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Singapore Workshop: several examples on
How can GenAI help teachers of mathematics?
Really helpful or sometimes too eager?

Finding powerful metaphors

Finding powerful metaphors...



provide three metaphors about variables in algebra that is appropriate for year 6 students

Here are three simple, year-6-friendly metaphors for variables in algebra:

1. A variable is a mystery box.

It's a little box with something inside, but you don't know the number until someone tells you or you figure it out.

2. A variable is a placeholder name-tag.

It's like writing a name on a chair to save the seat. The letter (like x) saves a place for whatever number will sit there later.

3. A variable is a blank in a puzzle.

Just like a blank space in a crossword or number puzzle, the variable stands for the number you need to find to make everything fit.

If you want, I can also give examples using these metaphors!



Another example



What are some metaphors for teaching proportionality?
Use ChatGPT or some other source.

<https://chatgpt.com/share/69efec20-e20c-8324-ac04-6be749e2695a>

Metaphors for proportionality



GenAI mathematical thinking



How reliable is GenAI as a source of mathematical thinking?

Source: Cameron, S., Mesiti, C. & Fijn, P. (2025). How Knowledgeable is ChatGPT 4o? Assessing the Pedagogical Content Knowledge of a Generative Artificial Intelligence Tool. Unlocking minds in mathematics education: Proceedings of the 47th annual conference of the Mathematics Education Research Group of Australasia, MERGA. Link: <https://hdl.handle.net/11343/357106>

Assessment Protocol Including Tasks



Assessment Protocol Including Tasks

Clear your memory of prior conversations

ChatGPT responds to prompt

<Item Square>

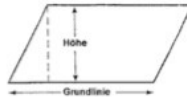
How does the surface area of a square change when the side length is tripled? Show your reasoning. Please note down as many different ways of solving this problem (and different reasonings) as possible (and number each method).

ChatGPT responds to task

<Item Parallelogram>

The area of a parallelogram can be calculated by multiplying the length of its base by its height as shown in the attached image where Höhe: Height and Grundlinie: Base. Please sketch an example of a parallelogram to which students might not be able to apply this formula.

<Image shown below is attached>



ChatGPT responds to task

<Item Minus 1 times minus 1>

A student says: I don't understand why $(-1) \cdot (-1) = 1$. Please outline as many different ways as possible of explaining this concept to your student (and number each explanation).

ChatGPT responds to task

<Item Recurring decimal>

Is it true that $0.999999 \dots = 1$? Please explain your answer.

ChatGPT responds to task

Note: <text> indicates annotations for this paper that were not provided to ChatGPT.

The COACTIV Instrument



An existing instrument, the COACTIV Test of Mathematics Teachers' Professional Knowledge (PCK – CK) was selected for use in this study (Krauss et al., 2008). This instrument was developed as part of the COACTIV project which aimed to assess secondary mathematics teachers' PCK and CK in Germany.

The COACTIV project conceptualised PCK as “knowledge of explanations and representations, knowledge of students' thinking, and knowledge of multiple solutions to mathematical tasks” (p. 888) and CK as “deep background knowledge of school-level mathematics” (p. 888). These definitions have been adopted for this study. (From Cameron, Mesiti & Fijn, 2025)

A Correct, Partially Correct and Incorrect Response to Item Square (Chat_1)



A Correct, Partially Correct and Incorrect Response to Item Square (Chat_1)

<p>Correct response.</p> <p>This response aligns with the 'covariate/functional' code provided in the COACTIV codebook.</p>	<p>Method 5: Logical reasoning via Length Doubling</p> <ol style="list-style-type: none">1. We know that doubling the side length ($2s$) results in quadrupling the area: $(2s)^2 = 4s^2$2. Now, tripling the side length is an even larger increase.3. Instead of $2^2 = 4$, we compute $3^2 = 9$.4. So, the area must increase 9 times.
<p>Partially correct response.</p> <p>The codebook indicated that the correct use of a visual representation must include a diagram, so this response is considered partially correct.</p>	<p>Method 4: Visual Representation</p> <ol style="list-style-type: none">1. Draw a square with side s, and label the area as s^2.2. Now triple the side length to $3s$, forming a new, larger square.3. This larger square can be divided into 9 identical original squares (each of area s^2).4. Now we have 9 times as many original-sized squares, the area increased by a factor of 9.
<p>Incorrect response.</p> <p>This response is incorrect as it is incomplete. The original length is not defined, the original area is not defined, and we must assume that the increase of side length by 3 corresponds to $3s$.</p>	<p>Method 6: Algebraic Expansion</p> <ol style="list-style-type: none">1. Express the new area in expanded form: $(3s)^2 = (3s) \times (3s)$2. Using the distributive property: $3s \times 3s = (3 \times 3) \times (s \times s) = 9s^2$3. The new area is 9 times the original.

Note: Emphasis in original.

Gen AI as a coding tool



Using Gen AI to simplify coding

Using Scratch for polygons



<https://chatgpt.com/share/69eee424-5658-8321-992d-1c606f1328e0>



Using Gen AI to simplify coding



Prime number generation using Excel:



Prime number in Excel – annotated



Prime number in Excel – annotated

<https://url.au.m.mimecastprotect.com/s/9v9pCXLKNwFBZBvgmc6fMTWUQuz?domain=docs.google.com>

Prime Number Finder – continued



Prime Number Finder

File Edit View Insert Format Data Tools Extensions Help

100% | \$ % .0 .00 123 | Default... | 10 | B I A

	B	C	D	E	F	G	H	I	J	K
6	5 Yes	5								
7	6 No									
8	7 Yes	7								
9	8 No									
10	9 No									
11	10 No									
12	11 Yes	11								
13	12 No									
14	13 Yes	13								
15	14 No									
16	15 No									
17	16 No									
18	17 Yes	17								
19	18 No									
20	19 Yes	19								
21	20 No									
22	21 No									
23	22 No									
24	23 Yes	23								
25	24 No									
26	25 No									
27	26 No									
28	27 No									
29	28 No									
30	29 Yes	29								
31	30 No									
32	31 Yes	31								
33	32 No									
34	33 No									
35	34 No									
36	35 No									

MAIN CODE LOCATION:
Cell B2 contains the main prime-checking formula.

HOW TO SEE THE CODE:
1. Click on cell B2
2. Look at the formula bar (long white box above the spreadsheet)
3. You will see the formula/code there

THE FORMULA IN B2:
No

WHAT THE CODE DOES:
- If number < 2 → "No" (not prime)
- If number = 2 or 3 → "Yes" (prime)
- Otherwise → checks divisors from 2 up to \sqrt{n}
- If no divisors found → "Yes" (prime)
- If any divisor found → "No" (not prime)

OTHER CODE LOCATIONS:
- Cells B3 to B101: Copies of the formula (one for each number)
- Cell C2 and down: Prime list formula (=IF(B2="Yes", A2, ""))
- Cell E1/F1: Count formula (=COUNTIF(B2:B101, "Yes"))

HOW CODE WORKS IN SPREADSHEETS:
Unlike Python or Java, spreadsheet "code" isn't in a separate file. It's written directly into cells using formulas. When you copy a formula down, it automatically adjusts for each row.

Phenomenology of AI



<https://chatgpt.com/share/69f292b7-7628-8323-a157-41b910c47cbf>





Contact me

**m.stephens
@unimelb.edu.au**



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