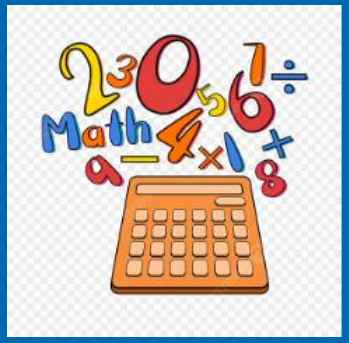
How to help with Maths



Barry Sisk

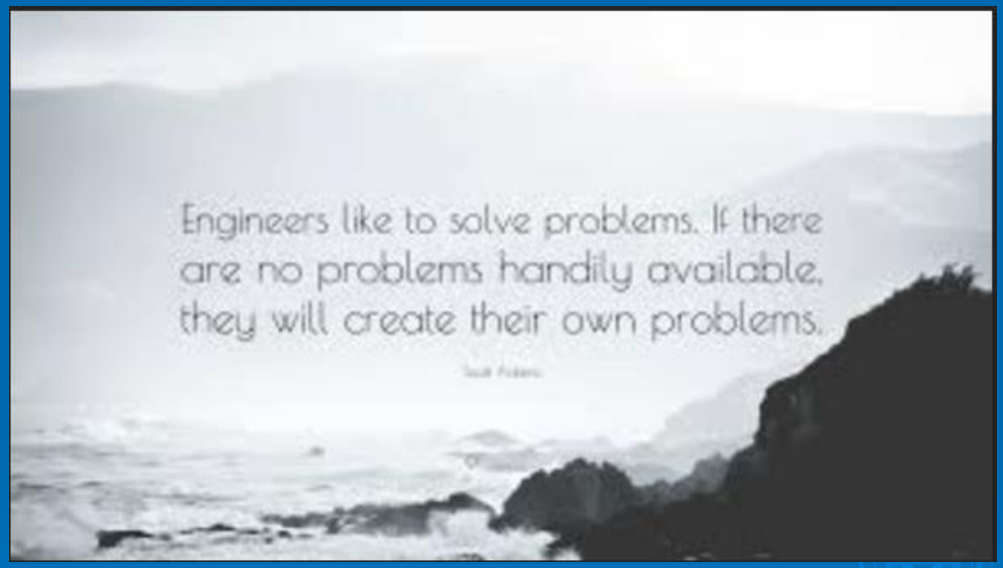
Maths Teacher

Ann Marie O'Brien

Home School Coordinator

Who am I

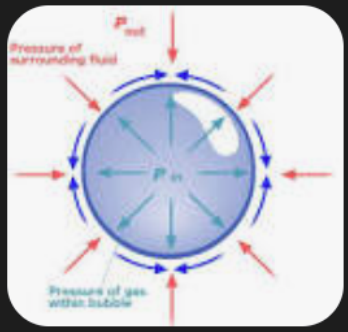
- Barry Sisk
  - 30 Years of Engineering with Intel Corp
  - Switched to Teaching Maths in 2024
  - Passionate about Maths and everything mathematical
  - View life through the lens of Mathematics



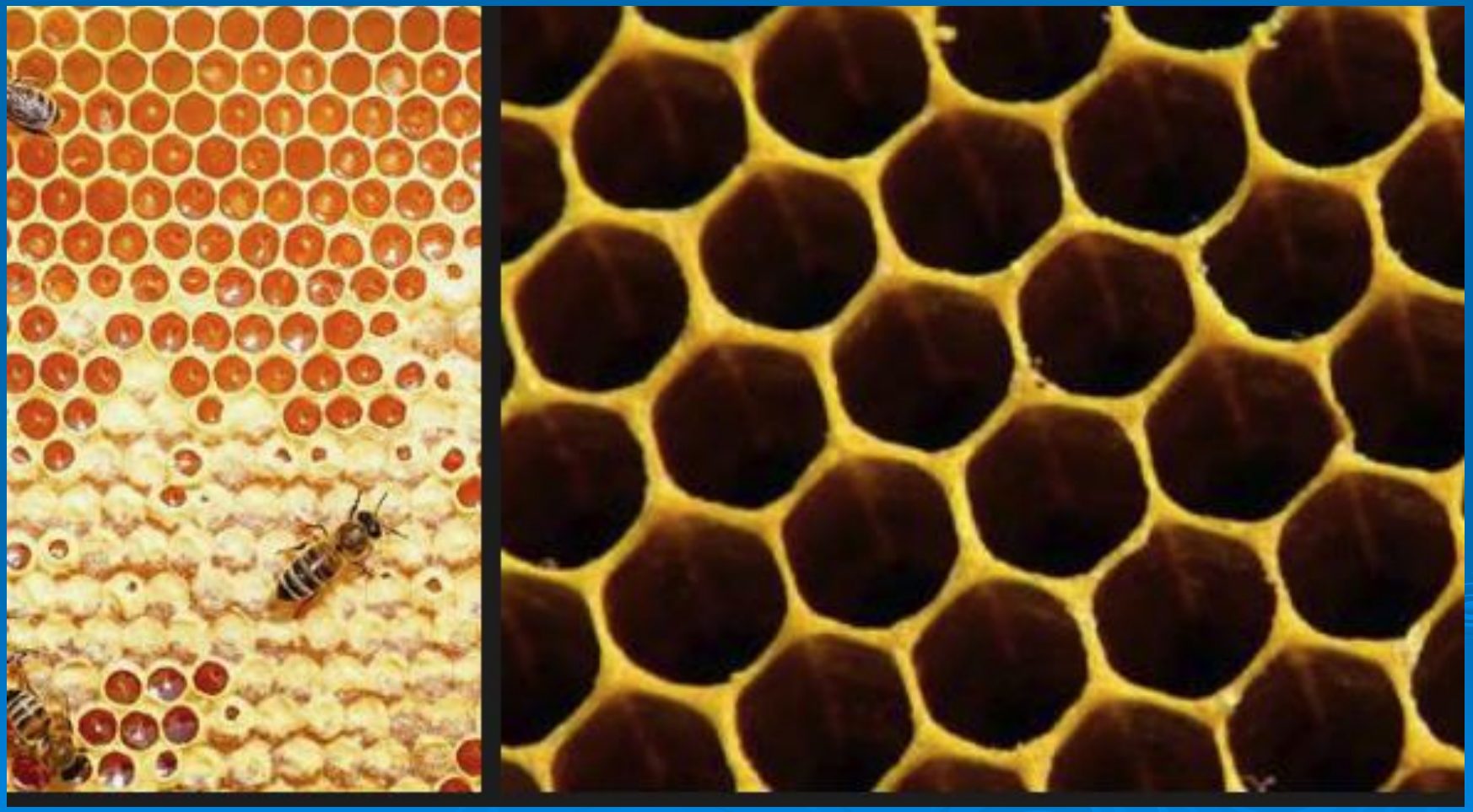
What do you see

What do you see

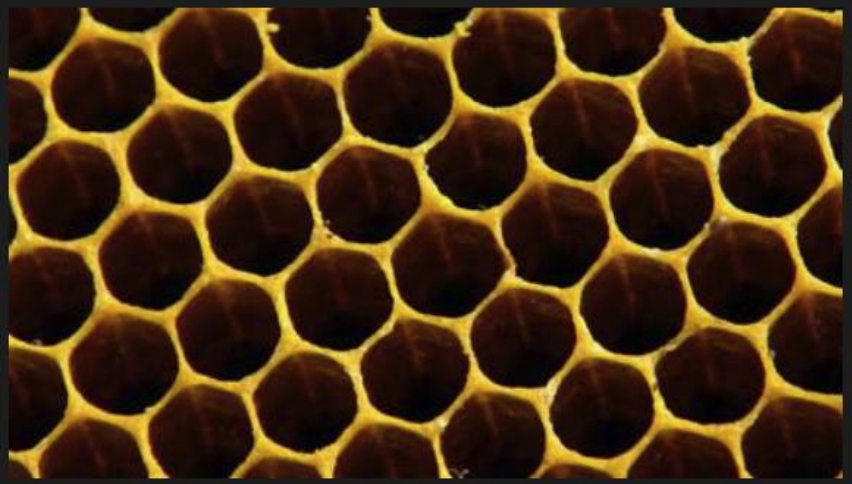
Bubbles are spherical because of surface tension, which pulls the liquid into a shape with the minimum possible surface area, and the sphere is the shape with the lowest surface area for a given volume. Inside the bubble, the air pressure pushes outwards, while surface tension pulls inwards, and a sphere is the resulting shape where these forces are in equilibrium and the film is minimized.

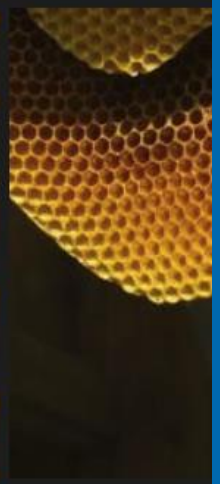


What do you see



What do you see

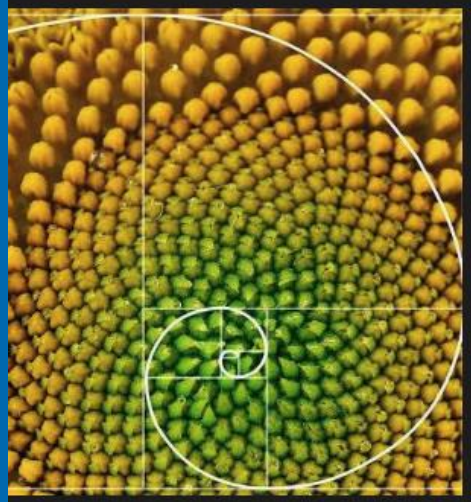


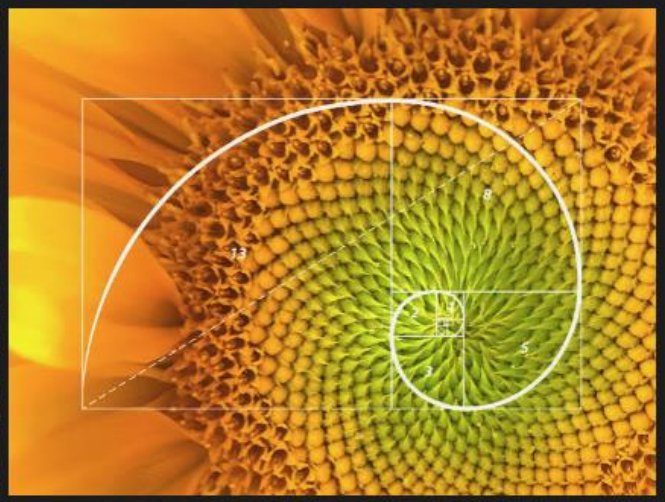


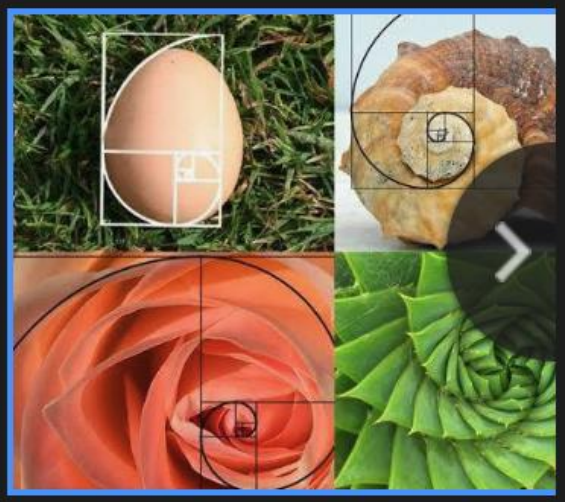
Honeycombs are hexagonal because it is the most efficient shape for maximizin storage space while using the least amount of material, wax. This efficiency is d the hexagonal shape having the smallest perimeter for a given area, which saves l valuable energy and wax. Additionally, hexagons are the only polygon with equal s that can tile a flat surface without any gaps.

What do you see

What do you see

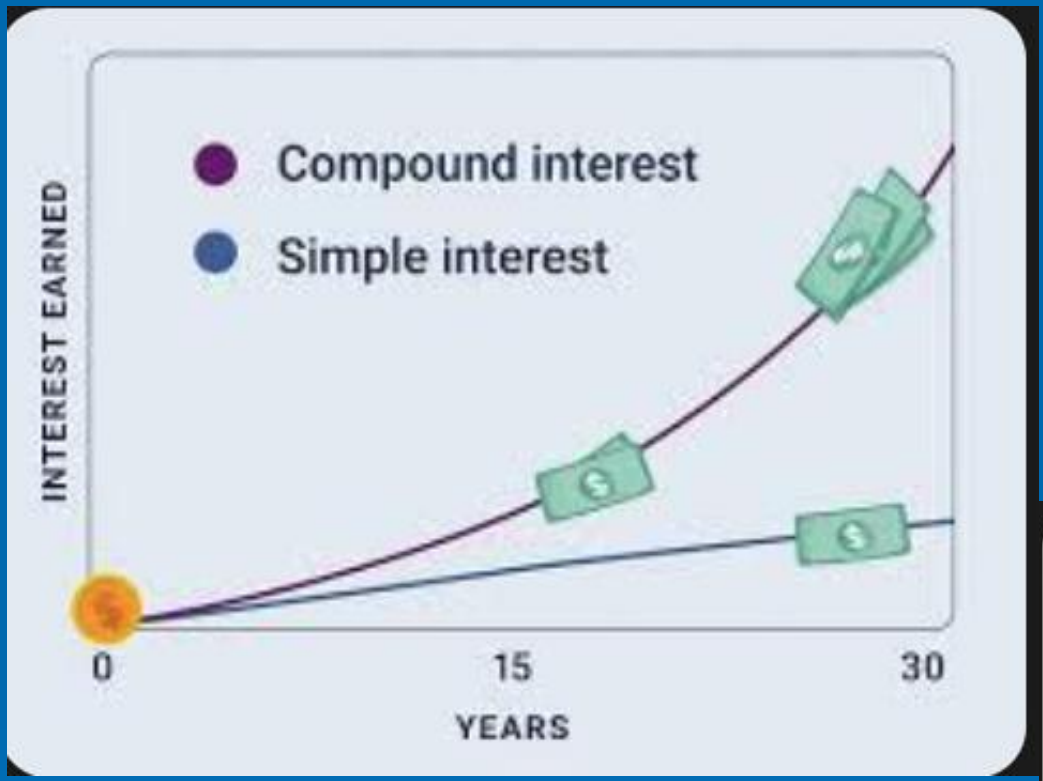


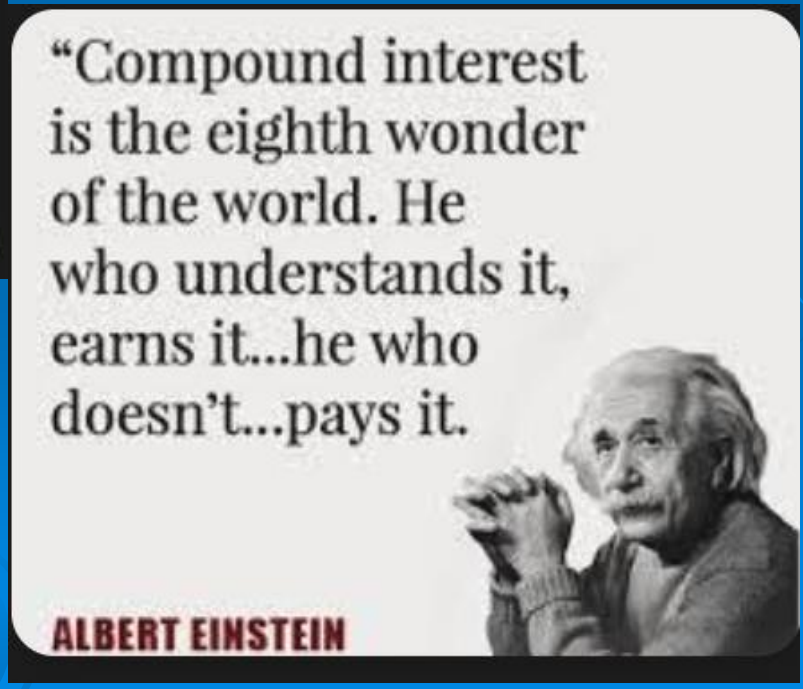




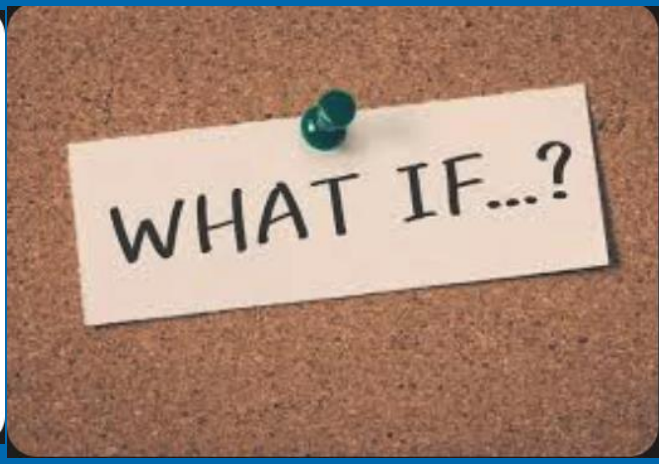
cci sequence appears in nature due to its efficiency in growth and ften seen in the number of petals on flowers (3, 5, 8, 13, 21) and the nt of seeds in a sunflower or pinecone. This is because the pattern, and golden ratio, allow for the most efficient use of space, such as maximizing leaves or fitting the maximum number of seeds into a small area.

What do you see



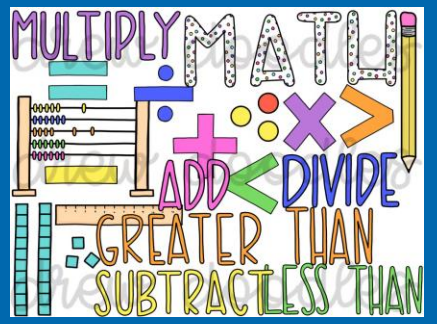


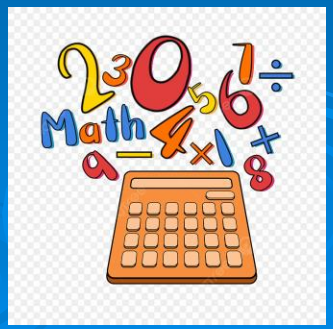
5 Images to Take Away



How to help with Maths at home

- Importance of Maths
- Practical examples of problem solving
- Common calculations
- Providing learning opportunities in the home
- Using the Internet
- Top Tips





Your Maths Level Shapes Your Future Choices

HONOURS MATHS

- 🎓 Leaving Cert Higher Maths
- ⭐ 25 Bonus Points at Leaving Cert
- 🧭 Pathway to Engineering, Science & Business
- 🚀 Keeps Career Doors Open

ORDINARY MATHS

- ⚠ Limited Subject Options
- 📉 Restricts College Courses
- 🔒 No Bonus Points at Leaving Cert
- 📉 Reduced Career Flexibility

Staying at Honours Maths keeps more doors open.
Support and persistence now mean more choices later.

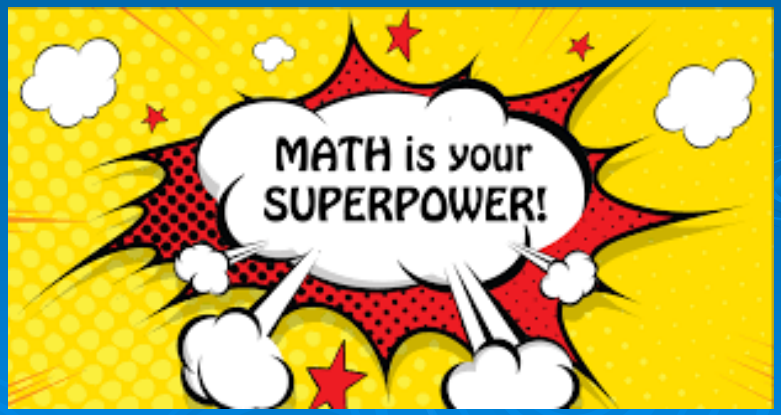
Maths – The Figures

Year	Higher Level	Ordinary Level	Foundation Level	Total Candidates	Total LC candidates	Mathematics as a % of total candidates for LCE
2019	18,153	31,474	5,467	55,094	56,071	98.3
2020	20,520	33,862	2,602	56,984	57,569	98.9
2021	22,919	32,319	2,065	57,303	57,952	98.9
2022	21,265	32,792	3,290	57,347	58,056	98.8
2023	20,516	33,220	3,612	57,348	58,006	98.9
2024	20,330	32,362	3,332	56,024	56,791	98.6

Table 2: Number of students sitting Leaving Certificate Mathematics at higher, ordinary and foundation level 2019-2024

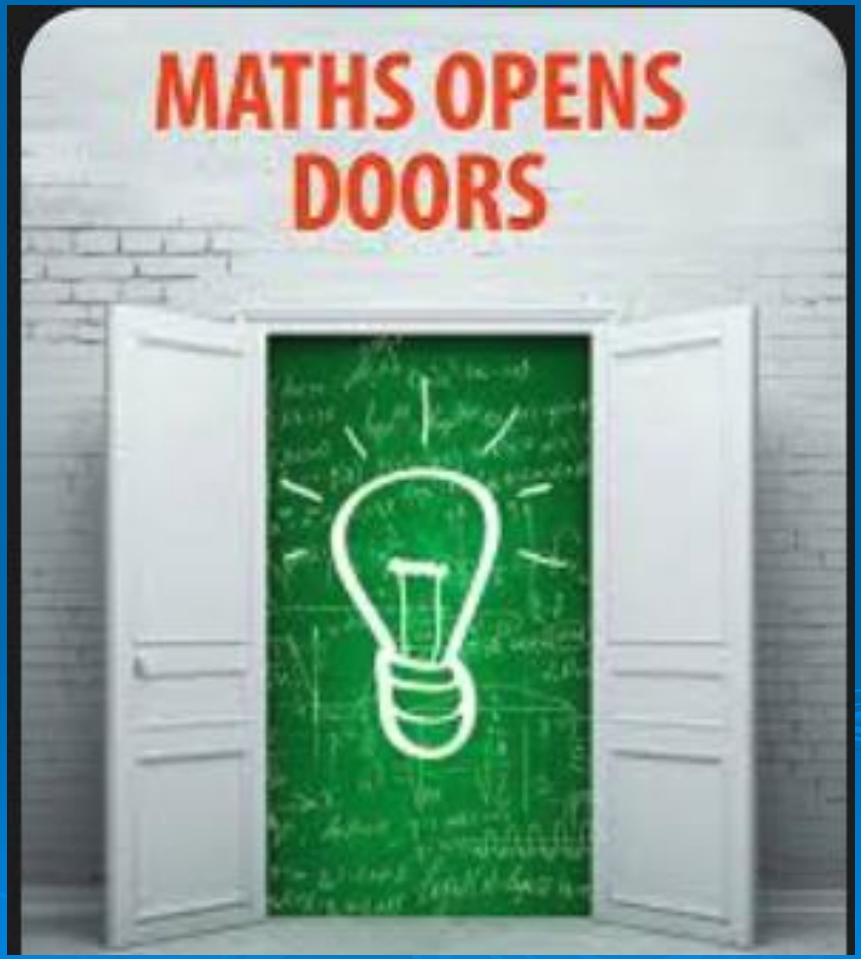
The value of Maths

- Helps develop problem-solving skills and creativity
- Helps develop critical thinking skills (logic and analysis)
- Improves memory and reasoning
- Encourages perseverance
- Improves communication



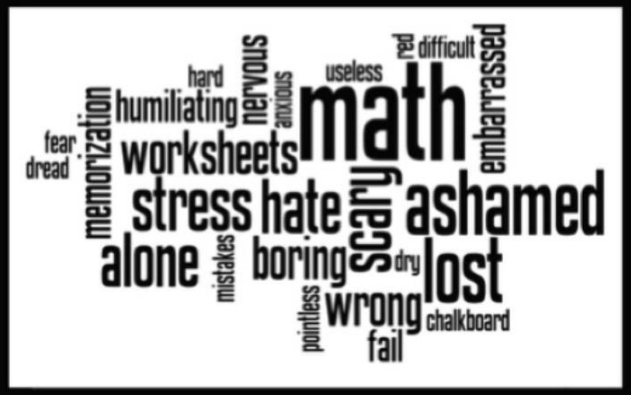
The value of Maths

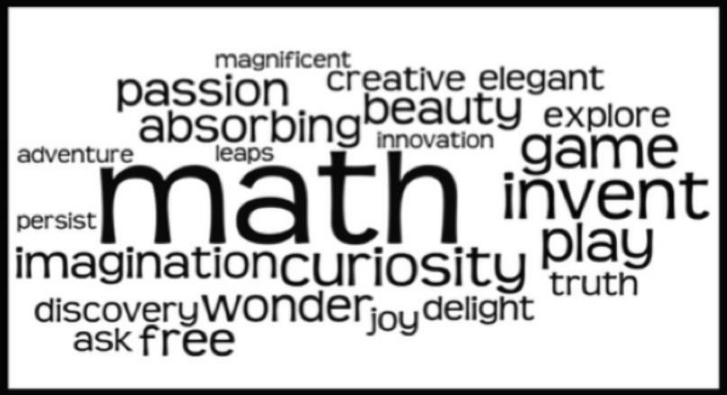
- Improves ability in other relevant subjects (accounting, business, economics, technical graphics, construction etc.)
- Prepares children for handling money sensibly, for business calculations & for courses and careers in sciences, engineering, technology, data analysis, finance and cybersecurity analysis



Changing Perspectives

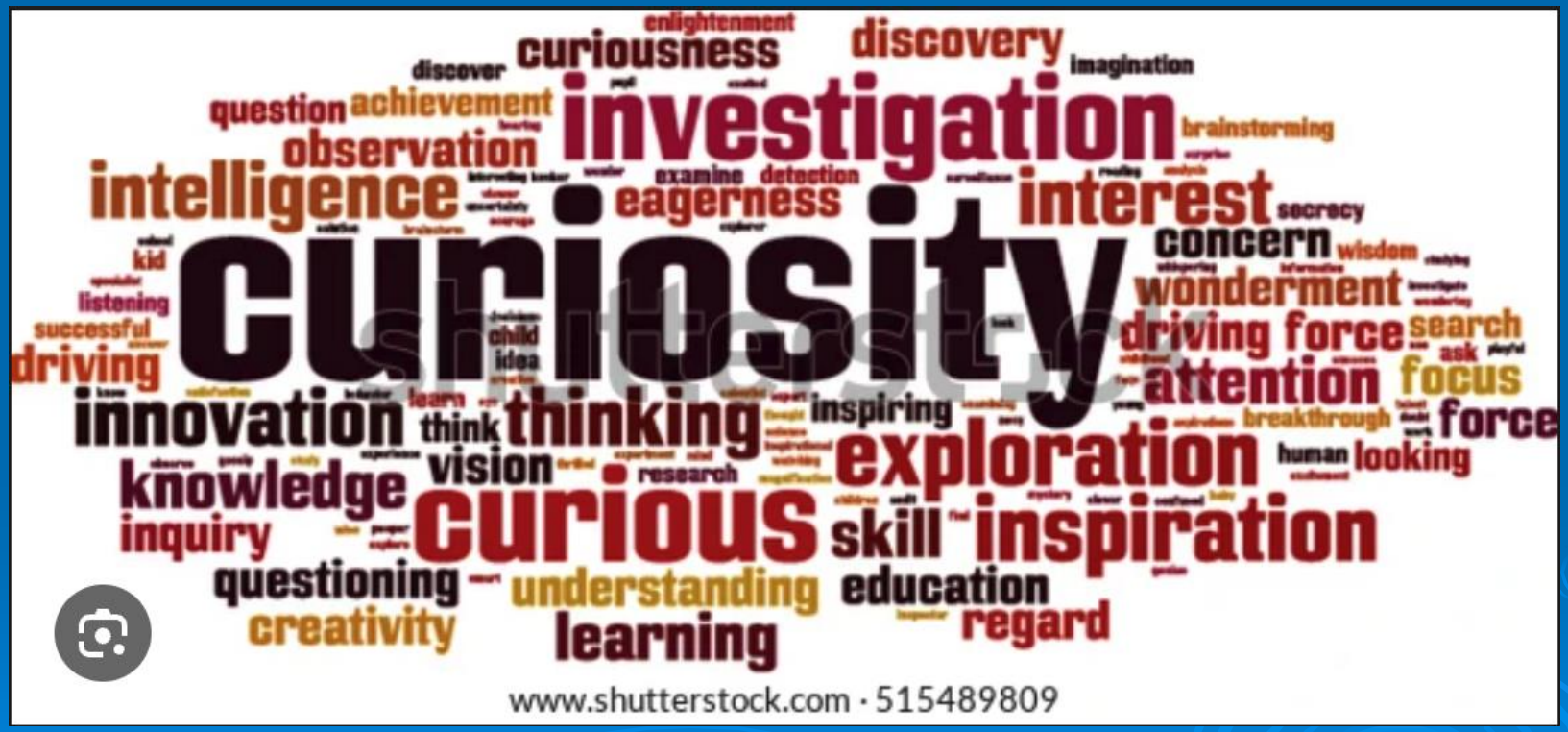
How can we go from here → to here?



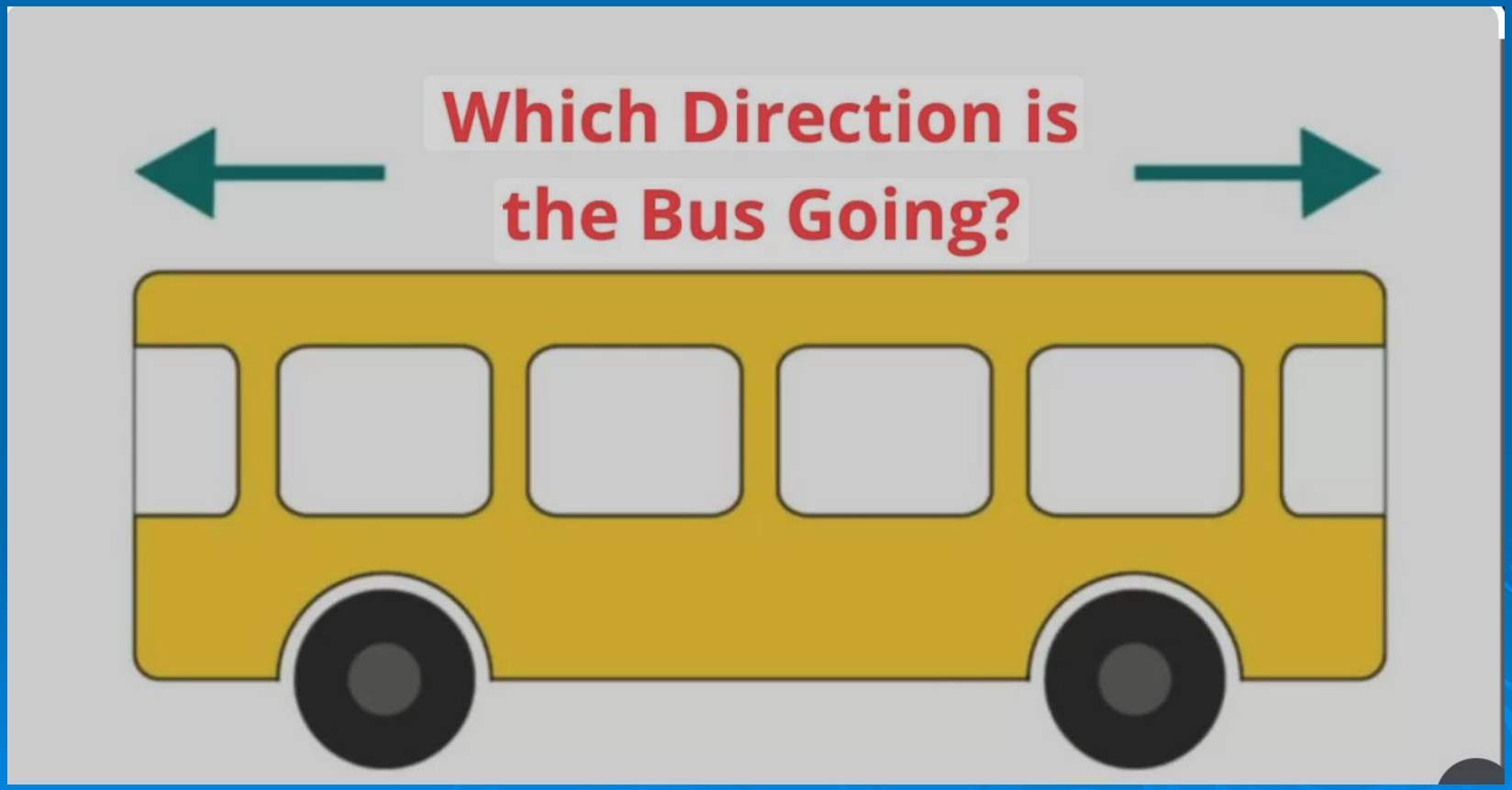


@TracyZager

Build Curiosity and Interest



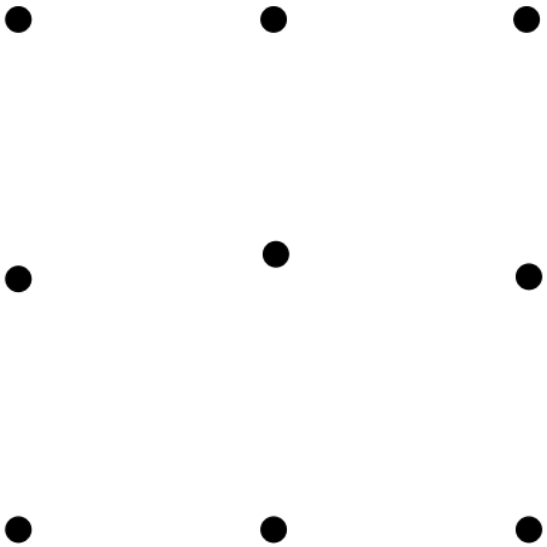
Puzzles – Problem Solving



Puzzle time

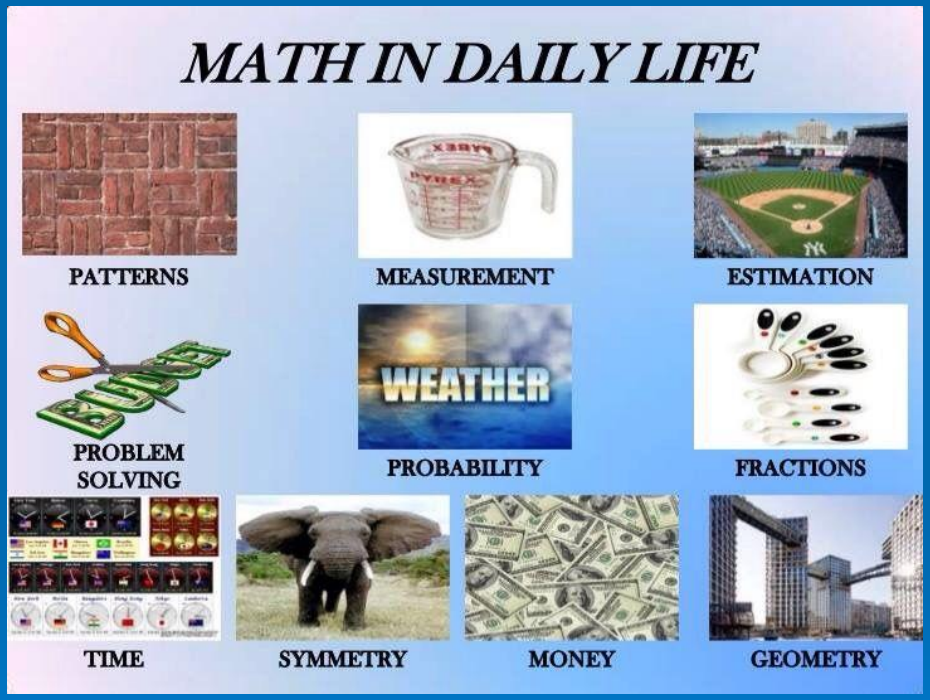
Four lines

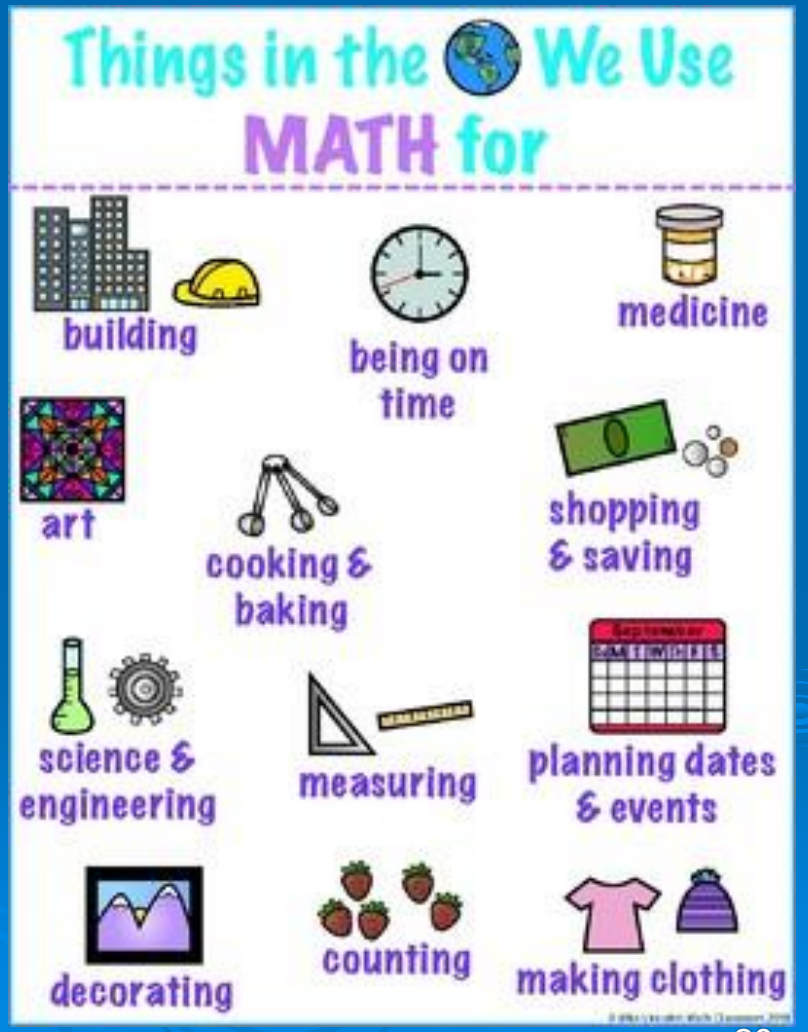
Now this really does need some imaginative thinking - but it is possible!!



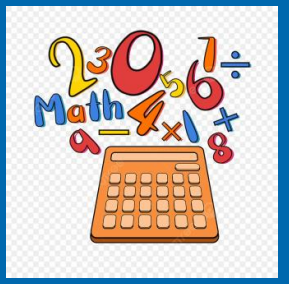
Can you join all nine dots with four straight lines, without taking your pencil off the paper?
You can not go over any line twice.

Making the Connection
Maths in daily life

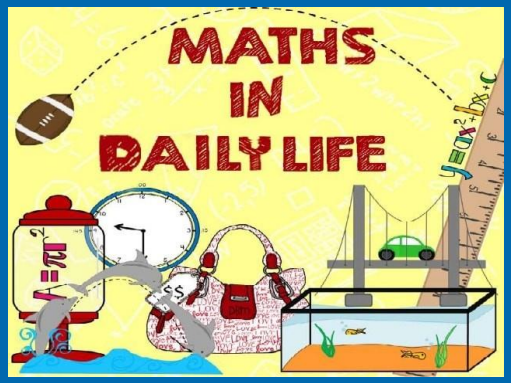




Uses of Maths in our daily life

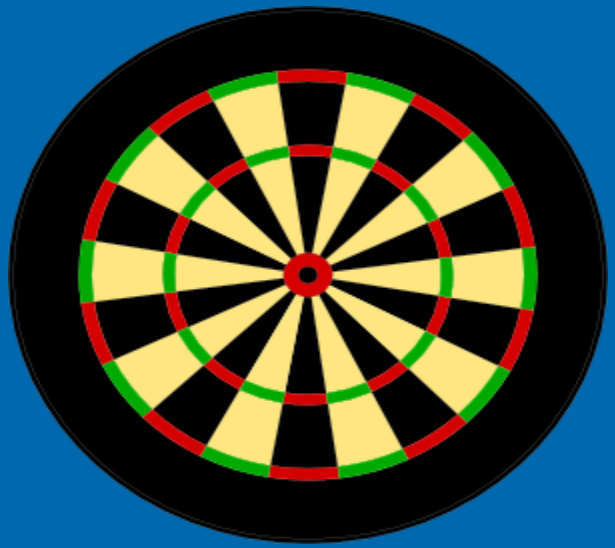


Helps us to…

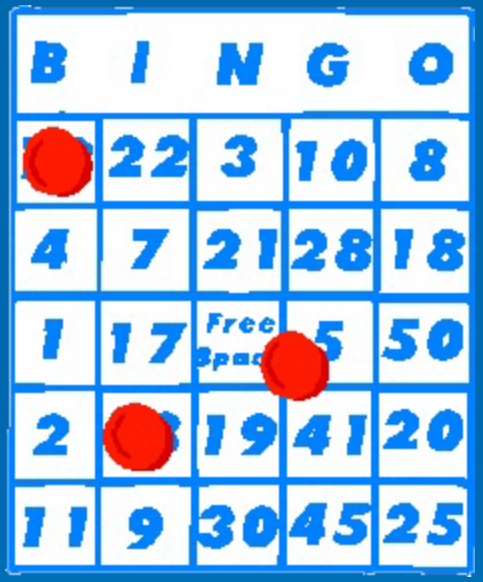


- budget and manage finances
- calculate discounts and final costs
- Measure ingredients
- Plan trips and calculate distances
- Calculate loan payments, interest charges and total costs
- Measure areas and volumes for DIY projects
- Calculate probabilities in everyday situations including in games

Bringing numbers into the home



Games



DICE Game

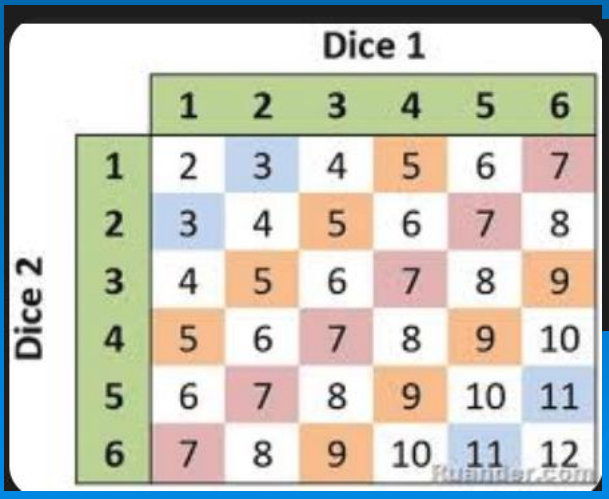
- What is the most common number when rolling 2 Dice

- Why are the number on DICE arranged the way they are (1 v 6 , 2 v 5 , 3 v 4)

DICE Game

When rolling two standard six-sided dice, the most common number is **7**, because it has the highest number of possible combinations (six ways to roll a 7) out of all the possible totals. The combinations are (1,6), (2,5), (3,4), (4,3), (5,2), and (6,1).

- **Highest probability:** The number 7 can be rolled in six different ways: (1,6), (2,5), (3,4), (4,3), (5,2), and (6,1).
- **Other probabilities:** This gives 7 a probability of $6/36$ (or $1/6$). Other sums are less likely, with 2 and 12 being the least common, each with only one combination.



Dice 2 \ Dice 1	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

The numbers on standard dice are arranged opposite each other so they always sum to seven (1 opposite 6, 2 opposite 5, and 3 opposite 4) **to ensure fairness and balance**. This distribution of high and low numbers across the cube creates perfect rotational symmetry, meaning no single side is heavier or more likely to land face-down. This traditional layout has been in use since ancient times, evolving from early designs that already followed this principle to create a standardized, fair die.

Maths Eyes

What is Maths Eyes?

- A way to see the maths that surrounds us in school, at home, in the garden, on the street, in the any other real-world settings
- A new way of looking at familiar things
- Developing communication by providing opportunities to talk about maths
- Identifing fun problems to solve
- Developing understanding
- Seeing how things are connected

3. Maths Eyes in your home

Some examples of what you could ask

- What shapes can you see?
- How many shapes can you see in a room?
- What is the biggest/smallest room where you live
- What is the shape of the different rooms where you live?
- How many windows/doors are there where you live?
- What proportion of each window opens?
- How far do your doors open?
- Do all the doors open in the same direction?
- What proportion of doors lock?
- Where can you see numbers where you live?
- Do all your clocks/devices show the same time?
- How many different measuring things can you find where you live?
- What colour is most used where you live?
- How many different kinds of pattern can you see where you live?
- What types of plants or trees can you see where you live?

Developing Number Sense at Home

Many of the words we use every day relate to estimation e.g., 'almost', 'nearly or 'about'. It is this number sense that should be encouraged when you are using Maths Eyes. Where you live is a great place to develop one's number sense.

Activity

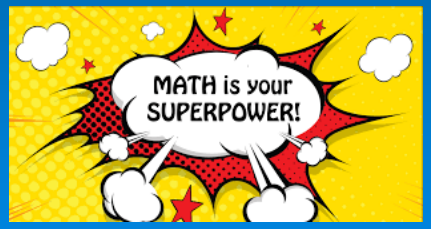
Working as a family, try to produce reasonable estimates to the questions below. Write down the main discussion points or issues you had to talk about for each challenge.

1. How far is it from the front door of where you live to the room you are sitting in now?
2. What is the weight of an egg? Is it similar for all eggs?
3. How far is it to the nearest shop from where you live?
4. How wide is a toilet roll?
5. How high is the ceiling?
6. What is the weight of a pot of water?
7. If everyone in the room lay head to toe, how far would you stretch?
8. What is the biggest rectangle where you live?
9. Estimate how many plugs there are where you live.
   (Estimations can be checked later using equipment).

Resource: Related activity 'Mix and Match' available page 32 of the Maths Eyes guide available at http://www.haveyougotmathseyes.com/wp-content/uploads/resources/mathseyes_resource_pack.pdf

Using money & shopping

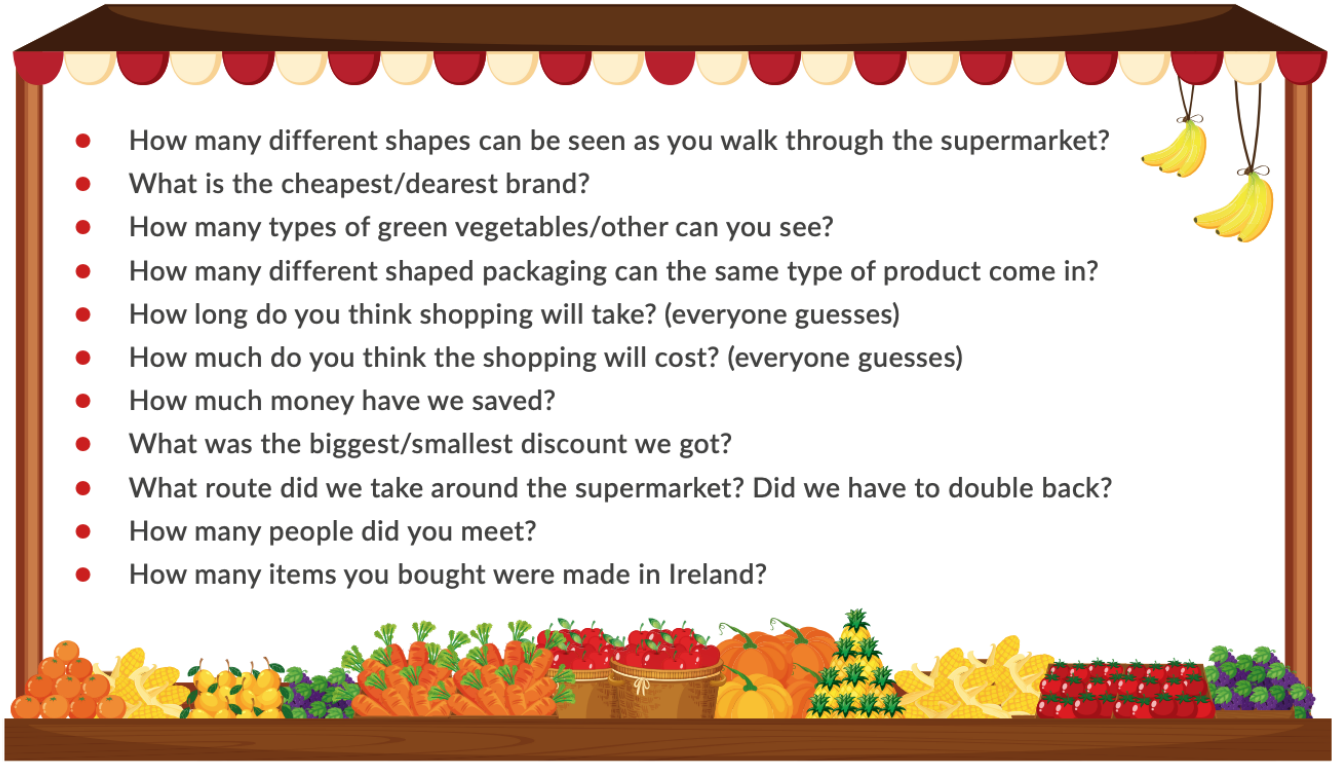
- Supermarket special offers brochure
- Advertisements
- Takeaway menus



1. Shopping with Maths Eyes

Shopping is a great activity to use and develop Maths Eyes.

Examples of questions that encourage the use of your Maths Eyes when shopping.

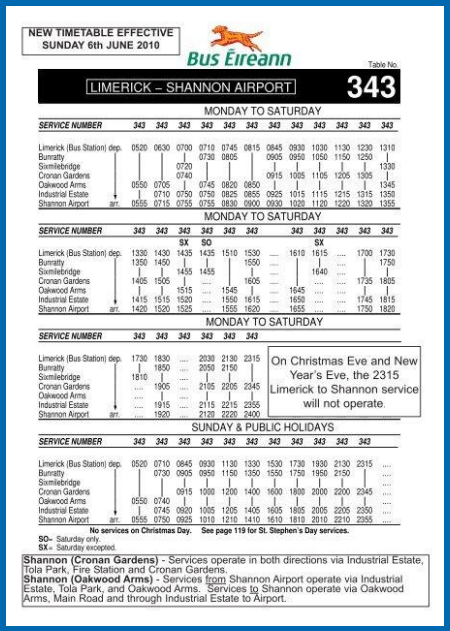


- How many different shapes can be seen as you walk through the supermarket?
- What is the cheapest/dearest brand?
- How many types of green vegetables/other can you see?
- How many different shaped packaging can the same type of product come in?
- How long do you think shopping will take? (everyone guesses)
- How much do you think the shopping will cost? (everyone guesses)
- How much money have we saved?
- What was the biggest/smallest discount we got?
- What route did we take around the supermarket? Did we have to double back?
- How many people did you meet?
- How many items you bought were made in Ireland?

2

Plan a day out or family holiday

- Holiday brochures
- Bus and train timetables
- Set a budget
- Work out cost of food and tickets
- Work out distance and time journeys will take


NEW TIMETABLE EFFECTIVE
SUNDAY 6th JUNE 2010

Bus Éireann

Table No.

LIMERICK – SHANNON AIRPORT 343

MONDAY TO SATURDAY

SERVICE NUMBER	343	343	343	343	343	343	343	343	343	343	343	343
Limerick (Bus Station) dep.	0520	0630	0700	0710	0745	0815	0845	0930	1030	1130	1230	1310
Bunratty				0730	0805		0905	0950	1050	1150	1250	
Sixmilebridge			0720									1330
Cronan Gardens			0740				0915	1005	1105	1205	1305	
Oakwood Arms	0550	0705		0745	0820	0850						1345
Industrial Estate		0710	0750	0750	0825	0855	0925	1015	1115	1215	1315	1350
Shannon Airport arr.	0555	0715	0755	0755	0830	0900	0930	1020	1120	1220	1320	1355

MONDAY TO SATURDAY

SERVICE NUMBER	343	343	343	SX	SO	343	343	343	343	SX	343	343	343
Limerick (Bus Station) dep.	1330	1430	1435	1435	1510	1530	....	1610	1615	....	1700	1730
Bunratty	1350	1450				1550	....		....	....		1750
Sixmilebridge			1455	1455			....		1640	....		
Cronan Gardens	1405	1505		....	....	1605	....		....	....	1735	1805
Oakwood Arms			1515	....	1545		....	1645	....	....		
Industrial Estate	1415	1515	1520	....	1550	1615	....	1650	....	....	1745	1815
Shannon Airport arr.	1420	1520	1525	....	1555	1620	....	1655	....	....	1750	1820

MONDAY TO SATURDAY

SERVICE NUMBER	343	343	343	343	343	343
Limerick (Bus Station) dep.	1730	1830	....	2030	2130	2315
Bunratty		1850	....	2050	2150	
Sixmilebridge	1810		....			
Cronan Gardens	....	1905	....	2105	2205	2345
Oakwood Arms	....		....			
Industrial Estate	....	1915	....	2115	2215	2355
Shannon Airport arr.	....	1920	....	2120	2220	2400

On Christmas Eve and New Year's Eve, the 2315 Limerick to Shannon service will not operate.

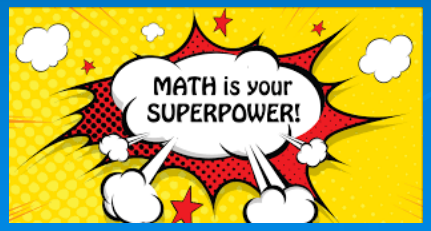
SUNDAY & PUBLIC HOLIDAYS

SERVICE NUMBER	343	343	343	343	343	343	343	343	343	343	343	343
Limerick (Bus Station) dep.	0520	0710	0845	0930	1130	1330	1530	1730	1930	2130	2315	....
Bunratty		0730	0905	0950	1150	1350	1550	1750	1950	2150		....
Sixmilebridge												....
Cronan Gardens			0915	1000	1200	1400	1600	1800	2000	2200	2345	....
Oakwood Arms	0550	0740										....
Industrial Estate		0745	0920	1005	1205	1405	1605	1805	2005	2205	2350	....
Shannon Airport arr.	0555	0750	0925	1010	1210	1410	1610	1810	2010	2210	2355	....

No services on Christmas Day. See page 119 for St. Stephen's Day services.

SO– Saturday only.
SX– Saturday excepted.

Shannon (Cronan Gardens) - Services operate in both directions via Industrial Estate, Tola Park, Fire Station and Cronan Gardens.
Shannon (Oakwood Arms) - Services from Shannon Airport operate via Industrial Estate, Tola Park, and Oakwood Arms. Services to Shannon operate via Oakwood Arms, Main Road and through Industrial Estate to Airport.



2. Looking at sport with Maths Eyes

Participating in and watching sport is a great activity to use and develop Maths Eyes.

Examples of the kinds of questions to ask.

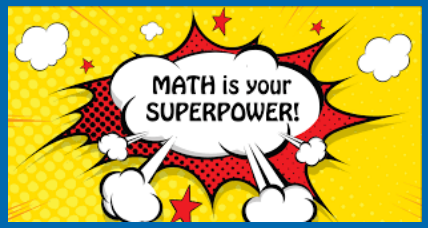
- How many players are on each team?
- How big is the full panel of players for a match?
- How long does a match take?
- How does the scoring work?
- What are the chances of there being a draw?
- What distance would a single player cover in one half?
- Can you track how much your team has the ball or how long the ball is in play?
- Is the pitch level?
- Can you point out some lines of symmetry on the pitch?
- What impact does the weather have on how the players play?
- How would you work out how to calculate the amount of time a team is in their opponent's half of the pitch?
- Is the number of supporters present at a match influenced by the teams that are playing?
- What proportion of the stadium is full/empty?
- Is there a pattern to the scoring?

Other sports and activities

Nearly all sports and activites have some mathematics associated with them. Some examples are given below.

Sport/Activty	Mathematics
Walking	Distance, speed, uphill/downhill/level, wind, temperature, direction
Music	Counting, rhythm, scales, intervals, patterns, symbols, harmonies, time signatures, overtones, tone, pitch
Bird Watching	Type/size eggs or nests Equipment e.g., magnification in binoculars Speed/distance/migration (pattern) Flight pattern Formation, number, shape
Soccer/Rugby	Dimension of pitch, scores time, points ranking, relationship between teams playing and supporters attending
Playing darts	Shape, scores, scoring, combinations, patterns, doubling, tripling
Playing Board Games (e.g., ludo, draughts, chess)	Shape, number, strategy, rules, chance, types of moves

TV Guides



- Length of individual programmes

- How much time does a channel give to sports coverage, soaps or travel programmes

TV Guide Magazine Grids

DATE | PRIMETIME | DAYTIME | EASTERN/CENTRAL | PACIFIC

WEDNESDAY OCTOBER 18

Eastern Central	7:00pm 6:00pm	7:30pm 6:30pm	8:00pm 7:00pm	8:30pm 7:30pm	9:00pm 8:00pm	9:30pm 8:30pm	10:00pm 9:00pm	10:30pm 9:30pm
BROADCAST								
ABC	**Local Programming**		**Celebrity Jeopardy!**: Celebrity contestants Steven Weber, Shane Battier and Melissa Fumero. TV-PG-L NEW		**Celebrity Wheel of Fortune**: Celebrity contestants Rashad Jennings, Marcellus Wiley and Jared Allen. TV-PG NEW		**The $100,000 Pyramid**: Bobby Moynihan vs. Natasha Leggero and Lisa Ann Walter vs. Tip "T.I." Harris. TV-PG-D NEW	
CBS	**Local Programming**		**Survivor**: Tribes must dig deep in the immunity challenge to land a win and earn safety for one more night; the fourth person is voted out of the game. TV-PG-L NEW			**The Amazing Race**: Teams continue racing in Vietnam and face the hustle and bustle of a congested Vietnamese market, where they must properly set up a fish stand and deliver mattresses to a local hotel. TV-PG NEW		
THE CW	**Local Programming**		**Sullivan's Crossing**: The annual land blessing is thrown into disarray when one of the campers goes missing. TV-PG-DLV NEW		**The Spencer Sisters**: Darby and Victoria investigate stolen intellectual property for a trio of Silicon Valley-style tech developers. TV-PG-DL NEW		**Local Programming**	
FOX	**Local Programming**		**The Masked Singer**: Celebrating the music of Elton John. TV-PG NEW		(9:02) **Snake Oil**: Celebrities Will Arnett and Brad Paisley serve as guest advisers. TV-14-DL NEW		**Local Programming**	
NBC	**Local Programming**		**Quantum Leap**: Now a government agent, Ben investigates unexplained extraterrestrial activity; after a mysterious incident in New Mexico, two young girls' lives are on the line; Ben meets Hannah Carson, who may be more than she appears. TV-PG-LV NEW		**Magnum P.I.**: Magnum and Higgins enlist Katsumoto to go under cover when a high-end restaurant chef goes missing; Kumu works with Cade at the cultural center, confronting America's dark chapter of the internment of Japanese Americans in the wake of Pearl Harbor. NEW		**Chicago Fire**: Mouch builds a classic firetruck model for the Deputy District Chief but needs assistance from Gallo and Ritter; Brett and Violet encounter multiple victims with a strange set of symptoms; Cindy's chemotherapy results loom over the Herrmann family. TV-14	
PBS	**PBS NewsHour**: Co-anchors Amna Nawaz and Geoff Bennett and correspondents offer in-depth analysis of current events. NEW		**Nature**: Peter Walsh studies the life of the platypus in Tasmania. TV-PG NEW		**NOVA**: Exploring how some of the earliest life emerged on Earth. TV-PG NEW		**Secrets of the Dead**: Discovering the world of dinosaur fossil collecting, including perspectives from private collectors and paleontologists on the largest Triceratops fossil ever found. TV-PG NEW	
CABLE								
A&E	**The First 48**: Dallas police detectives sift through a web of lies to find the person who gunned down a good Samaritan. TV-14-LV		**The First 48**: Desperate to stop the senseless shootings in her community, Detective Kenyata KeeKee Taylor must find out why the latest teen victim was wearing a ski mask		**The First 48**: Tulsa, Okla., detectives race to find the perpetrator of a vicious hammer attack that leaves two young men clinging to life; a selfless act performed by an Atlanta man leads to his		(10:01) **The First 48**: In Mobile, Ala., the murder of a 19-year-old becomes personal when the team learns that the victim is Detective Jermaine Rogers' cousin; in Tulsa, Okla., a 31-year-old	

Problem Solving

- Step 1 - Read the problem
- Step 2 - Organise the calculation

- Step 3 - Answer the calculation
- Step 4 - Answer the problem

Puzzle time

Code breaker

A code is a way of writing a message in secret.
The code below is very easy.
Each letter of the alphabet is replaced by a number.
Send your message in numbers and then your friend can use the de-coder to find out what it says.

THE DE-CODER

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
14	15	16	17	18	19	20	21	22	23	24	25	26

So, if I want to write 'hello' I would write 8 for H, 5 for E, 12 for L and 12 for L again and then 15 for 0.
My code would be 8 5 12 12 15

Now try and work out what this says.

The code:

9			1	13		2	18	9	12	12	9	1	14	20
1	20		13	1	20	8	19							

Fun with Estimations

So who was Enrico Fermi and what are Fermi Problems…?

One super smart dude..!

- Named after the Italian-American University of Chicago professor and noted 20th century physicist and Nobel Prize-winner
- Fermi problems are math word problems that require making educated guesses using estimation skills and prior knowledge
- Fermi problems are solved by breaking the complex problem into smaller ones and using estimation skills to continuously refine your

How Many Basketballs in a Double Decker Bus

- What is the volume of a bus ? How Many Square Meters
- What is the volume of a basketball ? How Many per Square Meter
- What about the seating ?
- How Many Golf Balls ?

How Many Kitchen Rolls would fill your Kitchen

- What is the volume of a an average Kitchen? How Many Square Meters
- What is the volume of a pack of Kitchen rolls ? How Many per Square Meter
- What if you could compress them ?

Practice, Practice , Practice

- Build proficiency through practice
- Use Corbett Math Worksheets to build competence , proficiency and confidence
  - WWW.CORBETTMaths.com
- CBA (Class Based Assessment) in Year 2

Key Skills of Junior Cycle

An tSraith Shóisearach do Mhúinteoirí

Junior CYCLE for teachers

Junior Cycle Mathematics Learning Outcomes

Unifying strand

Elements

Building blocks

Students should be able to:

- U.1 recall and demonstrate understanding of the fundamental concepts and procedures that underpin each strand
- U.2 apply the procedures associated with each strand accurately, effectively, and appropriately
- U.3. recognise that equality is a relationship in which two mathematical expressions have the same value

Representation

Students should be able to:

- U.4 represent a mathematical situation in a variety of different ways, including: numerically, algebraically, graphically, physically, in words; and to interpret, analyse, and compare such representations

Connections

Students should be able to:

- U.5 make connections within and between strands
- U.6 make connections between mathematics and the real world

Problem solving

Students should be able to:

- U.7 make sense of a given problem, and if necessary mathematise a situation
- U.8 apply their knowledge and skills to solve a problem, including decomposing it into manageable parts and/or simplifying it using appropriate assumptions
- U.9 interpret their solution to a problem in terms of the original question
- U.10 evaluate different possible solutions to a problem, including evaluating the reasonableness of the solutions, and exploring possible improvements and/or limitations of the solutions (if any)

Generalisation and proof

Students should be able to:

- U.11 generate general mathematical statements or conjectures based on specific instances
- U.12 generate and evaluate mathematical arguments and proofs

Communication

Students should be able to:

- U.13 communicate mathematics effectively: justify their reasoning, interpret their results, explain their conclusions, and use the language and notation of mathematics to express mathematical ideas precisely

Number strand

Students should be able to:

N.1 investigate the representation of numbers and arithmetic operations so that they can:

a. represent the operations of addition, subtraction, multiplication, and division in N, Z, and Q using models including the number line, decomposition, and accumulating groups of equal size

b. perform the operations of addition, subtraction, multiplication, and division and understand the relationship between these operations and the properties: commutative, associative and distributive in N, Z, and Q **and in R\Q, including operating on surds**

c. explore numbers written as a^0 (in index form) so that they can

I. flexibly translate between whole numbers and index representation of numbers

II. use and apply generalisations such as $a^0 a^q = a^{p+q}$; $(a^p)/(a^q) = a^{p-q}$; $(a^p)^q = a^{pq}$; and $n^{1/2} = \sqrt{n}$, for $a \in Z$, and p, q, p–q, $\sqrt{n} \in N$ **and for a, b, $\sqrt{n} \in R$, and p, q ∈ Q**

III. use and apply generalisations such as $a^0 = 1$; $a^{p/q} = \sqrt[q]{a^p} = (\sqrt[q]{a})^p$; $a^{-r} = 1/(a^r)$; $(ab)^r = a^r b^r$; and $(a/b)^r = (a^r)/(b^r)$, for a, b ∈ R; p, q ∈ Z; and r ∈ Q

IV. generalise numerical relationships involving operations involving numbers written in index form

V. correctly use the order of arithmetic and index operations including the use of brackets

d. calculate and interpret factors (including the highest common factor), multiples (including the lowest common multiple), and prime numbers

e. present numerical answers to the degree of accuracy specified, for example, correct to the nearest hundred, to two decimal places, or to three significant figures

f. convert the number p in decimal form to the form $a \times 10^n$, where $1 \le a < 10$, $n \in Z$, $p \in Q$, and $p \ge 1$ **and $0 < p < 1$**

N.2 investigate equivalent representations of rational numbers so that they can:

a. flexibly convert between fractions, decimals, and percentages

b. use and understand ratio and proportion

c. solve money-related problems including those involving bills, VAT, profit or loss, % profit or loss (on the cost price), cost price, selling price, compound interest for not more than 3 years, income tax (standard rate only), net pay (including other deductions of specified amounts), value for money calculations and judgements, **mark up (profit as a % of cost price), margin (profit as a % of selling price), compound interest, income tax and net pay (including other deductions)**

N.3 investigate situations involving proportionality so that they can:

a. use absolute and relative comparison where appropriate

b. solve problems involving proportionality including those involving currency conversion and those involving average speed, distance, and time

N.4 analyse numerical patterns in different ways, including making out tables and graphs, and continue such patterns

N.5 explore the concept of a set so that they can:

a. understand the concept of a set as a well-defined collection of elements, and that set equality is a relationship where two sets have the same elements

b. define sets by listing their elements, if finite (including in a 2-set or **3-set** Venn diagram), or by generating rules that define them

c. use and understand suitable set notation and terminology, including null set, Ø, subset, ⊂, complement, element, ∈, universal set, cardinal number, #, intersection, ∩, union, ∪, set difference, \, N, Z, Q, R, and R\Q

d. perform the operations of intersection and union on 2 sets **and on 3 sets**, set difference, and complement, including the use of brackets to define the order of operations

e. investigate whether the set operations of intersection, union, and difference are commutative and/or associative

Geometry and trigonometry strand

Students should be able to:

GT.1 calculate, interpret, and apply units of measure and time

GT.2 investigate 2D shapes and 3D solids so that they can:

a. draw and interpret scaled diagrams

b. draw and interpret nets of rectangular solids, **prisms (polygonal bases), cylinders**

c. find the perimeter and area of plane figures made from combinations of discs, triangles, and rectangles, including relevant operations involving pi

d. find the volume of rectangular solids, cylinders, **triangular-based prisms, spheres,** and combinations of these, including relevant operations involving pi

e. find the surface area and **curved surface area (as appropriate)** of rectangular solids, **cylinders, triangular-based prisms, spheres,** and combinations of these

GT.3 investigate the concept of proof through their engagement with geometry so that they can:

a. perform constructions 1 to 15 in *Geometry for Post-Primary School Mathematics* (**constructions 3 and 7 at HL only**)

b. recall and use the concepts, axioms, theorems, corollaries and converses, specified in *Geometry for Post-Primary School Mathematics* (section 9 for OL and **section 10 for HL**)

I. axioms 1, 2, 3, 4 and 5

II. theorems 1, 2, 3, 4, 5, 6, 9, 10, 13, 14, 15 **and 11, 12, 19,** and appropriate converses including relevant operations involving square roots

III. corollaries 3, 4 **and 1, 2, 5** and appropriate converses

c. use **and explain** the terms: theorem, proof, axiom, corollary, converse, and implies

d. create and evaluate proofs of geometrical propositions

e. display understanding of the proofs of theorems 1, 2, 3, 4, 5, 6, 9, 10, 14, 15, **and 13, 19**; and of corollaries 3, 4, **and 1, 2, 5** (full formal proofs are not examinable)

GT.4 evaluate and use trigonometric ratios (sin, cos, and tan, defined in terms of right-angled triangles) and their inverses, involving angles between 0° and 90° at integer values **and in decimal form**

GT.5 investigate properties of points, lines and line segments in the co-ordinate plane so that they can:

a. find and interpret: distance, midpoint, slope, point of intersection, and slopes of parallel **and perpendicular** lines

b. draw graphs of line segments and interpret such graphs in context, including discussing the rate of change (slope) and the y intercept

c. find and interpret the equation of a line in the form $y = mx + c$; $y - y_1 = m(x - x_1)$; **and $ax + by + c = 0$** (for a, b, c, m, x_1 $y_1 \in Q$); including finding the slope, the y intercept, and other points on the line.

GT.6 investigate transformations of simple objects so that they can:

a. recognise and draw the image of points and objects under translation, central symmetry, axial symmetry, and rotation

b. draw the axes of symmetry in shapes

Algebra and functions strand

Students should be able to:

AF.1 investigate patterns and relationships (linear, quadratic, doubling and tripling) in number, spatial patterns and real-world phenomena involving change so that they can:

a. represent these patterns and relationships in tables and graphs

b. generate a generalised expression for linear **and quadratic** patterns in words and algebraic expressions and fluently convert between each representation

c. categorise patterns as linear, non-linear, **quadratic, and exponential (doubling and tripling)** using their defining characteristics as they appear in the different representations

AF.2 investigate situations in which letters stand for quantities that are variable so that they can:

a. generate and interpret expressions in which letters stand for numbers

b. find the value of expressions given the value of the variables

c. use the concept of equality to generate and interpret equations

AF.3 apply the properties of arithmetic operations and factorisation to generate equivalent expressions so that they can develop and use appropriate strategies to:

a. add, subtract and simplify

I. linear expressions in one or more variables with coefficients in Q

II. quadratic expressions in one variable with coefficients in Z

III. expressions of the form a / (bx + c), where a, b, c ∈ Z

b. multiply expressions of the form

I. a (bx + cy + d); a (bx^2 + cx + d); and ax (bx^2 + cx + d), where a, b, c, d ∈ Z

II. (ax + b) (cx + d) **and (ax + b) (cx^2 + dx + e),** where a, b, c, d, e ∈ Z

c. divide quadratic **and cubic expressions** by linear expressions, where all coefficients are integers and there is no remainder

d. flexibly convert between the factorised and expanded forms of algebraic expressions of the form:

I. axy, where a ∈ Z

II. axy + byz, where a, b ∈ Z

III. sx – ty + tx – sy, where s, t ∈ Z

IV. $dx^2 + bx$; $x^2 + bx + c$; **and $ax^2 + bx + c$,** where b, c, d ∈ Z **and a ∈ N**

V. $x^2 - a^2$ **and $a^2x^2 - b^2y^2$,** where a, b ∈ Z

AF.4 select and use suitable strategies (graphic, numeric, algebraic, trial and improvement, working backwards) for finding solutions to:

a. linear equations in one variable with coefficients in Q and solutions in Z **or in Q**

b. quadratic equations in one variable with coefficients and solutions in Z **or coefficients in Q and solutions in R**

c. simultaneous linear equations in two variables with coefficients and solutions in Z **or in Q**

d. linear inequalities in one variable of the form $g(x) < k$, and graph the solution sets on the number line for $x \in N, Z,$ and R

AF.5 generate quadratic equations given integer roots

AF.6 apply the relationship between operations and an understanding of the order of operations including brackets and exponents to change the subject of a formula

AF.7 investigate functions so that they can:

a. demonstrate understanding of the concept of a function

b. represent and interpret functions in different ways — graphically (for $x \in N, Z,$ and R, [continuous functions only], as appropriate), diagrammatically, in words, and algebraically — using the language and notation of functions (domain, range, co-domain, f(x) = , f :x →, and y =) (drawing the graph of a function given its algebraic expression is limited to linear and quadratic functions at OL)

c. use graphical methods to find and interpret approximate solutions of equations such as f(x) = g(x) **and approximate solution sets of inequalities such as f(x) < g(x)**

d. make connections between the shape of a graph and the story of a phenomenon, including identifying and interpreting maximum and minimum points

Statistics and probability strand

Students should be able to:

SP.1 investigate the outcomes of experiments so that they can :

a. generate a sample space for an experiment in a systematic way, including tree diagrams for successive events and two-way tables for independent events

b. use the fundamental principle of counting to solve authentic problems

SP.2 investigate random events so that they can:

a. demonstrate understanding that probability is a measure on a scale of 0-1 of how likely an event (including an everyday event) is to occur

b. use the principle that, in the case of equally likely outcomes, the probability of an event is given by the number of outcomes of interest divided by the total number of outcomes

c. use relative frequency as an estimate of the probabilty of an event, given experimental data, and recognise that increasing the number of times an experiment is repeated generally leads to progressively better estimates of its theoretical probability

SP.3 carry out a statistical investigation which includes the ability to:

a. generate a statistical question

b. plan and implement a method to generate and/or source unbiased, representative data, and present this data in a frequency table

c. classify data (categorical, numerical)

d. select, draw and interpret appropriate graphical displays of univariate data, including pie charts, bar charts, line plots, histograms (equal intervals), ordered stem and leaf plots, **and ordered back-to-back stem and leaf plots**

e. select, calculate and interpret appropriate summary statistics to describe aspects of univariate data. Central tendency: mean **(including of a grouped frequency distribution),** median, mode. Variability: range

f. evaluate the effectiveness of different graphical displays in representing data

g. discuss misconceptions and misuses of statistics

h. discuss the assumptions and limitations of conclusions drawn from sample data or graphical/numerical summaries of data

A Look at the Future

BREAKTHROUGH MATHS

Free Notes 📚 | Leaving Cert | Junior Cycle | Primary School | Pricing

What Exactly Is Changing

The NCCA is rolling out a revised specification for Leaving Cert Maths in schools from September 2027.

One big shift: there will be Additional Assessment Components (AACs) in many subjects. These are assessment tasks not based solely on the traditional written exam. The AACs will account for at least 40% of the total mark in any given subject under the new scheme. That means written exams will drop to ~60% of the grade in those subjects.

These AACs might take the form of projects / written investigations / experiments / possibly oral components or presentations or practicals depending on the subject. For example, in the science subjects: students will do a project involving research and experimentation and submit a written report. All the assessment components will be externally assessed (by the State Examinations Commission) rather than purely marked in-school in a loose / internal way. There will also be some work to manage integrity, things like school / teacher authentication of student work, development of guidelines for AI / integrity of projects etc.

Move to 40% Project Based

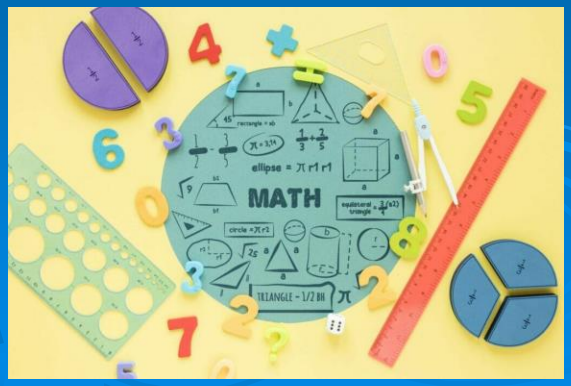
Assessment

The introduction of an AAC was welcomed as an opportunity for students to secure 40% in advance of the written paper and as a motivator for students in 5th year. Participants noted the importance of aligning the assessment closely with the learning set out in the specification and felt that the AAC should assess learning that could not be assessed in the written examination. Whilst concerns were raised about how AI might impact on equity and the completion of an AAC it was agreed that clear guidelines would need to be given on the role of the teacher and the process of authenticating student work. When discussing the nature of an AAC, there was support for the junior cycle CBAs in theory but most felt that there would need to be much more clarity over what exactly the AAC would be assessing. Clear language and student choice were considered essential aspects for any AAC to enable students to take ownership of their work and to ensure equitable access for all students. Teachers disagreed on the exact nature of an AAC but welcomed the opportunity afforded by an AAC to assess learning not easily assessed in a written paper and felt it needed to be integrated into the teaching and learning rather than being an additional piece of work.

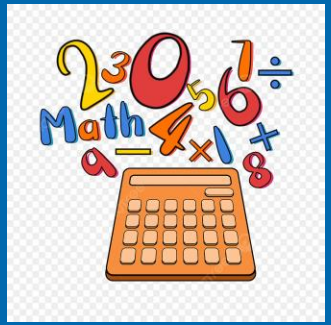
The internet as a learning tool
Recommended websites

- www.codakid.com
- www.khanacademy.org
- www.mathsisfun.com
- www.coolmathgames.com
- www.amathsdictionaryforkids.com

- www.mathplayground.com
- www.bbc.co.uk/bitesize/subjects
- www.mathsphere.co.uk
- www.nerdlegame.com

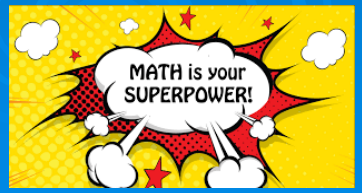


Top 5 tips

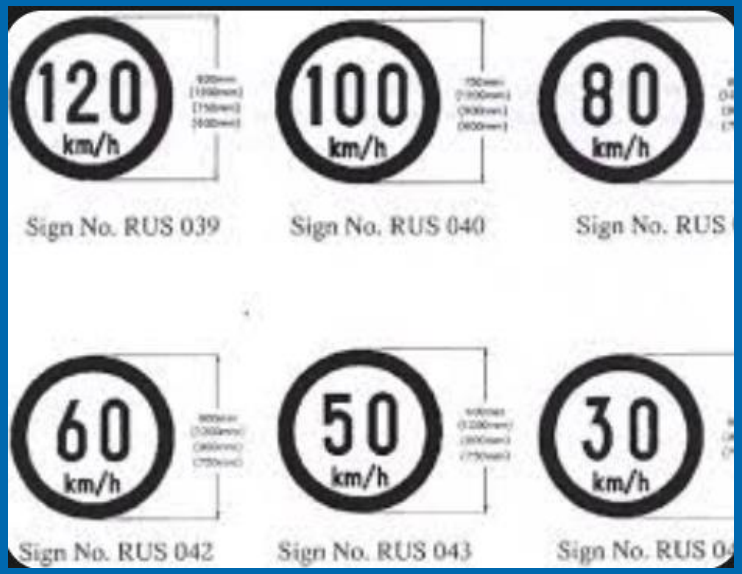


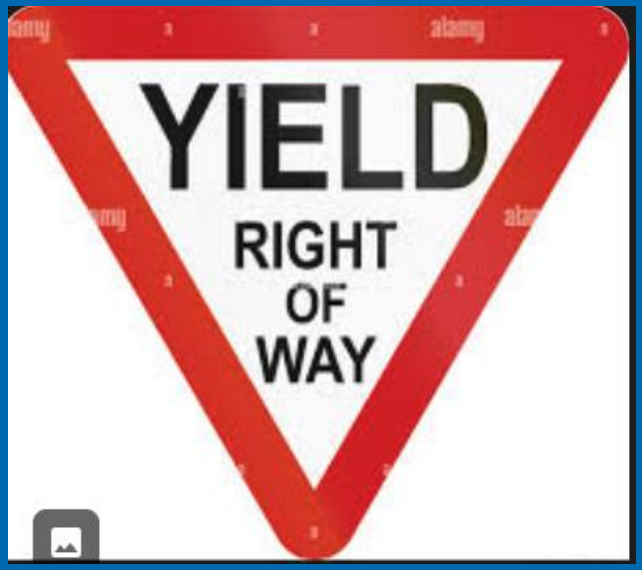
- Make Maths fun – Play number games
- Get your child to work out costs and change, distance and time using brochures, adverts, menus, timetables etc.

- Encourage your child to use Maths websites
- Remind your child to think carefully about a Maths problem before solving it
- Encourage your child to ask questions in class when they do not understand



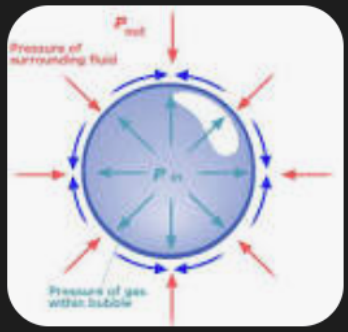
What do you see





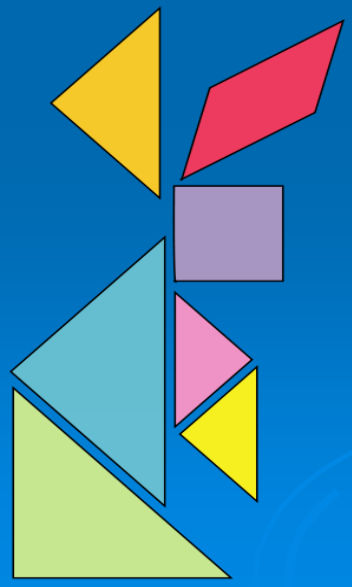
What do you see

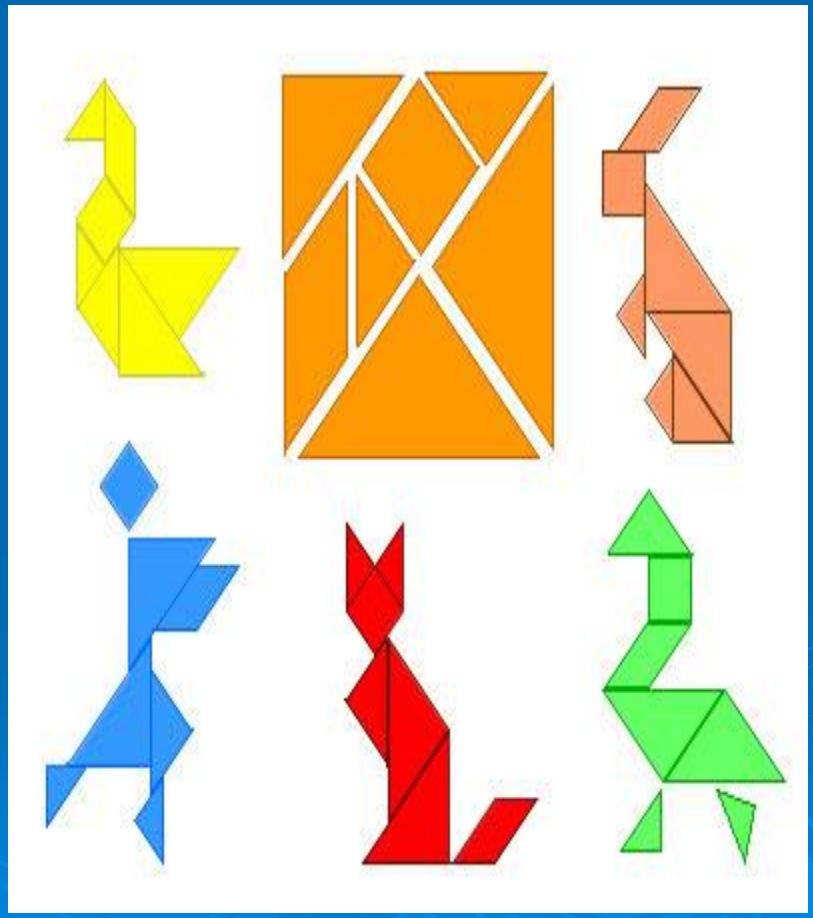
Bubbles are spherical **because of surface tension, which pulls the liquid into a shape with the minimum possible surface area**, and the sphere is the shape with the lowest surface area for a given volume. Inside the bubble, the air pressure pushes outwards, while surface tension pulls inwards, and a sphere is the resulting shape where these forces are in equilibrium and the film is minimized.



Tangram shapes

- Develop problem solving skills
- Awareness of space





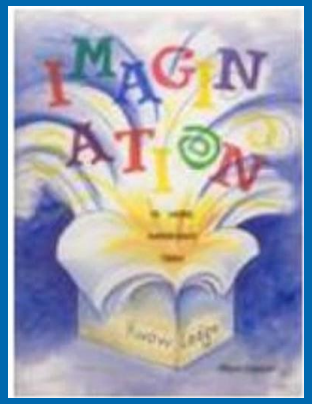
So who was Enrico Fermi and what are Fermi Problems…?

One super smart dude..!

- Named after the Italian-American University of Chicago professor and noted 20th century physicist and Nobel Prize-winner
- Fermi problems are math word problems that require making educated guesses using estimation skills and prior knowledge
- Fermi problems are solved by breaking the complex problem into smaller ones and using estimation skills to continuously refine your

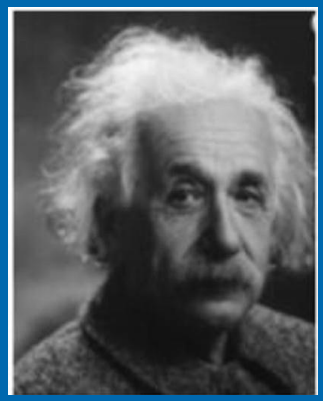
and what's so much fun about them... ?

Fermi problems require imagination



Fermi problems will 1orce" you to think differently

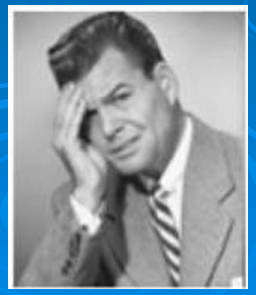
Fermi problems are good exercise for your brain



Fermi problems often don't have an exact

Fermi problems will help make you rich and famous!

You can even create your own Fermi problems and stump your parents!



Let's take a look at some examples of Fermi Problems...

I. How many basketballs would fill this classroom?

II. How many piano tuners are there in the city of Chicago?

III. How many hot dogs will be sold at Yankee Stadium this season?

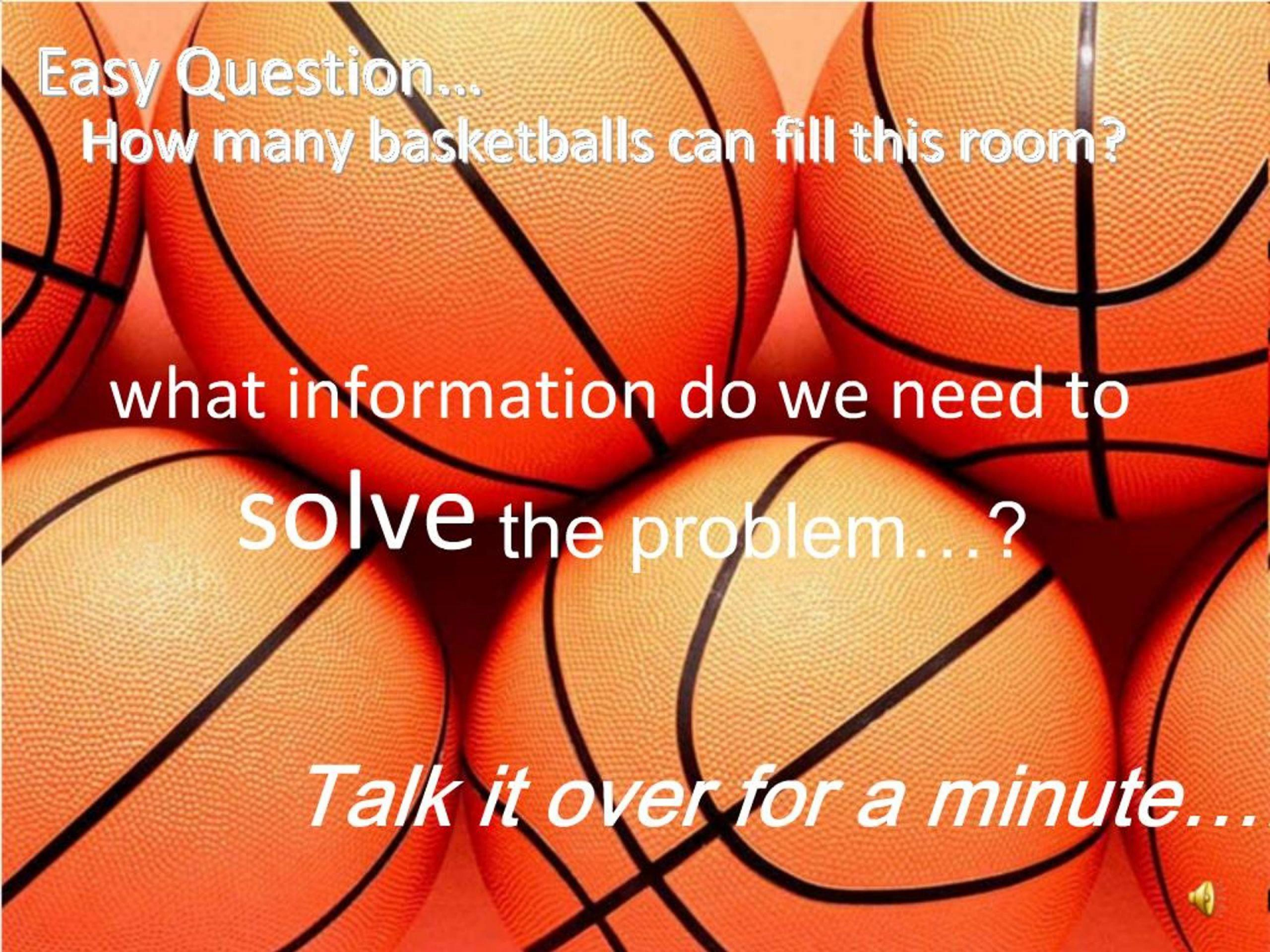
Let's start with an easy one...

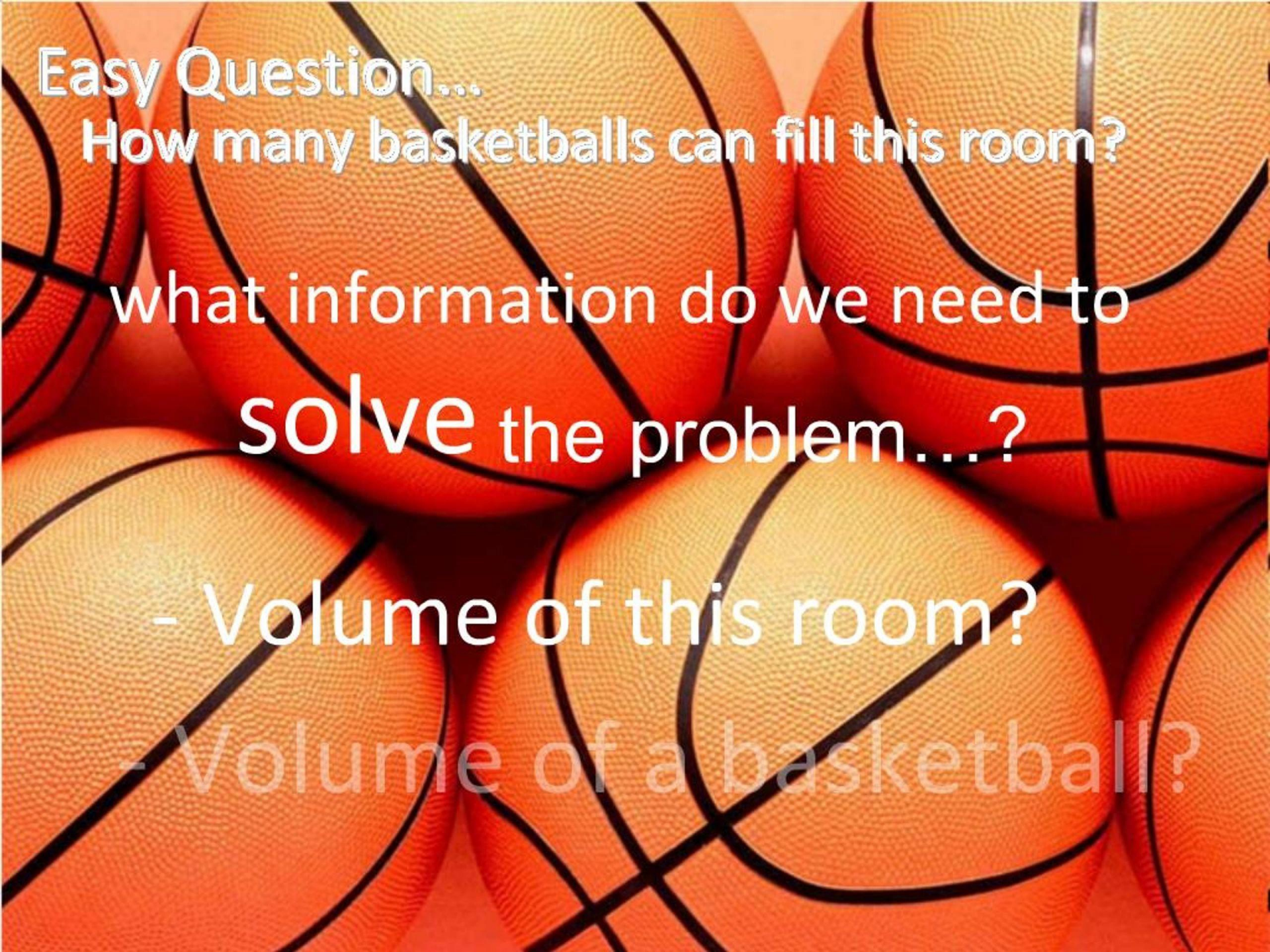
some might even call it a..

lay-up


Easy Question…
How many basketballs can fill this room?


Easy Question...
How many basketballs can fill this room?


Easy Question…
How many basketballs can fill this room?
what information do we need to
solve the problem…?
Talk it over for a minute…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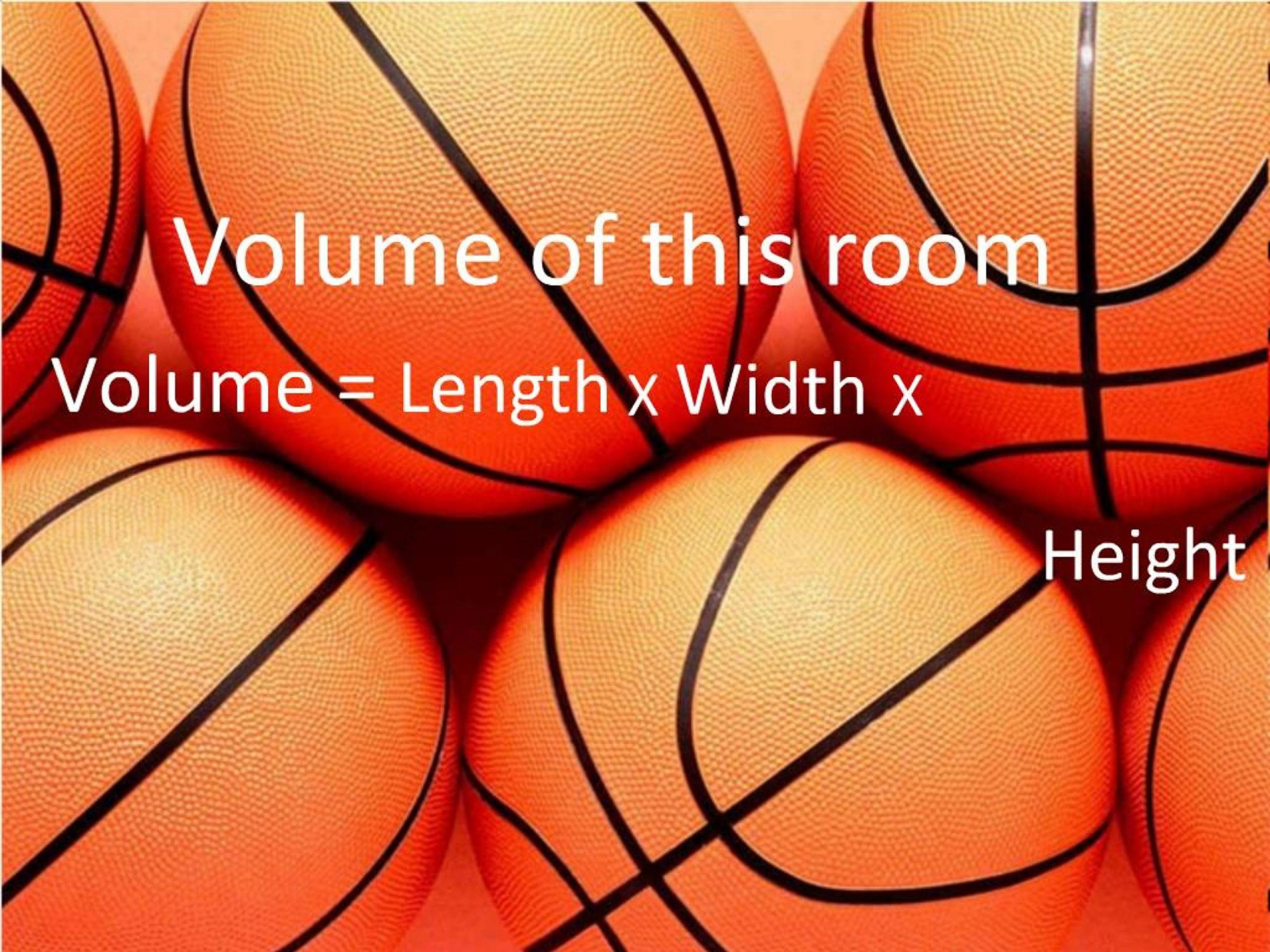
How many basketballs can fill this room?
what information do we need to
solve the problem…?
- Volume of this room?
- Volume of a basketball?


Let's get to
work people!


Volume of this room
Volume = Length x Width x
Height

Volume of this room

(in inches)

Length	X	Width	X	Height	=	Volume
240		300		120		8,640,000

Volume of a basketball?

Well, a basketball is a sphere….

And the volume of a sphere = 4/3 πr3 where r is the radius of the ball of course!

Hey old guys - use the circumference to calculate the radius

Volume of a basketball?

Volume of a basketball?

Circumference = 29.5 in = $2\pi r$

Radius r = $29.5/(2\pi)$ = 4.69 in

So back to the easy question…

How many basketballs can fill this room?

Answer:

Divide the volume of the room by the volume of the basketball

= 8,640,000 cu.in. / 432 cu.in.

= 20,000 basketballs

So, how does that compare to your initial guesses?

Pictures & Music Sources:

Enrico Fermi pictures – American Institute of Physics, University of Chicago

Basketball background - http://images.google.com/imgres?imgurl=http://static.desktopnexus.com/wallpapers/16950/

Yankee Stadium - http://diananeighborhood.files.wordpress.com/2009/07/yankee-stadium-hot-dog-permanently-scattered-ashes1.jpg

Piano keys - http://www.paulhahn.com/images/pianos.jpg

Basketball - http://www.barryonline.com/storage/basketball.jpg

Sweet Georgia Brown (Harlem Globetrotters)
by Bobby Morgenstein Productions
From the Album Sports & Novelty Themes

Larry Bird & Kevin McHale http://images.allposters.com/images/pic/PHOTAAFC033~Larry-Bird-Kevin-McHale-1-Posters.jpg

Kevin Garnett http://www.thesunblog.com/gbournegal/kevin-garnett12.jpg

Paul Pierce & Ray Allen - http://artfiles.art.com/5/p/LRG/27/2731/D3VND00Z/paul-pierce--ray-allen-game-4-of-the-2008-nba-finals.jpg

Mathematics & Patterns

Understanding the World Around Us

What Are Patterns?

Patterns are predictable sequences that repeat or follow rules.

Number Patterns

2, 4, 6, 8, 10...

Adding 2 each time

Visual Patterns

Alternating colors

Shape Patterns

△ ▢ ○ △ ▢

Repeating sequence

Patterns in Nature

Fibonacci Sequence

1, 1, 2, 3, 5, 8, 13...

Found in flower petals, pinecones, and spiral shells

Symmetry

Mirror reflections

Butterflies, snowflakes, and human faces all show symmetry

Tessellations

Repeating shapes

Honeycombs and fish scales tile perfectly with no gaps

What Students Learn

Arithmetic Sequences

Adding or subtracting the same number each time

Example: 5, 10, 15, 20, 25

Geometric Sequences

Multiplying by the same number each time

Example: 2, 4, 8, 16, 32

Algebraic Patterns

Finding rules with variables

If n = 1, 2, 3, 4...

Then 2n = 2, 4, 6, 8...

Why Patterns Matter

Understanding patterns helps students develop critical thinking and problem-solving skills.

Real-World Applications

- Coding and computer science
- Financial planning and budgeting
- Music and art composition

Career Connections

- Engineering and architecture
- Data analysis and statistics
- Game design and animation

Patterns are the foundation of mathematical thinking!

Maths = Patterns

Question 1: These patterns are made from sticks

Pattern 1 Pattern 2 Pattern 3

(a) Draw pattern 4
(b) Draw pattern 5
(c) How many sticks will there be in pattern 6?
(d) How many sticks will there be in pattern 10?
(e) Which pattern will use 31 sticks?

Theo says that he has made a pattern with exactly 100 sticks.

(f) Explain why Theo must be wrong.