Robotics and STEAM Workbook — Grades 6–8

Robotics and STEAM Workbook for Middle School — Complete Course Practice

Cuaderno de Robótica y STEAM — 6.º a 8.º grado

Cuaderno de robótica y STEAM para escuela intermedia — Práctica completa del curso

Middle School Series / Serie de Educación Intermedia

Robotics and STEAM / Robótica y STEAM

White Ink-Saver Edition / Edición imprimible para ahorro de tinta

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This workbook provides a complete, hands-on introduction to robotics and STEAM for grades 6–8. Across six practical units, students explore fundamental robotics concepts, physical mechanics, electronic circuits, and coding logic. Each unit features short mini-lessons with functional visual diagrams, step-by-step worked examples, guided practice, independent practice, and a mini-quiz to reinforce learning. The workbook concludes with a final exam, a comprehensive bilingual glossary, and a complete answer key with step-by-step explanations.

Este cuaderno ofrece una introducción práctica y completa a la robótica y STEAM para los grados 6 a 8. A través de seis unidades prácticas, los estudiantes exploran conceptos fundamentales de robótica, mecánica física, circuitos electrónicos y lógica de programación. Cada unidad incluye mini-lecciones breves con diagramas visuales funcionales, ejemplos resueltos paso a paso, práctica guiada, práctica independiente y un mini-quiz para reforzar el aprendizaje. El cuaderno concluye con un examen final, un glosario bilingüe completo y una clave de respuestas completa con explicaciones paso a paso.

Your guide in this workbook is **Tingilillo the owl**, who appears in short tips throughout the book.

Tu guía en este cuaderno es **Tingilillo el búho**, que aparece en consejos breves en todo el libro.

- **Unit 1: What Is a Robot? Sensors and Parts** / Unidad 1: ¿Qué es un robot? Sensores y piezas
- **Unit 2: Simple Machines and Gears** / Unidad 2: Máquinas simples y engranajes
- **Unit 3: Coding a Robot** / Unidad 3: Programar un robot
- **Unit 4: Circuits and Power** / Unidad 4: Circuitos y energía
- **Unit 5: The Engineering Design Process** / Unidad 5: El proceso de diseño de ingeniería
- **Unit 6: My STEAM Project** / Unidad 6: Mi proyecto STEAM

Workbook Structure / Estructura del cuaderno:

- 6 Core Units with structured learning content
- Mini-Lessons with functional visual diagrams and practical rules
- Worked Examples with step-by-step mathematical solutions
- Guided Practice and Independent Practice sections in every unit
- Unit Mini-Quizzes for ongoing assessment
- Comprehensive Final Exam covering all course concepts

- Bilingual Glossary (EN/ES) of essential robotics terms
- Full Answer Key with detailed explanations for every problem

This workbook teaches real school robotics content with simple, verifiable math.

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Starter Mini-Lesson: Thinking Like an Engineer / Mini-lección inicial: Pensar como un ingeniero

Engineering is a creative problem-solving process. Engineers begin by observing a real-world problem and asking targeted questions to define what needs to be solved. Next, they imagine multiple potential solutions and select the most practical design to build. Once a prototype is constructed, engineers test it under real conditions, analyze its performance, and make precise

improvements. Remember: nothing works perfectly the first time. Iteration—testing, failing, learning, and refining—is the heart of successful engineering!

Starter Activity (not graded): **Robot Spotting** — name one machine you used today that senses something and reacts. What does it sense, and what does it do? / Actividad inicial (sin calificación): **Detectar robots** — nombra una máquina que usaste hoy que detecta algo y reacciona. ¿Qué detecta y qué hace?

UNIT 1: What Is a Robot? Sensors and Parts

(En español: Unidad 1: ¿Qué es un robot? Sensores y piezas)

Mini-Lesson

(Mini-lección)

1. **The Core Robot System: Sense, Think, Act:** A robot is an autonomous or semi-autonomous machine designed to perform tasks. Every robot operates on a three-step cycle: it senses its environment using inputs (sensors), thinks and processes information using a central controller (brain or microcontroller), and acts on the environment using outputs (actuators like motors, LEDs, or speakers).

2. **Types of Sensors (Inputs):** Sensors gather physical data from the surroundings. Touch or bump sensors detect physical contact. Light sensors measure ambient brightness. Ultrasonic distance sensors emit sound waves to measure how far away objects are. Color sensors identify visible light frequencies. Sound sensors measure acoustic volume. All sensors send input data to the central controller.

3. **Counting Components in a Build List:** To analyze a robot schematic or parts inventory, engineers categorize every item into specific groups:

- Inputs: All sensors that gather data.
- Outputs: All actuators that perform actions (motors, lights, sound units).
- Controllers & Structure: Microcontrollers, frames, wheels, and fasteners.

Total parts are calculated by summing all individual components declared in the build list.

Tingilillo's Tip: Group your build list into Inputs, Controller, and Outputs before assembly to easily verify all hardware connections!