Forces on the Move

Read how balanced forces, ramp force, and energy transfers affect motion.

5.7 "Force, motion, and energy. The student knows the nature of forces and the patterns of their interactions. The student is expected to: investigate and explain how equal and unequal forces acting on an object cause patterns of motion and..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each sentence that tells what balanced or unequal forces do to motion. Circle each detail the ramp team keeps the same during its test.

A Wagon, a Ramp, and Moving Energy

1. At a playground, two students pull a wagon from opposite sides. When they pull with equal strength in opposite directions, the forces are balanced. The net force is zero. A stopped wagon stays stopped, and a moving wagon keeps the same speed and direction. If one student pulls harder, the forces are unequal, so the wagon's motion changes in the stronger pull's direction.
2. To test how force affects a toy car, a team uses one ramp and raises one end to make the ramp steeper. They keep the ramp's length the same, so changing the raised height changes the angle. They use the same car, track surface, starting point, and release method each time. The team measures how far the car rolls after leaving the ramp and repeats each test three times.
3. As the car travels down the ramp, gravitational potential energy transfers mainly to kinetic energy, the energy of motion. A steeper ramp can provide a greater downhill component of gravity than a gentler ramp when the ramp length is held constant. Friction acts against the car's motion. It transfers some energy to thermal energy and sound, so the car eventually slows and stops.

2 ANSWER WITH EVIDENCE

Use the passage

1. What two conditions make the wagon's forces balanced, and what is the net force?

2. What happens to a moving wagon when balanced forces act on it?

3. What did the ramp team change, and what did they keep the same so that the ramp angle changed?

4. Describe two energy transfers or effects that happen as the car moves down the ramp and then slows.

3 YOUR TURN

Your own words

Design a balloon-rocket investigation that tests how the amount of air affects the rocket's motion. Write exactly four sentences: state your question and prediction, tell what you will change, name at least three details you will keep the same, and explain what you will measure and how you will repeat the test.

ANSWER KEY

Forces on the Move

GRADE 5 · TEKS 5.7

PART 1 · READ AND MARK

Underline each sentence that tells what balanced or unequal forces do to motion. Circle each detail the ramp team keeps the same during its test. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What two conditions make the wagon's forces balanced, and what is the net force?	**The pulls must be equal in strength and in opposite directions. The net force is zero.**
2	What happens to a moving wagon when balanced forces act on it?	**It keeps the same speed and direction.**
3	What did the ramp team change, and what did they keep the same so that the ramp angle changed?	**They raised one end of the ramp. They kept the ramp length the same.**
4	Describe two energy transfers or effects that happen as the car moves down the ramp and then slows.	**Gravitational potential energy transfers mainly to kinetic energy. Friction transfers some energy to thermal energy and sound, causing the car to slow and stop.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My question is whether the amount of air in a balloon changes how far a balloon rocket travels, and I predict that more air will make it travel farther. I will change only the amount of air by inflating balloons to two marked sizes. I will keep the same string length, string angle, balloon type, straw, tape, and starting position. I will measure the distance traveled and run three trials at each balloon size.

Accept equivalent investigations that change one force-related variable, hold comparison conditions constant, measure a motion result, and include repeated trials. For Question 4, accept accurate descriptions of the stated energy transfers and friction's effect.