

# Turing Tumble



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**STEM-CTE HUB**



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# Turing Tumble

The Turing Tumble kit enables hands-on STEAM learning through building mechanical computers powered by marbles. Students construct devices to solve logic puzzles, developing skills in computational thinking, engineering, and problem-solving. Its interactive design supports projects that foster creativity and critical thinking.



## Grade Level

3rd - 12th grades

## Group Size

Up to 2 students per set

## Time Duration

45 - 90 Minutes

## Content of Kits

### Components

- 3x Turing Tumble sets



# Usage

## Getting Started

1. **Set Up the Board:** Secure the Turing Tumble board in an upright position.
  2. **Understand the Components:** Familiarize yourself with the different pieces like gears, ramps, and switches.
  3. **Follow the Puzzle Guide:** Start with simple puzzles in the included booklet to learn the mechanics.
  4. **Create Your Own Circuits:** As you gain confidence, design and build your own logic circuits to solve more complex problems or perform computations.
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## Storage

Store all components in the original packaging to avoid loss of pieces and to keep the marbles secure.

## Troubleshooting

- Check the alignment of pieces on the board if the marbles do not flow as intended.
- Ensure all pieces snap securely into place on the board.



# Activity Guide

## Beginner

### Basic Logic Gates

Students will start by building simple logic gates using a few Turing Tumble components to understand binary operations. By setting up basic mechanisms, they will explore how marbles follow predetermined paths based on logic gate functions like AND, OR, and NOT. This hands-on introduction to computational thinking helps students grasp the foundations of binary code and logic circuits in an engaging, interactive way.

## Intermediate

### Combining Gates for Circuits

Building on their knowledge of individual gates, students will combine multiple logic gates to create basic circuits and solve intermediate puzzles from the Turing Tumble guide. They will experiment with different configurations to see how logic gates interact and troubleshoot their setups to ensure correct functionality. This activity deepens their understanding of logical operations, sequencing, and problem-solving in computational systems.

## Advanced

### Complex Computations

Students will take on the challenge of using the full range of Turing Tumble components to build complex circuits that solve advanced puzzles. They will design intricate sequences that perform multi-step operations, applying their understanding of logic to create functional computational models. This activity reinforces engineering concepts, algorithmic thinking, and real-world applications of logic in computer science.

## Extension Activity:

### Design Your Own Puzzle

In this open-ended challenge, students will create their own Turing Tumble puzzles, applying their knowledge of logic gates and circuits to develop unique challenges for their classmates to solve. Students will test and refine their designs to ensure logical consistency and playability. This activity promotes creativity, critical thinking, and deeper engagement with computational problem-solving.



# Learning Extensions

## STEAM Connections: Technology - Math - Computer Science

### Learning Objectives:

- Understand the basic principles of computing and programming.
- Develop problem-solving skills.
- Gain insights into the mechanical processes that underpin digital operations.

### Career Connections:

- **Computer Science & Programming** – Understanding logic gates and binary operations lays the foundation for careers in software development, coding, and artificial intelligence.
- **Systems Engineering** – Building complex circuits mirrors real-world problem-solving in designing and optimizing computer hardware and digital systems.
- **Electronics & Hardware Development** – Exploring logic and circuit design provides insights into careers in microchip design, robotics, and embedded systems engineering.
- **Mathematical & Computational Research** – Strengthening logical reasoning and algorithmic thinking supports careers in data science, cryptography, and mathematical modeling.
- **Game Design & Interactive Media** – Understanding logical sequences and computational thinking is essential for designing interactive experiences, game mechanics, and simulations.

### Essential Employability Skills:

- Logical Reasoning
- Critical Thinking
- Creativity
- Technology Literacy





# Resources and Accessibility

## Safety Guidelines

- Supervise younger students to prevent them from accidentally swallowing small parts.
- Ensure a clutter-free area to avoid distractions and mishaps.

## Accessibility

- Ensure the board is accessible at a comfortable height for all students.
- Provide guidance for students who may have difficulty with fine motor skills.

## Library Catalog



## Library Resources



## Feedback

QR to feedback survey

