Shelf
Junior and Infant School

Everyone can shine

Maths at Shelf Junior and Infant School

Contents

Maths Policy

As Mathematics is a core subject, it is a legal requirement that it should form a substantial part of the primary school curriculum alongside all other subjects in the broad and balanced curriculum we provide.

Our Aims

We follow the aims of the national curriculum for mathematics to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics helps children to make sense of the world around them through developing their ability to calculate, to reason and to solve problems. It enables children to understand and appreciate relationships and pattern in both number and space in their everyday lives. Through their growing knowledge and understanding, children learn to appreciate the contribution made by many cultures to the development and application of mathematics.

Additionally, at Shelf Junior and Infant School, we aim to:

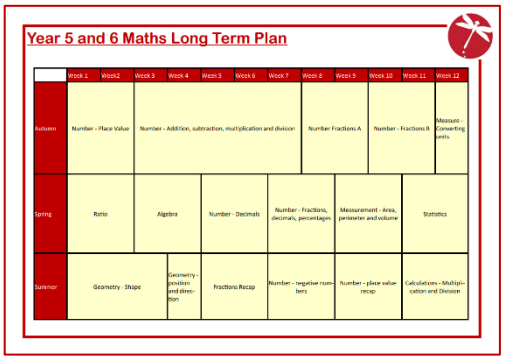
1. develop a positive attitude to maths as an interesting and attractive subject in which all children gain some success and pleasure.
2. develop mathematical understanding through systematic direct teaching of appropriate learning objectives.
3. encourage the effective use of maths as a tool in a wide range of activities within school and, subsequently, adult life.
4. develop an ability in the children to express themselves fluently, to talk about the subject with assurance, using correct mathematical language and vocabulary
5. develop an appreciation of relationships within maths.
6. develop ability to think clearly and logically with independence of thought and flexibility of mind.
7. develop mathematical skills and knowledge and quick recall of basic facts.

Planning Process

Mathematics is a core subject in the National Curriculum, and we use the objectives within the national curriculum when we start planning our maths lessons. This is then paired with

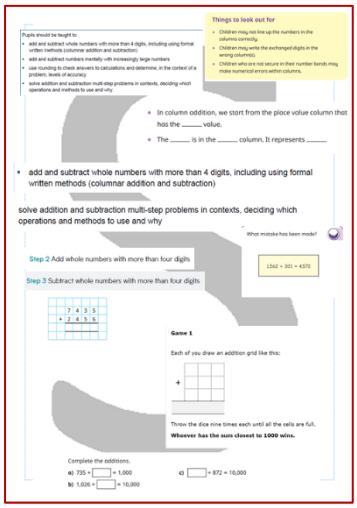
resources and small steps from White Rose Maths. Guidance available from the White Rose maths Hub and the National Centre for Excellence in the teaching of Mathematics (NCETM) also help to support with the implementation of the statutory requirements of the programme of study for mathematics.

We carry out the curriculum planning in mathematics in different phases. An outline of what we teach in the long term for each year group is available on our website.



Our long term plans use the structure of the White Rose Maths sequence of learning as their basis. Through discussions with the maths lead and senior leaders, this has then been adapted to meet the needs of the children of Shelf Junior and Infant School.

Our medium term mathematics plans define what we teach. They ensure an appropriate balance and distribution of work across each unit of work. Our medium term plans (or 'S' plans) contain the objectives that will be taught, key questions and misconceptions that could occur and also outlines different methods and representations to teach the unit.



Teachers then plan individual lessons, using high quality PowerPoints and resources to ensure that the needs of all pupils are taken into account.

Teaching and Learning Style

The school uses a variety of teaching styles to cater for the variety of learning styles of pupils in mathematics lessons. Our principle aim is to develop children's knowledge, skills and understanding in mathematics. We do this through a daily lesson that has a high proportion of whole-class and group-direct teaching.

During lessons, we encourage children to ask as well as answer mathematical questions. They have the opportunity to use a wide range of resources and we encourage children to use and apply their learning in everyday situations.

In all classes, there are children of differing mathematical ability. We recognise this fact and provide suitable learning opportunities for all children by matching the challenge of the task to the ability of the child. We achieve this through a range of strategies – in some lessons through differentiated individual and group work, and in other lessons by organising the children to work in pairs on open-ended problems or games. Teachers must ensure that work is matched to the needs of individuals.

Calculation Policy

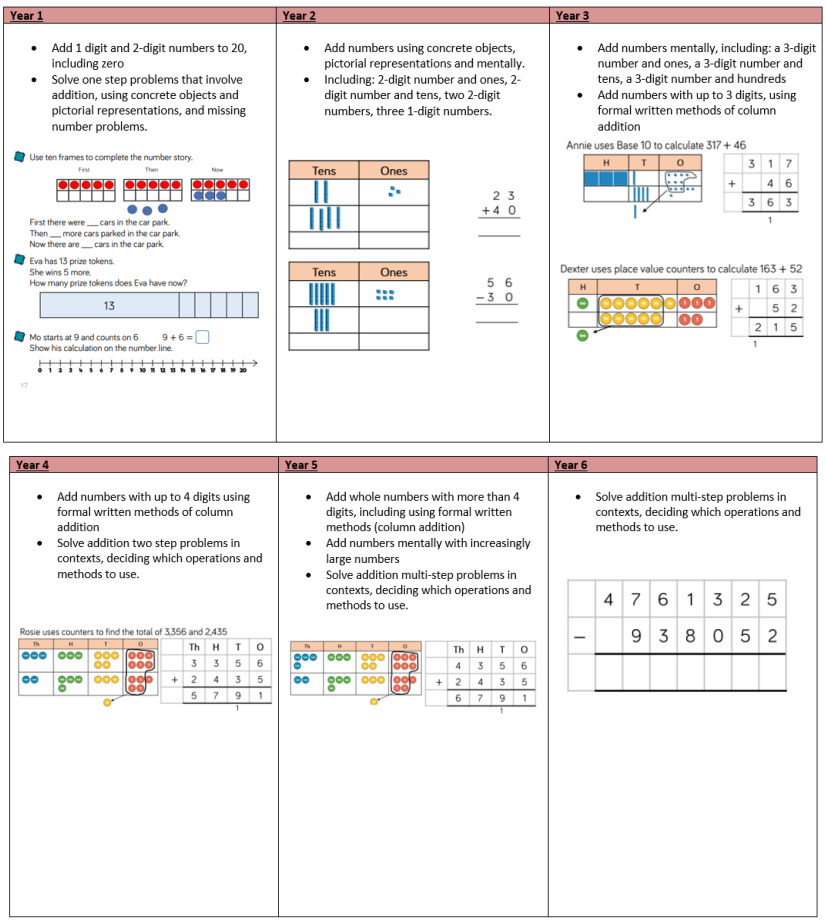
Overview

At Shelf Junior and Infant School, we have an ambitious maths curriculum in order to ensure that our pupils can achieve at their full potential. As a school we follow the White Rose Maths schemes of learning that progresses from Reception right through to Year 6. Our curriculum follows the CPA approach to maths: concrete, pictorial, abstract.
Concrete- Using physical objects to solve maths problems
Pictorial – Using drawings to solve maths problems
Abstract – Solving maths problems using only numbers

Calculation Policy

The tables below show the methods that we use to teach the four modes of operation in maths: **addition, subtraction, multiplication, and division**. Each mode of operation is split into the different year group. Each table contains the national curriculum objective for that year group followed by examples of the methods used by that year group to teach that area of maths. We encourage the use of both formal and mental arithmetic within calculation lessons.
Although the methods are split into year groups, the methods are intended to be progressive. If a child is not at the stage of the learning to be ready for more formal methods, they can still use pictorial and concrete methods to help them.

Addition



Subtraction

Year 1

- Subtract one-digit and two-digit-numbers to 20, including zero
- Solve one-step problems that involve subtraction, using concrete objects and pictorial representations and missing number problems.

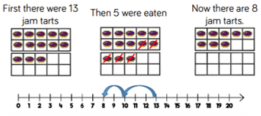
Use the number pieces and the number line to complete the number sentences.

20 – 7 = ___

Use this method to calculate:

20 – 8
18 – 6
19 – 4

First there were 13 jam tarts. Then 5 were eaten. Now there are 8 jam tarts.



Rosie has used the ten frames to calculate 12 – 5

Year 2

- Subtract numbers using concrete objects, pictorial representations and mentally.
- Including: 2-digit number and ones, 2-digit number and tens, two 2-digit numbers, three 1-digit numbers.

22 – 7 =

Can you put the larger number in your head and count back the smaller number? Start at 22 and count back 7

Can we use number bonds to subtract more efficiently?

We can partition 7 into 5 and 2 and use this to bridge the 10

34 – 13 = ____

- Partition the number 34.
- Partition 13 and subtract the ones and the tens.
- Place the partitioned number back together.

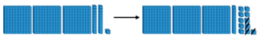
Subtract 13 from 28

2 8
– 1 3
1 5

Year 3

- Subtract numbers mentally, including: a 3-digit number and ones, a 3-digit number and tens, a 3-digit number and hundreds
- Subtract numbers with up to 3 digits, using formal written methods of column subtraction

Teddy uses Base 10 to calculate 321 – 4



Alex uses place value counters to calculate 434 – 72

	3	13	4
–		7	2
	3	6	2

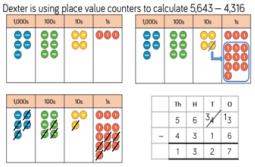
Year 4

- Subtract up to 4-digit numbers using the formal written method of column subtraction where appropriate
- Solve subtraction two-step problems in context, deciding which operations and methods to use and why

Eva uses place value counters to calculate 3,454 – 1,224

	Th	H	T	O
	3	4	5	4
–	1	2	2	4
	2	2	3	0

Dexter is using place value counters to calculate 5,643 – 4,316

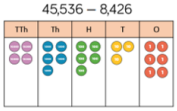


	Th	H	T	O
	5	6	13	13
–	4	3	1	6
	1	3	2	7

Year 5

- Subtract whole numbers with more 4 digits, including using formal written methods (column subtraction)
- Solve subtraction multi-step problems in context, deciding which operations and methods to use and why.

45,536 – 8,426



	TTh	Th	H	T	O
	4	5	5	3	6
–		8	4	2	6
	3	7	1	1	0

Year 6

- Solve subtraction multi-step problems in context, deciding which operations and methods to use and why.

	4	7	6	1	3	2	5
–		9	3	8	0	5	2

Multiplication

Year 1

- Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays.

Build an array with counters to represent the apples. Complete the sentences.

There are ___ apples in each row.
There are ___ rows.
___ + ___ + ___ = ___
There are ___ apples altogether.

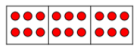
Complete the table.

Array	Description - columns	Description - rows	Totals
	5 columns 2 cookies in each column	2 rows 5 cookies in each row	2 + 2 + 2 + 2 + 2 = 10 5 + 5 = 10

Year 2

- Recall multiplication facts for the 2, 5 and 10 multiplication tables
- Show that multiplication of two numbers can be done in any order (commutative)
- Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods and multiplication facts

Complete the sentences to describe the equal groups.



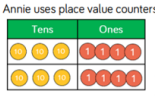
___ + ___ + ___ = 18
___ × ___ = 18

There are ___ equal groups with ___ in each group.
There are three ___

Year 3

- Recall and use multiplication facts for the 3, 4 and 8 multiplication tables
- Write and calculate statements for multiplication using the multiplication tables they know, including two- digit times one-digit numbers, using mental and progressing to formal written methods

Annie uses place value counters to work out 34 × 2



	T	O
	3	4
×		2
	6	8

Amir then calculates 5 × 34

	T	O
	3	4
×		5
1	7	0
	1	2

Year 4

- Recall multiplication fats for multiplication tables up to 12 x 12
- Multiply 2-digit and 3-digit numbers by a 1-digit number using formal written layout.

Complete the calculation.

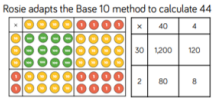
Hundreds	Tens	Ones

	H	T	O
	2	0	3
×			3

Year 5

- Multiply numbers up to 4 digits by a 1 or 2-digit number using a formal written method, including long multiplication for 2-digit numbers.

Rosie adapts the Base 10 method to calculate 44 × 32



×	40	4
30	1,200	120
2	80	8

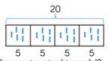
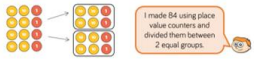
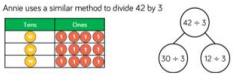
		2	3	
×		1	4	
		9	2	(23 × 4)
	2	3	0	(23 × 10)

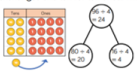
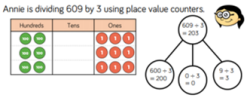
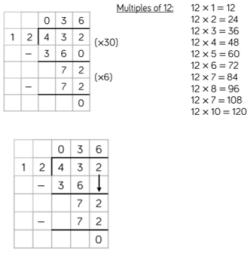
Year 6

- Multiply multi-digit numbers up to 4 digits by a 2-digit whole number using the formal written method of long multiplication.

3046
73 x
9138
213220 +
222358

Division

Year 1	Year 2	Year 3
• Solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays.  15 been shared into 3 equal groups of 5	• Solve problems involving division, using materials, arrays, repeated addition, mental methods and division facts, including problems in contexts. Ron draws this bar model to divide 20 into 4 equal groups. How does his model represent this? He writes 20 ÷ 4 = 5  What other number sentences could Ron create using his model? Apples can be sold in packs of 10 How many packs can be made below? 	• Write and calculate mathematical statements for division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods. Ron uses place value counters to solve 84 ÷ 2  Annie uses a similar method to divide 42 by 3 

Year 4	Year 5	Year 6
• Practise mental methods and extend this to three-digit numbers to derive facts (for example 600÷3 = 200 can be derived from 2x3 =6) Rosie is calculating 96 divided by 4 using place value counters. First, she divides the tens. She has one ten remaining so she exchanges one ten for ten ones. Then, she divides the ones.  Annie is dividing 609 by 3 using place value counters. 	• Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context. Here is a method to calculate 4,892 divided by 4 using place value counters and short division. 	• Divide numbers up to 4 digits by a two digit whole number using the formal written methods of long division, and interpret remainders as whole number remainders, fractions or by rounding, as appropriate for the context Multiples of 12: 12 × 1 = 12 12 × 2 = 24 12 × 3 = 36 12 × 4 = 48 12 × 5 = 60 12 × 6 = 72 12 × 7 = 84 12 × 8 = 96 12 × 7 = 108 12 × 10 = 120 

Timetable

EYFS Timetable

Monday	Tuesday	Wednesday	Thursday	Friday
Maths session and provision	Maths session and provision	Maths session and provision	Maths session and provision	
30-minute maths mastery	30-minute maths mastery		30-minute maths mastery	30-minute maths mastery

KS1 Timetable

Monday	Tuesday	Wednesday	Thursday	Friday
1-hour lesson	1-hour lesson	1-hour lesson	1-hour lesson	1-hour lesson
15-minute times table session		15-minute times table session	15-minute times table session	15-minute times table session
30-minute maths mastery	30-minute maths mastery		30-minute maths mastery	30-minute maths mastery

KS2 Timetable

Monday	Tuesday	Wednesday	Thursday	Friday
1-hour lesson	1-hour lesson	1-hour lesson	1-hour lesson	1-hour lesson
15-minute times table session	15-minute times table session	15-minute times table session	15-minute times table session	15-minute times table session

Maths lessons

1-hour maths lesson

Lessons are taught following the National Curriculum and White Rose Maths schemes of learning. Each lesson begins with a 'Flashback 4': this allows pupil to recall learning from the last week, the last unit, the last term and the previous year.

Children are then taught the day's learning objective. This can involve explicit teaching and group work. Children are then given the opportunity to apply their learning during independent practice tasks.

Once work is marked, next lessons are adapted based on the outcomes of the previous lesson. This then allows for flexible groupings and lessons to be adapted for the needs of individual children.

Maths mastery

Children in KS1 and EYFS take part in a maths mastery, 'Mastering Number' sessions. Mastering Number is designed to help children in EYFS, Year 1 and Year 2 to embed good number sense including fluency and flexibility with number facts.

Times tables

Times tables are a crucial part in children's learning and need to be applied in all areas of maths. At Shelf J and I School, we understand the importance of this and design sessions to help the children learn these. This knowledge will be vital to help the pupils in the year 4 multiplication check.

Each year group has a dedicated times table session designed to help pupils with the times table they need to learn. This could take the form of reciting tables, use of a counting stick or using maths songs. Children in Key Stage 1 have access to Numbots. Children in Key Stage 2 have access to TT Rockstars which they can use both in school and at home. In school we set regular times table battles and celebrate the achievements in assemblies.

Interventions

Through the use of assessment and pupil progress meetings, target children are identified who may need extra interventions. This could take the form of same-day intervention, power of 2 intervention programme or White Rose Maths tutoring with our in-house trained tutors.

Marking and Assessment

Teachers gain valuable feedback about how much maths teaching is being retained in the longer term from the daily 'Flashback 4' sessions at the start of lessons in KS1 and KS2. This information should be used to revisit areas where learning is not secure within maths meetings.

Progress in 'Hot and Cold tasks' given after teaching a unit as end of unit tests also provide vital feedback to the teacher about areas that might need more teaching for certain individuals either in class or through an intervention.

In terms of day to day maths learning, teachers will mark work completed by children. Errors will be identified and children should be encouraged to check them and have another go. Red stamped stars will be used for motivation and are linked to awarding a 'Class Dojo' point.

Other strategies that could support marking in class:
In KS2, teachers could have the answers to problems available, and after doing 4 or 5 calculations, children could check their answers themselves. That way, if they have got the wrong end of the stick and misunderstood something, they can alert the teacher immediately. Another benefit is that less confident children might want to start at the easiest level of work provided, but with instant feedback available, after getting their first few calculations correct, they feel confident to move to the next level.

Another strategy teachers can use is to get children to compare answers in a group and where answers do not agree, challenge each other and try and find where the other person has gone wrong.

Where children are more confident, and finish their work slightly earlier than others, they can consolidate their learning by 'marking' other children's books.

When they do this, the crucial step is that they should not take their own book with them and just read off the correct answer. They should do the calculations again – faster and possibly mentally – so in effect doing the work twice thus getting the sort of over-learning that leads to solid long-term retention.

The onus is always on the learner checking their work and if they've got an answer wrong, trying to identify their own errors. Children need to be taught how to do this purposely; otherwise they think it just means scanning quickly through their work, reading but not really thinking. Checking involves thinking deeply about the work you have just learnt. When you think deeply about something, it is much more likely to get stored in your long term memory, available to be recalled at will. As Daniel Willingham says 'memory is the residue of thought.'

So as an alternative to providing the answers, teachers should model ways of checking and then expect children to do the same, in effect '**proof reading' maths**. So for example, children might repeat a calculation in a different coloured pen and check they've got the same answer.

For addition calculations involving more than two numbers, adding the numbers in a different order is an even better way of checking. Teachers should model how children can use the inverse operation to go and check they get back to where they started.
With 2 or 3 part word problems, a classic error is to give the answer as the first part of the problem and forget about following through to the second (or third) part of the question.

Often, word problems are written with each instruction on a different line, a bit like success criteria. Again, teachers should show children how to check work as we go, returning to the question and ticking off each line –writing each answer alongside, being really clear we are answering the final question, having done all of the previous steps.