

MATHEMATICAL REASONING & PROBLEM-SOLVING PROGRESSION

EYFS → YEAR 6

2026-2027

Think • Connect • Explain • Solve • Justify • Generalise

Developing confident mathematicians who notice structure, make connections, select strategies and explain why their mathematics works.

What do I notice?

What do I already know?

Can I represent it?

Is there another way?

How do I know?

Does my answer make sense?

Can I prove it?

Can I generalise?

$4 \times 7 = 28$

$0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10$

$x + 5 = 12$

$36 \div 6 = 6$

NOTICE CONNECT EXPLAIN JUSTIFY CONJECTURE PROVE GENERALISE

Reasoning develops alongside mathematical knowledge – not after it.

ACT IT	BUILD IT	DRAW IT	REPRESENT IT	PLAN IT	SOLVE IT	CHECK IT	REFINE IT
EYFS Explore • Notice • Try	KS1 Represent • Explain • Connect	× LOWER KS2 Select • Reason • Justify	UPPER KS2 Conjecture • Prove • Generalise	END POINT INDEPENDENT MATHEMATICAL THINKER			

REASONING IS NOT A CHALLENGE ACTIVITY.
REASONING IS HOW WE LEARN MATHEMATICS.

FLUENCY + REASONING + PROBLEM SOLVING

SAME MATHEMATICS – DEEPER THINKING

GREATER DEPTH ≠ BIGGER NUMBERS

ACCESS FOR EVERY CHILD

FLUENCY
What do I know?

REASONING
How do I know?

PROBLEM SOLVING
How can I use what I know?

MATHEMATICAL UNDERSTANDING

$7 \times 6 = 42$

FLUENCY I know $7 \times 6 = 42$.

CONNECT So I know $70 \times 6 = 420$.

REASON + I know this because the value is ten times greater.

GENERALISE Multiplying one factor by 10 makes the product ten times greater.

NOT:

- ✗ harder numbers
- ✗ next year's content
- ✗ extra worksheets
- ✗ simply working faster

INSTEAD:

- ✓ deeper connections
- ✓ multiple representations
- ✓ strategy comparison
- ✓ justification
- ✓ proof
- ✓ generalisation

DEPTH COMES FROM THE THINKING – NOT THE SIZE OF THE NUMBER.

ACCESS FOR EVERY CHILD

- Manipulatives
- Visuals
- Sentence stems
- Oral rehearsal
- Widgit
- Modelling

SCAFFOLD THE ACCESS – NOT THE THINKING.

I DON'T JUST KNOW THE ANSWER – I CAN EXPLAIN WHY.

NOTICE → CONNECT → EXPLAIN → JUSTIFY → PROVE → GENERALISE
Curious thinkers • Flexible problem solvers • Confident mathematicians

♥ EVERY CHILD. ★ EVERY CHANCE. 🧠 EVERY DAY.

OUR APPROACH TO REASONING & PROBLEM SOLVING

Reasoning isn't what comes after the mathematics – it is how children make sense of mathematics.

At St Stephen's, fluency, reasoning and problem solving are developed together. Children are taught to notice mathematical structure, make connections, explain their thinking, select and adapt strategies, justify decisions and apply their knowledge in familiar and unfamiliar contexts.



WHAT DO WE MEAN BY MATHEMATICAL REASONING?

NOTICE

What do I see?
What is the same?
What is different?

CONNECT

What does this remind me of?
What do I already know?

EXPLAIN

How did I work it out?
Why does my strategy work?

JUSTIFY

How do I know this is true?
What evidence can I give?

PROVE

Can I convince someone that it must be true?

GENERALISE

Will this always work?
What mathematical rule can I describe?



AN ANSWER TELLS US WHAT. REASONING TELLS US WHY.

WHAT DO WE MEAN BY PROBLEM SOLVING?

UNDERSTAND

What is the problem asking?

CONNECT

What knowledge might help me?

REPRESENT

Can I build, draw or model it?

SELECT

Which strategy might be useful?

SOLVE

Carry out the mathematics.

CHECK

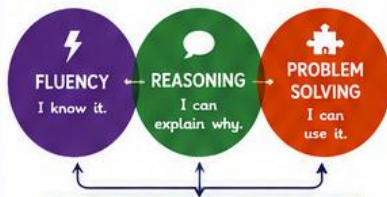
Does my answer make sense?

REFLECT

Was there another or more efficient way?

WE TEACH CHILDREN HOW TO SOLVE PROBLEMS – WE DON'T JUST GIVE THEM PROBLEMS TO SOLVE.

FLUENCY + REASONING + PROBLEM SOLVING



THESE ARE INTERCONNECTED – NOT THREE SEPARATE LESSON TYPES.

REASONING IS FOR EVERYONE

NOT:

Fluency → finish the work → reasoning challenge

INSTEAD:

Fluency ↔ Representation ↔ Reasoning ↔ Problem Solving



EVERY CHILD SHOULD BE ASKED TO THINK, EXPLAIN AND REASON.

The level of scaffold changes – the expectation to think doesn't.

WHAT DOES THIS LOOK LIKE IN A LESSON?

- MODEL**
Teacher models the mathematics and the thinking.
- REHEARSE**
Children talk with a partner, manipulate and represent.
- QUESTION**
Teacher probes understanding.
- APPLY**
Children use the idea in varied contexts.
- DEEPEN**
Children compare, justify, prove and generalise.

RETRIEVE & CONNECT



REPRESENTATION SUPPORTS REASONING

$$24 \div 6 = 4$$



- SEE IT**
4 groups of 6
- SAY IT**
"Twenty-four divided into groups of six gives four groups."
- CONNECT IT**
 $6 \times 4 = 24$
- REASON**
"Division is the inverse of multiplication."

REPRESENTATIONS MAKE MATHEMATICAL STRUCTURE VISIBLE.

QUESTIONS THAT MAKE CHILDREN THINK



- What do you notice?
- How do you know?
- Can you represent it?
- What is the same? What is different?
- Can you find another way?
- Which strategy is more efficient? Why?
- Is this always true?
- Can you prove it?
- What would happen if...?
- Can you generalise?

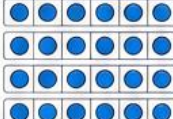
THE POWER OF VARIATION

$$6 \times 7 = ?$$

$$60 \times 7 = ?$$

$$6 \times 70 = ?$$

$$60 \times 70 = ?$$



"What stays the same?"

"What changes?"

"What relationship do you notice?"

VARIATION HELPS CHILDREN NOTICE STRUCTURE – NOT JUST PRACTISE PROCEDURE.

GREATER DEPTH IS NOT...

- ✗ Bigger numbers
- ✗ More calculations
- ✗ Faster completion
- ✗ Next year's curriculum
- ✗ A worksheet labelled 'Challenge'

GREATER DEPTH IS...

- ✓ Making connections
- ✓ Selecting efficient strategies
- ✓ Comparing representations
- ✓ Explaining relationships
- ✓ Spotting patterns
- ✓ Testing conjectures
- ✓ Justifying
- ✓ Proving
- ✓ Generalising

GO DEEPER – NOT FURTHER.

ACCESSES FOR ALL

SCAFFOLD THE ACCESS – NOT THE THINKING.

- Manipulatives
- Visual representations
- Sentence stems
- Oral rehearsal
- Widgit
- Chunked problems
- Adult modelling
- Additional rehearsal

But we still ask:
✓ What do you notice?
✓ How do you know?
✓ Can you show me?

PRODUCTIVE STRUGGLE

TOO MUCH SUPPORT

Adult does the thinking

JUST ENOUGH SUPPORT

Child thinks with appropriate scaffolding

TOO LITTLE SUPPORT

Child cannot access the mathematics

SUPPORT SHOULD ENABLE THINKING – NOT REPLACE IT.



WHEN A CHILD IS STUCK...

Instead of immediately showing the method, ask:

- ✓ What do you know?
- ✓ What could you represent?
- ✓ Have you solved something similar?
- ✓ Could you try a simpler example?
- ✓ What is the problem actually asking?
- ✓ What could you try first?



OUR NON-NEGOTIABLES

- ✓ Reasoning is embedded in everyday mathematics
- ✓ All pupils reason – not only those working at greater depth
- ✓ Fluency, reasoning and problem solving are interconnected
- ✓ Representations expose mathematical structure
- ✓ Children regularly explain how and why
- ✓ Teachers model mathematical thinking aloud
- ✓ Questions-grab understanding rather than only answers
- ✓ Children compare strategies and representations
- ✓ Errors are explored as opportunities for reasoning
- ✓ Problem-solving strategies are explicitly taught
- ✓ Scaffolds support access and are gradually faded
- ✓ Depth comes through connections, not just practice

NOTICE → CONNECT → EXPLAIN → JUSTIFY → PROVE → GENERALISE

EVERY CHILD.

EVERY CHANCE.

EVERY DAY.



NOTICING & MAKING CONNECTIONS



Strong mathematicians notice patterns, relationships and structure in mathematics and their world. They make connections between ideas, facts, representations and strategies to deepen understanding and recall.

WHAT IT LOOKS LIKE

- ✓ Spotting patterns and regularities
- ✓ Seeing relationships between numbers and operations
- ✓ Connecting facts and strategies
- ✓ Linking representations
- ✓ Using prior learning
- ✓ Making sense of structure
- ✓ Connecting mathematics to real life



PROGRESSION OF SKILLS

EYFS



- Notice amounts and patterns.
- Talk about similarities and differences.
- Notice change.
- Connect numbers to quantities and actions.



KS1



- Notice number bonds and related facts.
- See connections between operations.
- Spot patterns in numbers and shapes.
- Link strategies and choose related facts.



LOWER KS2



- Recognise relationships between operations.
- Use place value to make connections.
- Spot patterns in sequences and tables.
- Connect facts, strategies and representations.



UPPER KS2



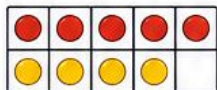
- Notice structure within a range of mathematics.
- Connect ideas across different topics.
- See how one mathematical idea leads to another.
- Use connections to reason and solve problems.



EXAMPLES OF NOTICING & MAKING CONNECTIONS

NUMBERS

What do you notice?



I notice there are doubles.

OPERATIONS

What's the same?
What's different?

$$18 + 6 = 24$$

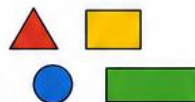
$$17 + 7 = 24$$



The numbers are different, but the total is the same.

SHAPES

How are these shapes connected?



They all have straight sides and corners.

REAL LIFE

Where do we see this in the real world?



I see patterns in clocks every day.

QUESTIONS TO DEVELOP THINKING

- What do you notice?
- What's the same? What's different?
- How is this connected?
- What pattern can you see?
- How does this remind you of something else?
- How could we show this another way?



★ THE IMPACT

- ✓ Children understand mathematics more deeply.
- ✓ They recall facts more easily.
- ✓ They choose strategies more confidently.
- ✓ They solve problems more flexibly.
- ✓ They see mathematics as connected and meaningful.



NOTICE → CONNECT → UNDERSTAND → SOLVE

Stronger connections • Deeper understanding • Confident mathematicians

♥ EVERY CHILD.

★ EVERY CHANCE.

🧠 EVERY DAY.



EXPLAINING & JUSTIFYING



Strong mathematicians explain their thinking clearly and justify how they know. They use mathematical language, representations and evidence to show why their ideas make sense.

WHAT IT LOOKS LIKE

- ✓ Saying how you found an answer
- ✓ Giving reasons using facts or properties
- ✓ Using mathematical vocabulary
- ✓ Showing your thinking in more than one way
- ✓ Explaining why a strategy works
- ✓ Building a convincing argument



I know this because...

PROGRESSION OF SKILLS

EYFS



- Talk about how they solved it.
- Use words like more, less, same.
- Explain with pictures, objects or actions.
- Say whether their answer is right.



KS1



- Explain how they worked it out.
- Use mathematical sentence stems.
- Give reasons using number facts or patterns.
- Show their thinking using drawings or equations.



LOWER KS2



- Explain with clear steps.
- Use mathematical vocabulary.
- Justify answers using facts, properties and relationships.
- Compare and justify different strategies.



UPPER KS2



- Give detailed explanations.
- Justify using multiple pieces of evidence.
- Evaluate and defend different methods.
- Explain and justify generalisations or conclusions.



WAYS WE EXPLAIN AND JUSTIFY

SPEAK



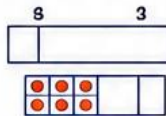
I think ... because...

WRITE



I solved it by...
My answer is...
I know this because...

REPRESENT



This shows...
I can see that...

USE VOCABULARY

because
so
therefore

This works because...
This is true because...

GIVE EVIDENCE



The evidence is...
This proves that...

EXAMPLES OF JUSTIFYING IN MATHEMATICS

NUMBER

$$23 + 17 = 40$$



I added the tens first, then the ones.

SHAPE



I know these are rectangles because they have 4 right angles.

MEASUREMENT



The sides are equal, so the balance is level.

PROBLEM SOLVING

I used a bar model to help me.

28	
?	15



I know this because $28 - 15 = 13$.

QUESTIONS TO DEVELOP THINKING

- How did you work that out?
- Why did you choose this method?
- What makes you think that?
- Can you explain it another way?
- What fact or rule helps you?
- How do you know your answer is right?
- Can you prove it?



★ THE IMPACT



Children think deeper and understand more.



They make their maths thinking clear and confident.



They can explain to others and work together.



They justify their ideas and make better decisions.



They are prepared for greater depth and real life.

EXPLAINING OUR THINKING MAKES OUR MATHEMATICS STRONGER.

NOTICE → CONNECT → REPRESENT → CHOOSE → SOLVE → JUSTIFY → REFLECT



EVERY CHILD.



EVERY CHANCE.



EVERY DAY.



CONJECTURING, PROVING & GENERALISING

Strong mathematicians look for patterns, make predictions, test ideas and think more deeply.

They look for patterns and relationships, make sensible predictions, test them, prove ideas and generalise to new situations. They ask "what if?" and explore possibilities.

WHAT IT LOOKS LIKE

- ✓ Spotting and describing patterns
- ✓ Making and testing predictions
- ✓ Asking "what might happen if?"
- ✓ Looking for general rules
- ✓ Proving that an idea is always true
- ✓ Explaining why it must be true
- ✓ Applying ideas in new situations
- ✓ Seeing connections and structure
- ✓ Thinking mathematically beyond the given



I wonder if this will always work...

PROGRESSION OF SKILLS

EYFS



- Notice simple patterns.
- Predict what might come next.
- Try things out and see what happens.
- Talk about results.



KS1



- Find and describe patterns.
- Make sensible predictions.
- Explain how they know.
- Begin to look for general rules.
- Use simple examples to test ideas.



LOWER KS2



- Identify and extend increasingly complex patterns.
- Make predictions and justify them.
- Explore "what if?" questions.
- Look for and describe general rules.
- Use examples to prove ideas.



UPPER KS2



- Find rules and generalise to any situation.
- Prove that ideas are always true.
- Use algebra and reasoning to prove.
- Explain and justify generalisations clearly.
- Apply ideas in new and unfamiliar contexts.



WAYS WE EXPLORE AND PROVE IDEAS

LOOK FOR PATTERNS



What do you notice?
What comes next?



The pattern keeps alternating.

MAKE PREDICTIONS

I think...
I predict that...

14, 18, 22, 26, ...



TEST IDEAS

Let's try it.
Does it always work?



PROVE IT

I can show that this is always true because...



GENERALISE

This works for any number because...

So it will be true in any situation.



EXAMPLES IN MATHEMATICS

NUMBER PATTERNS

3, 6, 9, 12, 15, ...

The rule is "add 3".
It always works.

3	6	9	12	15
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FIGURATE PATTERNS



The next shape will have 15 dots.

WHAT IF?

What if the starting number changes?



What if I start on 5 instead of 2?

GENERAL RULE

For any even number n , $n + 2$ will also be even.

Example: $8 + 2 = 10$
 $14 + 2 = 16$
 $32 + 2 = 34$

This is always true.

QUESTIONS TO DEVELOP THINKING

- What do you notice?
- What happens next?
- What do you predict will happen?
- What if we change this?
- How do you know?
- Can you prove it?
- Is it always true?
- What is the rule?
- Can you generalise it?



THE IMPACT



Children think creatively and curiously.



They persevere, test ideas and don't give up.



They make reasoned predictions.



They justify and prove their ideas with confidence.



They transfer ideas to new situations.

NOTICE → CONNECT → REPRESENT → CHOOSE → SOLVE → JUSTIFY → REFLECT

Deeper thinking. • Greater understanding. • Lifelong mathematicians.



PROBLEM-SOLVING STRATEGIES

Strong mathematicians choose, use and adapt strategies to solve problems with confidence and resilience.



They tackle problems in different ways, persevere when problems are difficult and use what they know to find solutions to both familiar and unfamiliar problems.

WHAT IT LOOKS LIKE

- ✓ Choosing an appropriate strategy
- ✓ Trying different approaches
- ✓ Breaking problems into smaller parts
- ✓ Working systematically
- ✓ Persevering when it gets tricky
- ✓ Reviewing and improving solutions
- ✓ Explaining which strategy worked best
- ✓ Applying strategies to new problems



There is more than one way!

PROGRESSION OF SKILLS

EYFS



- Solve problems in play and practical contexts.
- Try things out and see what works.
- Talk about what helped.
- Keep trying with support.



KS1



- Use objects, pictures and numbers to help.
- Try different ways to solve problems.
- Break problems down into smaller steps.
- Check and improve solutions.



LOWER KS2



- Select and use efficient strategies.
- Use logical reasoning to solve problems.
- Work systematically and organise information.
- Check answers and explain thinking.



UPPER KS2

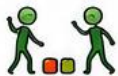


- Choose the most efficient strategy for the problem.
- Solve complex multi-step problems.
- Use algebraic thinking and generalise.
- Evaluate and refine solutions.



STRATEGIES WE USE

ACT IT OUT



Use objects, resources or role play.
"I can show it first."

DRAW A PICTURE



Draw to help me see the problem.
"A picture helps me think."

MAKE A LIST



List information or possibilities.
"I can organise my thinking."

LOOK FOR A PATTERN



Find and use patterns or relationships.
"I can spot a pattern."

WORK BACKWARDS



Start from the end and work back.
"I can reverse it."

GUESS & CHECK



Make a sensible guess and check it.
"I can test my idea."

BREAK IT DOWN



Break the problem into smaller, manageable parts.
"One step at a time."

USE A TABLE OR DIAGRAM



Organise and display information clearly.
"This helps me see it clearly."

GEORGE'S PROBLEM-SOLVING JOURNEY

1 UNDERSTAND

What do I know?
What is the problem?



I need to understand.

2 PLAN

Which strategy could I use?



What could help me?

3 SOLVE

Carry out the plan.



I'll have a go.

4 CHECK

Does my answer make sense?



Does this look right?

5 ADAPT

If not, what else could I try?



I'll try another way.

6 REFLECT

What worked?
What didn't?



I can learn from this.

7 APPLY

Try it in a new way or problem.



I can use this again!

THINK ABOUT...

- Which strategy is best for this problem?
- Why did you choose that strategy?
- Is there another way?
- How could you make it easier?
- How do you know it is correct?
- What would you do differently next time?



THE IMPACT

- ✓ Children become confident, flexible and resilient problem solvers.
- ✓ They make better choices about strategies to use.
- ✓ They persevere and don't give up.
- ✓ They apply their knowledge in new and unfamiliar situations.
- ✓ They see that mathematics is creative, logical and powerful.

I can solve it!



GOOD PROBLEM SOLVERS...

- ✓ Read the problem carefully.
- ✓ Think about what they know.
- ✓ Choose a strategy.
- ✓ Carry it out.
- ✓ Check their answer.
- ✓ Try another way if needed.
- ✓ Explain how they solved it.
- ✓ Learn from the problem.



THINK → PLAN → SOLVE → CHECK → ADAPT → REFLECT → APPLY

Different strategies • Smart choices • Confident problem solvers



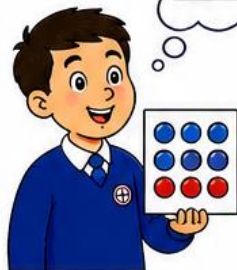
EVERY CHILD.



EVERY CHANCE.

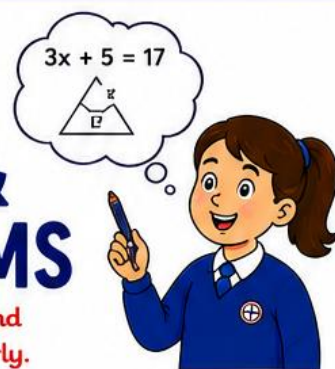


EVERY DAY.



REPRESENTING & MODELLING PROBLEMS

Strong mathematics uses representations to understand problems, explore ideas and communicate thinking clearly.



Children use concrete, pictorial and abstract representations to make sense of problems. They choose the most helpful representation and can move between different forms with confidence.

WHAT IT LOOKS LIKE

- ✓ Using concrete resources
- ✓ Drawing pictures and diagrams
- ✓ Making number sentences
- ✓ Using bar models and part-whole models
- ✓ Creating tables and charts
- ✓ Using symbols and algebra
- ✓ Moving between representations
- ✓ Choosing the best representation
- ✓ Explaining what the representation shows



I can show my thinking in different ways.

PROGRESSION OF SKILLS

EYFS



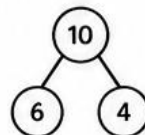
- Use objects to represent ideas.
- Make marks, drawings or models.
- Talk about what their model shows.
- Begin to match representations to numbers.



KS1



- Use pictures, objects and bar models.
- Make number sentences and part-whole models.
- Represent problems in different ways.
- Choose and explain which representation is most helpful.



LOWER KS2



- Use diagrams, tables and bar models.
- Move between different representations.
- Interpret and create graphs and charts.
- Use symbols and equations.



UPPER KS2

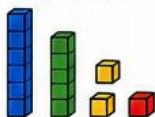


- Use algebraic expressions and formulae.
- Choose fluent representations to solve problems.
- Use complex models and mathematical notation.
- Evaluate which representation is most effective.

$$2x + 7 = 19$$

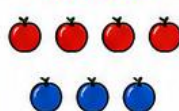
WAYS WE REPRESENT AND MODEL PROBLEMS

CONCRETE



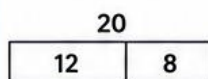
I can use objects to help me.

PICTORIAL



I can draw a picture or diagram.

BAR MODEL



I can use a bar model to show the parts.

NUMBER SENTENCE

$$12 + 8 = 20$$

I can write a number sentence.

TABLE

Input	Output
1	4
2	7
3	10

I can organise information in a table.

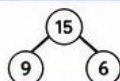
ALGEBRAIC

$$3x + 5$$

I can use symbols to represent rules.

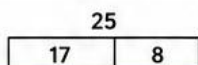
EXAMPLES OF REPRESENTATIONS

PART-WHOLE MODEL



$$9 + 6 = 15$$

BAR MODEL



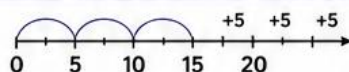
$$17 + 8 = 25$$

ARRAY



$$4 \times 6 = 24$$

NUMBER LINE



QUESTIONS TO DEVELOP THINKING

- What can you see?
- What does this show?
- How is this useful?
- Can you show it another way?
- Which representation is the most helpful?
- What do the parts or numbers mean?
- How does this help you solve the problem?



THE IMPACT

- ★ Children understand problems more deeply.
- ✓ They can explore and explain their thinking clearly.
- ✓ They choose the most effective representations.
- ✓ They can transfer their understanding to new situations.
- ✓ They become fluent, confident and independent mathematicians.



GOOD MATHEMATICIANS USE REPRESENTATIONS TO THINK, SOLVE AND COMMUNICATE.



CHOOSING, COMPARING & EVALUATING STRATEGIES

Strong mathematicians think about the best way to solve a problem.
They compare methods, decide what works best and explain why.

Children consider different approaches, compare their efficiency and accuracy, and evaluate solutions to choose the most effective strategy.
They reflect on their thinking to improve and learn.



WHAT IT LOOKS LIKE

- ✓ Considering different strategies
- ✓ Deciding which is the most efficient
- ✓ Comparing accuracy and reasonableness
- ✓ Explaining the advantages and disadvantages
- ✓ Justifying your choice
- ✓ Reflecting on what could be better
- ✓ Learning from mistakes
- ✓ Improving your approach
- ✓ Evaluating the reasonableness of answers



Which strategy is best? Why?

PROGRESSION OF SKILLS

EYFS



- Try different ways.
- Talk about which way worked best.
- Say what was easy or hard.



KS1



- Use different strategies.
- Compare methods and results.
- Decide which method is best and explain why.
- Think about time and accuracy.



LOWER KS2



- Compare strategies for efficiency and accuracy.
- Explain the advantages and disadvantages.
- Justify the best choice for the situation.
- Reflect on and refine your method.



UPPER KS2



- Evaluate multiple strategies in depth.
- Consider efficiency, accuracy and generality.
- Justify decisions with clear reasoning and evidence.
- Adapt and improve strategies for complex problems.



WAYS WE COMPARE AND EVALUATE

COMPARE METHODS



I can look at different ways to solve it.

CHECK EFFICIENCY



Which way is quicker or easier?

CHECK ACCURACY



Which answer is most accurate?

EXPLAIN REASONS



I can explain why this is the best way.

REFLECT & IMPROVE



What could I do better next time?

EXAMPLE – SOLVING $48 + 36$

Method 1 Expanded Column

$$\begin{array}{r} \text{T} \quad \text{O} \\ 48 \\ + 36 \\ \hline 84 \end{array}$$

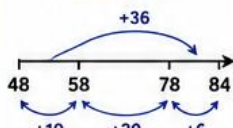
- Easy to understand
- Organised
- Takes a little longer

Method 2 Partitioning

$$\begin{aligned} 40 + 30 &= 70 \\ 8 + 6 &= 14 \\ 70 + 14 &= 84 \end{aligned}$$

- Breaks numbers down
- Helps understanding
- Good for mental maths

Method 3 Number Line



- Visual and clear
- Good for checking
- Takes more steps

WHICH IS BEST?



It depends on the question and the numbers.
I chose the partitioning because it was quickest today.

QUESTIONS TO DEVELOP THINKING

- What strategies could you use?
- Which strategy is most efficient?
- How do you know?
- Which strategy gives the most accurate answer?
- What are the advantages and disadvantages of each method?
- Why did you choose this strategy?
- Could you solve it another way?
- What would you do differently next time?



★ THE IMPACT

- ✓ Children make confident choices about strategies.
- ✓ They solve problems more efficiently and accurately.
- ✓ They can explain and justify their thinking clearly.
- ✓ They reflect and improve their maths learning.

Thinking carefully helps me succeed!



GOOD MATHEMATICIANS...

- ★ Consider options
- ★ Make comparisons
- ★ Justify their choices
- ★ Reflect and improve



CHOOSE → COMPARE → EVALUATE → JUSTIFY → IMPROVE

Smart choices • Strong reasoning • Better mathematicians

♥ EVERY CHILD.

★ EVERY CHANCE.

🌀 EVERY DAY.



EXPLAINING WHY A STRATEGY WORKS

Strong mathematicians explain and justify why their methods are effective and always make sense.



Children give clear mathematical reasons, using facts, properties and relationships. They build convincing arguments and communicate their thinking so others can understand and agree.

WHAT IT LOOKS LIKE

- ✓ Giving clear mathematical reasons
- ✓ Using facts, properties and relationships
- ✓ Linking ideas together
- ✓ Building a logical argument
- ✓ Using precise mathematical vocabulary
- ✓ Checking that the answer makes sense
- ✓ Explaining in different ways
- ✓ Making thinking convincing



This works because...

PROGRESSION OF SKILLS

EYFS



- Talk about why it works.
- Use simple reasons.
- Say which part helped.
- Begin to use maths words.



KS1



- Explain how their method works.
- Use number facts or patterns.
- Link steps in order.
- Use maths words to explain.



LOWER KS2



- Use facts, properties and relationships to explain.
- Link ideas together clearly.
- Explain why each step works.
- Use precise vocabulary.



UPPER KS2



- Give detailed, mathematical explanations.
- Justify using multiple pieces of evidence.
- Use formal vocabulary and reasoning.
- Explain and defend conclusions.



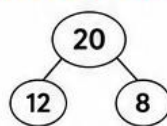
WAYS WE EXPLAIN

USE WORDS



I think this works because...
The reason is...
This shows that...

USE REPRESENTATIONS



This model shows...
It works because...

USE FACTS & PROPERTIES

$$6 \times 4 = 24$$

$$4 \times 6 = 24$$

Commutative Property

I know this because...
This property means...

USE EXAMPLES



For example...
Another example is...

CHECK & EXPLAIN



I checked my answer...
This makes sense because...

EXAMPLES OF EXPLAINING WHY

NUMBER FACTS

$$18 + 7 = 25$$



I know
 $18 + 2 = 20$
and $20 + 5 = 25$,
so it works!

PROPERTIES

$$7 \times 5 = 35$$



I know
 $5 \times 7 = 35$ too.
This shows the
commutative
property!

PART-WHOLE MODEL

$$15 + 23 = 38$$



The parts
15 and 23
make 38.

QUESTIONS TO DEVELOP THINKING



- Why does this strategy work?
- What facts or properties did you use?
- Can you explain another way?
- What evidence supports your answer?
- Do all steps make sense? Why?
- How do you know your answer is correct?
- Could someone else understand your explanation?



★ THE IMPACT



Children
think more
deeply.



They build
confidence in
their maths.



They communicate
clearly and work
together.



They make
better choices
and decisions.



They are prepared
for greater depth
and real life.

EXPLAINING WHY BUILDS CONFIDENCE, UNDERSTANDING AND EXCELLENCE.

NOTICE → CONNECT → REPRESENT → CHOOSE → SOLVE → JUSTIFY → REFLECT

♥ EVERY CHILD.

★ EVERY CHANCE.

🧠 EVERY DAY.



WHAT GREATER DEPTH LOOKS LIKE

Greater depth means going beyond the expected.
It is about thinking deeply, making connections and applying mathematics in different ways.

Children working at greater depth show curiosity, perseverance and creativity.
They reason mathematically, solve problems in unfamiliar contexts and can explain and justify their thinking with confidence.

OVERALL, CHILDREN WORKING AT GREATER DEPTH...

- ✓ Think deeply and make connections
- ✓ Use and apply knowledge confidently
- ✓ Solve problems in unfamiliar contexts
- ✓ Explain and justify their reasoning
- ✓ Use precise mathematical language
- ✓ Select and adapt the best strategies
- ✓ Make generalisations and spot patterns
- ✓ Are curious and ask thoughtful questions
- ✓ Reflect on their learning and improve
- ✓ Show resilience and do not give up

I can explain my thinking and solve tricky problems!

PROGRESSION OF GREATER DEPTH

EYFS



- Explore and investigate patterns and relationships.
- Make connections between ideas.
- Talk about their thinking in detail.
- Solve problems in different contexts.
- Persist and show curiosity.



KS1



- Apply knowledge in a range of contexts.
- Reason and explain their thinking clearly.
- Solve problems with more than one step.
- Make connections between topics.
- Choose and use efficient strategies.



LOWER KS2



- Solve problems in unfamiliar contexts.
- Justify using clear reasoning and evidence.
- Make generalisations and predict patterns.
- Adapt and combine strategies to solve problems.
- Reflect, evaluate and improve their solutions.



UPPER KS2



- Tackle complex problems independently.
- Prove and justify with convincing arguments.
- Generalise and connect ideas across topics.
- Evaluate and refine solutions to improve.
- Think creatively and show mathematical maturity.



CHARACTERISTICS OF GREATER DEPTH LEARNERS

CURIOUS



They ask questions and show natural curiosity.

DEEP THINKERS



They think deeply and make strong connections.

CLEAR COMMUNICATORS



They explain and justify their ideas clearly.

RESILIENT



They persevere, even when it is challenging.

REFLECTIVE



They reflect on their learning and improve.

PATTERN SPOTTERS



They notice patterns and make connections.

INDEPENDENT



They work independently and take ownership.

EXAMPLES IN ACTION

- ★ Explains why their answer makes sense using multiple methods.
- ★ Solves a problem in a new or tricky context.
- ★ Finds patterns and explains the rule.
- ★ Links ideas together across different areas of maths.
- ★ Justifies and proves their thinking.
- ★ Evaluates their solution and improves it.



QUESTIONS TO DEVELOP THINKING

- Can you explain why?
- What else could you try?
- Can you solve it another way?
- What patterns do you notice?
- How do you know your answer is correct?
- Can you prove it?
- Can you generalise this?
- What might happen if...?



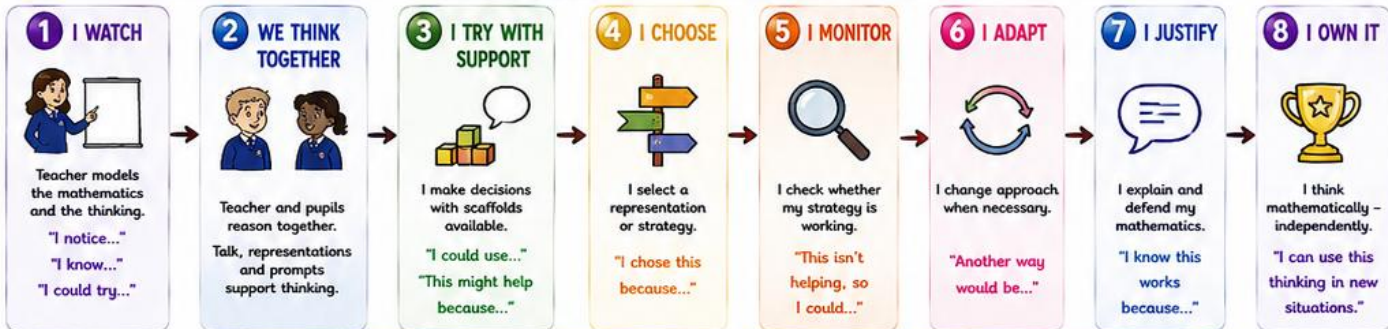
THINK DEEPLY • MAKE CONNECTIONS • CHOOSE STRATEGIES • JUSTIFY • IMPROVE
Greater depth today, brighter futures tomorrow.

FROM SUPPORTED REASONING TO MATHEMATICAL INDEPENDENCE

Developing pupils who know what to do when the mathematics is unfamiliar.

At St Stephen's, children are supported to become increasingly independent mathematical thinkers. Through explicit modelling, purposeful representations, mathematical talk, carefully chosen scaffolds and opportunities to reason and solve problems, pupils develop the confidence to make decisions, persevere, adapt their thinking and explain why their mathematics works.

THE JOURNEY TO INDEPENDENCE



THE GOAL IS NOT TO REMOVE SUPPORT. THE GOAL IS TO DEVELOP INDEPENDENT THINKING.



WHEN I'M STUCK, I CAN...

- What do I know?
- What do I need to find?
- What could I represent?
- What resources could help?
- Could I try a simpler example?
- Could I work backwards?
- Could I explain it aloud?
- Could I try another strategy?
- Can I check what I have done so far?
- Does my answer make sense?

INDEPENDENCE MEANS...

- I choose resources purposefully.
- I select strategies.
- I check my thinking.
- I change my approach when needed.
- I ask for appropriate help.
- I learn from mistakes.

USING A RESOURCE IS NOT A LACK OF INDEPENDENCE. KNOWING WHEN AND WHY TO USE IT IS INDEPENDENCE.

SCAFFOLD → FADE → INDEPENDENCE

HIGH SUPPORT
Teacher models
Resources provided
Prompts & sentence stems

↓

GUIDED CHOICE
"Which of these might help?"

↓

OPEN PROMPT
"What could you use?"

↓

INDEPENDENT CHOICE
I select what is useful.

↓

STRATEGIC INDEPENDENCE
I use, adapt or reject a scaffold according to need.

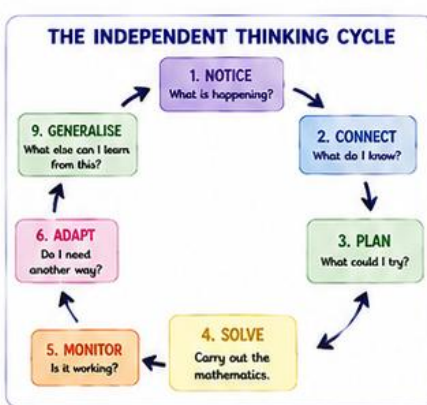
WE FADE A SCAFFOLD WHEN IT IS NO LONGER NEEDED - NOT BECAUSE OF A CHILD'S AGE.

INDEPENDENCE LOOKS DIFFERENT FOR DIFFERENT CHILDREN

- One child may use manipulatives.
- One child may reason orally.
- One child may work in writing.
- One child may use visual support.
- One child may use sentence stems.
- One child may rehearse with a partner.

THE RESOURCE DOES NOT DO THE THINKING - THE CHILD DOES.

ACCESS ≠ DEPENDENCE



I notice...

I can generalise...

I can prove...

I can adapt...

I connect...

I can represent...

I can choose...

I can justify...

I DON'T NEED TO BE TOLD WHAT TO DO NEXT. I KNOW WHAT I CAN TRY.

OUR END POINT

- I notice mathematical structure.
- I connect across my learning.
- I represent my thinking.
- I choose effective strategies.
- I solve unfamiliar problems.
- I justify using mathematical evidence.
- I reflect and check my thinking.
- I generalise relationships.

BY THE END OF YEAR 6, I AM AN INDEPENDENT, FLEXIBLE, REFLECTIVE MATHEMATICIAN.



SUCCESS IS WHEN THE QUESTIONS WE USED TO ASK BECOME THE QUESTIONS CHILDREN ASK THEMSELVES.



NOTICE → CONNECT → REPRESENT → CHOOSE → SOLVE → JUSTIFY → REFLECT
Confident thinkers • Flexible problem solvers • Independent mathematicians

EVERY CHILD.

EVERY CHANCE.

EVERY DAY.