

# Steepest Incline

## The challenge

Design and build a vehicle that is activated by a touch sensor, climbs the steepest incline, and stops at the top.



Photo credit: will\_cyclist (2014) via flickr.com

## Setup

You will need an adjustable slope, e.g. a length of timber or shelving resting on the edge of table. (A ~1.8m length of timber resting against a 720mm table gives a ~25 degree slope.)

## Constraints

Only one EV3 brick, the motors from a single kit, and no grappling hooks. (-:

Your robot should not start moving until the touch sensor is pressed, and it must not leave anything behind.

Your robot can start on the ramp if you find that easier, but to get full points, your robot needs to be able to start off the ramp and drive onto it.

## Robot design

Before you start building, you should consider some alternatives and possibly do some research. Depending on how long you've got for this challenge, your options might include tracks, four-wheel drive, gearing down the motors, ...?

Other design factors to consider include gear ratios, friction, and the centre of mass of your robot.

## Program

The program for this robot will be nice and simple – it needs to wait for a touch sensor to be pressed and then turn on the motor(s).

For example, here's part of a solution, but there's a problem. The motors will turn only once and then stop. You need to find a way to fix this. (e.g. by modifying the Move block, adding an additional Wait block at the end, or something else...?)



Note: There are a few different ways that the Wait for Touch Sensor block can be configured. Here's what some of the terms relating to this sensor mean...

- Compare – Waits until the sensor reads a certain value
- Change – Waits until the state of the touch sensor changes
- Bumped – Waiting for bumped means that the sensor needs to be pressed **and then** released before continuing. This is useful if you want to ensure that you don't accidentally register single button press as multiple button presses.

## Assessment

One point for each of:

- Motors turn on when a touch sensor is pressed
- Is able to drive from the ground onto a shallow ramp
- Robot climbs at least a 25° slope
- Stretch goal #1 - Stops at top of ramp
- Stretch goal #2 - Doesn't fall off the sides of the ramp
- Stretch goal #3 - Climbs the steepest incline

Acknowledgements: This challenge is based on one from Eric Wang's "Engineering with LEGO Bricks and ROBO LAB", 3<sup>rd</sup> Edition.