

# SCIENCE 8 BY SARAWAK ENERGY

## Autonomous Rover Challenge

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Primary School Category • Theme: Driving Innovations

### Rules, Guidelines & Scoring System

## 1. Competition Overview

SCIENCE is the 8th annual Sarawak Community Innovation & Engineering Convention, organised by The Learning Curve and sponsored by Sarawak Energy. The Primary School Category challenges teams of three pupils to program a fully autonomous rover to navigate a line-following race track — integrating sensor logic, navigation algorithms, and real-world problem-solving.

This challenge is designed to cultivate computational thinking, teamwork, and perseverance among primary school students across Sarawak, including communities in Kota Samarahan & Baram this year.

#### Key Details

Format: Autonomous rover race — no verbal presentation required

Team size: 3 pupils per team (Primary 1 – 6; ages 6 to 12 as of 2026)

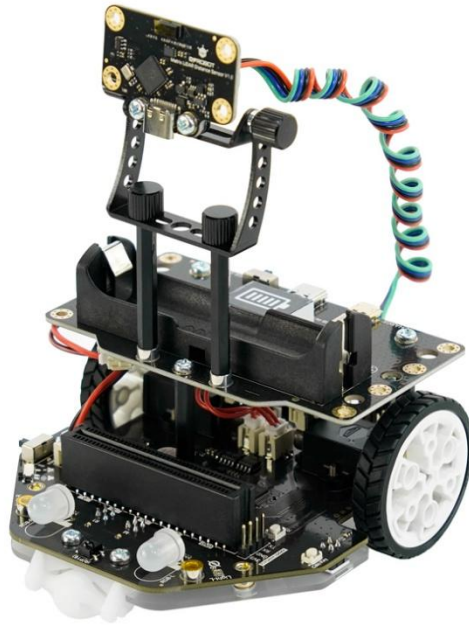
Race attempt: 1 attempt per team; maximum 5 minutes per run

Main event: 20 – 21 June 2026 @ Makeramai Makerspace, Plaza Merdeka

Track reveal: 08:00 AM on 20 June 2026

## 2. Hardware Specifications

### 2.1 Primary Hardware (mandatory)



Each team must use one (1) DFRobot Maqueen Plus V3 rover. The rover must be controlled by one of the following approved microcontroller boards:

- BBC micro:bit (any version)
- UNIHAKER K10 AI Coding Board

All autonomous navigation and scored functions must be programmed and executed by the approved microcontroller board. No other microcontroller or single-board computer is permitted.

## 2.2 Extensions & Additional Hardware

No extension boards, shields, or additional hardware modules are permitted beyond the Maqueen Plus V3 chassis and its onboard sensors. Teams must work exclusively with the built-in hardware of the rover and chosen microcontroller board.

Permitted onboard micro:bit and Maqueen Plus V3 sensors include:

- IR line-tracking sensors (x5)
- Ultrasonic distance sensor (SR04)
- RGB LED strips
- Onboard motors and motor driver
- Temperature, Light Sensor, Microphone, Buttons and Touch Sensor

## 2.3 Power

The rover must be powered by 18650 rechargeable batteries only. No other power source (USB power bank, AA batteries, AC connection, or external power supply) is permitted during the race.

Teams are responsible for ensuring batteries are fully charged before their race slot. Organisers will not supply replacement batteries on competition day.

## 3. Race Track

### 3.1 Track Layout

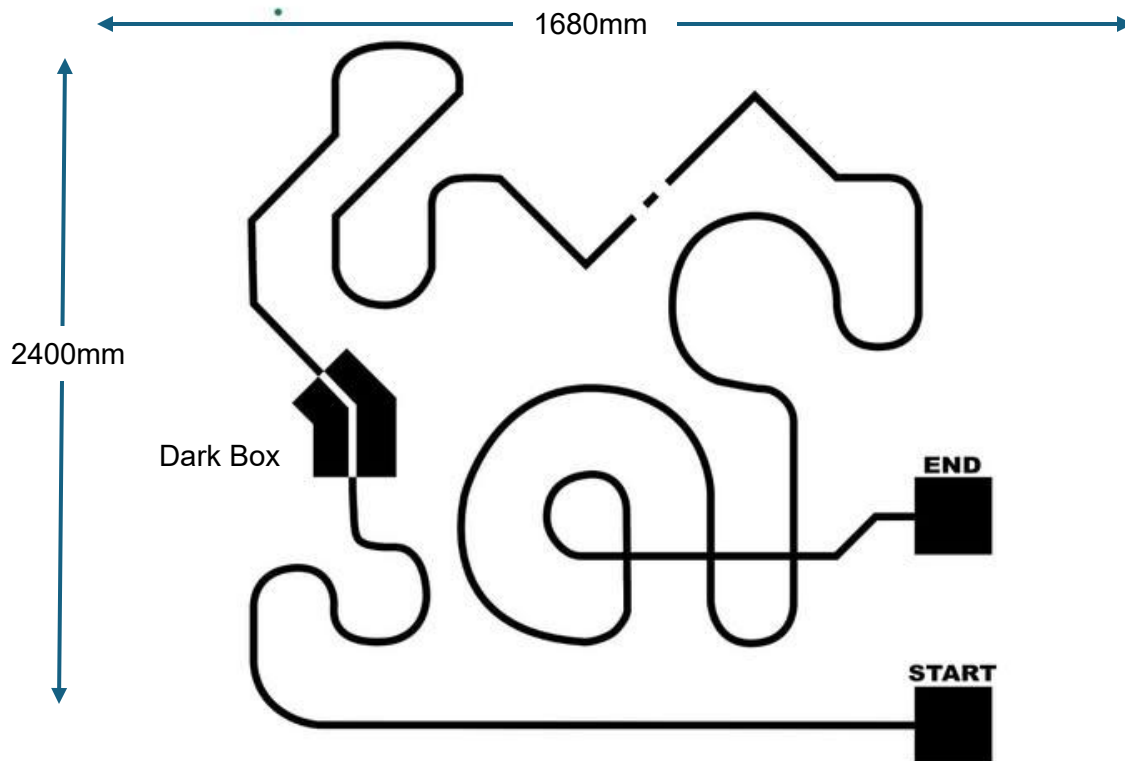


Figure 1 Example Track Layout [Not Competition Layout]

The race track is printed on 4 x A0 sheets, forming a combined track surface of approximately 2,378 mm × 1,682 mm. The track consists of a black line (approximately 20 mm wide) on a white background.

The track will include at least one(1) the following navigational elements:

- Y-junction
- T-junction
- Roundabout
- Crossroad (4-way intersection)
- One (1) dark box section: 250 mm × 250 mm × 250 mm enclosure in total darkness

#### Track Reveal

The exact track map will be revealed at 08:00 AM on 20 June 2026.

Teams will not have advance access to the specific layout. Programme your rover to handle all junction types.

## 3.2 Start & Finish Zones

The track has one designated starting **light grey** box and one finishing **light grey** box. Timing begins when the rover crosses the start line and stops when the rover's front reaches the finish box. If the rover does not reach the finish box within 5 minutes, a score of zero (0) points is awarded for the Time Score component.

## 3.3 Dark Box Section

One section of the track passes through a 250 mm × 250 mm × 250 mm enclosed dark box in total darkness. Inside this section, teams may programme the rover to take a temperature measurement.

Judges will read the preset (0 deg Celcius) temperature immediately before the race begins. The temperature value is recorded after each team's run and will be used to verify the rover's reading in the Dark Box.

# 4. Race Rules

## 4.1 Attempt Structure

Each team is allocated one (1) race attempt. The clock starts when the rover crosses the starting line and runs continuously — it is not paused under any circumstance.

If the rover malfunctions before the run begins or within the first 30 seconds, the team may request a 30-minute repair window and attempt one (1) additional run. This dispensation is granted at the judge's discretion and is available once per team only.

## 4.2 Rover Recovery

If the rover leaves the line — defined as the track line no longer passing between both drive wheels [OR] outside of the race tract perimeter — the rover is considered "lost." In this situation:

- One (1) team member may retrieve the rover and place it back at the starting line.
- The clock continues to run without pause during retrieval.
- The rover must restart the entire track from the starting line.
- There is no limit to the number of retrievals, subject to the 5-minute (300 seconds) maximum run time.

### Line Out Definition

The rover is considered out of line when the track line no longer falls between both drive wheels [OR] leaves the race perimeter

Judges' determination is final.

### 4.3 Autonomy Requirement

The rover must operate fully autonomously during the race. No remote control, wireless command, or human intervention to guide the rover is permitted once the race begins (except physical retrieval as described in Rule 4.2).

All programming must be completed prior to race. Teams may not modify code during the race or between retrieval and restart.

## 5. Scoring System

Scoring is based on race performance. The maximum achievable score is 1,020 points.

### 5.1 Time Score (Primary Component)

The Time Score is calculated using the following formula:

$$\text{Time Score} = 1,000 \div \text{Total Time to Finish Race (in seconds)}$$

Where Total Time is measured in seconds from race start to when the rover reaches the finishing grey box. If the rover does not finish within 5 minutes (300 seconds), the Time Score is 0.

### 5.2 Bonus Points

Bonus Criterion	Condition	Points
Race Completion Bonus	Rover completes the full track without going out of line / perimeter at any point (line remains between both wheels throughout)	+10
Temperature Measurement Bonus	Rover successfully records and displays temperature inside the dark box section. Judge verifies value against pre-recorded ambient temperature.	+10

#### Temperature Verification Method

Judges will measure and record the temperature inside the dark box before the race begins.

After the race, teams must show the temperature reading captured by the rover.

The reading must be within  $\pm 3^{\circ}\text{C}$  of the pre-recorded judge value to qualify for the bonus.

The reading must be  $0^{\circ}\text{C}$  before race begins [pre-race check]

## 5.3 Scoring Summary

Component	Maximum Points
Time Score (1,000 ÷ finish time in seconds)	Variable (faster = higher)
Race Completion Bonus (no line-out)	+10
Temperature Measurement Bonus	+10
<b>TOTAL POSSIBLE SCORE</b>	<b>Time + Race Bonus + Temperature Bonus</b>

### [EXAMPLE]

Component	Measured	Score
Time Score	50 seconds	$1000/50 = 20$ pts
Race Completion Bonus (no line-out)	✓	+10 pts
Temperature Measurement	✓	+10 pts
<b>TOTAL POSSIBLE SCORE</b>		<b>40 pts</b>

## 6. Competition Format (2-Day)

### 6.1 Day 1 — Qualification Round

All registered teams compete in the qualification round on Day 1. Each team completes their one (1) race attempt from 12.00noon to 4.00pm

### 6.2 Day 2 — Finals

The Finals on Day 2 feature qualifying teams from Day 1

- Winning teams will be decided based on **Total Score** from both days

All finalists complete one (1) race attempt on the same track. Final rankings are determined by the total scores only.

*Tiebreaker rule: In the event of equal total scores, the team with the faster finish time is ranked higher. If still tied, the Temperature Bonus is used as the secondary tiebreaker.*

## 7. Eligibility & General Rules

- Each team consists of up to 3 primary school students (Primary 1 to Primary 6).
- All programming must be completed prior to competition day. No code changes are permitted once the race has started.
- Teams must use the issued Maqueen Plus V3 rover. Bringing an alternative rover chassis is not permitted.
- Only BBC micro:bit or UNIHIKER K10 is permitted as the controlling microcontroller. No other boards are allowed.
- No extension boards or additional hardware beyond the rover's built-in components are permitted.
- The rover must run on 18650 rechargeable batteries autonomously. Teams must supply their own charged batteries.
- Organisers will provide the printed race track. Teams must not modify or tamper with the track surface.
- Wiring fixes and minor physical adjustments to the rover are permitted during the 30-minute repair window (Rule 4.1) only.
- 3D printed parts and decorative additions are permitted provided they do not violate physical constraints or provide an unfair advantage.
- Manual or radio control of rover during races will be disqualified and permanently barred from SCIENCE, and future events by the organisers.

## 8. Disqualification Criteria

**A team will be disqualified if any of the following are found:**

- Rover is controlled remotely or manually during the race (other than physical retrieval as per Rule 4.2)
- Prohibited hardware (extension boards, alternative microcontrollers) is used
- Clear evidence of parental or external adult hands-on involvement on competition day
- Rover presents a safety hazard: exposed wiring, fire risk, or structural instability
- Rover is a commercially purchased autonomous product with minimal or no student programming
- Team modifies code or makes programming changes during the race

## 9. Awards & Prizes

	Award	Prize
1st	First Place	RM 1,000 + Certificate
2nd	Second Place	RM 700 + Certificate
3rd	Third Place	RM 500 + Certificate
★	Special Prize	Certificate + Special Recognition

*Note: Prize money is awarded per team in cash.*