

## RobotChallenge LEAGUE Explore

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### Steel Melody Theme Competition Rules

Revised on November 28, 2024

Competition Theme: "Steel Clashes with Notes, Igniting a Sensory Feast! The 'Steel Melody' Music Festival is Here!"

This is no ordinary music festival—it's a sensory revolution! We've meticulously combined stunning stage design, electrifying atmosphere, immersive interactive experiences, and performances by top-tier musicians to deliver an unprecedented fusion of technology and art!

Prepare to ignite your passion and unleash your soul in the collision of steel and melody! The "Steel Melody" Music Festival awaits!

### Infrastructure Construction

Infrastructure materials for the festival are ready. Use engineering machinery effectively to contribute to a successful completion.

≤ 8 years old

### 1. Competition Field

Field dimensions: 0.9m × 2.0m (material: UV knife-coated fabric).

### 2. Robot Requirements

A. Participants must bring disassembled equipment, including motors and battery boxes. Parts must be plastic building blocks (no 3D-printed components).

Recommended: LEGO® 9686 motor and battery box.



B. Power source must be battery boxes and motors (voltage ≤9V).

C. Spare batteries allowed (non-rechargeable dry cells only; no lithium batteries).

### 3. Competition Tasks

#### 3.1 Task Overview

Build robots on-site to complete three sequential tasks: collection, lifting, and transportation of materials.

## RobotChallenge LEAGUE Explore



### 3.2 Field Markings

#### A. Zones:

Collection Start Zone (A): Begin here.

Material Collection Zone (B): Gather materials here.

Lifting Robot Zone (B-C): Place crane robot here.

Transport Robot Loading Zone (C): Load materials here.

Transport Destination (D): Deliver materials here.

#### B. Props:

Speed bumps: 3 bars ( $30 \times 1.2 \times 0.6$ cm), 6 bars ( $25 \times 1.2 \times 0.6$ cm).

Obstacles and material blocks:  $5 \times 5 \times 5$ cm cubes (EVA foam).



### 3.3 Task Details

#### 3.3.1 Pre-Competition Inspection

A. Teams must bring disassembled parts. Judges will verify parts

B. No assembly guides or reference materials allowed.

#### 3.3.2 Pre-Competition Assembly & Testing

A. Total time for assembly and testing: 60 minutes.

B. Build three robots (Electric transmission) :

Material Collection Robot

Crane Robot

Material Transport Robot

C. Testing begins after assembly. Competition starts after 60 minutes.

D. Collection Robot must fit within Zone A (max.  $14 \times 30$ cm). No size/weight restrictions, but it cannot expand.

E. Crane Robot must be tower crane-style with a cargo shelf. No size/weight limits. It must lift props  $\geq 5$ cm high and rotate the arm manually by  $\geq 180^\circ$  (base cannot

## RobotChallenge LEAGUE Explore

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rotate).

F. Transport Robot must fit within Zone C (max. 15×30cm). No size/weight limits, but it must navigate obstacles smoothly.

### 3.3.3 Task Execution

A. The material collection robot starts from any area A, crosses obstacles, collects 3 materials on the route, and transports them to the corresponding area B. After the robot arrives at area B (the robot is deemed to have arrived when part of its projection touches the area), the team members turn off the power supply at the right time. Human intervention in the location of the materials is not allowed, otherwise the materials will not be scored.

B. After first collection, retrieve the robot and restart for a second round.

C. Scores based on material positions after two rounds. Results do not affect subsequent tasks.

D. One reset allowed (with penalty). Teams restore materials and restart; scores recalculated.

E. After collection, use Crane Robot (max. 2 materials per lift).

F. Team members manually load materials in area B (the shelves cannot be in the air during loading). After loading, they operate the robot to lift the materials to an effective height, then rotate and translate the materials clockwise to area C. Finally, they lower the shelves to the ground and manually unload the materials.

G. During the lifting process, if materials fall off, they will not be scored, but it will not affect the use of the next stage of the task.

H. After the lifting task is completed, the team members manually load the supplies and then start transportation.

I. Transport Robot starts in Zone C, navigates obstacles to Zone D (partial contact counts). Power off upon arrival.

J. Dropped materials during transport score 0.

K. One reset allowed (with penalty). Retrieve robot to Zone C; scores recalculated.

L. Tasks must be sequential. Repairs allowed during faults (time continues).

M. During the collection and transportation process, if the robot wheels leave the boundary of the field, it is considered out of bounds. The team members should stop the robot immediately and choose to reset or continue the task.

N. Dropped materials are not considered dropped parts.

### 3.3.4 Scoring Criteria

A. Collection Robot fully exits Zone A: 5 points.

B. Navigate one obstacle: 15 points (max. 30).

C. Material fully in Zone B: 10 Points/piece (max. 60).

D. Material partially in Zone B: 5 Points/piece.

## **RobotChallenge LEAGUE Explore**

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- E. Material moved from start position but outside Zone B: 2 Points/piece.
- F. Successfully transfer materials using lifting equipment: 15 Points/piece (max. 90).
- G. Materials dropped during robot transfer: 5 points/ piece.
- H. Transport Robot fully exits Zone C: 5 points.
- I. Navigate one obstacle: 15 points (max. 30).
- J. Material delivered to Zone D: 10 points/ piece (max. 60).
- K. Navigate two obstacles without delivery: 5 points/ piece.
- L. No boundary violations or fallen parts: 20 points.
- M. Reset penalty: -10 points/reset.
- N. Material fully out of bounds: -5 points/ piece.

### **3.3.5 Total Score**

- A. Task score: 300 points max.
- B. Time bonus: 10% of total score (based on remaining seconds).
- C. Time bonus = (Remaining time ÷ Total time) × 30.
- D. Total score = Task score + Time bonus.

## **4. Competition Requirements**

### **4.1 Time Limit**

- A. 5 minutes per round. Time ends immediately; judges tally scores.

### **4.2 Rounds**

- 2 rounds per team.

### **4.3 Start of Competition**

- A. Place robots in designated zones before the whistle. Countdown: 3-2-1, whistle starts the round.
- B. Sequence: Collection → Lifting → Transportation.

### **4.5 End of Competition**

- A. Time ends; scores tallied.
- B. Teams may finish early; time stops upon signal.

### **4.6 Rankings**

- A. Best of two rounds determines ranking.
- B. Tiebreaker: Team with more remaining time in highest-scoring round wins.
- C. Further tiebreaker: Compare secondary scores and remaining times.

## "Infrastructure Construction" Scoring Sheet

Judge Items			Value	Points	Score
1	Collection Tasks	Collection Robot fully exits the starting zone	0 1 (N) (Y)	5	
		Collection Robot successfully navigates one obstacle	0 1 2	15	
		Material fully within Zone B (projection)	0 1 2 3 4 5 6	10	
		Material partially within Zone B (projection)	0 1 2 3 4 5 6	5	
		Material outside Zone B but completely left the starting position	0 1 2 3 4 5 6	2	
2	Lifting Tasks	Successfully transfer materials using lifting equipment	0 1 2 3 4 5 6	15	
		Materials dropped during robot transfer	0 1 2 3 4 5 6	5	
3	Transportation Tasks	Transport Robot fully exits the starting zone	0 1 (N) (Y)	5	
		Transport Robot successfully navigates one obstacle	0 1 2	15	
		Material successfully delivered to Zone D	0 1 2 3 4 5 6	10	
		Transport Robot navigated two obstacles but failed to deliver material to Zone D	0 1 2 3 4 5 6	5	
4	No boundary violations or fallen parts during the competition		0 1 (N) (Y)	20	
5	Number of resets		0 1 2	-10	
6	Material completely out of bounds			-5	
7	Time bonus = (Remaining time (seconds) ÷ Total time (seconds)) × 30 (10% of total score)				
			Total Score		
			Remaining Time:		