



# Autonomous Intersection

Design an autonomous car that can safely cross an intersection.

## Learning Objectives

Students will:

Design, use, and evaluate solutions to a real-world problems and physical systems

## Vocabulary

Design brief, prototype, criteria

## Grades

6-8

## Subjects

Engineering, STEM, Coding

## Duration

120+ Minutes

## Difficulty

Advanced

## Standards

### NGSS

MS-ETS1-1. / MS-ETS1-2. / MS-ETS1-3. /MS-ETS1-4

### CSTA

2-A-2-1 / 2-A-7-2 / 2-A-7-3 / 2-A-7-4 / 2-A-5-5 / 2-A-5-6 /  
2-A-5-7 / 2-A-4-8 / 2-A-3-9 / 2-A-6-10 / 2-C-7-11 / 2-C-4-12 /  
2-D-5-16 / 2-I-1-20

## Materials Needed

LEGO® MINDSTORMS Education EV3 core set  
LEGO MINDSTORMS EV3 Software or Programming app  
ROBOTC software (optional)

# Autonomous Intersection

## CONNECT

### Design Brief

The ability to safely cross intersections is a definite challenge for autonomous car builders. Safety on the road is critical and cars need to be aware of danger at all times. They need to detect other cars and traffic lights, and monitor their speed while driving and turning.

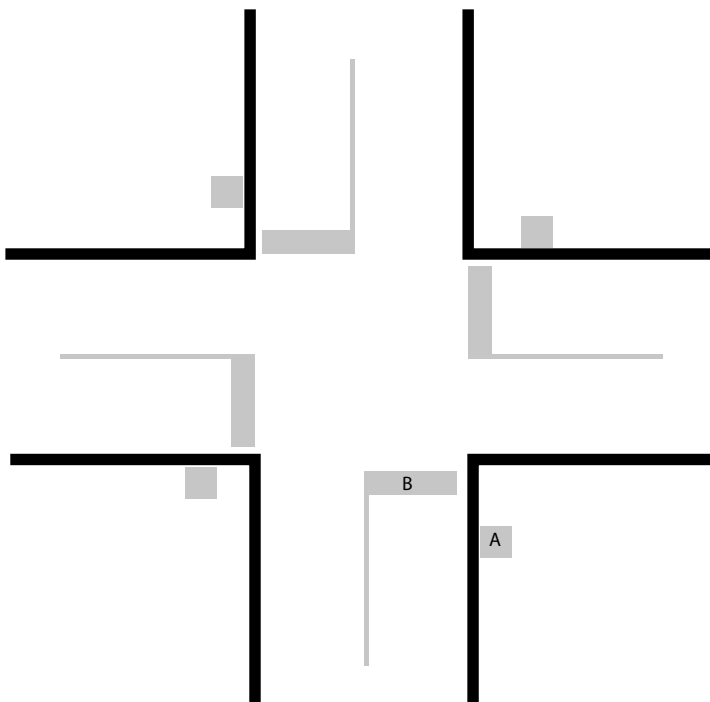
Your challenge is to design an autonomous driving vehicle that can safely cross an intersection. Your solution must be able to:

- Drive to an intersection, properly signal, and turn right
- Repeat the above sequence turning left
- Detect traffic lights and react accordingly to their signals
- Detect other cars and react accordingly

### Setup

Design your own classroom setup for this challenge. The setup must provide situational context for the problem the students are trying to solve.

Here is a suggested setup, where A is traffic light position and B is the stop line:



## **Brainstorm**

Have your students look at the design brief and generate multiple possible solutions to the problem. What features do they intend to include in their build, and in the programming? Will they need to change the physical design of their robot? Have them write down all of their thoughts and sketches.

## **Select the Best Solution**

Encourage the students to weigh the pros and cons of each idea they have come up with. They should then decide on a final design to carry forward.

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# **CONSTRUCT**

## **Build and Program a Solution**

Have the students build and program a robot that can solve the problem.

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# **CONTEMPLATE**

## **Test and Analyze**

Have the students test and evaluate the efficiency of their solution.

## **Review and Revise**

Have the students improve their solution until it meets the design criteria.

## **Communicate**

Encourage the students to share their learning process. Provide them with the opportunity to share their thinking, ideas, and reflections using the documentation tool(s) they have available.

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# **CONTINUE**

## **Using text-based programming**

Have the students explore text-based programming solutions so they can compare different programming languages.