CodeAIR Mission 6 Assignment	**Name:**

Pre-Mission Preparation

What are RANGERS, and what are they used for?	Answers can vary. A possible answer: RANGERS are laser sensors that can detect distance. CodeAIR has three ranger sensors: up, down and forward. They are used to detect distance to an object in those three directions.
Avoidance, the last program in Mission 5, could throw an exception. What was your 'bugfix'?	Avoid the bug by creating a way to escape or for something to happen when the number of turns reaches 8. A graceful surrender was programmed where CodeAIR landed peacefully after 7 attempts.

Mission 6 Checks – Navigate!

Objective #1 What is the flow sensor?	An optical device with a lens pointed at the ground, like a low-res camera
What can the flow sensor detect?	It can detect movement in the x and y directions
What are "deltas"?	Changes in position, both x and y; represented with dx, dy
What is the code for reading the flow sensor?	dx, dy = get_data(FLOW)
Give an example of a format string:	print(f"x = {x_value}")
Objective #2 How does altitude affect flow values?	When the drone flies at a higher altitude, more data passes through the flow sensor. This would make the flow sensor think the drone is flying faster than it is. Lower altitude means less data, not necessarily slower speed.
How does the flight controller account for altitude?	It uses the down-facing laser ranger so it can factor altitude into the position calculations.
Objective #3 What does the flow sensor "see" during rotation?	It detects patterns moving in curved trajectories rather than linear ones. This can be interpreted as unpredictable motion, leading to drift or inaccuracies in positioning.
Objective #4 What is the code for reading the battery voltage?	volts = power.battery_voltage(10)
When can you assess the battery level?	When the drone is not plugged into USB.
What is the best way to know the true battery level?	Testing under load, like when the motors are powered on.
Objective #5 What is a byte?	8 bits, or binary digits
What is the code for using binary to turn on LEDs?	leds.set_mask(255, 50)

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The 8 blue LEDs can display an integer value between 0 and 255. Practice your binary skills by converting the binary to decimal and decimal to binary:

Binary number	Decimal number
00000010	2
00000100	4
00000110	6
00010001	17
00100000	32

Decimal number	Binary number
3	00000011
10	00001010
15	00001111
33	00100001
64	01000000

Objective #6 What are exceptions in programming?	Errors that might happen during your program run.
What exception happens when you run the code for this Objective?	Index out of range error
Objective #7 Does CodeAIR use an external positioning system? Why or why not?	CodeAIR does not use an external positioning system. They can be expensive and require careful planning and setup. It is designed to be self-reliant and figure out its own position.
What code is used to handle exceptions?	A try…except block
Why do the pixel LEDs turn pink?	When you press STOP or plug in the CodeAIR to USB, CodeSpace sends a "KeyboardInterrupt" to CodeAIR, which is a type of exception. The program turns the pixels PINK when there is an exception.

Log the Data: Make notes with each test flight. You can use the chart on the next page, use the spreadsheet, or come up with your own note-taking system. You can add more routes. You can also change the velocity. Use the data to answer the reflection questions.

Post-Mission Reflection: During the Objective you were presented with three questions:
- How accurately can you move a particular distance using flow sensor data?
- Is flow-sensor accuracy dependent on altitude?
- Would a slower velocity help or hurt?

Reflect on the data and write a response:

Answers will vary based on their trials and observations.

Mission 6 Navigate – Flight Data

Name:

Make notes with each test flight. ***Run each route multiple times.*** Add more routes to expand the data set.
- How much does the distance vary between runs?
- What is the average distance?

Route	Velocity	Height	Route distance	Measured distance	Describe conditions
1	0.2m	0.3m	1.0m		