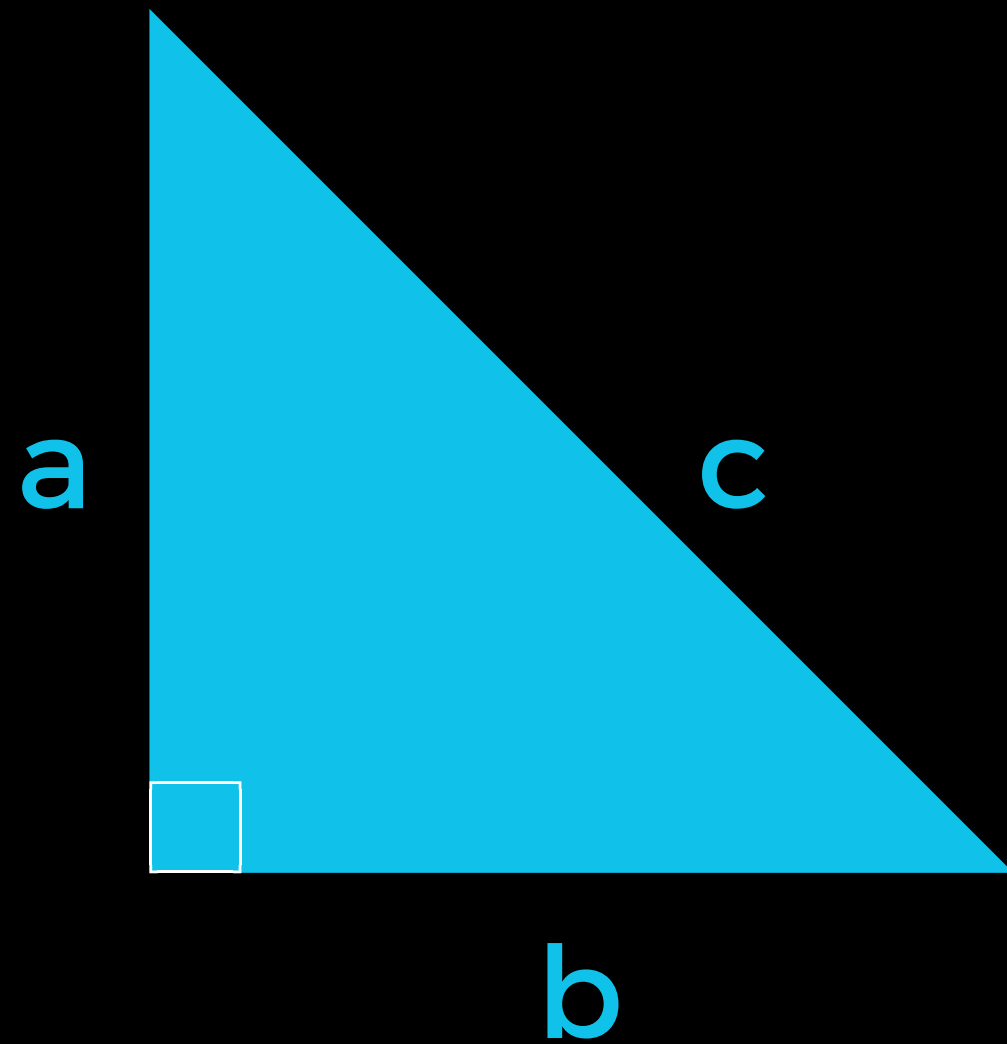
194,233rd decimal place!

And it will occur an infinite number of times!

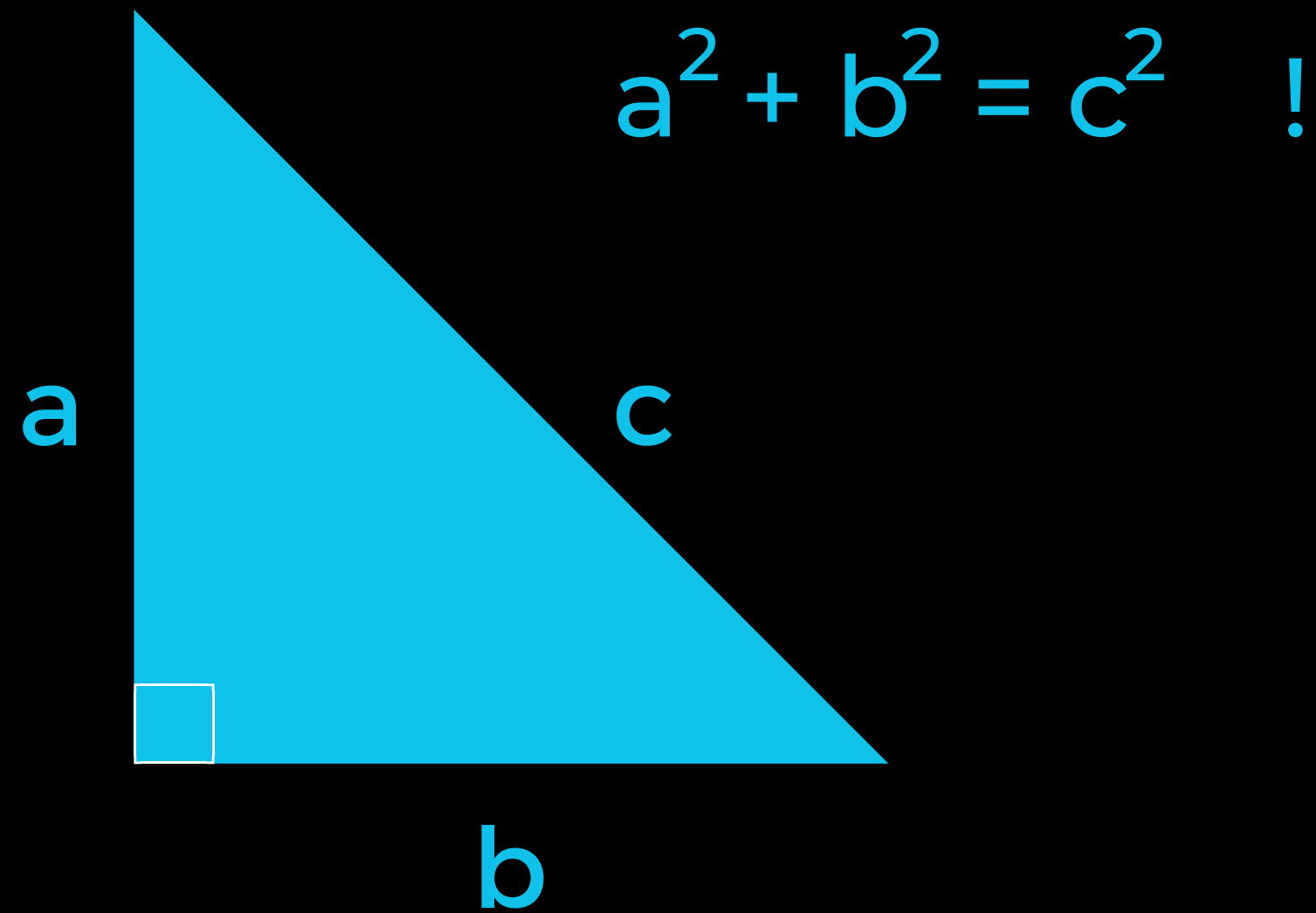


Pythagoras

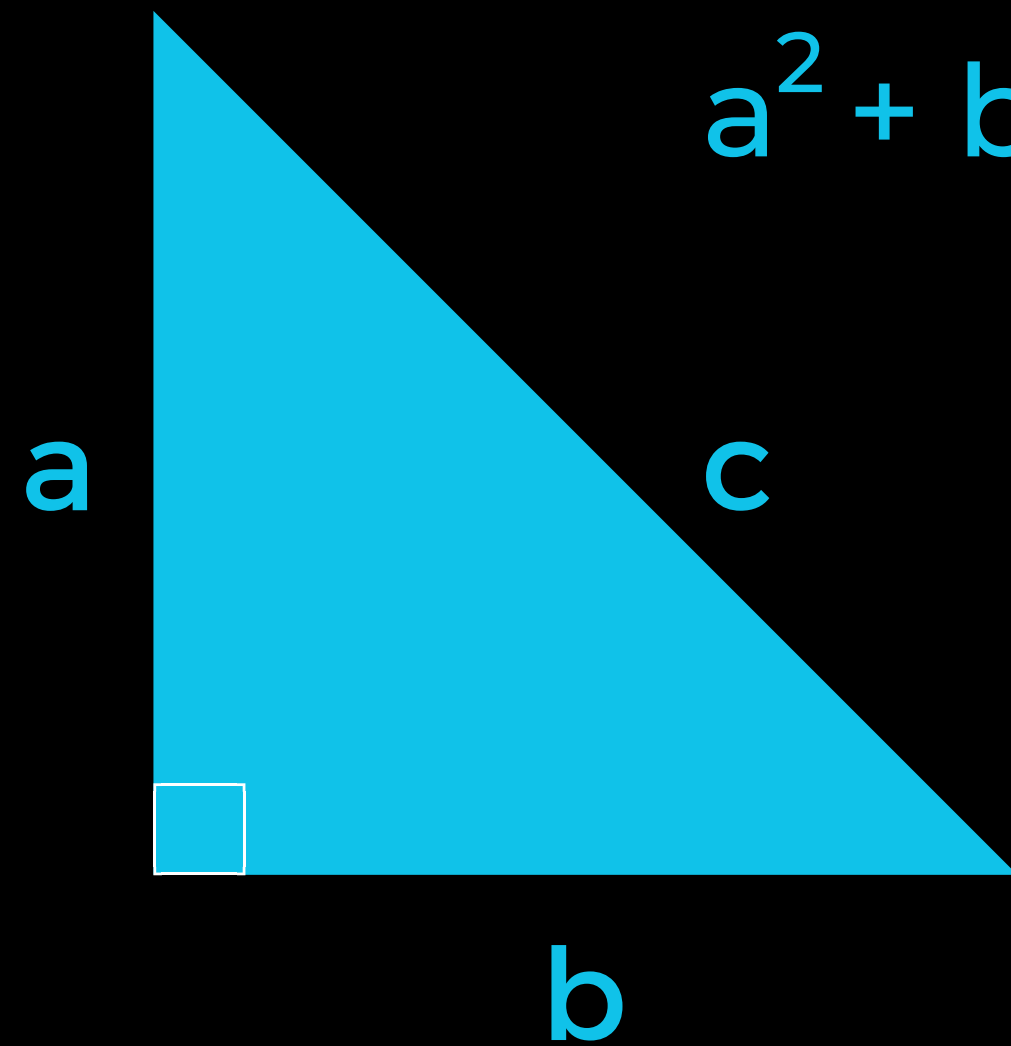
Pythagoras



Pythagoras



Pythagoras



$$a^2 + b^2 = c^2 \quad !$$

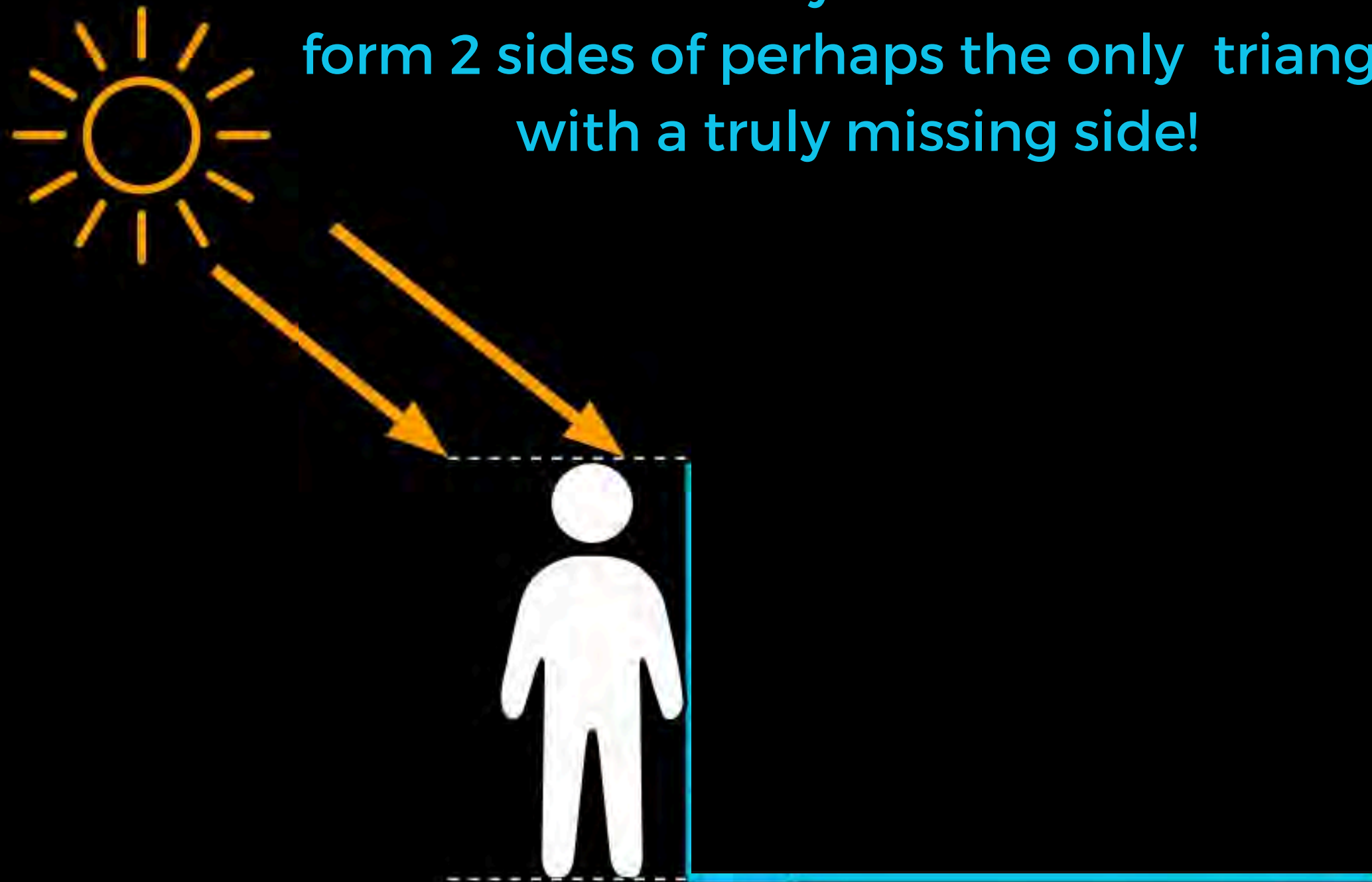


THE MATHEMATICS OF
YOUR SHADOW

You and your shadow
form 2 sides of perhaps the only triangle
with a truly missing side!

THE MATHEMATICS OF
YOUR SHADOW

You and your shadow
form 2 sides of perhaps the only triangle
with a truly missing side!

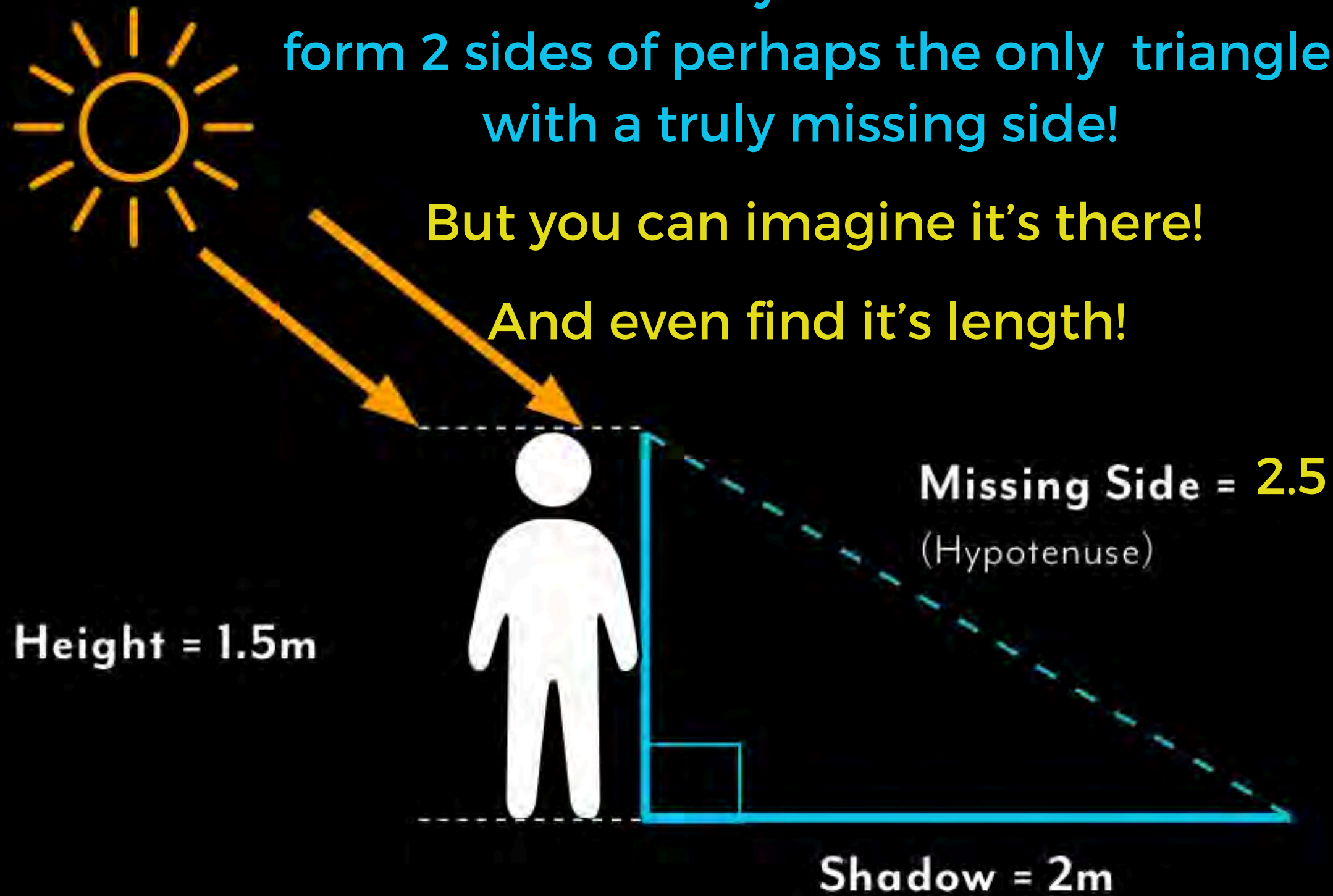


THE MATHEMATICS OF
YOUR SHADOW

You and your shadow
form 2 sides of perhaps the only triangle
with a truly missing side!

But you can imagine it's there!

And even find it's length!

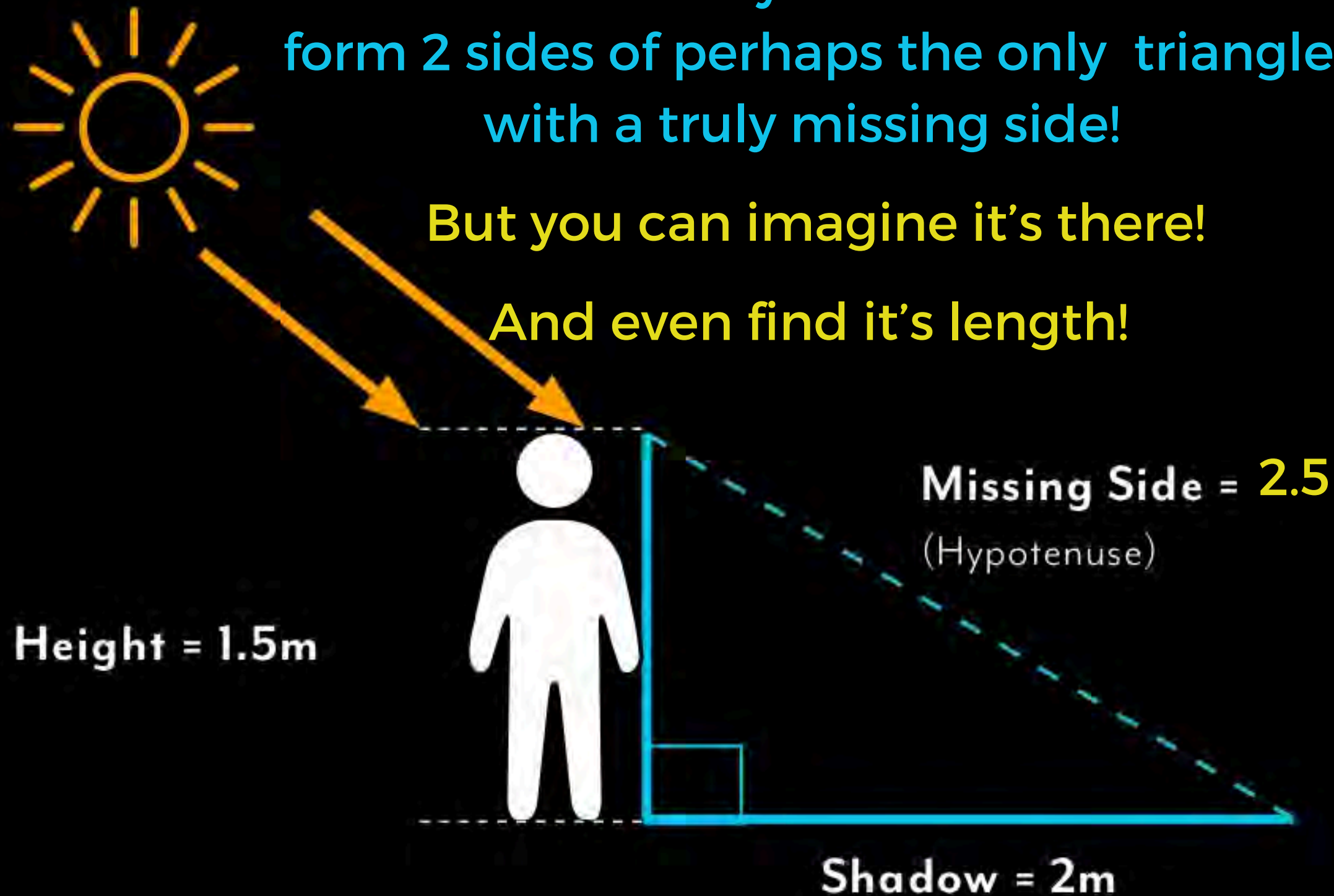


THE MATHEMATICS OF
YOUR SHADOW

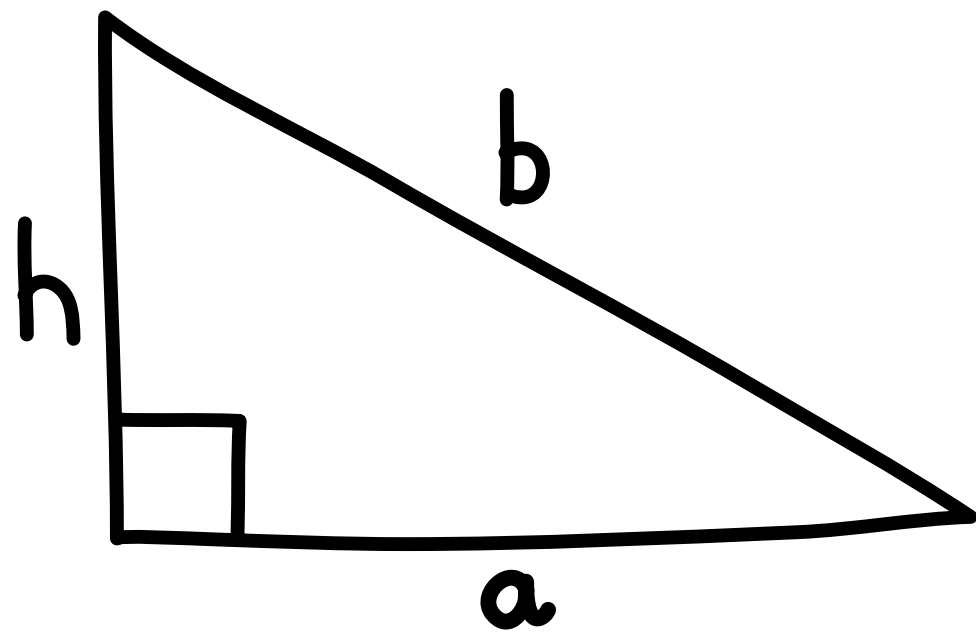
You and your shadow
form 2 sides of perhaps the only triangle
with a truly missing side!

But you can imagine it's there!

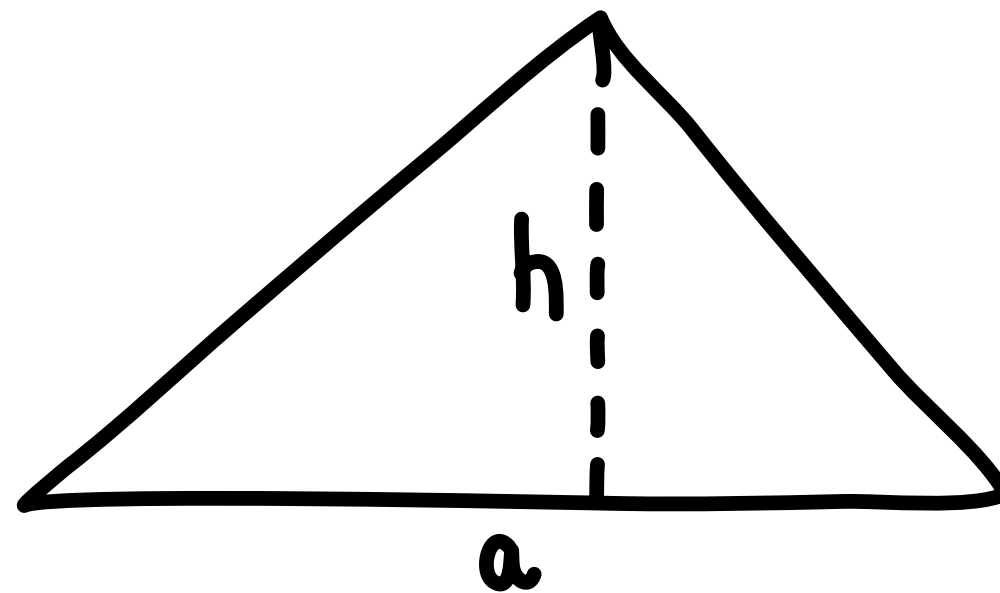
And even find it's length!



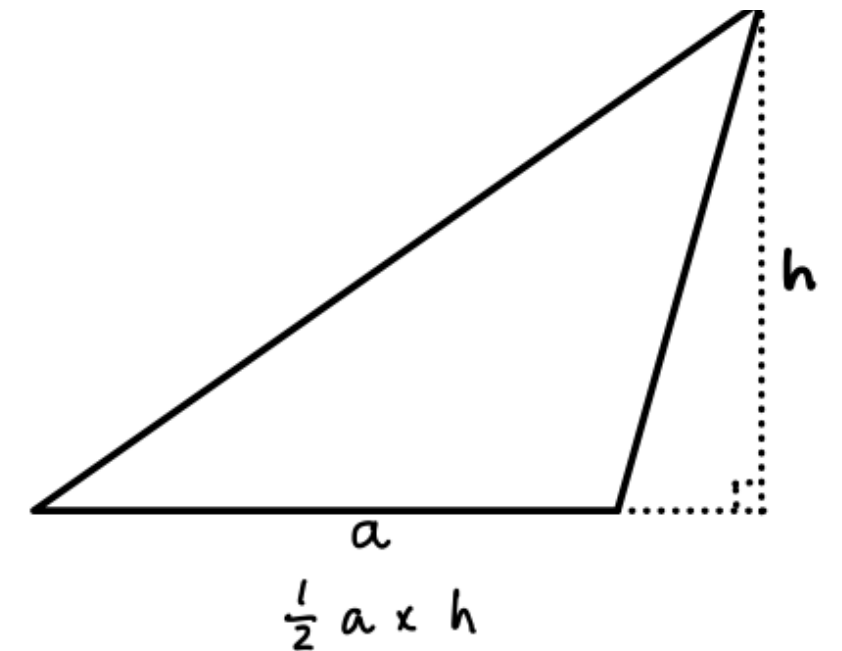
Area of a triangle on a whiteboard



$$\frac{1}{2} \times a \times h$$




$$\frac{1}{2} \times a \times h$$



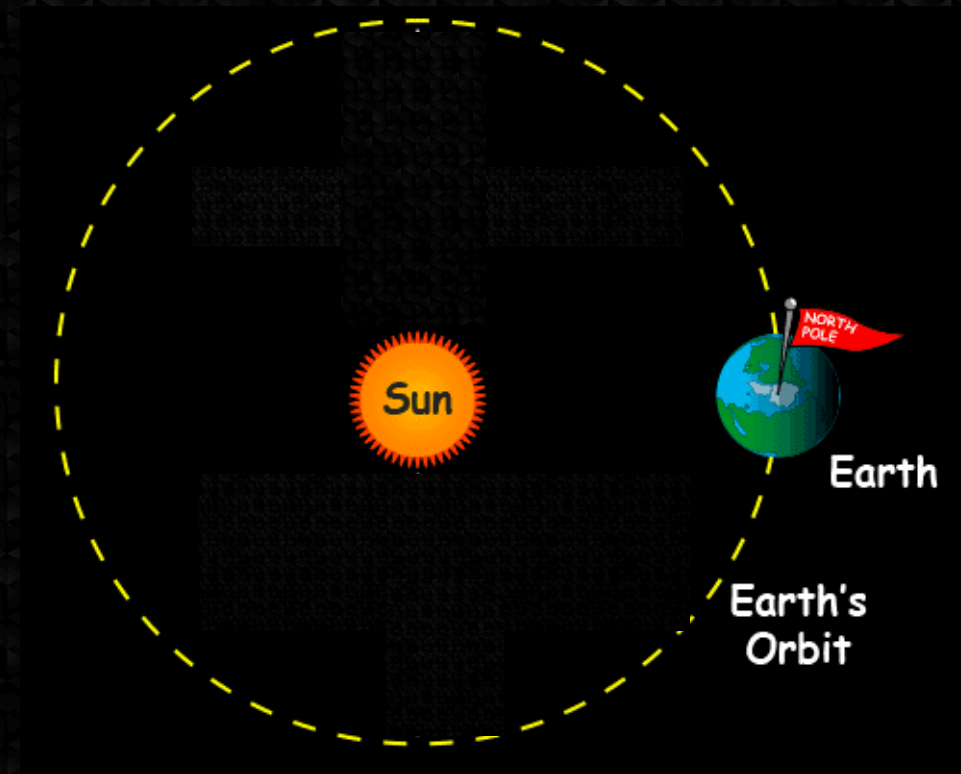
$$\frac{1}{2} a \times h$$

Area of a triangle
on a footpath.....

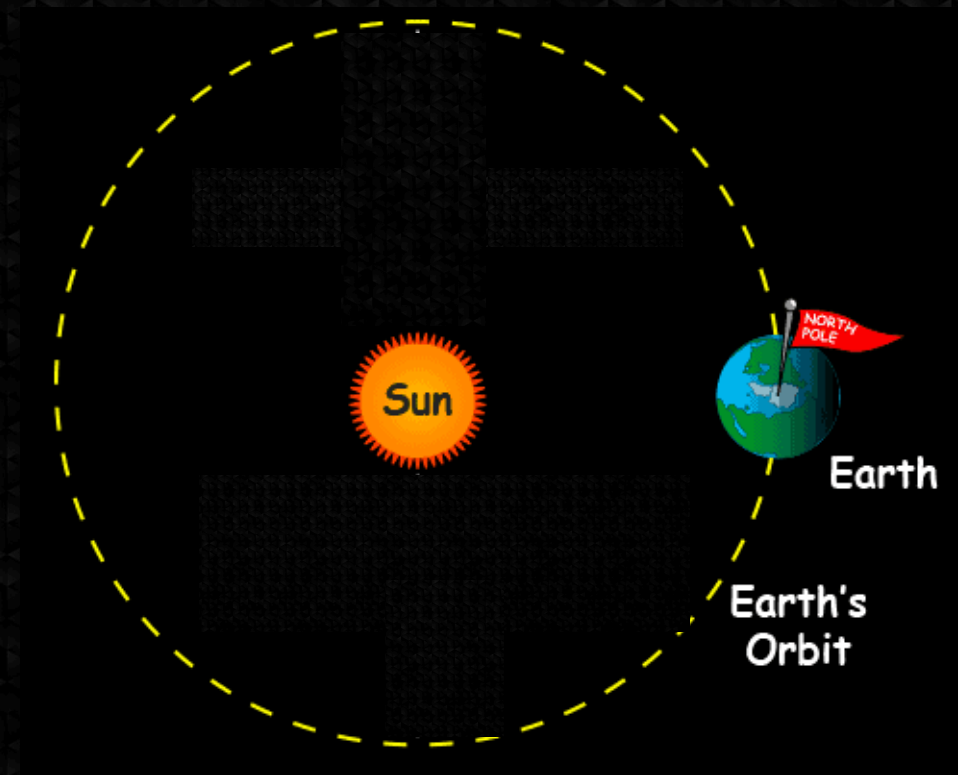




2. Bring the
Universe
to your
classroom!



Do you know how fast we're travelling around the sun?



Do you know how fast we're travelling around the sun?

Radius = 150,000,000 km



The distance is around 950,000,000 kilometres
That's 950,000,000 km / year



The distance is around 950,000,000 kilometres

That's 950,000,000 km / year

How far in a second?



The distance is around 950,000,000 kilometres

That's 950,000,000 km / year

How far in a second? 30km/second!!



During this presentation,
we'll travel 110,000km!



THE MATHEMATICS OF
THE BEACH



THE MATHEMATICS OF **THE BEACH**

Have you ever wondered
how many grains of sand
there are on a beach?

Could you count them?

How much sand could you count if you
spent your life doing it?

If you counted sand at 1 grain per second for 80 years....

Counting sand at 1 grain per second

Time	Calculation	Grains counted	% of 1m ³
1 second	1×1	1	< 0.0001%
1 minute	1×60	60	< 0.0001%
1 hour	60×60	3,600	< 0.0001%
1 day	$3,600 \times 24$	86,400	0.0006%
1 year	$86,400 \times 365.25$	31,557,600	0.2%
80 years	$31,557,600 \times 80$	2,524,608,000	16.2%

After 80 years,
 you would have counted
 less than 20% of 1 cubic metre!

Counting sand at 1 grain per second

Time	Calculation	Grains counted	% of 1m ³
1 second	1 x 1	1	< 0.0001%
1 minute	1 x 60	60	< 0.0001%
1 hour	60 x 60	3,600	< 0.0001%
1 day	3,600 x 24	86,400	0.0006%

And you'd also be
 more than 2.5 billion seconds old!

And while we're talking about your age...

When do you turn

1 billion seconds old?

When do you turn

1 billion seconds old?

114 days before your 32nd birthday

Other big birthdays:

Other big birthdays:

Age (billion seconds)	When it occurs
1/4	29 days before 8th birthday
1/2	57 days before 16th birthday
1	114 days before 32nd birthday
1.5	194 days after 47th birthday
2	137 days after 63rd birthday
3	23 days after 95th birthday

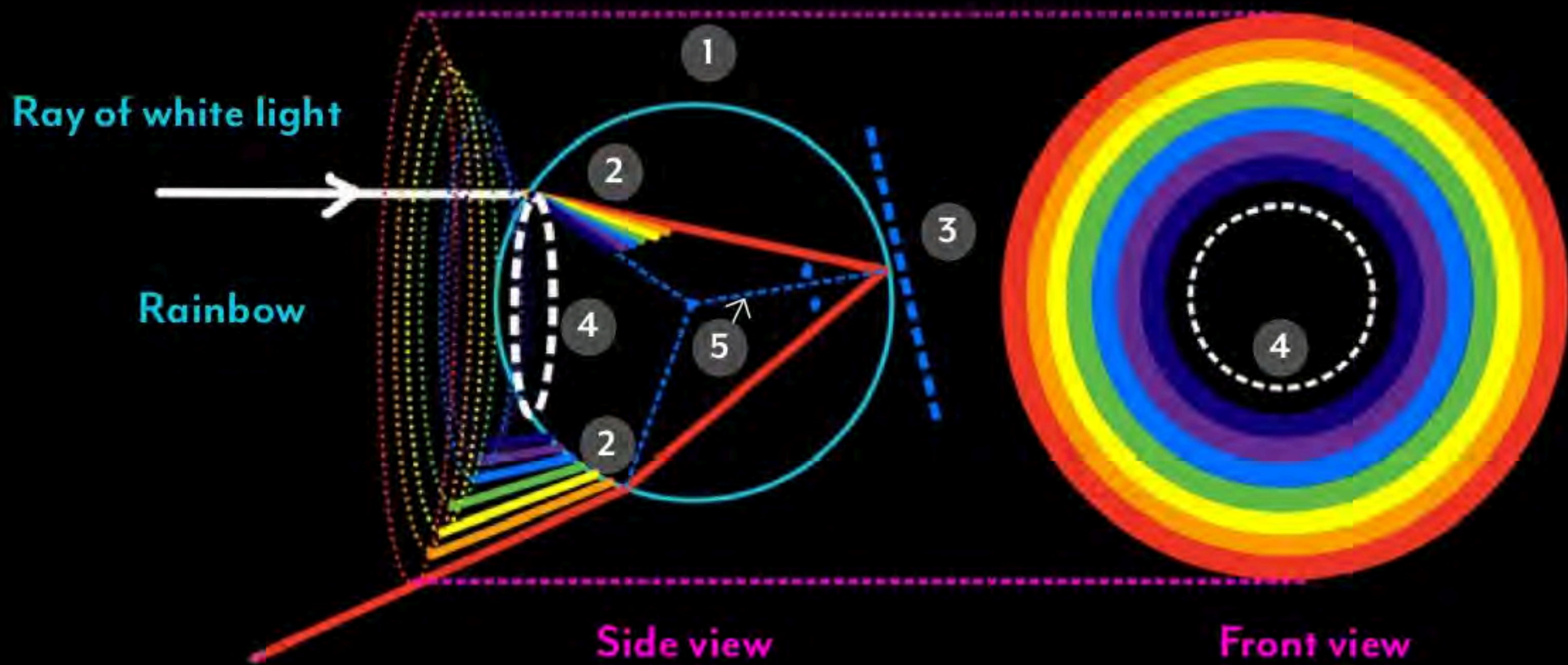
Don't miss them!

Other big birthdays:

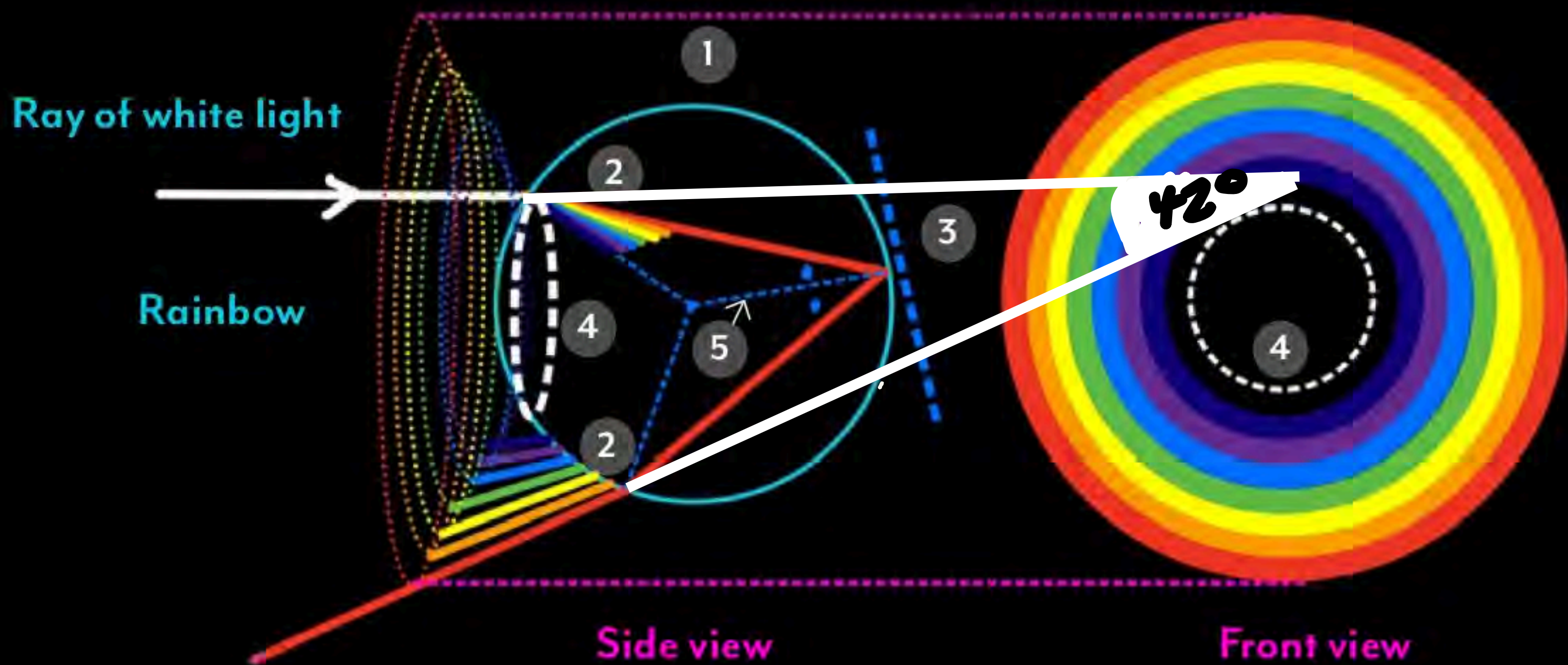
Age (billion seconds)	When it occurs
1/4	29 days before 8th birthday
1/2	57 days before 16th birthday
1	114 days before 32nd birthday
1.5	194 days after 47th birthday
2	137 days after 63rd birthday
3	23 days after 95th birthday



THE MATHEMATICS OF
THE RAINBOW



Angles, speed, waves, reflection, circles



What is this angle? 42°

THE MATHEMATICS OF

PAPER

This is a sheet of
A4 paper.

Why A4?

THE MATHEMATICS OF **PAPER**

Because you fold A0 4 times
to get A4, and....

because its area is
 2^{-4}m^2

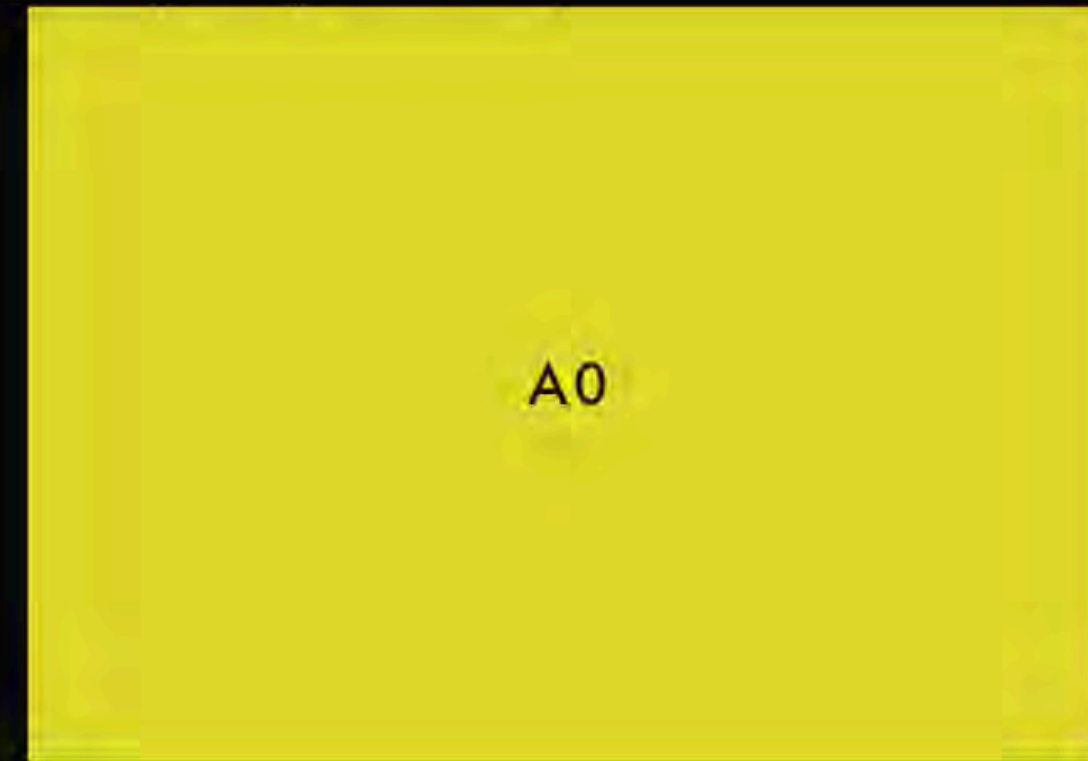
This is a sheet of
A4 paper.

Why A4?

Meet the A4 family

A4 family

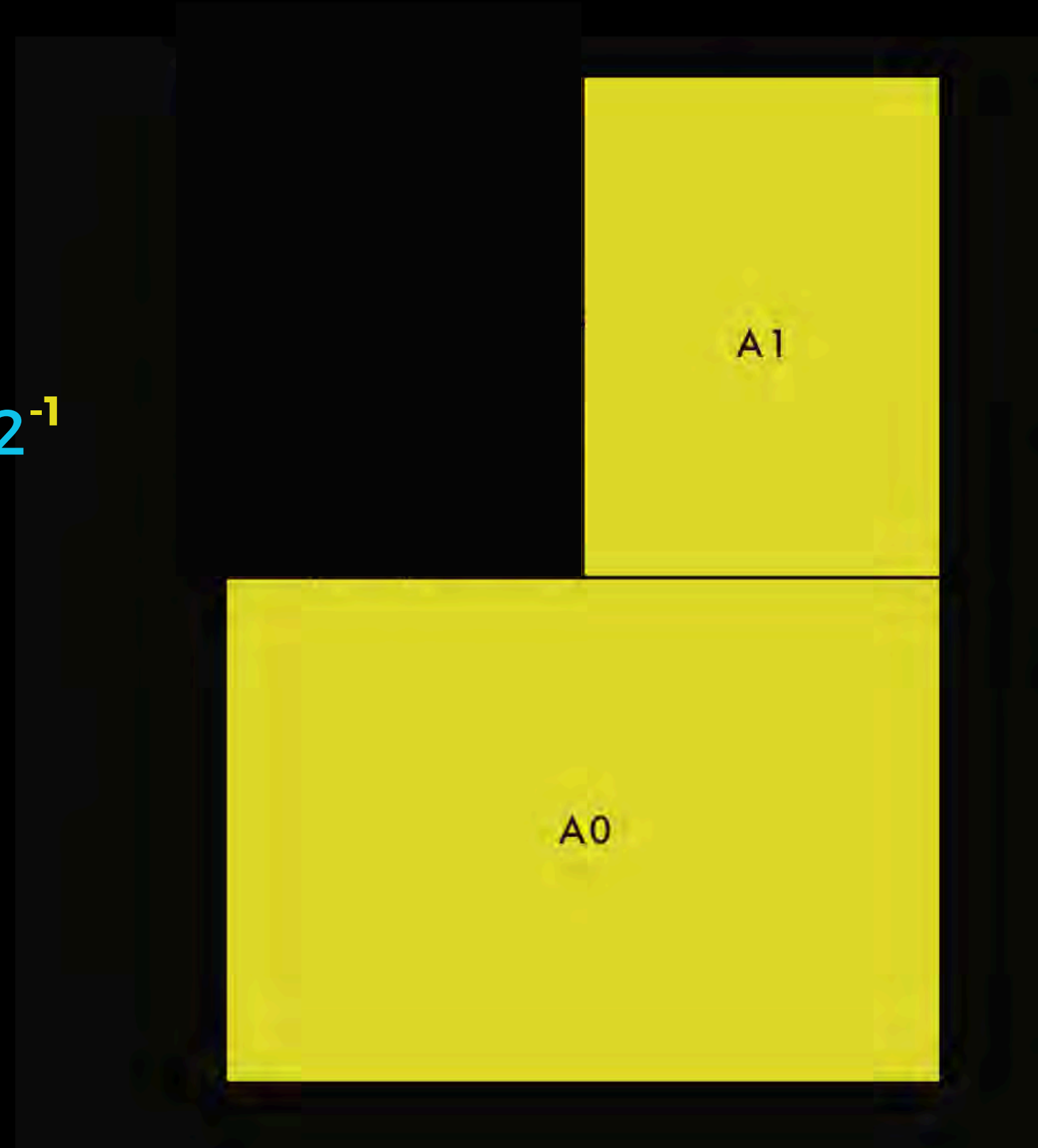
A0 is the largest. Area is 1m^2 . And it weighs 80g (if it's 80gsm)



A4 family

A0 is the largest. Area is 1m^2

Fold A0 once to get **A1** = $\frac{1}{2}\text{m}^2$ = 2^{-1}

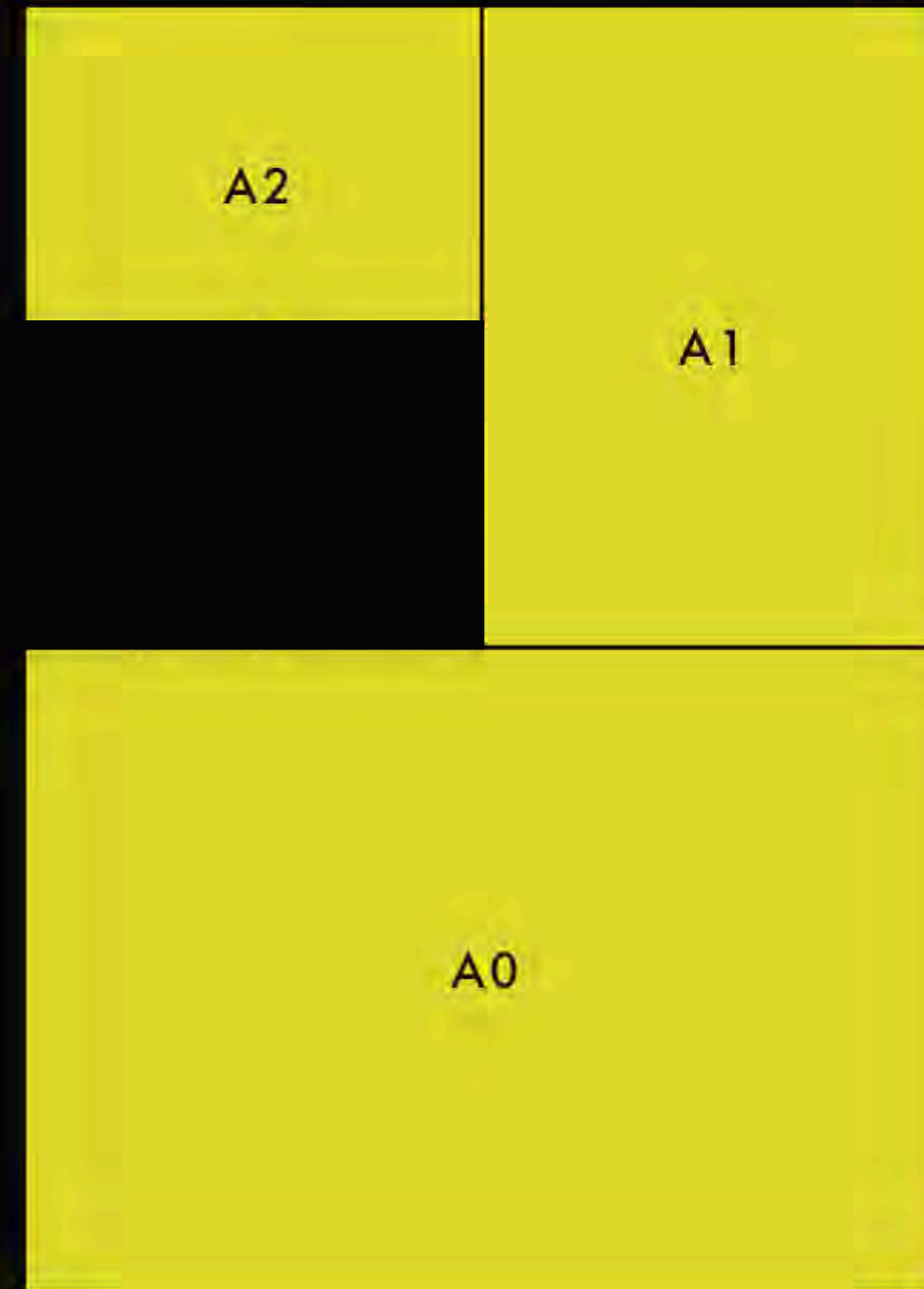


A4 family

A0 is the largest. Area is 1m^2

Fold A0 once to get A1 = $\frac{1}{2}\text{m}^2 = 2^{-1}$

Fold A0 2 times to get A2 = $\frac{1}{4}\text{m}^2 = 2^{-2}$



A4 family

A0 is the largest. Area is 1m^2

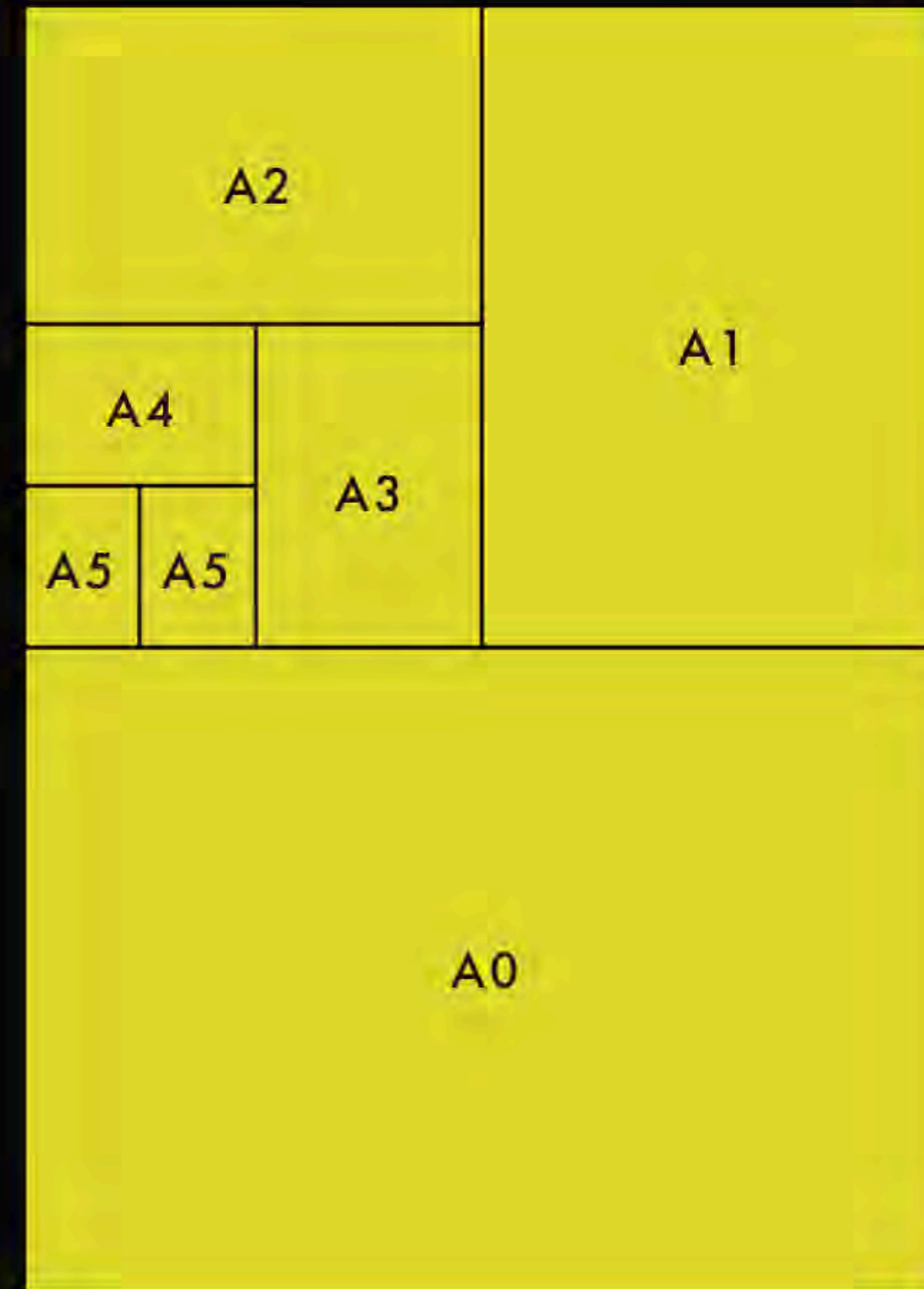
Fold A0 once to get A1 = $\frac{1}{2}\text{m}^2$ = 2^{-1}

Fold A0 2 times to get A2 = $\frac{1}{4}\text{m}^2$ = 2^{-2}

Fold A0 3 times to get A3 = $\frac{1}{8}\text{m}^2$ = 2^{-3}

Fold A0 4 times to get A4 = $\frac{1}{16}\text{m}^2$ = 2^{-4}

Fold A0 5 times to get A5 = $\frac{1}{32}\text{m}^2$ = 2^{-5}



A4 family

A0 is the largest. Area is 1m^2

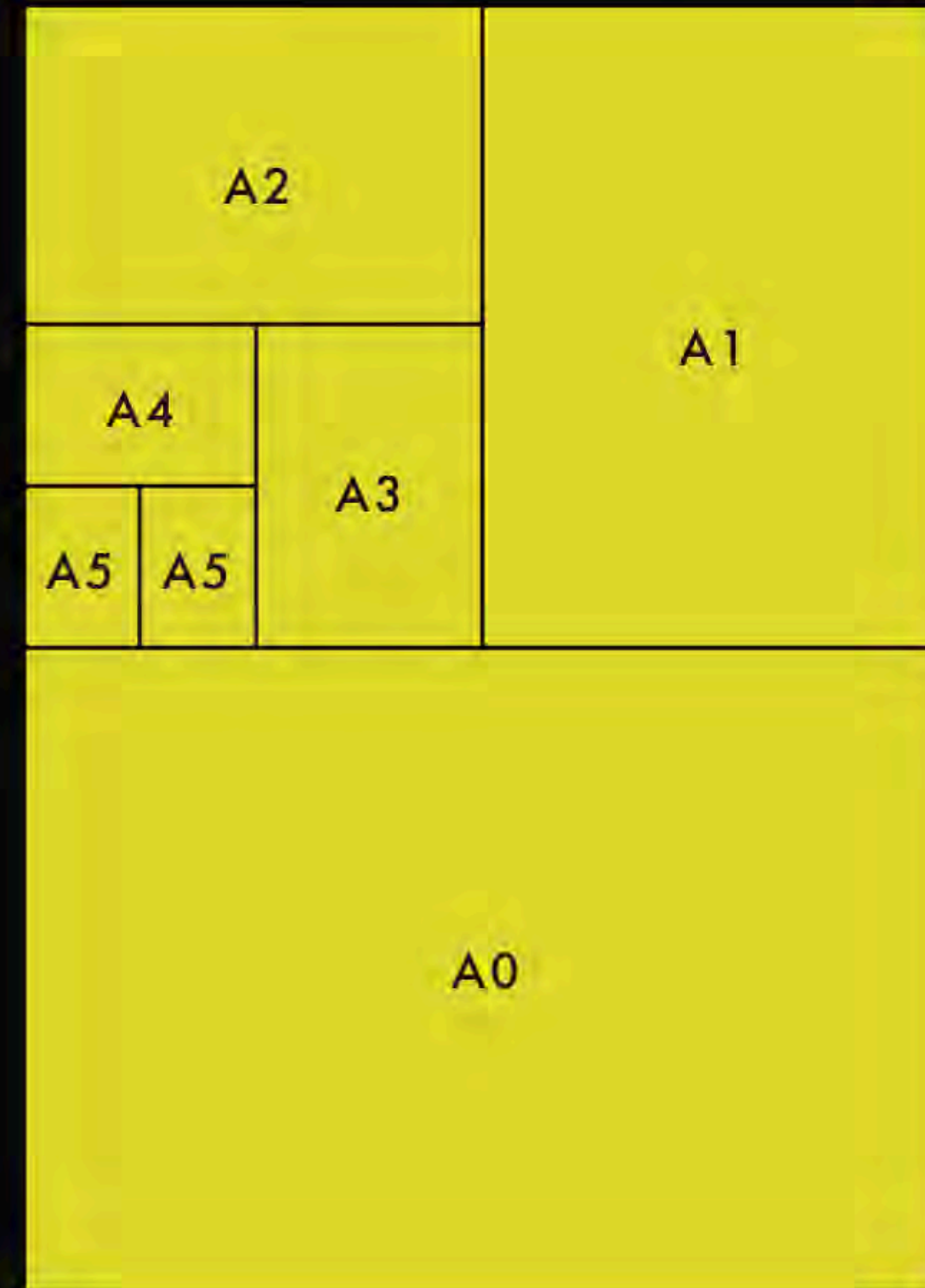
Fold A0 once to get A1 = $\frac{1}{2}\text{m}^2 = 2^{-1}$

Fold A0 2 times to get A2 = $\frac{1}{4}\text{m}^2 = 2^{-2}$

Fold A0 3 times to get A3 = $\frac{1}{8}\text{m}^2 = 2^{-3}$

Fold A0 4 times to get A4 = $\frac{1}{16}\text{m}^2 = 2^{-4}$

Fold A0 5 times to get A5 = $\frac{1}{32}\text{m}^2 = 2^{-5}$



So what are the dimensions of the A4 page?

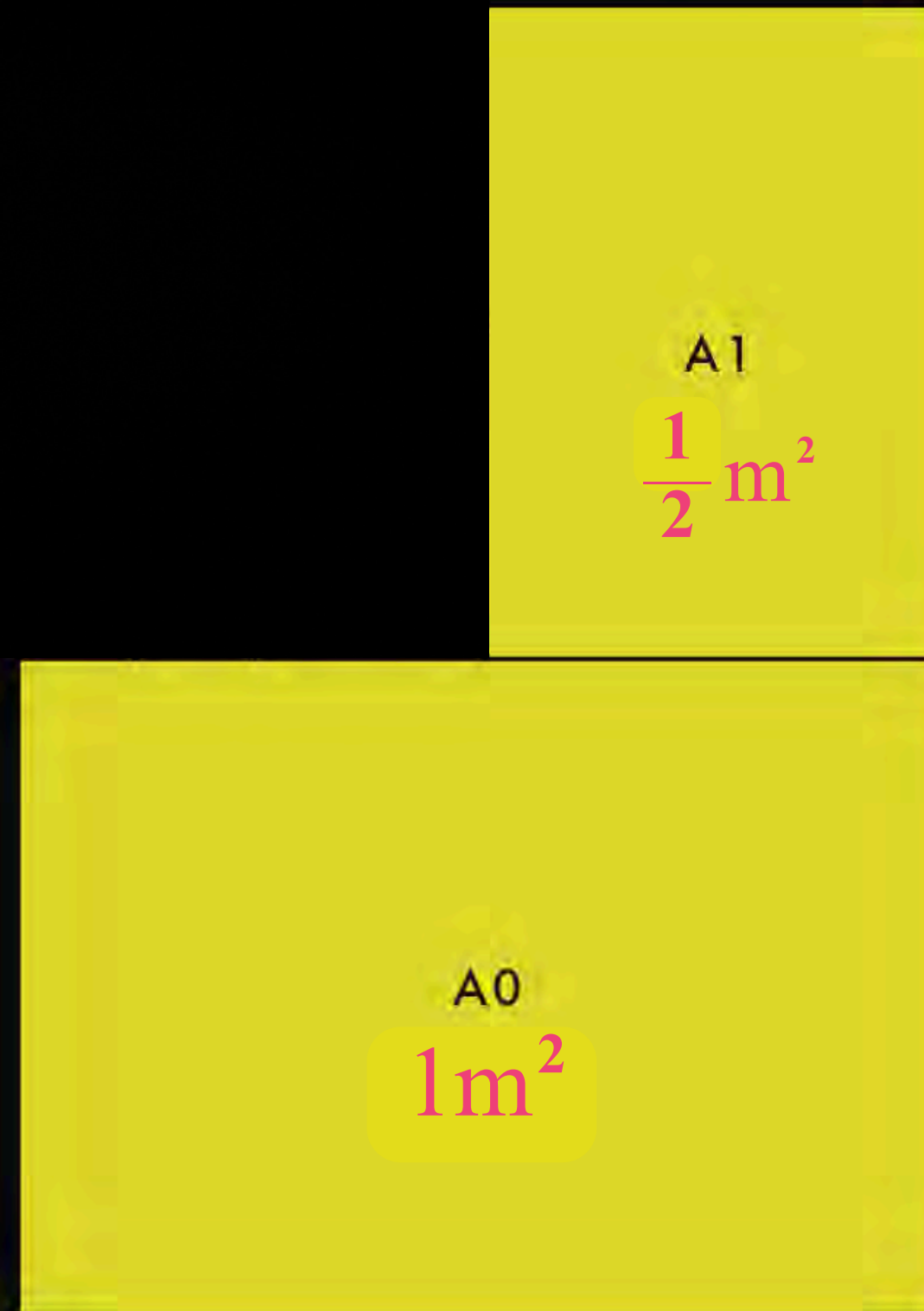
A4 family

A0 is the largest. Its area is 1m^2

The area of a size is half the area of its predecessor

The length of A0 is the width of A1, and so on.

Each size is mathematically similar to all the other sizes.



A4 family

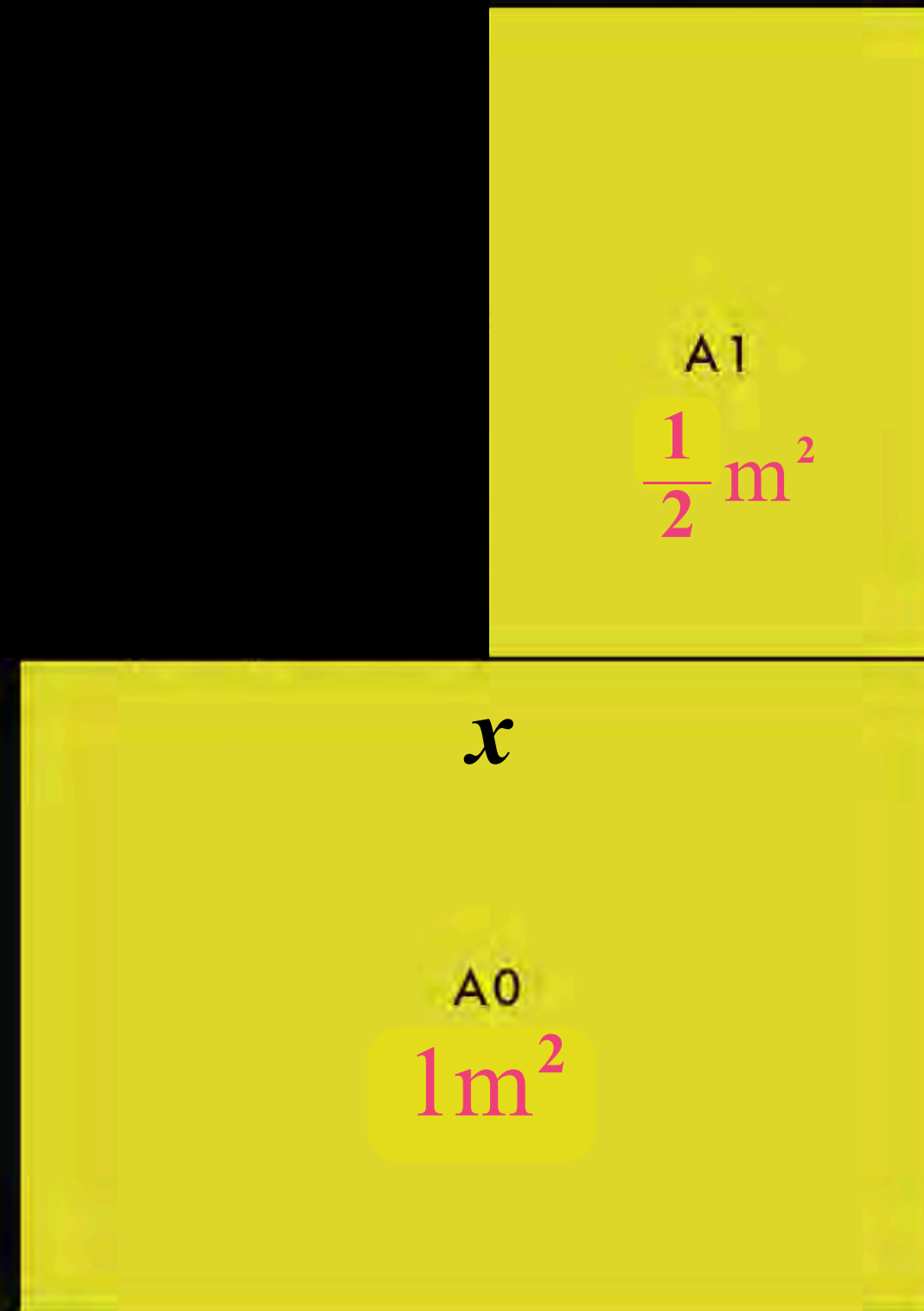
A0 is the largest. Its area is 1m^2

The area of a size is half the area of its predecessor

The length of A0 is the width of A1, and so on.

Each size is mathematically similar to all the other sizes.

Let x be the length of A0.



A4 family

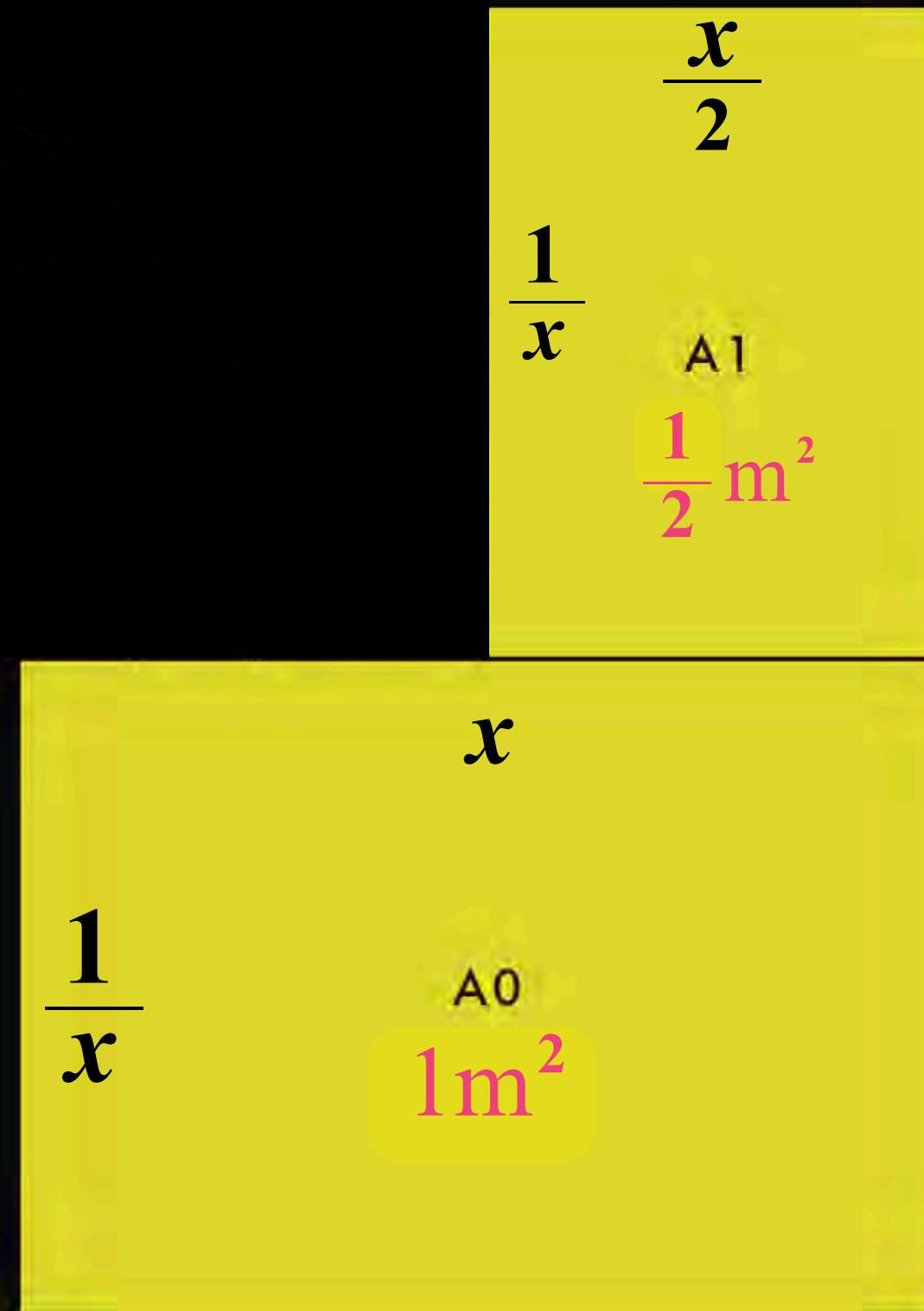
A0 is the largest. Its area is 1m^2

The area of a size is half the area of its predecessor

The length of A0 is the width of A1, and so on.

Each size is mathematically similar to all the other sizes.

Let x be the length of A0.



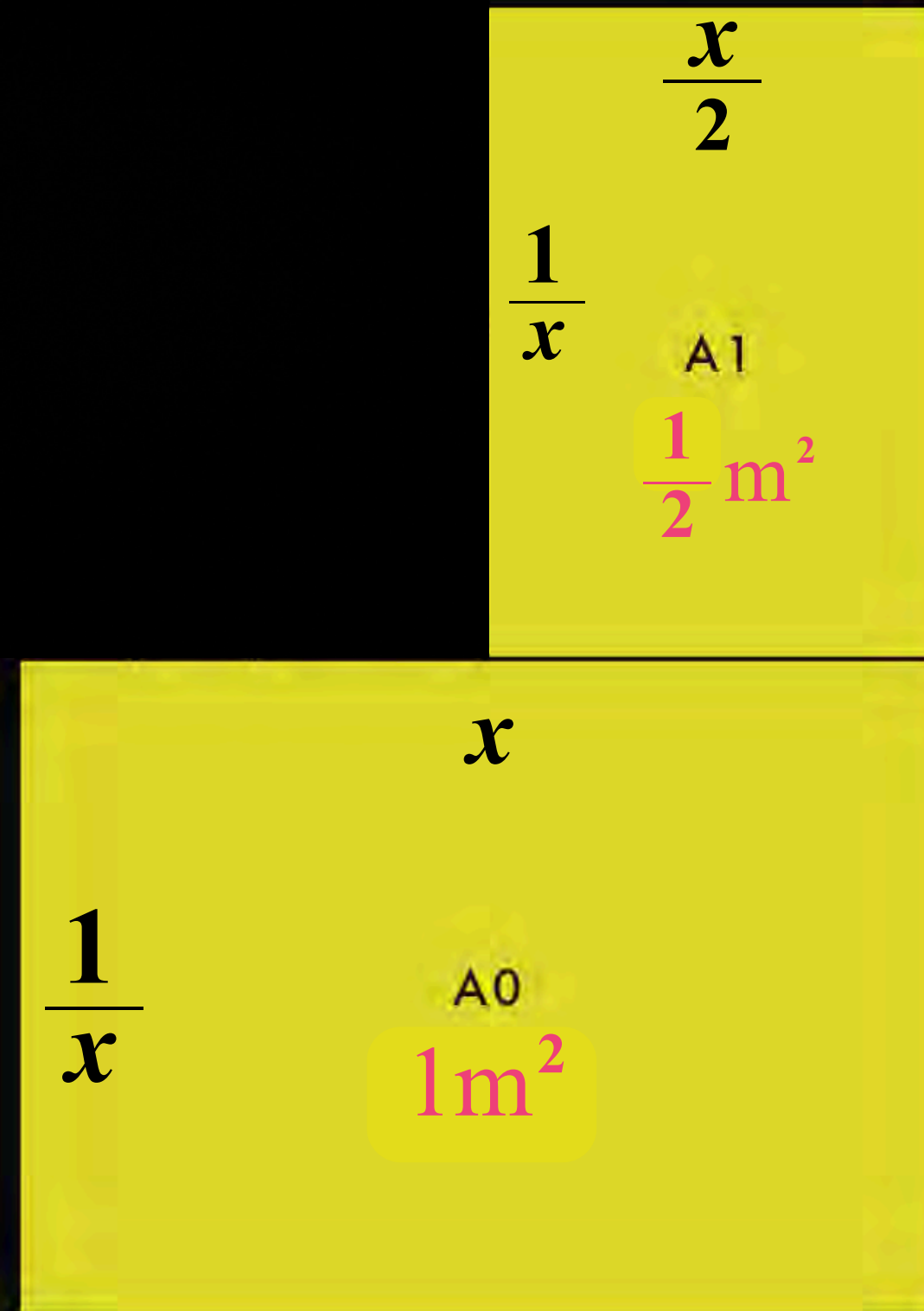
A4 family

A0 is the largest. Its area is 1m^2

The area of a size is half the area of its predecessor

The length of A0 is the width of A1, and so on.

Each size is mathematically similar to all the other sizes.



$$x \cdot \frac{1}{x} = \frac{1}{x} \cdot \frac{x}{2}$$

$$x^2 = \frac{2}{x^2}$$

$$x^4 = 2$$

$$x = \sqrt[4]{2} = 2^{1/4}$$

Therefore:

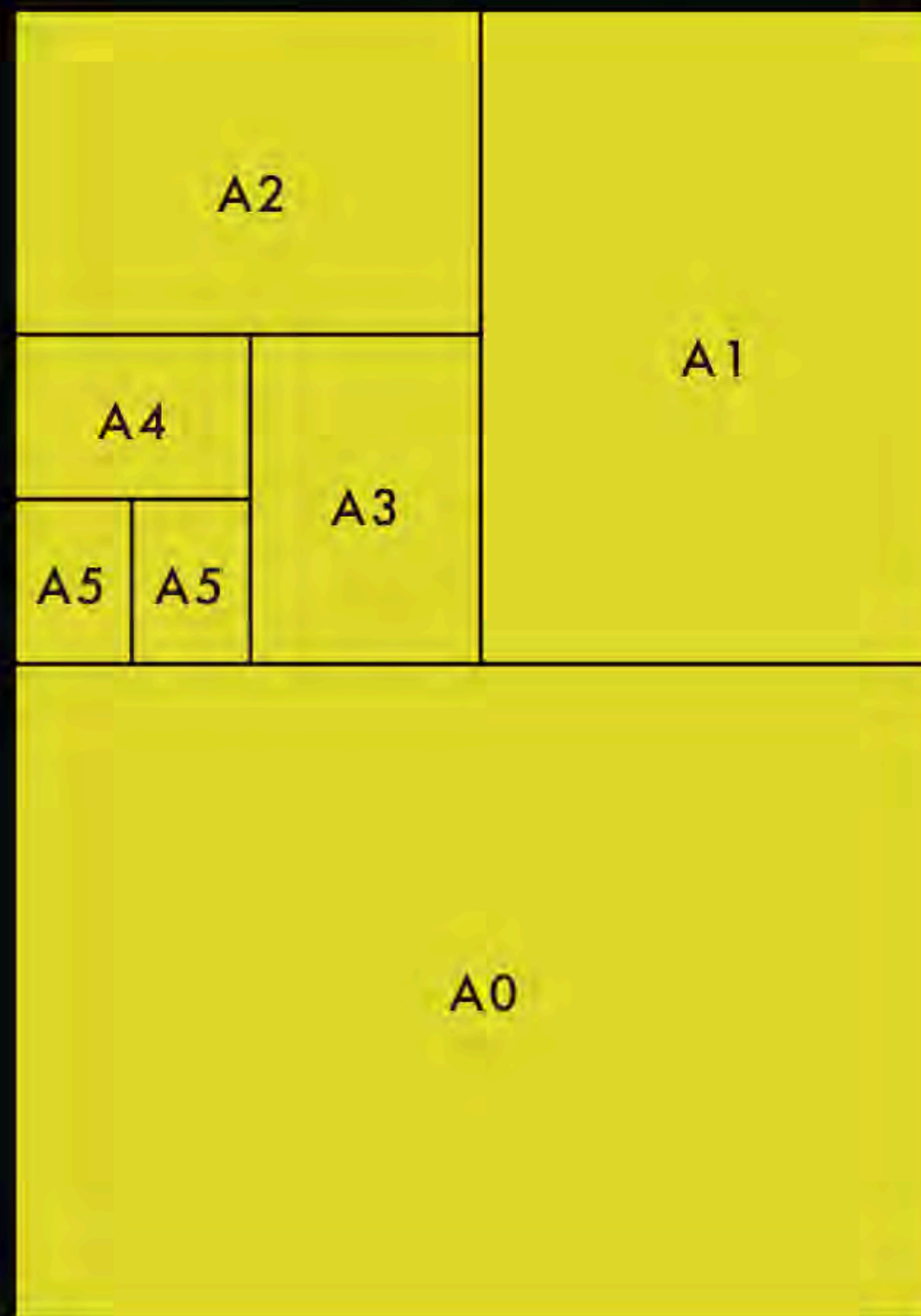
$$\begin{aligned} \text{The length of A0} &= 2^{1/4} \\ \text{width is} &= 2^{-1/4} \end{aligned}$$

A_0 A_1 A_2 A_3 A_4
 $2^{1/4}$ $2^{-1/4}$ $2^{-3/4}$ $2^{-5/4}$ $2^{-7/4}$ $2^{-9/4}$
 2 2 2 2 2 2

Exact A_4 dimensions

$$2^{-7/4} = 0.291\text{m}$$

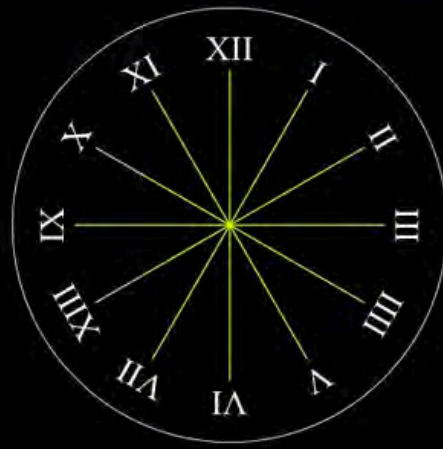
$$2^{-9/4} = 0.210\text{m}$$





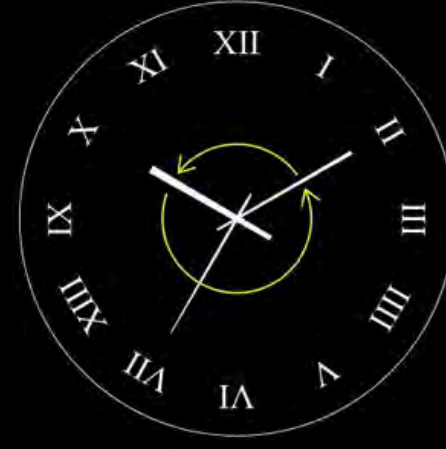
THE MATHEMATICS OF THE CLOCK

When you look at an analogue clock, what do you see? Some hands that tell the time? Look a bit closer - there's a lot more maths to behold!



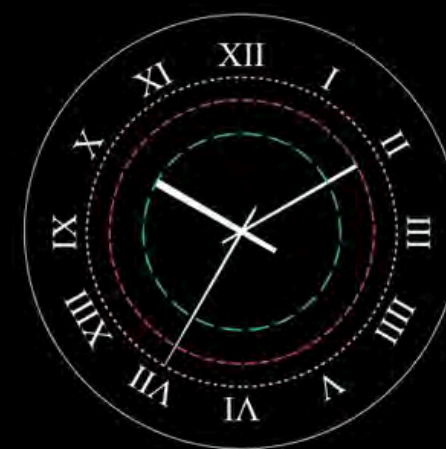
Fractions

Each minute represents $\frac{1}{60}$ of an hour; two minutes represents $\frac{1}{30}$ of an hour, 3 minutes $\frac{1}{20}$; 4 minutes $\frac{1}{15}$, 5 minutes $\frac{1}{12}$; 6 minutes $\frac{1}{10}$; 10 minutes $\frac{1}{6}$, 15 minutes $\frac{1}{4}$, 30 minutes $\frac{1}{2}$, and so on.



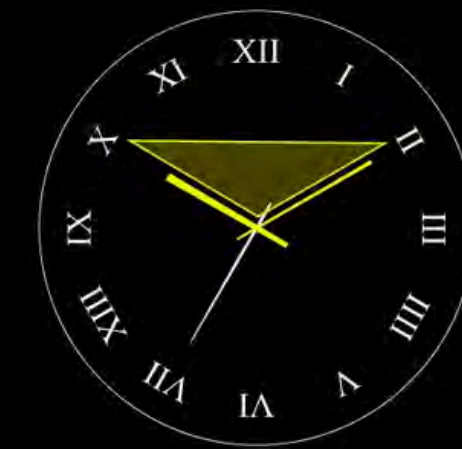
Angles

The hour hand and the minute hand (and the second hand, if there is one), are separated by an angle that is constantly changing.



Speed

The hands are travelling at different speeds. In fact, every point on each hand is travelling at a different speed! It's because each point is tracing out a circle when it moves, and each circle all have different radii, and therefore different circumferences. Yet each point travels around their circle in the same time, so they must each be travelling at a different speed! That's mind blowing!



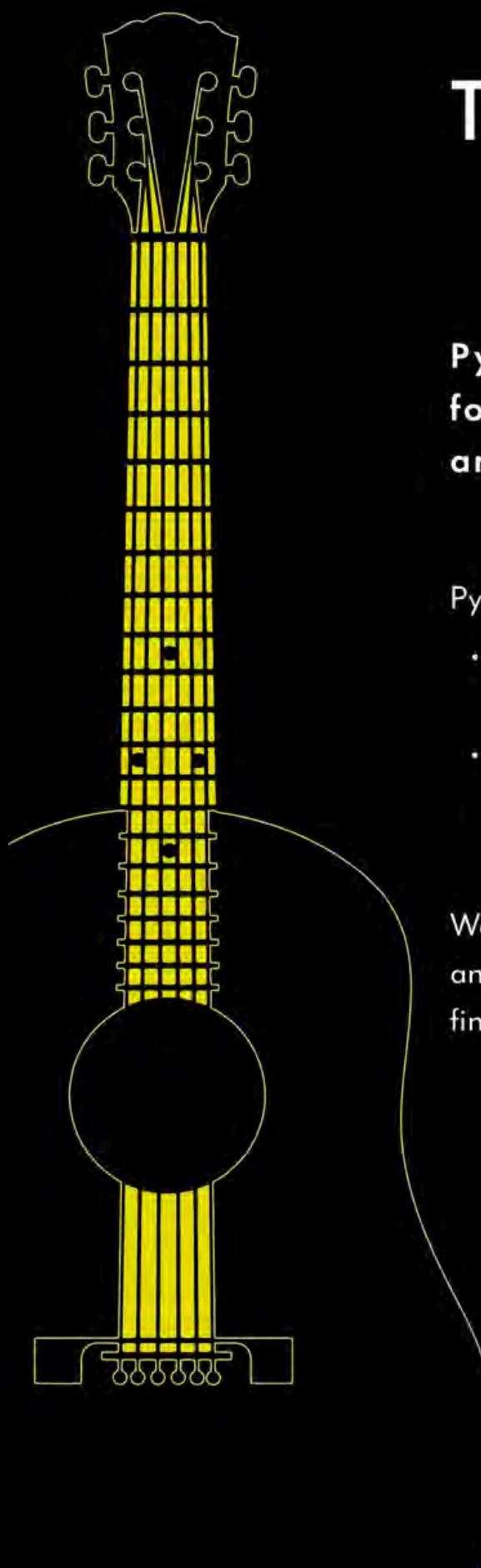
Triangles

The hour and the minute hands form two sides of a triangle. Can you picture the missing side? The triangle changes over the course of each hour between scalene, right and isosceles, but is never equilateral (unless the hour and the minute hands are the same size). And if you do a bit more Maths, you can work out when each type of triangle is formed, and the area and perimeter of the triangle.

FACT

Did you know a clock is often numbered with Roman Numerals.

Interestingly, the number 4 is generally represented on clocks as 'IIII' instead of the usual 'IV'.



THE MATHEMATICS OF THE GUITAR

Pythagoras is most famous for Pythagoras's Theorem (described in March). However he is also well known for his contribution to music. He experimented with strings of different thicknesses, lengths and tensions, and found that dividing the string in simple fractions produced notes that were harmonious.

Pythagoras discovered that:

- Halving the length of a string produced the same note an octave higher.
- Shortening a string by $\frac{1}{2}$ or $\frac{1}{3}$ or $\frac{1}{4}$ produced notes that sounded good with the original note.

We can demonstrate this with a guitar. Play an open string, then play the string with your finger placed on the 5th fret. Repeat with the

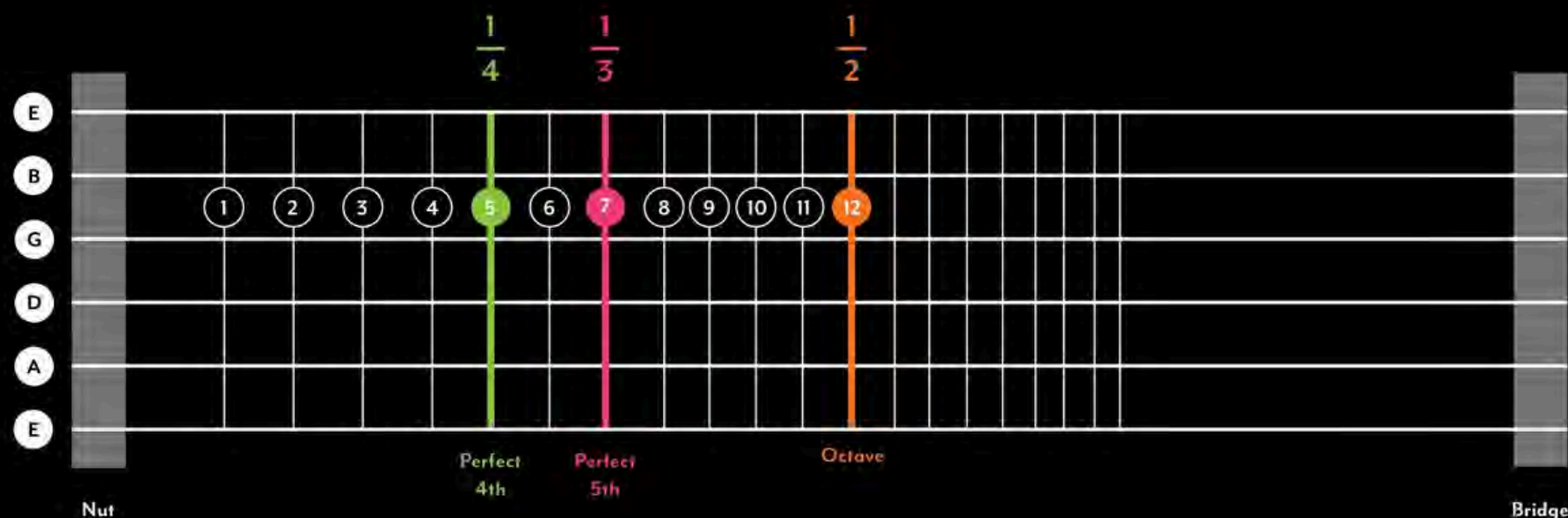
7th fret, and then the 12th fret. Do you hear how good it sounds?

When you place your finger on the 5th fret of any string, you're reducing the length of the string by $\frac{1}{4}$. Similarly, holding the 7th fret reduces the string's length by $\frac{1}{3}$. And holding the 12th fret reduces the string's length by $\frac{1}{2}$. And notice the 12th fret produces the open string one octave higher!

You could say that good music is the result of harmonious fractions working together!

The way the frets are positioned on a guitar is highly mathematical too. The positions are determined by dividing the open string length by the 12th root of 2, $\sqrt[12]{2}$.

So next time you pick up a guitar listen for the maths in your music!



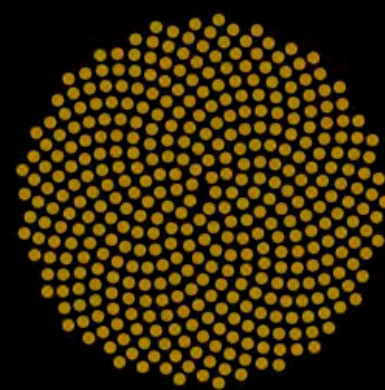
THE MATHEMATICS OF **THE SUNFLOWER**

There are few things as happy as a field of sunflowers in full bloom. They also showcase the mathematics that's everywhere around us. When sunflowers are growing, one side grows in the daytime and the other at night, which gives the effect of them turning towards the sun.

When you look at a sunflower more closely, even more fascinating things emerge. Can you see the seeds are in a spiral pattern?

The number of seeds in each spiral is a **Fibonacci number!** (The first 10 Fibonacci numbers are; 0, 1, 1, 2, 3, 5, 8, 13, 21, 34. Each number is the sum of the previous two numbers).

The spiral pattern follows an amazing formula which the French Mathematician Pierre Fermat is credited with discovering, and so it is called **Fermat's spiral**.



Koboldy(<https://commons.wikimedia.org/wiki/File:Sunflower.svg>),
"Sunflower", <https://creativecommons.org/licenses/by-sa/3.0/legalcode>



Photo: Cass Holmes on Unsplash

THE MATHEMATICS OF THE PIZZA

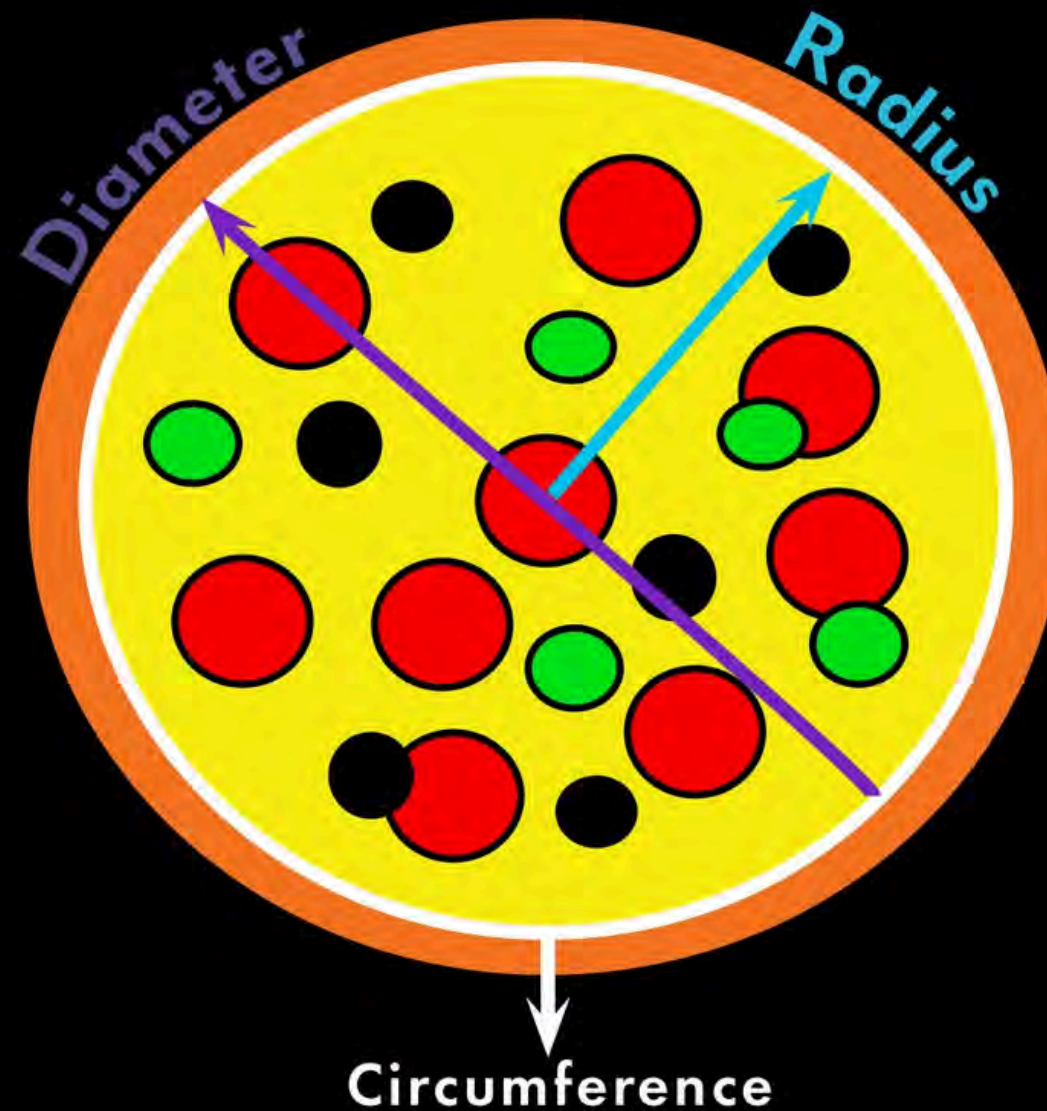
Pizza! Everyone likes pizza!! Perhaps it's because inside each slice there is a delicious chunk of mathematics!

The size of a pizza usually refers to its diameter. By halving the diameter we get the radius. With the radius (r), we can work out the pizza's circumference (C), and its area (A)! Because for any circle, $C = 2\pi r$, and $A = \pi r^2$.

When a pizza is cut into slices, each slice is a sector of the circle. It almost looks like a triangle, but the outside edge isn't a straight line.

If you want to ensure you cut your pizza into identical slices, you could use a protractor! The angle at the centre of the circle is 360° . So if you want to cut the pizza into 8 equal slices, the angle of each would be $360 \div 8 = 45^\circ$. Or you could cut it in half, then halve each half, then halve the quarters, giving you eighths!

Pi (π) = the result when you divide the circumference of a circle by its diameter. It doesn't matter how big or small the circle is, you'll always get the same result. Mind blowing, isn't it!



If a 12 inch pizza costs \$20, and a 16 inch pizza costs \$25, which is the better value for money?

We can work out the answer by calculating the area of the two pizzas, and dividing each by its price. This will tell you how much pizza you get for \$1.

The 12-inch pizza gives you 5.8 square inches for \$1, while the 16-inch gives you 8.0 square inches. So the 16-inch is better value!

Diameter = a straight line that goes from one side of a circle to the other, and passes through the centre.

Radius = a straight line from the centre of a circle to the circumference. It's half the diameter.

Circumference = the length of the outside of a circle.

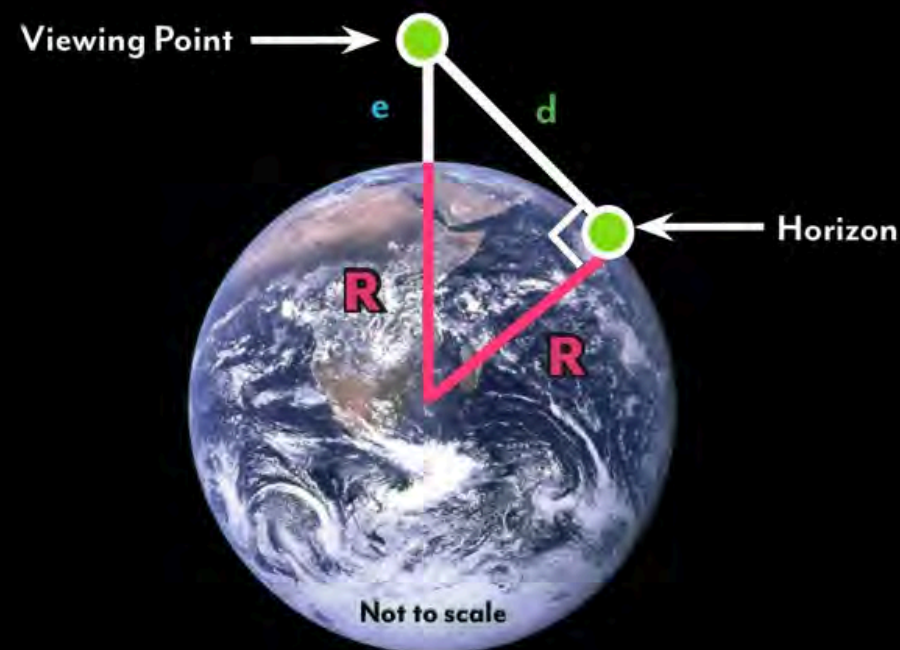
THE MATHEMATICS OF THE HORIZON

Horizons are associated with dreams, the future, the wonderful world we live in and even infinity - similar to what comes to mind when you think about maths! And no wonder - the horizon is a very mathematical concept!

The horizon is the apparent boundary between the earth and the sky. It's the place where roads and railway lines disappear into. It looks like a straight line, yet it is curved, just as the earth is curved. Have you ever thought how far the horizon might be? Once again, Pythagoras comes to the rescue because there's a right triangle at work!

The distance depends on your elevation above sea level. If we let e be the elevation, R be the radius of the earth (approximately 6378 km), and d be the distance to the horizon, we can form a right triangle (see picture).

Pythagoras' Theorem (see May) tells us that $(R + e)^2 = d^2 + R^2$. If we simplify this and make the assumption that the elevation is very small compared to the radius, we get d is approximately equal to $\sqrt{2eR}$.



Another mind blowing fact is that if people with different heights are viewing the horizon, at different elevations, the distance will change for each of them! See the table below:

	Elevation: 0m	Elevation: 10m	Elevation: 100m	Elevation: 1km
Height of Person	Horizon Distance	Horizon Distance	Horizon Distance	Horizon Distance
1m	3.6km	11.8km	37.4km	112.9km
1.5m	4.4km	12.1km	38.3km	113.0km
2m	5.0km	12.4km	39.1km	113.0km



Photo: Anthony Adu on Unsplash



THE MATHEMATICS OF THE ROTARY CLOTHESLINE

Do you ever think about maths when you're hanging out the washing? There's a lot of maths going on, although it might be hiding in plain sight.

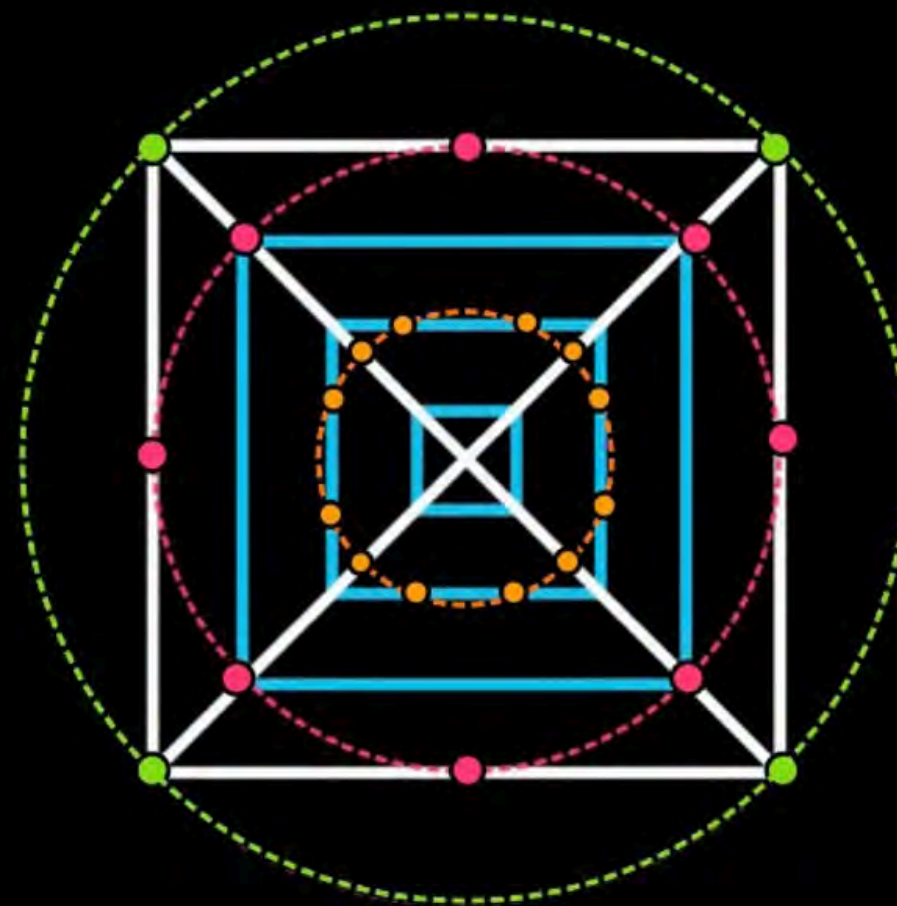
One of the most **mind-blowing things** about a clothesline is that when it turns, all the points on each individual line are moving at different speeds! That's because each point of the clothesline moves in a circle (**also a bit mind-blowing!**), and the speed depends on the distance around the outside of the circle. There are an infinite number of these circles!

Top View of the Clothesline

The **12 orange points** are travelling at the same speed.

The **8 pink points** are travelling at the same speed, but faster than the orange points.

The **4 green points** are travelling at the same speed, but faster than the pink and orange points.



There's an abundance of shapes and other mathematical constructions in a clothesline:

- Transversals
- Perpendicular Lines
- Congruence
- Similarity
- Symmetry
- Squares
- Isosceles Triangles
- Right Triangles
- Hypotenuse
- Straight Angles
- 45° Angles
- Parallel Lines

FUN FACT

Did you know that triangles are used to animate shapes in games and movies?

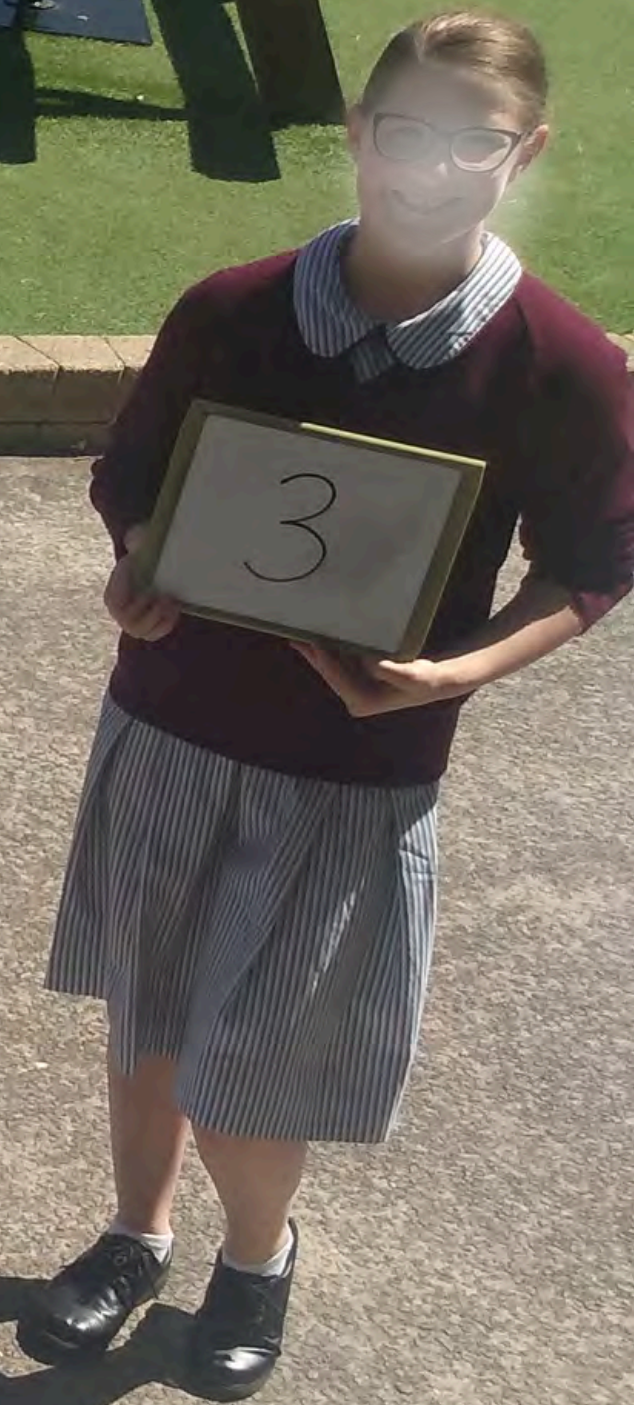
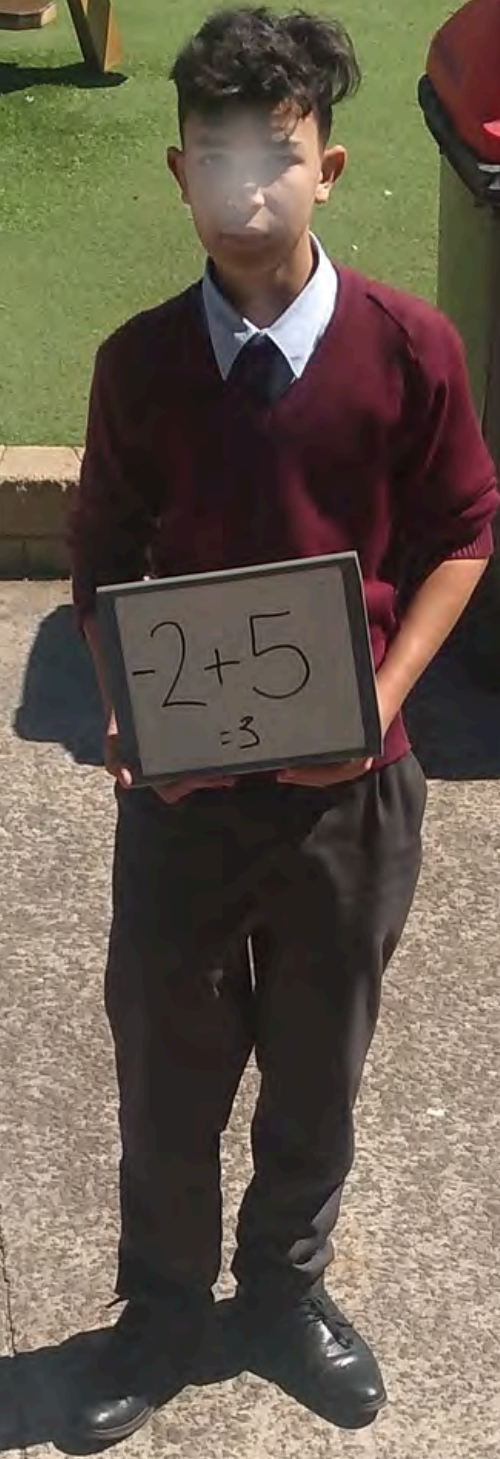
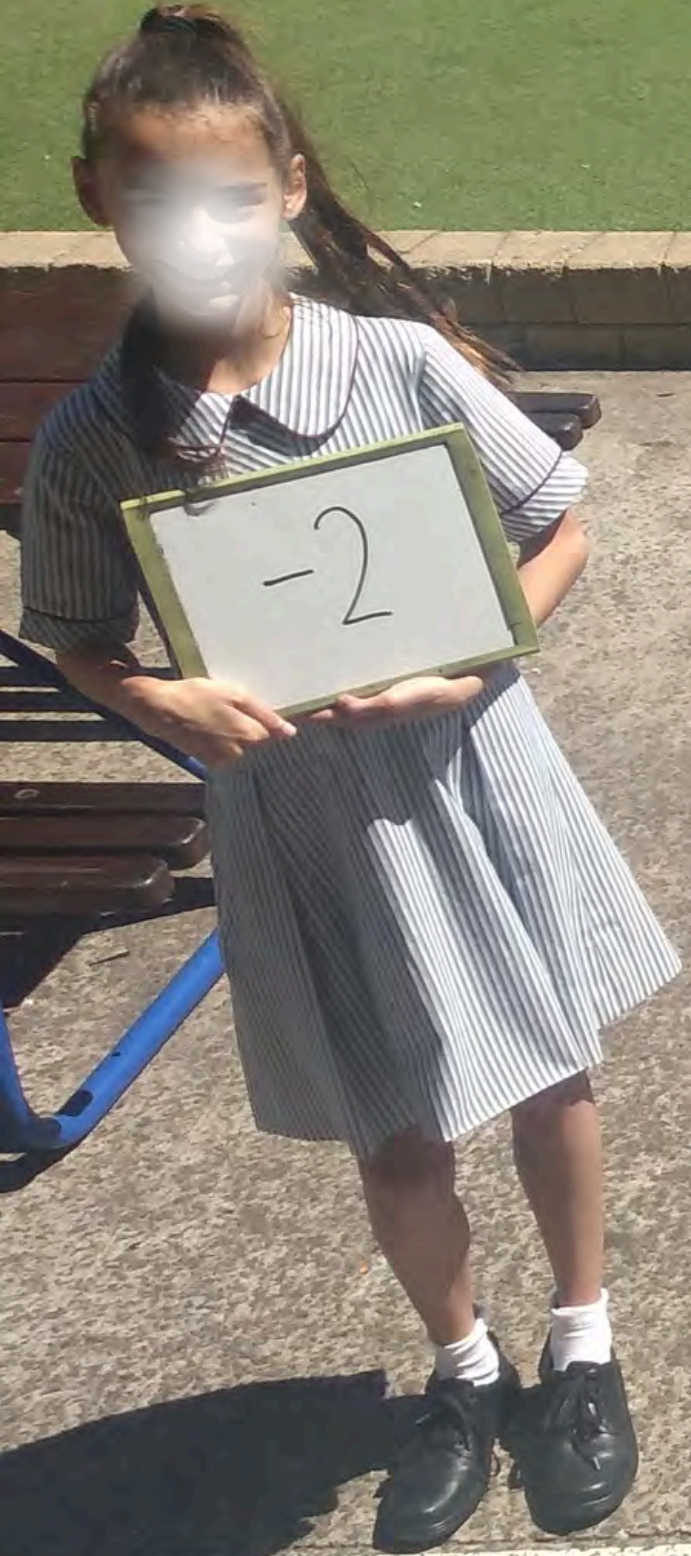


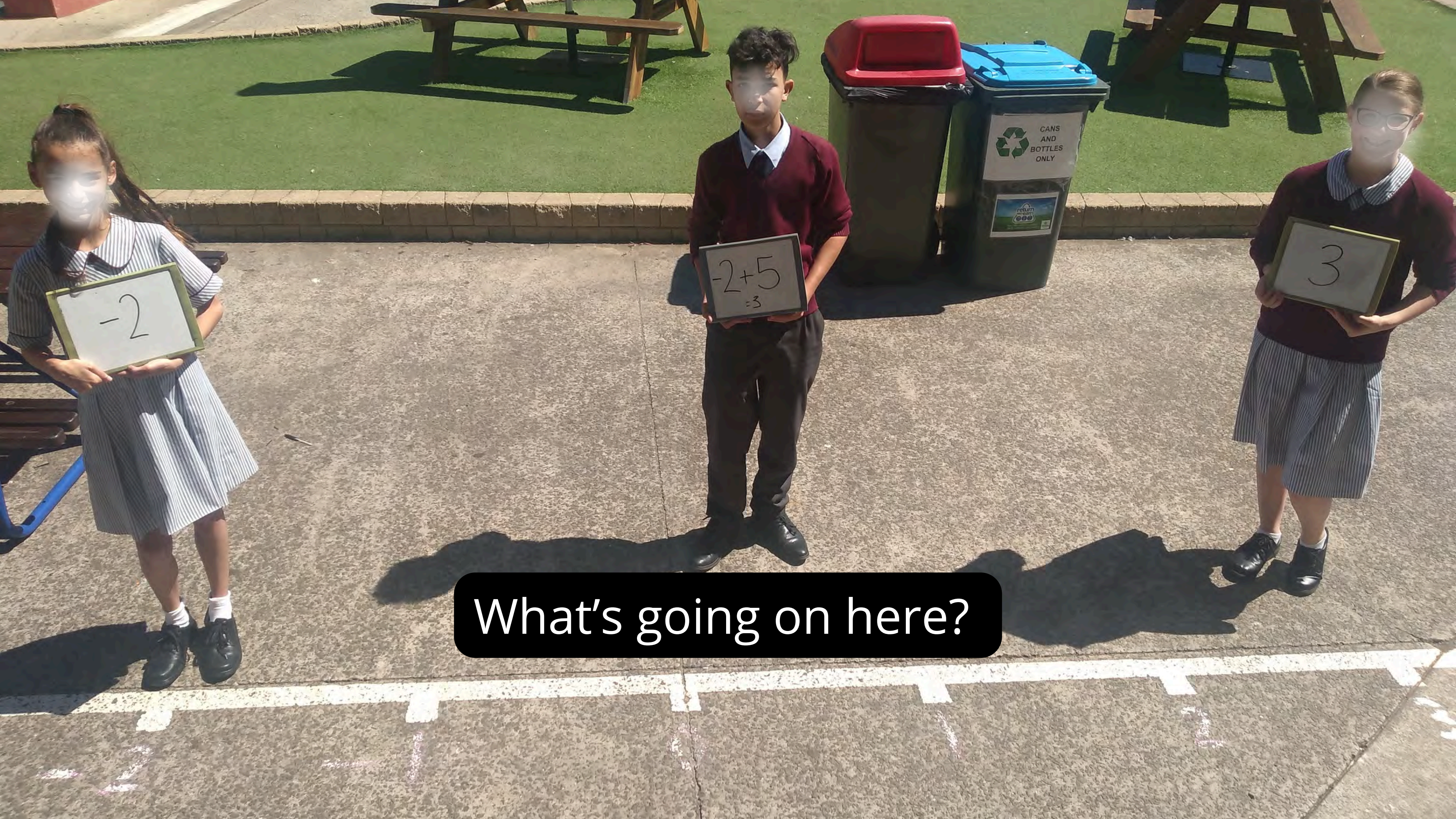


3. Go out to
the Universe

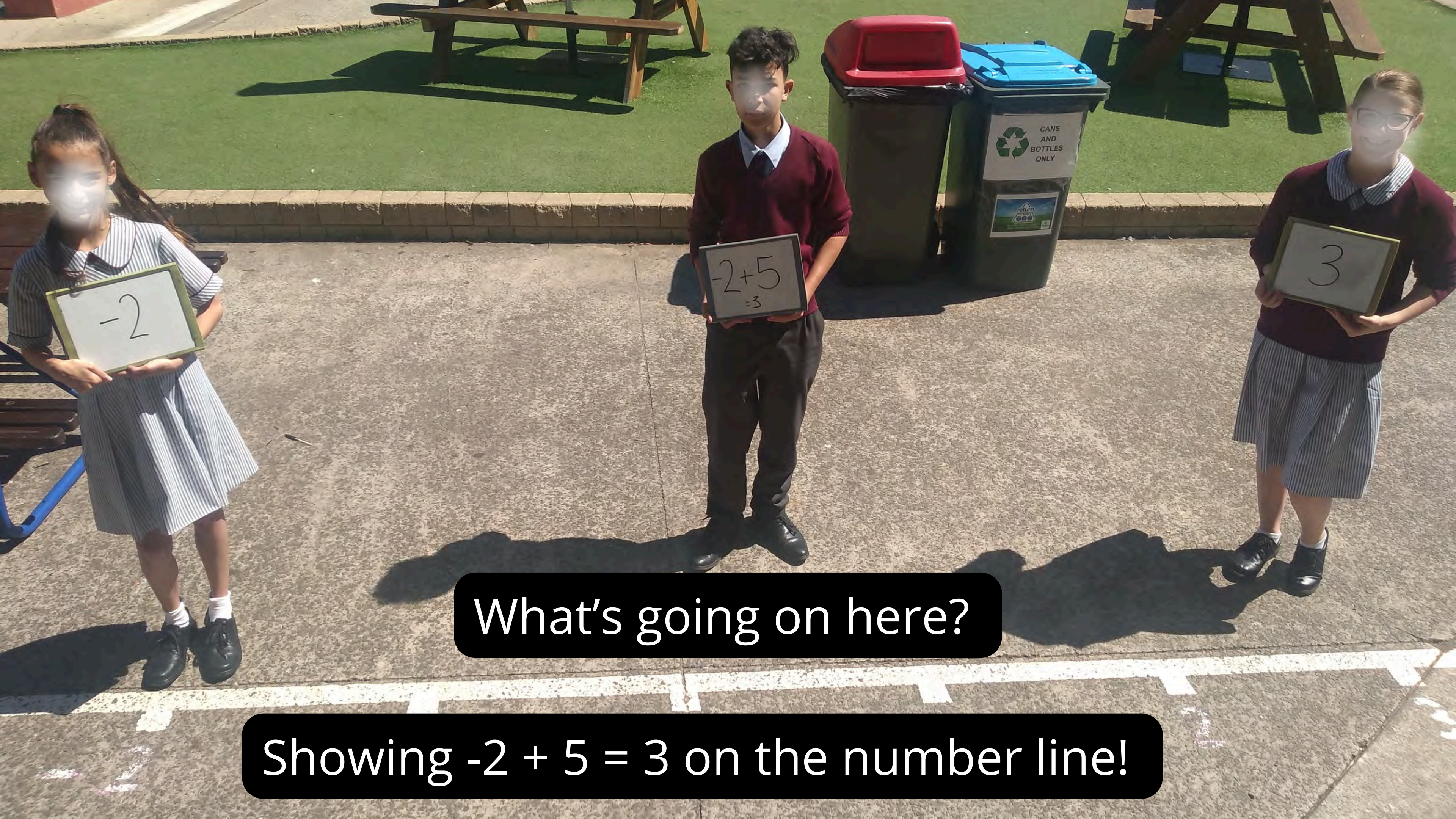
**Mathematics, rightly
viewed, possesses
not only truth, but
supreme beauty.**

Bertrand Russell





What's going on here?



What's going on here?

Showing $-2 + 5 = 3$ on the number line!



Lots more possibilities...



What's going on here?



What's going on here?

Finding coordinates on the Number Plane!



Students are coordinates.

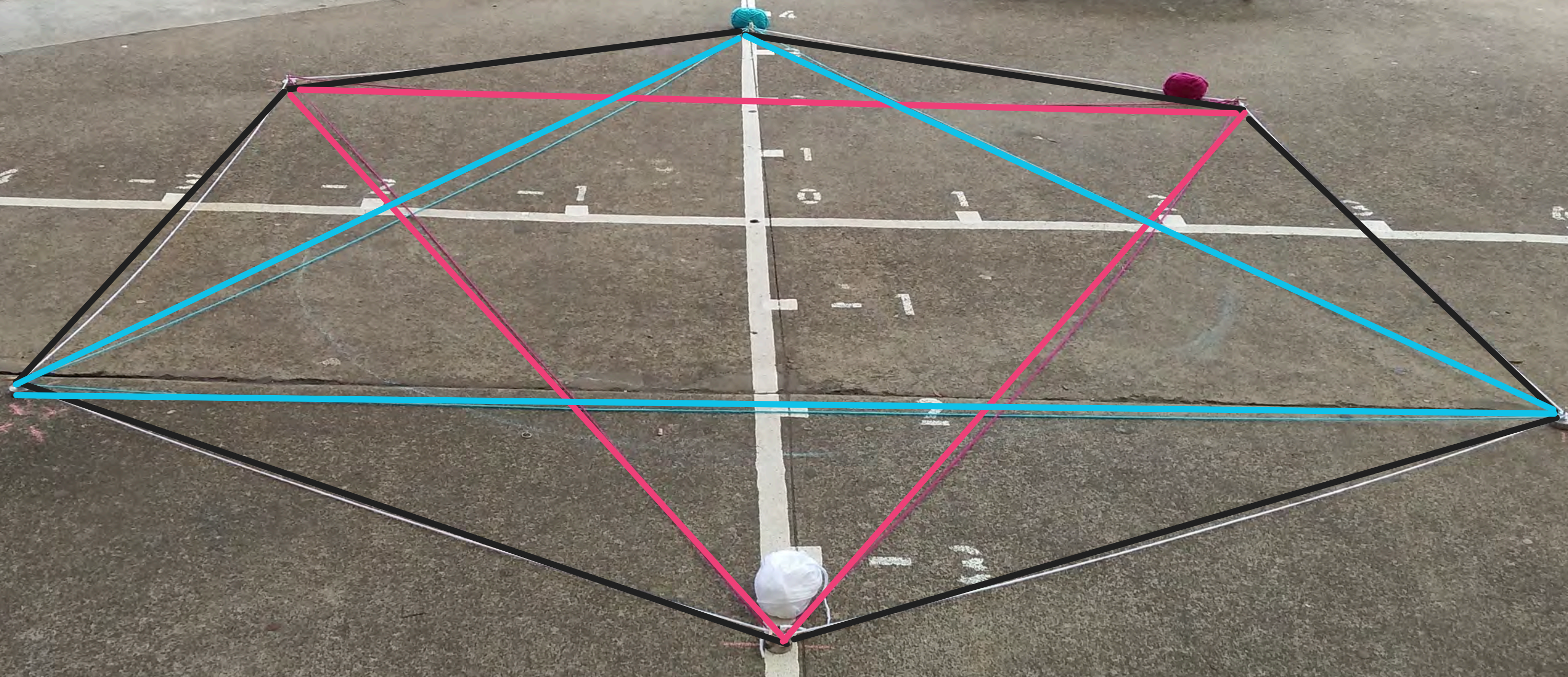
RMAAs* in the playground

RMAs* in the playground

*Random Mathematical Activities!



What's going on here?



How many triangles are there?

THE MATHEMATICS OF THE PLUMBER

Plumbers wouldn't be able to do their job without Maths. And it's pretty interesting Maths too. Take a look:

Pythagoras

Plumbers often have to make angles square (that is right-angled, or 90°). They use the "Rule of 3, 4 and 5". You might remember these numbers from last month. They measure 3 units (such as metres) from a corner along one wall, and 4 units from the corner on the other wall. Then they measure the distance between those two points. If it's 5m, they know it's a right triangle because $3^2 + 4^2 = 5^2$! They're using Pythagoras's Theorem (explained in March). Other tradesmen like carpenters, carpet-layers, concreters also use Pythagoras extensively.

Ratios

Plumbers frequently use a mixture called mortar. It's made by mixing together 6 parts of sand, 1 part of cement and 1 part of lime. This ratio is 6:1:1. So if the plumber needed 8kg of mortar, they would use 6kg sand, 1kg cement and 1kg lime. They can mix any quantities using this ratio.

Trigonometry

Plumbers connect copper pipes to taps. Often they lay several pipes that come out on the same wall. To make the pipes look neat in the buildings, they use trigonometry to work out what offsets and angles to make! The finished product is a piece of art (see the picture). What a shame that it's usually covered up when it's finished!

Gradients

All roofs have pitches (or angles). The pitch determines how quickly the rain falls from the roof. If the gradient is not correct, the water will either pool on the roof, or overflow from the gutter. The plumber has to make sure this doesn't happen by adjusting either the pitch, or the gutter's capacity.

Pressure

Plumbers use pumps that must deliver water to people on all floors of an apartment building. They use Maths to calculate the power of the pump and the diameter of the pipes needed so that when the person on the top floor apartment turns on the tap, water comes out!



Plumbing perfection thanks to trigonometry

Carpet Layers

Carpet Layers use
Pythagoras to make
sure the carpet
looks square



Poster installers!

Have to centre the poster!

How would you do it?!



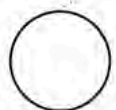



4. Getting Personal

You have a lot of personal Maths to
tap into!


Time to fill out your Passport!

Language of the Universe

 **PASSPORT** 

NAME: _____ Class: _____

1. Date of Birth (DDMMYY) _____
2. Sum of the digits: _____
3. Sum of day+month+year: _____
4. Age in years: _____
5. No. of factors in age: _____
6. List the factors: _____
7. Personal Coordinate: _____
8. Personal Fraction: _____

 **Mathematicalendar**
www.mathematicalendar.com

Time to fill out your Passport!

Language of the Universe

PASSPORT

I SPEAK THE LANGUAGE OF THE UNIVERSE

NAME: _____ Class: _____

1. Date of Birth (DDMMYY) 5 12 06

2. Sum of the digits: 14

3. Sum of day+month+year: 23

4. Age in years: 18

5. No. of factors in age: 6

6. List the factors: 1, 2, 3, 6, 9, 18

7. Personal Coordinate: (12, 5)

8. Personal Fraction: 5/12

Mathematicalendar

Activity – Factors in your age

- How many factors in your age?

Activity – Factors in your age

- How many factors in your age?
- Will you have the same, more, or less on your next birthday?

Activity – Factors in your age

- How many factors in your age?
- Will you have the same, more, or less on your next birthday?
- What's the most factors you've had in your age so far?

Activity – Factors in your age

- How many factors in your age?
- Will you have the same, more, or less on your next birthday?
- What's the most factors you've had in your age so far?
- If you live to 100, what's the most factors you will have in your age?

THE MATHEMATICS OF YOUR AGE

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100


No. of factors	1	2	3	4	5	6	7	8	9	10	12
No. of ages with this many factors	1	25	4	32	2	16	1	10	2	2	5

Activity – Personal Fraction

- Plot your PF on the appropriate number line
- Work out the distance between you and your neighbour
- Find your table's sum and product (strategise first!)
- What else could you do with your class?

Activity – Personal Coordinate

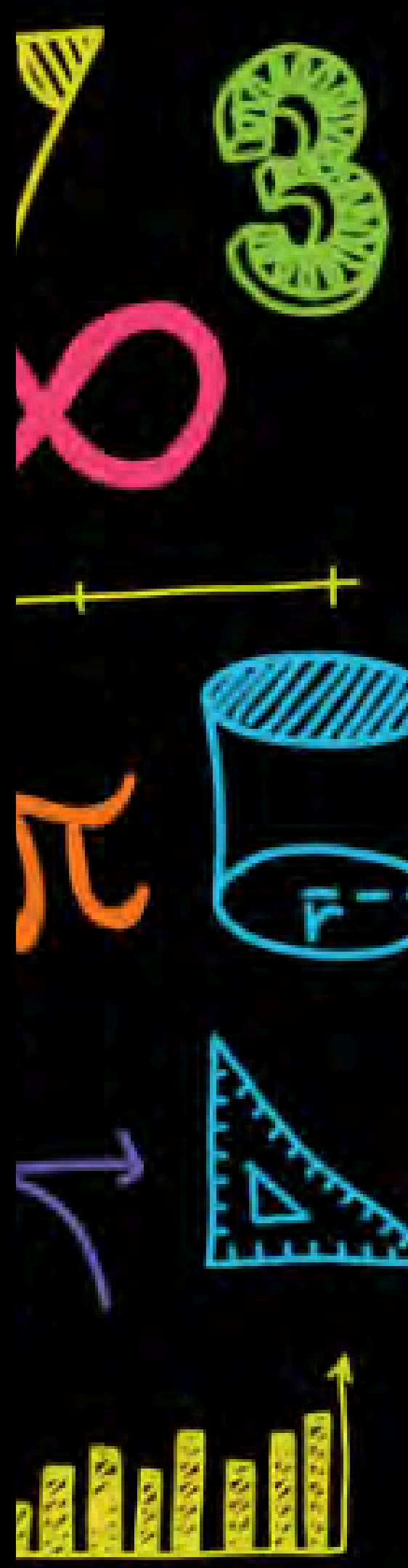
- Plot your PC on the sheet
(Great way of keeping track of your class's birthdays!)
- Find a partner and work out:
 - the distance between your PC's
 - the equation of the line linking them
- what else could you do with your class?



5. A prism to
view the world

Without mathematics,
there's nothing you can
do. Everything around
you is mathematics.
Everything around you is
numbers.

Shakuntala Devi



Last week I had a class of 19 students

2 were absent

So there were 17 in the class

$$19 - 2 = 17$$

Anything special about these numbers?

Last week I had a class of 19 students

2 were absent

So there were 17 in the class

$$19 - 2 = 17$$



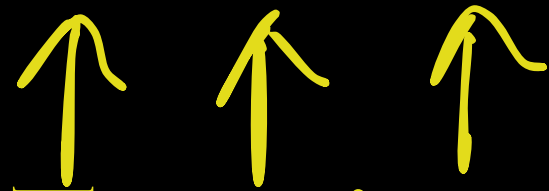
THEY'RE PRIME NUMBERS

Last week I had a class of 19 students

2 were absent

So there were 17 in the class

$$19 - 2 = 17$$



THEY'RE PRIME NUMBERS

Is there a different combination this could happen with?

Another time there were 25 students

And we....



... formed that perfect square!



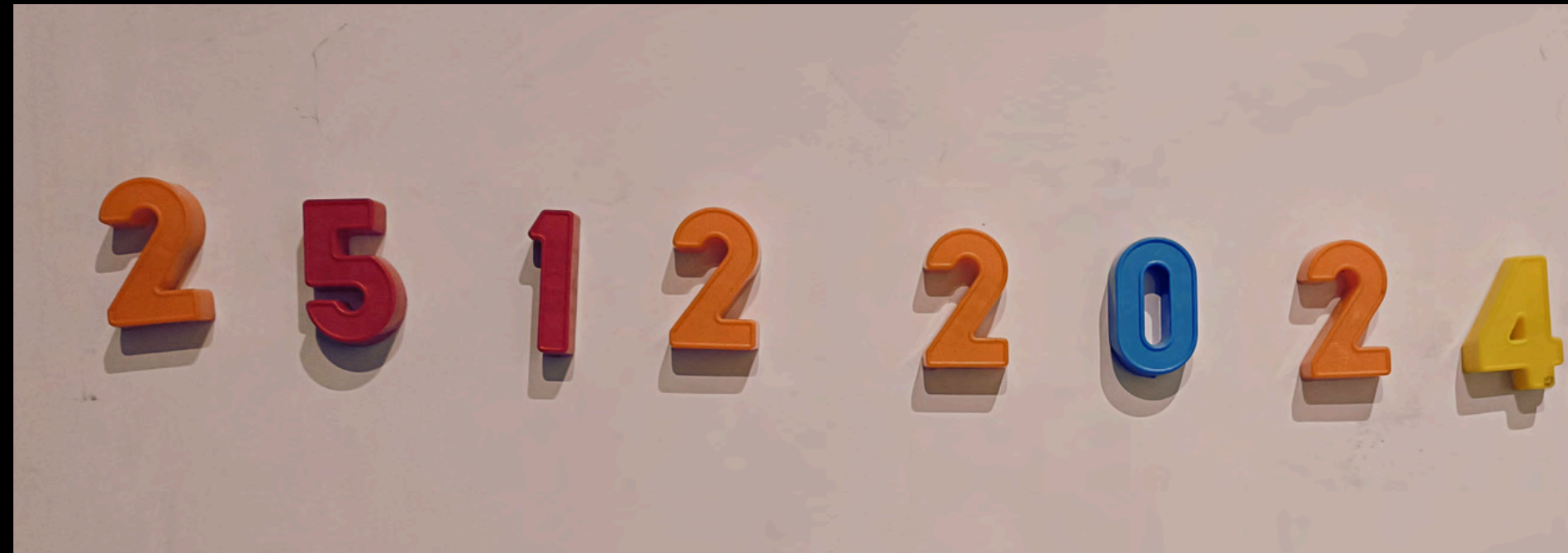
And then found that $1+3+5+7+9 = 25$!!!

A group of approximately 25 schoolgirls in a courtyard, many waving their hands. They are wearing dark blue school uniforms with red and white plaid skirts. The courtyard has green artificial grass and several white, conical shade structures. A brick building is in the background.


These are also RMA's

And then found that $1+3+5+7+9 = 25$!!!

Christmas equation

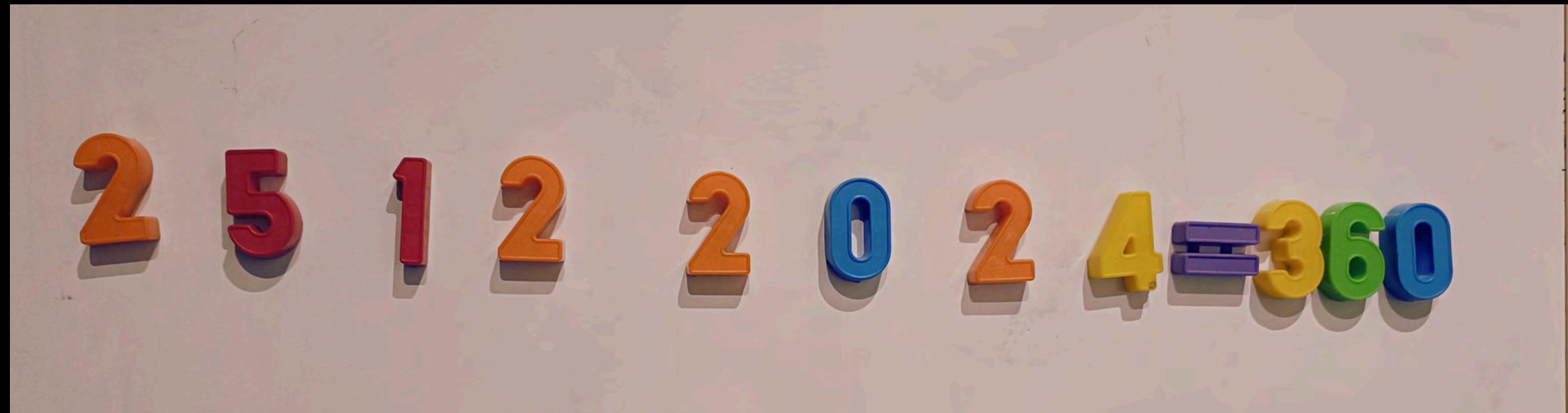


Christmas equation



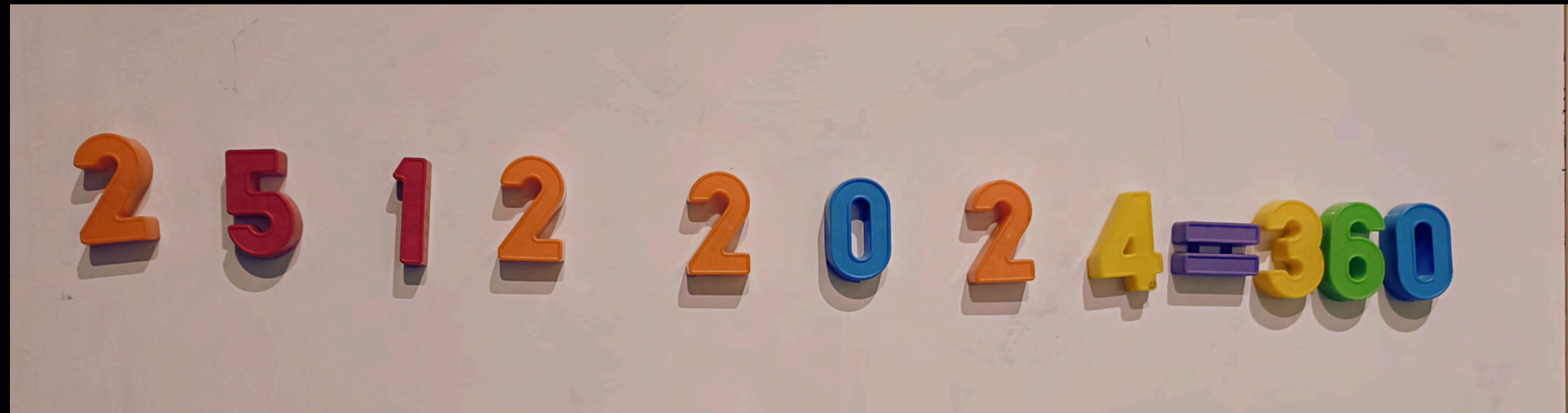
2 5 1 2 2 0 2 4 = 3 6 0

Christmas equation



Can you make the 2 sides equal
keeping the numbers in the same order?

Christmas equation



Can you make the 2 sides equal
keeping the numbers in the same order?

Answers a little later...

Road signs

M1

PACIFIC HIGHWAY

Byron Bay	14
Bangalow	16
Ballina	40
Grafton	169
Sydney	782

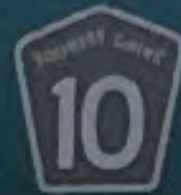


How many odd/ even/ prime/ square numbers?

What is the shortest/longest distance between towns?

The next sign is 15km away. What will it show?

OCEAN DRIVE



North Haven	1
Bonny Hills	8
Lake Cathie	16
Port Macquarie	32

OCEAN DRIVE



North Haven	1
Bonny Hills	8
Lake Cathie	16
Port Macquarie	32

$$= 2^0$$
$$= 2^3$$
$$= 2^4$$
$$= 2^5$$

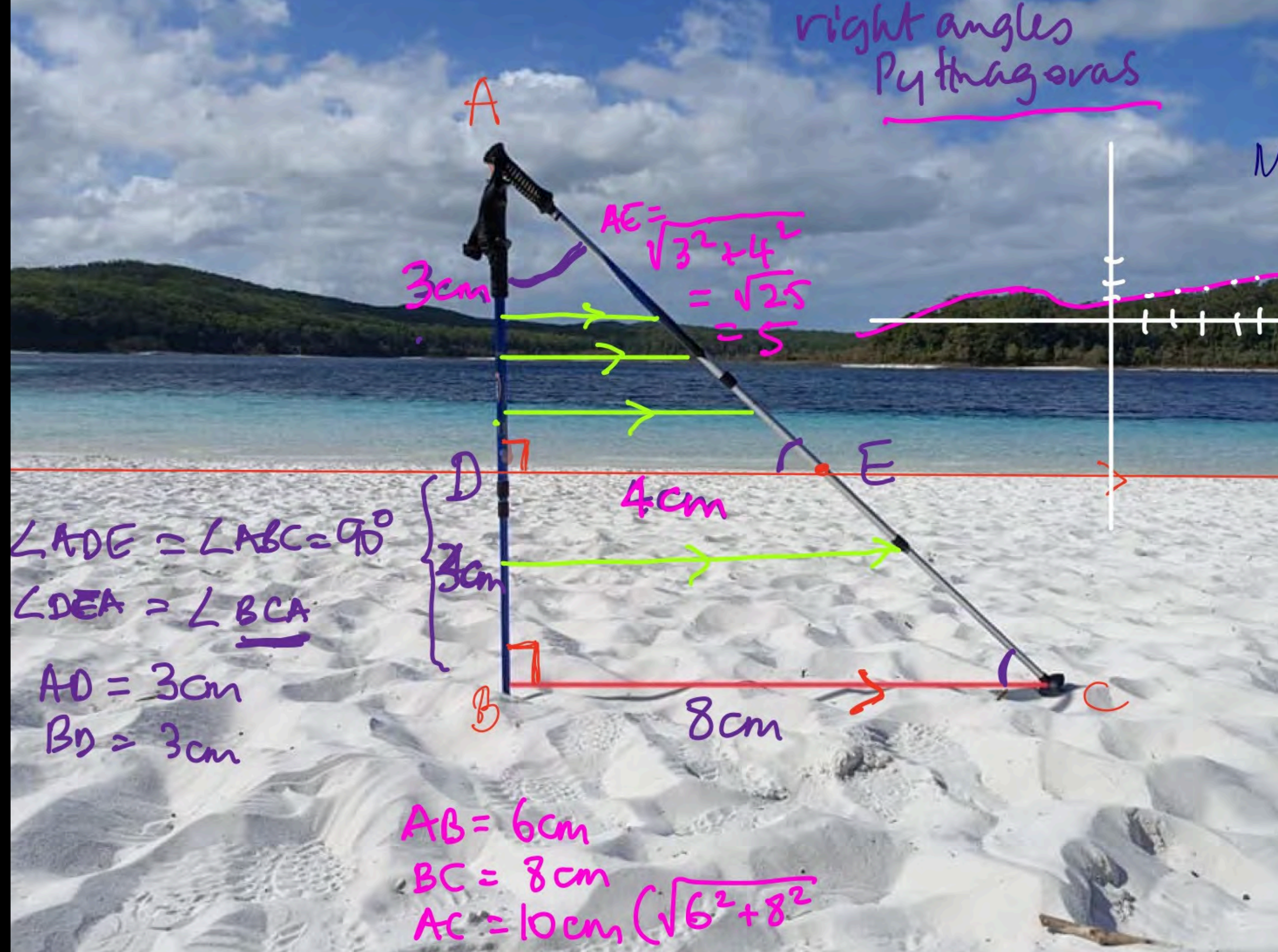
The
Mathematics
of
Fraser Island



The
Mathematics
of
Fraser Island



Mathematics everywhere!



right angles
Pythagoras

$$AE = \sqrt{3^2 + 4^2} \\ = \sqrt{25} \\ = 5$$

$\angle ADE = \angle ABC = 90^\circ$
 $\angle DEA = \angle BCA$
 $AD = 3\text{cm}$
 $BD = 3\text{cm}$

$AB = 6\text{cm}$
 $BC = 8\text{cm}$
 $AC = 10\text{cm} (\sqrt{6^2 + 8^2})$

Mathematics
everywhere!



Mathematics
everywhere!



Mathematics
everywhere!



Mathematics
everywhere!



What is this man doing?

Mathematics
everywhere!



He's making angles on
parallel lines



So celebrate!

So Celebrate!!

- Wed 25/12/24: Revolution Day (360)
- Mon 30/12 : 301224 - Most factors (64)
- Wed 5/2/25: Palindrome
- Thu 27/2: Day - Month = Year
- Thu 14/3: Pi Day
- Sat 30/3: Right Angle Day (90)
- Tue 10/4: Day 100
- Fri 27/6: Straight Angle Day (180)
- Thu 24/7: Pythagorean Triad (7,24,25)
- Fri 31/10: 311025 - Most factors (48)
- Wed Dec 26: Revolution Day (Day 360)

Mathematicalendar 2025

THE MATHEMATICS OF THE GARDEN HOSE

Does Maths ever come to mind when you're watering the garden? It should because there's a lot of Maths going on! Firstly, let's take a look at the hose. The cross-section is a circle, which has a radius, diameter, circumference and area. The hose also has a length and surface area. These measurements help you to work out the pressure of the water in the hose, and that it's long enough to reach all your plants.

Turn the hose on and point it upwards. The water follows a curved path going up and then down. The curve is called a parabola, commonly found in high school Mathematics and in the world around you (see picture below).



If you have your back to the sun, and turn it? Move the hose slightly and you see more phenomenon as well! (See photo at right)

Finally, try laying the hose in a coil. It's not always easy! You're actually creating a type of knot. Knot theory is a branch of Mathematics that helps understand different ways of tying strings, ropes and hoses efficiently to prevent tangling. Mathematicians study how knots form and the best methods to untangle them, which can be applied practically to stowing and using garden hoses and other applications.

Can you see why Maths is the Language of Nature?

APRIL

MON	TUE	WED	THU	FRI
	1 $1^2/2^2/3^2$	2 $2^2/2^1+2^1+2^0$	3 $3+4+2+5$	4 $4+4+2^2+2+5$
7 $7+4+25+36.5$	8 $8+4+2^4$	9 $9^2/2^2/3^2$	10 $10+(2+0)+2+5+100$	11 DOP29123
14	15 $15-(4+2+5)+7$	16 $16^2/2^2/3^2$	17 $17^3/3^3/5^3/7^3/9^3$	18 $1+8+4+2+0+2$
21	22 $22^2-4+5^2/2^2/3^2/4^2$	23 $2+3+4+25$	24 $24+4+(2+0)+2+5$	25 21425.5
28	29 $29+4+25$	30 $3-(0-(4-2+3))-5$		

THE MATHEMATICS OF THE CROISSANT

Do you like croissants? Of course you do! Doesn't everyone? And they taste even better when you Maths behind their deliciousness!

The secret ingredient behind French pastries is butter. There's butter between each layer of dough - that's why it tastes so good! But there's not just 100 layers of butter in croissants. You might think it would take some time to make 100 layers, but applying a bit of Maths shows that it only needs 7 layers!

To begin with the dough is flattened or rolled into a roughly rectangular shape, and the top is smeared with butter, making 2 layers - one dough, one butter.

It's then divided into 3 sections, which are folded over. Now there are 3 layers of dough on the bottom and top layer, 3 layers of butter and 2 double layers of dough. The mix is flattened again, which causes the double layers of dough to become single layers. So there are now 7 layers of which 3 are butter.

By repeating the process, the layers increase quite quickly. And the layers of butter increase by powers of 3! You only need to fold it 4 or 5 times.

After being flattened for the final time, the pastry is cut into triangles which are rolled up and then baked! So a croissant is actually a delicious rolled-up triangle with mathematics the hidden ingredient in all its layers!



Fold	Layers
1	$3 \times 3 = 9$
2	$7 \times 3 = 21$
3	$21 \times 3 = 63$
4	$63 \times 3 = 189$
5	$189 \times 3 = 567$

FEBRUARY

MON	TUE	WED	THU	FRI	SAT
					1 1025+55.5
3 $3+2+2+0+2+5$	4 $4225+63^2$	5 Palindrome 5225	6 DOP 1069	7 $7225+89^2$	8 $8^2/2^2/2^4+2^2+2^0$
10 $10+2+2^2+25$	11 $1+1+2+2+5$	12 $12-(2-(2-5))+7$	13 $13225+119^2$	14 $1^4 \times 20+25+45$	15 18225.5
17 $17+2+2+0+2^2$	18 $18225+119^2$	19 $1+9+2+2+0+2+5$	20 $20+2+2+5$	21 $21^2/19^2/19^2/19^2/19^2$	22 $22+2+25+49$
24 DOP 75677	25 $2^5-3+2^2/3^2/3^2/3^2/3^2$	26 $2+6+2+25+7$	27 $27225+169^2$	28 $28+2+25+55.5$	

JUNE

MON	TUE	WED	THU	FRI
30 30625+175^2				
2	3 $3+6+2+0+2+5$	4 $4+6+2^2 \times 2+5$	5 $5625+79^2$	6 DOP 22527
9	10 $10+6+20+(2+5)$	11 $1^2/3^2/3^2/3^2/3^2/3^2$	12 $12+6+(2+0)+2+5$	13 $1+3+6+2+5$
16	17 $1+(7-(6-(2-5)))+7$	18 $18+6+25+49$	19 $19+6+25$	20 $20+6+20+25+7$
23	24 $24+6+25+55.5$	25 $15^2/12^2/29^2/0.5^2/13^2/12^2$	26 $26+6+2^4$	27 $2+7+6+2+5$
				28 $2+8+6$

AUGUST

MON	TUE	WED	THU	FRI	SAT	SUN
				1 $1+8+(2+0)^2+5^2$	2 $2+8+2^2+2+5$	3 $3+8+25+36$
4 $4+8+2^3$	5 $5+8+20+(2+5)$	6 $1+2+3+1+3+1+3+1+3+1$	7 $7+8+20+25$	8 $8+8+2+0+2^2$	9 $9+8+2+0+2+5$	10
11 DOP 14376	12 $128+2^{10}+1+5^2$	13 $1+3+8+2+0+2+5$	14 $3^2/3^2/3^2/3^2/3^2/3^2$	15 $(15+8+2+0)+2+5$	16 $16+8+25+49$	17
18 $1+8+8-(2+0)+2^2$	19 $19+8+20+2+5$	20 $2+1+8+2+5+7$	21 $2+2+8+2+0+2+5$	22 $22+8+25+55.5$	23 $2+3+8+2^2+2+5$	24 True or False?
25 $2^4+2^2/2^2/2^2+2^2/2^2$	26 $2+6+8-(2+0)+2+5$	27 DOP 17075	28 $2+8-((8-2)-5))+7$	29 $2^{11}+1+2^2+2+5$	30 $5^2+0.5^2/3^2/3^2/19^2/12^2$	31 $31+8+25+64$

FORMULA FOR LIFE

As you travel on life's curves and the gradient gets tough, when it seems to have no turning point and it's hard to have a laugh, there are a few simple steps, as easy as ABC. I hope that you will follow them so that you can be happy.

Be positive, not negative, make a difference. Find unity amongst division as you go. Make sure that things add up before you start. And if you need to carry something, carry it.

Make your points with care and know your limits. If you differentiate, things will work out. Be sure you know all the factors when you multiply. Keep your expressions simple, but let them be.

Viewed from the right angle something is different. We may not be congruent, but we're similar. It is a beautiful world, may your fortune be good. May your numbers always come up. May your limit be the sky!



Photo by Dan Gurnea on Unsplash

MAGIC MATHEMATICAL MOMENTS



Seeing how Maths works in the windows of a building, and finding shapes, angles and Pythagoras



Making Maths with hiking poles on a beach



Finding symmetry or the Fibonacci sequence in nature, such as petals or stamens of flowers



Discovering amazing images with reflections, shapes, symmetry and vanishing points

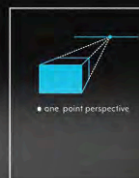
THE MATHEMATICS OF THE VANISHING POINT

The vanishing point is the point on the horizon where everything seems to disappear. When you look at the beach huts in the picture below, for example, they appear to get smaller, narrower and narrower, and would eventually disappear. This is an illusion of course - they wouldn't really disappear!



Photo by Auro Sain on Unplash

- There can be 1, 2 or 3 vanishing points. An artist wishes to convey. Lines are drawn using the lines.
- You can see that the lines form a 3D feel. They are harnessed by game-designers to create a 3D feel.



• one point perspective

• Artists, photographers, graphic designers are among the many that use the vanishing point to obtain perspective - the concept that makes a 2D drawing look 3D.

OCTOBER

MON	TUE	WED	THU	FRI
		1 $1025 + 105^2 \square$	2 $2025 + 145^2 \square$	3 DOP 215310
6 $-6 \times 10 + 25p$ $p = 7$	7 $7 + 1 + 0 + 2 + 0 + 2 \times 5$	8 $2^2/2^2 + 2^2/2^2 + 2^2 + 2^2$	9 $-9 \times (1 + 0 + 2 + 0 + 2 \times 5)$	10 101025 Δ
15 $15 \times 10 + 2 + 0 + 25 + 7$	14 $14 + 10 + 25 + 49 \square$	15 $15 + 10 + 25$	16 $3^2 - 3^2 - 3^2/3^2 - 3^2/3^2 - 3^2$	17 $1 \times 7 + 1 + 0 + 2 + 0 + 2 \times 5$
20 $20 + 10 + 25 + 55 \Delta$	21 $2 + 1 + 1 + 0 + 2 + 5$	22 DOP 673188	23 $2 \times 3 + 10 + 2 + 5 + 7$	24 $3^2 - 1^2/3.5^2 - 1.5^2/15^2 - 12^2$
27 $2 + 7 + 1 + 0 + 2 + 5$	28 $-2 + 8 + 1 + 0 + 2 + 5$	29 $29 + 10 + 25 + 64 \square$	30 $5 + 6/5 \times 2/5 + 5$	31 $31 + 1 + 0 + 2^2$

THE MATHEMATICS OF THE SUN

The Sun is the big gas giant at the centre of our solar system. The Sun's gravity keeps the Earth in a good place to see large numbers at work, because they are mind-blowingly large!

How far is the Sun from Earth?

The Sun is around 150,000,000km from Earth. If it was possible to walk there, and you walked at 5 km/hour and didn't stop, it would take more than 3,000 years to arrive! But light from the Sun only takes 8 minutes to get here!

What is the Sun's diameter?

The diameter of the Sun is around 1,400,000km, which is more than 100 times the diameter of the Earth! The circumference is about 4,400,000 km or about 3% of the distance from the Earth to the Sun.



Photo by Collins on Pexels.com

DECEMBER

MON	TUE	WED	THU	FRI	SAT
1 $1 + 12 + 20 + 2 + 5 + 7$	2 $2 + 2 + 2 + 0 + 25$	3 $3 + 2 + 2 + 0 + 2^2$	4 $4^{1/2} \times (2 + 0) + 2^2$	5 DOP 561922	6
8 $8025 + 285^2 \square$	9 $-(-9 + 2 - 2 - 0) + 5$	10 $1 + 6 + 1 + 2 + 20 + 2 + 5 + 6$	11 $11 + 12 + 2 + 0 + 25$	12 $12 + 12 + 25 + 49 \square$	13 $13 + 12 + 25$
15 $2^2 - 2^2/2^2 + 2^2/2^2 - 2^2 - 2^2$	16 $1 + (-6 + 1) + 24 + 12 + 5 + 1 + 7$	17 $1 \times (7 + (-1 - 2) - 2) + 5$	18 $18 + 12 + 25 + 55 \Delta$	19 $(2 + 0) + 12$	20
22 DOP 1275905	23 $23 + 1 + 2 + 2 + 0 + 25$	24 $3^2 - 3^2/3^2 + 3^2/3^2 - 3^2 + 3^2$	25 $24 - 5 + 124 + 25 + 6 + 7$	26 Revelation Day (86)	27 $27 + 12 + 25$
29 $29 + 12 + 25 + 66 \Delta$	30 $15 \times 9 + 14 \times 9 + 21/15^2 - 12^2$	31 $31 + 1^2 - 2^2$			

THE MATHEMATICS OF MOORE'S LAW

Have you heard of Moore's Law? It's named after Gordon Moore, one of the founders of Intel. In 1975, he predicted that the number of transistors (key components of modern technology like phones and computers) would double every two years as it became smaller. This prediction became known as Moore's Law.

So how accurate was his prediction? We can start with the first commercially-produced microprocessor, the Intel 4004, that was released in 1971. It contained 2300 transistors. It doubles every 2 years, then after 10 years it will have doubled $10 \div 2 = 5$ times. This is the same as multiplying by $2 \times 2 \times 2 \times 2 \times 2 = 2^5 = 32$. In other words, raise it by 2 and raise it to this power. Interestingly, this works even if the number of years is odd - see the table below - but you might need a calculator!

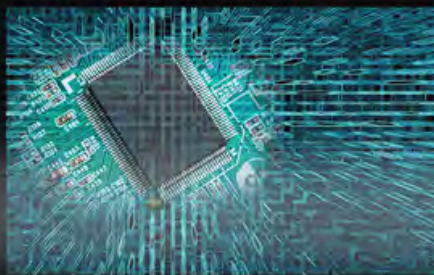


Image by s100 on Freepress

The table below shows the major microprocessor releases and actual number of transistors. It also shows that until 2004, Moore's Law was accurate, but as the size of microprocessors approaches the atomic level, it becomes less reliable.

Year	Microprocessor	Transistors	Approximate Transistors
1971	4004	2,300	$2^{10} = 1,024$
1974	8008	6,000	$2^{12} = 4,096$
1976	8080	290,000	$2^{18} = 262,144$
1982	286	2.75 million	$2^{24} = 16,777,216$
1985	386	2.75 million	$2^{24} = 16,777,216$
1989	486	12 million	$2^{26} = 67,108,864$
1993	Pentium	3.1 million	$2^{28} = 268,435,456$
1997	Celeron	9.5 million	$2^{30} = 1,073,741,824$
2000	Celeron	9.5 million	$2^{30} = 1,073,741,824$
2004	Celeron	290 million	$2^{32} = 4,294,967,296$

And by the way, did you know that this average microprocessor contains around 10 billion transistors? (Mind Blowing)

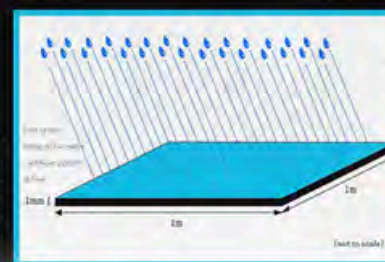
MAY

MON	TUE	WED	THU	FRI	SAT
			1 $1 \times 5 + (2 + 0) + 2 + 5$	2 $3^2 - 3^2/3^2 - 3^2/3^2 - 3^2$	3 $35 + 20 + 2 + 5$
5 $5 + 5 + 25 + 49 \square$	6 $6 \times 5 + 2 + 0 + 2^2$	7 $-7 \times 5^2 + 0 + 2^2$	8 $8 + (-5 - 2) + (-2) - 5 + 7$	9 $9 \times 5 + 20 + 25$	10 $5 \times 2/5 + 1/5 + 5$
12 $12 + 5 + 25$	13 DOP 22608	14 $-1 \times 4 + 5 + 2 + 10 + 2 + 5$	15 $15 + 5 + 2 + 5$	16 $3^2 - 3^2/3^2 - 3^2/3^2 - 15^2 - 12^2$	17 $17 + 5 + 2 + 0 + 2 + 5$
19 $19 + 5 + 25 + 49 \square$	20 $20 + 5 + 25$	21 $-2 \times 1 + 5 + 2 + 5$	22 $22 + 5^2 + 0 + 2 + 5$	23 $2 \times 3 + 5 + 20 + 2 + 5$	24 $2 \times 4 + 5 + 2^2 + 2 + 5$
26 $26 + 5 + 25 + 49 \square$	27 $27 + 12 + 0 + 25$	28 DOP 48848	29 $-2 \times 9 + 5 + (-2 - 5) + 7$	30 $30 + 5 + 2^2 + 2 + 5$	31 $31 + 5 + 2^2 + 25$

THE MATHEMATICS OF RAINFALL

When you hear about rainfall, it's usually measured in millimetres. But normally liquids like water are measured in litres or millilitres. So why millimeters for rainfall? There's a good reason - it's another piece of hidden-in-plain-sight maths!

1mm of rainfall is defined as the amount of rain that, if collected over an area of one square metre, would have a depth of 1mm. So the 1mm refers to the depth of the rain. But how many litres of rain is this?



So if the rain falls over an area of 1m² it will have a depth of 1mm. In other words, 1mm of rainfall means 1 litre for every square metre.

Think of the square metre as the base of a prism (see diagram). If the height of the prism was 1mm, the volume would be 1m x 1m x 1mm (area of the base x height). Before multiplying we have to convert them to the same units. Let's convert them to cm - you'll see why soon!

$$\begin{aligned} \text{Volume} &= \text{Area} \times \text{Height} \\ &= 100\text{cm} \times 100\text{cm} \times 0.1\text{cm} \\ &= 1000\text{cm}^3 \\ \text{And } 1000\text{cm}^3 &= 1\text{ litre} \end{aligned}$$

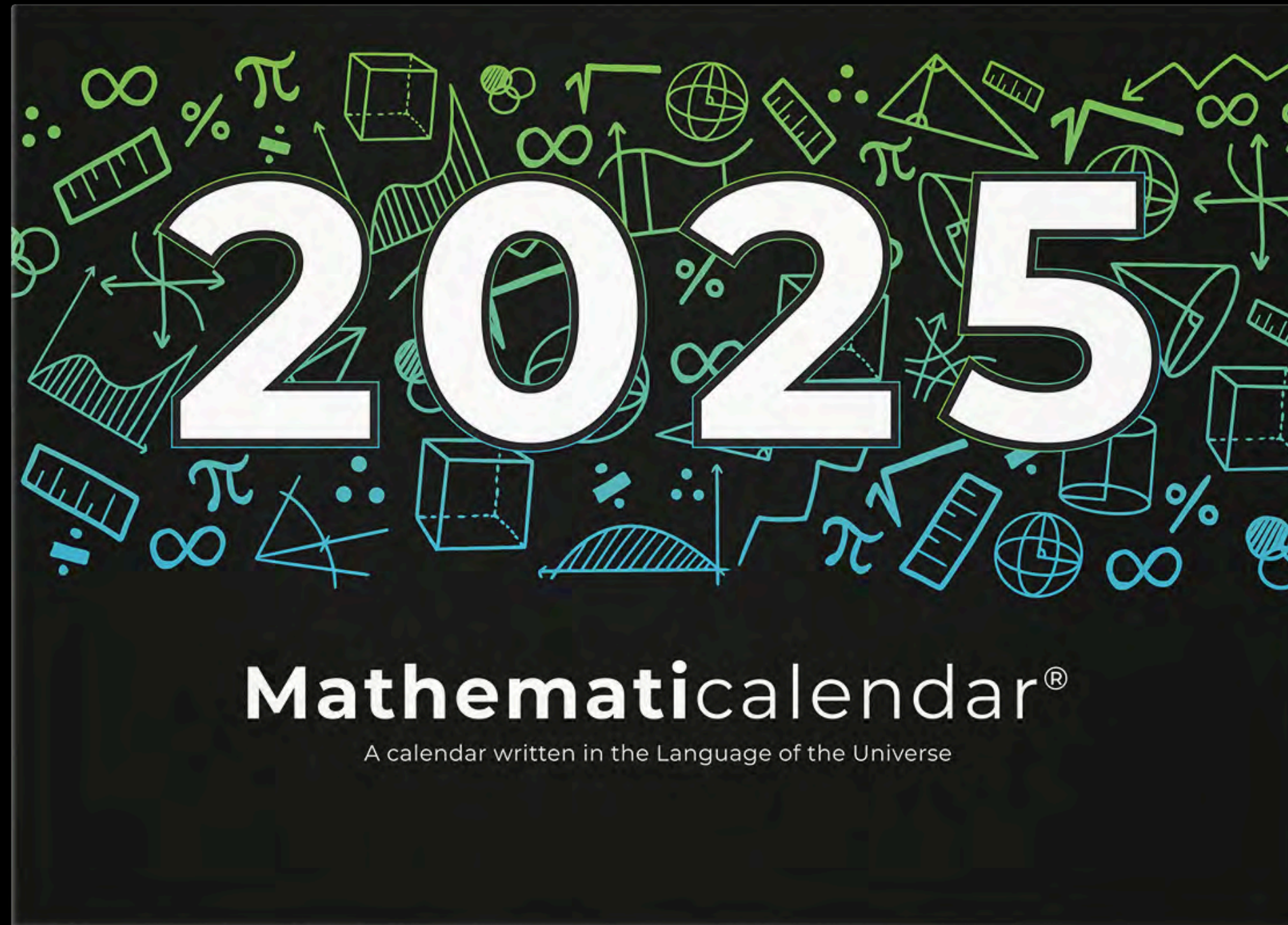
If an area of say 10 km² received 5mm of rain, then every square metre would have received, on average, 5 litres of rain. So the total amount of rain would be 10km² x 5 litres = 10 x 1000m x 1000m x 5L = 50,000,000L, or 50 million litres! This would be more than what 1000 people would drink in their lifetimes! Mind Blowing!

MARCH

MON	TUE	WED	THU	FRI	SAT	SUN
31 Bright Angel Day (90)					1 Day 60	2
3 $3 \times 1 \times 5 + 2 + 5 + 90$	4	5 $5 \times (3 - 2) + 5 + 7$	6 $6 + 3 + 2 + 0 + 2 + 5$	7 $7 + 3 + 2 + 5$	8 $8 + 3 + 25 + 36 \Delta$	9
10 $2^2 + 1^2/2^2 + 1^2/15^2 - 12^2$	11 DOP 65088	12 $5 \times (3 - 2) + 5 + 7$	13 $6 + 3 + 2 + 0 + 2 + 5$	14 Pi Day	15 $8 + 3 + 25 + 36 \Delta$	16
17 $3^2 + 3^2/3^2 + 3^2/3^2 - 3^2$	18 8325 Δ	19 $1 + -23 - 2^2 + 25$	20 $15 + 3 + 2 + 5 + 7$	21 DOP 329210	22 $15 + 3 + 20 + 25$	23
24 $17 + 5 + 25 + 48 \Delta$	25 $2^2 + 2^2/2^2 - 2^2/2^2 + 2^2 - 2^2$	26 $19 + 5 + 2 + 0 + 25$	27 DOP 204952	28 $21 + 3 + 25 + 48 \square$	29 $22 + 5 + 25$	30
31 $2m + 4 + 82 + 5m + 7$	2 $2 + 5 + (-5 - 2 - 0) + 2 + 5$	3 $26 + (-5 - 2) + 0 + 25$	4 $17 + 3 + 25 + 55 \Delta$	5 $28 + 3 + 25$	6 $29 + 32 + 0 + 2 + 5$	

OCTOBER

MON	TUE	WED	THU	FRI	SAT	SUN
		1 $11025 = 105^2 \square$	2 $21025 = 145^2 \square$	3 DOP 213310	4	5 $5 \times 1 / 5 \times 2 / 5 \times 5$
6 $-6 \times 10 = 25p$ $p = ?$	7 $7 + 1 + 0 + 2 + 0 = 2 \times 5$	8 $2^3 / 2^3 + 2^1 / 2^4 + 2^3 + 2^0$	9 $-9 = (1 \times 0 - 2 - 0 - 2 - 5)$	10 101025 Δ	11	12 $1 \times 2^{10+2} + 0 = 2^5$
13 $13 \times 10 + 2 + 0 + 25 = ?$	14 $14 + 10 + 25 = 49 \square$	15 $15 + 10 = 25$	16 $3^5 - 3^2 - 3^0 / 3^2 + 3^0 / 3^3 - 3^1 + 3^0$	17 $1 \times 7 + 1 + 0 = -2 + 0 + 2 \times 5$	18	19 $19 - 10 = 2 + 0 + 2 + 5$
20 $20 + 10 + 25 = 55 \Delta$	21 $2 + 1 \times 1 + 0 = -2 + 5$	22 DOP 673188	23 $2 - 3 - 10 \times 2 + 5 = ?$	24 $5^2 - 1^2 / 3.5^2 - 1.5^2 / 13^2 - 12^2$	25	26 $26 - 1 - 0 = 25$
27 $2 + 7 + 1 + 0 + 2 \times 5$	28 $-2 + 8 + 1 + 0 + 2 + 5$	29 $29 + 10 + 25 = 64 \square$	30 $5 \times 6 / 5 \times 2 / 5 \times 5$	31 $31 + 1 + 0 = 2^5$		



ONLY \$24.95
AT THE MAV STAND

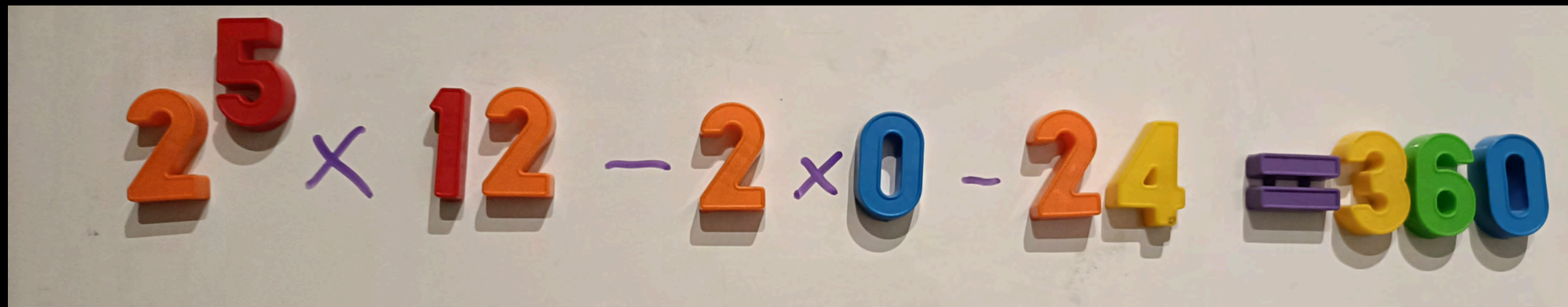
Using the date



Did you find an answer?

Can you make the 2 sides equal
keeping the numbers in the same order?

Using the date


$$2^5 \times 12 - 2 \times 0 - 24 = 360$$

Here's one...

Can you make the 2 sides equal
keeping the numbers in the same order?



Conclusion

1. Blow their Minds!
2. Bring the universe to the classroom
3. Go into the Universe
4. Get Personal
5. A prism to view the world
6. Celebrate!



GO FORTH

AND MULTIPLY!



Thank you!

Paul Bowyer

pbowyer88@gmail.com

0438 856 880

[@mathematicalendar](https://www.instagram.com/mathematicalendar)

Questions?

