

Forces ▪ *Review and Reinforce*

Friction and Gravity

Understanding Main Ideas

Answer the following questions on another sheet of paper.

1. What are the two factors that affect the friction force between two surfaces?
2. What is one way you could reduce the friction between two surfaces?
3. The acceleration due to gravity of all objects in free fall is the same. Why, then, do some objects fall through the air at a different rate than others?
4. How does mass differ from weight?
5. What two factors affect the gravitational force between two objects?

Building Vocabulary Skills

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

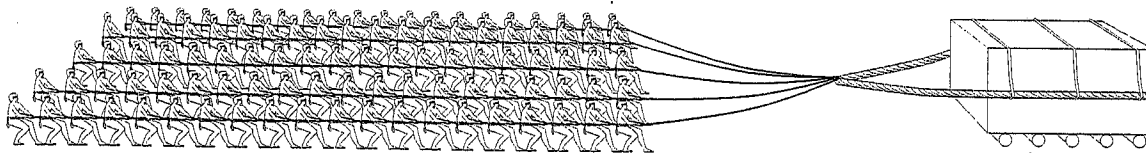
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|-----------------------------|---|
| _____ 6. friction | a. the force that accelerates objects towards Earth |
| _____ 7. rolling friction | b. the kind of friction that exists between oil and a door hinge |
| _____ 8. sliding friction | c. the general term for the force that one surface exerts on another when they rub against each other |
| _____ 9. fluid friction | d. the kind of friction that slows a falling object |
| _____ 10. weight | e. the state that exists when the only force acting on an object is gravity |
| _____ 11. free fall | f. the kind of friction that results when you rub sandpaper against wood |
| _____ 12. gravity | g. the kind of friction that results when a wheel turns on a surface |
| _____ 13. terminal velocity | h. a measure of the force of gravity on an object |
| _____ 14. air resistance | i. a falling object reaches this when forces of gravity and air resistance are balanced |

Forces • Enrich

The Great Pyramids

The early Egyptians built pyramids out of large blocks of limestone. No one knows for sure how they managed to move the blocks across land.

One idea about how the Egyptians moved the stone blocks without modern machines is a simple one. Set a heavy book on a table. If you try pushing it with your little finger, it will be hard to do. Next, place five round pencils, parallel to each other, under the book and try again. This time you can move the book easily. You have replaced sliding friction with rolling friction. The force needed to overcome rolling friction is much less than the force needed to overcome sliding friction. Some people believe that the ancient Egyptians used this understanding of friction and moved the heavy stone blocks by placing a layer of wooden logs under the blocks. As the stone was pulled forward, the logs in back were picked up and placed in front of the block again, to provide a kind of friction-reducing track along which to roll the blocks of stone.



Answer the questions below on the back of this sheet or on a separate sheet of paper.

1. List two reasons why the limestone blocks of the pyramids were so difficult to push across land.
2. How might the Egyptians have been able to move the heavy stone blocks?
3. Can you think of another way the Egyptians might have tried to reduce friction to move the heavy blocks?
4. Historians know that large stone blocks can be dragged by placing logs under them. Is the idea that the Egyptians built the pyramids by rolling stone blocks on logs a fact or a hypothesis?