

Astro Pi Mission Space Lab

A worked code example for teams of students to use with the Mission Space Lab Creator Guide.

Team name: _____ Date: _____

THE CODE

```
from picamzero import Camera
from sense_hat import SenseHat
import csv

camera = Camera()
sense_hat = SenseHat()

# take a photo and save it in a file called image.jpg
camera.take_photo("image.jpg")

# create a variable to store the sensor readings
data = []

# repeat 5 times
for i in range(5):
    # read the raw x,y,z data from the magnetometer.
    # The contents of magnetometer_reading will be a dictionary
    # that looks like this:
    # {
    #   "x": 7.907470226287842,
    #   "y": 5.466001033782959,
    #   "z": 12.868783950805664
    # }
    magnetometer_reading = sense_hat.get_compass_raw()

    # Take the numeric values from the magnetometer_reading
    # and put them in a list called magnetometer_values
    magnetometer_values = list(magnetometer_reading.values())
    # append the values to the data list to save later
    data.append(magnetometer_values)

# open a file called data.csv for writing
with open("data.csv", "w") as csvfile:
    writer = csv.writer(csvfile)

    # write a header to explain what the columns mean
    writer.writerow(["magnetometer_x", "magnetometer_y", "magnetometer_z"])
    # write all 5 readings from the data list to data.csv
    writer.writerows(data)
```

PREDICT

Read the code with your team. What will it save? How many sensor readings will the program capture? Which sensor is being used? What will be the output?

Our prediction:

RUN

Upload the code to rpf.io/replay. Was your prediction correct? What outputs did you get?

What we saw:

INVESTIGATE

Find the loop. How many times does it repeat? What is inside the "data" list at the end?

Our answers:

Astro Pi Mission Space Lab

MODIFY – Change the code

1. Capture a sequence of photos

The code takes only one photo. Change it to take 10 photos, one after another. Use a loop, like the loop for the sensor data. Give each photo a new name, for example image_0.jpg, image_1.jpg, image_2.jpg.

2. Take more sensor data

The code reads only the magnetometer. Add code to read another sensor too – for example, the temperature sensor (`sense_hat.get_temperature()`) or the accelerometer (`sense_hat.get_accelerometer_raw()`). Save the new data in the CSV file, with appropriate headers.

3. Run the program for 10 minutes

The code repeats 5 times. Change it so the program runs for up to 10 minutes – the full time your team has on the ISS. Hint: Use the datetime library. Record the start time, then use a while loop that continues until 10 minutes have passed.

MAKE – Personalise your program

Try changing the code to capture specific data to conduct a science experiment of your choice. What data will you need to capture? Think about how much data you will need, and how often you will need to capture it.

TEST AND SUBMIT YOUR PROGRAM

Before you submit your final program, test it with the Astro Pi Replay Tool. You can find more details on how to test it and send it to us here: rpf.io/msl-creator