## MOTIVATION



Encoding and decoding messages is at the heart of communication. Humans encode thoughts using language. For example, we might give a friend a set of verbal instructions. When our friend hears "Bring me the book on my shelf," they decode the message and understand that they are supposed to go to our shelf, pick up the book we want, and bring it to us.

One way of looking at programming is to see it as a way of communicating human instructions to computers, which then carry out the tasks we want them to perform. The main 'alphabet' of computers is *binary*, which uses the numbers 0 and 1. We represent these numbers using the presence or absence of an electric signal.

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## OBJECTIVES

The student will be able to:

* Encode and decode messages using patterns
* Use binary as one method of representing data
* Understand the importance of codes in computer science

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## SECTIONS AND RESOURCES

**Encoding and Decoding**

Presentation: Encoding and Decoding ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_and_Decoding_Data_Power_Point.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_and_Decoding_Data_Power_Point.pdf) )

Day 1 Lesson Plan: Encoding and Decoding Data ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/EncodingAndDecodingData.docx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_And_Decoding_Data_PDF.pdf) )

Day 1 Activity: Encoding and Decoding Messages ([Source](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_and_Decoding_Messages.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_and_Decoding_Messages.pdf))

Day 1 Activity Solutions ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/encoding_and_decoding_solutions.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/encoding_and_decoding_solutions_PDF.pdf) )

Day 2 Lesson Plan: Encoding and Decoding Data ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/EncodingAndDecodingData2.docx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_And_Decoding_Data_2.pdf) )

Day 2 Activity: Make Your Own Code ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_and_Decoding_Activity.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Encoding_and_Decoding_Activity.pdf) )

**Data Representation with Binary**

Lesson Plan (3 days): ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/DataRepresentationWithBinary.docx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Data_Representation_with_Binary_Lesson_Plan.pdf) )

Day 1: Binary Numbers Activity ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersCountTheDots.pdf) )

Day 1: Binary Cards for the Activity ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersCountTheDotsCards.pdf) )

Day 1: Binary Lesson ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersIntroduction.pdf) )

Day 1: Worksheet 1 (Binary Numbers) ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersCountingWorksheet.pdf) )

Day 1: Worksheet 2 (Working with Binary) ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersWorkingWithBinaryWorksheet.pdf) )

Day 2: Worksheet 3 (Sending Secret Messages) ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersSecretMessagesWorksheet.pdf) )

Day 2: Worksheet 4 (Email and Modems) ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersModemWorksheet.pdf) )

Day 3: Worksheet 5 (Counting Higher than 31) ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersCountingHigher31Worksheet.pdf) )

Day 3: Worksheet 6 (More on Binary Numbers) ( [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/BinaryNumbersExtraWorksheet.pdf) )

**Data Representation with LEGO Blocks**

Lesson Plan (2 days): ([Source](http://www.muddx.com/c4x/HMC/MyCS/asset/LegoDataRepresentation.docx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/Lego_Lesson_Plan.pdf))

Day 1 Activity: Encoding LEGO Instructions ([Source](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1UnderstandingEncodingandDecoding.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1UnderstandingEncodingandDecoding.pdf))

Day 1 Activity Solutions ([Source](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1UnderstandingEncodingandDecodingSOLUTIONS.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1UnderstandingEncodingandDecodingSOLUTIONS.pptx))

Day 1 BONUS Activity: Additional LEGO Encoding Practice ([Source](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1AdditionalPractice.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1AdditionalPractice.pdf))

Day 1 BONUS Activity Solutions ([Source](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1AdditionalPracticeSOLUTIONS.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/LEGOEncodingDay1AdditionalPracticeSOLUTIONS.pdf))

Day 2 Worksheet: Secret Fortress Construction Challenge ( [Source](http://www.muddx.com/c4x/HMC/MyCS/asset/Secret_Fortress_Construction_Challenge.pptx) / [PDF](http://www.muddx.com/c4x/HMC/MyCS/asset/SECRET_FORTRESS_CONSTRUCTION_CHALLENGE.pdf) )