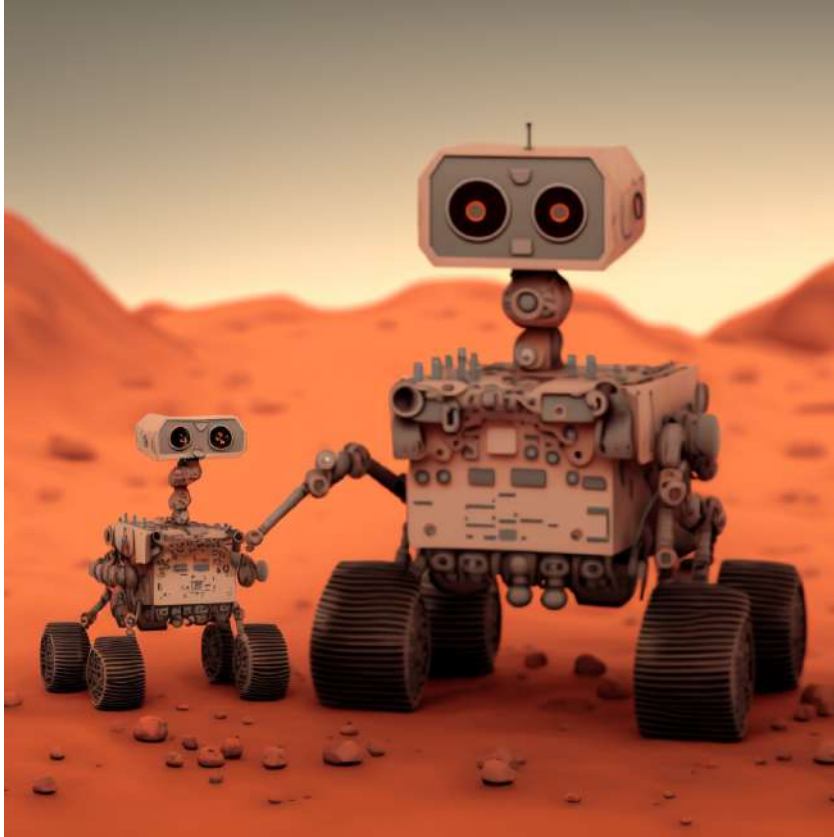


**Anatolian Rover Challenge  
Junior 2023**



## Version Information

This file is the ARC Jr. Manual v.3 released on 06.03.2023.  
Written by the ARC Committee. Digitally distributed.

## Information Channels and Contacts

The Anatolian Rover Challenge website is the main source of information about the event.

**ARC Website:** [www.anatolianrover.space](http://www.anatolianrover.space)

**ARC Mail Adress:** [contact@anatolianrover.space](mailto:contact@anatolianrover.space)

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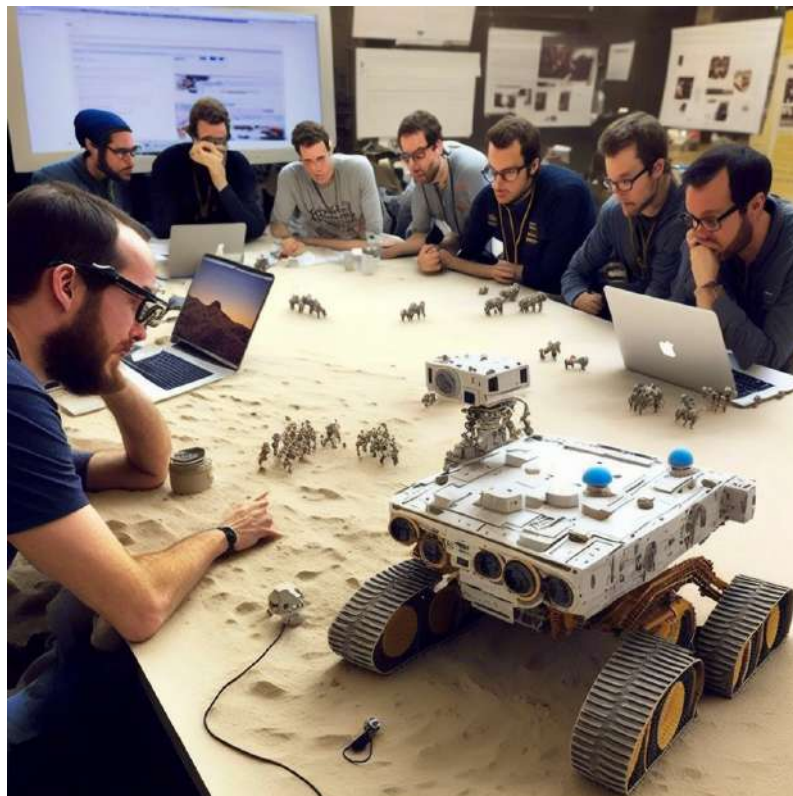
## 1. Calendar

An up-to-date calendar of the challenge and important dates are shown in the table below.

<b>Date</b>	<b>Event</b>
09.01.2023	ARCJr'23 Manual V1
06.03.2023	ARCJr'23 Manual V3
15.03.3023	Applications Start
15.07.2023	Applications End
16.07.2023	Announcement of Finalists
19.07.2023	Online Check-in and Timetable Announcement
20.07.2023	Delivery Challenge
21.07.2023	Excavation Challenge
22.07.2023	Climbing Challenge

## 2. Introduction

The **Anatolian Rover Challenge Junior** is a competition for small **desktop rovers** open to participants of any nationality and age. Participants will submit a photo of their "planet exploration rover," or **desktop rover**, on the website to qualify. Finalist **desktop rovers** will be chosen based on readiness and announced prior to the event. During the finals, held on a special challenge field, **desktop rovers** will complete various tasks in different challenge scenarios. Points will be awarded by judges according to the ARC Junior Manual, and prizes will be given to the top teams at the end of the challenge day. The ARC Junior event provides an opportunity for individuals to showcase their ability to solve complex engineering and scientific problems through the design, manufacturing, and equipping of their vehicles. The competition is organized by Space Exploration Society, UKET. Anatolian Rover Challenge (ARC), a member of World Rover League (WRL), is a UKET project. UKET also is the producer of International Rover Design Competition (IRDC) and New World Design Competition.





## 3. General Rules

The general rules are listed below:

1. The challenge will take place in July 2023 as part of ARC'23, organized by the **ARC Organizing Committee, a subcommittee of the Space Exploration Society (UKET)**, a non-profit organization which is established to contribute to space studies in Türkiye.
2. **Desktop Rover** is a small unmanned ground vehicle that is remotely controlled or autonomous.
3. Only one **desktop rover** per challenge is allowed to participate. The competition is open to all nationalities and all ages. Participants submit their application through the website to qualify for the competition.
4. The challenge will take place on a simulated lunar or Martian surface, approximately 3 meters long and 1.5 meters wide, with loose soil and potentially cratered or sloped sections.
5. **Desktop rovers** must be designed to withstand local climate and conditions, including gravel, loose or hardened soil, and fine particle sand.
6. The size of the **desktop rover** must fit within a 30x30x30 centimeter cube at the start of the task, and be able to fit within a 40x40 centimeter area around the target to be considered successful.
7. Wireless communication, including sound or radio waves, is allowed for control of the **desktop rover**, with the participant standing within a few meters of the rover and maintaining visual contact.
8. The deadline for the event and specific challenge times will be announced by the Organizing Committee after online check-in. The challenge schedule may be subject to change at the discretion of the Supreme Board of Jury.
9. Applications must be submitted electronically through the online application system on [anatolianrover.space](http://anatolianrover.space). Any changes to application information must be reported to the Organizing Committee. Questions can be answered through website chat.
10. Teams may be disqualified for serious violations of the rules, specifications, or safety regulations, and may file an objection to the Supreme Board of Jury through an objection form on the website.
11. The top teams will be awarded at the end of each day, with a certificate of participation given to all on-site participants.
12. The Organizing Committee is not responsible for any damage to hardware or software during the challenge.
13. In all challenges, **desktop rovers** must return to the start location to end their task. If there is a tie in points earned, the team that finished earlier will be declared the winner.
14. Teams must adhere to any changes or updates to the rules as specified on the challenge website.



## 4. Challenges

There will be three separate challenges held over the course of three days. Each challenge will be evaluated independently at the end of the day, with an award ceremony to follow. Participation in all challenges is not required.

### 4.1. Delivery Challenge

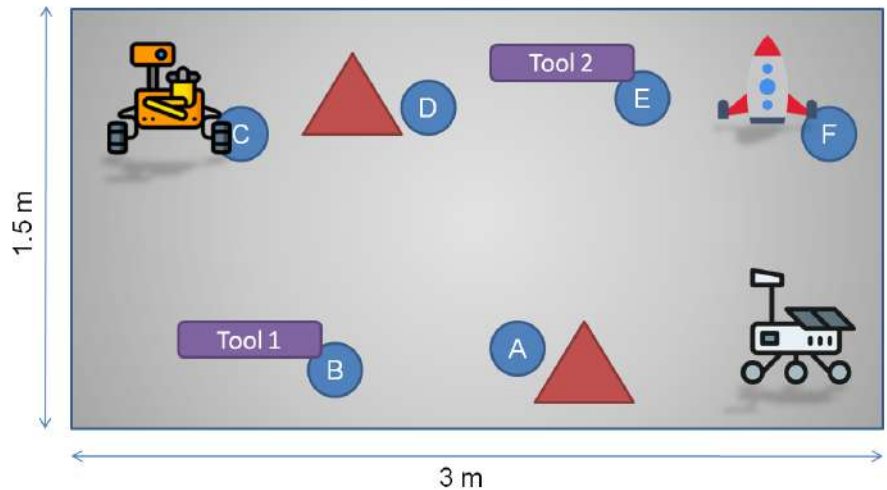
**Time Limit:** 15 minutes

**Challenge Field:** Moon Field

**Purpose of the task:** Bring tools to the rover and carry samples to the rocket.

**Scenario:** It's 2030 and the sample collecting rover on the lunar surface has experienced a mechanical error in the "sample acquisition system." The rocket is set to take off in two hours and the astronauts

need the samples for their research, but it will take at least an hour for them to arrive from the Moon base. The desktop rover must repair the rover by delivering wrenches and a replacement part to two different locations and bring the ready sample to the rocket, avoiding the rocky terrain as it goes. Can the desktop rover repair the mechanical error and deliver the samples in time?



#### 4.1.1. Task

1. The **desktop rover** starts at the designated starting point and makes its way to point A, navigating around the first obstacle.
2. Then the **desktop rover** reaches point B and retrieves Tool 1.
3. The **desktop rover** delivers Tool 1 to the broken rover at point C.
4. The **desktop rover** reaches point D, overcoming the second obstacle along the way.
5. Then the **desktop rover** reaches point E and takes Tool 2.
6. The **desktop rover** delivers the tool taken from point E to point C.
7. The **desktop rover** picks up the sample cup from point C and delivers it to point F.

Note: A team will be considered to have successfully picked up a tool when the entire tool has been removed from its designated original area. A team will be considered to have reached a destination when the entire rover is within the designated target area.

#### 4.1.2. Score Table

Delivery Challenge will be scored according to the table below.

No	Score Parameter	Explanation	Challenge Score
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1.1	1st obstacle	<b>Desktop rover</b> starts from the starting point and reaches point A.	10
1.2	Taking the Tool 1	<b>Desktop rover</b> picks up Tool 1 from point B.	15
2	Delivery to rover	Delivers the Tool 1 to the broken rover at point C.	15
3.1	2nd obstacle	The <b>desktop rover</b> reaches to point D.	10
3.2	Taking the Tool 2	The <b>desktop rover</b> picks Tool 2 from point E.	15
4	Delivery to rover	The <b>desktop rover</b> delivers Tool 2 to the rover at point C.	15
5	Take the sample	<b>Desktop rover</b> takes the sample cup from the broken rover.	15
6	Delivery to the rocket	Drops the sample onto the rocket at point F.	20
7	Time Bonus	Two points for every unused minute upon completion of all steps and return to base.	up to 30
8	Desktop rover design bonus	The score will be added to the teams that pay attention to the external design of the desktop rover.	5

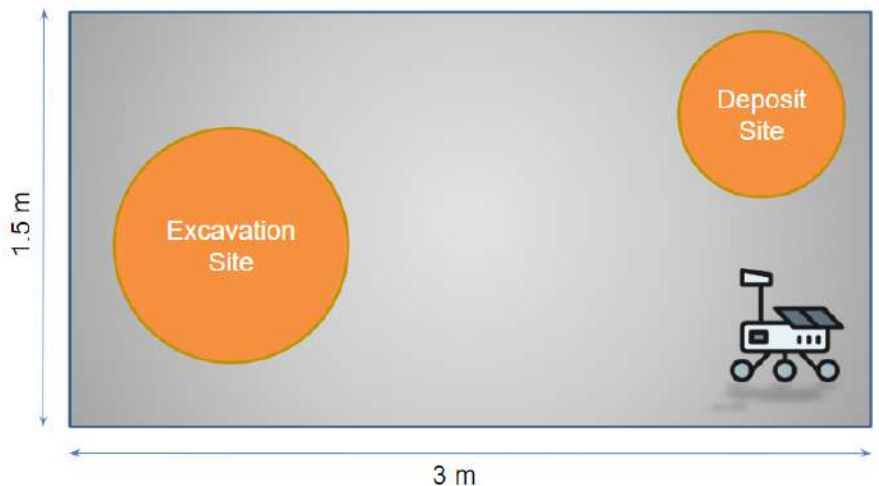
## 4.2. Excavation Challenge

**Time Limit:** 10 minutes

**Challenge Field:** Moon Field-Circular radius of excavation area 30 cm

**The purpose of the task:** **Desktop rover** should quickly dig the soil in the designated area and drop it into the designated container.

**Scenario:** As the world's population grows, our resources are becoming scarce. In 2023, it is estimated that humanity will have exhausted our resources nearly 150 days before the end of the year. However, space mining may offer a solution. The moon's surface is believed to be rich in helium-3 isotopes, which can fuel nuclear fusion reactors and provide energy for Earth for thousands of years. To extract these resources, advanced desktop rovers have been deployed to the lunar surface. Your mission is to collect as much soil as possible from a designated mining area and deliver it to the moon base for analysis. Navigate the rocky lunar terrain with care, avoiding damage to the rovers or loss of soil samples. Help the team at the moon base determine the potential of space mining to solve the resource crisis on Earth.



### 4.2.1. Task



1. The **desktop rover** begins at the designated starting point and navigates to the designated excavation area at point A.
2. Within the allotted time, the **desktop rover** collects soil samples from the excavation area and deposits them into the provided sample container.
3. Repeats this process as necessary.

Note: The objective of this competition is to collect as much soil as possible within the given time. Rovers will be ranked based on their soil collection efficiency. The surface soil will be composed of fine, loose particles similar to the dust found on the Moon.

### 4.2.2. Score Table

Excavation Challenge will be scored according to the table below.

No	Score Parameter	Explanation	Challenge Score
1	Amount of soil	Desktop rovers will be evaluated based on their ability to collect regolith, with each gram earning one point.	Unlimited
2	Desktop rover design bonus	The score will be added to the teams that pay attention to the external design of the desktop rover.	5

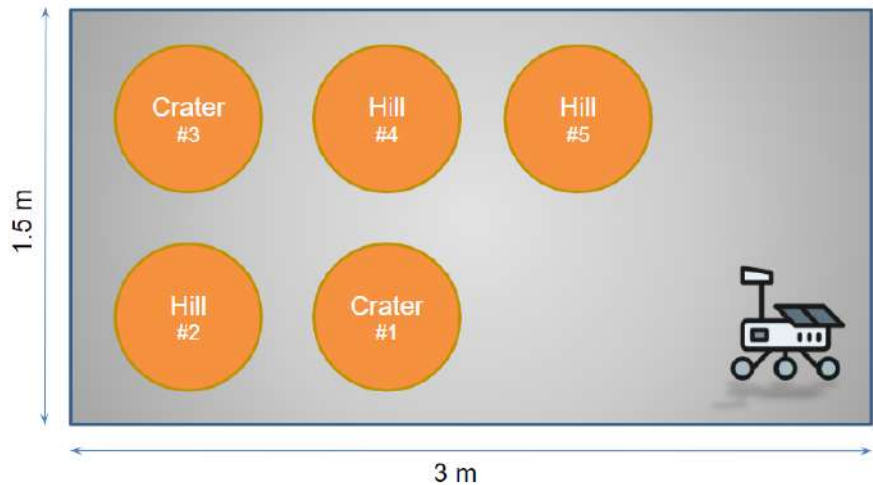
## 4.3. Climbing Challenge

**Time Limit:** 10 minutes

**Challenge Field:** Moon Field

**The purpose of the task:** The rover will traverse challenging terrain to explore the surrounding.

**Scenario:** The desktop rover is on a mission to explore the moon's underground water reserves, using advanced handling and climbing abilities to navigate through steep slopes, jagged hills, and deep craters. As it searches for



signs of water on the lunar surface, it faces numerous challenges and obstacles, but its advanced capabilities help it overcome them all. The desktop rover's data and observations will be valuable in understanding the potential of the moon's resources and paving the way for future exploration and colonization. Join us on this exciting journey of discovery as we follow the desktop rover on its quest to unlock the secrets of the cosmos.

### 4.3.1. Task

1. Begin at the designated starting point.
2. Navigate through the terrain, traversing the various hills and craters as needed.
3. Return to the starting point.





Note: The terrain consists of five different elevations, including two craters and three hills. The order in which the rovers tackle these elevations is not important. The objective is simply to successfully navigate through the terrain and return to the starting point.

### 4.3.2. Score Table

Climbing Challenge will be scored according to the table below.

No	Score Parameter	Explanation	Challenge Score
1.1	Climb height	Descend to crater and reach the 1st area (-10cm)	10
1.2		Climbing up the hill and reaching the 2nd area (20cm)	15
1.3		Descend to crater and reach the 3rd area (-30cm)	10
1.4		Climbing up the hill and reaching the 4th area (40 cm)	20
1.5		Climbing up the hill and reaching the 5th area (60 cm)	35
1.6		Return to starting point	10
2	Desktop rover design bonus	The score will be added to the teams that pay attention to the external design of the desktop rover.	5