Overview

Bringing it to life - essence meets content

The BitL tool - mathematics years 5-6

Fluency: Years 5-6

What can you recall?
This is about remembering/identifying mathematical, names, shapes, symbols, facts, processes and formulas that are important to know when working with mathematical ideas.

Can you choose and use your mathematics flexibility?
To be able to choose and use mathematics efficiently students need to be able to recall processes and facts. Choosing and using is about selecting (age appropriate) processes, facts and mathematical language appropriate to the context.

How can you interpret?
This is about creating meaning from the problem that has been presented or created by the student in response to curiosity about their world. It is useful to have the students describe (in their own words) what they have been asked to do. Descriptions of the task could be oral or written, as appropriate for the students and the task.

In what ways can you model and plan?
This is about describing a problem mathematically. Across years 3 to 6, ideas are represented using models, pictures and symbols. The complexity of the pictures will develop from those representing an image of the problem (in years 3 and 4) to those that support thinking about the problem and are more abstract in appearance (in years 5 and 6).

Problem solving: Years 5-6

Students benefit from working in a problem solving context in many aspects of the curriculum.

Pedagogical questions:

- How could you record that mathematically?
- How could you do it?
- How could you use a calculator to...
- Can you remember a way to...
- What is the name of...
- What is the symbol for...
- What is the formula for...
- How many centimetres are there in a metre?
- How many millimetres are there in a centimetre?
- What is the value of...
- What is the formula for...
- How much...
- Which was easiest for you to understand?
- Does that seem right to you?
- Do other people think that too?
- Which was easiest for you to understand?
- What did you like about...
- What would you do differently now?
- How reliable is your answer?
- What would you do differently now?
- What is the mechanics of problem solving - the doing of calculations (the adding/subtracting/multiplying/dividing) and checking how appropriate the answer is.

Pedagogical questions:

- What are you being asked to find out, demonstrate or prove?
- What information is helpful?
- What information is not useful?
- What additional information would be useful?
- How reliable was this strategy?
- Which was easiest for you to understand?
- Does that seem right to you?
- Do other people think that too?
- Which was easiest for you to understand?
- How reliable was this strategy?
- What would you do differently now?
- How reasonable/reliable is your answer?

Examples

What metric units of measurement are used for length, area, volume, capacity and mass (including large and small measurements)? How many millimetres are there in a centimetre? How many centimetres are there in a metre? How many metres are there in a kilometre? What is the name of...

Examples

Order a selection of angles from smallest to largest. Measure and record the size of each angle to verify the order that you have placed them in. Calculate how many millimetres there are in a kilometre. Calculate how many grams there are in a tonne.

Examples

Teachers: Use your creative story telling skills to embellish these facts:
Matt and Jane are playing a computer game. In the first part of the game they get 2 minutes to collect credits that they can use later on in the game. There are three items that they can collect to earn credits, worth 14, 25 and 36 points (use an appropriate combination).
Give the characters Matt and Jane a selection of items and ask, “Who has collected the most credits?”
Ask them to record in their own words) what they have been asked to do. Descriptions of the task could be oral or written, as appropriate for the students and the task.

Examples

Look at the following calculations:
4 × 2 = 2
2 × 2 = 4
If you use the same values and operations, but in a different order, do you always get the same answer? Investigate.

Pedagogical questions:

- What would be an efficient way to...
- How could you use a calculator/computer to...
- Can you represent the problem as a picture or by using equipment?
- Can you add it up?
- Can you represent the information using numbers and symbols?
- What information could you put in a diagram to support your thinking?
- When we are being good problem solvers, what do we do to get started?
- Speak to a peer. Ask them to show you what they are trying.

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Understanding: Years 5-6

What patterns/connections/relationships can you see?
This is about noticing and using the characteristics of shapes, objects, quantities and patterns that show similarity and difference. It is about looking for patterns and connections in number, in shape, and in data.
As students move from year 3 to year 6 we support them to make generalisations (detailed in the reasoning proficiency) from the patterns they notice. Noticing similarity and difference helps students to build conceptual understanding.

Reasoning: Years 5-6

In what ways can you communicate?
This is about being able to convince yourself and others about your mathematical thinking. In year 3 to year 6, proof, in line with understanding, will be represented using models, diagrams and symbolic representation. The complexity of the diagrams will develop to be more abstract in appearance and will use mathematical conventions, such as those for labelling angles or communicating length.
It is important to evaluate different ways of communicating to see the same idea and justify the choices that are made.

Pedagogical questions:

* How are these… (values/shapes/angles/questions/graphs/words/number sentences) the same as each other?
* How are these… (values/shapes/angles/questions/graphs/words/number sentences) different to each other?
* What’s the connection between…?
* Which is the odd one out?
* What if… (change something), is it still…?
* Is it always the same? Are there any exceptions?
* Estimate…
* Which is greater/bigger/larger/better?
* Which is less/smaller/shorter?

*Making closed questions such as these can allow the teacher to see the connections that the student(s) are making, even if the student(s) can’t articulate the connections. These questions can help the teacher to identify the root of the misconception.*

Examples

How is 3 x 4 the same as 4 x 3 and how is 3 x 4 different to 4 x 3?

What’s the connection between these calculations?

7 x 6 = 42
3 x 12 = 42
(The answer is not just that they both have an answer of 42)

How are these number sequences the same as each other? How are they different?

3½ x 12 = 42
7 x 6 = 42

What’s the connection between these calculations?

3 x 12 = 36
4 x 9 = 36
5 x 7 = 35

These calculations are always (or never) true.

Pedagogical questions:

* What is another way to do that calculation?
* Simplify…
* Rename…
* Represent… in different ways.

Examples

Is there more than one way to work out 15 x 16?

Notice the use of this question in each proficiency.

Which of the following fractions can you simplify?

18/30 16/20 13/52 7/21

How would you represent ‘even chance’ as a fraction, decimal and percentage?

Pedagogical questions:

* What is another way to do that calculation?
* Simplify…
* Rename…
* Represent… in different ways.

Examples

Meg says that 14 x 17 will have the same answer as 15 x 16. Why do you think that Meg has made this connection? Do you agree/disagree? Prove it!

Pedagogical questions:

* What else could it be?
* Why isn’t it… (followed by an incorrect name or process)?
* Why can’t I… (followed by an incorrect name or process)?

Pedagogical questions:

* Prove that…
* Explain if/why (to somebody who hasn’t been involved in the learning).
* Can you show me how that works?
* Why did you choose to…?
* What’s the best way to show…?

Pedagogical questions:

* What is another way to do that calculation?
* Simplify…
* Rename…
* Represent… in different ways.

Examples

Draw a rectangle and enlarge it with a scale factor of two. What do you notice about the area of the enlarged rectangle compared to the area of the original rectangle? Start with a rectangle of a different area. What do you notice about the area of the enlarged rectangle compared to the area of the original rectangle? Exchange some results with a peer. Is there a rule about how the area of the enlarged rectangle compares to the area of the original rectangle? Does this rule work if you enlarge your rectangle by a scale factor of three?

Pedagogical questions:

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* Simplify…
* Rename…
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Examples

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* Rename…
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Examples

The arm spans of six people were recorded. Here are the measurements:

62, 70, 65, 68, 71, 64.

What lengths are possible to work out what it is, but I can only think about different styles of questions that you like? What do you think if I tell you that they are people of school age? I’m thinking of… (a number/a shape) and I’m going to give you some clues… Can you work out what my number/shape is? I’m thinking of… (a number/shape) and I’m going to give you some clues… Can you work out what the possible answers are? I’m thinking of… (a number/shape). You can ask questions to help you to work out what it is, but I can only answer yes or no. You could use sentence structures such as: I…, Then…

*Because I know… I also know…*