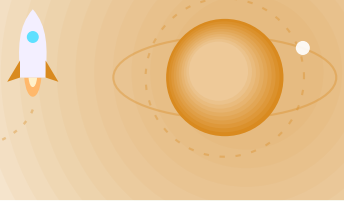
LESSON M-01 · MIDDLE SCHOOL BRIDGE LESSONS (6-8)

Newton's Three Laws

MIDDLE SCHOOL (6-8)



Name _____ Date _____ Class / Period _____

Newton's three laws, in a rocket

Sir Isaac Newton found that a push makes things speed up (force = mass × acceleration), and that every push has an equal push back. A rocket pushes exhaust down, so the exhaust pushes the rocket up. We are on the Moon, where there is no air to get in the way.

Mission goal: find out how the size of the push and the weight of the rocket change how fast it speeds up.

Standards practiced: MS-PS2-2 · Words to know: newton, force, mass, acceleration, reaction

1 LOOK

OBSERVE BEFORE YOU TOUCH A CONTROL

Step 1 · A bigger push

- Our rocket sits on the Moon. There is no air, so nothing slows it down.
- It has a mass of _____ kg. Its engine pushes with _____ N (newtons) at full throttle, or _____ N at half throttle.

Step 2 · A heavier rocket

- Picture a second rocket with the same engine, loaded until it is twice as heavy: _____ kg instead of _____ kg.
- The engine still pushes with _____ N. Acceleration is the push divided by the mass.

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. Same rocket, two pushes: a small push (half throttle) and a big push (full throttle). Which one makes the rocket speed up faster?

Hint: Acceleration is how quickly the speed grows. A bigger number means the rocket speeds up faster. The push of the engine is called thrust.

□ Both speed up the same

□ The small push (half throttle)

□ The big push (full throttle)

Because...

Prediction 2. Same engine push, two rockets: one is light and one is twice as heavy. Which rocket speeds up faster?

Hint: Mass is how much stuff the rocket is made of, measured in kilograms (kg). The engine has to push all of it.

□ The heavy rocket (twice as heavy)

□ Both speed up the same

□ The light rocket

Because...

3 EXPERIMENT

CHANGE ONE VARIABLE AT A TIME

Step 1. Press **[Space]** to fire the engine at full throttle for 3 seconds. Then press **[C]** once to snap the throttle to exactly 50% and wait 3 seconds. Press **[X]** to cut the engine.

Step 2. Read the numbers above, 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*