



Internet of Things (IoT) at UCF



UNIVERSITY OF CENTRAL FLORIDA

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*UCF RET Site: Collaborative Multidisciplinary  
Engineering Design Experiences for Teachers*

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# Algebra 2 Standard and Honors

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Algebra 2 Spring Q3

# READ THIS FIRST

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## RET Site: Venn Diagram Logic Gates Lesson Plan

**Subject Area(s):** Mathematics

**Course(s):** Algebra 2

**Grade Level:** 8-12

**Suggested Length of Lesson:** 70 Minutes

**Lesson Summary:**

Students will discover the visual representation of the basic logic operators AND, OR, and NOT via constructing logic gate circuits and testing the various ways two switches need to be engaged in order to illuminate a lamp given each type of gate. These tasks will be developed, and experiences recorded, using the accompanying Venn Diagram Logic Gate lesson printout

**Prerequisite Knowledge:**

Basic structure of Venn diagrams and probability. This is an introductory activity to the probability unit for Algebra 2, therefore students have had prior experience with the basic concepts, though will need a refresher.

**Materials/Technology Needed**

- Computers for logic.ly website or logic gate kits
- Venn Diagram Logic Gate Lesson Handout

**Where this Fits/Lesson Dependency**

- Within the Algebra 2 probability unit

**Lesson Objective(s)/Learning Goal(s) (2-4)**

- Students will be able to represent with a Venn diagram the following logic statements
  - A and B
  - A or B
  - Exclusively A/B
  - Not A/B
- Students will be able to represent the probabilities of each logic statement given a Venn diagram.
- Students will be able to explain the basic function of a digital logic gate.
- Students will be able to correlate probability logic statements with the accompanying area of a Venn diagram

**Standard(s)/Benchmark(s) Addressed (2-4)**

- *Standards:*
  - *S-CP.1.1:* Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).

**Standards for Mathematical Practice**

- Look for and make use of structure
- Use appropriate tools strategically
- Reason abstractly and quantitatively
- Make sense of problems and persevere in solving them

**Instructional Strategies**

- Scaffolding
- Multiple representations
- Small groups
- Discovery-based learning

**Evidence of Learning (Assessment Plan)**

- Students will complete the Venn Diagram Logic Gate Assessment Tool, which will have them justify solutions, complete short answer responses, and use critical thinking to solve an open-ended logic ate full adder truth table.

**Description of Lesson Activity/Experiences**

1. The pre-assessment tool should be given before the day of instruction in order to be used to tailor the instruction for each class.
2. On the day of instruction, the Instructor will introduce logic gates, their usefulness, and how they connect to the content and real-world application (please see the logic gate video in teacher resources to familiarize with the concepts)
3. Students will work in groups of two, each with their own handout, constructing logic gates using the [www.logic.ly](http://www.logic.ly) free digital circuit website.
4. The task is self-guided with critical thinking questions.
5. Instructor should work through the first question with the logic.ly website projected to assist students in understanding the structure of the task
6. Instructor should then circulate as students work through the task, informally assessing and asking guiding questions if students become stuck.
7. The post-assessment should be given on the next day, in order for students to synthesize their knowledge and prepare.

**Recommended Assessment(s) and Steps**

- Allow students 5 minutes to take the pre- assessment
- During the lesson, informally assess while circulating and asking guiding questions to elicit responses and promote critical thinking.

**List of Materials/Resources Used**

- Computers for logic.ly website or logic gate kits
- Lesson handout
- Projector

**Engineering Connection (60-100 words/3 sentences)**

The students will work with logic gates, which are the fundamental building blocks of modern technology, and use them to understand voltage pulse activation of LEDs.

Students will problem solve solutions to logic gate problems, designing their own logic gate designs.

**Engineering Category (choose one)**

<b>X</b>	relating science and/or math concepts to engineering (primarily science & math with some engineering)
	engineering analysis or partial design (primarily engineering with some science/math)
	engineering design process (full engineering design)

**Key Words**

Digital Logic gates  
 Venn diagram  
 Probability  
 Algebra 2  
 Common Core  
 Logic statements

**Introduction/Motivation (written as if talking to students)**

If you've ever looked at your phones or computers and wondered how these magic boxes work, what the underlying fundamental structure of these infinite gateways is, it's mind-numbingly simple. These miracles start from logic gates, switches, and two numbers—zeros and ones. Every digital device begins from zeroes and ones, and today we're going to begin working with the gates that allow these zeros and ones to interact with hardware and produce the digital world we've all become so interconnected with.

**Lesson Closure (written as if talking to students)**

All right everyone, we've now had a taste of a fundamental skill used in computer science and architecture. Please complete tonight's homework and go over today's lesson in order to prepare for tomorrow's warm up, which will be the same as the preassessment we all took yesterday!

**Lesson Background & Concepts for Teachers**

**Here is a six-minute video to become acquainted with logic gates and truth tables in order to develop the background knowledge necessary for the implementation of this lesson in the classroom**

**Link:** <https://youtu.be/-6w-MHjwzTO>

## Important Vocabulary

Term	Definition
Digital Circuit	A circuit where the signal is interpreted as one of two states, either on (1) or off (0), and typically these digits refer to voltage levels.
Logic Gate	Either a conceptual or physical device that adheres to a Boolean operator, such as AND, OR, NOT, etc.
Voltage	Pressure from an electric source that pushes charged electrons.
Boolean	A binary variable or algebraic notation of logical operators.

## Attachments

- [www.logic.ly](http://www.logic.ly)
- Venn Diagram Logic Gate Lesson Handout
- Answer key for handout and pre/post assessment
- Pre/Post Assessment (found within the Lesson Handout)

## References

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