Teams: groups of two students **Length:** 3–4 pages (12pt, double-spaced) + figures
Sources: ≥ 2 non-AI sources with citations and reference list **AI Log:** brief list of prompts.

Introduction

When one thinks about colonies in space, one typically thinks of a rotating space station. Such space stations have been popularized in science fiction, beginning with Arthur C. Clarke's *2001: A Space Odyssey* in 1968. The earliest such designs have been attributed to O'Neill, who also provided designs for rotating cylinders, as opposed to the Clarke-Kubrick depiction of a rotating doughnut. The idea is simply that such rotating systems provide an artificial gravitational environment that is familiar to its inhabitants.

Figure 1: The space station in Kubrick's 2001.

Purpose

Imagine arriving at a rotating space habitat, docking at the hub, riding the elevator to the rim, and exploring daily life there. The purpose of this project is to think creatively about what such an environment would be like, guided by basic physics concepts. You are not expected to calculate exact values but should reason qualitatively using provided resources. Generative AI can be used to brainstorm phenomena and scenarios but not to provide finished answers.

Preamble

Before beginning, review:

- A short discussion on centripetal acceleration, artificial gravity, and the Coriolis effect.
- Look for video clips involving rotating space stations (e.g., *2001: A Space Odyssey* jogging scene; hub docking shots).

These will help you imagine how moving from hub to rim changes your experience of gravity, balance, and orientation.

Part A — Guided Exploration

A1. Qualitative Expectations

Discuss with your partner what you expect to be different between hub and rim environments. Consider activities such as walking or jogging, turning your head, tossing a ball, or looking down a long corridor. Use the resources to guide your reasoning. As a group, write down what you both think the experience might be like supporting your thinking with resources.

A2. AI Brainstorm

Use AI to expand or challenge your list. Summarize the AI's suggestions and identify at least two ideas that seem unclear, wrong, or need verification. Quote short phrases and paraphrase the rest.

Part B — Scenario Building

B1. The Scenario

Each group member will choose a different one of the below experiences and write a first-person narrative of about one page.

1. Arriving and docking at the hub, taking the elevator to the rim, and your first steps into the corridor;
2. Exercising near the rim, including jogging, turning your head, and entering a side passage; or
3. Playing a recreational game such as ping-pong.

Annotate two or three moments in your narrative with physics-based notes, such as comments about Coriolis effects or perceptions of "down." Figures are encouraged.

B2. The Conversation

Exchange your stories, read them and discuss them with each other. Include a summary of what you learned from each other with your stories.

Part C. — Quantitative Checkpoint

Let's consider a space station that is 160 m in diameter, 15 m wide, and 3 m high inside.

C1. Artificial Gravity

- Estimate a rotation period that *could* yield near-1g acceleration at the rim (state the formula you consulted).
- Would most people find that spin tolerable? How many g's of acceleration would be intolerable? You might compare this to the effects of riding roller coasters.

C2. The Inside View

Standing on the rim floor assuming, how far down the hallway could you see the floor? A sketch might help.

C3. Projectile Motion

Sketch how a ball *might* arc in a long hallway volley (label "apparent" vs. "intended" path). Think about tossing the ball forward vs. backwards.

Formatting & Integrity

- Write with good grammar and paragraph structure.
- Figures modest in size, labeled and captioned, and referenced in text.
- In-text citations required, with a proper reference list at the end.
- **AI Log:** include prompts used, tool/date, and 1–2 lines on usefulness/limits.