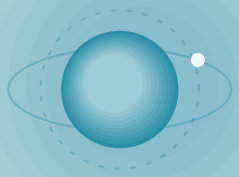
LESSON T5-02 · TIER 5 · TRANSFERS & RENDEZVOUS

Meet the Moving Mailbox





HIGH SCHOOL (9–12)

Name _____ Date _____ Class / Period _____

Leave at the right moment

To meet a satellite on a higher orbit you must leave when it is the right distance ahead of you. If you leave too early or too late you reach the top of your orbit and the satellite is somewhere else.

Mission goal: burn once, coast to the top of your oval, and arrive within {gateKm} km of the mailbox.

1 LOOK

OBSERVE BEFORE YOU TOUCH A CONTROL

Step 1 · Burn

- The mailbox circles Terra _____ km up, _____° ahead of us round the orbit. We are _____ km up.
- The trip to the top of our oval will take _____ minutes. In that time the mailbox moves about _____° round its own circle while we move 180°.

Step 2 · Coast to the top

- You are on an oval _____ by _____ km. One full lap of an oval like this takes _____ minutes.
- The mailbox is on its way round its circle too. We will measure the gap when you reach the top.

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. If you burn right now, where will the mailbox be, compared with you, when you reach the top of your transfer?

Hint: Think of two runners on circular tracks: while you run half a lap up the oval, the mailbox keeps moving on its own circle.

□ Behind

□ At the arrival point

□ Ahead

Because...

Prediction 2. How many minutes will it take to coast from the burn up to the top of the oval? Mark the range you expect.

Hint: The top of an oval is half a lap away. Aim for a band about 4 minutes wide.

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

Because...

3 EXPERIMENT

CHANGE ONE VARIABLE AT A TIME

Step 1. Click PROGRADE in the Flight Computer. Press **[Space]** to light the engine and **[C]** for half throttle. Watch the Orbit high point climb, and when it reads _____ km (at least _____) press **[X]** to cut the engine.

Step 2. Press **[.]** to speed up time and watch the Distance to target number. Slow time down with **[,]** when the Height stops rising: that is the top of your oval, where the gap is measured.

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*