Medium Term Plan Digital Learners
Using the K,S,U you have learnt in this unit, how can you use decomposition to achieve your goal?

Aspect of Study

Computer Science

Transferable Knowledge:

Breaking a problem into smaller sections, identifying key components in order to solve task

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

During this area of study students should be taught to:

Decompose programs into smaller parts
Use logical reasoning to detect and correct errors in algorithms and programs

This unit should build on previous experience in programming/coding in Year 3. Pupils have used 2Code in Year 3 and may have experience of Bee-Bots, Scratch and Scratch jnr (app on iPad). It is important to establish prior experience and knowledge before beginning the work and if needed then revisit earlier years content.
Pupils should know:
What an algorithm is
That programs are precise instructions that a device or computer follows
If a program does not work then we use debugging to find out what is wrong and fix it - (run through the program to see where the error is)

Digital
Learners

Engineers

Global
Enquirers

Designers

ASHINGTON
LEARNING
PARTNERSHIP

Healthy
Citizens

Sustainability
Ambassadors

Cultural
Explorers

Careers

Medium Term Plan Digital Learners
Using the K,S,U you have learnt in this unit, how can you use decomposition to achieve your goal?

…continued

Aspect of Study

Computer Science

Transferable Knowledge:

Breaking a problem into smaller sections, identifying key components in order to solve task

Pupils will be using Logo on Purple Mash which is a textual programming language. It is similar to Bee-bots in that they can program the "Turtle" to move forward, backward, turn right, turn left. However; where bee-bots automatically turn 90° on Logo they need to the angle that it needs to turn.

The work will be delivered through short demo by teacher at beginning covering aspects i.e. angles, set pen colour, etc then the pupils will be working through a series of challenges set as 2Do. It is recommended that no more than 2 challenges are set per week, so that each lesson combines, element of teacher modelling new learning, then pupils use existing and new learning to work towards completing challenges. **The 2Logo user guide is on the drive in the Year4 folder, page 16 onwards has information about each challenge and possible solutions.** There is a video to play at the beginning which is located in the Logo section on teachers page. The challenges cover the following skills and knowledge using Logo:

1. Using fd rt lt (forward right and left)
2. Using different angles
3. Using setpc (set pen colour) -
4. Developing understanding of areas covered so far
5. Further extending coding skills, combining a range of text language
6. Introducing repeat code
7. Using pu/pd (pen up pen down) and procedures in code
8. Procedures
9. - 12) further extending skills and applying these in more complex code.

Substantive Knowledge (subject-specific)

Able to explain what an algorithm is (previous learning)
Programs require precise instructions
Debugging means to work through a program to find the error

Disciplinary Knowledge?

Able to transfer from and to Maths understanding of angles, shapes.
Apply decomposition to any given problem in any subject area to solve a task.

Real World Links:

Problem solving
Writing programs or giving precise instructions

Opportunity for Skills for Life - linked to progression framework.

Influential Figures

OPAL links

Links to opportunities linked to OPAL

Curriculum Coverage

(Previous, expected and what follows on)

Prior National Curriculum Coverage	National Curriculum Coverage	Subsequent National Curriculum Coverage
Year 2: Understand what algorithms are and how they are implemented on digital devices Understand tht programs execute by following precise instructions Create and debug simple programs Use logical reasoning to predict the behavior of simple programs **Year 3:** Design programs that simulate virtual events Use logical reasoning to detect and correct errors in algorithms	Decompose programs into smaller parts Design, write and debug programs	**Year 5:** Design, write and debug programs that follow a sequence of instructions, including sequences and repetition.

Key vocabulary	Concepts	Language skills
program decomposition debug logic precise	Problems can be broken down into smaller sections which make it easier to solve. This can be applied in all curriculum areas and is a skill that is required on a day to day basis, in the home, school and workplace.	

Sequence of Teaching and Learning

	National Curriculum LO/EQ?	Lesson ideas/differentiation
1	**N.C: Decompose programs into smaller parts** **L.I.** Review previous knowledge and understanding and explore a new program. (During this lesson, without mentioning decomposition, pupils will already be doing this when they are thinking about what they want to create. The skill to develop in future lessons is that they recognise that they are doing this and can develop it even further by really considering what they want to achieve and identifying each step – using a whiteboard to write down the steps required before typing into the program.	Share learning intentions with class What is an algorithm - pupils could write their own algorithm for cleaning teeth, getting up in the morning etc, making a cup of tea. Remind pupils that an algorithm is a precise set of instructions. Teacher to address misconceptions – identify pupils who need to revisit algorithms – precise instructions. Introduction to Logo (Purple Mash) Use AB tutor to demonstrate Logo - Discuss layout and tools with pupils, show how to apply grid, change turtle and reset position of turtle. Demonstrate how to write a program to make the turtle draw a square. (e.g. fd 5 rt 90 fd 5 rt 90 fd 5 rt 90 fd 5) – **Pupils are then to explore what then to independently explore the program. Teacher to monitor use of angles or if pupils are just using fd & bk** **Stop class -** Logo uses left and right to change the position of the turtle but it must know what angle it has to turn Pupils are to create squares, rectangles and try to write their own initial. It would be beneficial for pupils to have whiteboard, pen and eraser so that they can draft out what they think they need to use before starting.
2	**N.C. Decompose programs into smaller parts** **Use logical reasoning to detect and correct errors in algorithms** L.I. Using decomposition, program the turtle to complete a task	*Memory recall – write down the instructions that you can use in Logo (forward, back, left, right) What instruction would need to be used if you wanted to turn the turtle a quarter turn to the right?* Share learning intentions with class – Children should write their Logo in the text area at the bottom. It is essential that they build up their Logo code progressively so that their solution displays the full answer rather than typing one step, deleting it and then typing the next. This means that they will not have to start from the beginning every time they make a mistake.

Sequence of Teaching and Learning

	National Curriculum LO/EQ?	Lesson ideas/differentiation
2	**…continued** **N.C. Decompose programs into smaller parts** **Use logical reasoning to detect and correct errors in algorithms** L.I. Using decomposition, program the turtle to complete a task	**First challenge - Maze** – teacher to demonstrate on AB tutor. Class to begin independent work – teacher to support where needed. During lesson teacher to demonstrate changing pen colour on Logo, pupils will be working to complete challenges so it is expected that pupils may be at different stages by the end of this lesson. During lesson teacher will need to decide whether there is scope to demonstrate Challenge 2 – this requires pupils to use different angles to negotiate the river. Recommend that pupils use small steps to navigate rather than trying to write the code in one long section. Thus demonstrating decomposition and being able to identify any errors (debugging) in each section.

Sequence of Teaching and Learning

	National Curriculum LO/EQ?	Lesson ideas/differentiation
3	**N.C. Decompose programs into smaller parts** **Use logical reasoning to detect and correct errors in algorithms** L.I. Using decomposition, program the turtle to complete a task	*Memory recall – could set an angle question similar to last week, or how penup is used or link to real world situations i.e. where might this type of program be used – to design patterns on wallpaper, signs etc. Used in engineering to draw repeated designs.* Share learning intention Challenge 3 – Teacher should use AB tutor to demonstrate how to change pen colour and use pen up pen down. Challenge 4 (pupils expected to complete in lesson) Pupils to continue with challenges – encourage use of whiteboards as evidence of decomposition, questioning : what do you think will happen if you use that code? How could you make the turtle move in this direction? Why is it not working? What is it in the program that is stopping the turtle from moving in the right direction?
4	**N.C. Decompose programs into smaller parts** **Use logical reasoning to detect and correct errors in algorithms** L.I. Using decomposition, program the turtle to complete a task	*Memory recall – give examples of how you could use decomposition in Maths, Science and English.* Share learning intention Pupils to continue with challenges – independently – again teachers should observe and note evidence of use of logical thinking and decomposition. Differentiation is evident in the challenges that pupils are able to attempt, higher ability pupils will be able to work towards Challenge 9 or even further. **Some pupils may complete these challenges at home. If this is the case then you could use them as digital leaders supporting other pupils within the class. However; ensure that they are explaining how the program works and not simply doing the work for the pupil.**