



Because maths matters!

Welcome to the MEI conference 2026

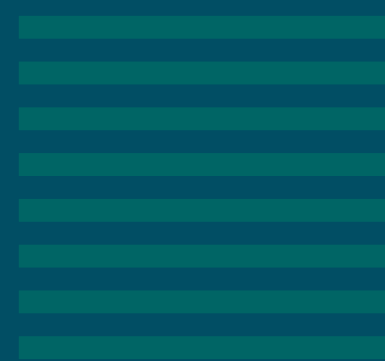
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A large, stylized green arrow pointing to the right, partially overlapping the text.

Let's not waste time, let's do a puzzle - together

Jo Sibley

A series of horizontal green lines of varying lengths, stacked vertically on the right side of the slide.

What we're doing

- I try to convince you that you should start a puzzle club for staff (and maybe students)
- Talking to each other about puzzles
- Putting that into action
- Try a new puzzle – collect some lemmas
- The power of the real-life team solve – we try an example
- You tell me you're convinced about the puzzle club and ask where you can get more puzzles to share!

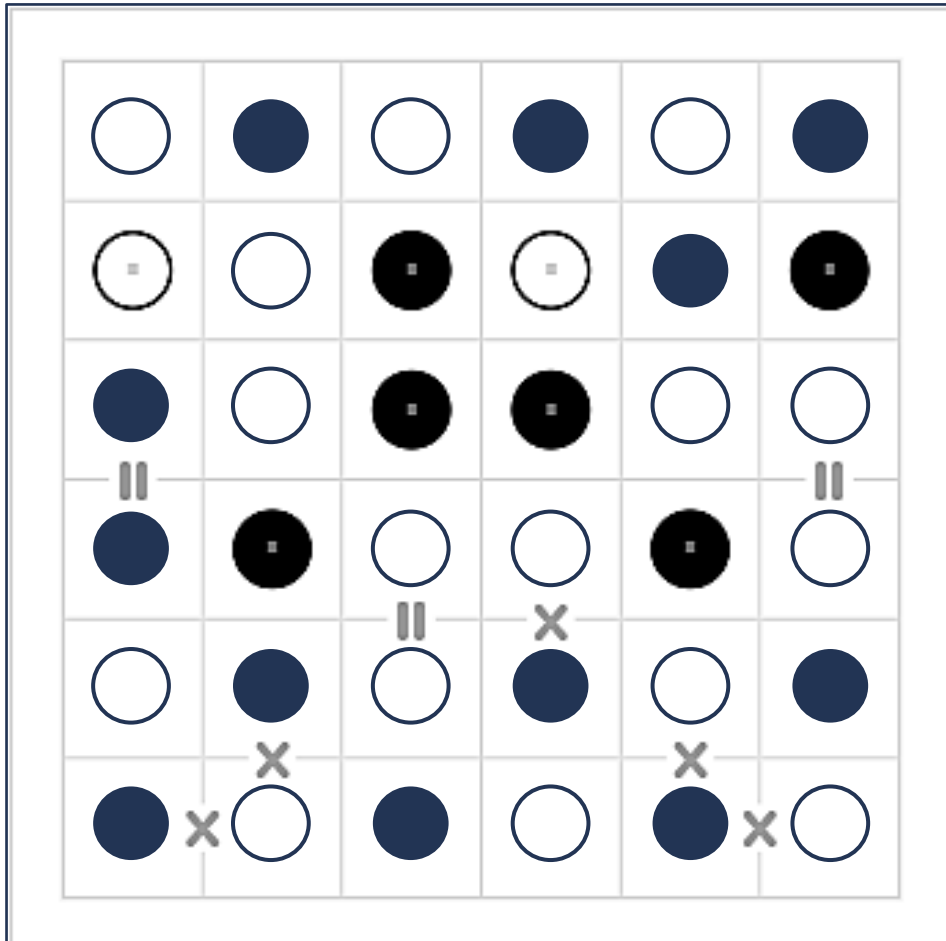
What's the first rule of Teambreak?

Actually, it's "We do not talk about work at Teambreak"

But the second rule of Teambreak is probably: we bond over puzzles.



Talking about puzzles – the first puzzle on your handout

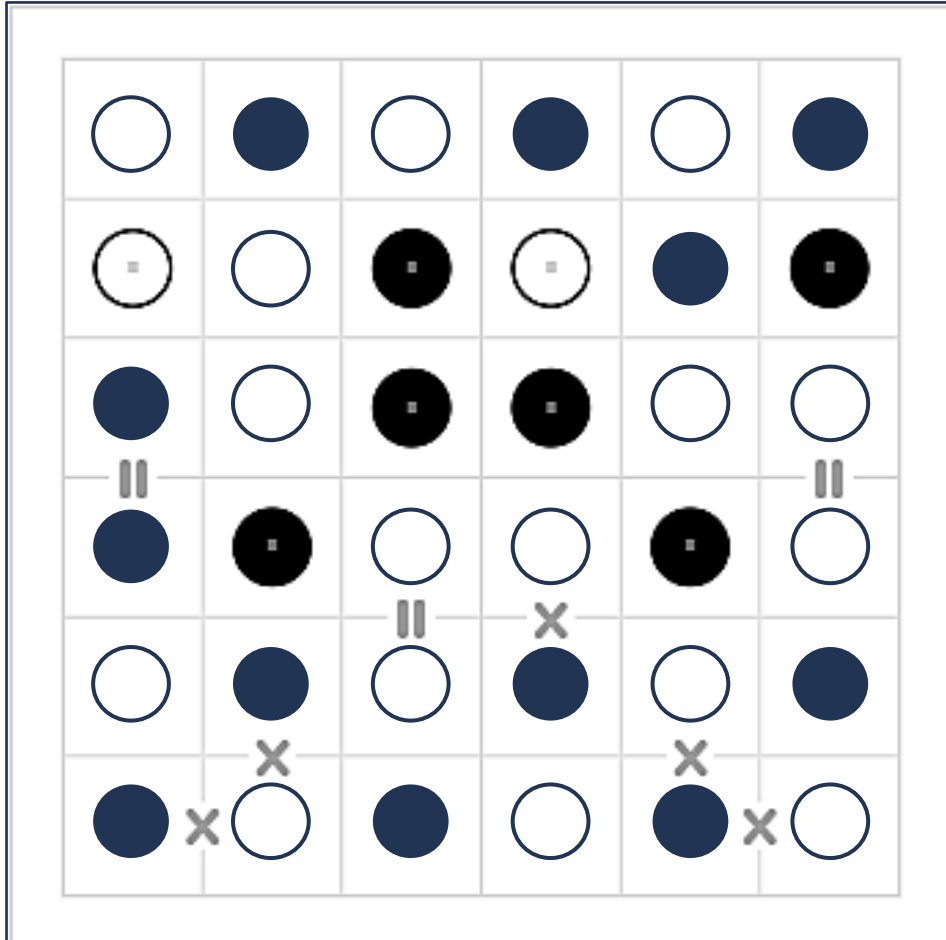


Discuss with a neighbour:

What are the rules?

- Equal numbers of white and black circles in each row and each column
- No more than two adjacent of the same colour
- 'Same =' and 'Different x' rules
- No two rows or two columns have the same pattern.

Talking about puzzles – why do it this way?



- Low threshold for engagement
- Encourages pattern spotting but...
- Can also help spot misconceptions which come from spurious pattern spotting

Ways of talking

EVERYONE TAKES TURNS (is this obvious?)

Responses:

- Yes, and...
- Respectfully, I disagree...
- I'll summarise that...
- My reflection is...

Questions:

- Can you elaborate?
- Do we have enough information?
- Is that a lemma?
- Can we record that?

Feedback on your discussion

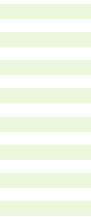
What did you learn from someone else?

Did you stick to the rules?



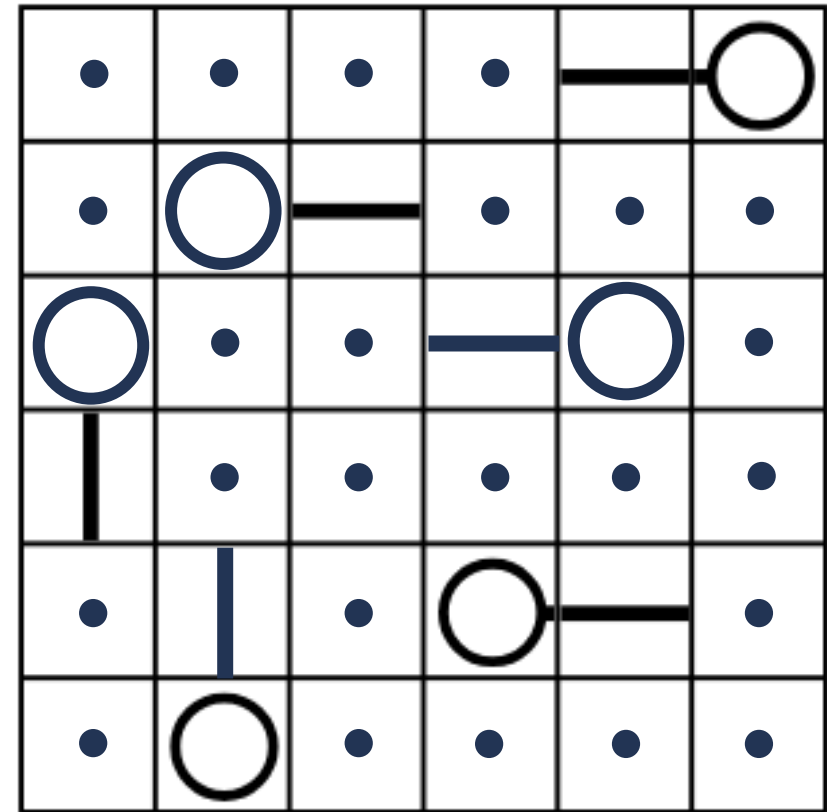
Who felt they did the last task well?

... because I need volunteers!



A **lollipop** is a single circle attached to a single straight line in an adjacent cell. Complete the lollipops on the grid and/or create new ones in such a way that:

- Every circle and line on the grid must be part of a lollipop (one circle + one line).
- Lollipops cannot touch each other: no two parts of different lollipops may share an edge.
- Parts of the same type (circle, horizontal line, vertical line) must be separated by a different part along a row or column. A horizontal and vertical line are considered two different parts.



<https://www.puzzle-lollipops.com/>

Feedback on your discussion

What did you learn from someone else?

Did you stick to the rules?



The Joy of Repetition?

Do you have students (or children of your own) who:

- Like to write the question out before they start?
- Are comfortable completing the same lengthy task but 'with different numbers' but don't know where to start with problem solving?
- Can play the same game for hours on end without a break?

Do you recognise this behaviour in yourself or colleagues?

Who else thrives on
a repetitive task?

Copilot loves repetitive tasks

1. Humans are naturally drawn to pattern recognition

Pattern recognition is considered a fundamental cognitive process. It allows us to identify regularities, make predictions, and learn from experience. Many researchers argue that this ability was strongly shaped by evolutionary pressures because detecting meaningful patterns helped with navigation, finding food, and avoiding threats. [\[https://eu...s/original\]](https://eu...s/original), [\[en.wikipedia.org\]](https://en.wikipedia.org), [\[psychologytoday.com\]](https://psychologytoday.com)

2. Solving puzzles can feel rewarding because of dopamine-based learning systems

Dopamine has long been associated with reward prediction and reinforcement learning. When outcomes are better than expected, dopamine signaling helps update expectations and reinforces behaviors that led to successful outcomes. Small puzzle-solving successes fit this type of learning process. [\[scienceinsights.org\]](https://scienceinsights.org), [\[nature.com\]](https://nature.com), [\[gershmanlab.com\]](https://gershmanlab.com)

3. Repetition is enjoyable when it produces a sense of mastery

Learning theories and flow research suggest that people are most engaged when challenges are matched to their skill level and when they receive immediate feedback. Repeated engagement with a task allows skills to improve, creating feelings of competence and control that can be intrinsically rewarding. [\[lernerlab.org\]](https://lernerlab.org), [\[learning-theories.com\]](https://learning-theories.com), [\[mlpp.pressbooks.pub\]](https://mlpp.pressbooks.pub)

4. Puzzles often create a "flow" state

Mihaly Csikszentmihalyi's flow theory proposes that people experience deep enjoyment, concentration, and immersion when challenges are well matched to their abilities. Puzzles are frequently used as examples of activities that can induce flow because they provide clear goals, immediate feedback, and an appropriate challenge-skill balance. [\[lernerlab.org\]](https://lernerlab.org), [\[open.ncl.ac.uk\]](https://open.ncl.ac.uk), [\[learning-theories.com\]](https://learning-theories.com)

5. Repetitive mental activities can reduce awareness of distractions

Flow theory also predicts intense attentional focus, where awareness becomes concentrated on the activity itself and unrelated concerns recede. This is one reason that repetitive but engaging activities can feel calming or meditative. [\[lernerlab.org\]](https://lernerlab.org), [\[isu.pressbooks.pub\]](https://isu.pressbooks.pub), [\[mlpp.pressbooks.pub\]](https://mlpp.pressbooks.pub)

6. Humans like closure and completion

The Zeigarnik effect describes the tendency for unfinished tasks to remain cognitively active and more memorable than completed ones. Completion relieves the tension associated with unresolved goals, which may help explain why solving a puzzle feels satisfying. [\[scienceinsights.org\]](https://scienceinsights.org), [\[en.wikipedia.org\]](https://en.wikipedia.org), [\[psychologytoday.com\]](https://psychologytoday.com)

Quick summary

1. Humans are naturally drawn to pattern recognition
2. Solving puzzles offer a dopamine 'buzz'
3. Repetition is enjoyable when it produces a sense of mastery
4. Puzzles often create a 'flow' state (getting 'in the zone')
5. Repetitive mental activities can reduce awareness of distractions
6. Humans like closure and completion
7. Curiosity and problem solving are linked to learning and adaptation

One caveat: psychologists generally do not claim that people enjoy repetition itself. Rather, the evidence suggests people enjoy repetition when it contains **novel information, progress, feedback, pattern discovery, or skill development**. Purely repetitive tasks without these features tend to produce boredom rather than enjoyment.

Big, real puzzles are real life maths

‘School’ maths = Puzzles with a small, concise, known answer, usually solved solo, in a few minutes

‘Real’ maths = Huge complex puzzles, with no known answer (yet), solved by teams of people, chipping away at part at a time, over years, decades, lifetimes or generations

Such as?

Heist problem

Teams of...

You know the problem will be simple and repetitive.

Briefly, discuss how you will plan to complete the task as **efficiently** as possible.

The task

For the integers between 0 and 200:

1. Find and count all the primes
2. Find and count all the pairs of primes in that that differ by four.
3. Find and count all the pairs of primes that differ by three.
4. Find and count all the pairs of primes that differ by two.
5. Decide how you might represent these results to illuminate further information.

The twin prime conjecture

An outstanding Millennium Maths Problem

“The **twin prime conjecture** states that there are infinitely many pairs of prime numbers that differ by exactly 2.

“Examples: (11, 13), (101, 103).

“While tested by computers for massive numbers, it remains an unproven fundamental problem in number theory.

“Mathematically, the statement asserts that there are infinitely many primes p such that $p + 2$ is also prime.”

The twin prime conjecture

What progress has been made?

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Questions to ask:

What is the largest twin prime pair we have so far?

Have we proved any different but similar conjectures?

How will we know we have a proof?

These are very
challenging questions!

The twin prime conjecture

What progress has been made?

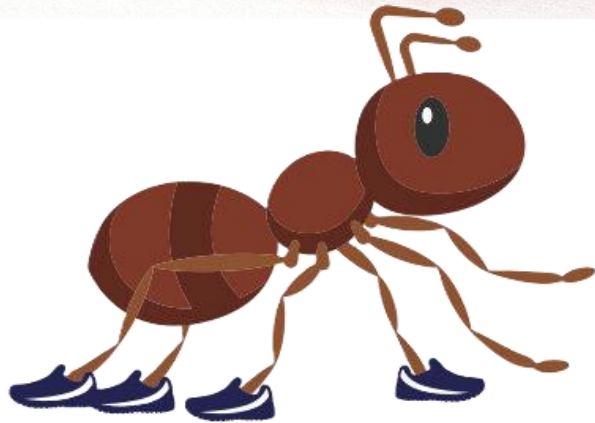
Questions to ask:

- What is the largest twin prime pair we have so far?
 - Have we proved any different but similar conjectures?
 - How will we know we have a proof?
- Largest twin prime pair:
 $2996863034895 \times 2^{1290000} \pm 1$
(found 2016, Wikipedia quoted Jan 2025)
 - In 2013, Yitang Zhang proved that for $N < 70$ million, there are infinitely many pairs of primes that differ by N . In 2014, this was reduced to 246 by James Maynard and Terence Tao.
 - It will be independently verified by other mathematicians.

Why are we looking at this?



*"If I have seen
further it is by
standing on the
shoulders of
Giants."*



...but, more importantly,
by walking in the shoes of
ants

The department that plays together stays together?

Solving puzzles together builds the team dynamic, brings different perspectives, gives a low-stakes reason to share time together.

Less confident team members gain a stronger voice, competitive team members can channel this into a team achievement.

Have I convinced you to start a puzzle club?

What else would you need?

Resources I use:

PuzzleGym

PuzzleTeam

Contains ads · In-app purchases

4.3★

66 reviews

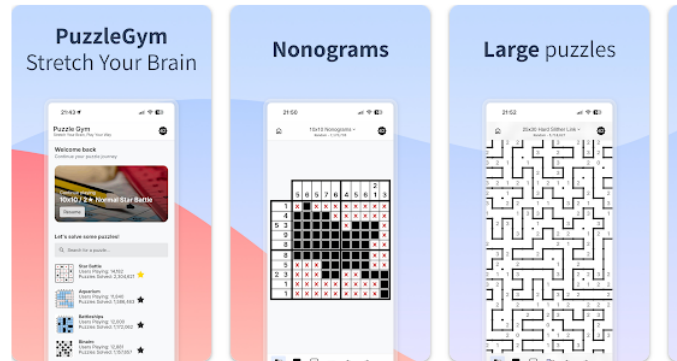
1K+

Downloads

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This app is available for some of your devices



Data safety

<https://www.puzzle-binairo.com/>

<https://www.puzzle-lollipops.com/> (currently patron-only)

LinkedIn Morning Puzzle

<https://www.linkedin.com/mynetwork/grow/>

What else do you use?

Mass print function

<https://www.puzzle-binairo.com/binairo-plus-10x10-hard/>

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Binairo

10x10 Hard Binairo+ Puzzle ID: 6,619,961
10x10 Hard Binairo+ Puzzle ID: 9,741,362
10x10 Hard Binairo+ Puzzle ID: 1,738,430
10x10 Hard Binairo+ Puzzle ID: 3,461,051
10x10 Hard Binairo+ Puzzle ID: 2,461,525
10x10 Hard Binairo+ Puzzle ID: 4,054,485
10x10 Hard Binairo+ Puzzle ID: 3,626,054
10x10 Hard Binairo+ Puzzle ID: 7,384,175
10x10 Hard Binairo+ Puzzle ID: 4,020,826

www.puzzle-binairo.com

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More settings ^

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Pages per sheet 1

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Options ☒ Headers and footers ☐ Background graphics

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Because maths matters!

Thank you

Jo Sibley