

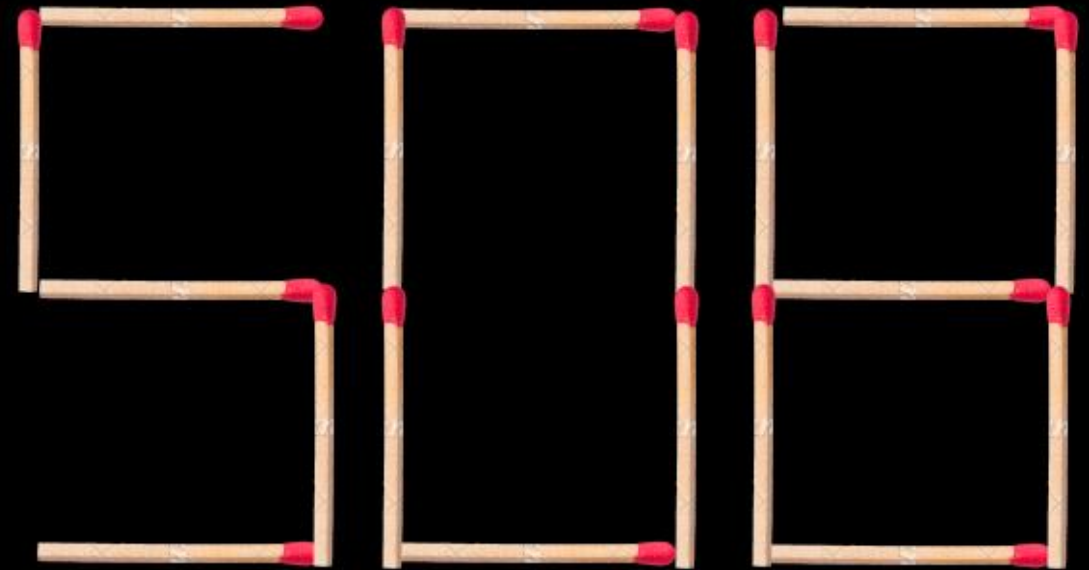
Preparing for teaching

Goals:

- *Obtain and share ideas for planning teaching*

Øistein Søvik, UiT

Problem of the day



If you can only move two matches, what is the biggest possible number?



Preparing



What is the goal
of preparation?

Think, Pair, Share





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We prepare amongst other things to

- Learn the material
- Be able to answer questions
- Stay calm, deal with anxiety

Notice how this is a very "me" focused learning perspective. "I need to be prepared, I need to..."

While the points above are valid, I argue the main focus of preparation should be to **maximize what the students learn**

**BE
PREPARED**



Constructive Alignment



There should be logical alignment between all three elements - it does not matter where the design point starts. (Adapted from Biggs, 2003)



Tips and tricks for preparing for seminars.

- **Begin with the end.** Clearly define what you want your students to have learned or understood after the session.
- **Post it:** Either write it on the blackboard or orally convey to the students what you want them to learn. One sentence ^^
- **Understand the concept:** Beforehand see that you understand the overarching concepts of the session. How would you explain the general themes / concepts?
- **Measure:** Plan how you will assess if the students have learned what you want them to.
- **Engage the students:** Plan good questions to make the students discuss in groups. Problem of the day.





Some general tips

- **Your time is valuable;** spend it wisely
- **Set a deadline:** 1 hour preparation per lecture and use it as effective as possible. Adjust as needed.
- Does my preparation **improve student learning?**
If not, scrap it!
- Measure how effective your preparation is. Adapt.
- Save time preparing using **conversation techniques**

(These will be covered next)



Communication techniques

I use communication techniques to lessen the time I need to prepare!

PÓLYA'S METHOD

I

Identify the problem

- What is the unknown? What are the data? What is the condition?
- Draw a figure. Introduce suitable notation

D

Develop a plan

- Draw connection between data and the unknown. Have you seen it before? Perhaps a problem with similar unknown?
- Try solving a **SIMPLER** problem.
- Try specialization and generalization of problem.

E

Execute the plan

- Execute the plan that you just developed.
- If it doesn't work, go back to step 2 and develop another plan.

A

Assess the solution

- Can you derive the solution differently?
- Can you use the result or method in some other problem?

- My goal is to get the students to follow Pólya's method
- Makes the student more independent
- Using Polya I can help the students without having seen the problem before
- Often In the process of using this the students discovers the solution on their own

Polya's First Principle: Understand the problem

- What are you asked to find or show?
- Do you understand all the words used in the problem?
- Can you restate the problem in your own words?
- What do you know? / Is there enough information to enable you to find a solution?

**“ IF YOU CAN'T
EXPLAIN IT
SIMPLY,
YOU DON'T
UNDERSTAND
IT WELL
ENOUGH ”**

A yellow lightbulb icon with rays emanating from it, symbolizing an idea or understanding.

Polya's Second Principle: Devise a plan

Ask the students to show what they have tried
or ask if they have any ideas for how to solve the problem

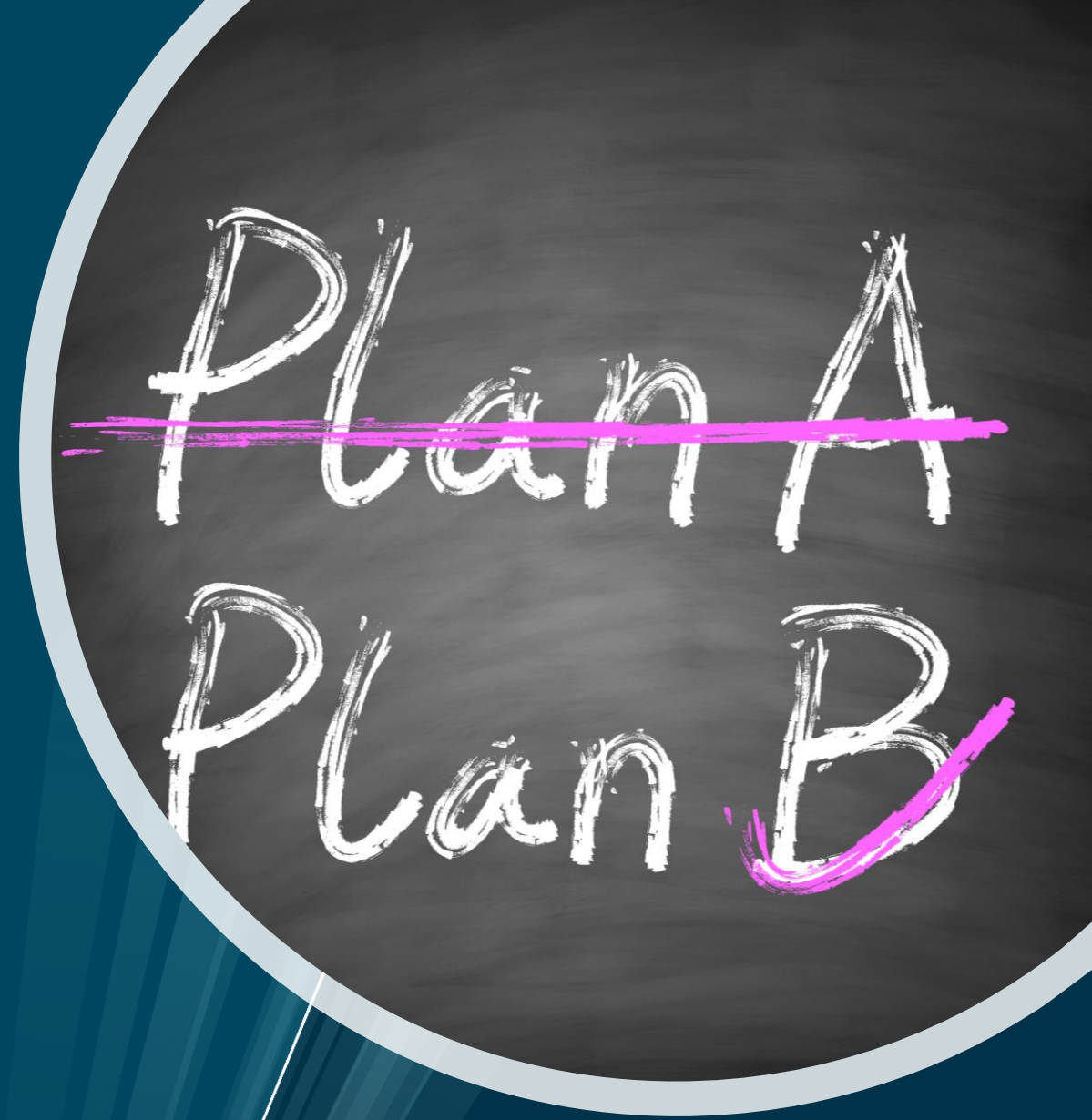
If not give the student some pointers, and time to try it.

- Guess and check
- Make an orderly list
- Eliminate possibilities
- Use symmetry
- Consider special cases
- Use direct reasoning
- Solve an equation
- Look for a pattern
- Draw a picture
- Solve a simpler problem
- Use a model
- Work backwards
- Use a formula
- Be ingenious



Polya's Third Principle: Carry out the plan

- Allow the students to attempt their plan on their own!
- Failing is a natural part of learning =)
- Encourage the students to pick another method to solve the problem if they did not succeed

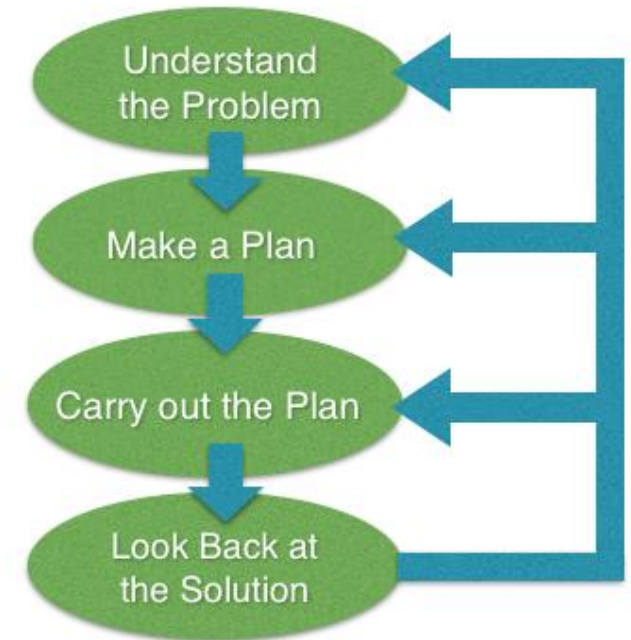


Polya's Fourth Principle: Look back

Every student: Is my answer correct???

- Make the students check if their own answer makes sense.

Polya mentions that much can be gained by taking the time to reflect and lookback at what you have done, what worked, and what didn't. Doing this will enable you to predict what strategy to use to solve future problems





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- Ask: "which problem are you working on"/"How far have you come." Instead of "do you need help".
- Ask: "What is the problem asking you to do?"
- What information does the problem give you?
- Give the student a starting point. Look at page x in the book, try this equation...
- Give the students time to think
- Circle the classroom
- Try in some way to make the student spot their own mistakes

When someone tells me to
do something I was already
planning on doing



Well now I'm not doing it 😡

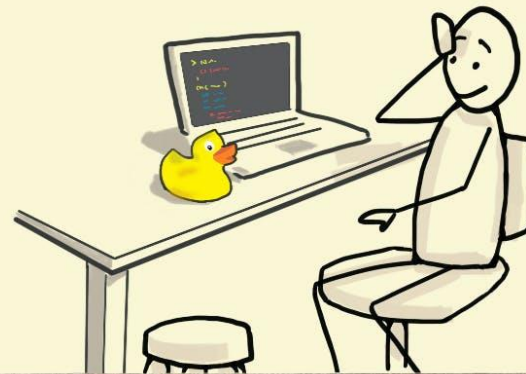
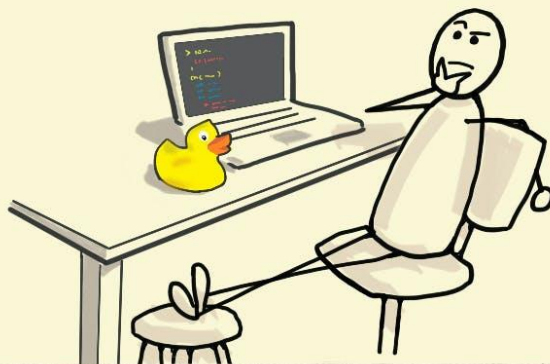
RUBBERDUCKING

THE TECHNIQUE OF EXPLAINING YOUR PROBLEM TO AN INANIMATE OBJECT TO HELP YOU SOLVE IT

I CAN'T FIGURE OUT WHAT'S UP.
I JUST TAKE EACH TRANSACTION
THEN APPLY THE FILTERS IN THIS
ORDER ANDHANG ON...

OF COURSE! WHAT WAS
I THINKING?? THANK
YOU RUBBER DUCK!

!!



sketchplanations

Open-ended Questions for Accountable Math Talk

- Compare _____. How are they the same? How are they different?
- What would you do if ...?
- What would happen if ...?
- What could you have done differently?
- If you do this instead, what will happen?
- Why did you decide to ...?
- Explain how you did ...
- Describe why you did ...
- What does (this) _____ represent?
- How did you know which ...?
- How did you know when ...?
- Consider how you could use other math tools to ...
- How could you record your work?
- How did you predict what the answer would be?
- How did you prove your estimate?

Background courtesy of <http://www.teacherspayteachers.com/Store/Krista-Walden>

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Talk Moves

To help you learn and think critically

REVOICING

Restate what someone else is saying by repeating, summarizing, rephrasing, or translating his/her words



REASONING

Think about what someone else is saying and compare your reasoning to his/her reasoning



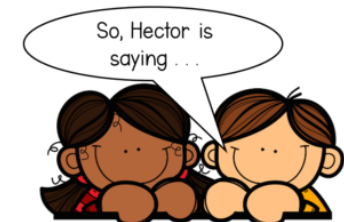
WAIT TIME

Give others time to think about the problem or discussion and time to respond



REPEATING

Repeat what someone said to show that what he/she said was heard and understood



ADDING ON

Connect your thoughts and ideas to what someone else is saying

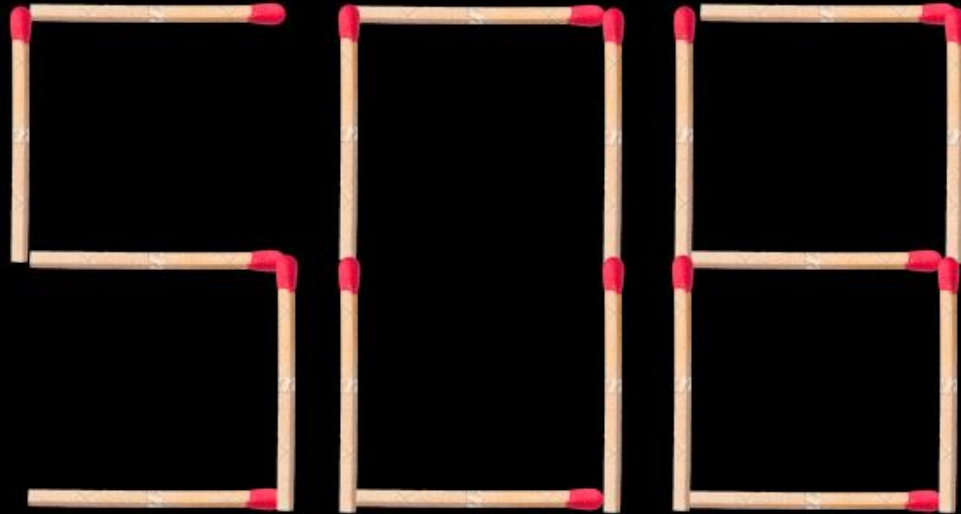


REVISE YOUR THINKING

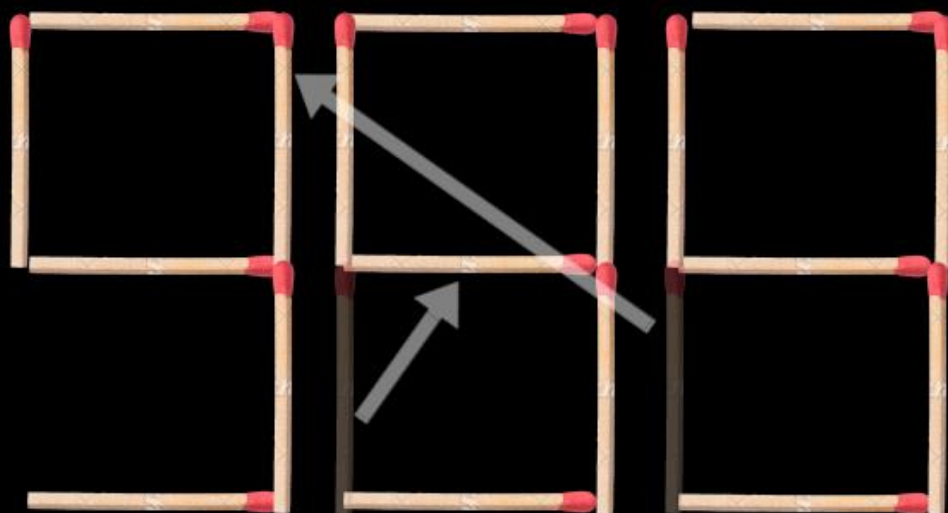
After listening to the thoughts and ideas of others, make changes to your thinking



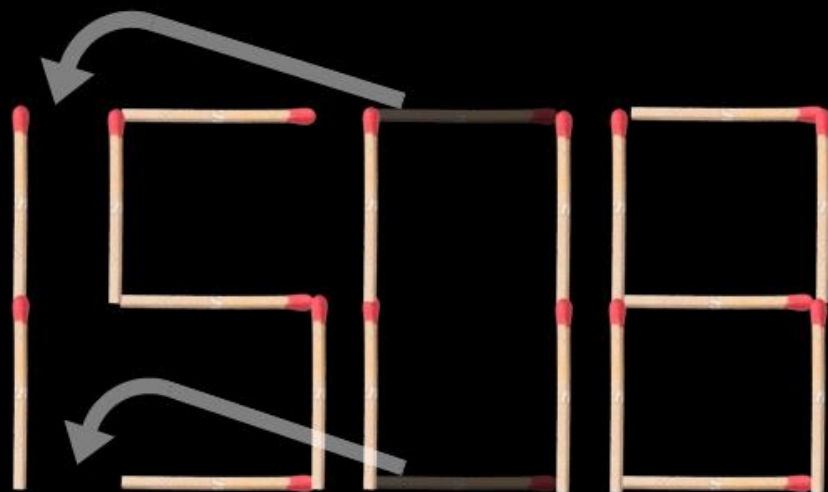
Share your solution with your neighbour.
Can you find another solution together?



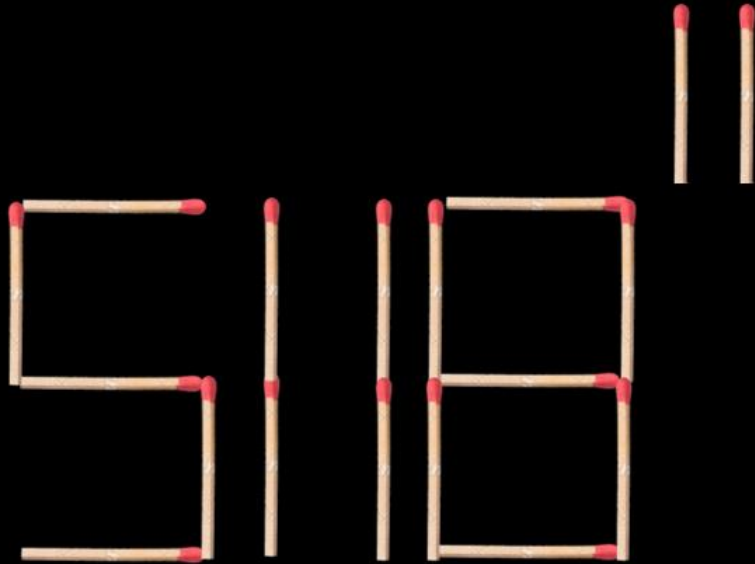
If you can only move two matches, what is the biggest possible number?



999. The highest possible 3 digit number.



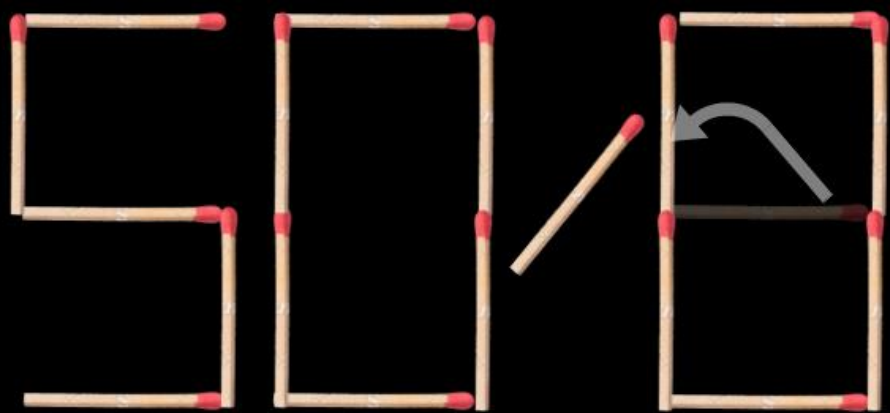
Move the top and bottom matchsticks in the middle zero to form a new digit in front of number 5



Use the two matches on top & below the middle zero



Use the two matches on top & below the middle zero to create power sign (^).
5 to the power of 118



**Move the middle match in number 8 to make a
divide sign. 50 divided by ∞ is infinity**

Assume you as a TA is asked to step in at 10 for someone sick to hold a exam preparation lecture in your course. How would you prepare?

Tuesday 09:58

Yo, Øistein Det har blitt en stor misforståelse med kræsjkurset i flerdim som e i dag kl 4, så vi har ingen te å hold kurset.. Har du tid å lyst te å gå gjennom en eksamen ellns?



Seff!

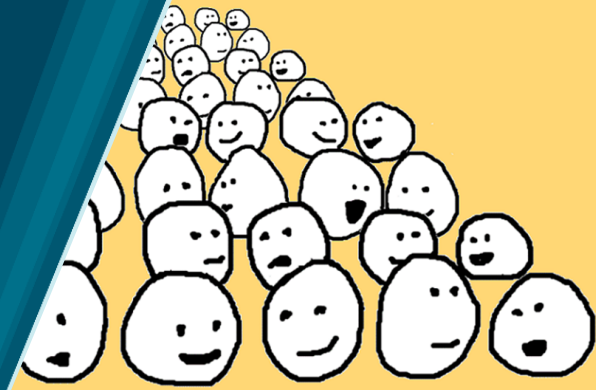
Think, pair, share:

- **Spend 2 minutes alone thinking**
- **Discuss in groups**
- **Share in Zoom**

Summary

Techniques: • Think Pair Share

- Pòlya,
- Problem of the day
- Plan how you prepare
- Give the students time to think
- Convey the purpose of the lesson to the students and yourself
- Use talk moves and ask open-ended questions
- Make the students explain and do their own work.
- Use Pólya to save time and make students more independent



THINK PAIR SHARE