When Learners can’t or won’t do maths

Making maths fun and accessible for everyone

Equals

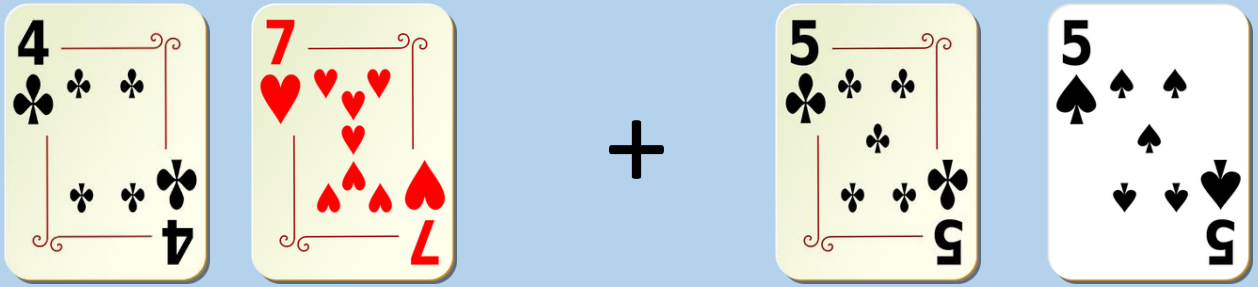
TLA

MATHEMATICAL ASSOCIATION

supporting mathematics in education

Use a deck that contains numbers ace (one) to nine. Deal four cards to each player.

Each player must make two 2 digit numbers that, when added, get as close to 100 as possible.



+ = 102

47 + 55 = 102

Equals Online - Mathematics and Special Educational Needs is a valuable resource for those working to ensure that all pupils will benefit from mathematics. Classroom teachers need the best support to develop good practice in line with current initiatives and it is the aim of Equals to provide this support in a number of practical ways. Age range: 3-18 years

Equals Online is produced by teachers and curriculum/SEN specialists dedicated to opening up mathematics to low attainers. In practical terms it provides support through the exchange of ideas to help teachers reveal the excitement and applicability of mathematics to those who have in the past found the subject inaccessible and/or irrelevant. Updates on issues affecting practice, book reviews, practical ideas and resources are just some of the features of Equals Online...

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What is a maths learning difficulty?

There are many things that can impact on the learning of mathematics, some relate to the learning environment, and some to the ability to use number.

It is not always straightforward to separate out the individual aspects of someone's difficulty with mathematics.

Areas that may impact on maths learning

- Mindset and resilience
- Confidence and anxiety
- Literacy
- Reasoning
- Memory and speed of processing
- Arithmetic – Learning delays or cognitive difficulty
- Another difficulty – Physical or cognitive

The affective domain

Affective domain	Cognitive domain
• emotions	• memory
• attitudes	• understanding
• motivations	• analysing
• values	• evaluating

- In maths, we tend to focus on the cognitive domain
- However, recent research has shown that logic & emotions are intricately linked
- Unless emotions are addressed, there is little prospect of engagement & progress in the cognitive domain

Areas that may impact on maths learning

Working memory and speed of processing

Working memory enables us to store information in our minds for a short period of time and use it for our current thinking. There is an upper limit to the amount of information we can store and use at any one time.

Speed of processing relates to how quickly we can retrieve or manipulate information.

Cat and mouse game – From Mark Pepper
'What are the chances?' Hounslow Teacher's Centre Maths Advisory Team Struggle Vol.29 1991

A game for two, who can discuss what they think the outcome will be. The players take it in turn rolling a 1-6 die. Regardless of which player rolls the die, if a number between 1 and 4, inclusive, is obtained the mouse moves that many spaces whilst if a 5 or 6 is obtained the cat moves that many spaces.
The mouse has to get to the hole before the cat gets the mouse. What could possibly go wrong? And, what are the odds on that!

Two models of dyscalculia:

Single deficit model – Butterworth – core deficit in the processing of number, lying in the intraparietal sulcus (IPS), an area of the brain that deals with the comparison of digits and of dot arrays.

Read Butterworth, B. and Laurillard, D. (2010) Low numeracy and dyscalculia: identification and intervention. In ZDM The International Journal of Mathematics Education. Vol. 42 issue 6 pg 527 – 539. Available online: http://link.springer.com/journal/11858/42/6/page/1

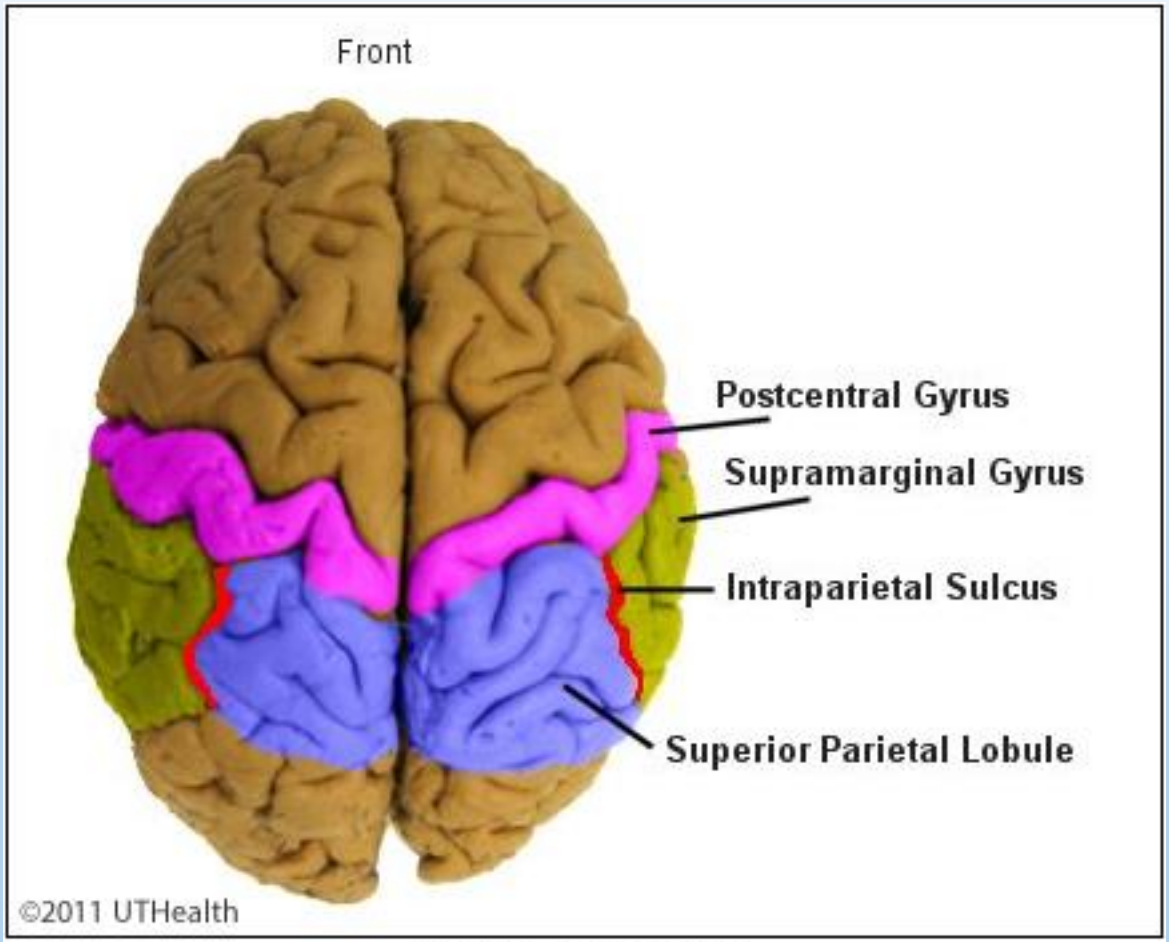
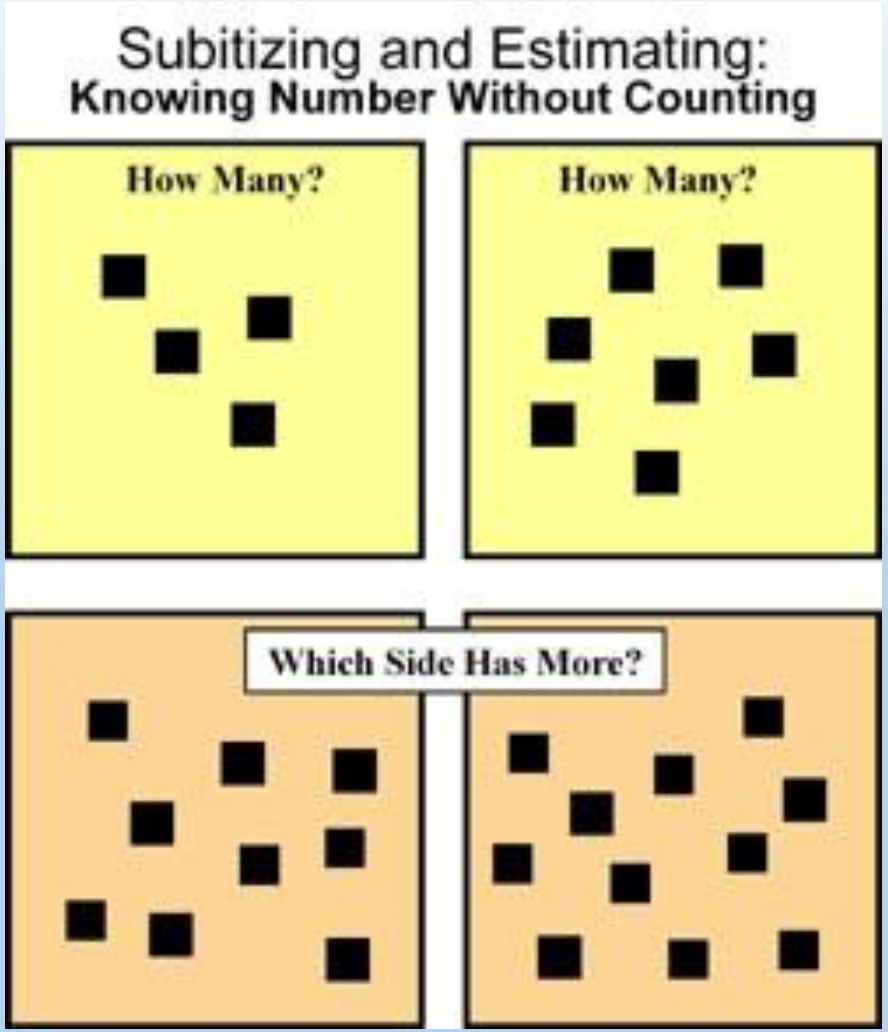
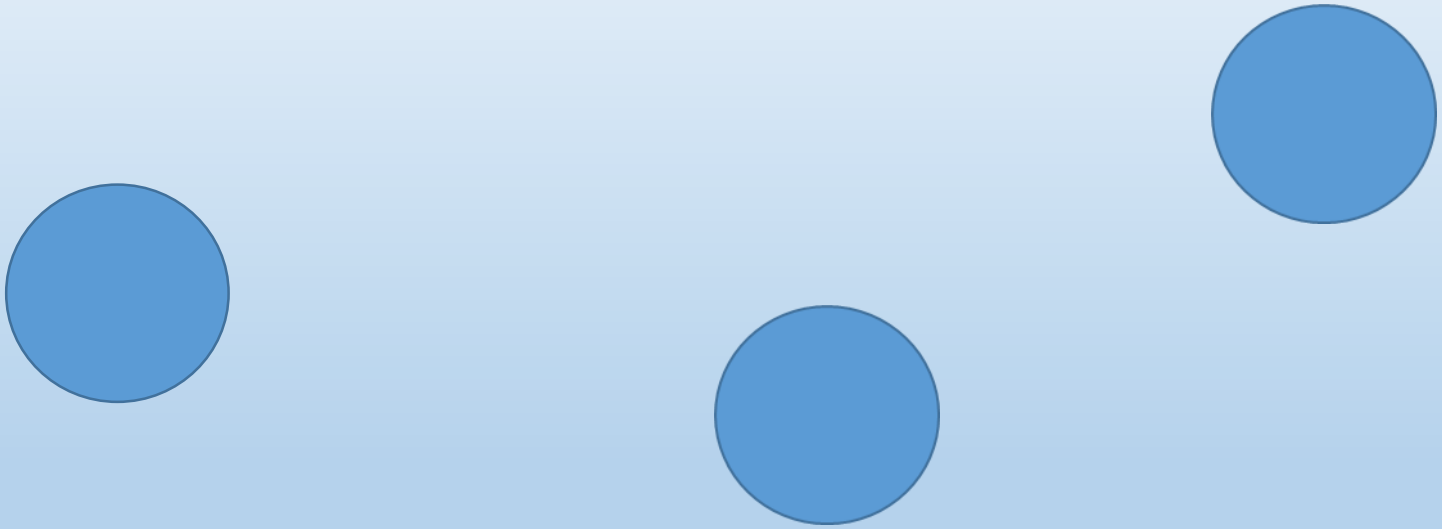


Figure 2 - Superior View



How many dots?



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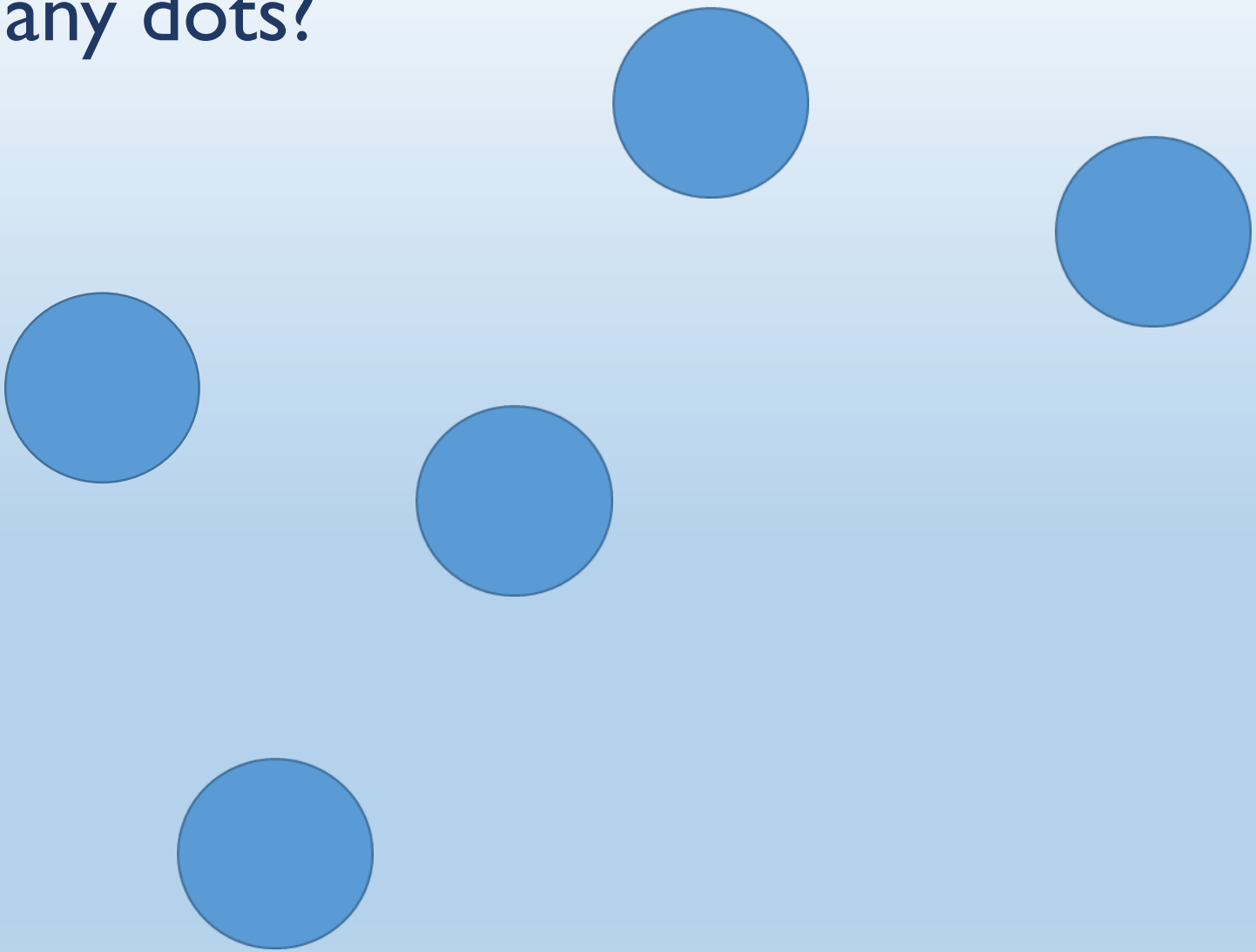
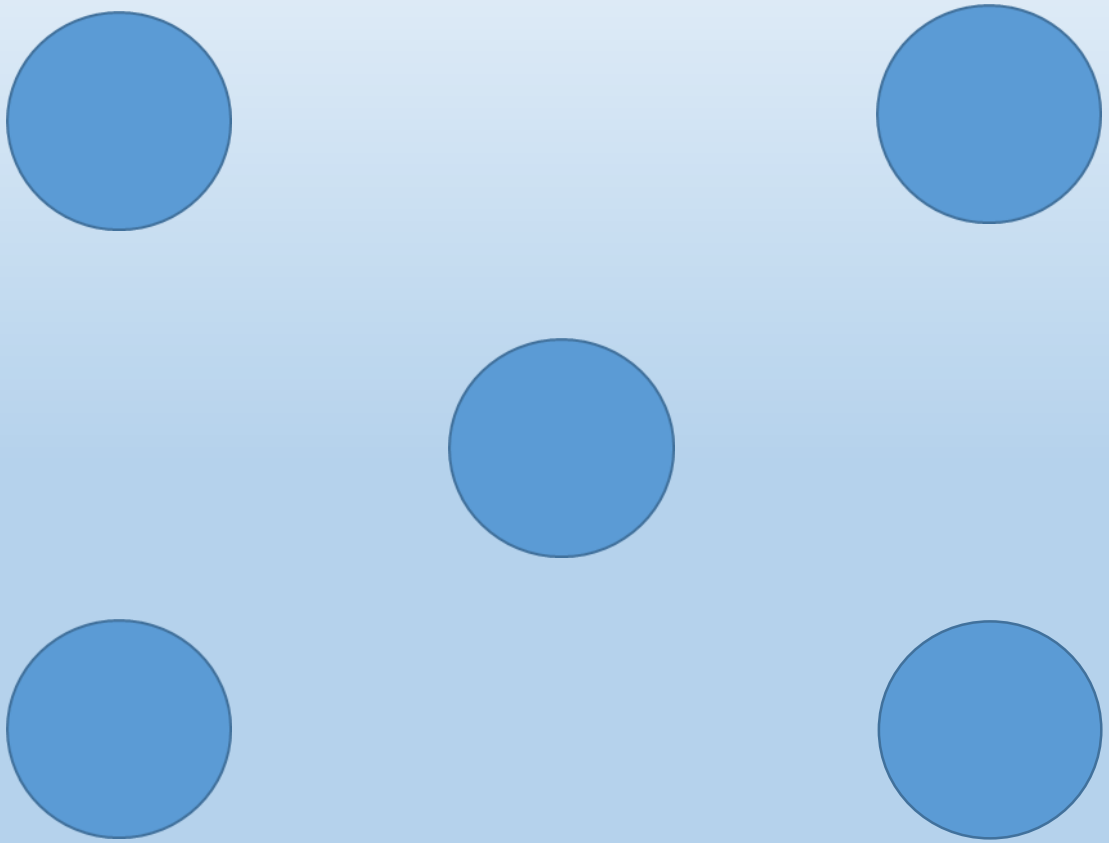
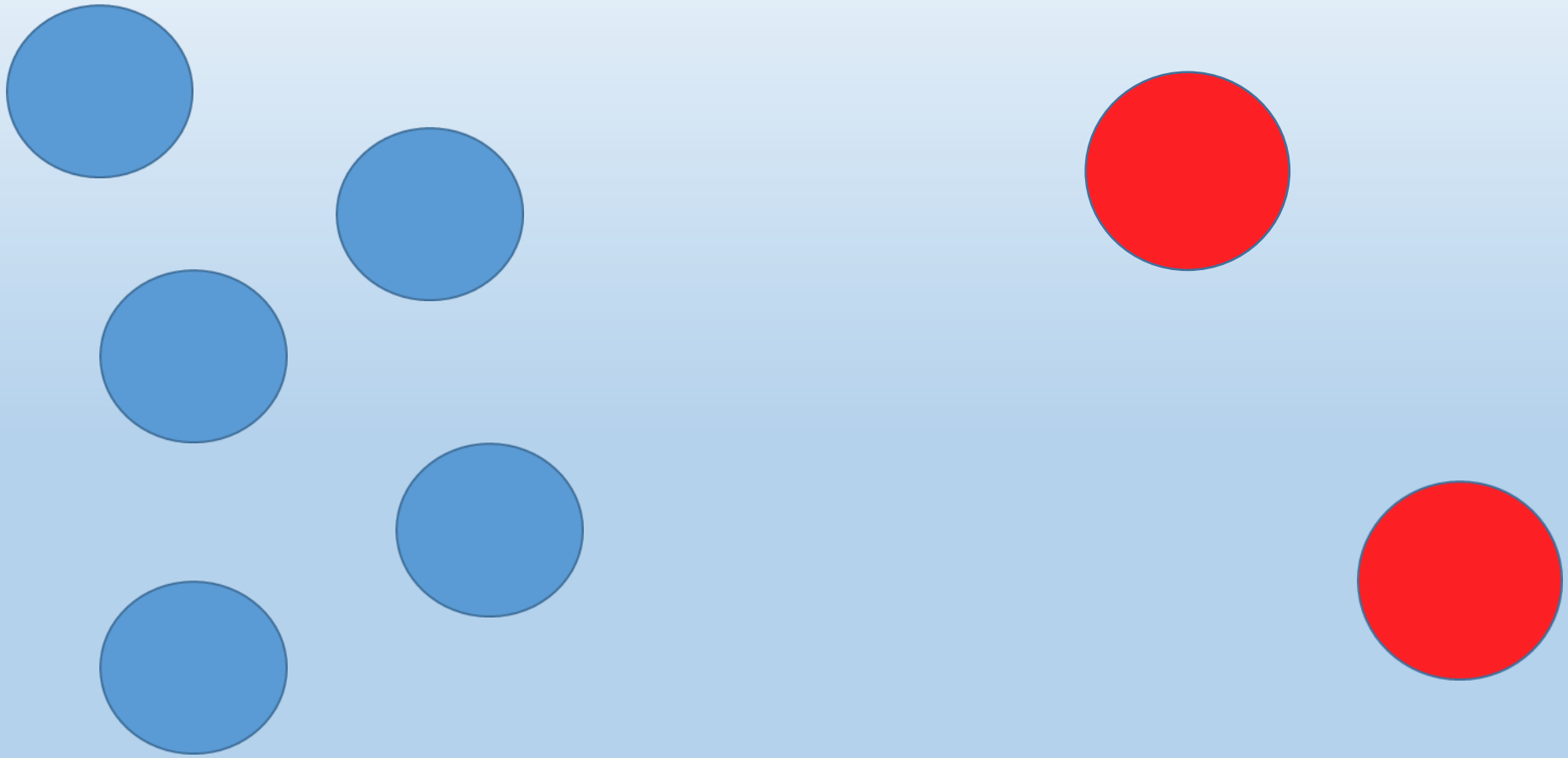


How many dots?



Which group is larger – blue or red?



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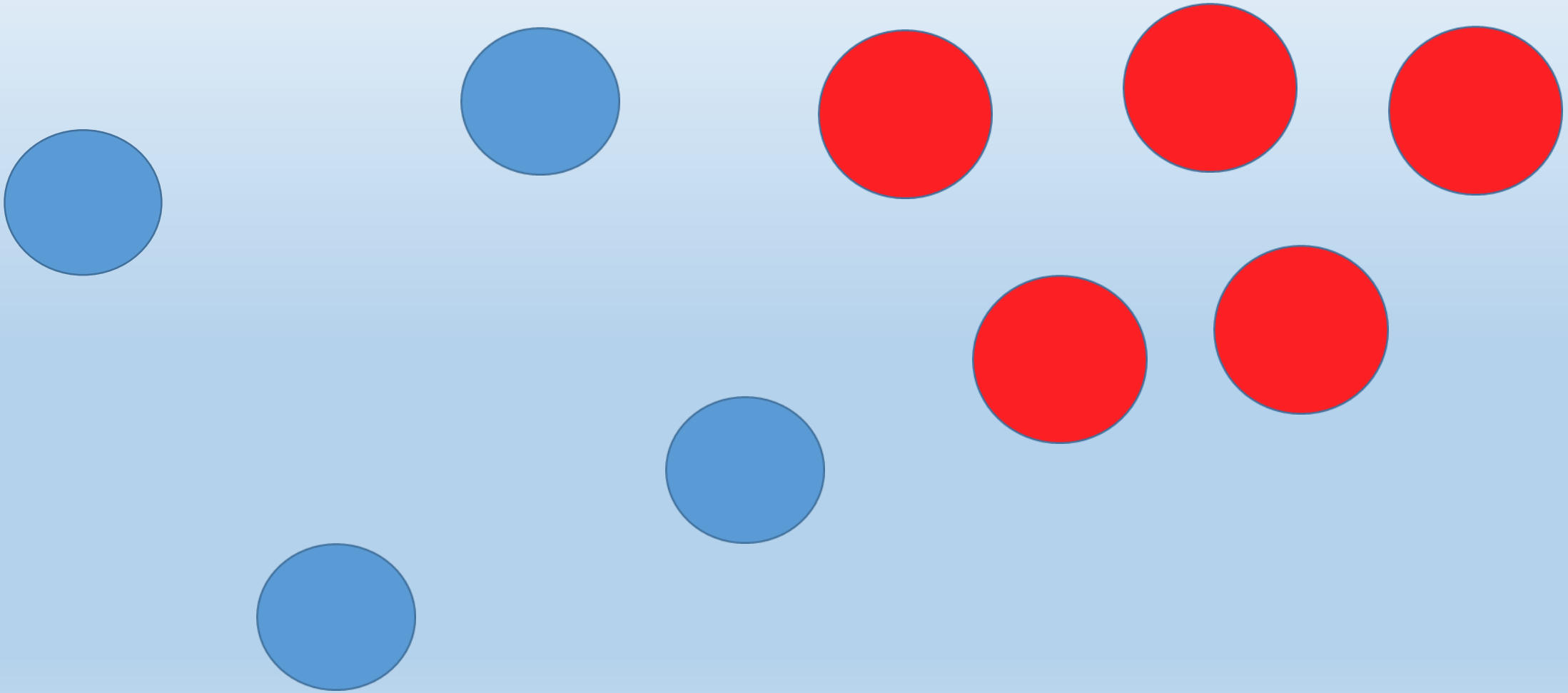

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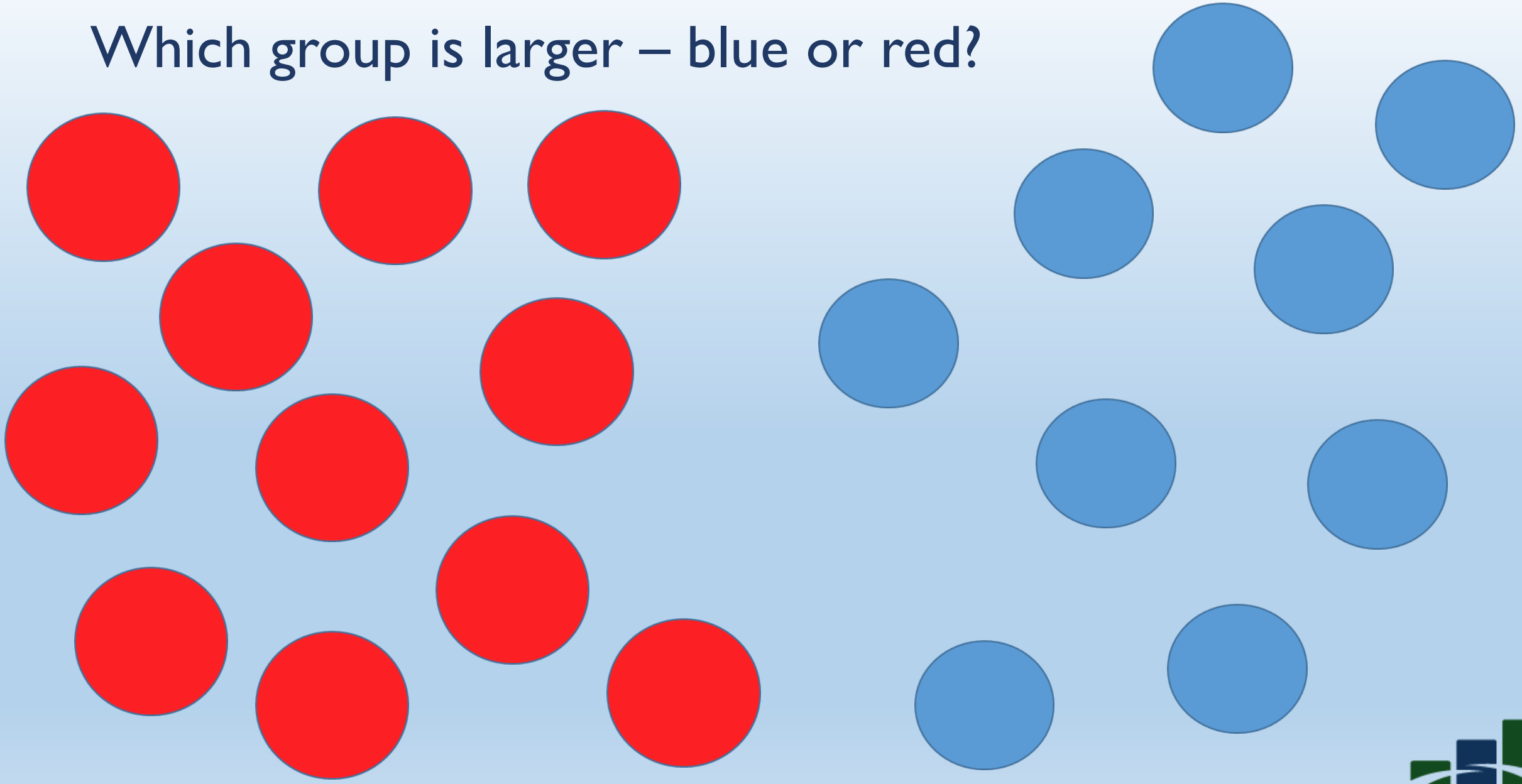


Two models of dyscalculia:

Maths learning difficulties/dyscalculia are heterogeneous in nature and can be indicated by:

- Logical thinking abilities and counting knowledge
- Language abilities
- Number representation
- Working memory

The Routledge International Handbook of Dyscalculia and Mathematical Learning Difficulties, 2015. Ed. Steve Chinn. Particularly chapters by Desoete, Landerl and Emerson

When learning maths we have to make connections between our non-symbolic representations of numbers – our ability to see the difference between two sets of objects -

and our symbolic representations of different number sizes – 4 or 12 or 1 000 000

We first make sense of real things by such skills as counting and our sense of number.

We then use our understanding and language, both verbal and the symbolic language of maths, to begin creating abstract ways of describing what is happening when we do stuff with numbers.

The symbols we use allow us to explain very complex ideas in a way that is more accessible than just words – but maths is a language in its own right.

Arithmetic

Six levels of mathematical knowledge

1. Intuitive
2. Concrete
3. Pictorial
4. Abstract
5. Application
6. Communication

Three components of mathematics

1. Linguistic
2. Conceptual
3. Procedural

Sharma (2012)
http://mathematicsforall.org/evaluation%20process%202012.pdf

A model that fits with the way we learn maths:

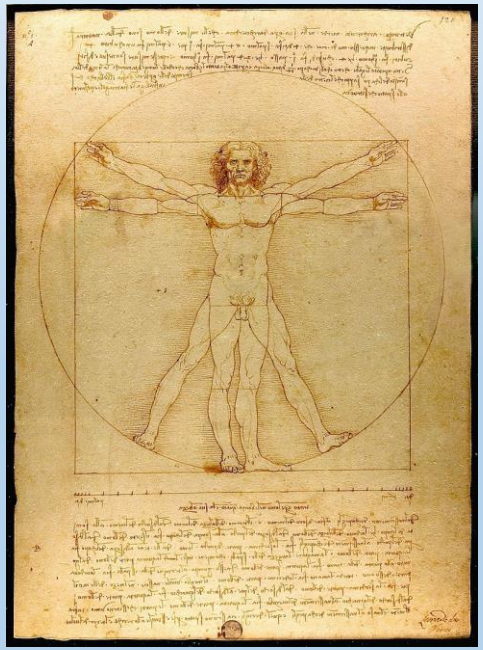
Concrete – manipulatives, real things

Semi-concrete – drawings, pictures, representations of real things

Abstract - symbols

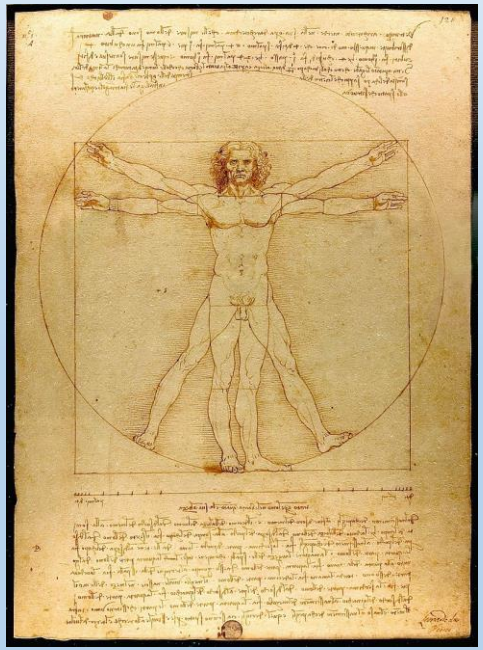
CSA

Ratio and the human body



Body parts	Ratio	Measurement	Your ratio
Height to arm span	1:1		
Height to head length from top of head to end of chin	1:8		
Height to head circumference	1:3		
Height to femur length	1:4		

Ratio and the human body



Leg length up to knee: Leg length = 1:1.618

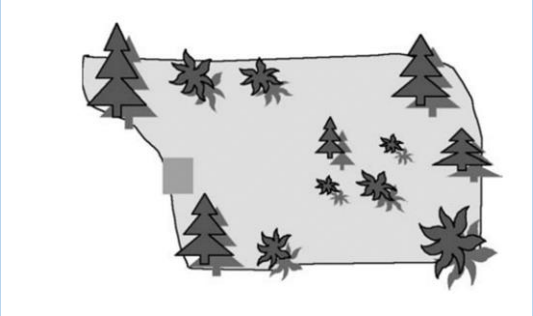
Body height up to navel: Body height = 1:1.618

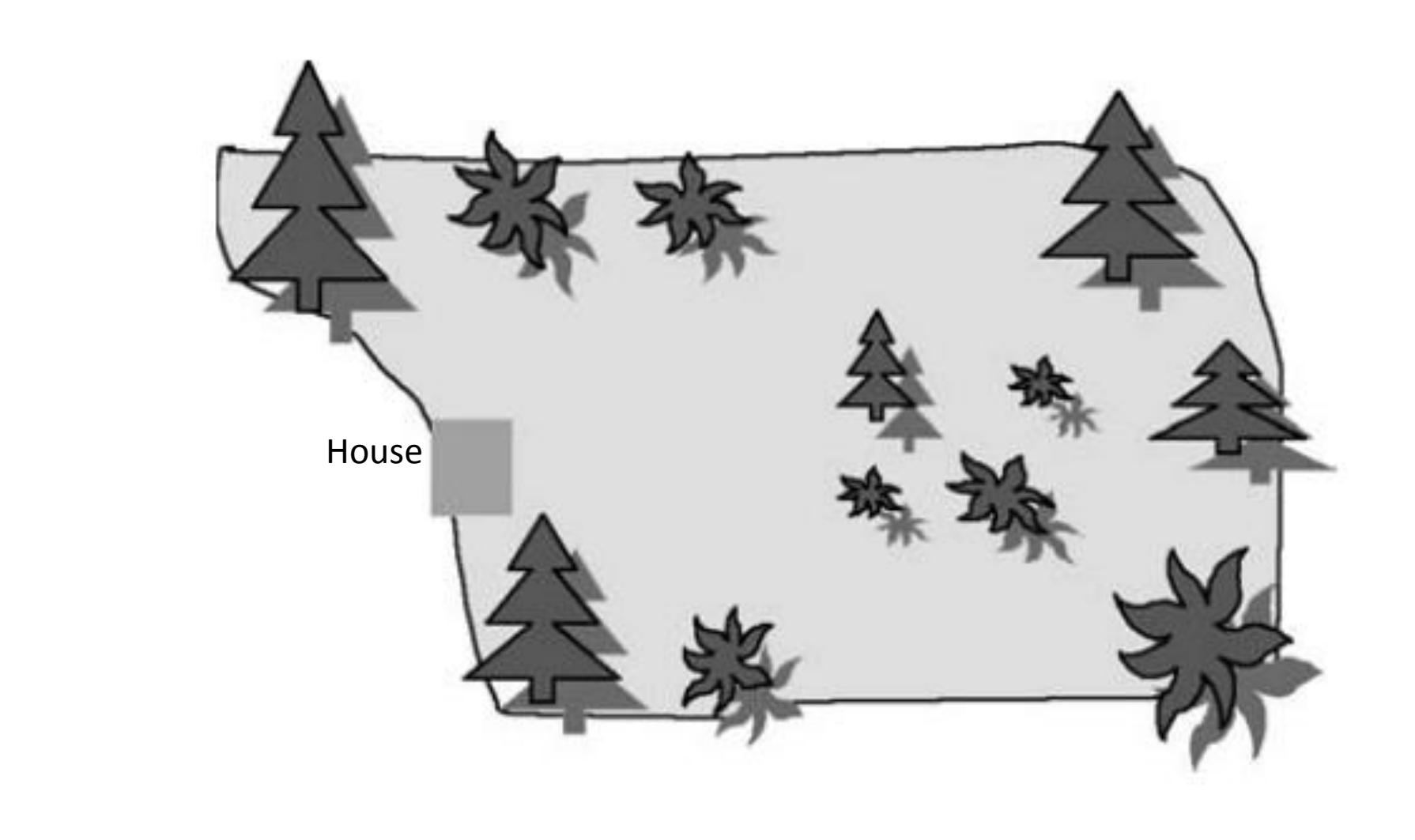
Which Tree Do You Mean?

Mundher Adhami

Equals Vol.14.1, 2008

Story: A gardener and her apprentice have to agree between them on a way of knowing which trees they are talking or writing about in the garden shown here. Ask for suggestions from pairs of pupils talking amongst themselves for a couple of minutes.




House

Sharing: The whole class looks at solutions from different groups.

Responses are likely to include:

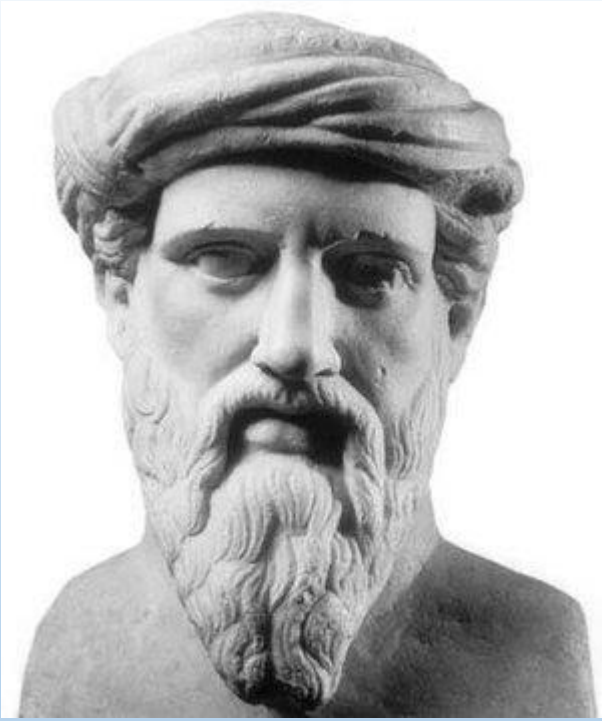
- Giving directions from the house. Perhaps using compass direction like North West, then counting trees.
- Splitting the 'map' into 4 quadrants, then using top-left, top-right

The teacher conducts a discussion on different issues in order to generalise:

- What order is possible to use to describe positions?: Top to bottom; left to right; clockwise; left and right; outer and inner. Some pupils may suggest a grid as a space organisation. It is important not to take this as 'the answer', but rather to talk about the pros and cons, or ease and difficulty of different ideas.
- How to classify/sort? Large and small trees; fir and bush, and how the type of tree can help in coding the trees.
- The need for two part coding to be agreed (i.e. using some order and some form of classification), then checked for ease of use and consistency.

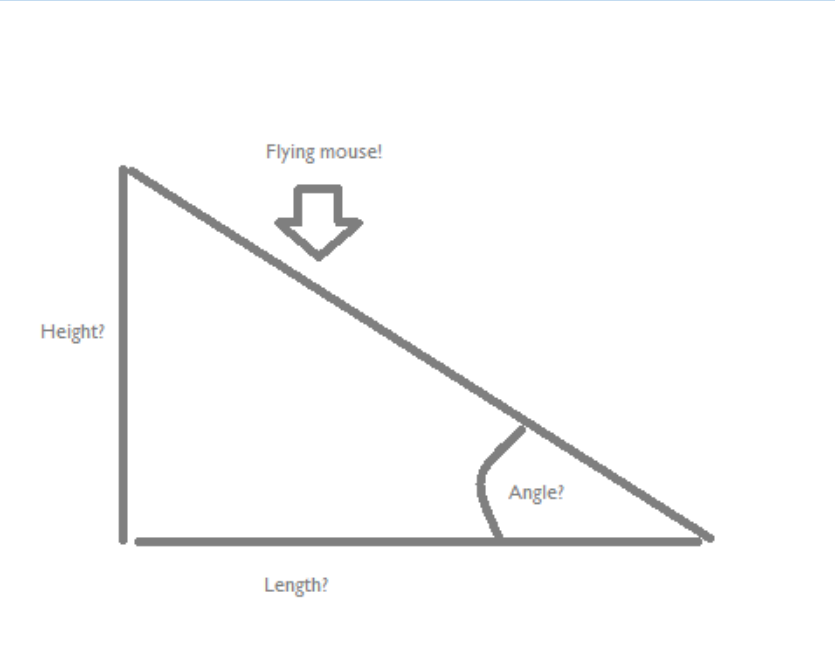
Hypotamouse – Pythagoras Part 1

How to avoid embarrassment on a wire.



Hypotamouse

Moving through Pythagorean Theorem to the relationship between side lengths and angles.

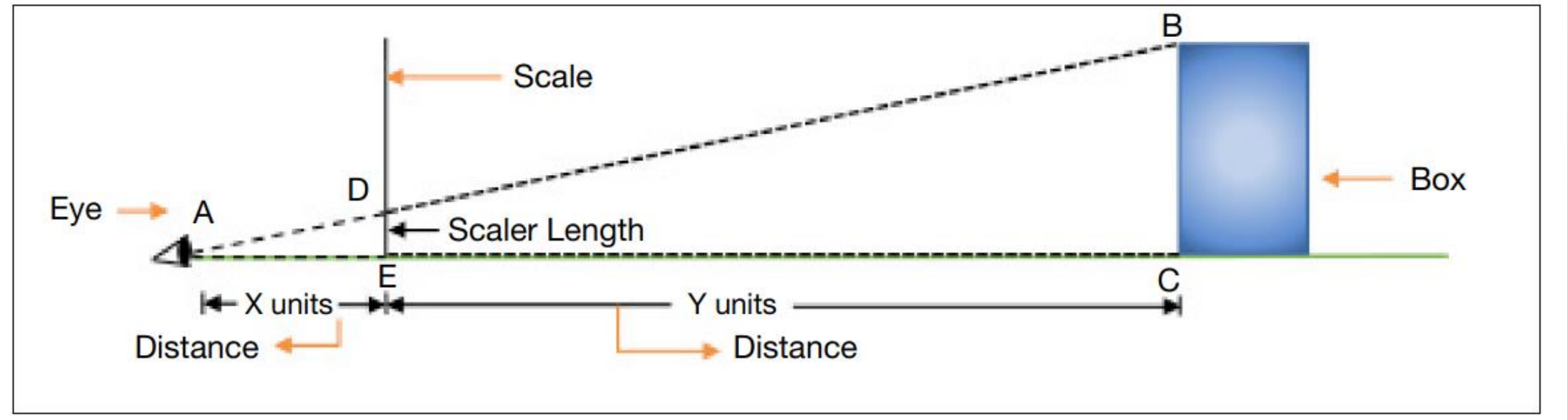


If we don't want Hypotamouse to get stuck what is the minimum angle and height that we need. What is the relationship between all the sides and the angle?

Mikos de Symmetria – A special approach to trigonometry

Sameer Sharma

Equals Online Vol. 21.2 Autumn 2016



From the above illustration we see that two triangles are formed (See Figure) i.e. Δ ABC and Δ ADE

Now in Δ ABC and Δ ADE

∠ BCA = ∠ DEA

∠ BAC = ∠ DAE

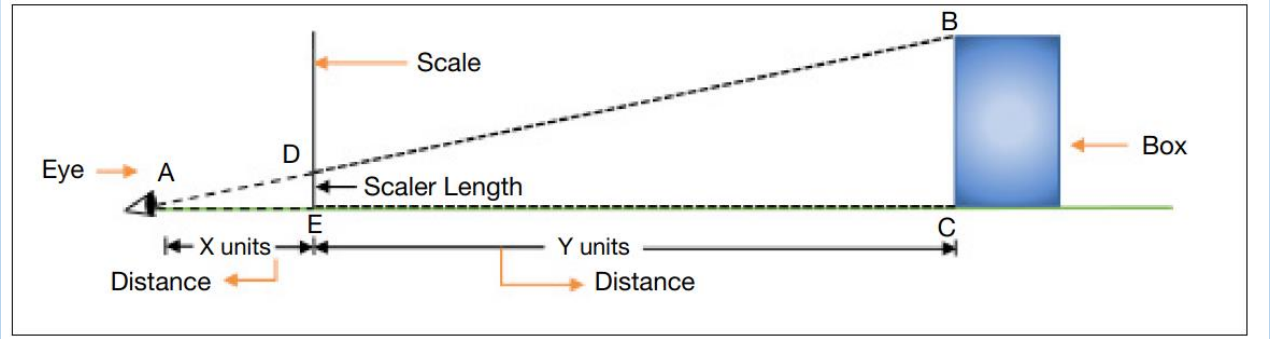
Therefore, by AA similarity Criterion,

Δ ABC is similar to Δ ADE, since they will form same ratio,

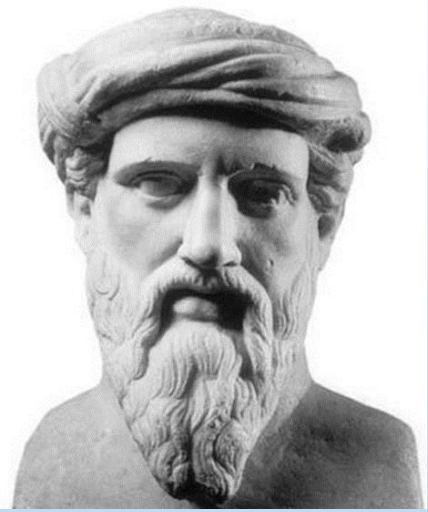
Therefore, $\frac{AE}{EC} = \frac{DE}{BC}$

And in the above equation, we know AE, EC, DE. By putting the values of three variables, we will get the formula as:

$$\text{Actual length (BC)} = \frac{(EC \times DE)}{AE}$$



Pythagoras Part 2 – The daddy of numerology.



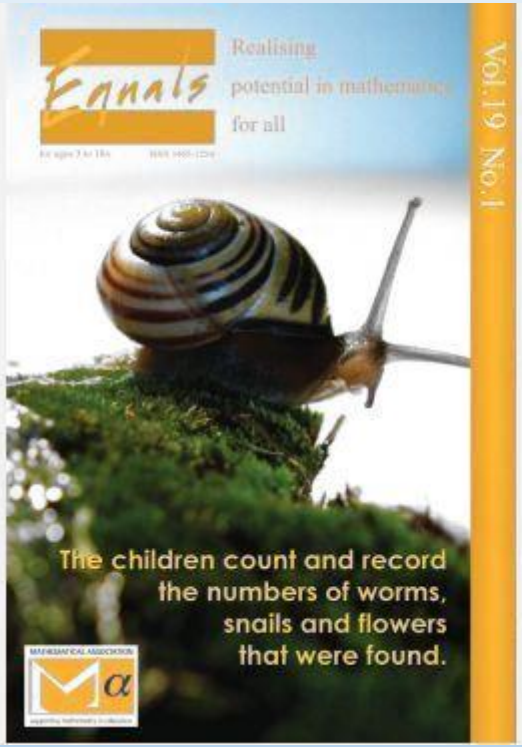
Add up the numbers from your birth date.
Include the full year. For example, BoJo was born on the 19/6/1964,
So, 1+9+6+1+9+6+4 = 36. If the answer is not a single digit keep adding until it is; 3+6=9.

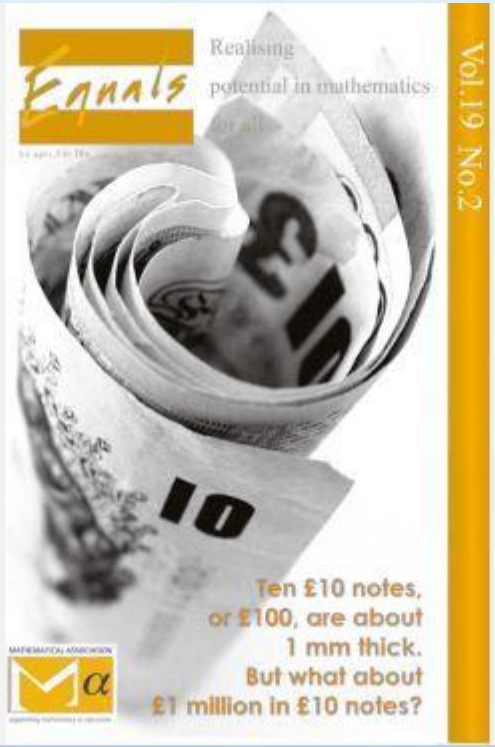
So, Boris is a 9!

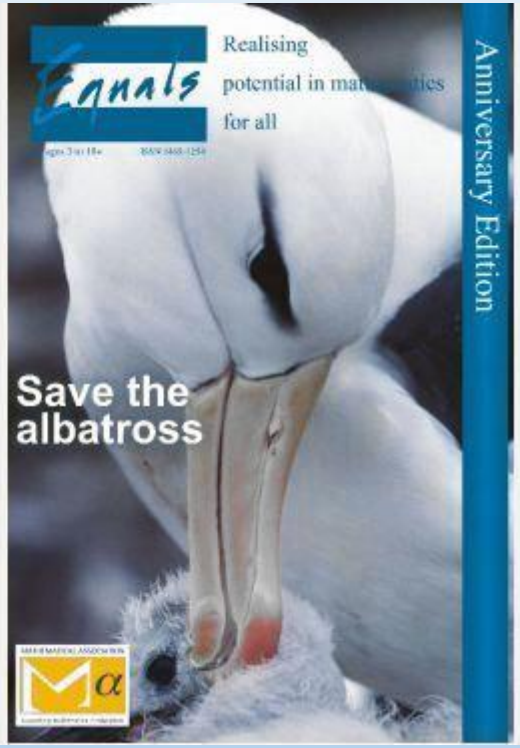
Here are the basic numerology attributes so you can try for yourself.

1. Free Spirited – outgoing nature
2. Easy going – no hassles for you
3. Adventurous – love fun and going out
4. Disciplined – works hard at relationships
5. Mischievous – active and bubbly
6. Romantic – enjoys making others feel special
7. Instinctive – if it feels right do it
8. Charming – confident and attractive
9. Generous – always wanting to help

http://www.m-a.org.uk/equals-online







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