Unit 2D Routes: controlling a floor turtle

YEAR 2

ABOUT THE UNIT

In this unit children learn how to create, test, modify and store instructions to control the movements of a floor turtle. They learn to programme the floor turtle to move around an area by using single instructions, a sequence of instructions and repeated sequences.

The unit will develop children's understanding of programmed devices used outside school.

Children should be able to apply what they have learnt in this unit when: creating and using maps in geography; working with shape and space in mathematics; and using devices in design and technology.

WHERE THE UNIT FITS IN

This unit assumes that children:

- are familiar with maps, plans and scales
- can estimate distances
- understand quarter-, half- and full turns
- understand directional language.

TECHNICAL VOCABULARY

- floor turtle
- control devices
- instructions
- data
- commands
- program

RESOURCES

- one, or more, floor turtles which follows instructions such as forward 10, right 5
- a large map of an imaginary treasure island, marked with treasure spots
- A4 copies of the treasure map for recording instructions

EXPECTATIONS

at the end of this unit

most children will:	produce an accurate set of instructions but will need to amend them to make them correct; combine three forward movements into one by adding units together; accurately predict the results of a set of instructions
some children will not have made so much progress and will:	produce a set of instructions but make mistakes with directions and distances; incorrectly predict or guess the results of a set of instructions
some children will have progressed further and will:	produce an accurate set of instructions with little need for amendment; incorporate instructions that involve difficult angles other than 90 and 180 degrees; accurately predict results of a set of instructions by identifying patterns

QCA

LEARNING OBJECTIVES	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES	POINTS TO NOTE
SETTING THE SCENE			
CHILDREN SHOULD LEARN		CHILDREN	
• **key idea:** that control devices must be programmed	◆ Pre-program the floor turtle to follow a path through a set of obstacles placed on the classroom floor. Demonstrate the floor turtle following the route. Ask the class how it 'knows' where to go. Explain that it is following instructions; this could be demonstrated by moving an obstacle into its path. Discuss with the class other devices which follow instructions, *eg washing machines*. Explain to the class that they will learn how to program the floor turtle to follow instructions.	• recognise control devices • recognise that control devices follow instructions	Children should understand that the floor turtle is not alive, can only do what it is instructed to do and will follow instructions exactly.
SHORT FOCUSED TASKS			
• **key idea:** that control devices follow instructions which can contain numerical data • **technique:** to use the appropriate keys to make the floor turtle go forward, backward, left and right by using instructions, such as forward 5, right 1	◆ Discuss the basic instructions followed by the floor turtle and show the children how to enter these instructions. They will need to be shown how to clear the memory and how to enter instructions one at a time. ◆ Place objects in front of, behind and to the left and right of the floor turtle. Objects should be placed so that children only have to give two or three instructions for the floor turtle to get to them. Explain that the floor turtle has no eyes and that it will need to be told how many paces to travel. Ask the children to predict the instruction which will make the floor turtle move to each object. Encourage them to use units bigger than one or two and limit the number of instructions required. Ask the children to take turns to enter instructions and check their predictions.	• enter instructions to control the floor turtle • predict the results of different instructions • check their predictions by programming the floor turtle	Place objects in positions that do not require difficult angles as this may confuse children. Program the floor turtle to make 90 degree turns only. Discuss how two separate instructions can produce the same result, *eg forward 2, forward 3 would get the same result as forward 5*. Children will need to develop an idea of scale of movement. Children should be encouraged to discuss how control technology can be used and to think about devices which follow instructions, *eg remote-sensing devices such as the Mars rover, bomb disposal devices, medical equipment*. Children could look on the Internet for pictures produced by remote-sensing devices.
• **key idea:** that instructions can be sequenced for more complicated tasks • **technique:** to enter a sequence of instructions	◆ Demonstrate how to enter sequences of instructions. Show the class some sequences which draw shapes, *eg forward 10, right 1, forward 5, right 1, forward 5, right 1, forward 5 draws a letter 'P'*. Divide the class into small groups. Show them a sequence of instructions and ask them to draw the path they think the floor turtle will follow. Ask them to test their predictions by programming the floor turtle.	• predict the result of a sequence of instructions • check their predictions by programming the floor turtle	Children could be given different sequences that produce more or less complicated shapes. Children may also use the recording conventions adopted in Unit 1F. Note that '1' represents a 90 degree turn.
• **key idea:** that instructions can be repeated • **key idea:** that devices that carry out repeated actions follow stored instructions, *eg washing machines* • **technique:** to use the repeat key to produce symmetrical shapes	◆ Describe the devices that repeat instructions, *eg photocopiers and robots*. Discuss how devices are programmed to repeat instructions. Show the children two or three sequences of instructions that make the floor turtle move forward and backward or in a square or 'staircase' movement. Write down the instructions and discuss which instructions are repeated. Show the children how the repeat button can be used to make the floor turtle repeat movements. Give the children a set of three repeat instructions to test with the floor turtle.	• recognise that instructions can be repeated • programme the floor furtle to repeat instructions	Children do not need to write their own repeat sequences at this stage but should be aware that it is possible. However, children who find the activity easy could try producing their own repeat sequences.
INTEGRATED TASK			
• to develop and record sequences of instructions to control the floor turtle, and predict and test results	◆ Tell the children a short story about searching for hidden treasure, using a treasure map and written instructions, such as a pirate might leave. Explain to the class that they will be using the techniques they have learnt in this unit to program the floor turtle to go to parts of an imaginary island to find hidden treasure. Ask the class to recall what they have learnt so far. Give them copies of the map with locations marked on it so that they can see where the turtle might go. ◆ Divide the class into groups and give each group a 'secret' place to hide their treasure. Ask each group to record a sequence of instructions, on an A4 recording sheet, to guide the floor turtle to their treasure; instructions should begin at the 'landing bay' of the imaginary island and end at the treasure spot. They should use a common recording method such as 'F' or a red arrow for forward, and include the turtle units. They should still use quarter and half turns at this stage. Ask them to test their sequences and amend them if necessary. ◆ Ask groups to exchange instructions. Get each group to take turns programming the floor turtle while the rest of the class tries to predict what route it will take.	• develop and record sequences of instructions • make predictions and test them	The map could be simulated by placing labelled items at each of the locations on an area of floor. The turtle could be 'dressed' as a pirate for this activity.

Ref: QCA/98/211

© Qualifications and Curriculum Authority (QCA) 1998