Ramp Energy Detectives

Use a fair test to connect ramp height, speed, and mechanical energy.

3.8.B "plan and conduct investigations that demonstrate how the speed of an object is related to its mechanical energy."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each action the class took to make its investigation fair. Circle the words that explain how mechanical energy and speed are connected.

A Car on Three Ramps

1. Ms. Lee's class planned an investigation with the same toy car and three ramps. Each ramp ended at the same spot, but one started 10 centimeters high, one 20 centimeters high, and one 30 centimeters high. The class kept the car, ramp length, and release method the same. They did not push the car. They released it from rest each time.

2. Height gives the car stored mechanical energy before it moves. As the car rolls down, much of that stored energy changes to moving energy. Moving energy is also mechanical energy. The class timed how long the car took to travel one meter. They repeated every test three times and used the average time. Their results are shown in the table.

TOY CAR INVESTIGATION RESULTS

Start Height	Average Time for 1 Meter	Speed
10 cm	2 seconds	0.5 m/s
20 cm	1.5 seconds	0.67 m/s
30 cm	1 second	1 m/s

3. The table shows that the car was faster when it began higher on the ramp. A higher start gave the car more stored mechanical energy. That energy changed into more moving energy as the car rolled. This investigation did not prove that every object moves this way. It showed a fair test with one car, one ramp, and no push.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which variable did the class change? Name two things they kept the same.

2. Why was it important that the class did not push the car?

3. Which start height gave the car the greatest speed? Use the table to give the speed.

4. Explain how starting higher on the ramp was related to the car's mechanical energy and speed.

3 YOUR TURN

Your own words

Plan a fair toy-car ramp investigation you could conduct. In each table row, choose a different start height, state what you will keep the same, and tell what you will measure. On the lines below, write one prediction about which car release will be fastest and why.

START HEIGHT	KEEP THE SAME	MEASURE

ANSWER KEY

Ramp Energy Detectives

GRADE 3 · TEKS 3.8.B

PART 1 · READ AND MARK

Underline each action the class took to make its investigation fair. Circle the words that explain how mechanical energy and speed are connected. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which variable did the class change? Name two things they kept the same.	**They changed the start height. They kept the same toy car, ramp length, and release method.**
2	Why was it important that the class did not push the car?	**A push could change the car's speed. Releasing the car without a push helped make the test fair.**
3	Which start height gave the car the greatest speed? Use the table to give the speed.	**The 30 cm start height gave the greatest speed, 1 m/s.**
4	Explain how starting higher on the ramp was related to the car's mechanical energy and speed.	**A higher start gave the car more stored mechanical energy. As it rolled, more energy changed to moving energy, so the car was faster.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

10 cm | Same toy car, ramp, and release with no push | Time to travel 1 meter 20 cm | Same toy car, ramp, and release with no push | Time to travel 1 meter 30 cm | Same toy car, ramp, and release with no push | Time to travel 1 meter Prediction: The car released from 30 cm will be fastest because it starts with more stored mechanical energy.

Accept other sensible ramp heights and controlled variables, such as the same distance, toy car, ramp, and no push. The prediction should connect a higher starting point to more stored mechanical energy and greater speed.