Fluency: Years 3-4

What can you recall?

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

Can you choose and use your mathematics flexibly?

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.

Pedagogical questions:

- How could you record that mathematically?
- How could you... (eg calculate that)?
- How could you use a calculator to do this...
- Can you remember a way to do this...
- What is the value of... (a calculation that you would expect automatic recall of eg number pairs to 10, 100, some times tables)?
- What is the name of...
- What is the symbol for...
- How many...

Examples

What metric units of measurement are commonly used for length, area, volume, capacity and mass?

Recall facts and definitions up to and including those used for length, area, volume, capacity and mass?

Recall multiplication and division facts up to and including those used in the question, for example

- When...?
- How much...?
- How many...?

Pedagogical questions:

- What are you being asked to find out or show?
- How could you use a calculator to check your answer?

Examples

- Use an array to check your answer to the question 24 ÷ 3.
- How could you... (partition/rearrange/group/show/represent that).

Pedagogical questions:

- What is the name of...?
- What is the symbol for...?
- How many...?

Examples

- Can you remember a way to... (count/estimate/rename/measure/compare/order/calculate/partition/rearrange/regroup/show/represent that).
- Use mathematical language to describe...
- What would be an efficient way to... (count/measure/order/compare/round off/subtract/multiply/divide/calculate/draw/write/record)?
- How could you... (partition/rearrange/regroup)?
- How could you use a calculator to check your answer?

Pedagogical questions:

- Do you have an idea?
- What could you try?
- Have you done a problem like this one before?
- How could you test your idea?
- What information is not useful?
- What information is useful?

Examples

Close questions can be useful to check if the student has accessed the information given in the question, for example

- How many...?
- How much...?
- When...?

These questions will vary depending on the context of the problem.

Problem solving: Years 3-4

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).

It is important for students to think about how they will attempt to solve the problem, rather than rushing into taking measurements or making calculations without thinking first about how helpful that will be.

Pedagogical questions:

- Would... (counting, a sum, a picture) help?
- What processes could you try?
- How could you use a calculator to check your answer?
- How efficient was this strategy?
- How reliable was this strategy?
- What would you do differently now?
- Do you have an idea?
- How reasonable/realistic is your answer?

Pedagogical questions:

- How can you... (add those numbers together/subtract that amount/multiply those amounts/divide these amounts)?
- How much...?
- How much...?
- What information is not useful?
- What information is useful?

Examples

- There are 24 children in Pam’s class. Each child is allowed to bring up to 4 guests to their open day. How many...?
- Do you have an idea?
- What could you try?
- Have you done a problem like this one before?
- How could you test your idea?
- What information is not useful?
- What information is useful?

Pedagogical questions:

- Can you remember a way to... (count/estimate/rename/measure/compare/order/calculate/partition/rearrange/regroup/show/represent that).
- Use mathematical language to describe...
- What would be an efficient way to... (count/measure/order/compare/round off/subtract/multiply/divide/calculate/draw/write/record)?
- How could you... (partition/rearrange/regroup)?
- How could you use a calculator to check your answer?

Problem solving:

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

In what ways can you solve and check?

This is the mechanics of problem solving; the doing of calculations (the counting/adding/subtracting/sharing/grouping/building) and checking how appropriate the answer is.

Pedagogical questions:

- Would you use a different strategy next time?
- How efficient was this strategy?
- How reliable was this strategy?
- Which was easiest for you to understand?
- What did you like about...?
- What would you do differently now?
- How reasonable/realistic is your answer?

Pedagogical questions:

- If the sharing is happening part-way through the problem solving process...
- If the sharing is happening at the end of the problem solving process...
- Would you use a different strategy next time?
- How efficient was this strategy?
- How reliable was this strategy?
- Which was easiest for you to understand?
- What did you like about...?
- What would you do differently now?
- How reasonable/realistic is your answer?

Pedagogical questions:

- If the sharing is happening part-way through the problem solving process...
- Would you like to change your mind and try something different?
- If the sharing is happening at the end of the problem solving process...
- Would you use a different strategy next time?
- How efficient was this strategy?
- How reliable was this strategy?
- Which was easiest for you to understand?
- What did you like about...?
- What would you do differently now?
- How reasonable/realistic is your answer?
Understanding: Years 3-4

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 (identified in the reasoning proficiency) from the patterns that they notice. Noticing similarity and difference helps students to build conceptual understanding.

Can you answer backwards/inverse questions?
This is about working flexibly with a concept.

Can you represent or calculate in different ways?
This is about representing amounts, patterns, shapes and data in different ways, and calculating using different processes. This is also about finding different ways to calculate the answer to computation problems. In year 3, this would include addition, subtraction and multiplication. In year 4 this would also include division.

Reasoning: Years 3-4

In what ways can you prove?...
This is about convincing yourself and others about your mathematical thinking.

In what ways can you communicate?
This is about making thinking visible and communicating a logical progression of ideas.

In what ways can your thinking be generalised?
This is really strongly connected to looking for patterns and relationships. This is about making statements that describe a pattern that always exists. At this stage generalisation may be verbal or written. Across years 3 and 4, age-appropriate mathematical terminology will be used increasingly.

Pedagogical questions:
- How are these… (values/words/number sentences) the same as each other?
- How are these… (values/words/number sentences) different to each other?
- What is the connection between…?
- Which is the odd one out?
- What if… (change something), is it still…?
- Which is greater/bigger/faster/taller?*
- Which is less/smaller/?

Examples

How are 4 and 6 the same as each other? How is it still the same?
If the answer is 12. What might the answer to my sum be?
If the answer is… what might the answer to my sum be?

Pedagogical questions:
- If the answer is… what might the question have been?
- What’s missing in this number sentence/from this group/in this pattern?

Pedagogical questions:
- What is another way to work that out?
- What is another way to do that calculation?
- Rename the number.
- Represent it in multiple ways.

Examples

I’m thinking of a multiplication sum and the answer to my sum is 12.
What might the questions have been?
In ten minutes it will be 3 o’clock.
What time is it now?
Extension: In ten minutes my watch will show 3 o’clock, but I know that my watch is running 5 minutes too fast. What time is it now?

This extension question is a little more challenging than the first pair (4 and 6) different to the second pair (5 and 7)? Why is it not…?
Why did you choose to…?
Can you show me how that works?

Pedagogical questions:
- Prove that…
- Convince me, yourself, someone who thinks differently…
- Try not to ask if you are correct, but instead try to tell when you know that you are correct. Then show HOW you know.
- Why else could it be?

Pedagogical questions:
- What is the best way to record your results, and why?
- How come…?
- Explain it to someone who hasn’t been involved in the learning, eg parent, a child in a different class.
- Can you show me how that works?
- Why did you choose to…?
- Why is it not…?

Examples

Represent… in multiple ways.
Numbers.

Examples

I’m thinking of… (a number/a shape). What could my number be?
I’m thinking of… (a number/a shape). How could my number be?
I’m thinking of… (a number/a shape). How do I know?

Pedagogical questions:
- What is another always the same/ different?
- Is there a rule that we could use to describe…?
- Is there a rule that always works?
- What makes these different processes the same?

Pedagogical questions:
- Now that you know… can you work…?
- 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/a 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/a 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: If… then….
- Because I know… I also know…

Pedagogical questions:
- Why do you think my two numbers are the same?
- What is it about all odd numbers that makes them the same and all even numbers the same?
- What makes the odd numbers different to the even numbers?

Examples

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