

Increasing Confidence and Competence in Algebra and Multiplicative Structures (ICCAMS-Maths)

Marc North
University of Nottingham



Education
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Original ICCAMS Project (2008-2012)

- **Phase 1:** Survey of attainment
- **Phase 2:** Intervention (Year 8) → development of:
 - 20 'Starter' activities (these provide teachers with the opportunity to gauge the way in which they students might respond to particular types of questions)
 - 40 formative assessment lessons dealing with topics of Algebra and Multiplicative Reasoning
- **Phase 3:** Trial with a small group of teachers and students

Design principles of the ICCAMS lessons

1. Formative assessment

Algebra: Lesson 3 STARTER

Up the garden path

Jan has built a garden path.

He used 4 diamond-shaped tiles and 12 triangle-shaped tiles:



Kim's path
has the same
pattern:



Kim says, "I used 20 diamond-shaped tiles".

Jan says, "Then you must have used 60 triangle-shaped tiles".

Explain Jan's reasoning. Is it right or wrong?

Commentary

The aims of this starter are to find out whether

- students tend to focus on numerical data to analyse a geometric pattern
- students consider a pattern's geometric properties to discern its structure.

Can students make sense of Jan's reasoning (whether or not it is right)?

Can students see that Jan's reasoning is wrong? What arguments do they use?

Design principles of the ICCAMS lessons

2. Use of 'realistic' contexts

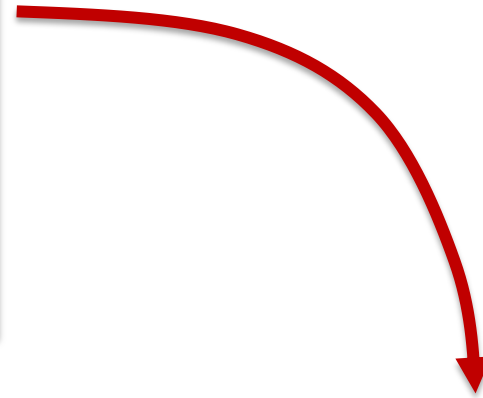
Algebra: Lesson 1A

Boat Hire

Olaf is spending the day at a lake.
He wants to hire a rowing boat for some of the time.

Freya's Boat Hire charges £5 per hour.
Polly's Boat Hire charges £10 plus £1 per hour.

Whose boat should Olaf choose?



Algebra: Lesson 1B

Comparing expressions

Which is bigger, $3n$ or $n + 3$?

Design principles of the ICCAMS lessons

3. Use of multiple representations

Multiplicative Reasoning: Lesson 1A

Models and stories

Here is an expression involving 12 and 3:

- Think of
- some ways of saying " 12×3 "
 - some ways of calculating 12×3
 - some diagrams that fit the expression
 - some stories that fit the expression.

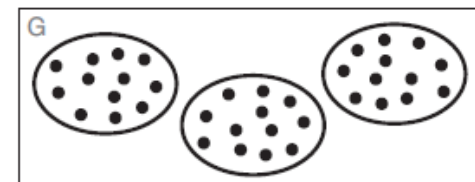
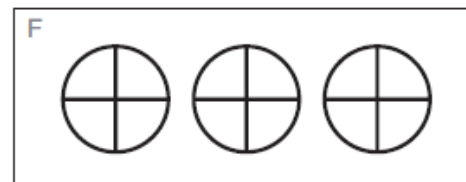
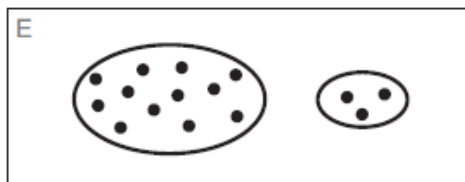
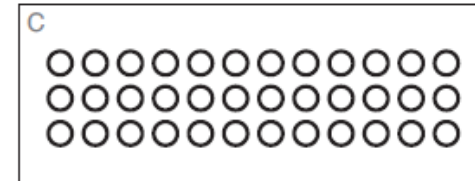
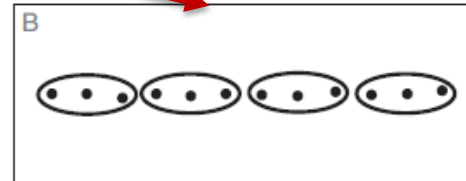
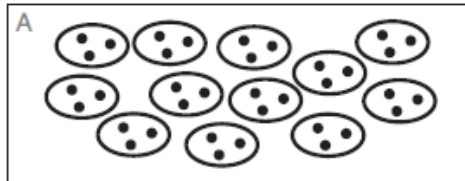
$$12 \times 3$$

A story for 12×3

Zak wants to learn to cook.

He has 3 lessons a week.

How many lessons is that in 4 weeks?



Design principles of the ICCAMS lessons

3. Use of multiple representations

Multiplicative Reasoning: Lesson 2A

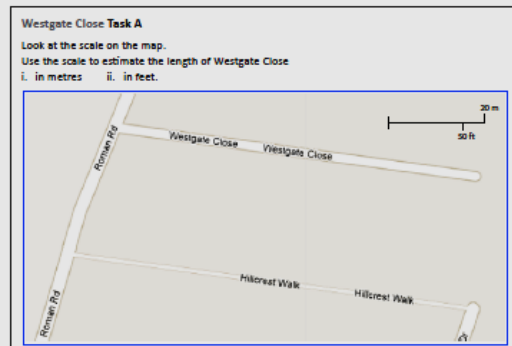
Westgate Close

Students estimate the length of Westgate Close, in metres and feet (Task A).

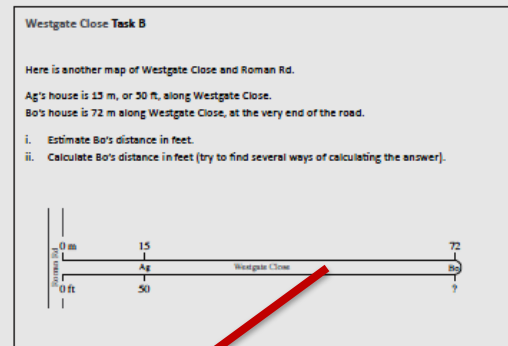
They then estimate and calculate two distances along Westgate Close (Task B and Task C).



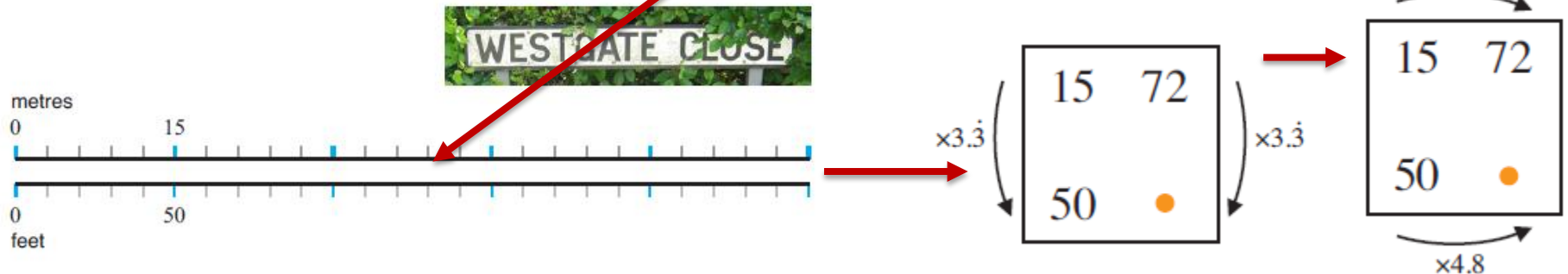
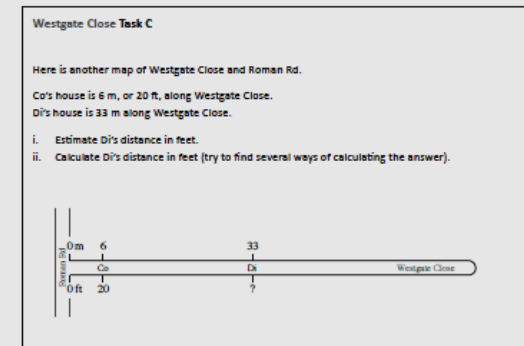
Task A



Task B

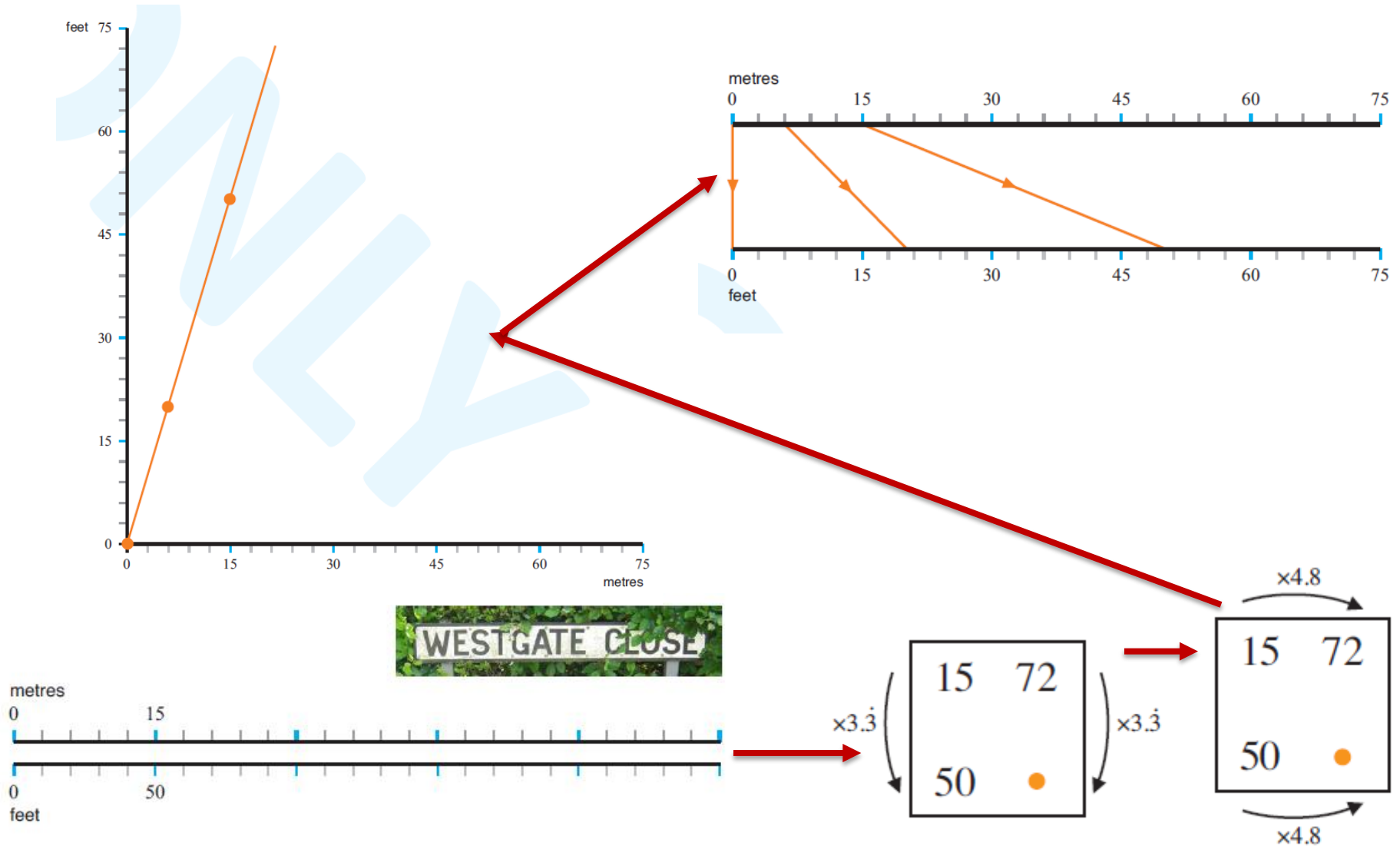


Task C



Design principles of the ICCAMS lessons

3. Use of multiple representations



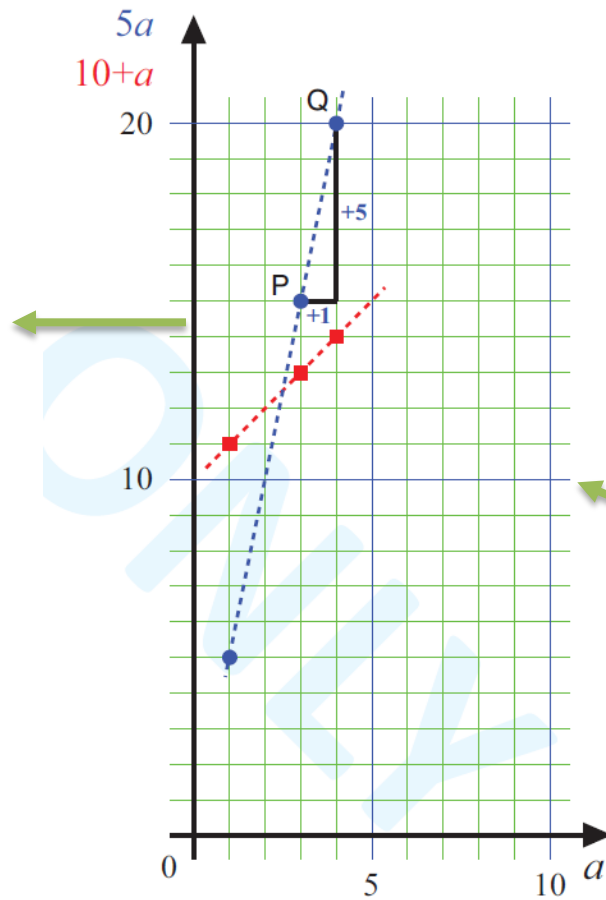
Design principles of the ICCAMS lessons

4. Making connections

Which is larger, $3n$ or $n + 3$?

Freya: $5a$

Polly: $10 + a$



Algebra: Lesson 1A

Boat Hire

Olaf is spending the day at a lake.
He wants to hire a rowing boat for some of the time.

Freya's Boat Hire charges £5 per hour.
Polly's Boat Hire charges £10 plus £1 per hour.

Whose boat should Olaf choose?

not ordered

a	$5a$
1	5
4	20
3	15

ordered

a	$5a$
1	5
3	15
4	20

Design principles of the ICCAMS lessons

5. Collaborative working



ICCAMS-Maths Project (2015-2017)

Primary objective = large scale trialing of the ICCAMS lessons

- **Phase 1:** Development of a professional development toolkit that PD leads can use to facilitate PD with teachers (**Nottingham**)
- **Phase 2:** Large scale trial involving 110 schools (**Durham University**)
 - 2 teachers from each school to attend PD sessions
 - Teachers to use the lessons in their classrooms (lesson observation by PD leads)
 - Teachers to cascade PD training/materials to departments
- **Phase 3:** I'm appointed as Education Minister

ICCAMS-Maths Project (2015-2017)



ICCAMS-Maths Project (2015-2017)

East Midlands Hub Involvement

- Participate in a maximum of 6 full day PD sessions during the first half of next year
(facilitated by myself, Jeremy Hodgen and Dietmar Kuchemann)
- After each PD session, trial specific ICCAMS lessons with your Y7 and/or Y8 classes
- Allow us into your classrooms to observe your use of the lessons (so that we can see the impact of the PD sessions/materials)

ICCAMS-Maths Project (2015-2017)

Benefits to you

- You get to spend time with me
- Nottingham Uni lunches



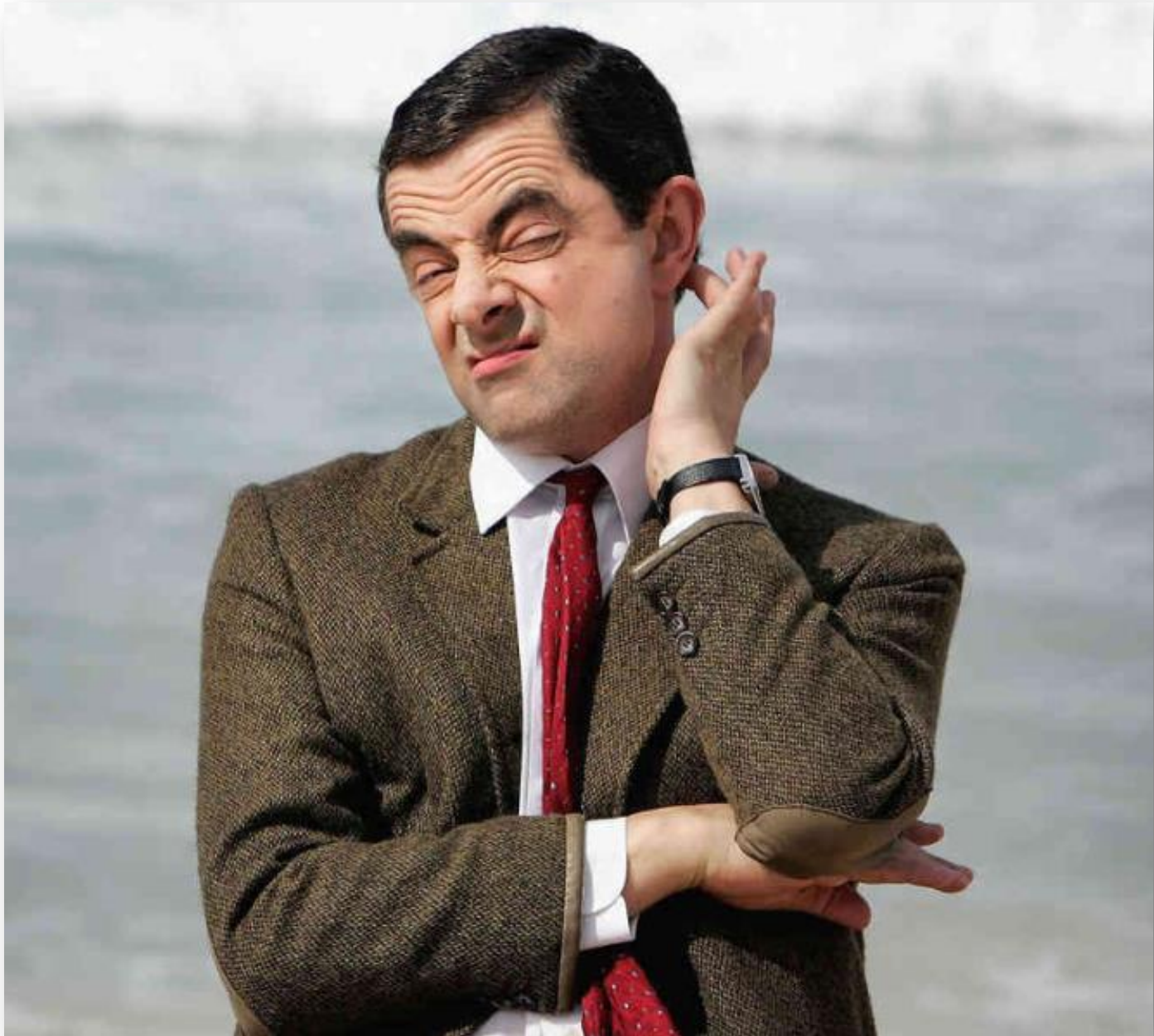
ICCAMS-Maths Project (2015-2017)

Benefits to you

- You get to engage with and input into the ongoing development of carefully designed and thorough formative assessment lessons and accompanying PD materials
- Money will be paid to your schools for supply cover

Watch out for an advert that will come via Matilda for the formal recruitment process.

Questions?



More information

Website: <http://iccams-maths.org/>

Email me: marc.north@Nottingham.ac.uk

Kanchana Minson (Project Administrator):
kanchana.minson@nottingham.ac.uk