MEI Insights 4:
MEI and Professional Development

by **Debbie Barker, Simon Clay, Terry Dawson and Bernard Murphy**

Introduction

Throughout its 50 year history, Mathematics in Education and Industry (MEI) has been providing professional development for mathematics teachers. In recent years these have included year-long courses, often in conjunction with universities, online courses with sessions spread over several weeks, 1- and 2-day courses, and sessions at our annual conference. In addition MEI is increasingly offering support through departmental reviews, a Heads of Mathematics course and, through its work in the NCETM, developing future leaders of professional development.

In this article we take four activities from MEI's courses and use these to illustrate the following guiding principles for our professional development work.

In all its courses, MEI believes it is important to:

- promote mathematical thinking
- present mathematics in an interconnected way
- provide resources that promote mathematical learning
- support teachers in embedding new ideas in their classrooms.

The Teaching Advanced Mathematics Course

First of all we invite you to try out the activity on page 12, which was designed by MEI to use with teachers on the year-long Teaching Advanced Mathematics (TAM) course. Full details of the course itself can be seen at: **www.mei.org.uk/tam**.

Read the 'information card' and then, using only the knowledge you would expect of a student embarking on an A level course, work through the other cards. As you do this, please think about the following in the context of your own A level classroom.

- How would you introduce this activity?
- Would you adapt it and, if so, how?
- How would you group your students to work on this activity?
- What opportunities are there for differentiation?
- What would you ask those students who finish first to do next?

And finally:

- How might an inexperienced colleague's answers to these questions be different from yours?

**** Now stop reading and have a go ****

The 1000+ teachers who have taken part in the TAM course arrive with a wide range of mathematical backgrounds and teaching experience. Whilst all teachers enjoy working through the cards, the real benefit occurs when they subsequently discuss questions similar to the first five you were asked to think about above; in this way they are supported in adapting the ideas from the TAM course for use in their own classrooms. In addition, it is common for this to motivate teachers to think creatively, seeing such a resource as a template for introducing other topics – students don't need to be taught what they can think through for themselves!

FRESH

The second resource included here (page 13) is taken from the activity *Clocks* used on the 1-day course *FRESH Strategies for Embedding Problem Solving*. MEI's new suite of FRESH courses is aimed at experienced teachers of mathematics. They seek to give busy teachers inspiration and suggested solutions for specific and evolving challenges within mathematics teaching. In this title we look at addressing the renewed focus of the new secondary curriculum and GCSE Mathematics on problem solving skills.

The session begins with 12 cards. A starting prompt of "what mathematical questions could we ask?" aims to promote mathematical thinking. (You may wish to jot a few down before reading further.) After spending a short

amount of time exploring the answers to one or more of these mathematical questions we discuss:

- What problem solving skills or habits might students need?
- What problem solving skills or habits might students develop further?
- What challenges would you face using this resource with your students?
- What solutions are there to these barriers?

Teachers often identify that they need support in meeting the challenge of students pursuing different lines of thought or in creating resources that provide scaffolding. The *Clocks* activity comes with a *GeoGebra* file, (**bit.ly/MEIclockangles**) which supports teachers in embedding these new ideas from the course in their own classrooms.

Core Maths

The third resource (page 14), Making Estimations from Limited Data, is from the 2-day course *Starting to Teach Core Maths*. This course is for anyone teaching, or thinking about offering, this new qualification. It aims to show some of the exciting new approaches being used with post-16 students and examines some of the challenges teachers face.

This particular session is about estimation and starts by asking teachers to work through an initial question about the Isle of Wight. Whilst attempting the question several points emerge.

- How can you deal with requests from students for more detailed information about the problem?
- How accurate is good enough?
- What makes a good estimate?
- When assessing this work what should I encourage/reward?

In the discussion which follows, teachers talk about the importance of explaining any assumptions made in reaching the estimate, the balance between accuracy and the amount of time spent on the problem, and the efficiency of different approaches they have used. The discussion-based teaching approach used with the teachers, based on the Japanese 'Neriage' method, models the one we encourage teachers to use with their students. The discussion finally focuses on what points to emphasize when teaching estimation and how to assess such questions, concluding by examining some of the sample assessments from the awarding authorities.

Heads of Mathematics

The final resource (page 15) is taken from Day 1 of the Heads of Mathematics course. Designed for new and aspiring heads of maths, the course aims to equip and prepare people for the challenges of this crucial role. The first day is all about the head of maths as a leader, exploring leadership styles, their current priorities and how effective leadership flows from a coherent vision of mathematics and its teaching.

The resource is from an early session which enables participants to assess their current priorities. They are given a set of responsibilities that potentially fit within the remit of a head of maths (18 are shown in the example but more are used in the course day). Participants are asked to select the nine responsibilities they deem to be most important and then arrange these in a 'diamond nine'. Once they have decided they then have the opportunity to discuss their selections in small groups before key themes are picked up with the whole group.

Often this activity marks the beginning of the realization that it is easy to focus on responsibilities that become urgent due to deadlines or pressure from other parties rather than on those which directly enhance the teaching and learning of mathematics in a school. From this starting point we are then able to explore what effective leadership in maths looks like and the crucial need to develop a vision for what mathematics should look like within their school.

The Future

We hope this article has proved insightful into the thinking behind some of MEI's courses. With the development of the Maths Hubs network MEI is increasingly providing on-going support at a local level. To find out more about your local Maths Hub and the professional development opportunities they provide see **www.mathshubs.org.uk/**. If you are involved with a Maths Hub and would like to work with MEI please do get in touch via **www.mei.org.uk/cpd**.

Keywords: Teacher support; Professional development; A level; GCSE.

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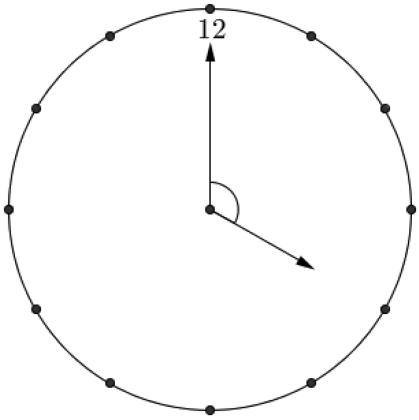
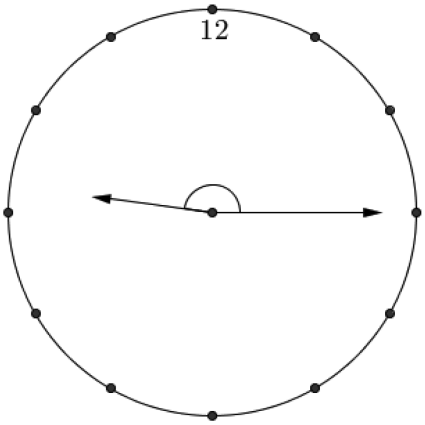
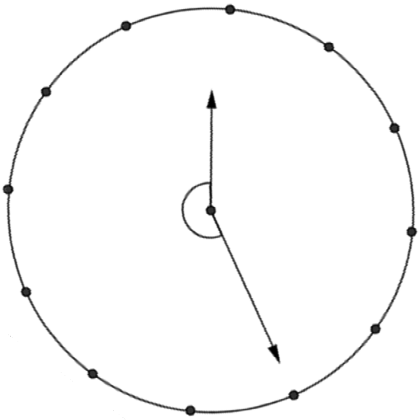
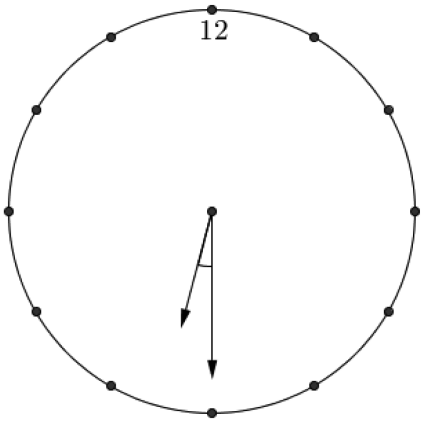
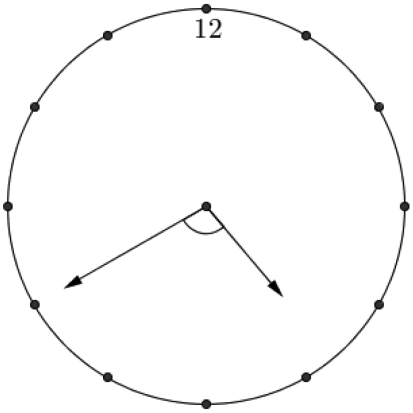
Information Card P:(0,1) and Q:(4, 4) are adjacent corners of the square PQRS (the corners being labelled in an **anticlockwise** fashion)	A. The length of QS	B. The area of the square	C. The equation of PR
D.	E. The length of PQ	F. The midpoint of PR	G. The gradient of PR
H. The coordinates of both points where the square meets the y-axis	I. The coordinates of R and S	J. The equation of the perpendicular bisector of side QR	K. The coordinates of the point where the line QS meets the x-axis

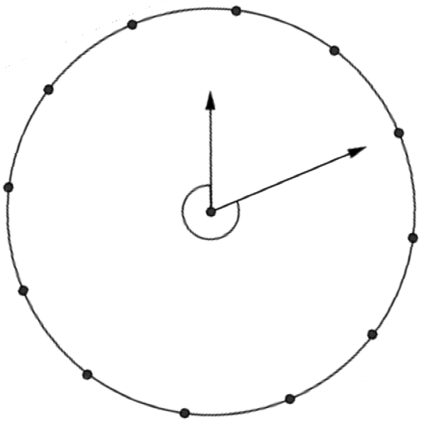


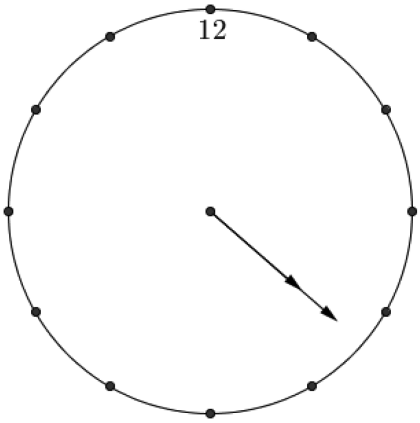


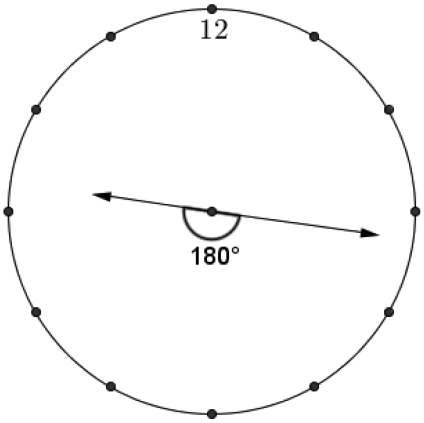


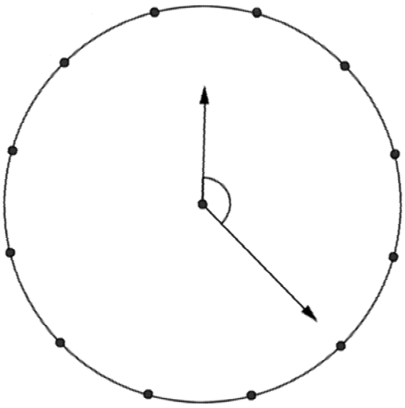


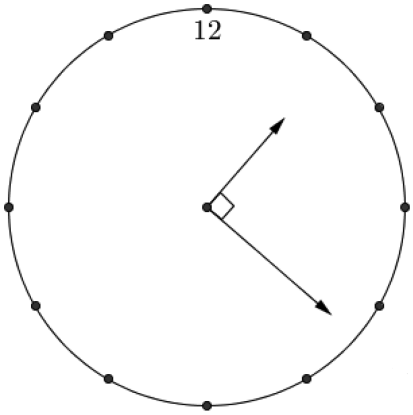


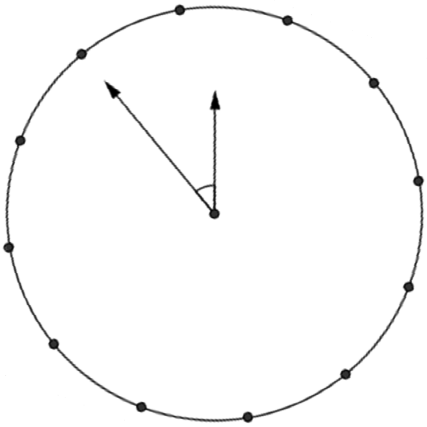










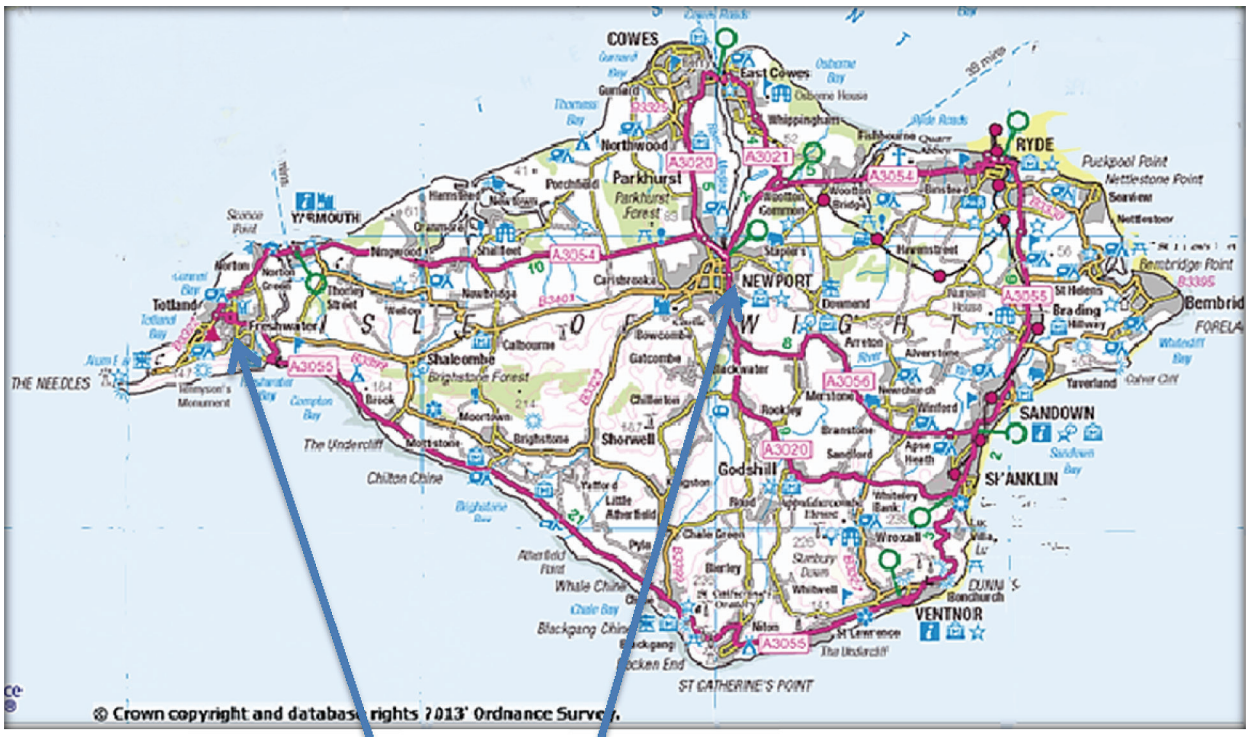


On the four clocks which do not have the 12 marked, the angles are 40°, 135°, 205° and 292.5°. Find the time or marked angle on each clock – whichever is harder!

Students' sheet – Making Estimates from Limited Information

Initial Question

At one time it was claimed that all of the world's population could fit on the Isle of Wight. In 2011, when the world's population was estimated to be **7 Billion**, would this claim still be true?



Hint – The road distance from Freshwater to Newport is approximately 15 km.

Some further questions

How many pieces of luggage go through Heathrow airport in a year?

A company is considering opening a child day care centre in a town with a population of 200 000. There are 100 centres in the town at present. Use a quick estimate to evaluate the market for such a centre.

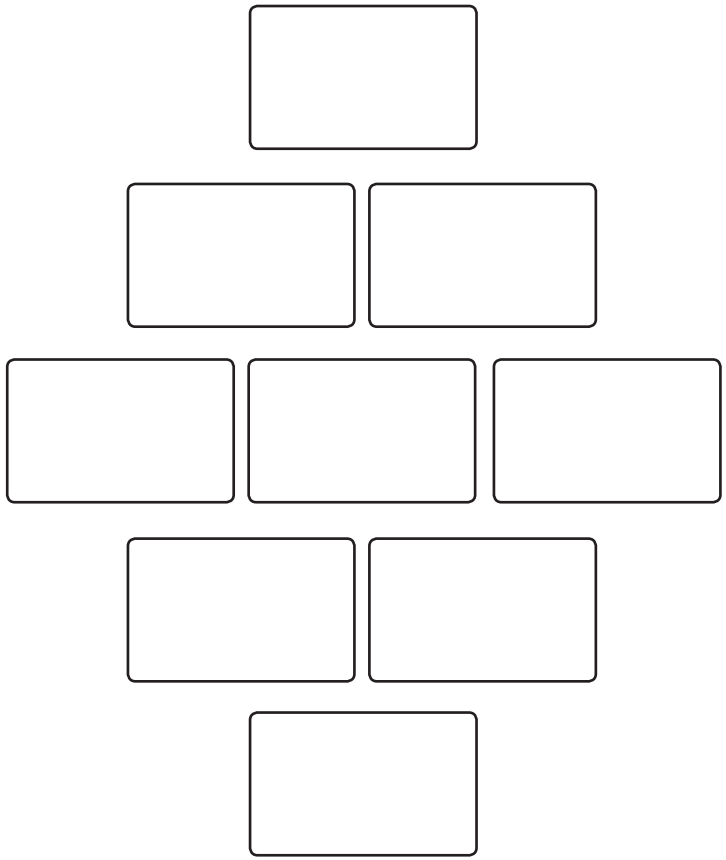
Five members of a swimming club plan to raise money for charity by attempting to swim around the coast of the Isle of Wight. Instead of one person swimming the whole distance they plan to take turns at swimming stages.

Is this activity feasible?

A food company is planning to bid for a franchise to supply pies to all of the English football league grounds in the top four divisions for a year. When interviewing someone to manage this project the panel asks them to estimate how many pies the company will need to produce during the year to fulfil the franchise. What would be a good answer to this question?

Defining your role

Task: Choose nine responsibilities which are most important to you in your current role. Arrange them in the 'diamond nine' according to the level of importance you assign to each of them.



Developing schemes of work for maths courses	Dealing with parents	Recruiting new maths teachers
Developing a maths department ethos	Conducting maths lesson observations	Leading the teaching of mathematics
Being accountable for students' exam results	Collecting, interpreting and acting on student data	Being a good role model
Work scrutiny, e.g. of students' books	Empowering maths teachers in the department	Tackling poor classroom practice
Line managing maths teachers and possibly others such as teaching assistants	Preparing for Ofsted	Being an outstanding mathematics teacher
Running maths department meetings	Managing the professional development of other members of the maths department	Keeping up to date with changes to maths curriculum and assessment