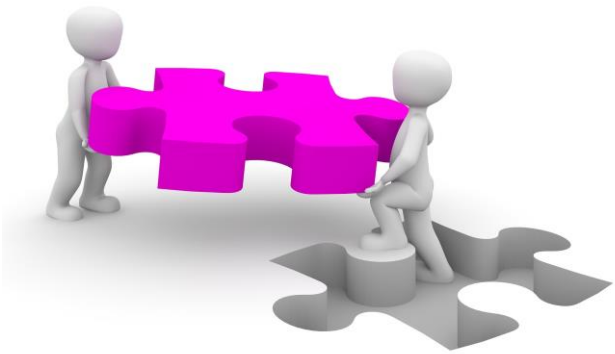
Using questions to develop learners' reasoning



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Reasoning Question Booklet

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Review
Checking the answer
– Check

- How did you solve the problem?
- What strategy did you use?
- What math words did you use or learn?
- What were the steps involved?
- Have you remembered to use units where needed? e.g. £ for money etc.
- How can you check your calculations without doing it all again?
- What have you discovered about … while solving this problem?
- What were you thinking when you chose this strategy to solve the problem?
- How does knowing … help you to answer …?

Identifying processes and connections
Getting started on the problem
– Read, Underline

- How is this like something you have done before?
- Can you estimate the answer? What do we need to…?
- How can you…?
- Could you use some other resources to…?
- How do you know…?
- What does… mean to you?
- What does this… represent?
- How are these …the same?
- How are these different?
- About how long/tall/heavy etc. is…?
- How many more/less is…?
- What things in the classroom have these same shapes?

This pocket sized booklet is designed to be used with all adults supporting learners with numerical reasoning.

The questions are designed to support development of the learner's reasoning skills. The questions have been organised under the three numerical reasoning elements of the LNF and are also linked to RUCSAC.

The questions are not exhaustive and should be used as a starting point for developing questioning. Useful verbs have been included for developing your own questions.

When developing questioning in the classroom, it might be most effective to focus on using one or two questions until these become a natural part of your repertoire rather than trying to use all of the questions.

Use verbs in your questions that encourage learners to communicate their thinking and understanding, to deepen their understanding and to extend their learning.

observe	evaluate
decide	conclude
notice	summarise
identify	infer
remember	visualise
compare	relate
contrast	differ
predict	consider
interpret	distinguish
explain	describe

Represent and communicate
Communicating workings – Calculation, Solve, Answer)

- Is there any other way you could ...?
- Why did you ...?
- How did you ...?
- How do you know?
- How did you know where ...?
- How did you know which ...?
- How did you know when ...?
- What does this part represent in your answer?
- How would you explain what ....just said, in your own words?
- Have you found all the possibilities? How do you know?
- What patterns can you see?

Review
Checking the answer
– Check

- How is this solution similar to or different from the others?
- How could you arrive at the same answer but in a different way?
- What would you do if ...?
- Is there any other way you could ...?
- What questions arose as you worked?
- How did you estimate what the answer could be?
- How did you prove your estimate?
- Have you found all the possibilities? How do you know?
- How else might you have solved the problem?

Ask learners to think out loud	Can you go through that step by step?
Encourage learners to ask questions and engage in dialogue	Would anyone like to ask … a question about that?
Encourage learners to make links	Can you remember anything else we did like this…?
Ask learners to repeat their explanation	Can you just say that again?
Think aloud with learners	Let's think this through together…
Make challenging statements	Someone in this group said… Were they right?

Identifying processes and connections

Getting started on the problem

– Read, Underline

- What are we being asked to work out?
- Have you seen anything like this problem before? Which methods did you use last time? Would they work in this problem?
- What information do we know – which bits are important? What other information might we need?
- What equipment might be helpful?
- Where do we need to start? Can anyone think of a different way?
- Which method might be best to use here?
- What does this make you think of?
- What other math can you connect with this?

Review

Checking the answer

– Check

- How else could you have …?
- How do you know you have answered the question?
- Can you think of a different way of solving this?
- Do you think your answer is reasonable? Convince me.
- How do you know your answer is reasonable?
- What helpful strategies have we learned for next time?
- How did you work it out? What could we try next?
- What else could you have done?

Represent and communicate

Communicating workings – Calculation, Solve, Answer)

- How will you remember what you have done so far?
- How could you record your work?
- How could you show your thinking?
- How could you share what you have found?
- How would you explain this to another learner?
- What could you add to your solution to make it clearer?
- What is the best way to display your data?
- What have you done so far?
- Which maths words would describe what you have done?

Identifying processes and connections
Getting started on the problem
– Read, Underline

- How is this pattern like addition? What would you measure it with? Why?
- If I do this, what will happen?
- How are adding and multiplying similar?
- How can we break this problem down into smaller steps – what can you work out first?
- What is this graph telling you? How can you use the information?
- How will this help you with the next steps of solving the problem?
- What decisions can you make using the pattern you have found?
- Where else do you see …?
- What strategies might we need to use?

Support with non-verbal interest	Nod head, rotate hand to indicate you want more…
Challenge learners to offer a reason	Can you explain why that works?
Cue alternative responses	Can you suggest another way of doing this?
Encourage learners to speculate	What would happen if…?
Invite learners to elaborate	Can you just say a little more about…?
Allow rehearsal of response	Let's think this through together…

Represent and communicate
Communicating workings – Calculation, Solve, Answer)

- How did you solve the problem?
- What did you do?
- What strategy did you use?
- What were the steps involved?
- Would a diagram, graph or chart be helpful? Which one is most appropriate?
- Are you using the most appropriate units?
- What is the best way to show your workings? Are they clear?
- Have you worked out a step-by-step approach to solving this and are you communicating this? – be methodical.

Review
Checking the answer
– Check

- Will it be the same if we use different numbers?
- Would this work every time?
- Can you think of any examples that don't work?
- What have you learned today?
- What mathematics were you investigating?
- What changes did you have to make to solve the problem?
- What was the most challenging part of the task?
- What would happen if?