SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Highly Commended

Programming, Apps & Robotics

Year 5-6

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Pedare Christian College

Mars Rover Mission

Category: Computer Programming and Robotics

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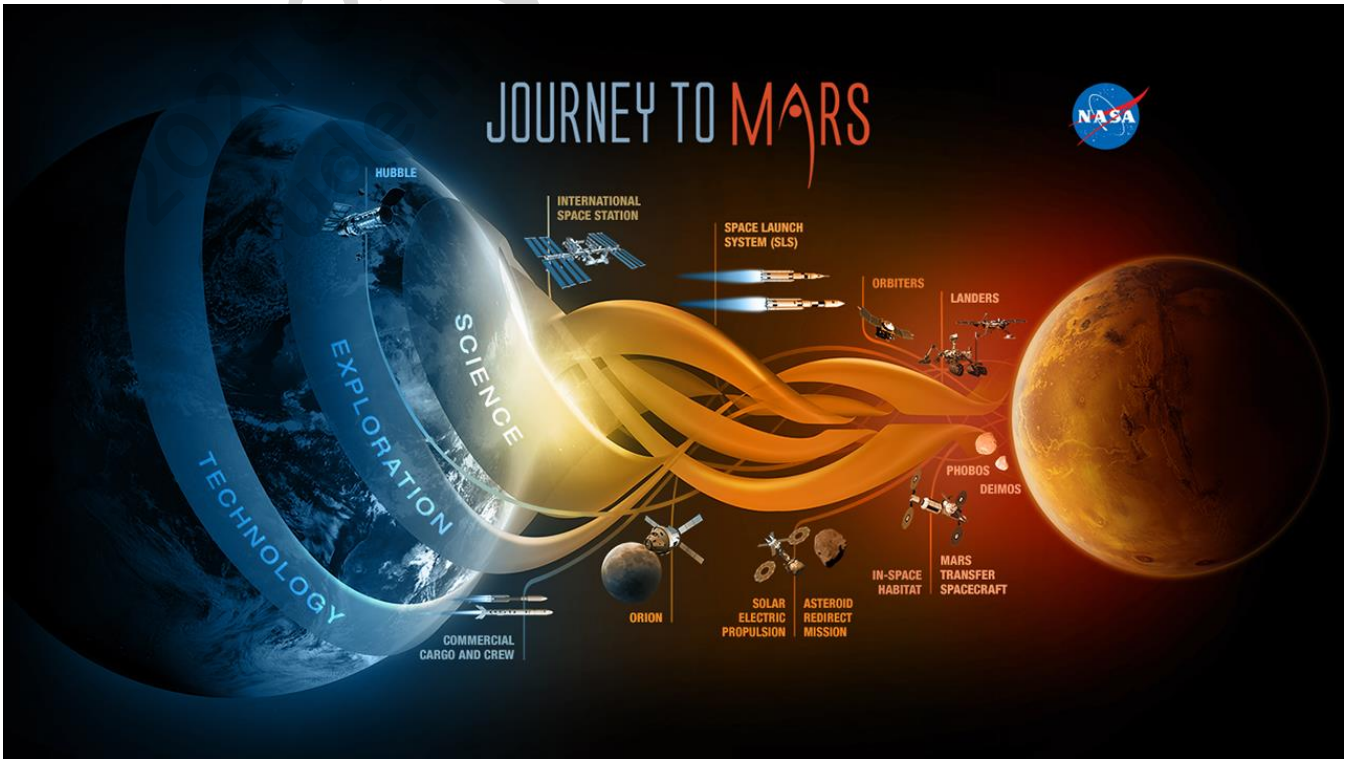


Objective

The objective of this project to create an interactive game to demonstrate the idea of exploring Mars using a Rover. This is an **educational game named "Mars Rover Mission"** and is based on Scratch Programming Language. This game can be used as STEM activity to educate children about Mars exploration program and to learn about Martian rocks. The purpose of this game is to inspire students to think and explore more about the Red Planet –Mars.

A Rover is a space exploration vehicle used for exploring the surface of a planet or moon. It collects information about the terrain, and crust samples such as dust, soil, rocks, and even liquids.

Background Information

Mars is the fourth planet from the Sun and is one of Earth's two closest planetary neighbours. Mars is also referred as the Red Planet. It's red because of rusty iron in the ground.

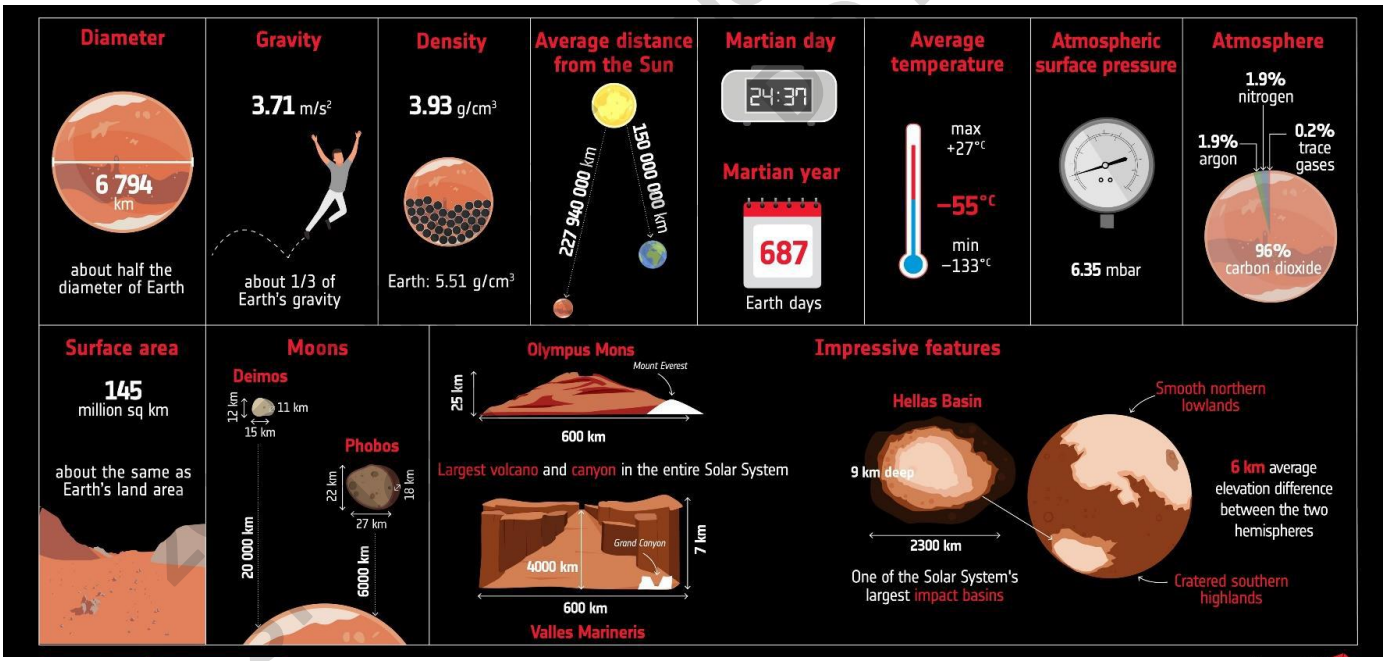


Figure 1: Mars Details

(Source: https://cesar.esa.int/index.php?Section=SSE_Mission_to_MarsI)

As per NASA, "Mars is the most accessible place for life other than on Earth. Mars has mountains, and lake beds, and recognizable landscapes". Planetary scientists can look for signs in rocks, sediments, and soils to learn more about Mars' geological and biological history. The age and composition of different types of rocks on the Martian surface are used by geologists to identify the sequence of events in the history of a planet. The identification of rocks and minerals generated in the presence of water is particularly significant.

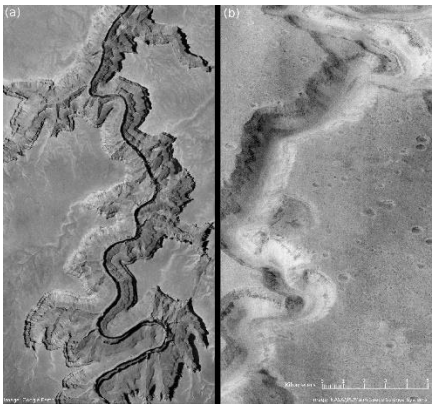


Figure 2: A comparison of Arizona's Grand Canyon, left, with Mars' Nanedi Valles, right.
(Source: https://spaceplace.nasa.gov/water-on-mars/en/)

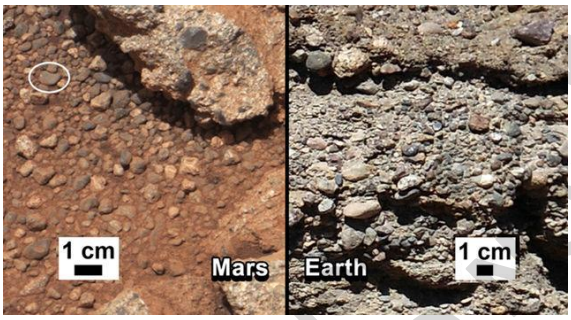


Figure 3: Rock Outcrops on Mars and Earth
(Source: https://www.nasa.gov/mission_pages/msl/multimedia/pia16189.html)

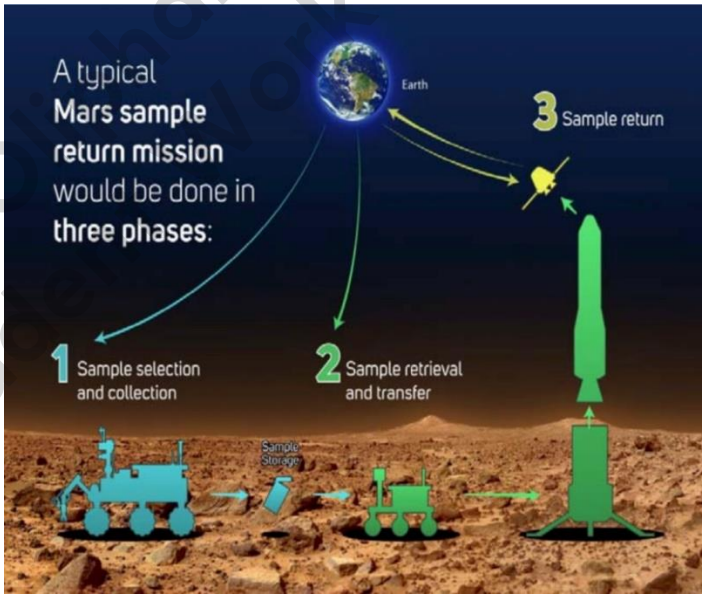


Figure 4: Mars Sample return mission
(Source: https://spaceq.ca/canadensys-wins-mars-sample-fetch-rover-concept-contract/)

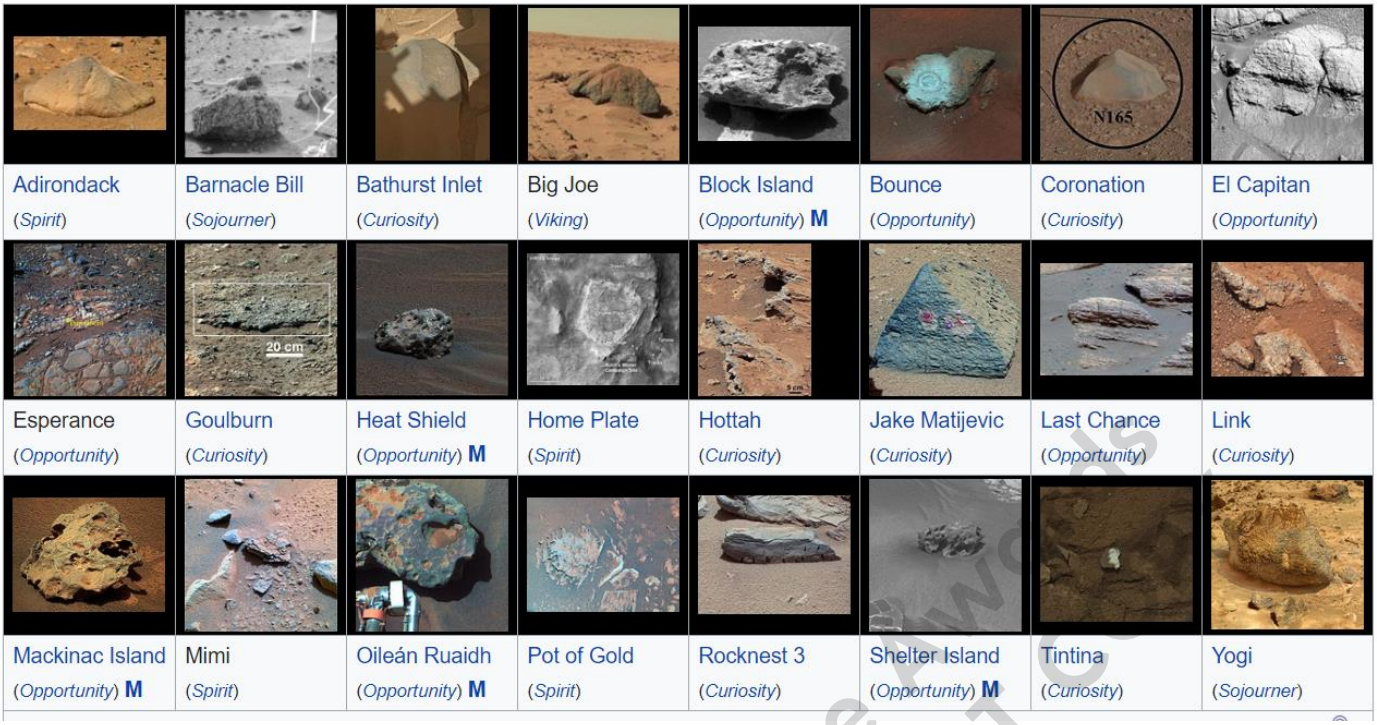


Figure 5: Notable Rocks on Mars
(Source: https://en.wikipedia.org/wiki/List_of_rocks_on_Mars)

Figure 6: Rover Facts
(Source: https://www.jpl.nasa.gov/)

My Project – "Mars Rover Mission"

Game Details

It's the year 2021, and Krishna Space Agency (KSA) has just launched their new rover, "**Determination"**. The Determination has been specially designed for the Mars Mission. Determination has a MOXIE inside its body which is used to turn Mars' carbon dioxide into oxygen. Your job as a scientist is to guide the Determination rover to analyse various rocks/meteorites on Mars' surface. This data will subsequently be relayed to scientists on the ground. Every time you study a new Martian rock, you will get points. Also, some rocks are worth more than others so try and explore as many rocks as possible! You must be careful not to bash into any hazardous rocks. The rover can take 3 blows (lives) before it is destroyed. So make sure that you drive the rover safely. Have fun!

System requirement to run this project:

Scratch is compatible with most modern web browsers and may be used on computers, laptops, and tablets. You can view projects on mobile phones, but you can't create or edit them right now. The following is a list of browsers that are officially supported.

Desktop

- Chrome (63+)
- Edge (15+)
- Firefox (57+)
- Safari (11+)
- Internet Explorer is NOT supported.

Tablet

- Mobile Chrome (63+)
- Mobile Safari (11+)

Note:

- If your computer doesn't meet these requirements, you can try the Scratch app editor
- If you encounter a WebGL error, try a different browser.
- On tablets, there is currently not a way to use "key pressed" blocks or right-click context menus.

Important keys to use while playing the game

- To start the game: left Click on the play button (displayed on the screen).
- To Move the Determination: Arrow keys on the keyboard.
- To exit the rock information screen press space bar.

There is a **cool book feature** in the game to explore some interesting facts about Mars.

- To open Book about mars: Press Info button ("i" button displayed on the screen).
- To close Book about mars: Press info button ("i" button displayed on the screen).
- To close arrows on the side: Press the cross button ("x" button displayed on the screen).

Instructions to Play the Game

1. Go to https://scratch.mit.edu/projects/550934288/
2. Click on the green play button to run the project.
3. Once you press 'play' button you will see a rocket launch. The rocket will spilt into two pieces, One going back to earth the other dropping off the rover. The rocket will just stop above the atmosphere and then the rover will launch. Once it lands on Martian surface you can start playing.
4. There will be a score button to count up your points as well as a high score and lives button. You will start with 3 lives. Bumping into a hazardous rock will make you lose a life. You can see at the top left corner of the screen number of lives remaining.
5. If you go to a rock then a screen will pop up with rock information, make sure to read it. You will earn points by exploring rocks.
6. You need 100 points to complete the game.

See how many points you get! Learn in a fun way about Mars and notable Martian rocks! Enjoy!

Note: This game can be played by children aged 7 years and above.

My username is coolkrish10 and my email is: krishnaneelam2610@gmail.com in case if you need to contact me.

Reference List

1. Scratch 3.0: https://scratch.mit.edu/
2. Scratch Frequently Asked Questions: https://scratch.mit.edu/info/faq
3. NASA's Mars Exploration Program: https://mars.nasa.gov/
4. NASA Science for Kids - https://spaceplace.nasa.gov/
5. NASA Jet Propulsion Laboratory (JPL) - Robotic Space Exploration: https://www.jpl.nasa.gov/
6. European Space Agency (esa.int): https://www.esa.int/
7. Wikipedia, the free encyclopaedia: https://en.wikipedia.org/
8. I have googled some images for the project.

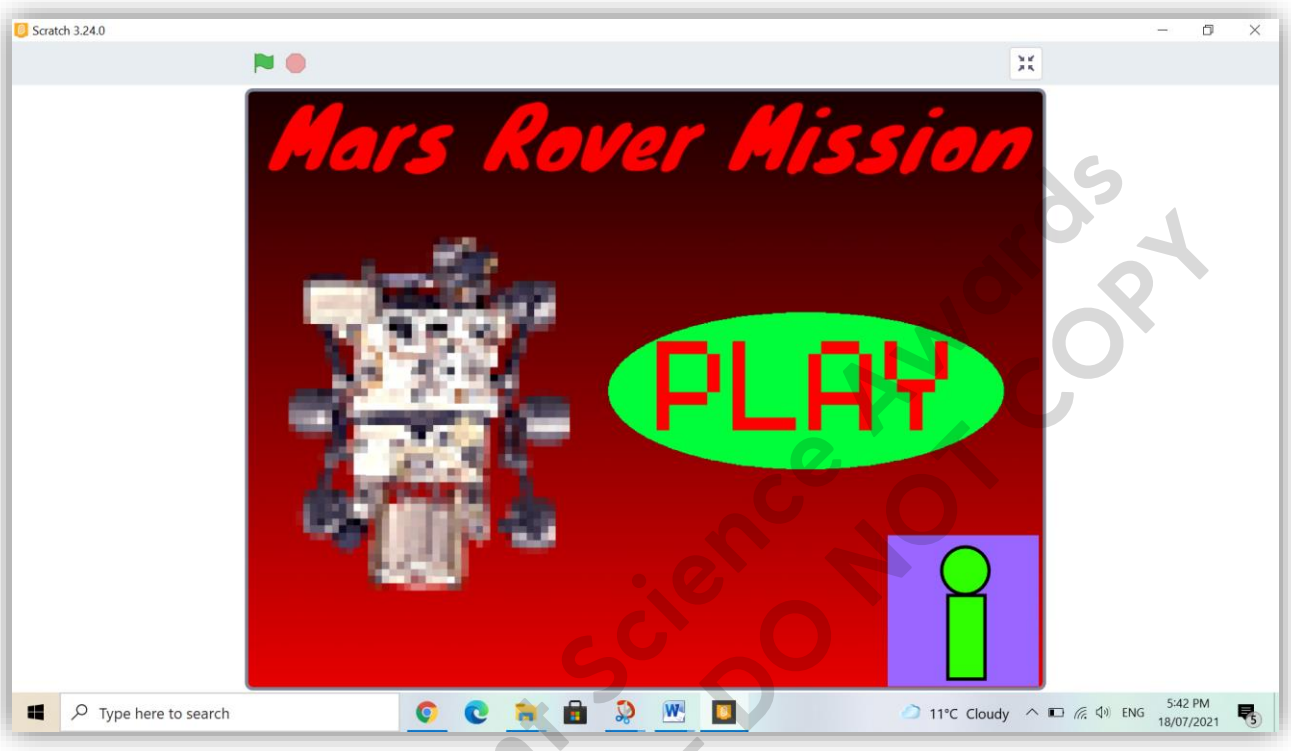
Acknowledgment

- My parents have helped me to edit the writing and formatting in this report.
- I had to do bit of research for some commands to develop the program. Scratch tutorials have been very helpful.

Appendix

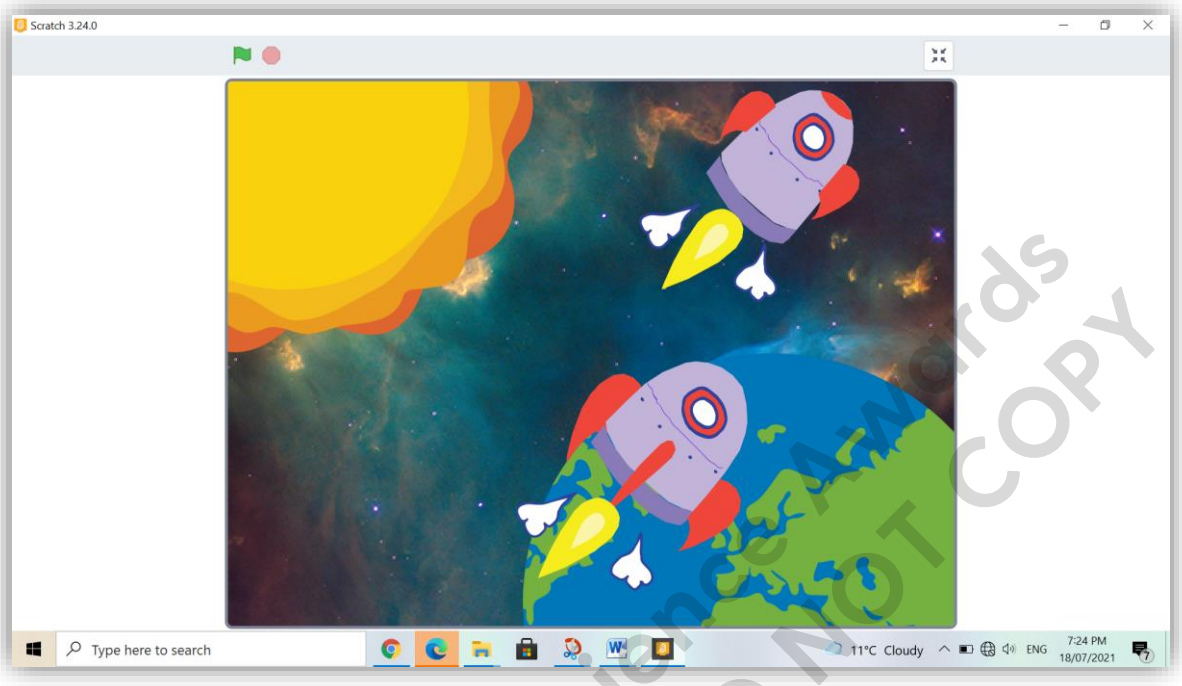
Important screenshots of the code in the program

The screen shot below is the home screen of the project. It shows the rover and the play button.

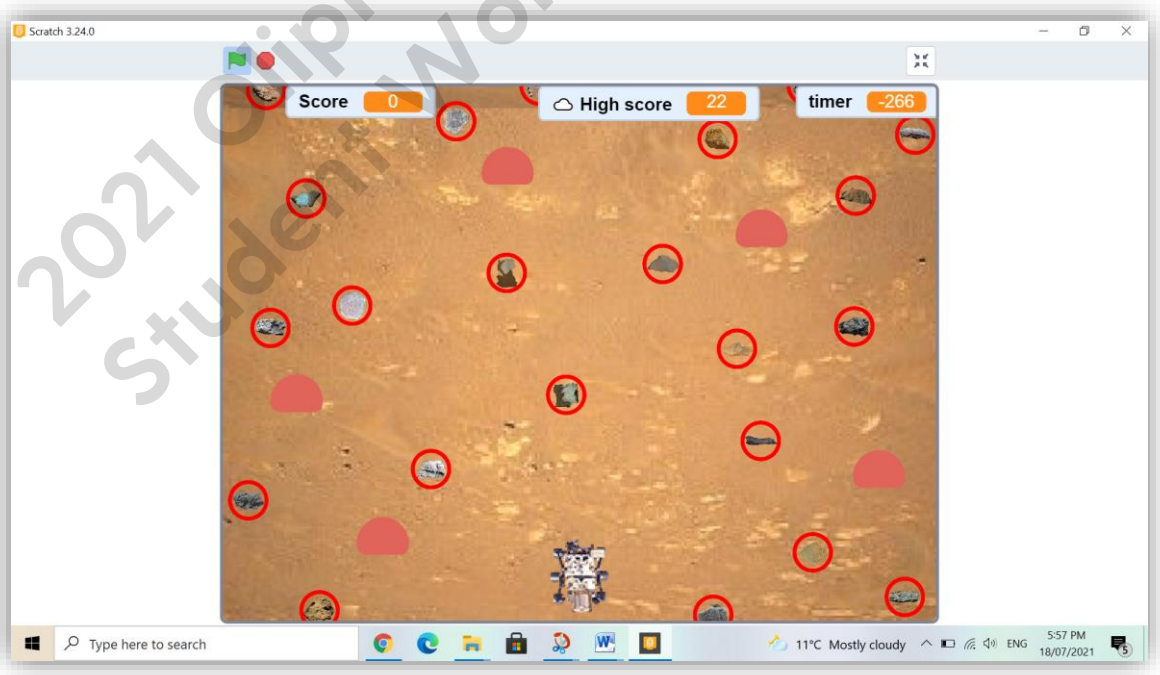


The image below is what the book's cover page looks like. Clicking the big "i" - information button will take you to this page. The two arrows at the bottom will help you switch pages. Clicking the cross will close the book.

Once you press 'play' button you will see a rocket launch. The rocket will spilt into two pieces, Image below shows what it looks like when the rocket splits into 2 parts. One part is going back to Earth the other part is dropping off the rover on the surface of Mars.



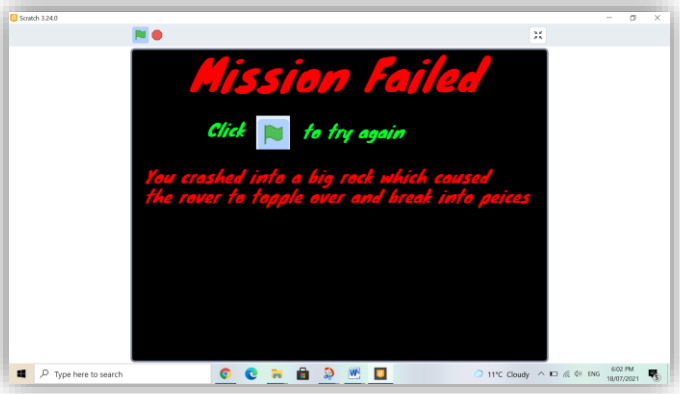
Screen below shows what it will look like once you have arrived on Martian surface. On the top of the screen there is a score button to count up your points, high score to show the highest score achieved yet and lives button to show the number of lives remaining. You will start with 3 lives. Bumping into a hazardous rock will make you lose a life.



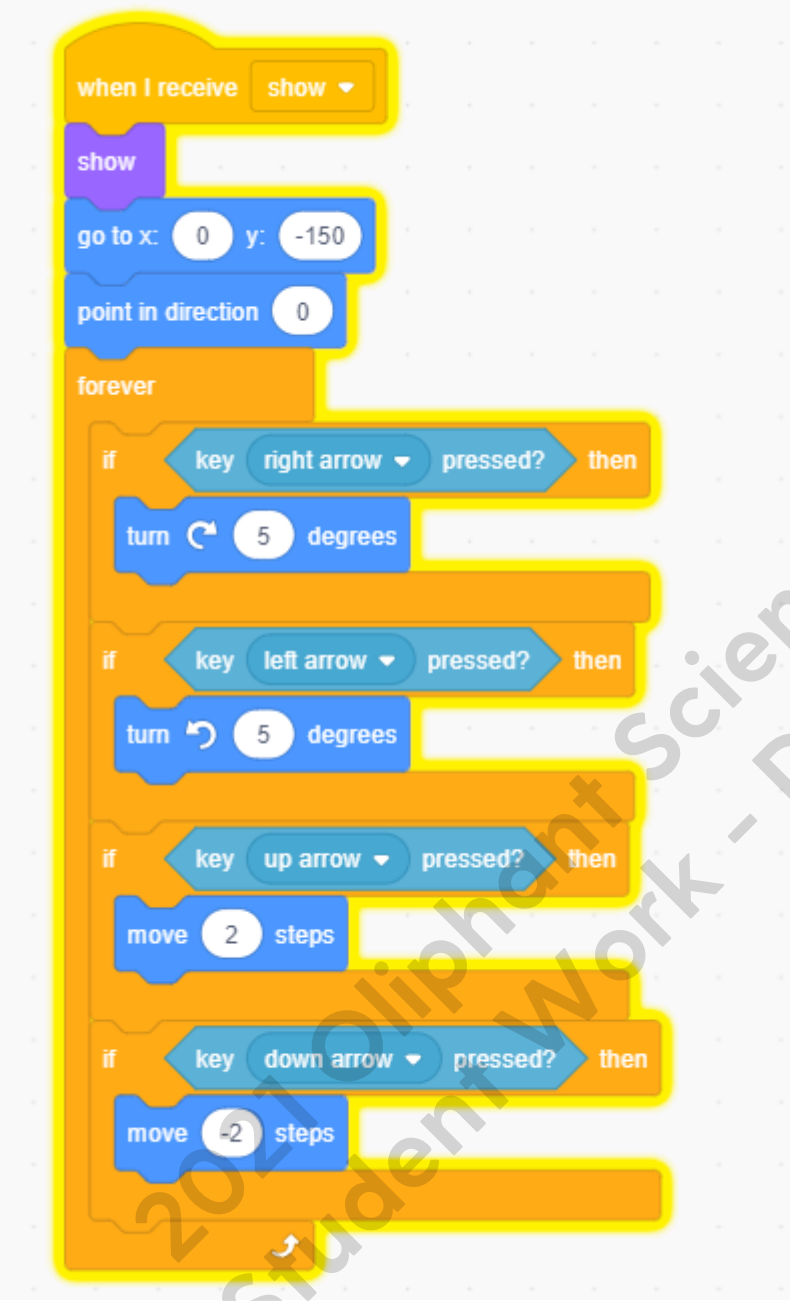
If you go to a rock then a screen will pop up with rock information as shown in the image below. You will earn points by exploring rocks.

See the image below. This is what is will look like if you complete the game.

If you lose all 3 lives before you explore all the rocks it means you did not complete the game, so the following screen will appear.



Important Codes



ROVER CODE

This is the code I used to make the rover move around.

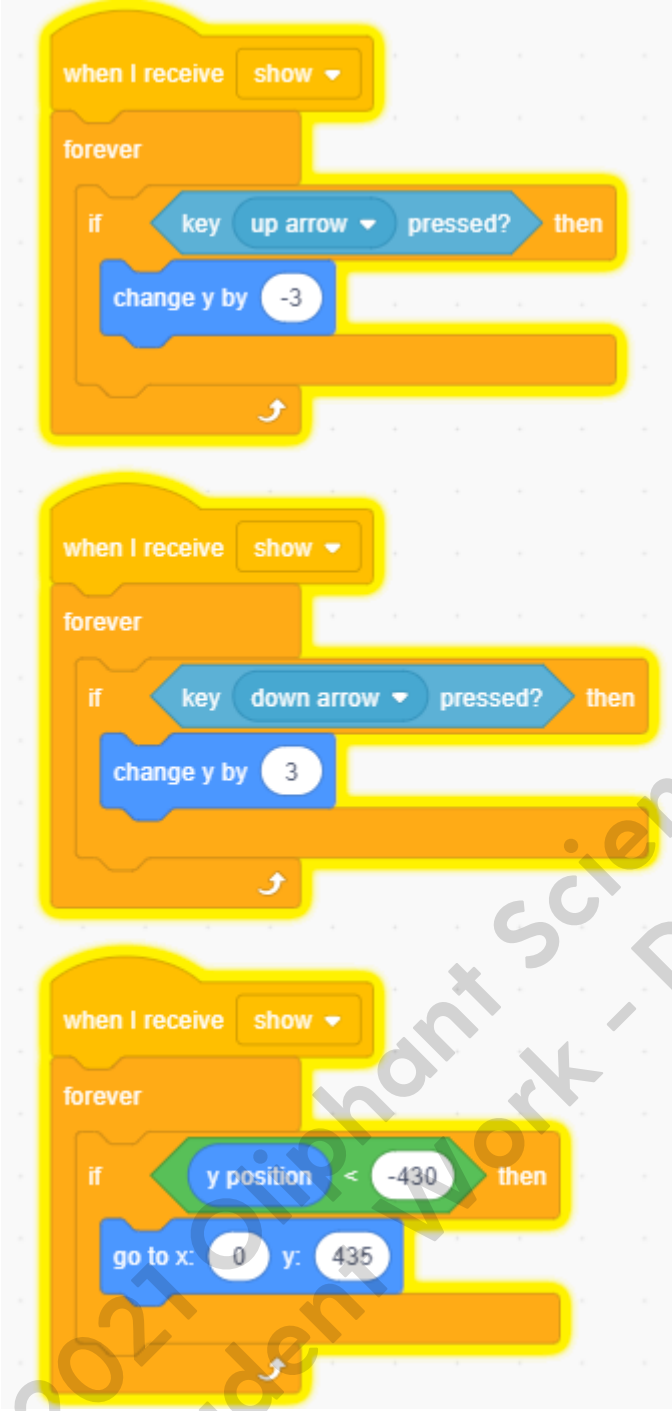
IF THEN Statements are very useful because you can make something happen if something else happens

eg: if key up arrow press the move to steps.

The change degrees block is also very useful if you want your character to point in a certain angle.

The show and hide blocks will make your character show or hide.

The move ___ steps block will make the sprite move a certain amount of steps.



BACK GROUND SCROLL

This is the code I used to make the back ground scroll

The blocks I used were:

When I receive block

In scratch you can broadcast messages. This block is use to receive messages and then do something.

Forever Block

This block will make the code keep going until the stop button is pressed.

Greater Than or Less Than block

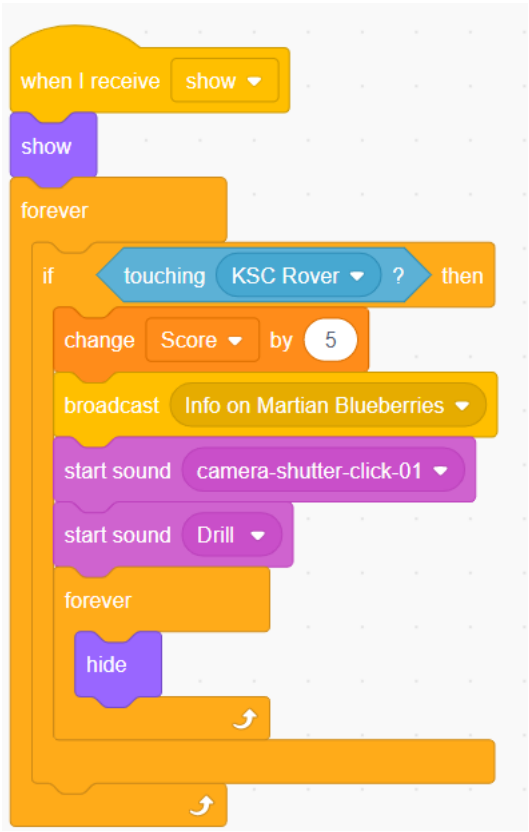
This block will check whether something is greater or less than something else.

Change Y by Block

This block will change the y position of the sprite (Sprites are character in scratch).

Go to X: ___ Y: ___ Block

This block will make the sprite go to certain co-ordinates.



ROCKS AND METEORITES

This is the code I used for my rocks and meteorites.

The blocks I used were:

Change score block

You can make variables in scratch. Once you have created a variable, a few blocks will pop up that you can use. One of which is the change – Your variable – by –how much you want.

Start Sound block

This block will play a sound that you can choose from the sound library or download a sound.

OBSTACLES.

This is the code I used for the obstacles.

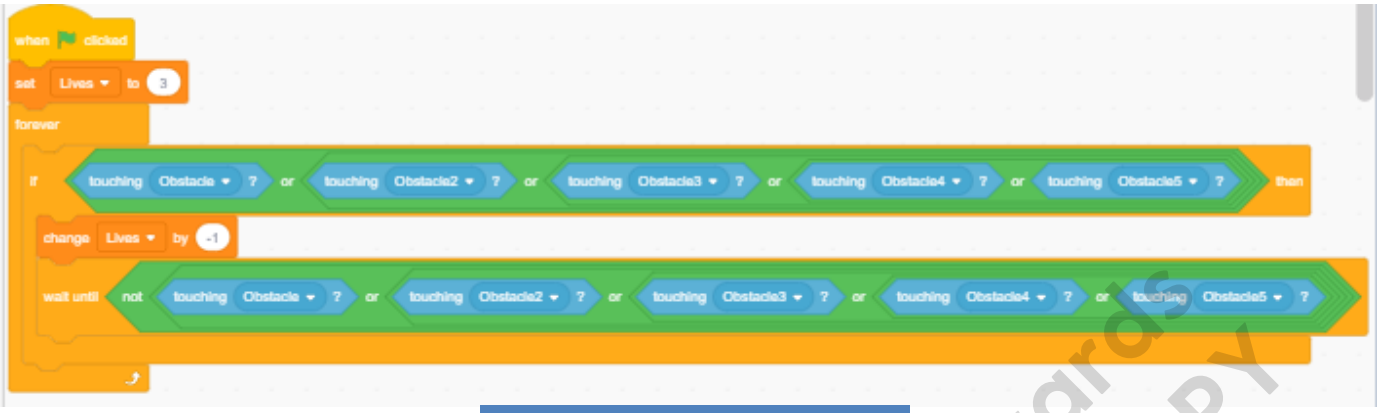
The blocks I used were:

Stop all block

This will cause everything to stop.

Equal to block

This block will check whether something is equal to something else.



LIVES

This is the code for the lives.

Some of the blocks I have used were:

If Touching Block:

This block can be used in case if you want to check whether something is touching something else.

Wait Until Block:

This is the block to use if you want something to wait until something else happens.

Green Flag Clicked Block:

This block will come in handy when you want something to happen when the green flag is clicked.

BOOK

This is the code I used for the book

Some of the blocks I used were:

Go to front or back layer block

This block will cause the sprite to go in front of all sprites or behind all sprites.

Switch Costume block

In scratch there are different costumes for a sprite. This block allows you to change the costume in the sprit