St. Paulinus Catholic Primary School

"Inspiring all to live, learn and love in the light of Jesus."

(I am the light of the world; whoever follows me will never walk in darkness but will have the light of life." *cf* John 8:12)

Mathematics Policy

Policy reviewed by Subject Managers : Miss N. Marray

Policy updated by : Miss E. Sinclair, May 2018

Policy review date : May 2021

Signed …… Date ……

Headteacher

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'An outstanding school, which is deeply committed to the Catholic mission… this school inspires all within this faith community to live life to the full.' *Ofsted 2017*

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Mathematics Policy

Mission Statement

"Inspiring all to live, learn and love in the light of Jesus"

Introduction

At St. Paulinus Catholic Primary School we believe that Mathematics equips pupils with a uniquely powerful set of tools, through developing an ability to calculate, reason and solve problems. It enables children to understand and appreciate relationships and patterns in both number and space in their everyday lives. Through their growing knowledge and understanding, they also learn to appreciate the contribution made by many people to the development and application of mathematics.

It is our aim to develop:

- A growth mind-set about ability to learn mathematics
- A positive attitude towards mathematics and an awareness of how fascinating elements of mathematics can be
- Competence and confidence with numbers and the number system and other mathematical knowledge, concepts and skills
- Problem solvers, who can reason, think logically, work systematically and apply their knowledge of mathematics
- An ability to communicate using mathematical language
- An ability to work both independently and with others

Teaching and Learning

Teachers' planning and organisation

We follow the Mathematics Mastery programmes of study, which ensures continuity and progression in the teaching of mathematics. Within a unit of work, the time spent on teaching a specific learning objective or set of learning objectives depends on the needs of the children.

Lessons follow a six part structure to allow for continuous Assessment for Learning:

1) Do Now (see appendix 1 for Do Now activities)

2) Sharing of the learning objective and modelling of the new learning

3) Paired Talk Task

4) Develop Learning

5) Independent Work

6) Plenary

1. Every lesson starts with an opportunity to answer the marking sticker from the previous lesson then to practise a key skill for that year group in the do now task.

2. Every lesson includes plenty of opportunity to talk – children are given the opportunity to explain how to do things or what they have found out. They can become the "teacher". (see appendix 2 for star words list)

3. Lessons build over the session, starting with the foundations and developing the learning as appropriate to the age of child.

4. Children are given opportunity to practise skills before moving on to applying them to different situations. Different situations could include word problems and puzzles/investigations. We have developed a list of generic greater depth challenges that are used within the lesson and in the marking stickers. (see appendix 3 going deeper ideas)

5. Work is marked promptly, and children are offered the opportunity to reflect on their own learning.

6. Questioning is a high priority in maths mastery lessons – adults use a variety of questioning to engage all learners of every ability including "explain" questions for the more able.

All teachers plan daily mathematics lessons following this structure using an agreed planning format. Planning is done on a weekly basis. (see appendix 4- planning format)

Planning includes learning objectives, brief text on what the teacher will be modelling, key vocabulary, at least one key open question and differentiated activities.

Where possible teachers pre-empt 'big' misconceptions that many children will have – eg a rectangle/oblong has four lines of symmetry (diagonals). Teachers also plan which vocabulary they will use and which models, images and concrete resources they will use to aid learning.

Effective plenaries are only part-planned as misconceptions only arise during the teaching of the lesson. However, all plenaries refer to the learning outcome and the success criteria in a meaningful way, allowing the children some time for self-assessment.

We ensure that across each term children are given a range of experiences in mathematics lessons e.g. practical activities and mathematical games, group problem solving activities, individual, group and whole class discussion activities, open and closed tasks.

We ensure that children can use a range of methods to calculate and have the ability to check whether their chosen methods are appropriate, reliable and efficient.

The 'Calculation Policy' is used throughout the school to ensure the continuing, and gradual, development of number skills.

Differentiation

We believe in enabling all our children, no matter their background or ability, to achieve their potential. We believe in allowing each and every child to have access to the learning for their age: supporting those who need extra help and further developing those who are ready to show their understanding in greater depth. As such, differentiation plays an important role in our daily maths lessons and work carried out beyond the maths lesson. At St. Paulinus, we employ some of the following methods of differentiation to help our children master maths concepts taught.

Differentiation of tasks is done in various ways:

- Open ended questioning and activities which allow more able children to offer more sophisticated mathematical responses
- Stepped Activities which can be accessed at different steps, supporting and challenging all
- Recording e.g. allowing some children to give verbal responses and photographing their learning
- Resourcing eg. Use of cubes, 100 squares, number lines, mirrors to support some children
- Grouping according to ability so that the groups can be given different tasks when appropriate. Activities are based on the same theme.

Part of independent work often involves some focused, targeted group work from the teacher. However groupings are 'fluid and flexible' based on the children's performance in a previous lesson or the beginning of that particular lesson.

Where Teaching Assistants are available, they are fully briefed before the lesson and use the same teaching methods modelled by the teacher to support individuals or groups. In some cases they may also model concepts to the class allowing the teacher to assess particular groups of children in more detail and identify their next steps.

Children with Special Educational Needs:

At St Paulinus we have a number of children who are working well below the year group expectations. We believe in the children being exposed to the learning for their year group but then it being differentiated down to the stage they are working on. In these cases the children are taught the skills they need to master their individual targets. A class teacher makes the judgement on how to best support the children in their class along with the support of the SENDCo as needed.

This may be evident in a variety of ways:

- Planning shows a different task for a group/ individual
- Different (but linked) key learning stickers
- Different task in books
- Different marking sticker
- Adult support in class
- Use of equipment to provide concrete materials to support access to the learning.

- Specific intervention work.
- Creating a focus group that regularly works with an adult.

More Able:

At St. Paulinus, we believe in challenging our more able, and enabling them to make good progress by helping them to show a greater depth of understanding. Teachers know who their more able children are through knowing their class and from Pupil Progress reviews and so even when sat in mixed ability groups, they can be a focus.

This may take the form of:

- Allow children to move on quickly to the pre-prepared challenge if they show a secure grasp and understanding of a key skill.
- Providing a daily challenge that is beyond solving word problems and allows children to apply their knowledge in a variety of situations.
- Pre-planning a greater depth challenge marking sticker.
- Using a variety of sources, including rising stars, NRICH, NCETM mastering maths booklets, to provide them with a rich and diverse number of problems to solve/ investigate.
- Always asking children to explain why, or how they know.
- Creating a focus group of more able children during the independent task.

Evidence of challenge can be seen in the planning and in the work in books – children will either write the word challenge with the work underneath or a challenge sticker could be stuck in.

Vocabulary and precision of language

Developing children's language and vocabulary is absolutely essential.

- In all lessons attention is given to whether key vocabulary has been learnt.
- Key vocabulary is listed during lessons and instantly added to as new words arise.
- Paired talk activities are used to encourage children to talk about their mathematics.
- Teachers insist that children mirror the language they hear the adults using.
- Where appropriate, children are encouraged to answer in full sentences.
- Adults mirror back alternative words for the same meaning to enrich children's range of vocabulary. E.g. Child says '3 times 5 is 15', teacher says, 'yes, the product of 3 and 5 is 15' or '3 multiplied by 5 equals 15'.
- Children are required to provide justification and reasoning for their answers. For example, 'I know the shape is a square because….'
- Teachers are required to have sound subject knowledge and understanding of the correct terminology and vocabulary and they refer to the school's glossary of maths terms if unsure. E.g. There is no such thing as a 'take away' sum (because 'sum' means 'add'). We use the terms 'calculation' or 'equation'.

Working walls

All classrooms have a clear working wall where models, vocabulary and visual images used in previous lessons are displayed and referred to. Children use these to support their learning.

- Concrete, Abstract and Pictorial examples are displayed according to the area of Maths covered that week along with problem solving questions relating to that area of Mathematics.
- Every classroom has a maths area that can be accessed at any time where children can solve problems linked to the four operations, fluency and statistics
- Communal displays- 'We are thinking mathematically' are interactive displays that include both calculation and problem solving questions.

Effective marking

- Aims to be encouraging and supportive.
- Using a marking sticker that includes practise/ going deeper/ support which is highlighted by teacher.
- Is often done while a task is being carried out through discussion between child and teacher.
- When support is highlighted on the marking sticker for a small number of children who have found the lesson challenging, a same day intervention is created where the children can work as a group with an adult to re-do/ re-practise the skills taught in the lesson.
- Where a child is falling significantly behind or has a significant gap – class teachers create a more formal/ regular intervention for that child to complete in order to "plug the gap" and allow them to access the daily lessons with more ease- e.g. Rapid Maths interventions.

Assessment

Ongoing Assessment for Learning

The learning objective is referred to during the lesson to gauge progress and at the end of the lesson to assess progress. Children assess themselves against this using a ▯ system which they colour in red, orange and green identifying what they have done well and how they could improve.

Teachers monitor and assess children throughout the lesson, and through marking their work, identifying any misconceptions which need to be addressed.

Record Keeping

Teachers use their own short assessment tasks. At the beginning of a unit children complete a pre-assessment and at the end a post- assessment. This can show progress within the unit. The work set, combined with a scrutiny of children's recorded work over the previous weeks, helps to review how well children have taken in the topics taught and identifies any remaining misconceptions. Termly assessments using 'Rising Stars' tests are also used to assess using and applying skills, inform planning and identify learning gaps. Records of objectives achieved are also recorded on the school O'Track system.

Formal Assessment

Teachers grade all pupils towards each half term and at the end of the Summer Term using end of Key Stage SATs/ year group tests and Optional SATs/ year group tests. The results of formal assessments are recorded on individual pupil trackers on O'Track.

Reporting to Parents

Parents are given the opportunity to discuss their child's progress on two official occasions but understand that the schools' 'open door' policy enables them to address concerns throughout the year.

Reports are completed before the end of the summer term.

Teachers use the information gathered from their assessments to help them comment on individual children's progress.

Monitoring and Evaluation

The mathematics subject leader is given opportunities to work alongside other teachers. This time is used to monitor and evaluate the quality and standards of mathematics throughout the school and enables the subject leader to support teachers in their own classrooms.

Opportunities for teachers to review the mathematics policy are given on a regular basis during staff meetings.

Role of the Subject Leader

- To take the lead in policy development
- To support colleagues e.g. leading staff CPD, planning support, team teaching
- To monitor and be accountable for progress in Mathematics – this may be done through scrutiny of work, observations and analysis of formal assessment data
- To take responsibility for the choice, purchase and organisation of central resources for Mathematics, in consultation with colleagues
- To liaise with other members of staff to form a coherent and progressive scheme of work which ensures both experience of, and capability in, Mathematics
- To be familiar with current thinking concerning the teaching of Mathematics, and to disseminate information to colleagues

The subject leader will report on mathematics to the Headteacher and will liaise with the named link governors.

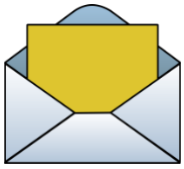
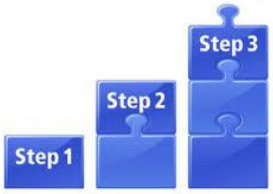
See also: Calculation Policy (separate document)

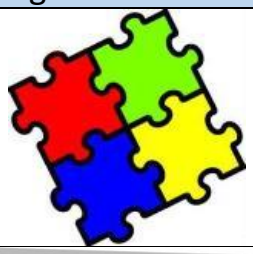
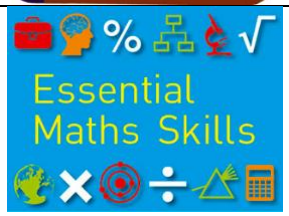
Policy Monitoring and Review

This policy will be reviewed following the 3-year Policy Review Cycle of the school or when there are significant changes to the curriculum that warrant it. It may also be reviewed earlier should it no longer comply with school practice or the legal requirements of schools.

APPENDIX 1

Maths Mastery: Whole school 'Do it now' activities

What?	How?	Why?	Image
True and false	Children are given statements and asked to label them as 'always true', 'sometimes true' and 'never true'.	Displays information in a different way and deepens understanding by encouraging children to think about why the statements are true or false.	
Challenge boxes	Children are presented with equations with missing numbers or operations, replaced by a 'challenge box'. The challenges may get progressively more difficult.	Presents children with an individual challenge and allows children to demonstrate their learning.	
Envelopes/Wallets	Each child or group is given or asked to find an envelope/wallet containing, for example, pictures or statements. The task may be to put these in order or discuss as a group.	It is a practical task and encourages discussion and teamwork.	
Misconceptions	Children are given statements/problems that are incorrect. They must spot the error(s), correct and justify their answers .	Deepens understanding by encouraging children to think about why the statements/ problems are incorrect. (Mistakes may be linked to those found in children own work).	
Odd one out	Children are given different a set of equations, pictures or symbols and have to spot which one is the odd one out and explain their thinking.	Encourages discussion and deepens understanding by encouraging children to think about why one is the odd one out.	
Follow the steps	Children are given a number and are encouraged to follow the 'steps' (including a range of operations) to get their final answer.	Practises skills including the 4 operations and allows children to demonstrate their learning.	
Countdown	Children are given a list of problems or questions to answer in a timed manner.	Prompts rapid recall of key facts and keeps all children active during the activity.	

What?	How?	Why?	Image
Match it	Children work together to match statements or number facts.	Promotes discussion around why the statements need to matched giving children the chance to work in a team and reason with each other.	
Be the teacher	Children work in role as teacher and pupil. They ask their partner questions and check if they are right. Then swap over.	Promotes discussion and opportunities to explain. Also allows children to develop their own checking skills and ability to spot mistakes.	
Keeping skills sharp	Children practise key skills either from answering questions from the board or from a sheet. Involves the 4 operations and other key skills such as tables recall.	Keeps key skills fresh allowing children to be able to apply them in different contexts throughout the lesson. Good for UKS2 in particular to keep them practising the written methods for the 4 operations.	

APPENDIX 2

Star Words List

Mastery - We think of a mastery of a particular part of Mathematics as the point when you can apply it to a totally new problem in an unfamiliar situation – it's not likely to happen at the end of a lesson or even a unit of work, but something we're all constantly striving to achieve **The Approach**.

The Approach	
What we say	**What we mean**
C+P+A	In order to develop conceptual understanding of an idea or a procedure or a technique, firstly we should **C**oncrete materials to represent it. When this is understood we should then move on to a **P**ictorial representation before we eventually extend our understanding to include **A**bstract forms. Most importantly, representing ideas in different forms helps to deepen our understanding and so enable us to apply ideas and skills in different contexts; it's not about C then P then A, but more C leading to C + P leading to C + P + A.
Depth	We're constantly striving to ensure pupils have a real understanding of the mathematics they are learning. Rather than just a superficial ability to memorise or repeat sets of procedures (i.e. just "do" the maths), we aim for pupils to engage at a deep level, understanding and explaining what they're doing and how/why it works. They recognise a concept in an unfamiliar context.
Fluency	Fluency is being flexible in the fundamentals of mathematics, having a deep conceptual understanding and being able to recall and apply knowledge rapidly and accurately
Growth Mindset	People with a growth mindset believe that "ability" to so something can be increased through effort; people with a fixed mindset think that "ability" is innate and cannot be change. We firmly believe that everyone can improve at mathematics – there's no "maths gene" and sustained effort is the path the success. People believe that understanding usually requires effort, resilience and curiosity.
Key Constructs	The "big ideas" in mathematics that are essential to understand to enable progress in the subject and to access other areas. These are the foci of our assessment.
Manipulatives	We often refer to the concrete materials we use in representations – such as counters, blocks, straws etc. as manipulatives; objects we can we handle, feel, move around and manipulate so we can develop our physical understanding of maths concepts as the first part of the C+P+A journey.
Problem Solving	Problem solving means applying mathematics to a variety of routine and non-routine problems including breaking down complex problems into a series of simpler steps and persevering in seeking solutions. Sometimes a problem can be in a real-life context, sometimes problems will just be

The Approach	
What we say	**What we mean**
	within mathematics itself e.g. looking at number patterns.
Reasoning	Reasoning in mathematics can be demonstrated by following a line of enquiry, making conjectures about relationships and/or generalisations. It includes developing the skills of presenting an argument and justifying a position using appropriate mathematical language and notation.

In Lessons :

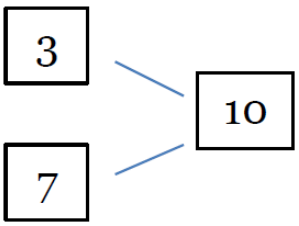
Lesson Structure	
What we say	**What we mean**
Do Now / Fluency First	A short activity at the start of a lesson that pupils can engage with, probably without any input at all from the teacher. This can be something to prepare them for the material in the coming lesson or a more general activity to practise/develop fluency or keep key skills sharp.
Talk Task / Let's Explore	Almost any task can be a "talk task". We always incorporate tasks into our lessons that provide pupils with opportunities to discuss the mathematics they are working on, so developing both their reasoning and mathematical communication.
Independent Task	An independent task is one which pupils should be able to perform independent of the teacher – not necessarily of each other as pair/group work may be useful in any part of the lesson and with any task
Plenary	A summary after a key part of learning (that might be at any point of the lesson) that can, for example, review and assess progress; draw out key points from the lesson, etc.

General	
What we say	**What we mean**
Bar Modelling	This is a way of representing a problem using pictures. It is often a very useful way of making a complex word problem more accessible to pupils. Although it is not in itself a method of solution, by "seeing" the problem in the visual form, it is them often easier for pupils to see how to approach the problem.
Concrete Manipulative	Any physical object that is used to represent a mathematical concept is a concrete manipulative e.g. counters, bead strings, fraction towers, people, straws…the possibilities are endless.
Dienes	Dienes blocks are concrete representations of numbers which are in exact proportion to each other, so they can represent all powers of tens, such as ones, tens, hundreds, thousands; hundredths, tenths, ones and tens; hundreds, thousands, ten thousands, hundred thousands; etc. They help pupils to understand the relationship between place value columns and see why we exchange e.g. one ten for ten ones.
Geoboard	A peg board used to illustrate, for example, properties of lines and shapes, counting, number, area, etc.

General	
What we say	**What we mean**
Odd One Out	From a set of items, pupils are asked to identify which one is different from the others and why. Often there can be more than one answer/reason and this is useful in helping pupils to develop their reasoning.
Same / Different Tasks	Useful in developing reasoning, pupils are asked to compare two or more objects, expressions, representations etc. and asked to identify what they have in common and how they differ .
Skip Counting	Selecting a multiple and a starting point and then counting in that multiple, for example, skip counting in fives from one would be 1, 6, 11, 16, 21, 26, 31, etc.

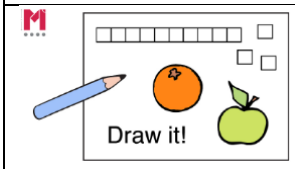
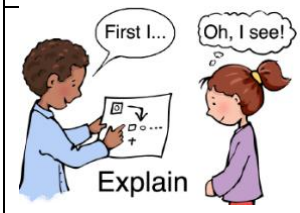
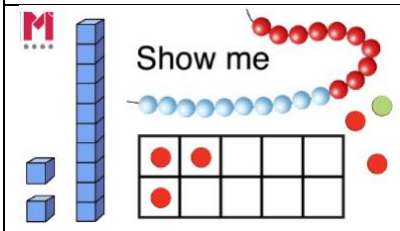
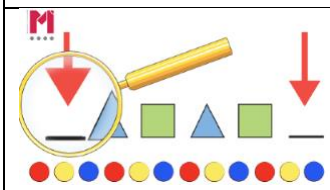
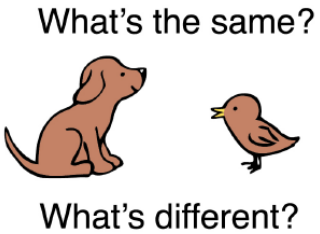
Mathematics - The following glossary is not meant to be used as a dictionary of Mathematical terms but contains some of the terms that are frequently used.

What we say	What we mean
Approximation	The number is not exact but is close, for example, it takes 57 minutes so you might say it takes approximately one hour.
Dividend	The amount that you want to divide, for example, in 12 ÷ 3 = 4, 12 is the dividend.
Divisor	The number you divide by, for example, in 12 ÷ 3 = 4, 3 is the divisor.
Equal to	We refer to quantities being “equal to” each other rather than “equals” as this emphasises the fact that equality works in both directions e.g. consider the equation “4 + 1 = 3 + 2”. Both sides of the equation are “equal to” each other, as both give the result 5.
Equation	Says that two things are equal. It will have an equal to sign, for example, 8 – 3 = 5 × 1
Equivalent	Having exactly the same value e.g. 12 ÷ 2 = 4 + 2
Estimation	Make an approximate calculation often based on rounding.
Expression	Numbers, symbols and operators grouped together but without the equal to sign, for example, 5 × 3 or 6 - 1
Factor	A number, that when multiplied with other factor(s), makes a given number, for example, 2 and 3 are factors of 6 because 2 × 3 = 6
Integer	A positive or negative whole number or zero
More / fewer and greater / less (Link to more / fewer document when on toolkit)	More and fewer are used when we talk about discrete data, i.e. objects that can be counted using positive whole numbers. Greater and less are used when we talk about continuous data, i.e. data that can take any value within a range.
Multiple	The result of multiplying a number by an integer, for example, 12 is a multiple of 3 and 4 because 3 × 4 = 12

What we say	What we mean
Number bond	A way of representing a number using a part-part whole model, for example, if 3 and 7 are the parts then the whole is ten 
Ones	We refer to the "ones" place value column between "tens" and "tenths" as the use of the word "units" is both unnecessary and confusing; the "unit" refers to the type of measure – cm, kg etc. whereas we count in "ones"
Partitioning	A way of breaking a number into at least two parts resulting in a number bond for the that number, for example, 12 is equal to ten and two.
Product	The answer you get when you multiply two numbers.
Proof	A formal mathematical argument that shows why a statement is always true.
Quotient	The result after you divide the dividend by the divisor, for example in 12 ÷ 3 = 4, 4 is the quotient.
Rounding	A method used to approximate a number to the nearest appropriate power of ten, for example, 11.74: 11.74 = 11.7 rounded one decimal place 11.74 = 12 rounded to the nearest whole number 11.74 = 10 rounded to the nearest multiple of ten
Sum	The result of adding two or more numbers. This is often used mistakenly to mean any calculations, but sum should only be used for additions.
Vinculum	The horizontal line used to separate the numerator and denominator in a fraction.

APPENDIX 3

Maths Mastery Going Deeper Ideas

Clipart	What is it?	Example
	This is the answer, what's the question?	The answer is 42 penguins. What could the question be?
	What's wrong with this? Children have a question where someone has made a mistake – they need to find it and say how they went wrong	Joe says that 15 + 20 = 17 Is he right? Can you spot his mistake and teach him how to solve this type of question?
	Draw it! Draw a picture to explain or demonstrate what you have worked out	Draw a picture to show that 32 divided by 3 has 2 left over.
	Reason it! Explain to your partner how you know an answer is correct - use the star words in your explanation.	George thinks that the area of this rectangle and the area of this rectangle is the same. Is he right? How do you know?
	Show me! Convince me that you are right using pictures	Using the digits 0 – 9 . What is the largest 5 digit digit number you can make where the digit sum is 35? What is the smallest? You can only use each number once!
	Find a pattern! What comes before or next? Can you see the pattern in the numbers? Can you see a pattern in the answers.	Start at 0. Keep adding 9 until you reach 99. Can you see a pattern in the numbers?
	What is the same and what is different?	Have a look at the rectangles below. Can you spot what is the same about them and what is different? (have 2 rectangles – with the same are but different perimeters)

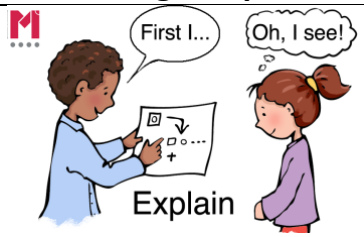
Clipart	What is it?	Example
	Have you found all the possibilities? How many different possibilities can you find? Have you found them all? How do you know?	How many different ways can you make 10 using +?
	Tell a story Make up a real life maths problem using this equation or these shapes. (this is a good one to see if they can use the star words correctly)	Make up a real life story to go with this number sentence: 34 + 8 = Solve it.
	Which is the odd one out and why? Is there another possibility? Explain why that is the odd one out.	
	What's missing?	
	Solve the puzzle! Find the solution to the puzzle using the skills you have learnt.	
	Prove it! Can you prove that?	
	Convince me! Convince me you are right. Convince me I am wrong. Convince me that Joe is right.	

APPENDIX 4

Year __ Maths planning Term__ Week __									
Class or group targets Autumn Term									
									
	Key Learning	Star words:	Do now:	New learning	Talk task (paired learning)	Develop learning	Independent task:	Plenary	Marking sticker
Monday									

APPENDIX 5

Marking Sticker Format

Practise	Going Deeper	Support
Answer:		Misconception : Intervention Notes :

Key Learning Format

Key Learning :