FIRST LEGO LEAGUE CHALLENGE

Mission Brainstorming Worksheets

TEAM NAME:
TEAM NUMBER:

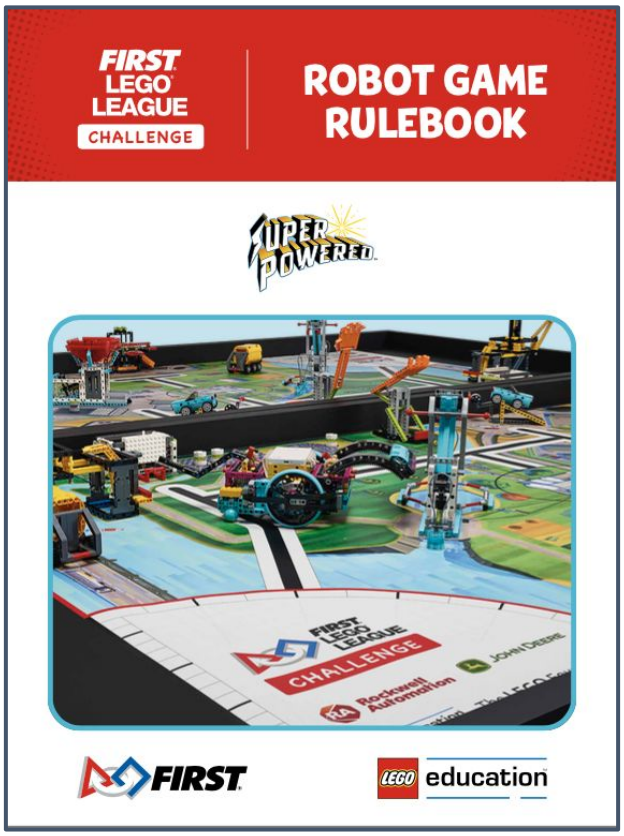
Updated: August 2021

Instructions

This document is *NOT* a substitute for reading the Robot Game Rulebook (RGR). The main purpose of this document is to brainstorm mechanisms and methods for solving missions. We assume that every student will start by reading all the rules.

Instructions for students:

1. **Read the rules carefully - https://www.firstlegoleague.org/season#resources**
2. **Check for any updates - https://www.firstlegoleague.org/season#resources**
3. **Brainstorm ideas.** Think about what you might have to build or program to solve this mission. Do you need to push/pull/pick up/drop off? What type of mechanism would be needed?

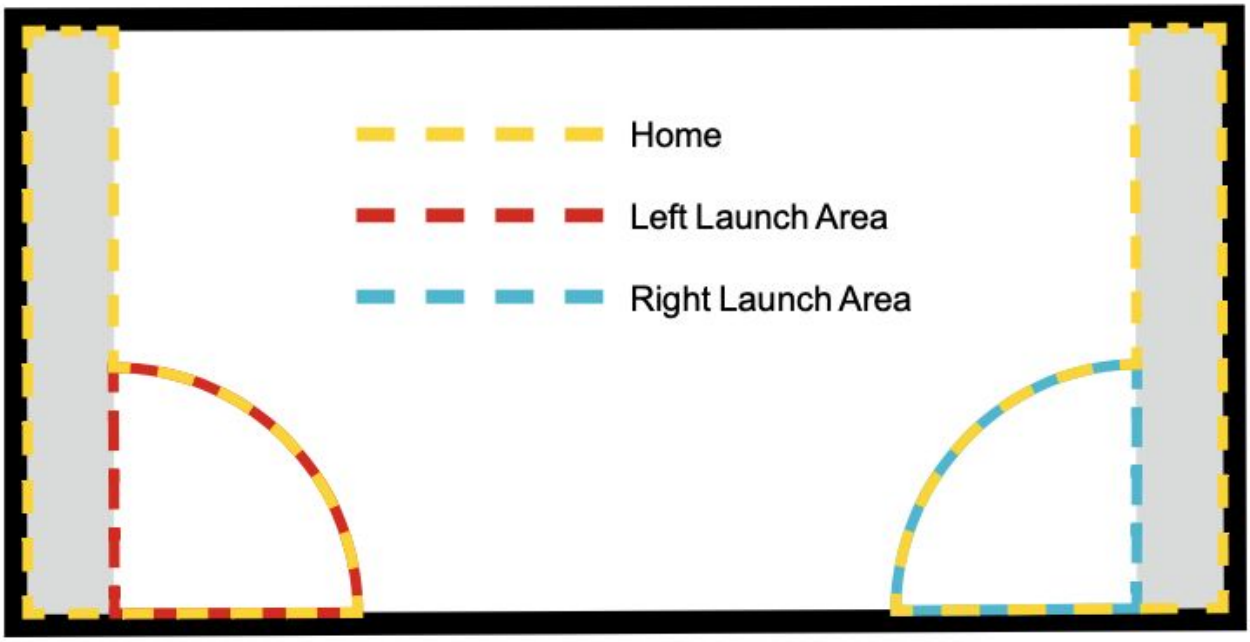


Credit: *FIRST LEGO League* Robot Game Rulebook.

EQUIPMENT INSPECTION

If your robot and all your equipment fit completely in one launch area and are under a height limit of 12 in. (305 mm) during the pre-match inspection: **20**

(See Rules, Match Setup 1)



How can we make sure that everything fits in one launch area?

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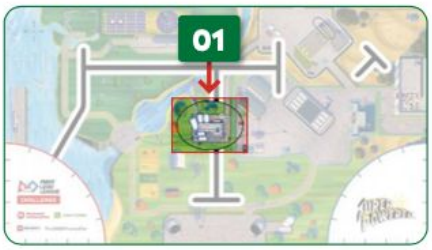
Mission 01 INNOVATION PROJECT MODEL

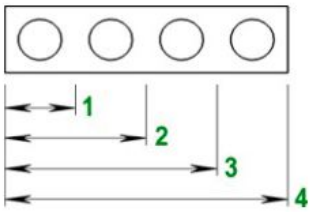


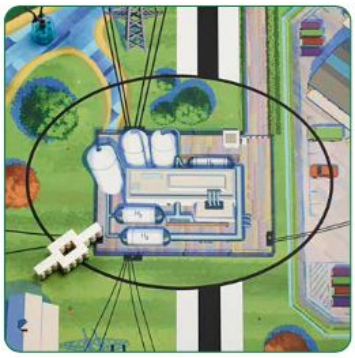
This model should represent the solution to your Innovation Project.

Deliver your Innovation Project model to the hydrogen plant target area.

- If your Innovation Project model is at least partly in the hydrogen plant target area: **10**

Design and bring a single Innovation Project model of your own to the match. To score, it must:
- *Be made of at least two white LEGO® pieces.*
- *Measure at least as long as four LEGO studs in some direction.*





10

10

What model will we make? How can we solve this mission?

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Mission 02 OIL PLATFORM

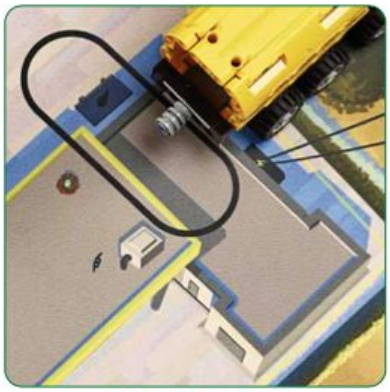
Oil is a non-renewable energy source that can be used to provide fuel for vehicles.

Pump the oil so that the fuel units load into the fuel truck, and then deliver the fuel truck to the fueling station.

- If a fuel unit is in the fuel truck: **5 EACH**
- Bonus: If at least one fuel unit is in the fuel truck and the fuel truck is at least partly over the fueling station target: **10 ADDED**

5 + 5

5 + 10
(1 fuel unit inside)



5 + 5 + 5 + 10
(3 fuel units inside)

How can we solve this mission?

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Mission 03 ENERGY STORAGE

New technologies help us to store energy. Volcanic rocks can be heated in an insulated enclosure to store energy until it is needed.

Load energy units into the energy storage bin and then release the stored energy unit from the tray under the model.

- If an energy unit is completely in the energy storage bin (max of three): **10 EACH**
- If the energy unit is completely removed from the energy storage tray: **5**

All energy units stored in the energy storage bin may not be touching team equipment at the end of the match.

10

10 + 10 + 10

10 + 10 + 10 + 5

How can we solve this mission?

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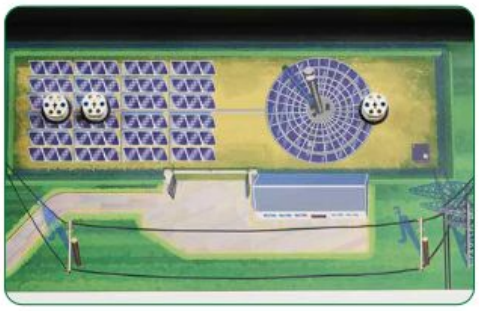
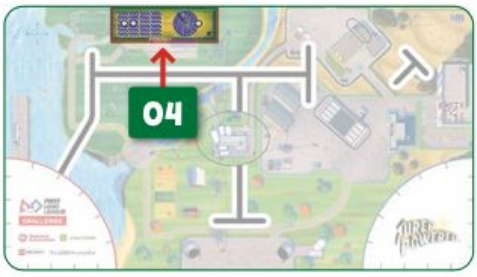
Mission 04 SOLAR FARM



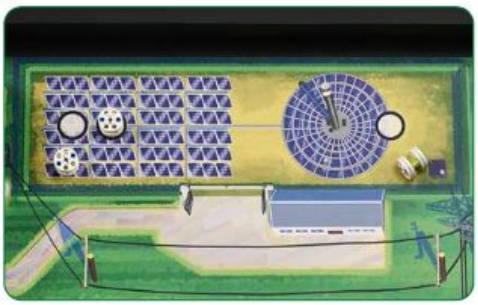


Solar energy can be stored using new concentrating solar power technologies and then used to generate electricity.

Start the distribution of the energy units by moving them off their positions on the mat.

- If an energy unit has been completely removed from its starting circle: **5 EACH**
- Bonus: If all three energy units have been completely removed from their starting circles: **5 ADDED**

5



5 + 5

5 + 5 + 5 + 5

How can we solve this mission?

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Mission 05 SMART GRID

Smart grids use electricity generated from all the different energy sources and distribute it to the consumer where and when it is needed.

Raise your field's orange connector to complete the smart grid connection with the opposite field.

- If your field's orange connector is completely raised: **20**
- Bonus: If both teams' orange connectors are completely raised: **10 ADDED**

The smart grid model may not be touching team equipment at the end of the match.

0

20

20 + 10

How can we solve this mission?

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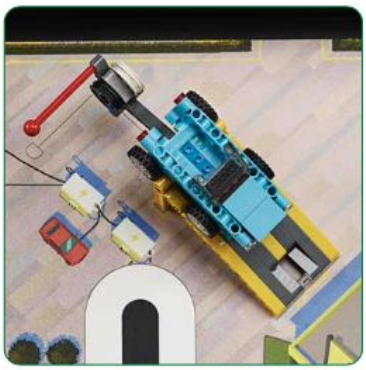
Mission 06 HYBRID CAR

Hybrid cars use a combination of energy sources and can recharge or refuel at the fueling station.

Recharge the hybrid car by inserting the hybrid unit into the car.

- If the hybrid car is no longer touching the ramp: **10**
- If the hybrid unit is in the hybrid car: **10**



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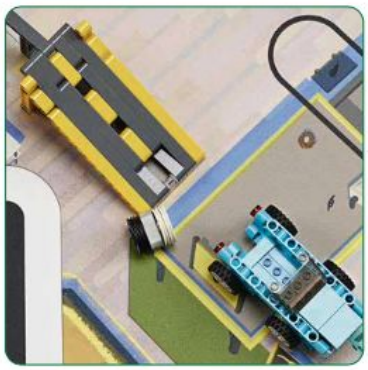

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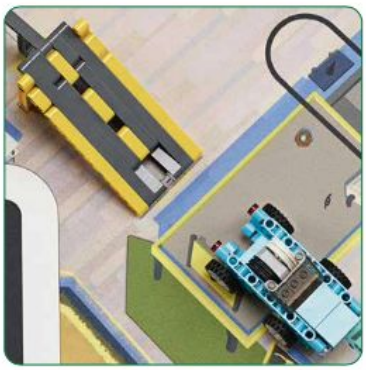

10 + 10

How can we solve this mission?

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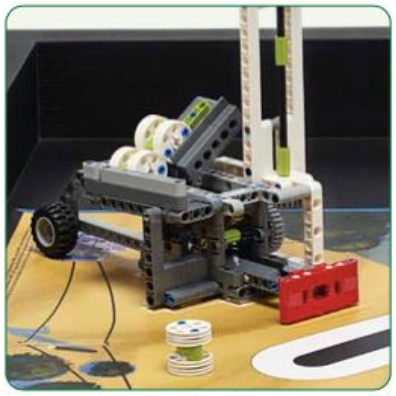
Mission 07 WIND TURBINE

Renewable energy from the wind is used to turn the turbine blades and generate electricity.

Release the energy units from the wind turbine.

- If an energy unit is no longer touching the wind turbine: **10 EACH**



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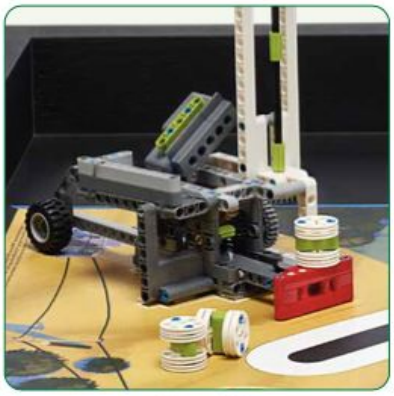
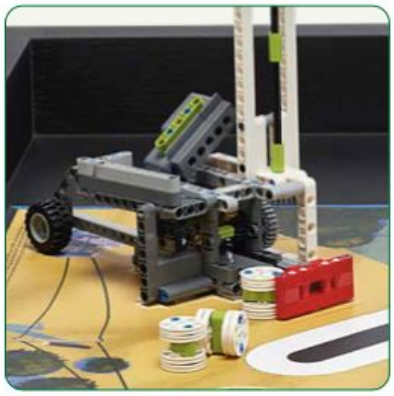


10 + 10



10 + 10

How can we solve this mission?

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Mission 08 WATCH TELEVISION

Energy consumption in our homes is part of everyday life, such as watching the television.

Raise the television screen and move the energy unit to the television slot.

- If the television is completely raised: **10**
- If an energy unit is completely in the green television slot: **10**

The watch television model and the energy unit in the green television slot may not be touching team equipment at the end of the match.

10

10

10 + 10

How can we solve this mission?

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Mission 09 DINOSAUR TOY

Electronic devices like toys require energy to work. Rechargeable batteries are a more sustainable choice than disposable batteries.

Insert an energy unit or a rechargeable battery into the dinosaur toy to make it work.

- If the dinosaur toy is completely in the left home area: **10**
- If the dinosaur toy lid is completely closed:
  - And there is an energy unit inside: **10**
  - Or there is a rechargeable battery inside: **20**

10
(Empty)

20
(Rechargeable battery inside)

10
(Energy unit inside)

How can we solve this mission?

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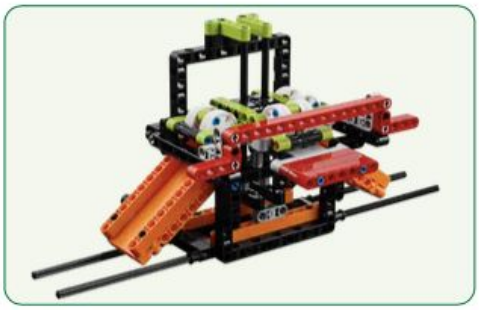
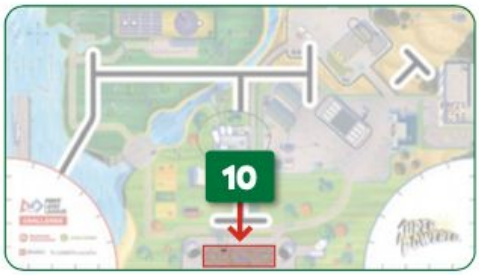
Mission 10 POWER PLANT

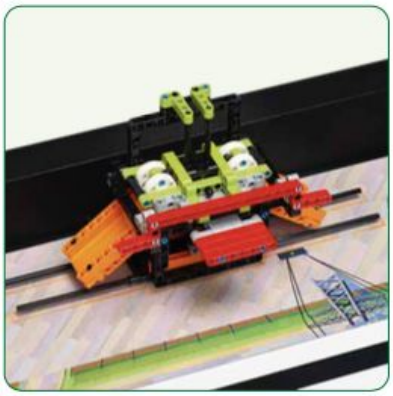




Demand for energy is very high, and many different energy sources can be used to meet that demand.

Release the three energy units from the power plant.

- If an energy unit is no longer touching the power plant: **5 EACH**
- Bonus: If all three energy units are no longer touching the power plant: **10 ADDED**



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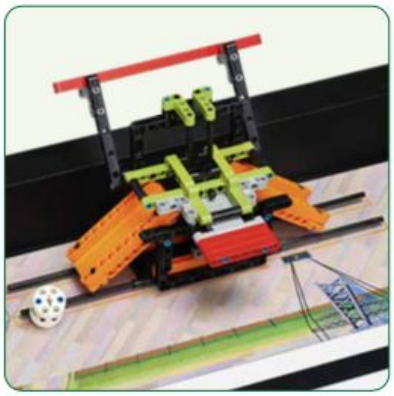
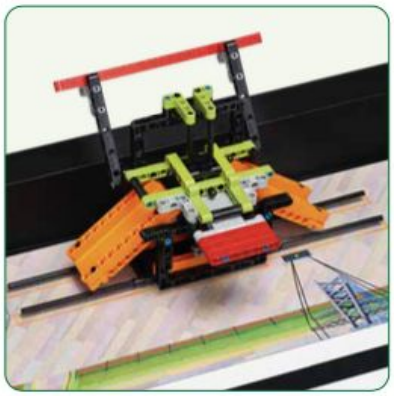


5 + 5



5 + 5 + 5 + 10

How can we solve this mission?

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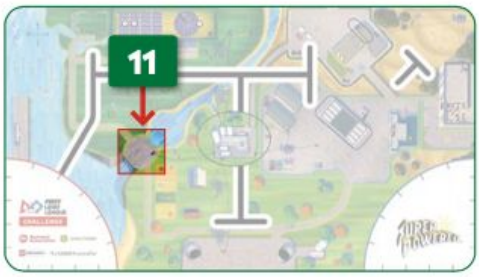
Mission 11 HYDROELECTRIC DAM



Water released from the reservoir turns the turbine wheel to generate electricity.

Send the water unit from the top of the hydroelectric dam into the turbine wheel to release the energy unit.

- If the energy unit is no longer touching the hydroelectric dam: **20**

0

0

20

How can we solve this mission?

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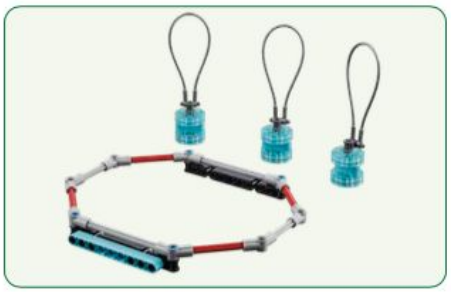
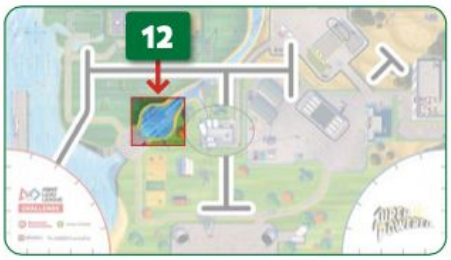
Mission 12 WATER RESERVOIR



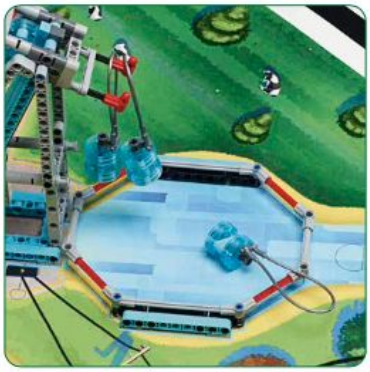


Water from the river above the dam is stored in the reservoir. Water from lower down the river can also be pumped back up to fill the reservoir at times when there is excess electricity to use.

Place the looped water units from the river above and below the dam into the water reservoir or onto the red hooks.

- If a looped water unit is completely in the water reservoir, touching the mat: **5 EACH**
- If a looped water unit is placed on a single red hook: **10 EACH HOOK**

The loop on the looped water unit may extend out of the water reservoir.
Looped water units in the water reservoir or on red hooks may not be touching team equipment at the end of the match.



5 + 10

5 + 10

5 + 10

How can we solve this mission?

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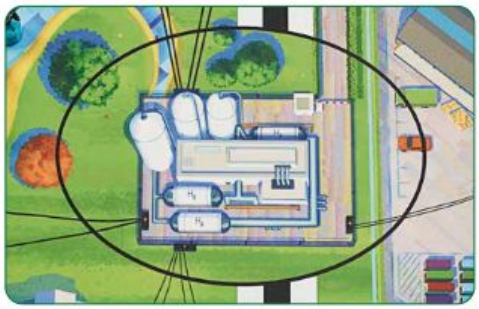
Mission 13 POWER-TO-X



Surplus renewable energy can be used to convert water into hydrogen gas that can be stored in tanks until it is needed.

Deliver energy units to the hydrogen plant target area.

- If an energy unit is completely in the hydrogen plant target area (max of three): **5 EACH**

5 + 5

5 + 5 + 5

5 + 5 + 5

How can we solve this mission?

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Mission 14 TOY FACTORY

Factories use large amounts of energy to make the products we use such as toys.

Deliver energy units to the toy factory bin and release the mini dinosaur toy.

- If an energy unit is at least partly in the slot in the back of the toy factory (or in the red hopper) (max of three): **5 EACH**
- If the mini dinosaur toy has been released: **10**

Energy units stored in the toy factory may not be touching team equipment at the end of the match.

5 + 5

5 + 5 + 5

5 + 5 + 5 + 10

How can we solve this mission?

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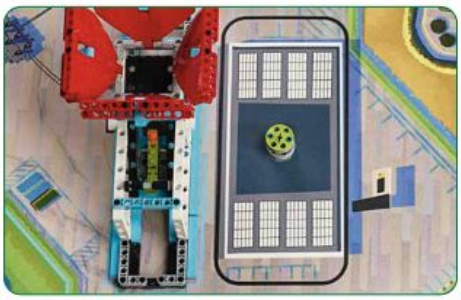
Mission 15 RECHARGEABLE BATTERY

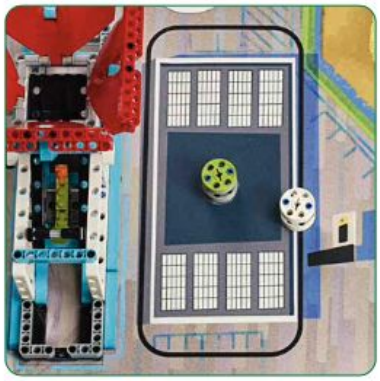


Power can be stored in batteries, but it takes a lot of energy to produce them.

Deliver energy units to the rechargeable battery target area.

• If an energy unit is completely in the rechargeable battery target area (max of three): **5 EACH**

The rechargeable battery is not an energy unit.
Energy units stored in the rechargeable battery target area may not be touching team equipment at the end of the match.



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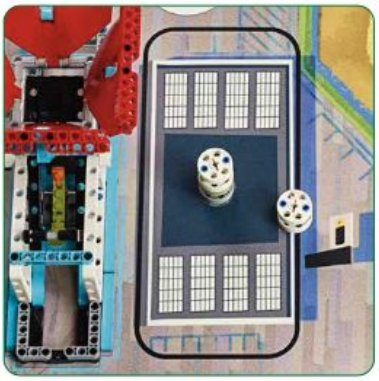

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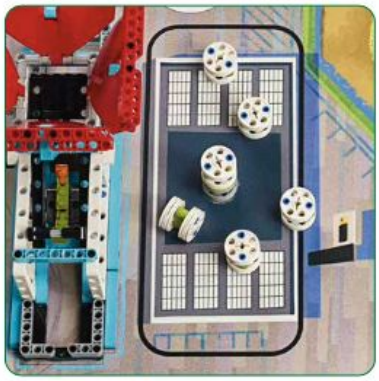

5 + 5 + 5

How can we solve this mission?

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PRECISION TOKENS

You begin the match with six precision tokens worth 50 free points. The referee holds onto them. If you interrupt the robot outside of home, the referee removes one token. You keep points for the number of remaining tokens at the end of the match. If the number remaining is:
1: 10, 2: 15, 3: 25, 4: 35, 5: 50, 6: 50

(See Rules, Outside Home 1 and 2)

How do we keep our free points?

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