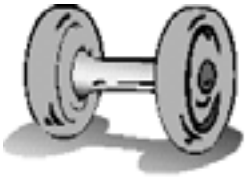
Chapter Science Investigation Name _____

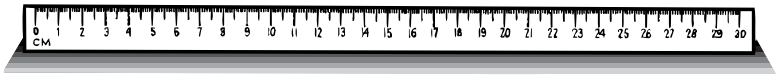
Working on a Slant

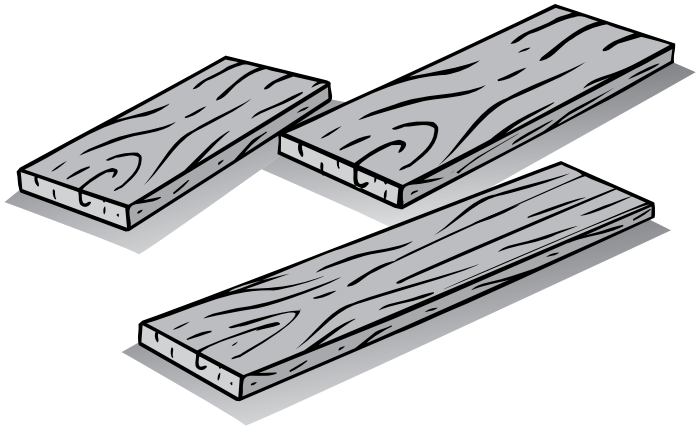
What You Need

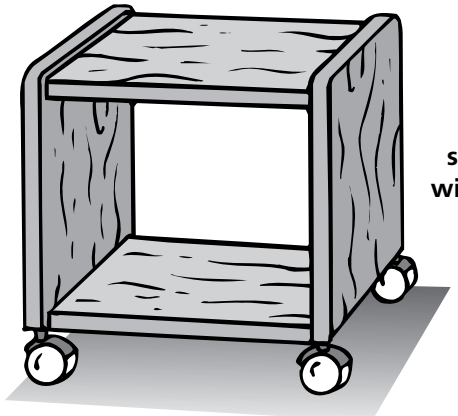

stack of books


spring scale


small heavy object


metric ruler


boards, each of a different length


small cart with wheels

Find Out

What effect does the slope of a ramp have on the force needed to use it?

Process Skills

Predicting
Measuring
Communicating
Observing

Time

- 20 minutes a day for four days

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What to Do

1. **Predict** which board will require the most work to pull the cart up the ramp.
2. **Measure** the length of the boards. **Record** these lengths in your chart.
3. Stack the books. **Measure** and **record** the height of each stack.
4. Use the first board to make a ramp up to the top of the stack of books.
5. Place the small, heavy object to be moved in a cart, and use the spring scale to pull the cart up the ramp at a steady speed. **Observe** and **record** the reading on the spring scale.
6. Repeat Steps 4 and 5 each day using a new board with a different length.

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Prediction: _____

_____

_____

Slope and Force			
Time	Length of Ramp (length of board)	Height of books (the same each time)	Force (reading on spring scale)
Day 1			
Day 2			
Day 3			
Day 4			

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Conclusions

1. Which board needed the greatest force to move the cart up the ramp?
the shortest board

2. Which board needed the least force?
the longest board

New Questions

1. When does a car exert the greatest force?
when it is going up a steep hill

2. Write a new question you have about ramps and the use of force.
Accept any reasonable question.

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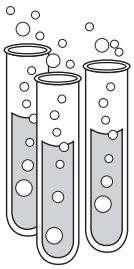

Name _____

ACTIVITY

Measuring Force

What happened when you and your partner pulled on the spring scale?
Students should observe that reaching 10 N is easier when both people are pulling.

What happened when you and your partner pushed on the scale?
Students should observe that reaching 10 N is easier when both people are pushing.

How much force does it take to move each object you have collected? **Record** your measurements in the chart.

Object	Force When You Pull	Force When You Push

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Name _____

Conclusions

1. What did you feel when your partner pushed or pulled on the spring scale?
a push or a pull

2. Which objects made the scale read the highest when you pulled and pushed them?
Answers will depend on objects tested. Heavier objects require more force to move.

3. Why did it take a bigger pull to move some objects?
Heavier objects need more force to make them move than do light objects.

Asking New Questions

1. Both pushing and pulling made the spring scale read 10 N. How are pushing and pulling the same?
The same amount of force is needed to move the object.

2. Why is it useful to be able to measure force?
Answers will vary but may include: measuring force is useful for comparing energies, weights, and speed. Scientists take measurements during experiments to learn about force and its effects on matter.

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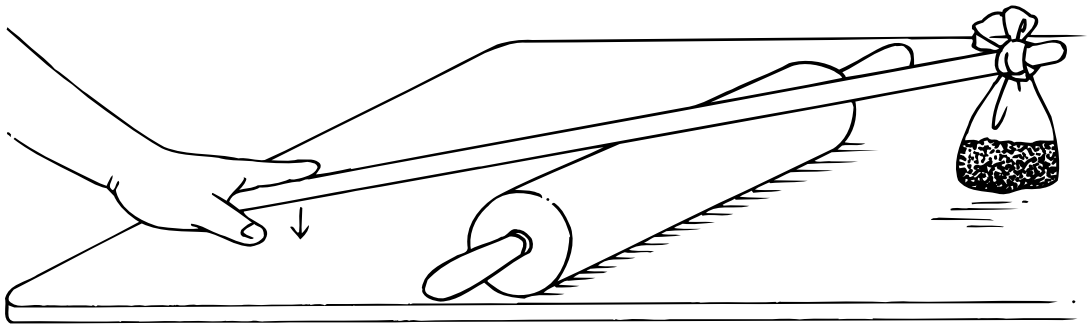
Name _____

ACTIVITY

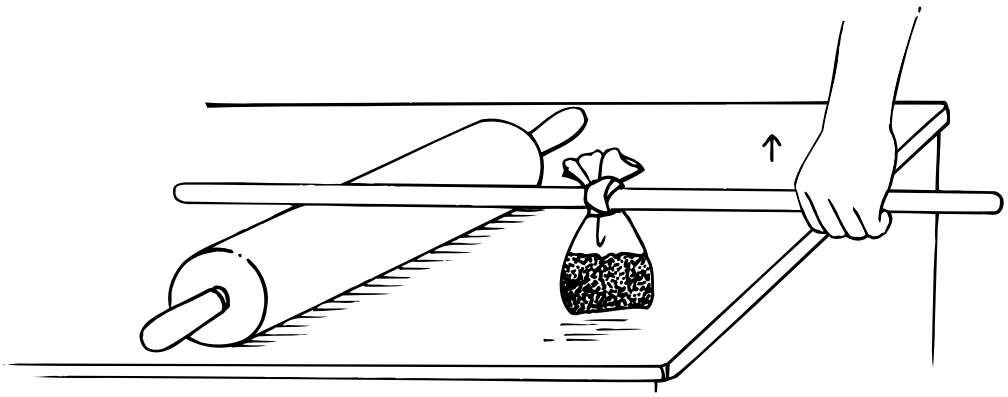
Making a Lever

Look at the pictures. Under each picture, **record** what happens when you use the lever this way.

Lever with Fulcrum at the Center and Load at One End



Lever with Fulcrum at One End and Load at the Center



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Name _____

Conclusions

1. Which kind of lever would you use to move a very heavy object? Why?

Lever with the fulcrum at one end and the load in the center. Effort is applied at the other end. Effort travels a longer distance than load; it is easier to lift a heavy object.

2. Which kind of lever would you use to lift an object high in the air? Why?

a lever with the fulcrum at one end and the load at the other. This lever uses a large effort to move an object over a great distance.

Asking New Questions

1. Look around at school and at home to see levers in use. Can you find at least five?

Possible answers: broom, light switch, scissors, wheelbarrow, crowbar, nutcracker, and so on.

2. What are some everyday uses for the kinds of levers you made in this activity?

Possible answers: moving heavy boxes, moving bricks to high places on a construction site, moving furniture, and so on.

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