How Computers Count with Two Fingers

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Jewish Education Project

July 30, 2025

11:30 am - 1:30 pm

Overview

The objective of the presentation is to demonstrate ways to use manipulatives to understand how to count in alternative bases.

1) Why use manipulatives?
2) Introduction to base ten number system and alternative bases
1) Using manipulatives to learn to count in base 2 and other bases
2) Addition and subtraction in alternative bases and generalization
3) Applying place value to polynomials
4) Feedback survey

Why use manipulatives in teaching math?

Constructivist Educational Theory emphasizes that students actively build their own understanding of mathematical concepts, rather than passively receiving information.

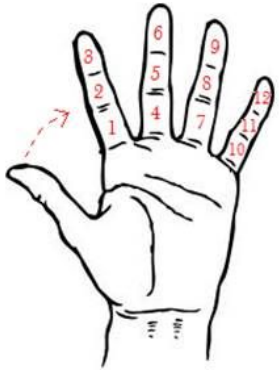
- Engaging with problems
- Making connections to prior knowledge
- Developing own strategies for solving problems
- Hands-on Activities
- Mathematical Modeling
- Open-Ended Problems

Benefits:

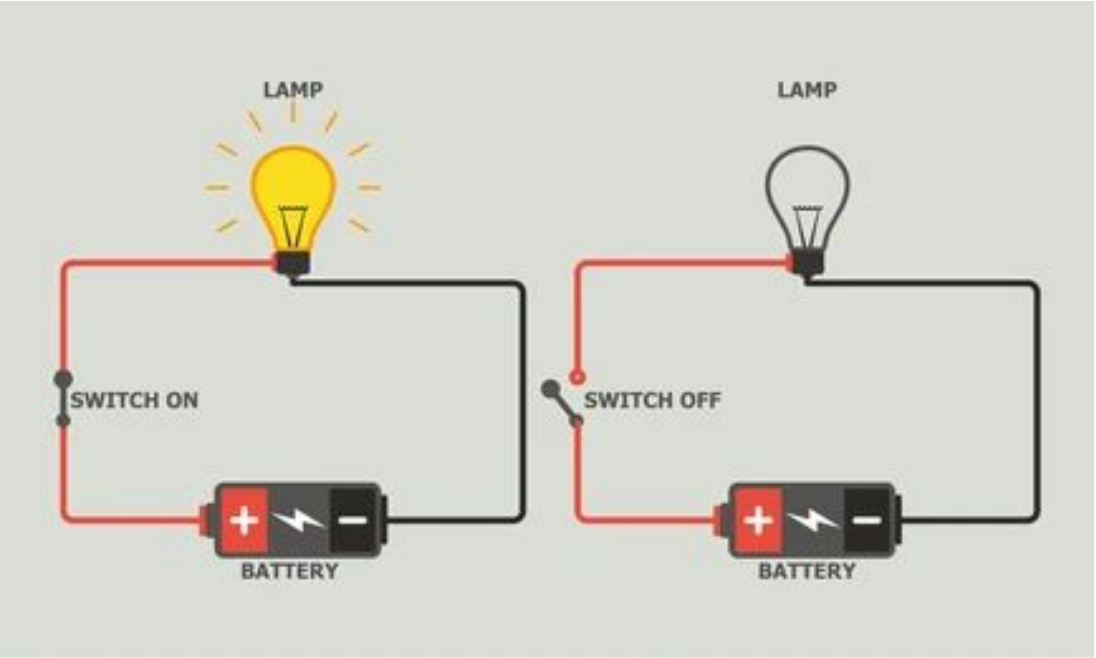
- Deeper Understanding
- Increased Motivation
- Development of Problem-Solving Skills
- Preparation for Advanced Math

Introduction to base ten number system

X



How do computers count?



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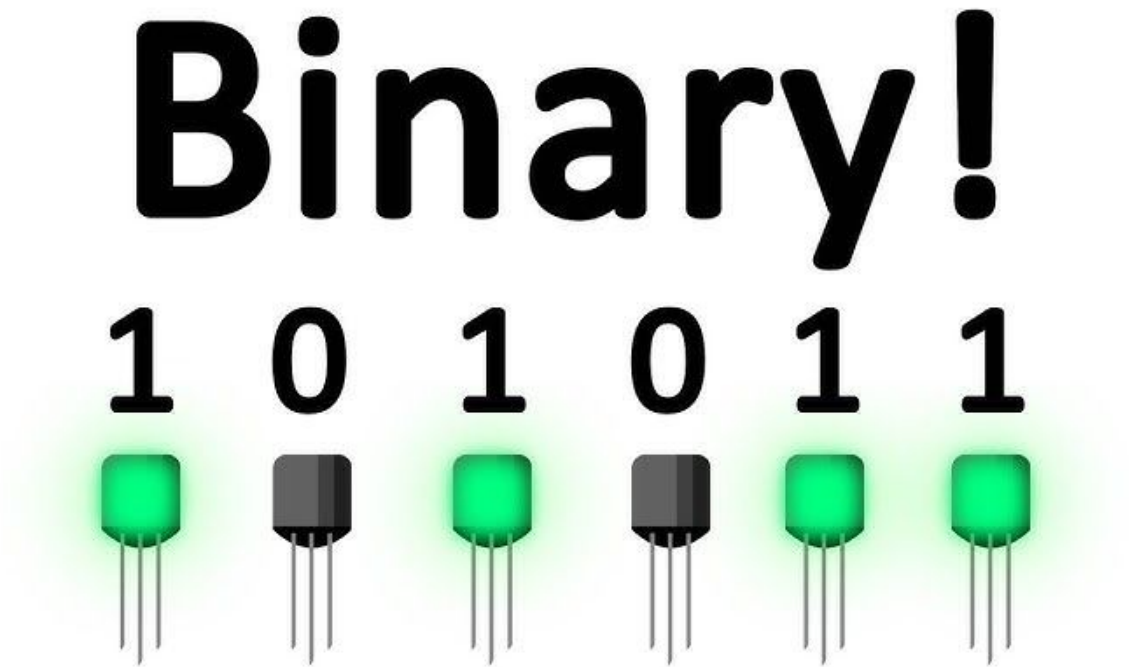
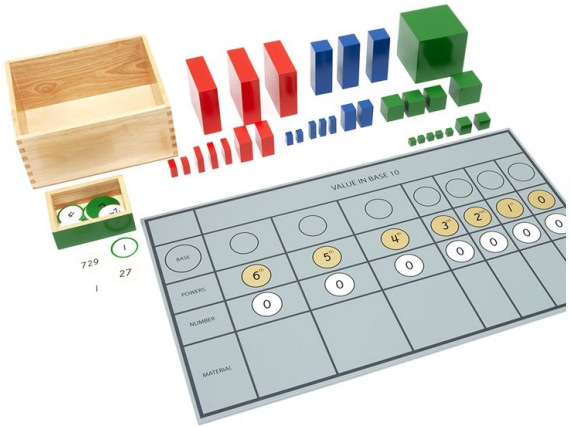
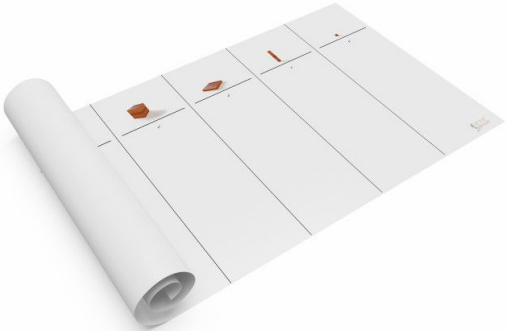


Learning objective: Students will be able to count in binary
Materials

Multi-Base Material



Multi-Base Math Chart



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- Graph paper
- Multi-Base Chart

Learning objective: Students will be able to count in binary
Count to 20

				Base: 2
16’s	8’s	4’s	2’s	Units

Learning objective: Students will be able to count in base 3
Count to 20

				Base: 3
81’s	27’s	9’s	3’s	Units

Learning objective: Students will be able to count in base 16
Count to 20

				Base: 16
65,536’s	4,096’s	256’s	16’s	Units

Learning objective: Students will be able to add in base 2

$1010_2 + 1100_2$

				Base: 2
16's	8's	4's	2's	Units

Learning objective: Students will be able to subtract in base 2

$1111_2 - 101_2$

				Base: 2
16’s	8’s	4’s	2’s	Units

Learning objective: Students will be able to generalize expressing numbers in any base

Base					
10	10000's	1000's	100's	10's	Units
2	16's	8's	4's	2's	Units
3	81's	27's	9's	3's	Units
16	65,536's	4,096's	256's	16's	Units
n	n^4	n^3	n^2	n^1	n^0

Learning objective: Students will be able to convert between base 2 and base 10

$1011_2 = ?_{10}$

				Base: 2
16's	8's	4's	2's	Units

$(1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) =$

Learning objective: Students will be able to express polynomials in terms of place value

$2x^2 + 3$

				Base: x
x^4's	x^3's	x^2's	x's	Units

Learning objective: Students will be able to add and subtract polynomials using concept of place value

$(x^2 + 3x + 5) + (2x + 6) =$

				Base: x
x^4's	x^3's	x^2's	x's	Units

Learning objective: Students will be able to add and subtract polynomials using concept of place value

$(x^3 + 4x^2 + 5) - (x^3 + 2x^2 + 4) =$

				Base: x
x^4's	x^3's	x^2's	x's	Units

Questions

Thank you and contact information

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Feedback

Rena Gelb Post Session Survey

https://forms.office.com/r/7LdgayKP0r