Literacy + Mathematics + Language = Numeracy
Does the equation work?

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Literacy + Mathematics + Language = Numeracy?
Outline

- What is numeracy?
- How does it relate to literacy?
- How does it relate to mathematics?
- And how does it relate to language?
- Does L + M + l = N?
- What does it mean for teaching numeracy?

Literacy + Mathematics + Language = Numeracy?

- The equation L + M + l = N, how else can we look at it?
- Should we start with the subject of the equation - numeracy? N = L + M + l
- What is numeracy?

So what is this N thing - Numeracy?

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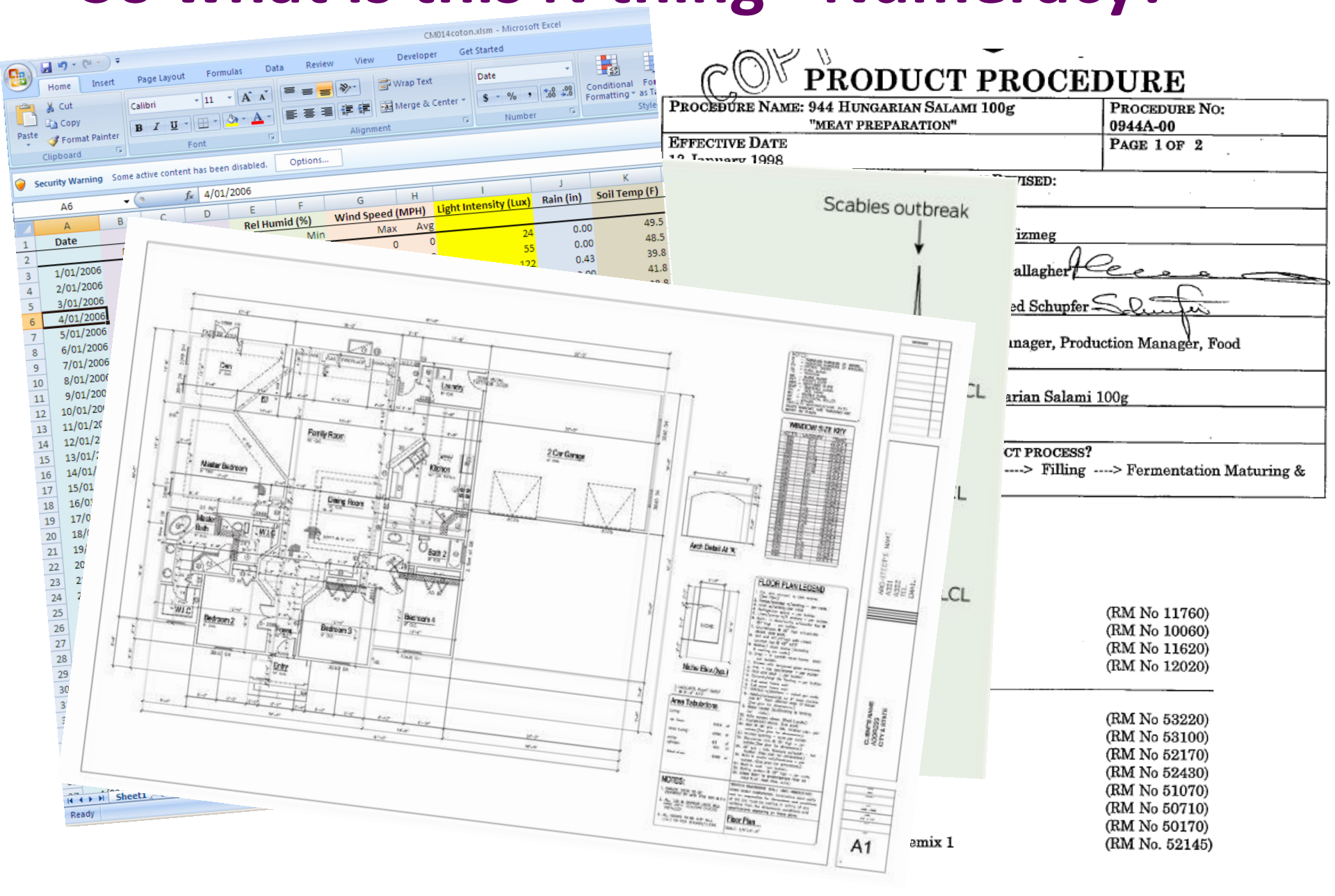


So what is this N thing - Numeracy?

Baby Drops Colourfree

Age	Average Weight	Dose
1 - 3 month	4 - 6 kg	0.6 - 0.9 ml
3 - 6 month	6 - 8 kg	0.9 - 1.2 ml
6 - 12 month	8 - 10 kg	1.2 - 1.5 ml
1 - 2 years	10 - 12 kg	1.5 - 1.8 ml

Elixir & Colourfree Suspension 1-5 Yrs

Age	Average Weight	Dose
1 - 2 years	10 - 12 kg	6 - 8ml
2 - 3 years	12 - 14 kg	8 - 9 ml
3 - 4 years	14 - 16 kg	9 - 10 ml
4 - 5 years	16 - 18 kg	10 - 11 ml
5 years	18 - 20 kg	11 - 13 ml

Elixir & Colourfree Suspension 5-12 Yrs

Age	Average Weight	Dose
5 - 6 years	18 - 20 kg	6 ml
6 - 7 years	20 - 22 kg	6 - 7 ml
7 - 8 years	22 - 25 kg	7 - 8 ml
8 - 9 years	25 - 28 kg	8 - 9 ml
9 - 10 years	28 - 32 kg	9 - 10 ml
10 - 11 years	32 - 36 kg	10 - 11 ml
11 - 12 years	36 - 41 kg	11 - 13 ml

So what is this N thing - Numeracy?

And in workplaces they use:

- Measurement, including of areas/volumes
- Numbers in all forms – whole, fractions, decimals, percentages
- Quantities – rates, \$/m, \$/m^3 etc
- Statistics – tables, graphs, averages
- Geometry and shapes
- And yes, they do use algebra!!

Numeracy definitions

PIAAC: Numeracy is the ability to *access*, *use*, *interpret*, and *communicate* mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life.

PISA: Mathematical literacy is an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals to recognise the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens.

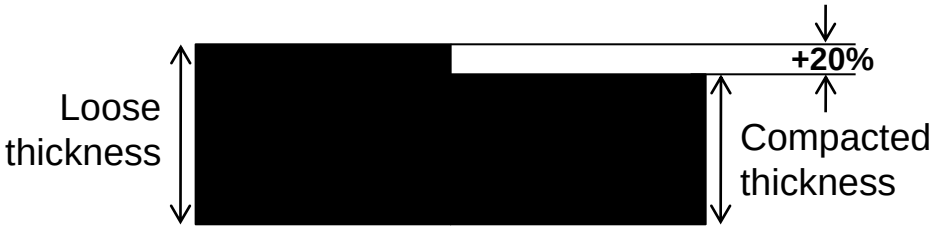
Solving a real numeracy problem

Joe measures the depth of a road to be filled with asphalt. It is 225 mm deep (= the compacted thickness).

He knows that the loose thickness needs to be 20% more than the compacted thickness.

How high must the “loose” asphalt be prior to compacting by the roller?

How did you work it out? What did you need to do to solve the problem?



Solving a numeracy problem

Step 1: Understanding the problem – reading the **real world** – reading/listening/watching – excavating the maths out of the context – a **literacy** related activity.

Step 2: **Doing** the **maths** – calculating / estimating / measuring / acting in some way

Step 3: Putting it back into the **real world** to make it work, interpreting the maths and communicating it to others. More **literacy**.

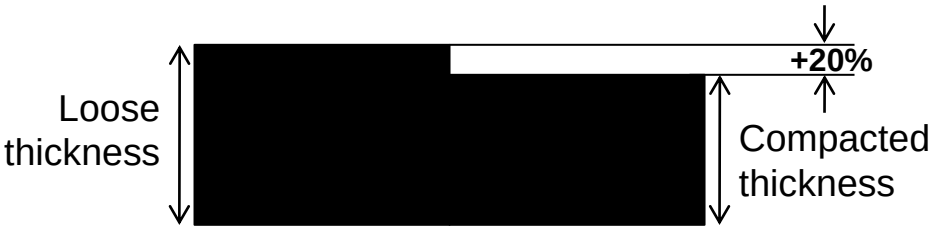
So you need some L (literacy) to be numerate!

And what about M (maths)?

What about the M (mathematics)?

Solving a real numeracy problem

And how did you calculate the 20%?



$$\frac{20}{100} \times \frac{225}{1}$$

But what about:

÷5 or

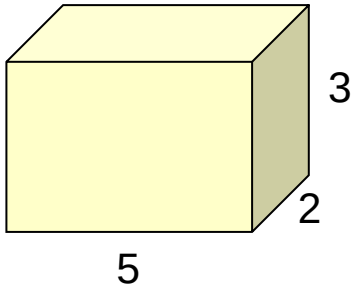
÷10 and double

What about the M (mathematics)?

- The **M** (mathematics) is central and critical to being numerate – you cannot be numerate without understanding and knowing some **mathematics**, no matter what level of numeracy we are talking about.
- "In this sense . . . there is no particular 'level' of mathematics associated with [numeracy]: it is as important for an engineer to be numerate as it is for a primary school child, a parent, a car driver or a gardener. The different contexts will require different mathematics to be activated and engaged in" (Johnston, 1994, p.34).
- The M is central to the numeracy equation N = L + M + I. You need M to be N.

What about the l (language) in the equation?

The lowest common denominator (LCD) is the denominator which contains a representative of factors of each of the denominators. To include all factors take the highest power of each different prime factor present.

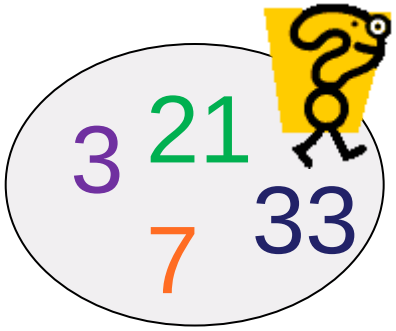


Interviewer: Do you know what volume means?

Child: Yes

Interviewer: Could you explain to me what it means?

Child: Yes, it's what is on the knob on the TV set.



$$^1/_2 + {}^1/_4 = {}^2/_6$$

What about the l (language) in the equation?

Different meanings and use of words:

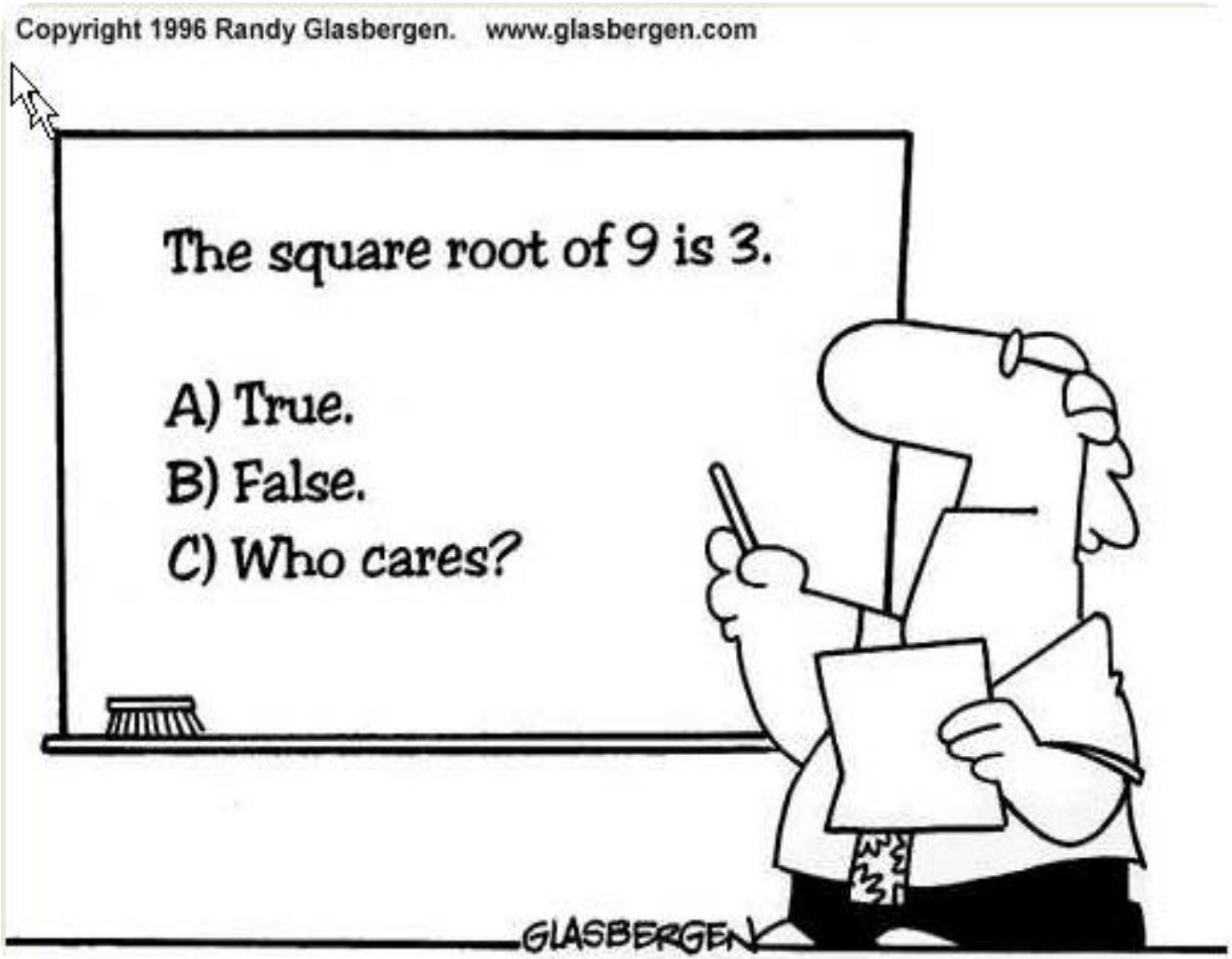
1. Consistent in both maths and everyday use, e.g. take-away
2. Just maths, e.g. isosceles
3. Related but different and potentially confusing, e.g. volume, odd, cube, square, negative

What about the l (language) in the equation?

The language and discourse of mathematics are crucial to the understanding and learning of mathematics and numeracy, but often language use and meaning is not addressed, nor are teachers aware of the important role language plays.

- Words can be difficult to understand
- Words can be misunderstood, confusing and misleading.

Does L + M + l = N? And so what?



Does L + M + l = N? And so what?

YES! Some implications for teaching and learning:

- Numeracy is a complex beast – not just about numbers or maths – but they are crucial variables
- Show learners how maths is embedded in real life tasks and help students to excavate the maths from real world tasks (the L)
- Teach knowledge & understanding of mathematics (the M)
- Teach the language (the l) of maths (and numeracy)
- Encourage reading and talking maths (the L&l)

So as numeracy educators we are also teachers of **literacy** and **language** and **mathematics**.

So, back to, what is numeracy?

Lynn A. Steen, probably the most articulate spokesperson for “Quantitative Literacy” in the US, states that:

"...numeracy is not the same as mathematics, nor is it an alternative to mathematics. Today's students need both mathematics and numeracy. Whereas mathematics asks students to rise above context, quantitative literacy is anchored in real data that reflect engagement with life's diverse contexts and situations.

Questions/discussion?

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