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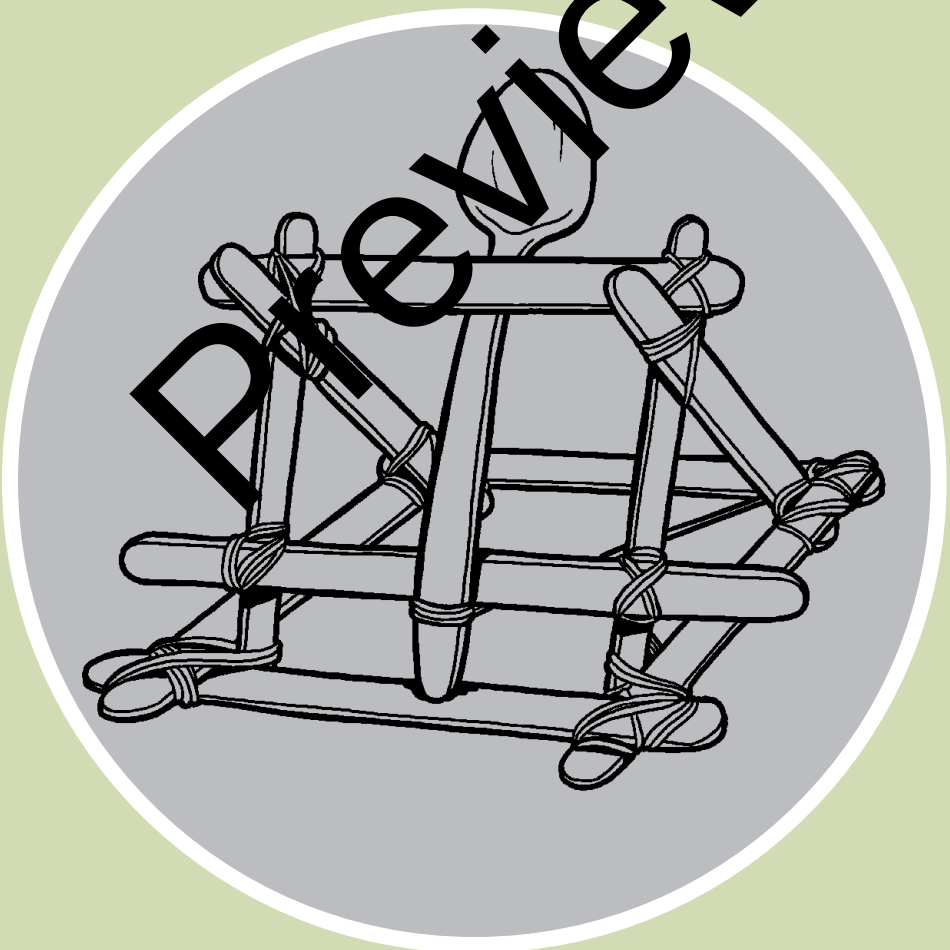
mini e-book

PHOTOCOPY MASTERS

Science

Push And Pull Forces



For Middle Primary

Ready-Ed Publications

mini e-book

PHOTOCOPY MASTERS

Contents

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First Law Of Motion

ACTIVITY

Without force, life on our planet would be very different. We wouldn't have movement and things wouldn't happen.

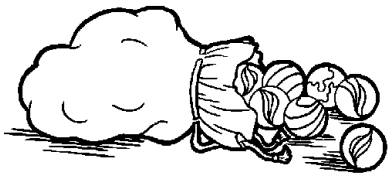
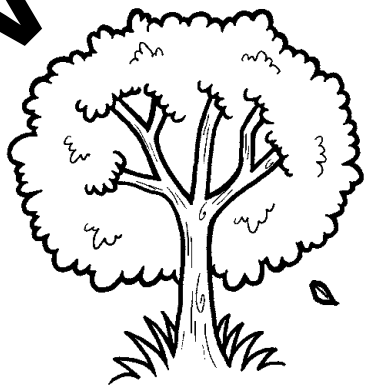
Sir Isaac Newton was famous for investigating three laws of motion:

A. First law: An object in motion will likely stay moving; an object at rest will likely stay at rest.

B. 2nd Law: If a force acts upon an object, it will impact speed and direction.

C. 3rd Law: For every force and action, there is an equal reaction.

❑ Here are three examples of Newton's first law of motion. Can you give three more examples? Either draw or find pictures. Label them.

Image 1	Image 2	Image 3
		

❑ My examples of Newton's first law of motion.

Image A	Image B	Image C

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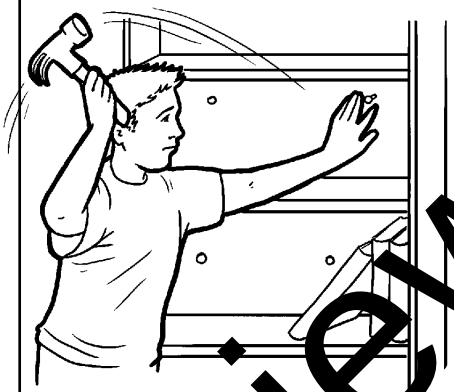
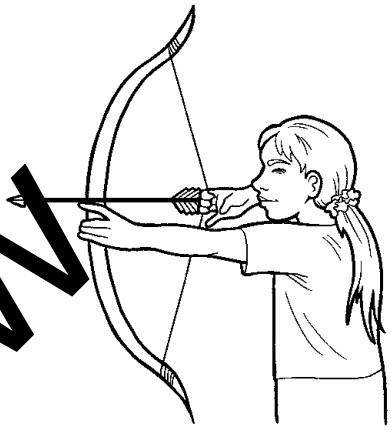
Second Law Of Motion

ACTIVITY

Sir Isaac Newton's second law of motion is:
If a force acts upon an object, it will impact speed and direction

❑ Here are three examples of Newton's second law of motion. Can you give three more examples? Either draw or find pictures. Label them.

Image 1	Image 2	Image 3
		

❑ My examples of Newton's second law of motion.

Image A	Image B	Image C

❑ Extra Newton's third law of motion is that for every force or action there is an equal reaction. Look at the picture right. Does this show the third law? How?

_____

_____

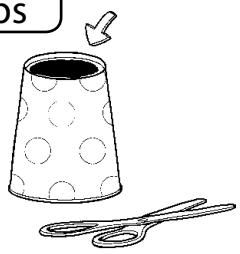
Potential And Kinetic Energy

ACTIVITY

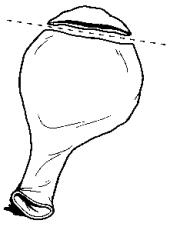
❑ A marshmallow launcher works by potential and kinetic energy. Pair up, then follow the steps to make your own launcher.

Materials:
● paper cup ● scissors ● balloon ● marshmallow ● tape measure ● duct tape

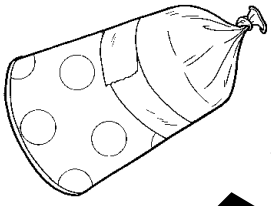
Steps



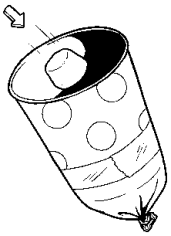
1. Cut out the bottom of the paper cup.



2. Cut the tip off the balloon.



3. Stretch the balloon over the end of the paper cup and tie a knot. Secure with duct tape.



4. Place a marshmallow inside the cup to shoot.

Operate

1. As you pull the balloon back, it builds up potential energy.
2. The further you pull back the balloon, the more potential energy is built up and generally the further the balloon will travel.
3. As you release the balloon, the potential energy is converted to kinetic energy.
4. Kinetic energy is what makes the marshmallow move through the air.

Results

1. Measure the distance of six launches (measure using a tape).

Launch 1- Distance:	**Launch 4**- Distance:
Launch 2 - Distance:	**Launch 5**- Distance:
Launch 3 - Distance:	**Launch 6**- Distance:

2. Complete the missing words.

When I pull back the balloon _____ energy is built up. The more _____ energy I build up the _____ the marshmallow will travel. As I release the balloon _____ energy changes into _____ energy. _____ energy is what makes the marshmallow travel through the air.

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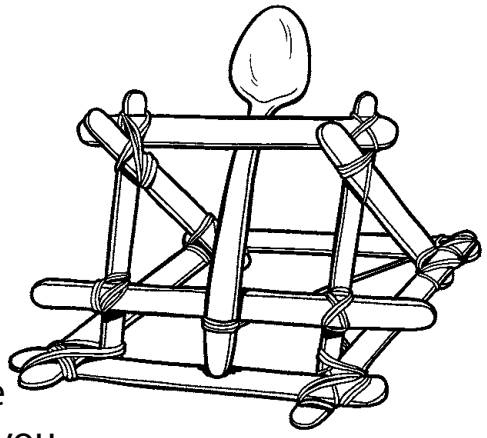
Build A Working Catapult

ACTIVITY

Catapults use potential and kinetic energy. Potential energy is built up when the 'launcher' is pulled backwards. When the 'launcher' is released, the potential energy turns into kinetic energy. The 'ammunition' moves through the air because of kinetic energy.



❑ Your task is to create a working catapult using the materials listed below. Look at the image to help you with your design. Work in pairs or small groups.

Materials:

- paddlepop sticks
- rubber bands or string
- plastic bottlecap or small plastic spoon
- glue

Questions To Ask

1. Which materials will make the best launcher? _____

2. How can I secure the base from moving? _____

_____

3. What will the item for launching go into? _____

4. Which materials don't I need? _____

Test It Out

Trial	Distance	Modifications	New Distance
1			
2			
3			

Conclusion

5. What did I learn from this design challenge?

_____

Gravity And Air Resistance 1

ACTIVITY

Our planet pulls everything towards its centre. This force is called gravity. We can't see gravity but it is working on us all the time. Gravity is what keeps our feet on the ground! If there was no gravity, we would float like we do in space. When we pick things up we have to pull against gravity. When we drop things, gravity pulls these things toward the ground.

Things fall at different speeds because of air resistance. Galileo, a famous scientist, discovered that an object that is more dense, or has more mass, falls at a quicker rate than a less dense object, due to air resistance. If a feather and a brick, for example, are dropped together, air resistance causes the feather to fall more slowly.

Let's Investigate Conduct the gravity and air resistance experiment below to see if Galileo was correct!

Materials:
● a leaf ● a stone ● an exercise book ● an eraser ● stop watch

Test A: Dropping items of different weight from the SAME height.

Step 1: Choose two items from the above list.

Step 2: Choose the tallest person in your group to drop the items from above their head.

Step 3: Start the stop watch as the item is dropped. Stop as it hits the floor.

Step 4: Record and compare the speeds taken to fall.

My Items:

Item 1:	Item 2:

My prediction: _____

_____

The results: _____

_____

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Gravity And Air Resistance 2

ACTIVITY

Materials:

● a leaf ● a stone ● an exercise book ● an eraser ● stop watch

Test B: Drop the same item (same weight) from DIFFERENT heights.

Step 1: Choose one item from the above list.

Step 2: Choose the tallest person in your group to drop the item from above their head.

Step 3: Choose the smallest person in your group to drop the same item from above their head.

Step 4: Start the stop watch as the item is dropped. Stop as it hits the floor.

Step 5: Record and compare the speed taken to fall.

My Items:

Item 1:	Item 2:

My prediction: _____

_____

The results: _____

_____

Conclusion What did I learn from this experiment?

_____

_____

Answers

Page 3

Take the time to discuss each law as students may find these concepts initially abstract. Relate them back to every day actions to help them.

Examples they could use

A: A spinning top

B: Hitting a tennis ball; mixing a cake

C: Waves in a pool; wind blowing a kite

Page 4

Possible examples:

A Playing golf

B Digging in the garden

C Pushing a person on a swing

Extra:

Yes, the image does show the third law. The force is a roller coaster cart racing downhill at speed. You can see an equal reaction of the air pushing against the people by looking at their hair.

Page 5

2. When I pull back the balloon potential energy is built up. The more potential energy I build up the further the marshmallow will travel. As I release the balloon, potential energy changes into kinetic energy. Kinetic energy is what makes the marshmallow travel through the air.

Page 6

Students may have difficulty using the rubber bands to create the catapult. Encourage them to experiment wrapping the bands in different ways and discuss their observations.

Page 7 & 8

Background information: Galileo (Italian scientist) found that things with different weight fall at about the same speed. Gravity is a useful force that holds everything together. Every object in the world has a pulling force of gravity working.