Computer Programming, Apps & Robotics

Year 5-6

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Solar System Simulation

AIM

The aim of this project is to create an interactive simulation of the planets orbiting the sun using Scratch. This project can be used in the educational department, and as a STEM activity. Children will learn the solar system, how the planets orbit, the planet's size and speed (not to scale).

A simulation is an approximate imitation of the operation of a process or system that represents its operation over time.

"Our solar system consists of our star, the Sun, and everything bound to it by gravity — the planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune, dwarf planets such as Pluto, dozens of moons and millions of asteroids, comets and meteoroids."

Ref: https://solarsystem.nasa.gov/solar-system/our-solar-system/overview/

The Size of the Seven Planets:

According to NASA, this is the estimated radii of the eight planets in our solar system, in order of size. Jupiter (69,911 km / 43,441 miles) – 1,120% the size of Earth

- Saturn (58,232 km / 36,184 miles) – 945% the size of Earth

- Uranus (25,362 km / 15,759 miles) – 400% the size of Earth

- Neptune (24,622 km / 15,299 miles) – 388% the size of Earth

- Earth (6,371 km / 3,959 miles)

- Venus (6,052 km / 3,761 miles) – 95% the size of Earth

- Mars (3,390 km / 2,460 miles) – 53% the size of Earth

- Mercury (2,440 km / 1,516 miles) – 38% the size of Earth

Ref: https://www.universetoday.com/36649/planets-in-order-of-size/amp/
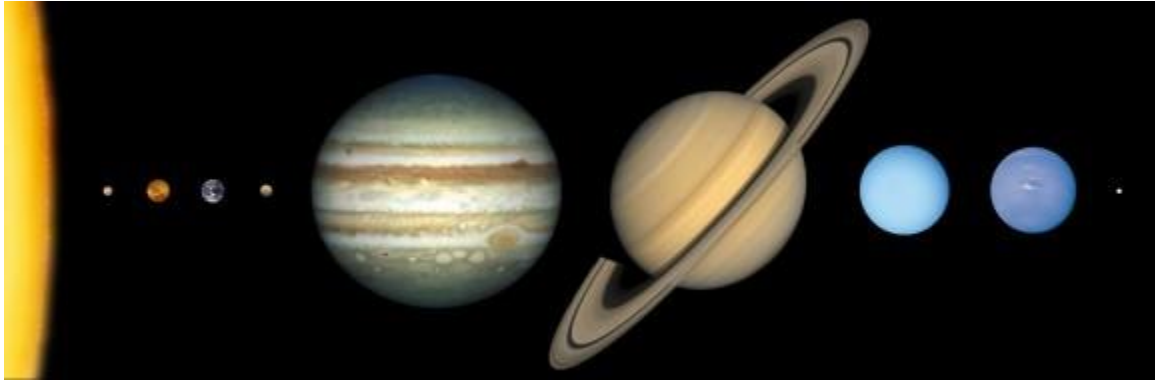
How Fast Do The Planets Orbit The Sun?

Mercury: 47.87 km/s (107,082 miles per hour), or a period of about 87.97 days

Venus: 35.02 km/s (78,337 miles per hour), or a period of about 224.7 days

Earth: 29.78 km/s (66,615 miles per hour), or a period of about 365.256365 days

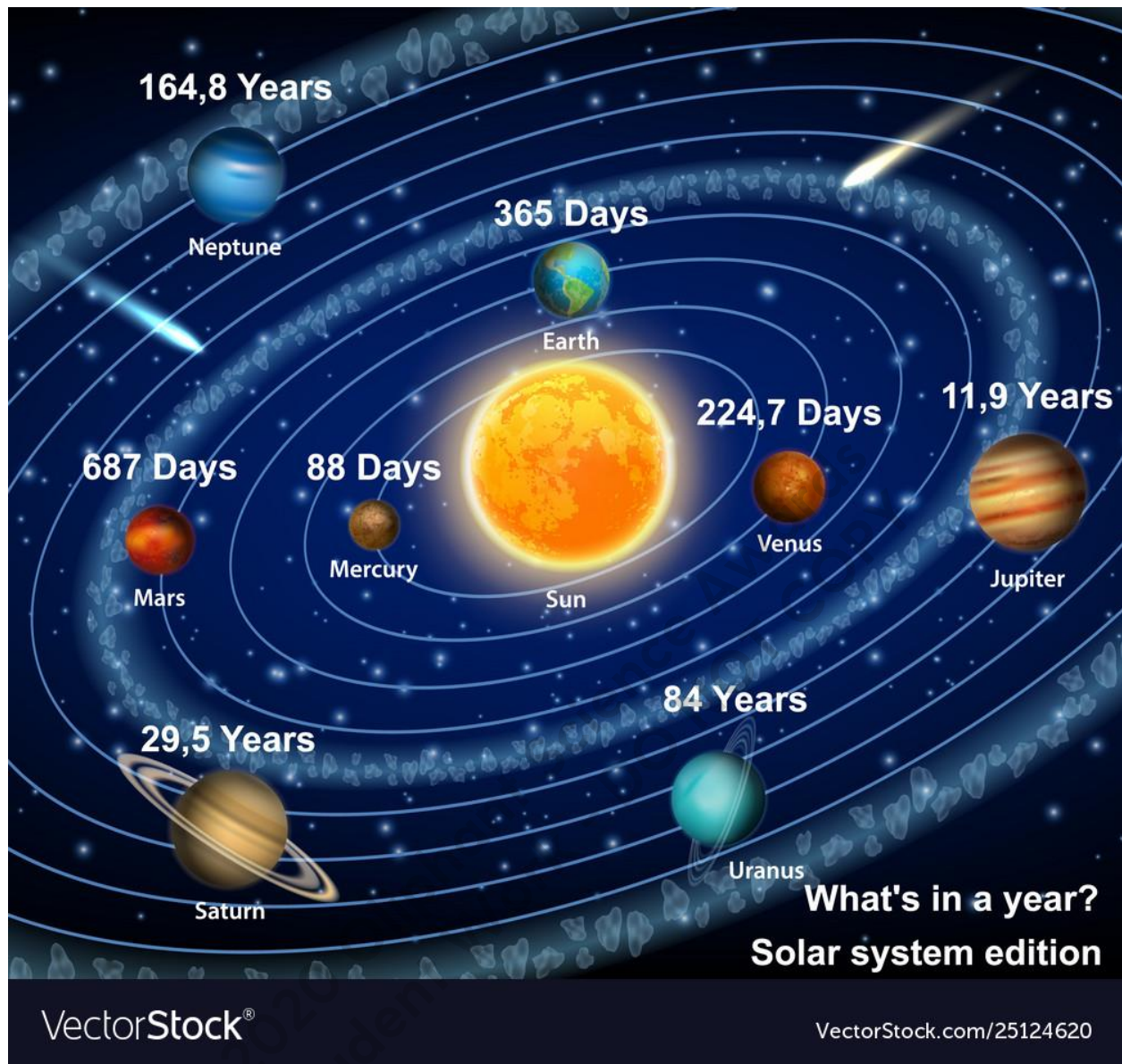Mars: 24.077 km/s (53,853 miles per hour), or a period of about 686.93 days

Jupiter: 13.07 km/s (29,236 miles per hour), or a period of about 11.86 years

Saturn: 9.69 km/s (21,675 miles per hour), or a period of about 29.42 years

Uranus: 6.81 km/s (15,233 miles per hour), or a period of about 83.75 years

Neptune: 5.43 km/s (12,146 miles per hour), or a period of about 163.72 years

Ref: https://public.nrao.edu/ask/which-planet-orbits-our-sun-the-fastest/

164,8 Years
Neptune

365 Days
Earth

224,7 Days

11,9 Years

687 Days

88 Days

Venus

Jupiter

Mars

Mercury

Sun

84 Years

29,5 Years

Uranus

Saturn

What's in a year?
Solar system edition

Type of devices required to run this project:

Scratch will run in most current web browsers on desktops, laptops and tablets. You can view projects on mobile phones, but currently you are not able to create or edit projects on phones. Below is the list of officially supported browsers.
Desktop
- Chrome (63+)
- Edge (15+)
- Firefox (57+)
- Safari (11+)
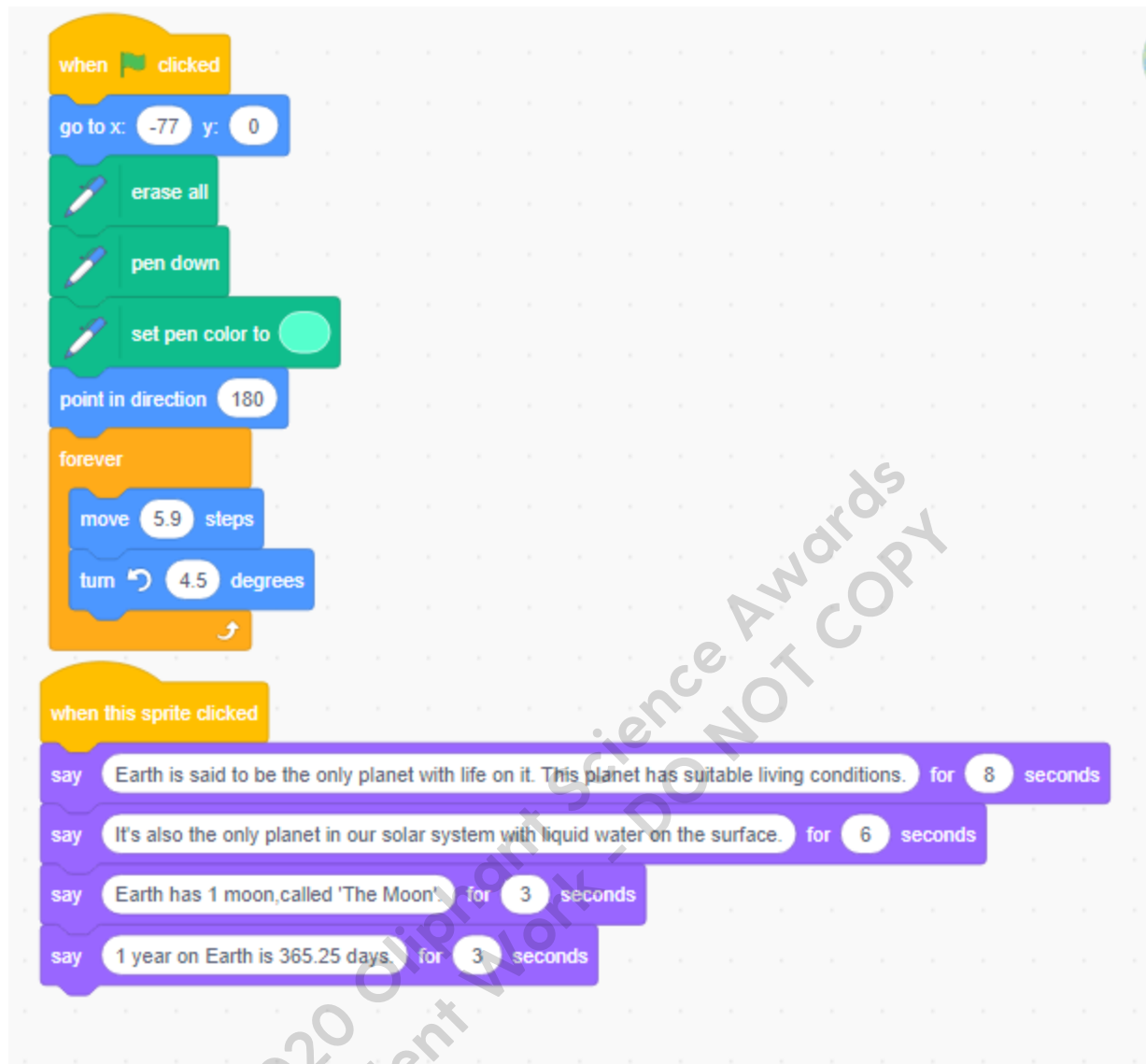- Internet Explorer is not supported.
Tablet
- Mobile Chrome (63+)
- Mobile Safari (11+)

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.

Instructions to see and run the project:

1. Go to https://scratch.mit.edu/projects/409641873/
2. Click on the green flag to run the project.
3. Watch and enjoy! Take the quiz! See how many points you get! Learn information about the planets in our solar system!
4. If you need to contact me, my email is: rashmiadiga09@gmail.com

```
when [flag] clicked
go to x: -77 y: 0
erase all
pen down
set pen color to ( )
point in direction 180
forever
    move 5.9 steps
    turn ↺ 4.5 degrees

when this sprite clicked
say  Earth is said to be the only planet with life on it. This planet has suitable living conditions.  for 8 seconds
say  It's also the only planet in our solar system with liquid water on the surface.  for 6 seconds
say  Earth has 1 moon,called 'The Moon'.  for 3 seconds
say  1 year on Earth is 365.25 days.  for 3 seconds
```

This is the code for the planet Earth. It makes the planet orbit around the sun in a circle.

The block "when flag clicked" means when the flag at the top of the screen is clicked, the whole project will run. It is important that you put this block on all the "sprites" that start what they need to do at the start of the program.

The block "go to X: – and Y: --" means that sprite (in this case, planets) will go to the X and Y positions that you have put in. The screen is divided into X (row) and Y (column) axis.

Example: The Sun is in the center of the solar system. So the position is x=0 and y=0.

The "erase all" block will erase all the things this sprite has drawn previously. Every time when you run the project, "erase all" will clear the screen.

The "pen down" block will put the pen down, which is what the sprite uses to draw.

The "set pen colour to" block sets the colour to a colour that you choose.

The "point in direction" block means that the sprite will point in that direction.

The "forever" loop means that this sprite will do the things inside it throughout the whole program.
The "move steps" block means that the sprite will move that many pixels. Example: move 4 steps= move 4 pixels.

The "turn degrees" means that the sprite will turn that many degrees. Example: turn 4 degrees= rotate 4 degrees. If the turn degrees number is small then the circle will be big and the planet takes longer to orbit. All planets orbit the Sun at their own speed. Adjust the move steps and turn degrees numbers to get the corresponding speeds of the planet.

The block "when this sprite clicked" is used if you want something to happen when that sprite is clicked. Here it is used to display the information about that planet.

The "say" block is used to make the sprite say something. When it is saying something, there will be a speech bubble coming out from it and the text inside will have what you want the sprite to say. Here I am using this block to make the sprite say the information for an amount of seconds.

Repeat the above steps to all of the planets. You will have to have different "go to X and Y"'s, "move steps" and "turn degrees".

Below is the code for the Quiz questions. You can start the quiz after pressing the space bar and entering the keyword "yes". There are 10 questions, with a redemption question. For each correct answer, you get 1 point.

When the space bar is clicked, the point's variable gets set to 0 and this sprite will ask you a question, which is " Are you ready for the solar system quiz?" and down at the bottom of the screen, there is a text box that you can type your answer into. If you answer 'yes', then it will say 'we will start' and it will broadcast question 1, then the quiz will start. If the answer is correct then the point variable will increase by 1. It will play a sound, like collecting a coin in a game. The sprite will say "correct!" and it will broadcast question 2. If the answer is wrong, it will play "Dun Dunn Dunnnnnnnnnnnnnnn!" say "WRONG!" gives the correct answer, and will say "better luck

next question" and broadcasts the next question. These steps will be repeated for all the questions.
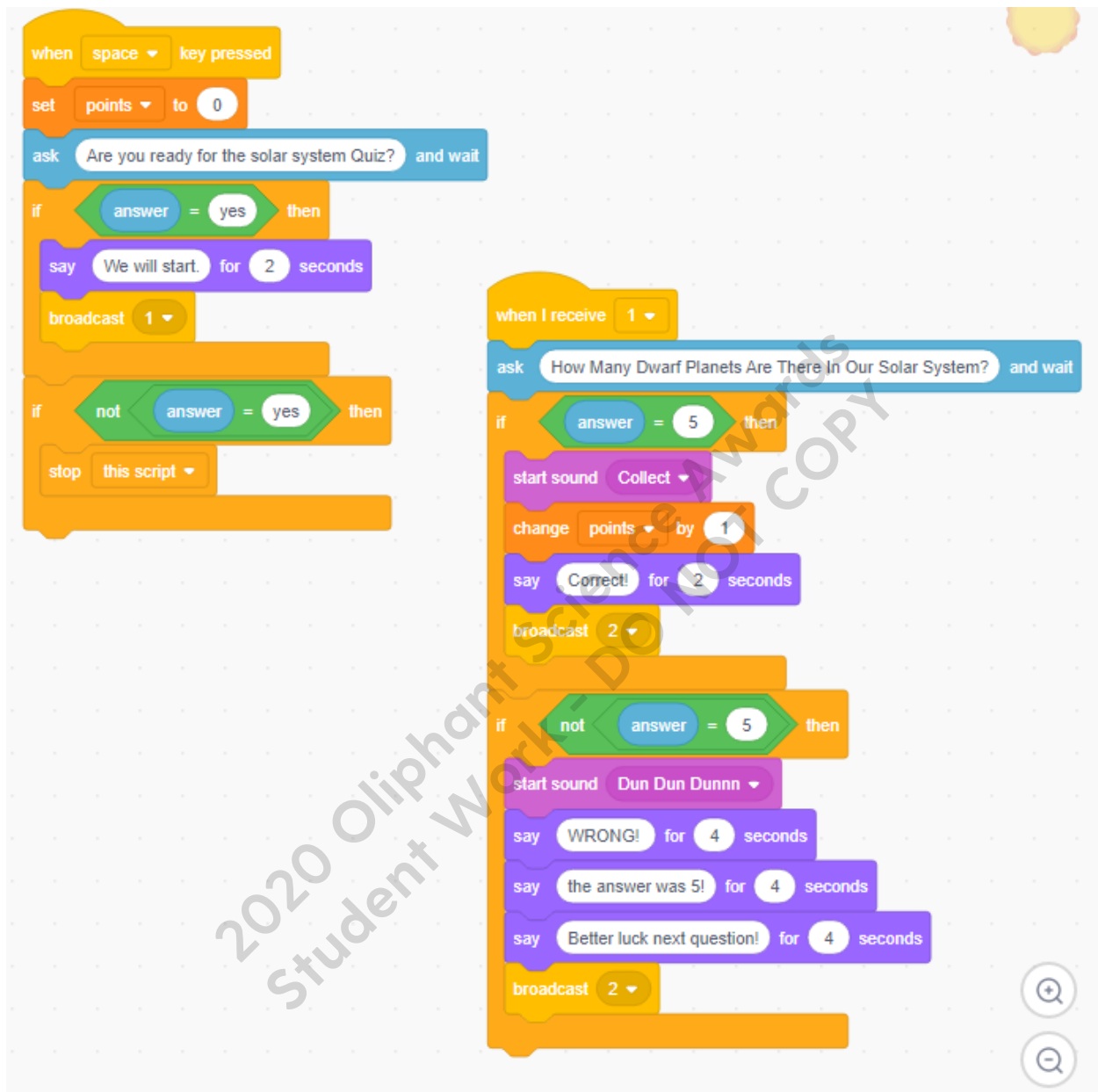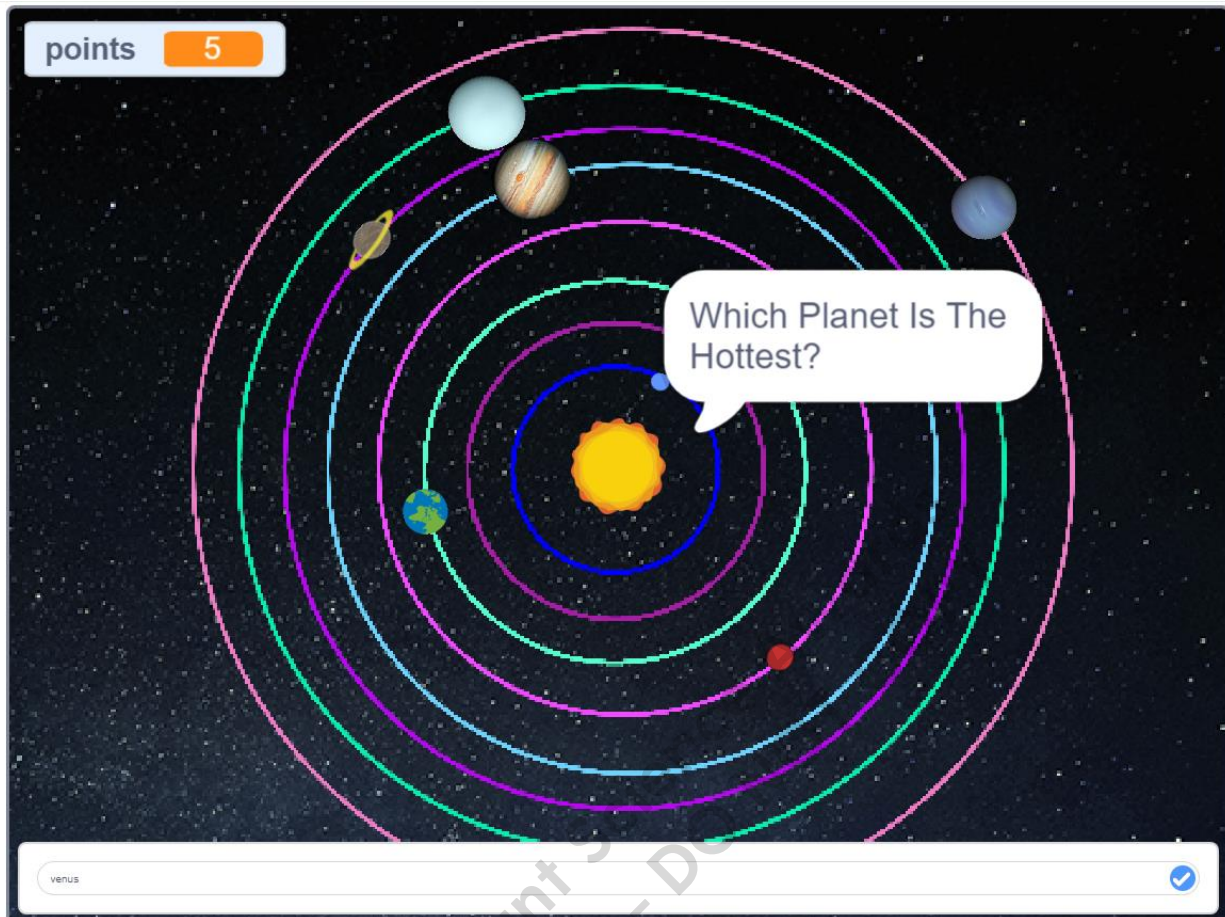
Below are 3 screenshots of the executed program. The first picture shows the orbits of all the planets and the second picture shows the display of the information of planet Earth. The size of the Sun, other planets and speed of the planets are according to the real solar system but not to scale. The third picture is about the quiz and the points.
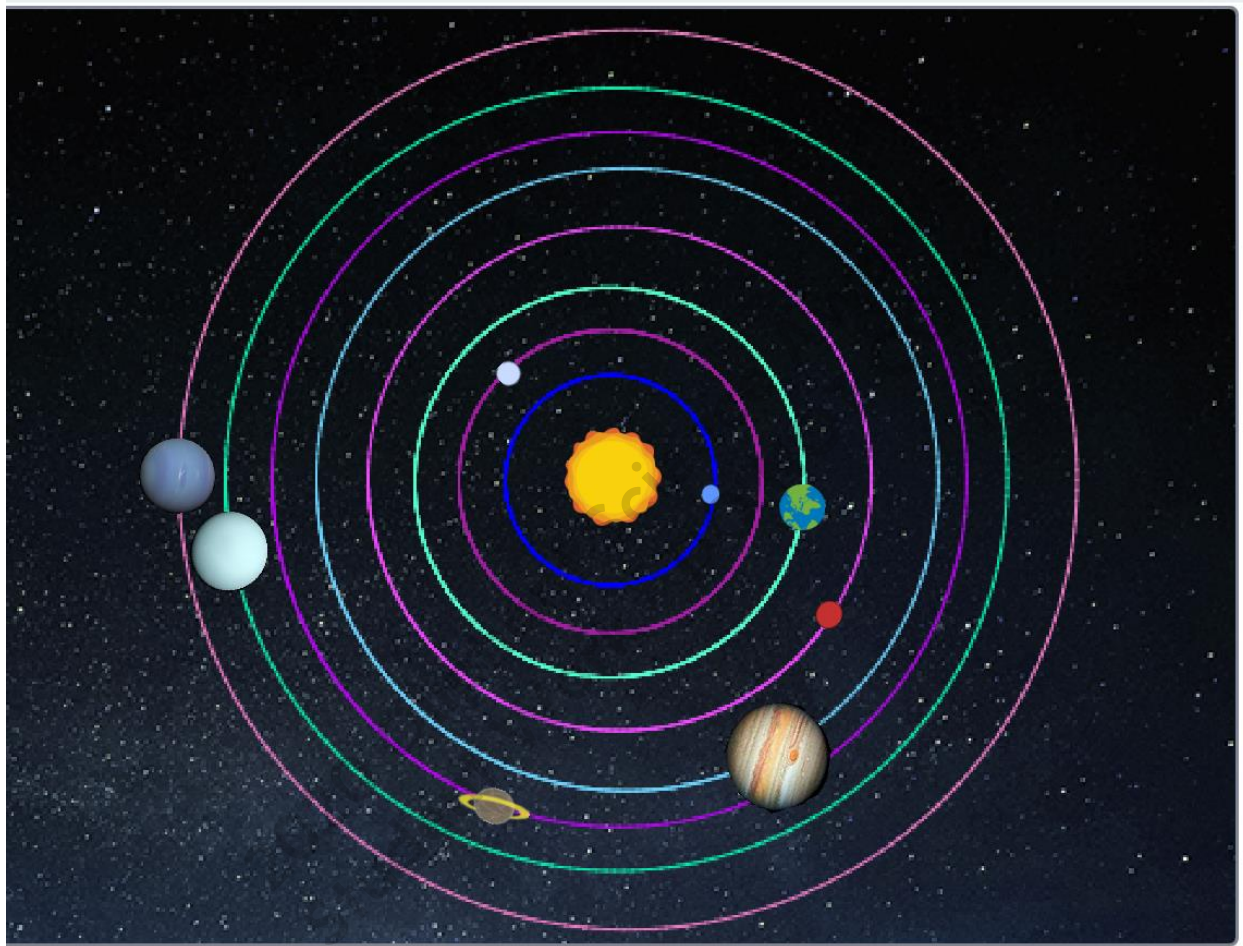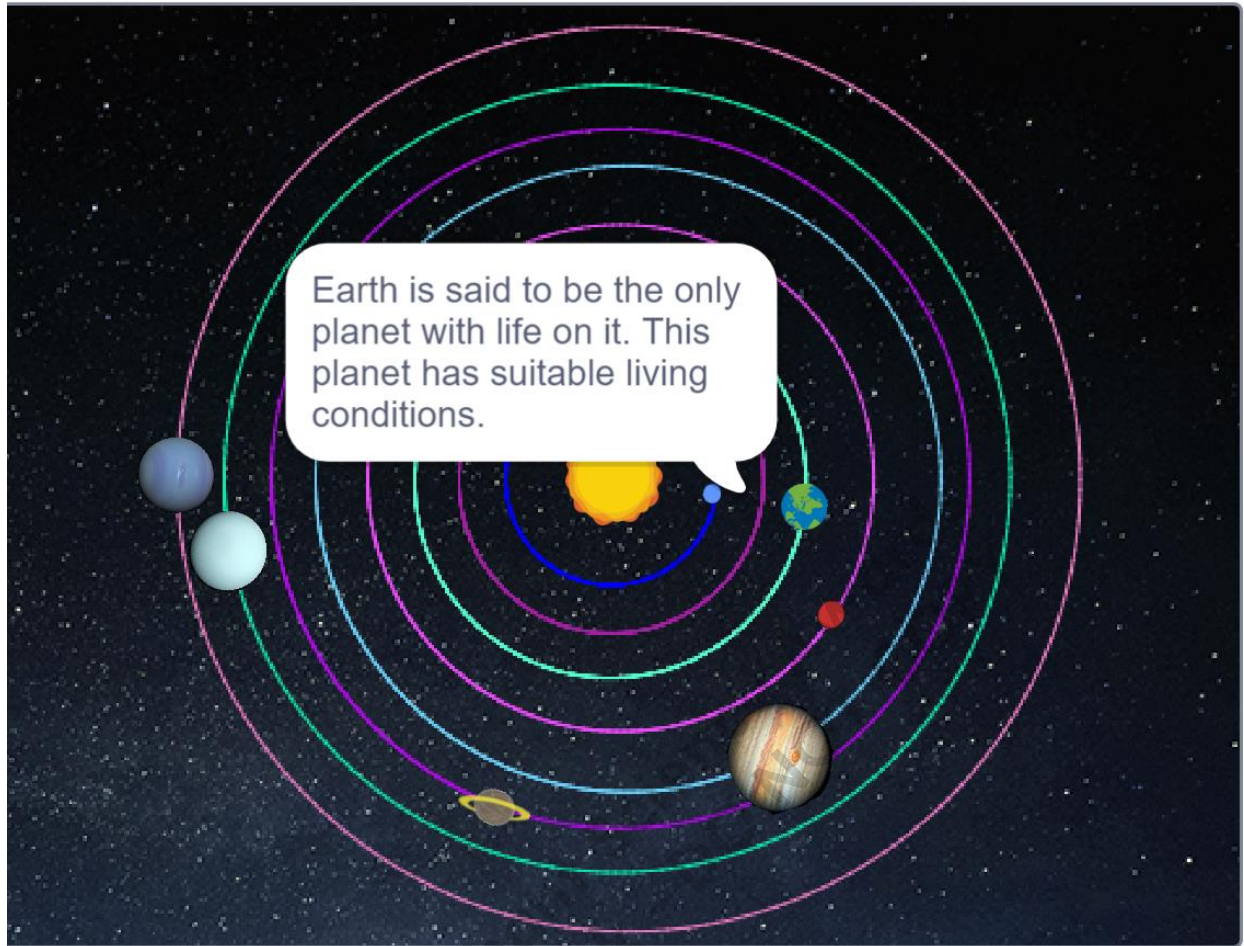
Acknowledgments

I have googled information and pictures about the solar system. I would like to thank my parents for helping me in editing my report.

Bibliography
Scratch 3.0(https://scratch.mit.edu/)
https://scratch.mit.edu/info/faq
I have googled some information about our solar system.
https://www.vectorstock.com/royalty-free-vector/solar-system-planets-with-orbital-period-vector-25124620 (solar system image)