# Unit 09: Binary Numbers

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 1**
Length: **1 Week**
Status: **Published**

## Brief Summary of Unit

Students will explore and learn about binary numbers and how they are used to represent data.

## Standards

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| MA.N-Q.A.1 | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. |
| MA.N-Q.A.2 | Define appropriate quantities for the purpose of descriptive modeling. |
| LA.RI.11-12.4 | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). |
| LA.RI.11-12.10b | By the end of grade 12, read and comprehend literary nonfiction at grade level text-complexity or above. |
| SCI.HS-ESS3-2 | Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. |
| SCI.HS-ETS1-2 | Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |
| TECH.8.1.12.A.1 | Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources. |
| TECH.8.1.12.A.2 | Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review. |
| TECH.8.1.12.D.1 | Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work. |
| TECH.8.1.12.D.3 | Compare and contrast policies on filtering and censorship both locally and globally. |
| TECH.8.2.12.A.2 | Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste. |
| TECH.8.2.12.B.4 | Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants. |
| TECH.8.2.12.C.4 | Explain and identify interdependent systems and their functions. |
| TECH.8.2.12.D.5 | Explain how material processing impacts the quality of engineered and fabricated products. |
| TECH.8.2.12.E.4 | Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements). |

## Transfer

## Essential Questions

- What is binary data?
- What is binary representation of data?

## Essential Understandings

- Binary coded decimal values are used in digital displays because they contain only 4 digit binary numbers and therefore are short.

## Students Will Know

- Binary Coded Decimal notation stores decimal digits.
- Hexadecimal values include letters A to F.
- How to convert decimal values to binary values to hex values and binary coded decimal values.
- key terms:  binary, binary coded decimal, hexadecimal, bit, byte.

## Students Will Be Skilled At

## Evidence/Performance Tasks

- demonstrate the ability to utilize the design loop as a problem solving tool.
- demonstrate understanding on written quizzes and tests about subject materials.
- develop a digital portfolio that logs student activities throughout the year. The portfolio will be graded using a rubric
- meaningfully address the essential and guiding questions of this unit of study.
- meaningfully participate in guided question and answer sessions, group and individual discussions, show an understanding of the purpose of  the unit lesson(s), and their key terms and concepts.
- problem based learning: implement an integrated circuit into an application like a timer, amplifier. The presentation will include a written report about the circuitry and components. The IC project and presentation will be evaluated using teacher and student designed rubrics.
- use unit vocabulary in written and oral communication.

## Learning Plan

- • Complete quizzes on other students' research and vocabulary.
- • Complete summative assessment by the student and teacher using a rubric specific to the problem which may include student driven goals.
- • Complete unit test.
- • Conduct formative assessment throughout the process with class discussion, student writing, practice quiz and review of student work.
- • Conduct formative assessments throughout the research problem.
- • Explore Integrated Circuit problem(s): Students or teacher will choose an application and integrated circuit to explore. Students will make the circuit and an oral and written presentation that would include schematic diagrams.
- • Pre-assessment to determine the direction of work.
- • Preview the essential questions and connect to learning throughout the unit.
- • Provide guidance and rubrics for the development of a digital portfolio.
- • Provide lecture and opportunities for discussion about the guiding questions.
- Suggested Supplemental manual and reference for experiments: • FED 101 – Fundamentals of Engineering Design, Electrical and Computer Engineering Module, Laboratory Manual and Supplementary Notes, John D. Carpinelli, Department of Electrical and Computer Engineering. NJIT. Copyright 2004, updated 2010.

## Materials

- • CAD and other software programs
- • DVDs
- • Email and e-board
- • Robotics lab equipped with MATLAB, PSpice, power supplies, logic testers, various electrical components, drill press and tools.
- • SmartBoard use for presentation and interactive lessons
- • Virtual Field Trips
- • Web sites

## Suggested Strategies for Modifications

- • additional time on task
- • alternative outcome options
- • assessment based on individual development in the area of study
- • audio tape of instruction
- • cooperative learning groups
- • handouts of notes, procedures, processes, diagrams, etc.
- • images and visual aids
- • one-to-one instruction and assistance
- • preferential seating

- reading material modified to student level
- revised techniques, use of tools and media in hands-on activity
- study partners
- testing materials appropriate to student level