Engaging the Disengaged

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Chair of NANAMIC and retired teacher

1

Starting out – First lesson

- What do you think of maths? – Discuss

2

7 Things that worked for me

- Use non-calculation starters

3

Possible starter activities

- The Great Race from
  We can work it out by ATM

4

The white car finished six places behind the blue car	It was raining on the day of the race	The purple car finished behind the white car	All the cars finished the race	There are nine cars in the race
The orange car finished between the green and the yellow cars	Find the finishing order of the cars	Only one car finished ahead of the blue car	The yellow car was in the middle of the order of finishing	The green car finished ahead of the black car
The pink car finished between the yellow and black cars	The average speed of the race was 102 mph	The red car finished four cars ahead of the yellow car	The green car finished before the yellow car	

5

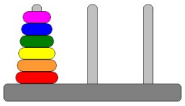
You may need to support

- Depending on your students you may need to suggest ordering pieces of paper marked with the colours
- There are 2 cards which are totally irrelevant

6

Other possible starters

- Picking up straws
- Tower of Hanoi
- Frogs



- Try to give simple printed instructions for them to follow

7

Picking up straws

- There are 41 straws on the table. You can pick **up to** 5 straws each time you have a go. Your opponent can also pick **up to** 5 straws each time. The winner is the one who picks up the last straw. You could pick 1, 2, 3, 4 or 5 straws to win.
- It is possible for you to win every time, if you go first. Can you work out how?
- What if you could both pick up to 6 straws on each go? Or 4 straws? What if you had only 23 straws?

8

7 Things that worked for me

- Use non-calculation starters
- Give them a reason for learning

9

Why learn?

- I am going to teach you Oshiwambo
- Why?
- We learn best what we want to learn like driving a car
- In the first lesson ask them what they would like to be able to do in maths by the end of the year that they can't do now – then make sure they can

10

7 Things that worked for me

- Use non-calculation starters
- Give them a reason for learning
- Start with a problem, not a method

11

Start with a problem

- Option1
  - Learn how to calculate area and perimeter then answer some questions
- Option 2
  - York City is about to move into a new stadium. They want to know how much grass they need and how long a fence to instal.

12

7 Things that worked for me

- Use non-calculation starters
- Give them a reason for learning
- Start with a problem, not a method
- Don't repeat what they already know

13

Don't teach what they already know

- So much time is wasted repeating things
- Find out their knowledge by using posters
- Build on previous knowledge

14

Reveal misconceptions

- Misconceptions are how we learn
- Segment or sector?

15

Use effective questioning

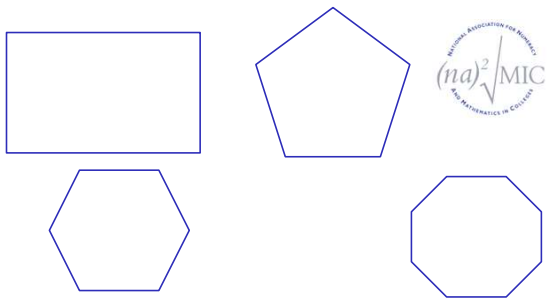
- It's not just about getting the right answer
- How many diagonals in a polygon?

16

Diagonals

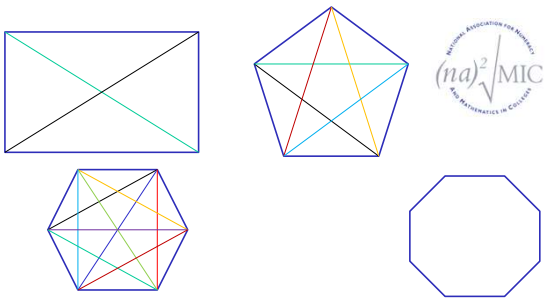
- How many diagonals do these shapes have? How many do you think a 10 sided polygon (a decagon) should have?

17



Number of sides	3	4	5	6	7	8	9	10
Number of diagonals								

18



Number of sides	3	4	5	6	7	8	9	10
Number of diagonals	0	2	5	9		20		

19

Find the pattern

- Number of diagonal = $\frac{n(n-3)}{2}$ where n is the number of sides
- Explain why

20

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- Don't repeat what they already know
- Use collaborative learning

21

Silence is (not) golden

- There is a place for individual work but
- Collaboration is key to understanding for most students
- Get them to explain why their answer is correct (even if it isn't)
- For investigations others might want to go in different directions

22

Frogs

- There are 5 lily pads in a pond and 2 red frogs and 2 green frogs are sitting on 4 of them. They want to swap so that the reds end up on the greens' pads and the greens end up on the reds'. They can hop from one pad to the next if it is empty or they can hop over one frog of the other colour onto an empty pad. What is the least number of goes you can do it in?

23

How to change to be more open

- NRICH Frogs (maths.org)

24

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- Don't repeat what they already know
- Use collaborative learning
- Reasoning rather than correct answer

25

Encourage reasoning

- Maths is all about getting the right answer!
- "Yes, but what's the answer?"
- Equals sign has become the bane of the maths teacher's life $6 = \square \times 2$
- We have placed too much emphasis on the answer and too little on understanding 3+4 = 7x8 = 56

26

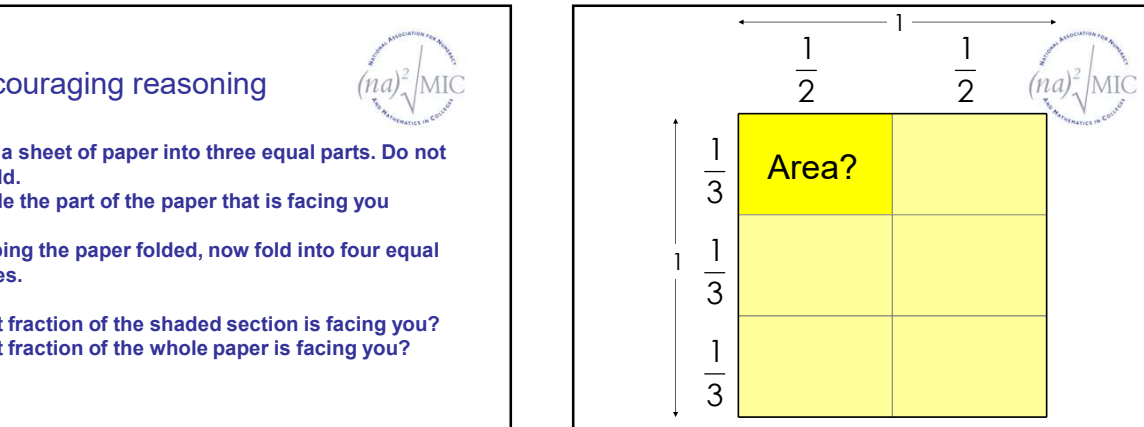
Encouraging reasoning

Fold a sheet of paper into three equal parts. Do not unfold.
Shade the part of the paper that is facing you

Keeping the paper folded, now fold into four equal pieces.

What fraction of the shaded section is facing you?
What fraction of the whole paper is facing you?

27



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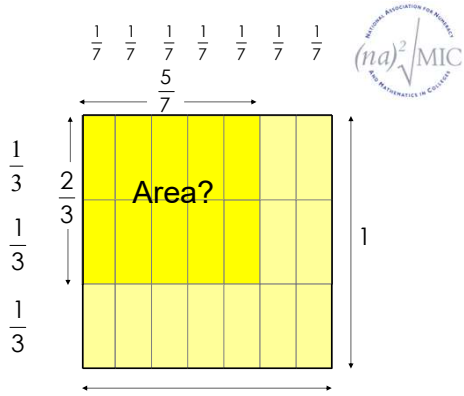

29

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- Use collaborative learning
- Reasoning rather than correct answer
- Create connections

30

Create connections

- Need to link topics
- A diagram can give understanding to some
- $(x + 3)(x + 2) =$

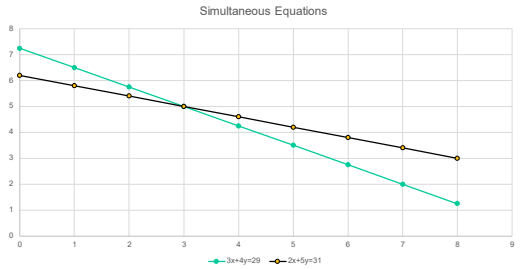
31

Create connections

- Need to link topics
- A diagram can give understanding to some
- Simultaneous equations and graphs

32

Simultaneous equations



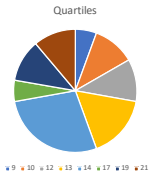
33

Create connections

- Need to link topics
- A diagram can give understanding to some
- Simultaneous equations and graphs
- Pie charts and box plot

34

Pie chart and Quartiles



- 1st quartile = 12
- Median = 14
- 3rd quartile = 17

35

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36

8 Principles for effective teaching

[*Malcolm Swan*]

- **Build on the knowledge learners bring to sessions**
- **Expose and discuss common misconceptions**
- **Develop effective questioning**
- **Use cooperative small group work**
- **Emphasize methods rather than answers**
- **Create connections between topics**
- **Use technology in appropriate ways**
- **Use collaborative tasks [Swan, 2006]**

37

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38