



2nd Science

Teacher's Manual & Workbook Samples

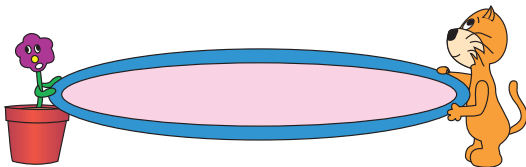
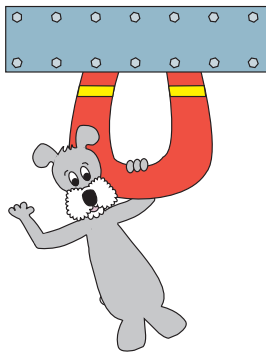
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2nd Science Scope and Sequence

Unit 1 Wholes and Parts (I)	Lessons 1-3
Unit 2 Parts of Plants (L)	Lessons 4-6
Unit 3 The Sky and Weather (E)	Lessons 7-9
Unit 4 Heat and Light (P)	Lessons 10-12
Unit 5 Critter Babies (I)	Lessons 13-14
Unit 6 Animals and Offspring (L)	Lessons 15-18
Unit 7 Geological Features (E)	Lessons 19-20
Unit 8 Movement and Force (P)	Lessons 21-24
Unit 9 Blocks and Mirrors (I)	Lessons 25-29
Unit 10 Animal Classes (L)	Lessons 30-34
Unit 11 Endangered and Extinct (E & L)	Lessons 35-36
Unit 12 Magnets (P) Lessons 37-40	
Unit 13 Scientists (I) Lessons 41-42	
Unit 14 Growing Plants (L & E)	Lessons 43-44
Unit 15 Electricity (P)	Lessons 45-49
Unit 16 Data and Predictions (I)	Lessons 50-51
Unit 17 Investigating Animals (L)	Lessons 52-54
Unit 18 Changing Substances (P)	Lessons 55-57
Unit 19 Attributes (I) Lessons 58-59	
Unit 20 Sound (P & L)	Lessons 60-61
Unit 21 Science Challenges (I & P)	Lessons 62-64
Unit 22 Light (P)	Lessons 65-66

The major emphasis of each unit is designated by a single letter in parenthesis:

I = Scientific Inquiry

L = Life Sciences

E = Earth and Space Sciences

P = Physical Sciences

Alignment to National Science Education Standards Grade K to 4

Standard A Science As Inquiry

Developing abilities for scientific inquiry

Units 1, 4, 5, 8, 9, 12, 14, 16, 18, 19, 20, 21, 22

Developing an understanding of scientific inquiry

Units 1, 4, 5, 8, 12, 13, 14, 16, 17, 18

Standard B Physical Science

Understanding of properties of objects and materials

Units 4, 8, 12, 18, 19, 21, 22

Understanding the position and motion of objects

Unit 8, 9

Understanding light, heat, electricity, and magnetism

Units 4, 12, 15, 22

Standard C Life Science

Understanding the characteristics of organisms

Units 2, 5, 6, 10, 14, 17, 20

Understanding life cycles

Unit 6

Understanding organisms and environments

Units 2, 5, 6, 11, 14, 17

Standard D Earth and Space Science

Understanding properties of earth materials

Units 3, 7, 1, 14, 17

Understanding objects in the sky

Unit 3

Understanding changes in earth and sky

Units 3, 7

Standard E Science and Technology

Developing the ability for technological design

Units 19, 21

Understanding science and technology

Units 11, 13

Developing abilities to distinguish between natural objects and objects made by humans

Unit 6

Standard F Science in Personal and Social Perspectives

Understanding about personal health

Unit 3

Science and technology in local challenges

Unit 11

Changes in environments

Unit 11

Standard G Sciences as a Human Endeavor

Units 13, 16, 19

Standard U Unifying Concepts and Processes

Understanding systems, order, organization

Units 1, 6, 15, 20, 21

Using evidence, models, explanations

Units 4, 15, 18, 20, 21

Understanding change, constancy, and measurement

Units 3, 4, 5, 6, 8, 12, 16, 21

Understanding form and function

Units 1, 15

More detailed information about National Science Standards (*Content Standards*) can be found on the web at:

<http://www.nap.edu/readingroom/books/nse/html>

Lesson 24

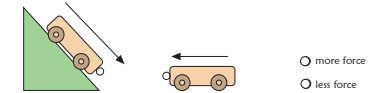
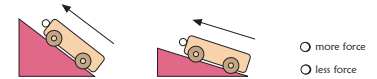
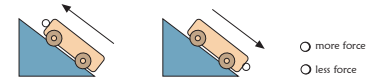
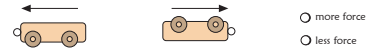
Objective

Students will measure the effects of wheels. (P)

Materials

- * Workbook page for Lesson 24
- * Wheeled Cart
- * Spring Scale (a 250 g / 2.5 Newton scale is included in the science kit)
- * Flat surface that can be inclined
- * Books or other objects to support the inclined surface
- * String
- * Pennies or washers about the size of pennies

Look at the first cart in each row. Will the second cart take more or less force to move it? Arrows show the direction the carts will be pulled.



Preparation

A flat surface could be a board about 18” long and about 5” or more wide, a cookie sheet, or a heavy piece of cardboard.

Books or cardboard boxes can be used to prop the incline.

The wheeled cart is a part of the science kit. It can also be made. It is a simple block of 2 x 2 wood with 4 wooden craft wheels attached. An eyehook can be installed on one end to attach the spring or a string. Our cart also has large holes drilled into the wood on the top and the bottom sides which are large enough to hold pennies or other weights.

A short string (about 2”) attached to the eyehook will make it easier to attach the hook on the spring scale.

Teaching

Students will explore the use of wheels to reduce the amount of force needed to move an object.

The cart can be flipped upside down and pulled. Students will compare this to pulling it with the wheels.

Weigh the cart down with pennies. The holes in the cart can hold several pennies. Repeat pulling it with and without wheels.

Did adding weight make it easier or harder to pull?

Using the spring scale, try several different ways on inclines. Try the cart upside down, wheel side down, with and without weights, steep and less steep inclines. Have students note the differences by recording the amount of lines the scale moves on a piece of paper.

Next, have students put the cart on a flat surface on its wheels. Keep the spring scale hooked up. Students will pull the cart very slowly with the scale. **Did the scale measure much force?** Next, have students jerk the cart with the spring scale. **Did the marker move farther?** The students should have noticed that the marker jumped when the cart was jerked. **Does it take more or less force to move the cart suddenly?** (more)

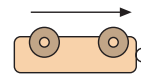
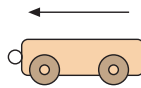
Conclusion

Students will complete the worksheet. Have students fill in the circles to compare forces needed to move the carts in the pictures. Look at the first cart in each row. Will the second cart need more or less force to move? The pictures show arrows indicating the direction the cart will be pulled.

Workbook Answers

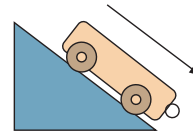
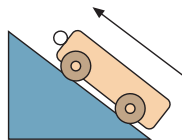
Inclines - Lesson 24

Look at the first cart in each row. Will the second cart take more or less force to move it? Arrows show the direction the carts will be pulled.



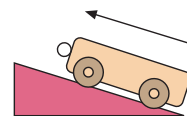
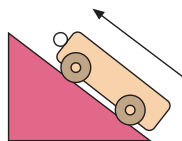
more force

less force



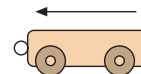
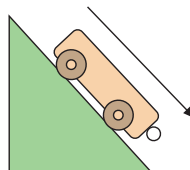
more force

less force



more force

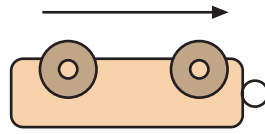
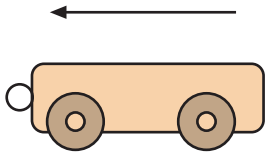
less force



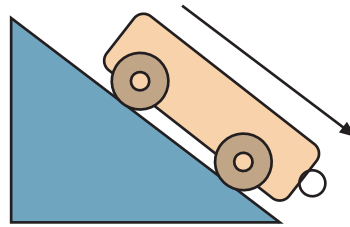
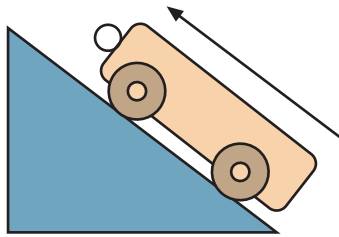
more force

less force

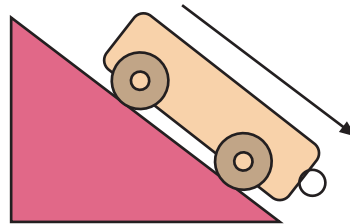
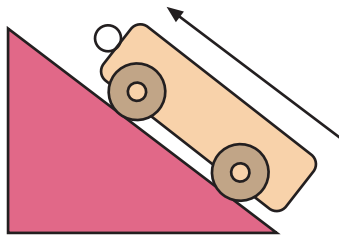
Look at the first cart in each row. Will the second cart take more or less force to move it? Arrows show the direction the carts will be pulled.



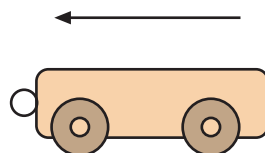
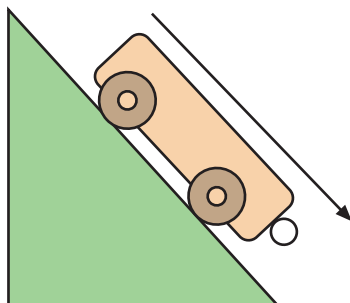
- more force
- less force



- more force
- less force



- more force
- less force



- more force
- less force

Unit 10 - Animal Classes

Lesson 30

Objective

Students will learn about mammals. (L)

Materials

- * Lesson 30 Cards (drawings of animals)
- * Workbook pages for Lesson 30

Preparation

Cut apart the cards.

Students will read about mammals. Students should attempt to read the first workbook page independently if possible. The teaching section before the reading is designed to help build content reading skills. In this lesson, students will preview a page before reading it. This helps alert students to important information and begins to form a frame of reference and structure for reading.

Teaching

Dogs and cats are kinds of animals. What are some other kinds of animals? Have students say names of kinds of animals. Write a list of the animals. **Think about how these animals are alike or different.** Show students the cards. **Sort these cards into groups of animals. Make groups of animals that you think are most alike.**

Ask students how they think the animals in each group are alike. **Over the next few lessons we're going to talk about ways scientist group animals. Putting animals into groups helps them understand the ways the animals live, die, grow, and survive. There are six main groups of animals. These groups are called classes. The six main classes are mammals, reptiles, amphibians, fish, birds, and arthropods (insects, spiders, crustaceans). We will learn about mammals, reptiles, amphibians and birds over the next four lessons.**

Today we'll begin by learning about mammals. Have students turn to the first Lesson 30 workbook page with the picture of a tiger at the top. **What three animals do you see on this page?** (Students may be unfamiliar with the pine marten, but they can find the answer by reading the caption.) **Words right below a picture that tell something more about the picture are called captions. Sometimes a caption is a single word, other times it's a sentence or two. Read the captions under each picture.**

Now, let's look for titles to sections. The titles are usually spaced apart from paragraphs. They are usually in bold or dark print. Titles have words capitalized in them, besides the first word. Can you find the two titles to the two parts on this page? Read them. (Many Kinds of Mammals, Why is a Mammal a Mammal?)


Are other words in dark print? Sometimes when you read books, certain words are important or new vocabulary words. The dark print helps you find these words quickly. These are words or points that help you remember important information. Look for these words before you read. What words in the paragraphs are in dark print? (warm blooded, fur, drink milk, vertebrate, four limbs, breathe air)

Mammals - Lesson 30


Many Kinds of Mammals

Mammals come in many sizes, shapes, and colors. There are over 4,000 kinds of mammals. Some are very small. Some are very large. Some eat plants. Some eat animals. Some live on land. Some live in the water.

There are many differences between mammals, but they are also alike in many ways. It's the way they are alike that make them mammals. In what ways are mammals alike?



Tigers hunt other animals.



A pine marten is a small mammal.

What Makes a Mammal a Mammal?

All mammals are warm blooded. That means their bodies can make their own heat. This makes it possible for animals to live in very cold areas like polar bears in the arctic. They can also live in warm areas like kangaroo rats in the desert. Animals in warm places sweat to cool their bodies.


All mammals have fur. Animals in cold places have fat and fur to help keep them warm. Fur can also protect animals from the sun. Whales are mammals, too. They have very fine fur that is hard to see.

Most mammals are born, not hatched. A few mammals do lay eggs. The duck-billed platypus is a very strange mammal that lays eggs. All mammal babies drink milk from their mothers. This means the mother has to take care of them for awhile.

Mammals are alike in other ways, too. All mammals have spines. Another name for animals with spines is a vertebrate. Do you know where your spine is? Feel the middle of your back. The bumps you feel are the bones of your spine. The bones are called vertebrae.

Mammals have four limbs. A dolphin's limbs are flippers and tail fins. Our limbs are legs with feet and arms with hands. Other mammals have legs with four paws or hooves. Bats have two wings and two legs.

Mammals breathe air. Even sea mammals like whales breathe air. They can hold their breath under water for a long time, but they can't breathe the water like a fish.



Whales (including dolphins), seals, and walrus are some mammals that live in water.

Tiger and Pine Marten Photos from the U.S. Fish and Wildlife Service National Image Library photo archives. Public Domain
Killer Whale Photo from the National Oceanic and Atmospheric Administration/Department of Commerce photo archives. Public Domain

Mammals - Lesson 30

Are the statements about mammals true or false? Fill in the circles by the correct answers.

- All mammals are small.
 true false
- All mammals are warm blooded.
 true false
- Whales breathe air.
 true false
- All mammal babies drink milk.
 true false
- Snakes are mammals.
 true false
- All mammals lay eggs.
 true false
- Mammals are not vertebrates.
 true false
- All mammals have fur.
 true false
- Arms and flippers are both limbs.
 true false
- Mammals only eat plants.
 true false

What title are these under? (Why is a Mammal a Mammal?) **Why do you think these words are in dark print? Are there any words in dark print that you don't know? Maybe you'll find out what they mean when you read. If not, what would you do?** (find it in a dictionary or ask someone else)

Students should read about the animals on the first workbook page. The text is reprinted below.

Mammals come in many sizes, shapes, and colors. There are over 4000 kinds of mammals. Some are very small. Some are very large. Some eat plants. Some eat animals. Some eat both plants and animals. Some live on land. Some live in the water.

There are many differences between mammals, but they are also alike in many ways. It's the ways they are alike that make them mammals. In what ways are mammals alike?

What Makes a Mammal a Mammal?

All mammals are warm blooded. That means their bodies can make their own heat. This makes it possible for animals to live in very cold areas like polar bears in the arctic. They can also live in warm areas like kangaroo rats in the desert. Animals in warm places sweat to cool their bodies.

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Mammals are alike in other ways, too. All mammals have spines. Another name for animals with spines is a vertebrate. Do you know where your spine is? Feel the middle of your back. The bumps you feel are the bones of your spine. The bones are called vertebra.

Mammals have four limbs. A dolphin's limbs are flippers and tail fins. Our limbs are legs with feet and arms with hands. Other mammals have legs with four paws or hooves. Bats have two wings and two legs.

Mammals breathe air. Even sea mammals like whales breathe air. They can hold their breath under water for a long time, but they can't breathe the water like a fish.

What are some other mammals that you have seen?

What are some mammals that you'd like to see someday?

What are some other things you'd like to learn about mammals?

Conclusion

Students will read the statements about mammals on the second workbook page. Are they true or false? Fill in a circle to answer.

Many Kinds of Mammals

Mammals come in many sizes, shapes, and colors. There are over 4,000 kinds of mammals. Some are very small. Some are very large. Some eat plants. Some eat animals. Some eat both plants and animals. Some live on land. Some live in the water.

There are many differences between mammals, but they are also alike in many ways. It's the ways they are alike that make them mammals. In what ways are mammals alike?



Tigers hunt other animals.



A pine marten is a small mammal.

What Makes a Mammal a Mammal?

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Mammals breathe air. Even sea mammals like whales breathe air. They can hold their breath under water for a long time, but they can't breathe the water like a fish.



Whales (including dolphins), seals, and walruses are some mammals that live in water.

Are the statements about mammals true or false? Fill in the circles by the correct answers.

1. All mammals are small.
 true false
2. All mammals are warm blooded.
 true false
3. Whales breathe air.
 true false
4. All mammal babies drink milk.
 true false
5. Snakes are mammals.
 true false
6. All mammals lay eggs.
 true false
7. Mammals are not vertebrates.
 true false
8. All mammals have fur.
 true false
9. Arms and flippers are both limbs.
 true false
10. Mammals only eat plants.
 true false

Lesson 48

Objective

Students will create circuits. (P)

Materials

- * Small light bulbs and bulb holders
- * Wires
- * Battery and holder (1.5 Volt AA)
- * Workbook pages for Lesson 48

Preparation

Any 1.5 volt battery can be used unless you are using the battery holder in the science kit. The science kit contains an AA battery size holder.

Each student or group will need the wires, a battery, and battery holder. Students will need two bulbs with holders.

Teaching

Students will begin by experimenting with a two bulb circuit.
Can you make a circuit with two bulbs lit?

Conclusion

Students will build the circuits on the workbook pages and record how the lights respond. Students will choose not lit if the light isn't lit. They will choose dim if the lights are not as bright as it is with a single bulb. They will choose bright for the brightest light. There are two pages of circuits.

Review the answers with the students.

Look at circuit 1. Why were the bulbs not as bright as when you lit only one light? (The electricity had to pass through both bulbs before the circuit was complete.)
What do you think would happen if we added another bulb into the circuit? (The bulbs would be even dimmer.)

Look at circuit 2. Why wasn't the B light bulb lit? Why was the A bulb bright? (There is a wire touching both terminals on bulb B. The electricity passed through the wire instead of the bulb. This is called a short circuit. Bulb A could use all the electricity, so it was bright.)

Look at circuit 3. Why wasn't the A light bulb lit? Why was the B bulb bright? (Bulb A didn't have a complete circuit with the battery. Bulb B could use all the electricity, so it was bright.)

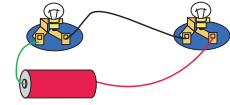
Look at circuit 4. Why were neither bulb lit? (Neither battery had a complete circuit.)

What lightbulbs will be lit? Will they be bright or dim? Fill in the circles to show your answers.

CIRCUIT 1

Bulb A Not Lit
 Dim
 Bright

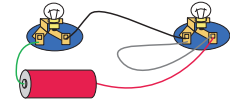
Bulb B Not Lit
 Dim
 Bright



CIRCUIT 2

Bulb A Not Lit
 Dim
 Bright

Bulb B Not Lit
 Dim
 Bright



Two Bulb Circuits - Lesson 48

What lightbulbs will be lit? Will they be bright or dim? Fill in the circles to show your answers.

CIRCUIT 3

Bulb A Not Lit
 Dim
 Bright

Bulb B Not Lit
 Dim
 Bright

CIRCUIT 4

Bulb A Not Lit
 Dim
 Bright

Bulb B Not Lit
 Dim
 Bright

Workbook Answers

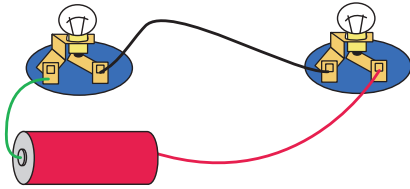
Two Bulb Circuits - Lesson 48

What lightbulbs will be lit? Will they be bright or dim? Fill in the circles to show your answers.

CIRCUIT 1

- Bulb A Not Lit
 Dim
 Bright

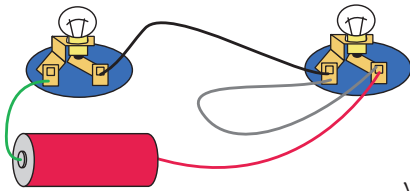
- Bulb B Not Lit
 Dim
 Bright



CIRCUIT 2

- Bulb A Not Lit
 Dim
 Bright

- Bulb B Not Lit
 Dim
 Bright



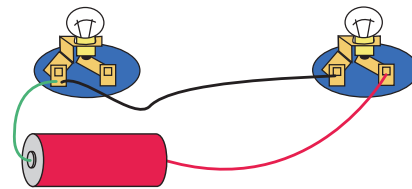
Two Bulb Circuits - Lesson 48

What lightbulbs will be lit? Will they be bright or dim? Fill in the circles to show your answers.

CIRCUIT 3

- Bulb A Not Lit
 Dim
 Bright

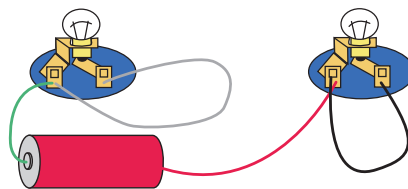
- Bulb B Not Lit
 Dim
 Bright



CIRCUIT 4

- Bulb A Not Lit
 Dim
 Bright

- Bulb B Not Lit
 Dim
 Bright

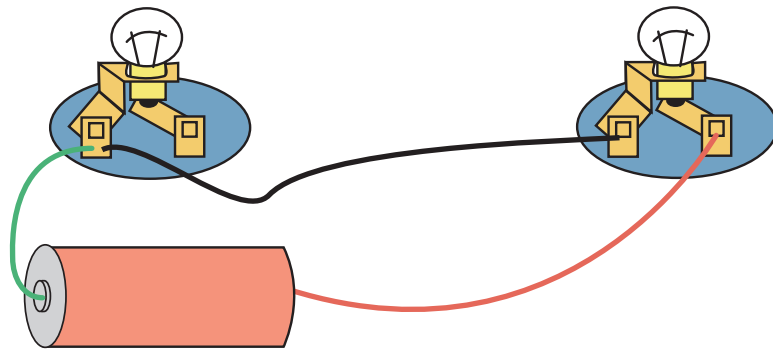


What lightbulbs will be lit? Will they be bright or dim? Fill in the circles to show your answers.

CIRCUIT 3

- Bulb A Not Lit
 Dim
 Bright

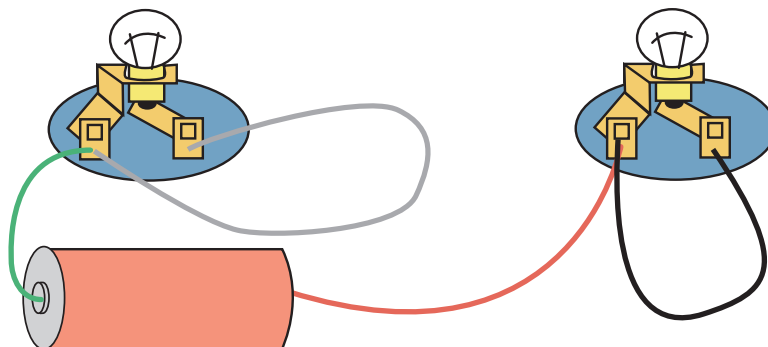
- Bulb B Not Lit
 Dim
 Bright



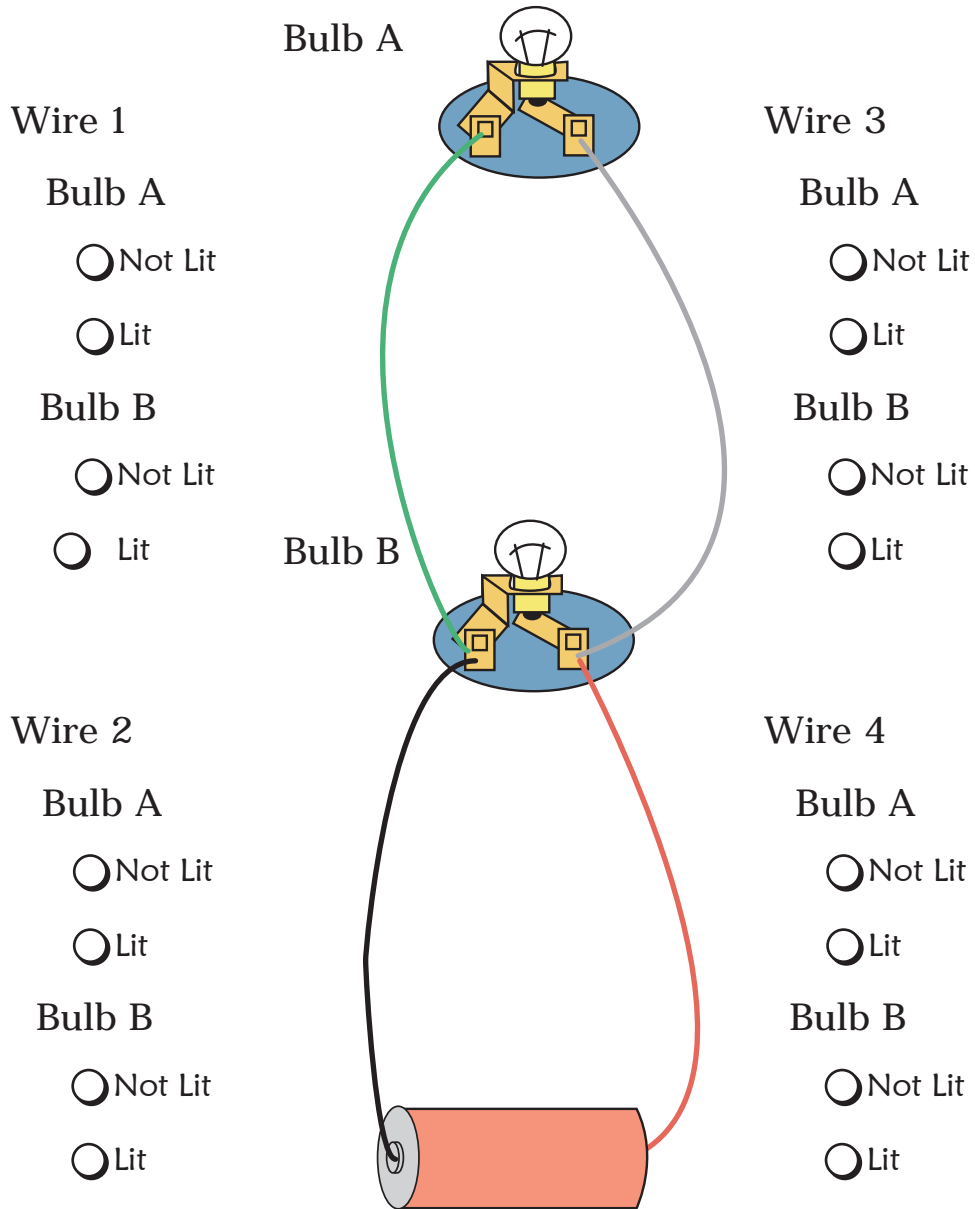
CIRCUIT 4

- Bulb A Not Lit
 Dim
 Bright

- Bulb B Not Lit
 Dim
 Bright



What lightbulbs will be lit? Will they be bright or dim? Fill in the circles to show your answers.



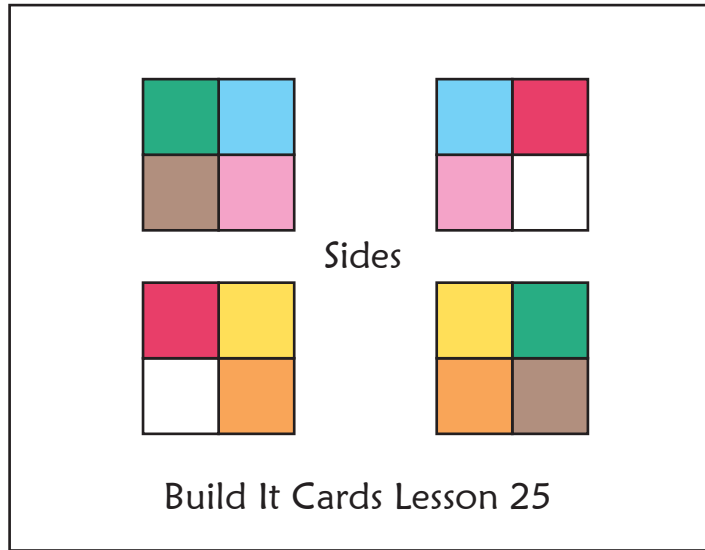
5. Loosen bulb A until it goes out. What happens to bulb B?

- Not Lit Brighter Same

6. Tighten bulb A until it comes on again. Loosen bulb B until it goes out. What happens to bulb A?

- Not Lit Brighter Same

Resource Packet Samples



Actual Size Card

Animal Classes Game Board *Lesson 34*

Start	dog		turkey	cobra		bullfrog		tuatara	
					feather			parrot	
treefrog		scales		crocodile		red-spotted newt		rabbit	
	lion			horned toad		sea turtle	mudpuppy		
river cooter		fowl	crane	elk		pelican		skin	
									tortoise
bear	fire-belly newt		iguana	talons		python	wood frog	robin	
	sea gull				deer		tadpole		
	skink			plains spadefoot		falcon			
born				gecko		hatch	cat	duck	
	loon	eggs		blue jay				Start	
zebra		tiger salamander		monkey		fur	oak toad		

Laminated Game Board (reduced size)

The Ear Lesson 61

