



## Get to know RAISEonline

Don't be daunted by this tool – it is user friendly and there is lots of guidance available. It is a key tool for any school leader and can save you a lot of effort if you invest a little time in getting to know it. To access RAISEonline you need a password and the various reports that will be useful for this purpose are:

- The *test paper pupil list report* which will show the performance of pupils in each assessment strand, e.g. Number and place value, relative to national figures.
- *Pupil lists* which can be filtered for different groups, e.g. FSM, and clicking on an assessment strand within a pupil list will generate a *test paper report* for the selected individual pupil
- The *test paper mark point report* which shows the performance of the cohort in each question, e.g. Paper 2 Q16, relative to the national figures. The Mark point reports can be filtered for different groups and clicking on a question/item number within the report will reveal the actual test question.

### Prompts for primary mathematics SL – use the data to improve your KS2 provision

#### Reflections on the curriculum and teaching

How does your data compare to the national points we have mentioned?

How does the item analysis by strand compare to your teacher assessment?

Which aspects are a surprise?

Could any striking points tell you something about the balance of your curriculum or give you teaching points to follow up with the current Y6?

#### Reflections on resilience and test strategies

How do your figures on the proportions of pupils attempting particular questions compare to national? Do any groups stand out as an issue to tackle?

Pupils must have the confidence to attempt questions to have any chance of success.

How do you build the confidence to 'have a go' as a matter of daily routine?

What do your teachers say or do when a pupil says 'I can't do that' or 'I don't know where to start'?

Is this a test preparation matter to be noted and planned for in the second half of Year 6 spring term?

### Prompts for secondary mathematics SL – use the KS2 data to improve your KS3 provision

#### Reflections on the curriculum and teaching

How does the data on the incoming Y7 cohort compare to the national points we have highlighted?

Do any groups such as Pupil Premium or SEND stand out as requiring support in particular areas?

What does the analysis by strand tell you about the relative strengths and weaknesses of the cohort? Are there any issues that could be supported by the use of practical resources? Are such resources available?

What aspects of the curriculum plan need to be adjusted in response to the analysis?

#### Reflections on resilience and the capability to show what they know

How do your figures on the proportions of pupils attempting particular questions compare to the national?

Do any groups such as Pupil Premium or SEND stand out as lacking confidence to 'have a go'?

If pupils have not attempted questions, then they may not have shown what they can do. Does the primary teacher assessment information throw up any anomalies with the test result?

How do Y7 teachers build the confidence to 'have a go' as a matter of daily routine?

What strategies do Y7 teachers use at the start of a unit of work to help pupils show what they know?

# Interpreting, reasoning and interrogating primary maths problems

Pupils often struggle to access a problem that involves interpreting a representation or diagram, they can also find it hard to relate their reasons back to the image or context. This summer the Improve Maths team's development work focused on the skills required to work with representations in problem solving questions. We gathered a collection of five questions from the 2016 KS2 Reasoning papers and developed them into teaching activities designed to support pupils in making sense of the mathematics and the problem. The notes use questions to encourage children to think deeply, reason, make connections in mathematics and everyday experiences and to explain their thinking.

The aim of the ideas is to improve pupils' skills of interpreting a representation, enable them to become more confident in reasoning and build confidence to interrogate and discuss aspects of a problem.

The approach, described on a single page, encourages whole class discussion to 'dig into' a problem, make connections with everyday experiences, develop language and thus build confidence and familiarity within different contexts. For each question we have suggested a discussion, led by teacher-questioning in four phases:

- Reading the form of representation
- Getting a feel for the values
- Working with the mathematics
- Maths around the school and making it real

**Prompts for primary mathematics SL – how well do your pupils interpret, reason and interrogate representations and problems?**

Connect this question to your analysis of the 2016 KS2 test papers. How successful were the pupils on questions involving representations?  
Does your team of teachers have strategies to help them focus on this aspect of a problem and build confidence and competence in gaining entry to the problem?

In the forthcoming terms the Improve Maths advisers will use this collection of activities in our workshops and in classroom support. We are happy to share them with you. If you would like a copy of 'Interpreting, reasoning and interrogating primary maths problems', email [annewhite@improvemaths.co.uk](mailto:annewhite@improvemaths.co.uk)

## Improve Maths advisors support for mathematics improvement

We know what makes a difference in primary and secondary maths classrooms and have influenced change in teaching and subject leadership in a range of contexts. We can help you to select and combine actions so that you build strong leadership and good maths teaching as part of your plans for wider school improvement. We offer bespoke support in primary and secondary schools and currently this includes:

- data analysis and improvement planning with senior and subject leaders;
- regular planning, implementing and evaluating of improvement actions alongside subject leaders;
- whole school or small group workshops on mathematics knowledge and teaching strategies;
- plan-teach-review cycles with pairs or small groups of teachers, including team teaching.

We are particularly impressed by the schools now investing in their new or developing subject leaders by planning regular, subject-expert support, for example through monthly or half termly mentoring.

If you would like to explore support for your teams, please email [annewhite@improvemaths.co.uk](mailto:annewhite@improvemaths.co.uk)

## Creativity and problem solving – expecting pupils to incubate a hard problem?

Mathematical problem solving has played a part in every International Conference on Mathematics Education since 1969. This year one of the topic study groups published a topical survey of the field of research into [Problem Solving in Mathematics Education](#). One aspect of the views that stimulated our thinking was [Jacque Hadamard's](#) classic work on invention at the crossroads of mathematics and psychology. He describes four separate stages of mathematical creativity as part of problem solving:

- *The initiation phase* consists of deliberate and conscious work. This might mean seemingly fruitless engagement with a problem and could involve trolling through a repertoire of past experiences.
- *The incubation stage* of the inventive process follows when the solver, unable to come up with a solution, stops working on the problem at a conscious level and begins to work on it at an unconscious level.
- *The illumination stage* describes the stage at which a solution or a strategy suddenly comes to mind. This can seem to come from nowhere, during a walk or upon waking, or at the instance of turning the conscious mind back to the problem after a period of rest.
- *The verification stage* is where the solver moves away from ideas and concepts and examines their solution in closer detail to evaluate its correctness.

*'There is another remark to be made about the conditions of this unconscious work: it is possible, and of a certainty it is only fruitful, if it is on the one hand preceded and on the other hand followed by a period of conscious work. These sudden inspirations never happen except after some days of voluntary effort which has appeared absolutely fruitless and whence nothing good seems to have come ...'* Poincaré, H. (1952), pg. 56. *Science and method*. New York, NY: Dover Publications Inc.

### Prompts for mathematics SL – is there greater scope for allowing pupils to come back to a problem?

Is it possible that mathematics planning has moved you away from 'meaty problems'?  
When was the last time you left something unresolved and expected pupils to 'mull it over'?

[NRICH](#) offers great ideas for teachers to use in this way.

Their associated site [WILD maths](#) is for pupils to use directly. It is a collection of mathematical games, activities and stories, encouraging creative thinking.

## Resources to support your improvement work

**Assessing problem solving.** Do you include problem solving questions in your internal assessment? In the new report, ACME considers the assessment of problem solving in public tests and examinations across all key stages of mathematical development. On page 7 of the report are the desirable characteristics of questions used to assess problem solving. <http://www.acme-uk.org/news/news-items-repository/2016/6/assessment-of-problem-solving-report>

**Building confidence and independence in the new style GCSE problem solving questions.** One of the Improve Maths team designed '[Going for Gold Problem Solving](#)', a short sequence of lessons to support skills and confidence with unstructured examination questions. These have been getting 5 star reviews on the TES site, with comments such as 'This is a great way of helping students develop the skills to attack these less structured questions we expect to dominate the new spec.'

**Mental strategies in KS2 Paper 1 'arithmetic'.** Over half the marks (22 out of 40) on 2016 paper 1 are more easily accessed using mental strategies, particularly when the tight timing is taken into account. Are you systematically teaching mental strategies throughout the key stage?

**Number sense in Early Years.** We would highly recommend the 'top ten' lists, pulled together by a group of national Early Years mathematics experts <http://www.foundationyears.org.uk/mathematical-resources/>