Move the Load

How pushes and friction change movement

P.6.6.3 "Investigate and communicate ways to manipulate applied/frictional forces to improve movement of objects on various surfaces (e.g., athletic shoes, wheels on cars)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each change Maya makes to move the books or keep her feet from slipping. Circle the words that tell how each change affects movement.

Books on the Move

1. At the school book fair, Maya moves a heavy box of books across the hall. She first pushes the box directly along smooth tile. Friction between the box and tile resists its motion, so she must keep pushing. She puts the box on a wheeled cart, then gives the cart a push. The wheels roll instead of the box sliding on the floor. Rolling usually reduces the force needed to move this load. When the cart reaches thick carpet, its wheels sink in slightly, so Maya pushes harder to keep it moving.

2. Near the entrance, rain has left a patch of tile wet. Maya's smooth-soled shoes slip when she tries to push the cart forward. Her feet need enough friction with the floor to push backward without sliding. She changes into shoes with textured rubber soles and wipes the wet tile before trying again. These changes help her feet grip the floor, so she can apply a steady forward push to the cart. Friction can be useful where feet meet the floor, even though friction can also slow a moving load.

3. Maya compares two carts with the same box on the same thick carpet. One cart has small wheels; the other has larger wheels. She pulls each cart at a steady speed and reads the force meter attached to its handle. The meter shows a smaller pull for the cart with larger wheels. Those wheels do not sink as deeply into this carpet. On smooth tile, both carts are easy to move. Maya learns that a change useful on thick carpet may make less difference on tile.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why is the wheeled cart easier to move across tile than the box by itself?

2. How does Maya change her applied force on the thick carpet, and why?

3. What two changes help Maya push without her feet slipping on the wet tile? Explain why they help.

4. How does Maya make her wheel-size test a fair comparison, and what does the force meter show?

3 YOUR TURN

Your own words

A sled carrying supplies must move across packed snow. Describe one change to the sled that changes friction and one change to the force you apply. Explain how each change would help the sled begin moving or keep moving.

ANSWER KEY

Move the Load

GRADE 6 · P.6.6.3

PART 1 · READ AND MARK

Underline each change Maya makes to move the books or keep her feet from slipping. Circle the words that tell how each change affects movement. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why is the wheeled cart easier to move across tile than the box by itself?	**The cart's wheels roll instead of the box sliding on the tile. Rolling usually takes less force for this load.**
2	How does Maya change her applied force on the thick carpet, and why?	**She pushes harder because the cart's wheels sink into the carpet, making the cart harder to move.**
3	What two changes help Maya push without her feet slipping on the wet tile? Explain why they help.	**She puts on shoes with textured rubber soles and wipes the tile. Both changes help her feet grip the floor so she can push without slipping.**
4	How does Maya make her wheel-size test a fair comparison, and what does the force meter show?	**She uses the same box and carpet and pulls each cart at a steady speed. The meter shows that the cart with larger wheels takes a smaller pull.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would wax the sled's runners to reduce friction as they slide over the packed snow. I would pull harder to start the sled moving, then use a smaller steady pull to keep it moving.

Accept other practical sled changes that alter friction and applied-force changes that fit the student's explanation. The response should explain how both changes affect movement on packed snow.