Computational Logic

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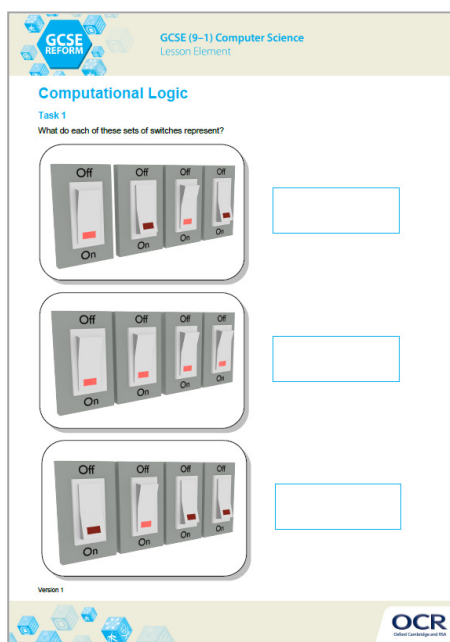
Instructions and answers for teachers

These instructions should accompany the OCR resource 'Computational Logic' activity which supports OCR GCSE (9 –1) Computer Science

The Activity:

This resource comprises of 3 tasks.

The activities introduce students to binary numbers and how to convert them into decimal. They learn about Boolean logic by filling in the gaps in a truth table.

This activity offers an opportunity for English skills development.

This activity offers an opportunity for maths skills development.

Associated materials:

'Computational Logic' Lesson Element learner activity sheet.

Suggested timings:

Task 1: 10 minutes   **Task 2:** 15 minutes   **Task 3:** 10 minutes

PROVISIONAL

This resource is an exemplar of the types of materials that will be provided to assist in the teaching of the new qualifications being developed for first teaching in 2016. It can be used to teach existing qualifications but may be updated in the future to reflect changes in the new qualifications. Please check the OCR website for updates and additional resources being released. We would welcome your feedback so please get in touch.

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Introduction

The main idea of this topic is to support the concept of how data is stored inside a computer – numbers or letters or command instructions are stored with zeros and ones. Computer scientists have developed patterns that make it possible to encode any information we could possibly need with just zeros and ones. This further flows from the physical structure of computers which need "gates" built of semiconductor materials to route electric signals around its circuits. When the electrical current moving down the wire exceeds a certain "threshold" value, and the gate is open, we get an "on" signal, also known as "binary 1" or "True".

While when the gate is closed, we get "off" or "binary zero" or "False". These are the building blocks of all data stored by computers. At the same time logic is a set of rules to evaluate expressions with either True or False outcome, where expressions are evaluated in sequence forming "logical chains". To illustrate this connection between the logical and the physical, we can use the pictures of light switches to represent zeros and ones.

Task 1

Using the enclosed images of light switches, by copying and pasting them in binary patterns, teacher prepares binary numbers, starting with nibbles and progressing to whole bytes,
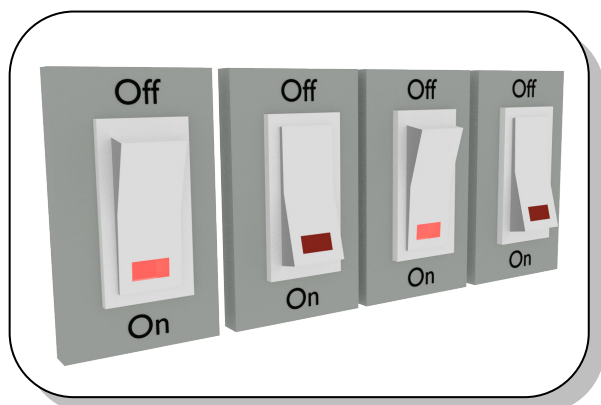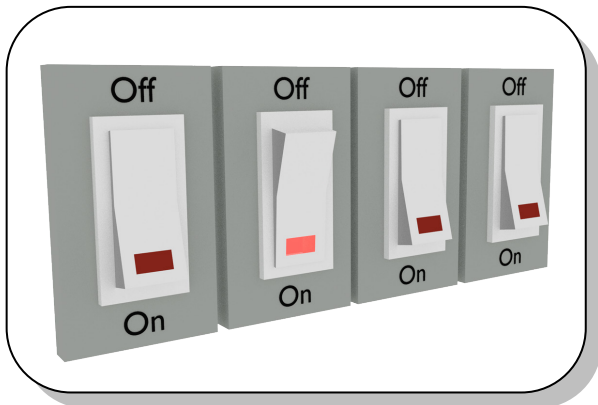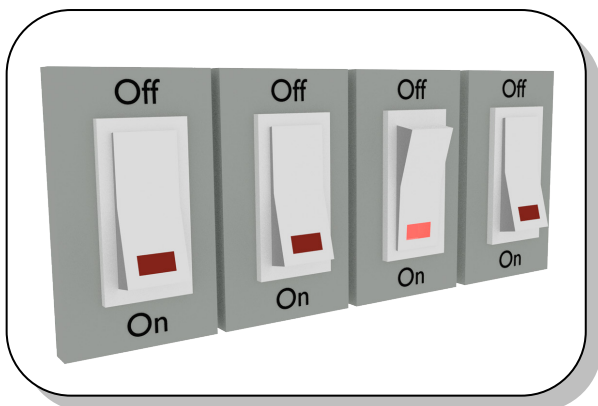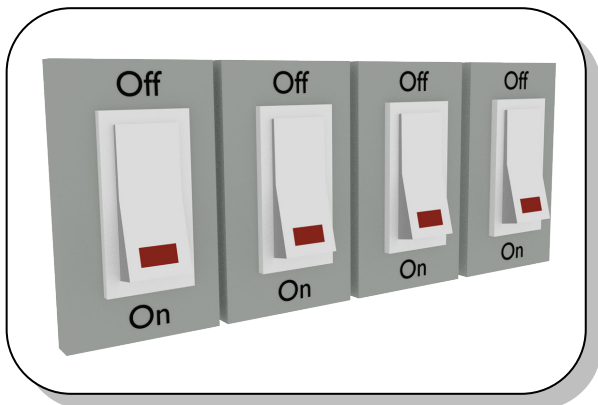

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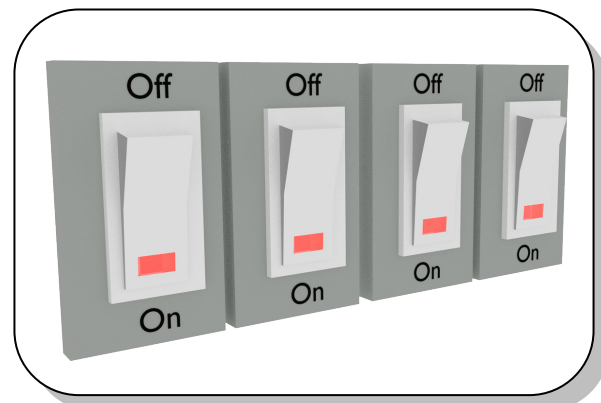
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Version 1

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The students are presented with cards showing switches either on/off to translate into numbers.

Extension task to this is to use the ASCII table to decipher a message which will contain binary codes for letters.

Give the learners a few short phrases to code to get them started. Then pupils draw their own messages (this could be set as homework) and exchange them to decode each other's messages.

Task 2

Alternative task: "binary bingo". A teacher would create a set of bingo cards/matrices in a typical bingo fashion but all numbers are in binary. The matrices are given to pupils. The caller calls out numbers in decimal and pupils have to see if they have this number and then cross it off. The first person to cross off all numbers wins!

Binary Bingo

101	10000	101000	111011	1000110
1100	11110	100001	111001	1000101
1001	11101	FREE	111011	1000100
111	11101	101001	110011	111110
100	11101	11111	110111	1001001

Task 3

Truth tables completion: fill in the blanks in incomplete truth tables.

Answers:

1	TRUE	AND	FALSE	FALSE
2	TRUE	OR	TRUE	TRUE
3	TRUE	OR	FALSE	TRUE
4	TRUE	AND	TRUE	TRUE
5		NOT	TRUE	FALSE
6	(TRUE AND FALSE)	OR	TRUE	TRUE
7	(TRUE AND FALSE)	AND	(TRUE OR TRUE)	FALSE

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