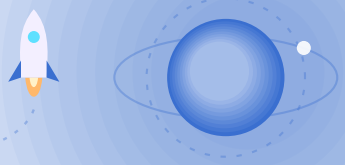
LESSON T4-05 · TIER 4 · FALLING AROUND THE WORLD

Gravity Still Works Here

GRADES 6-12



Name _____ Date _____ Class / Period _____

Gravity never switches off

Astronauts float in orbit, so it can look as if gravity has gone. It has not. Gravity is still pulling them and their craft, and they are falling together, around the world, so nothing pushes on them. Floating is free fall.

Mission goal: measure gravity and the push you feel while orbiting, then use the inverse-square rule.

Standards practiced: HS-PS2-4 · Words to know: gravity-in-orbit, proper-acceleration, free-fall, inverse-square

1 LOOK

OBSERVE BEFORE YOU TOUCH A CONTROL

Step 1 · Is gravity there?

- Our craft circles Terra _____ km up. That is _____ km from the centre of Terra.
- Two meters will show it: how hard gravity pulls (in m/s²) and the push you feel, like the seat of a car.

Step 2 · The push you feel

- The engine pushes the craft, so a push meter would read the engine's acceleration. Gravity does not push the craft separately from you: it pulls everything at once.
- Fire the engine for 2 seconds and then coast. Watch the You feel a push number and the Gravity pulls number.

Step 3 · Farther away

- Gravity gets weaker with distance from the centre of Terra: twice as far means a quarter as strong. This is the inverse-square rule.
- At _____ km from the centre gravity pulls with _____ m/s². Now picture the craft _____ times as far out: _____ km from the centre.

Write the numbers shown in the sim in the blanks above, then record what you notice:

2 PREDICT

COMMIT TO A HYPOTHESIS FIRST

Prediction 1. Is there gravity at orbital height?

Hint: Gravity is the pull between a planet and everything near it.

□ No, gravity is absent in orbit

□ Yes, gravity still acts and supplies the orbit's centripetal force

Because...

Prediction 2. In free fall, what does a push meter (an accelerometer, which feels pushes like the seat under you) read?

Hint: Think of what you feel at the top of a roller coaster drop.

□ About 1 g0 (the same as on the ground)

□ About zero

Because...

Prediction 3. Predict the pull of gravity at the new orbital radius. Mark the range you expect.

Hint: The unit m/s² means "metres per second, every second". Gravity at the ground is about 9.8 m/s². Aim for a band about 1 m/s² wide.

My prediction (circle or fill in): _____ to _____

Because...

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3 EXPERIMENT

CHANGE ONE VARIABLE AT A TIME

Step 1. Just watch! Keep your eyes on the Gravity pulls and You feel a push numbers for 10 seconds. Do not press anything.

Step 2. Press **[Space]** to light the engine and **[C]** for half throttle for about 2 seconds, then press **[X]** to cut it. Then coast and watch the You feel a push number.

Step 3. Read the numbers, then press Got it.

Trial	What I changed	What I measured / saw	Matched my prediction?
1			Yes · No · Partly
2			Yes · No · Partly
3			Yes · No · Partly

4 EXPLAIN

CLAIM · EVIDENCE · REASONING

Claim — What did you find out? (answer the mission goal in one sentence)

Evidence — Which numbers or observations from the sim support your claim?

Reasoning — Which science idea connects your evidence to your claim?

Self-check: □ I made a prediction before experimenting □ I used numbers from the sim □ I explained *why*, not just *what*