# Welcome to
# Teacher Subject Specialism Training

## (TSST 2018-19)

Wymondham College

Department for Education

Farlingaye High School

MathsHUBS Norfolk and Suffolk

Sir Isaac Newton Sixth Form

# Introductions

- Name
- Day job (school, year group, interests)
- Favourite number and why

# Overview of the programme

Seven sessions - held at Wymondham College, Farlingaye High School or Sir Isaac Newton Sixth Form.

Residential of six sessions held at Wymondham College

# TSST Primary Maths

| Primary Sessions | Delivered by | Wymondham | Farlingaye | Sir Isaac Newton |
|---|---|---|---|---|
| **Effective Mathematics Teaching**<br>• To understand the core principles behind how to teach mathematics effectively | Alison Borthwick/ Rose Keating | Sat 3rd Nov<br>9.15 – 11.30am | Wed 31st Oct<br>5.00 – 7.15pm | Thurs 1st Nov<br>5.00 – 7.15pm |
| **Conceptual Understanding**<br>• To understand the principles and practicalities behind conceptual mathematics in the classroom | Alison Borthwick/ Rose Keating | Wed 28th Nov<br>5.00 – 7.15pm | Tues 27th Nov<br>5.00 – 7.15pm | Thurs 29th Nov<br>5.00 – 7.15pm |
| **Fluency**<br>• To understand the importance of seeing links and forming relationships between numbers or values | TBC | Wed 23rd Jan<br>5.00 – 7.15pm | Thurs 17th Jan<br>5.00 – 7.15pm | Tues 22nd Jan<br>5.00 – 7.15pm |
| **Reasoning**<br>• To explore the strategies required to solve problems by establishing an understanding of patterns and themes | TBC | Sat 2nd Feb<br>9.15 – 11.30am | Thurs 7th Feb<br>5.00 – 7.15pm | Tues 12th Feb<br>5.00 – 7.15pm |
| **Problem Solving**<br>• To understand and appreciate how pattern is at the heart of mathematics | TBC | Wed 13th March<br>5.00 – 7.15pm | Thurs 7th March<br>5.00 – 7.15pm | Tues 12th March<br>5.00 – 7.15pm |
| **Number**<br>• To understand positional, additive and multiplicative place value and the properties of number, including big numbers, decimals and negative numbers | Sophie Kardi | **Residential**<br>Friday 5th April – Saturday 6th April<br>at Wymondham.<br><br>For more information email:<br>**machinro.staff@wymondhamcollege.org** | | |
| **Algebra**<br>• To understand the foundations of algebra, including the importance of equals | Alison Borthwick (TBC) | | | |
| **Geometry**<br>• To explore the part of mathematics that is about shapes, sizes, positions and patterns. | Katy Doidge | | | |
| **Calculations 1**<br>• To explore how effective addition and subtraction strategies underpin much of the curriculum | TBC | | | |
| **Calculations 2**<br>• To explore how effective multiplication and division strategies underpin much of the curriculum | TBC | | | |
| **Bar Modelling**<br>• To understand pictorial representations of problems or concepts and their benefit in visualising problems | Alison Borthwick (TBC) | | | |
| **Numbers in context**<br>• To understand how measures and statistics are numbers in a context | Becky Crabtree (TBC) | Wed 22nd May<br>5.00 – 7.15pm | Thurs 23rd May<br>5.00 – 7.15pm | Tues 21st May<br>5.00 – 7.15pm |
| **Proportionality**<br>• To explore fractions as the relationship between the parts of a whole and the whole itself. | Alison Borthwick | Sat 8th June<br>9.15 – 11.30am | Thurs 13th June<br>5.00 – 7.15pm | Tues 11th June<br>5.00 – 7.15pm |

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# TSST Secondary Maths

| Secondary Sessions | Delivered by | Wymondham | Farlingaye | Sir Isaac Newton |
|---|---|---|---|---|
| **Effective Mathematics**<br>• Five big ideas that support effective maths teaching in the new curriculum. | Alison Borthwick/ Rose Keating | Sat 3rd Nov<br>9.15 – 11.30am | Wed 31st Oct<br>5.00 – 7.15pm | Thurs 1st Nov<br>5.00 – 7.15pm |
| **Conceptual Understanding**<br>• To understand the principles and practicalities behind conceptual mathematics in the classroom | Alison Borthwick/ Rose Keating | Wed 28th Nov<br>5.00 – 7.15pm | Tues 27th Nov<br>5.00 – 7.15pm | Thurs 29th Nov<br>5.00 – 7.15pm |
| **The Number System**<br>• Understanding place value and the properties of numbers. | Kay Lowdon / Sophie Kardl / Tom Marjoram | Sat 19th Jan<br>9.15 – 11.30am | Thurs 17th Jan<br>5.00 – 7.15pm | Tues 15th Jan<br>5.00 – 7.15pm |
| **Calculation strategies**<br>• Effective addition, subtraction, multiplication and division strategies. | Charlie Dawson | Wed 6th Feb<br>5.00 – 7.15pm | Thurs 7th Feb<br>5.00 – 7.15pm | Tues 12th Feb<br>5.00 – 7.15pm |
| **Problem solving**<br>• Strategies to enable students to construct and solve mathematical problems. | Nicola Coe | Sat 9th March<br>9.15 – 11.30am | Thurs 7th March<br>5.00 – 7.15pm | Tues 5th March<br>5.00 – 7.15pm |
| **Proportionality**<br>• Understanding fractions, decimals, percentages, ratio and proportionality. | Katy Doidge | **Residential**<br>Friday 5th April – Saturday 6th April at Wymondham.<br><br>For more information email:<br>**machinro.staff@wymondhamcollege.org** | | |
| **Probability**<br>• Effective strategies to teach probability for conceptual understanding. | Sophie Kardl | | | |
| **Transformations**<br>• Understanding how geometrical shapes and functions may be transformed. | Andrew Gemmell | | | |
| **Geometrical reasoning**<br>• Geometrical problem solving in the new curriculum. | Craig Stuart | | | |
| **Algebra and linear equations**<br>• Introducing algebra and working with the unknown in a linear context. | Charlie Dawson | | | |
| **Quadratics**<br>• Further algebra and working with the unknown in a quadratic context. | Charlie Dawson | | | |
| **Measures**<br>• Understanding perimeter, area and volume and their interconnections. | Jess Palmer | Sat 18th May<br>9.15 – 11.30am | Thurs 23rd May<br>5.00 – 7.15pm | Tues 21st May<br>5.00 – 7.15pm |
| **Pythagoras and Trigonometry**<br>• Effective strategies to introduce these 9-1 Foundation tier topics. | Rebecca Spearpoint | Wed 12th June<br>5.00 – 7.15pm | Thurs 13th June<br>5.00 – 7.15pm | Tues 4th June<br>5.00 – 7.15pm |

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# Rationale behind this TSST

- Richard Skemp
- John Mason
- Anne Watson
- Thomas Guskey
- Jo Boaler

# Golden Threads

- Conceptual understanding
- Connections between topics
- Fluency, Reasoning and problem solving
- Misconceptions in mathematics
- KS2/GCSE 9-1 Mathematics Curriculum

# Expectations from Trainers

- Well prepared sessions and resources
- A level of expertise of knowledge in the session they are running
- Friendly, on hand advice about mathematical issues
- Challenge (in a supportive way) towards existing practice
- Homework / Take away tasks after each session

# Expectations from Teachers

- Attendance at the sessions
- Completion of Homework tasks
- Upkeep of a folder (suggestions include: a reflective diary; notes/thoughts from the sessions; any observations or feedback )
- A pen pic at the end of the course

# Evaluation and Impact

- Informal session evaluations
- Conversations with Rob, Sophie and Tom
- Evaluation at the end of the Residential
- Teacher Audit on NCETM website
- Pupil survey

# Comments from last year

The impact that the TSST course has had on my teaching has been immense. I feel that I have grown in confidence which now shines through my teaching and the children have picked up on this.

All in all, this course has been absolutely amazing and I would recommend it to anyone in any year group, confident or not with maths. The teaching has been fantastic and it has also been very helpful to meet other teachers in all year groups and share ideas and trials and tribulations! I now feel up to date with current thinking and equipped to prepare my children for the rigours of the new curriculum and the end of KS2 tests in a way that they will really enjoy and gain a good understanding of mathematical concepts.

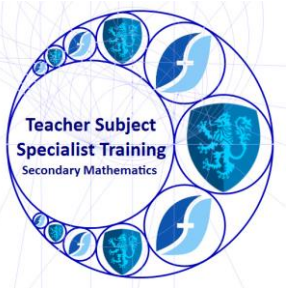
# Comments from last year

Each session has left me feeling inspired and excited about using my latest knowledge back at school the next Monday.

The course itself exceeded my expectations.

The Mathematics Course has been excellent and it has definitely fulfilled all my expectations. The speakers have been so knowledgeable and enthusiastic it has been really inspiring.

Spending Saturday mornings as part of a group of passionate and dedicated 'bods' who are all different, but all get excited about similar things has been quite special.




# Effective Mathematics Teaching

*Led by Alison Borthwick and Rose Keating*

Wymondham College

Department for Education

Farlingaye High School

MathsHUBS Norfolk and Suffolk

Sir Isaac Newton Sixth Form

# Golden Threads

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# What are the most effective ways to teach mathematics?

- Much debate …..

- Ofsted / DfE / STA / Academy Trust / Headteacher / Subject Leader

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# The headlines!

- Mathematical misconceptions
- Reasoning (thinking)
- Problem Solving
- Fluency
- Conceptual Understanding
- Language
- Making connections
- Subject specific pedagogy
- Attitudes and independence

# Misconceptions

There is variety of reasons why mistakes are made:

- a lapse in concentration
- memory overload
- a failure to notice important features in a problem.

However some mistakes, are symptomatic of more profound mathematical difficulties known as misconceptions.

*Many familiar and common misconceptions are based upon generalisations which are made during early mathematical experiences. Too often, pupils are given ample opportunity to practise and reinforce their misconceptions through repetitive exercises.*

Research suggests that teaching approaches which encourage the targeting of misconceptions, result in greater long-term learning compared with those approaches that try to avoid these from the start.

# Reasoning

What is reasoning?

How is it different to thinking?

What are the skills of reasoning?

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# Problem Solving

"When decisions have to be made about the steps to tackle a mathematical task this is called problem solving."

Pearson, 2014

- seeking solutions not just memorising procedures
- exploring patterns not just memorising formulas
- formulating conjectures, not just doing exercises

Polya, 1945

These skills need to be taught!

# Fluency

Across the curriculum

Arithmetic laws

The importance of balance

$$95 \div 5 =$$

# Conceptual Understanding

*"Mathematics is an abstract subject which requires representation, how it is represented may either hinder or support the development of understanding.*

*How we represent an idea in mathematics is a key part of the process by which we develop understanding and give meaning to that idea*."
(Barmby et al, 2009)

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# Part of conceptual understanding is the CPA teaching approach

# Language

- How is mathematical language developed in lessons?
- Which mathematical words do children struggle to remember and apply correctly?

*Children learn mathematics best by using it, and understanding the language of math it gives students the skills they need to think about, talk about, and assimilate new math concepts as they are introduced*

*Dr. David Chard, 2003*

# Making Connections

- *Which areas of mathematics are connected?*
- *How does this help children to learn?*
- *How does this fit in with our teaching?*

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# Subject specific pedagogy

- Mastery
- Mindset
- Lesson study
- Key questions:
  What is the same? What is different?
  What do you notice?

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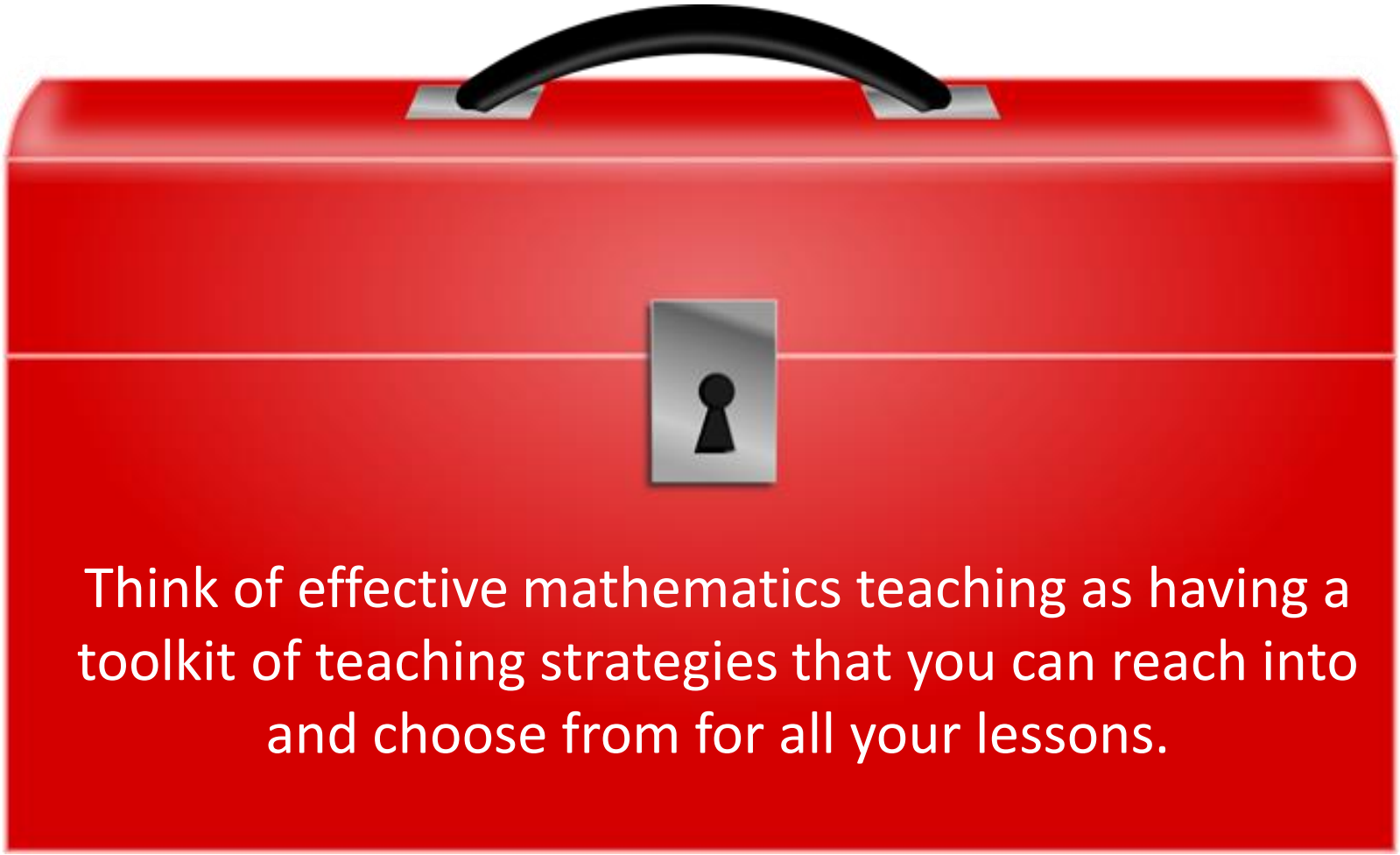
# Attitudes and independence

- *Do you 'nurture a thirst' for knowledge?*
- *Do you love maths?*
- *Do children see your enthusiasm and passion for mathematics?*

- *Do you nurture mathematical independence? How do you do this?*
- *How do you develop perseverance and resilience?*

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# Homework

Read

Skemp, Richard. (1976) Relational Understanding and Instrumental Understanding. *Mathematics Teaching* 77, 20-26

# Contact Details

| Rob Machin | Sophie Kardi | Tom Marjoram |
|---|---|---|
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