



The Anti-Theft Alarm

Make your code smart! Use conditionals ('If-Then') to make decisions and build an alarm that reacts to movement.

Courses

- Grades 3-12

Materials

- Cell phone, tablet, or computer
- Internet connection

Educational Objectives

- Understand the concept of "IF-THEN" conditionals.
- Create a technological object (prototype) using a device.
- Identify relationships between technology and the surrounding world.
- Evaluate personal work and the work of others.
- Engage in discussions and reflect on improvement ideas.

Start (10 minutes) - The Logic of an Alarm

1. Welcome students and introduce the day's activity: **"Today, we will learn how to prototype a motion-detecting alarm."**
2. Ask the class: **"Have you ever seen an automatic door or a security light? How do you think they know you're there?"**
3. After discussing their ideas about sensors, explain that we'll use their phone's camera as a motion sensor. But how does a program *decide* when to sound the alarm? This is the perfect moment to introduce **conditional logic**—the 'IF/THEN' statement.
4. Finally, explain that the program needs to check for motion constantly, not just once, which requires a **Main Loop** to run the check over and over.

Have you ever heard of motion sensors?

Motion sensors are smart devices that can detect when someone or something moves near them.

Some, like those in automatic doors, work with **infrared** (a type of light we can't see) or **ultrasound** (a sound we can't hear). They sense changes when their signals bounce off a moving object.

Using a Camera as a Motion Sensor

There are also motion sensors **based on cameras**, which is what we will use in this activity. A program can watch the video feed from a camera and detect **changes between frames**. If a large part of the image suddenly changes, the program knows that **something is moving**.

IF There's Motion, THEN Sound the Alarm

To make our program smart, we need to teach it how to make decisions. The simplest way to do this is with a conditional statement: **IF a condition is true, THEN an action happens**. This "IF... THEN..." structure is a core building block of all programming, from simple games to complex artificial intelligence.

A Practical Example

Let's see how to use a conditional to activate our alarm. We'll tell the program: **IF** the amount of motion detected by the camera is greater than a certain number (like 40), **THEN** play the alarm sound. But how do we make the program check for motion *continuously*? We can't just check once! This is where a **main loop** is essential. By placing our 'IF motion' check inside a 'repeat forever' loop, we create a system that is always watching.

Development (20-30 minutes) - Building the Security System

1. Now that they understand the logic of "IF motion is detected, THEN sound the alarm," it's time to build the security system.
2. Lead the students through **the instructions for adding the components and constructing the conditional code**, as detailed in the hands-on section below. Make sure they understand why the IF block must be placed inside the main loop to be effective.

Closure (5-10 minutes) - Security Debrief

1. Once the alarms are working, it's time for a security expert's debrief. A real security expert always thinks about the weaknesses of their system.
2. Use the final section to guide a discussion about the limitations of their camera-based alarm. This encourages them to think critically about how technology works in the real world and how it could be improved.

Reflect

You've built a security system. Now, think like a security expert.

- What would happen if a thief entered at night with all the lights off? Would a camera-based sensor still work?
- How reliable is this alarm? What might accidentally trigger a false alarm (like a pet running by)?