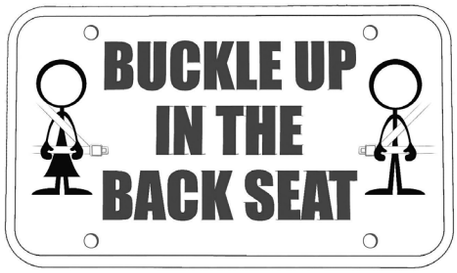
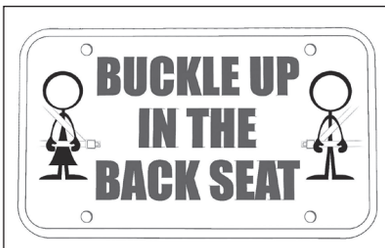


Overview of Lesson Plans

This 5th grade curriculum is divided into three lessons. The first lesson is **Newton's First Law of Motion**. The teacher and the class discuss and list points that are covered in the video presentation. For example, they discuss and list what they can do to make themselves safer when riding in a car. Students are provided worksheets to develop math and science skills about Newton's Law of Motion.

The second lesson is titled **Airbags, Seat Belts and Injury Prevention**. Worksheet activities include identifying of body structures that protect us, (e.g. long bones, flat bones). The activities include math problems, graphing and studying of the human body structure, which are based on concepts covered in the video presentation.

The third lesson is titled **Making Choices**. Students compare and contrast ideas and brainstorm facts presented in the video presentation. Students' reactions and discussion provide the teacher with an evaluation of how much students gained from the lessons.



Lesson 1: Newton's First Law of Motion

COLORADO ACADEMIC STANDARDS

- Math 5.1.1.d
- Math 5.1.2.a
- Math 5.1.4.f

MATERIALS

- *Buckle Up in the Back Seat* video
- Parent/Guardian Letter for each student
- Computer/LCD projector or TV monitor/DVD player
- DVD script
- Worksheet 1: Newton's Law of Motion
- Worksheet 2: Math Part 1 – Newton's Law of Motion
- Stopping Distance Resource
- Newton's Law of Motion Resource

INTENDED LEARNING

1. **Students learn the safest location for children to sit in a car.**
   - Share ideas as to the safest location for children to sit in a car.

2. **Students learn the safest way to wear a seat belt.**
   - Critically analyze the safest position on their bodies to wear a seat belt.

LESSON

Preparation

- Send home with each student a copy of the Parent/Guardian Letter a few days before the lessons begin.
- Review the *Buckle Up in the Back Seat* video.
- Review the script for the video
- Copy of the worksheets for each student.

Teaching

1. **Tell students:** Today we are going to begin learning about how we can be safer when we ride in an automobile. We will learn the proper way to use seat belts. We will also learn where the safest place is in a car for children to ride. **Ask students:** What do you think is the proper way to wear a seat belt? What are some wrong ways to wear a seat belt? Where is the safest place in a car for you to sit? Why? Make a list of the answers.

2. **Tell students:** *Newton's First Law is an object which is moving at a constant velocity or an object at a state of rest, does not change its state unless a force acts upon it.* **Ask students:** What does that mean?

3. Play video - Lesson 1 Newton's First Law of Motion

4. Review Newton's First Law. Have students give examples of how Newton's First Law works in their lives. Ask students the following review questions.
   - How many young people are killed in traffic accidents each year?
   - At what age will you be able to sit in the front seat?
   - Explain *inertia*.
   - What is Newton's First Law of Motion?
   - How can you calculate "*crash force*"?
   - If you are in a car traveling at 35 mph and the car you are in collides with another car, what are some *"outside forces"* that will stop you?
   - Why is the backseat the best place for someone your age to sit?

5. Distribute worksheets and allow students time to complete them.
   - Worksheet 1: Have students list several ways they have observed Newton's First Law in action in their lives. The worksheet contains several

cartoon panels. Students will use these panels to illustrate Newton's First Law.

- Worksheet 2 Math: *Part 1.* Using the traffic fatality rate for young people in car crashes, students answer several math problems. Using the data from the video, (see *Resource — Stopping Distance)*, on how long it takes a moving car to stop, students calculate stopping distances. Then interpret this data to make themselves safer when they are walking across streets or other places cars travel.

  Note to teacher: Ask students what the speed limit is in your school zone. Discuss with students how often they think cars and drivers really travel the speed limit or less.

Evaluation

- Have students share their cartoons about Newton's First Law. Review how Newton's First Law applies to their safety in cars.

- Discuss why stopping distance should be taken into consideration when crossing a street.

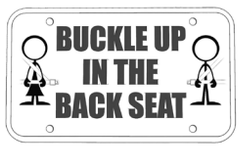
VOCABULARY

- Koi fish
- inertia
- external force
- velocity
- crumple zone
- crash force
- defy
- modify

See Glossary for detailed definitions.

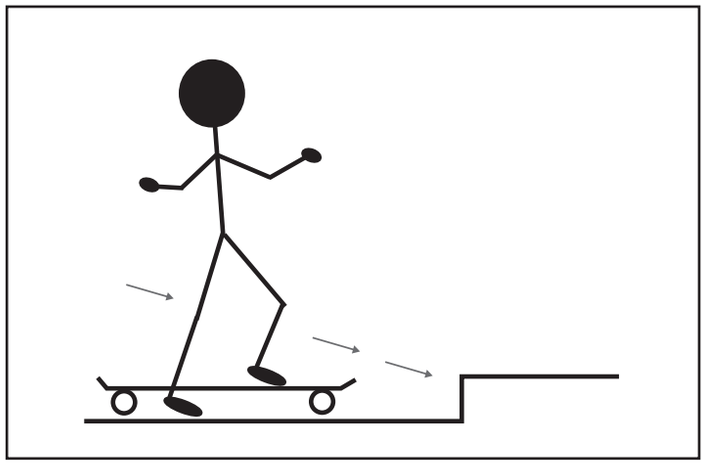
WORKSHEET 1

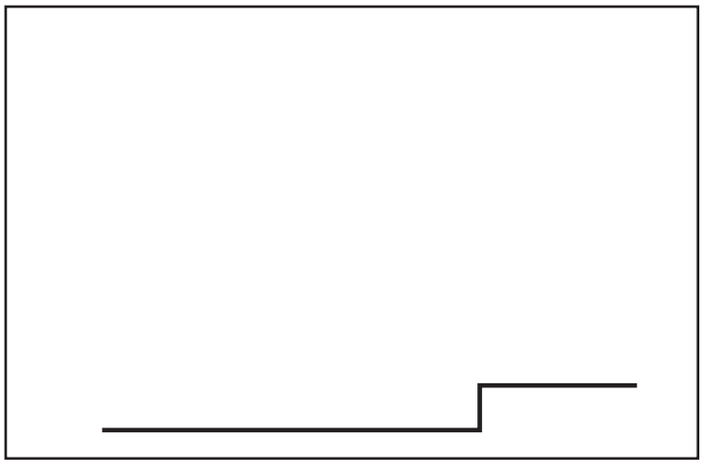
Newton's Law of Motion

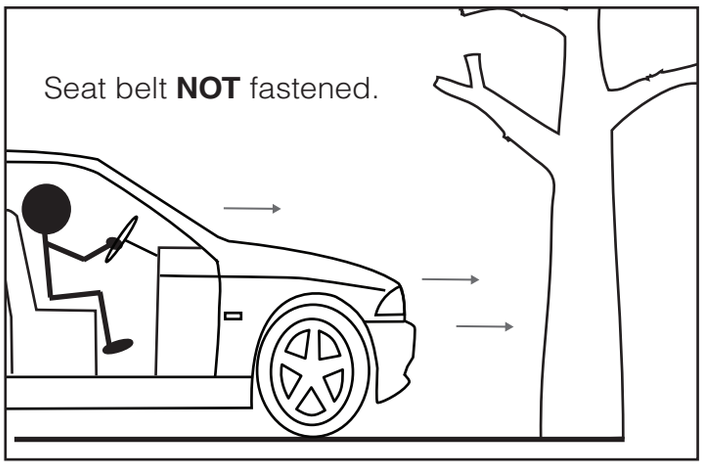


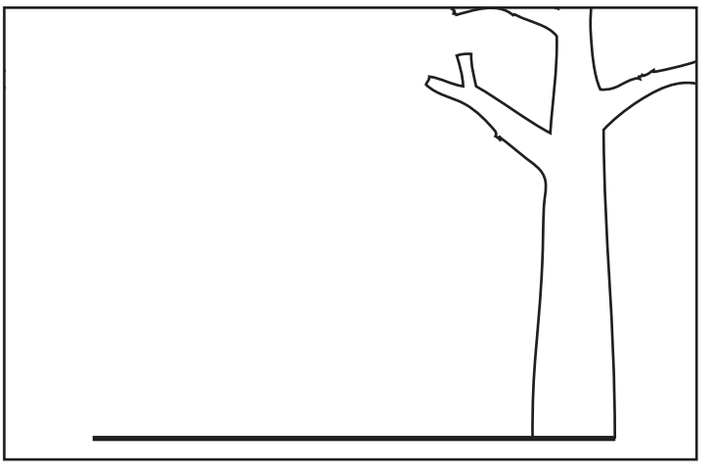
Name:_____ Date: _____

Instructions: What happens next? Study the drawings below. Using the box next to each picture, draw what you predict will happen next.

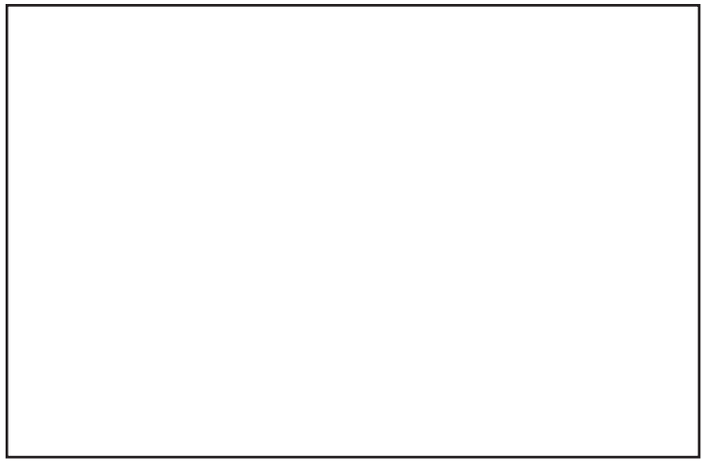


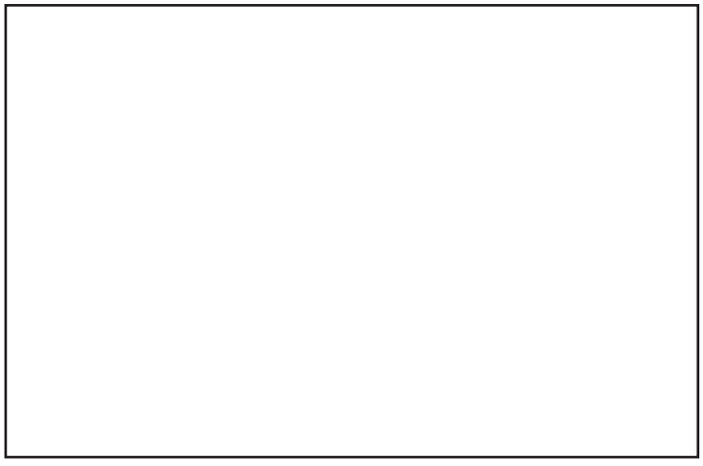






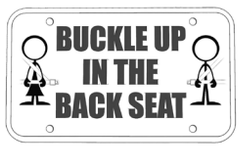
Sketch your own example of Newton's First Law in action.





WORKSHEET 2 – MATH PART 1

Newton's Law of Motion



Name:_____ Date: _____

- **Fact:** More than one person your age is killed each day in traffic accidents and more than three times as many are injured.

- **Fact:** Of the more than 400 people your age killed in traffic accidents each year, nearly half were NOT wearing seat belts.

Use these facts to solve the problems below.

1. About how many people your age are injured each year in traffic accidents?

_____

_____

_____

2. About how many people your age are killed each month in traffic accidents?

_____

_____

_____

3. About how many people your age are injured each month in traffic accidents?

_____

_____

_____

4. From the time you enter kindergarten until you continue to sixth grade, about how many children will be injured in traffic accidents?

_____

_____

_____

RESOURCE

Newton's Laws of Motion

Isaac Newton summed up motion in three laws. Today we take these laws for granted, as we grow up assuming they are true. We do not realize the struggles scientists went through in an attempt to understand the world around them. The following activities use brainstorming, discussion, and simple labs to illustrate the laws.

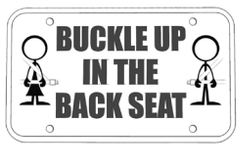
Newton's Three Laws

1. An object that is moving at a constant velocity or at a state of rest does not change its state unless a force acts upon it.

2. Acceleration of an object increases as the amount of force causing the acceleration increases when mass is constant.

3. For every force, there is an equal and opposite force.

RESOURCE
Stopping Distance



Thinking Distance
Thinking distance is the time it takes you to activate your brakes and the distance you travel before they start to affect the speed of the car.
Tip: *Thinking distance* is approximately 1 foot for every mile per hour (mph) you are traveling. For example, if you are traveling at 30 mph, then your thinking distance is approximately 30 feet or 9 meters. (1 meter = 3.28 feet)

Braking Distance
Braking distance is the distance your car travels after you apply the brakes until your vehicle comes to a stop. The faster you travel, the more momentum you have. Therefore, the braking distance will increase accordingly.

Stopping Distance For Cars
Stopping distance is the total distance cars travel before you hit the brakes plus the distance you travel while the brakes slow you down.

Thinking Distance + Braking Distance = Stopping Distance
For example: Typical braking distance while travelling 30 miles per hour

Thinking Distance = 9 meters or 30 feet
Braking Distance = 14 meters or 45.9 feet
Stopping Distance = 9+14 = 23 meters or 75.9 feet (about 6 car lengths)

The figures given are only typical because, in reality, real stopping distances are affected by different circumstances. For example, thinking distance varies depending on the driver and what state he or she is in (tired, distracted).

Car Length	Meters (m)	Feet (ft)
1	3.8	12.6
3	11.4	37.9
6	23	75.9

Typical Stopping Distance in meters

Speed (mph)	20	30	40	50	60	70	80
Thinking Distance (m)	6	9	12	15	18	21	24
Braking Distance (m)	6	14	24	38	54	75	96
Total Stopping Distance (m)	12	23	36	53	72	96	120

RESOURCE

Stopping Distance Resources

Speed	Thinking Distance		Braking Distance		Stopping Distance
20 mph (32 km/h)	6 m	+	6 m	=	12 meters (40 feet) three car lengths
30 mph (48 km/h)	9 m	+	14 m	=	23 meters (75 feet) six car lengths
40 mph (64 km/h)	12 m	+	24 m	=	36 meters (118 feet) nine car length
50 mph (80 km/h)	15 m	+	38 m	=	53 meters (175 feet) thirteen car lengths
60 mph (96 km/h)	18 m	+	55 m	=	73 meters (240 feet) eighteen car lengths
70 mph (112 km/h)	21 m	+	75 m	=	96 meters (315 feet) twenty-four car lengths

(1 mile/hour = 1.6 km/hour)

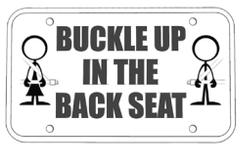
How to remember Stopping Distances

Here is a great way to remember overall stopping distances in feet. Starting from 20 mph simply multiply the speed by intervals of 0.5, beginning with 2 (for example, 2, 2.5, 3, 3.5) as follows.

20 mph x 2 = 40 feet
30 mph x 2.5 = 75 feet
40 mph x 3 = 120 feet
50 mph x 3.5 = 175 feet
60 mph x 4 = 240 feet
70 mph x 4.5 = 315 feet

These calculations are a simple way to remember the correct stopping distances in feet, but be aware that they are approximate.

WORKSHEET 2 – MATH PART 2
Stopping Distance



Name:_____ Date: _____

- **Fact:** *Thinking distance* is the time it takes to activate your brakes plus the distance you have travelled before they start to affect the speed of the car. Thinking distance is approximately 1 foot for every mile per hour you are travelling.
- **Fact:** *Braking distance* is the distance your car travels after you apply the brakes until your vehicle stops. The faster the car travels, the more momentum you have, therefore the braking distance will increase accordingly.
- **Fact:** Stopping distance = Thinking distance + Braking distance. 1 meter = 3.28 feet • 1 mile/hour = 1.6 km/hour
- **Fact:** For every 10 mph increase in speed, it takes three additional meters of thinking time to stop the car.

1. Convert thinking distance, braking distance, and total stopping distance into feet in the chart below.

Speed (mph)	20	30	Calculate the number of feet 20 mph	30 mph
Thinking Distance (m)	6	9		
Braking Distance (m)	6	14		
Total Stopping Distance (m)	12	23		

2. Convert speed from miles per hour to kilometers per hour in the chart below. Using the facts above, write a number model or sentence to show your thinking.

Miles per hour (mph)	Kilometers per hour (km/h)
20	
30	
40	
50	
60	
70	

3. What kinds of things would cause the *thinking distance* to increase and why? List below.

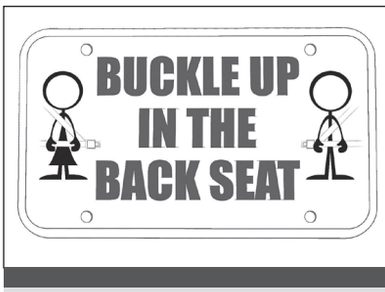
_____

_____

4. You are preparing to cross at a street corner. A car is travelling at approximately 30 mph and is about one half block away (3 car lengths). What action do you take? How does this data influence you as a pedestrian? Explain.

_____

_____



Lesson 2: Airbags, Seat belts and Injury Prevention

COLORADO ACADEMIC STANDARDS

- Life Science 5.2.1.b
- Life Science 5.2.2.a,c

MATERIALS

- *Buckle Up in the Back Seat* video
- Computer/LCD projector or TV monitor/DVD player
- DVD script
- Skeleton Resources
- Worksheet 1: Life Science
- Worksheet 2: Life Science
- CDOT Map

INTENDED LEARNING

1. **Students learn how their bodies support and protect them.**
   - Analyze how a bone shape determines its function.
   - Realize that long bones (arm and leg bones) provide structural support for the body.
   - Realize that flat bones (e.g. skull, ribs, vertebrae) protect vital organs such as the brain, heart, lungs, and spinal cord.
2. **Students learn what they can do to protect themselves.**
   - Appreciate that they can protect themselves by wearing pads and a helmet when skating, skateboarding, or riding bicycles.
   - Realize that seat belts protect them.
   - Understand the proper way to wear seat belts.

LESSON

Preparation

- Review Lesson 1.
- Preview script and DVD for Lesson 2.
- Copy worksheets for each student.
- Post CDOT Colorado Highway map on a bulletin board.

Teaching

1. **Tell students:** Today we are going to learn how your body is designed to protect you. Most of your bones can be put into two categories: bones that support and bones that protect. **Ask students:** Name some bones that protect vital organs in your body (for example, ribs, skull, vertebrae). Name some bones that support your body (long bones in your arms and legs). How does the shape of a bone affect the job it does? Which type of bones do bike helmets and elbow and knee pads resemble (flat bones)?

2. **Tell students:** We will learn what you can do to protect your body. Seat belts, like flat bones, protect your body in a collision, but only if they are worn properly.

3. Play video – Lesson 2 Airbags, Seat Belts and Injury Prevention

4. **Tell students:** Air bags inflate at 175 miles per second. Look at the CDOT map of Colorado. Find the key. **Ask students:** How many miles are represented by one inch on the map? Using this figure, how many inches long would a piece of string be to represent 175 miles? **Tell students:** Take the string. Put one end on Denver. Using the string, draw a circle with Denver at its center with a radius the length of the string that represents 175 miles. List the important cities and towns included in that circle.

5. **Ask students:** Considering how fast an air bag deploys, would you have enough time to raise your arm to protect yourself? What do you need to do to keep you safe when the air bags deploy? (Fasten your seat belt properly. Sit in the back seat.) List the dangers of riding in cars without your seat belt fastened (injury from a deploying air bag, being thrown into the dashboard or some other hard surface, being thrown out of the car).

6. Distribute worksheets and allow students time to complete them.
   - Worksheet 1: Life Science – The worksheet has a cartoon of a child sitting in a car. Have students draw a seat belt on the child showing the seat belt in proper position for maximum safety. Have students list the dangers of riding in cars without seat belts fastened.

   - Worksheet 2: Life Science – The worksheet shows a cut-away view of the inside of a car. Have students identify on the cut-away places where children might come in contact with a hard surface during a collision. Have students write a brief paragraph explaining why people should always wear seat belts and where the safest place is for children to sit.

Evaluation

- Have students share their drawings of proper placement of a seat belt. Have students list the dangers of riding in cars without seat belts.

- Have students identify places in a car where children might come into contact with hard surfaces during a crash. Have students explain why and how seat belts work.

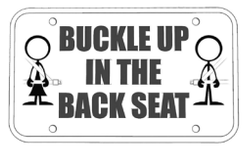
VOCABULARY

- skeleton
- spine
- rib cage
- skull
- deploy
- air bag

See Glossary for detailed definitions.

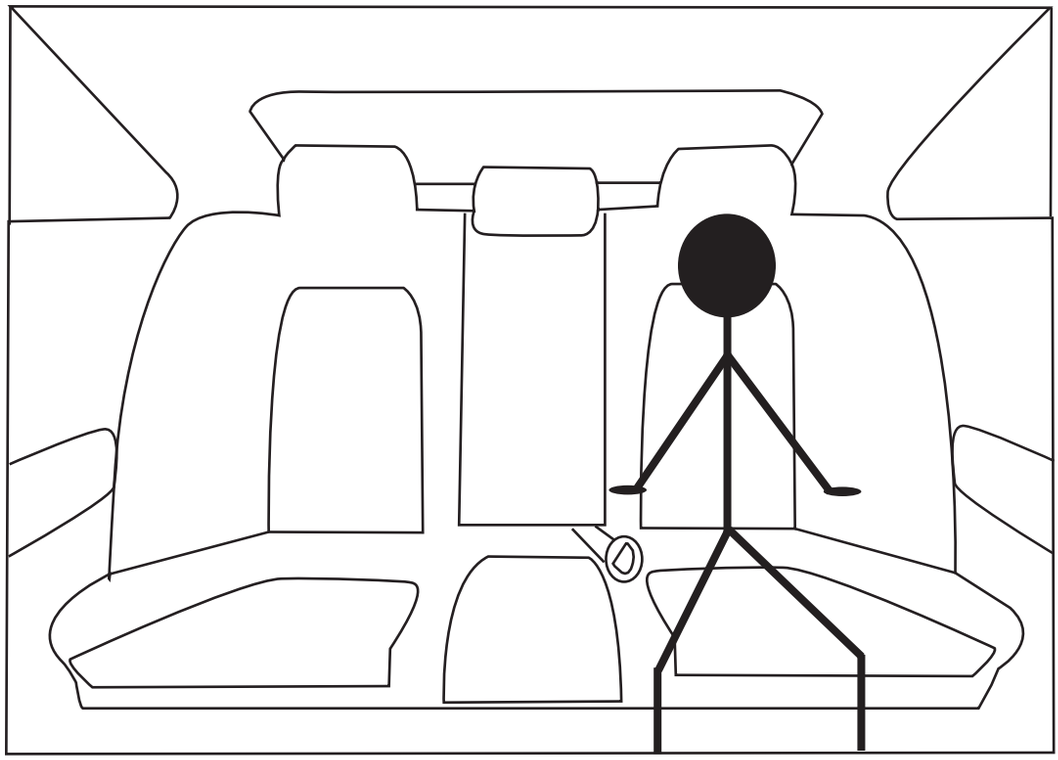
WORKSHEET 1

Life Science



Name:_____ Date: _____

Draw a seat belt in correct position on the figure below.



List the dangers of riding in cars without your seat belt fastened.

_____

_____

_____

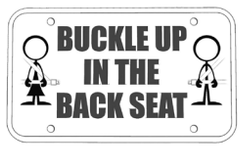
_____

_____

_____

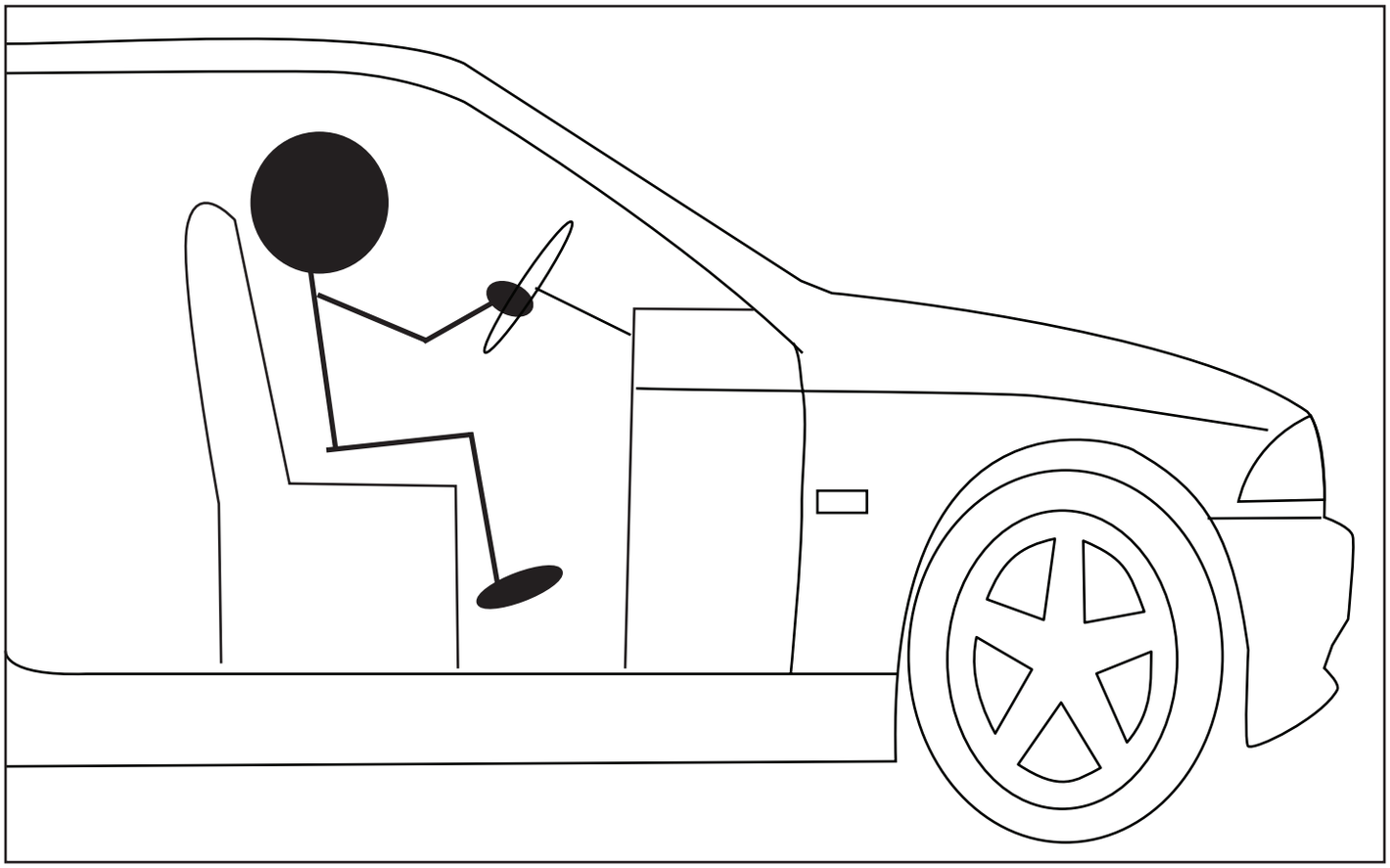
WORKSHEET 2

Life Science



Name:_____ Date: _____

Circle the hard surfaces people may come in contact with during collisions.



Write a brief paragraph explaining why you should always wear a seat belt and where the safest place is for you to sit.

_____

_____

_____

_____

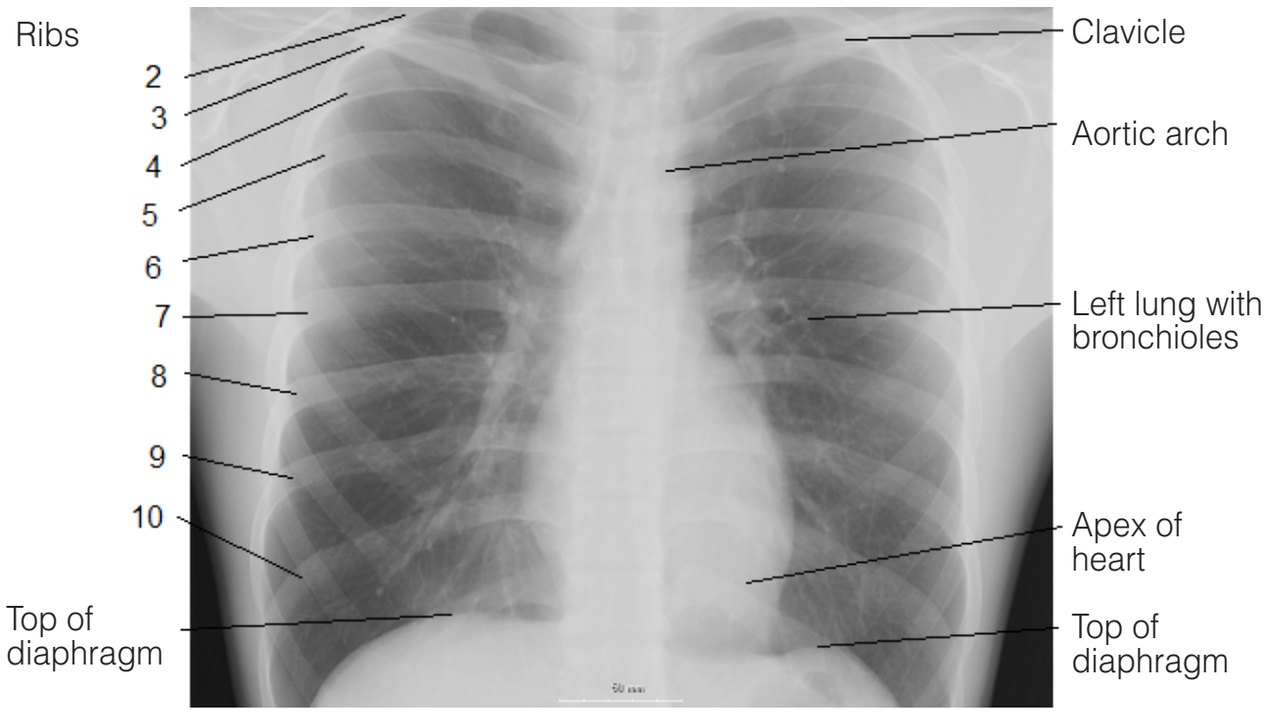
_____

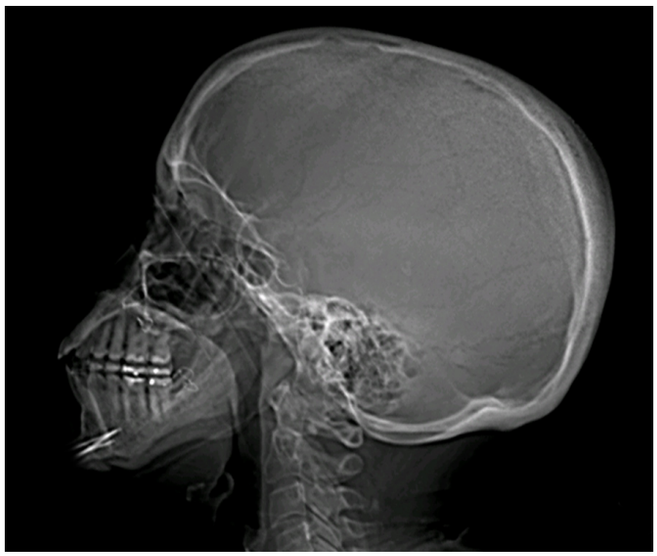
_____

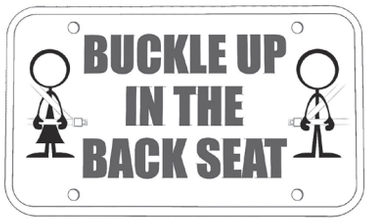
Skeleton Resources

YouTube (http://www.youtube.com/watch?v-TOI1jIIsmFe&feature-related)
- Introduction to the Skeleton.
- Them Not-So-Dry-Bones
- Bones of the Skull

Wikipedia (http://en.wikipedia.org/wiki/File:Chest labeled.png, http://en.wikipedia.org/wiki/File:Skull X-ray – lateral view. jpg)
- Chest
- Skull X-Ray – lateral view.jpg







Lesson 3: Making Choices

COLORADO ACADEMIC STANDARDS

- Comprehensive Health 5.3.1
- Comprehensive Health 5.4.3

MATERIALS

- *Buckle Up in the Back Seat* video
- Computer/LCD projector or TV monitor/DVD player
- Making Choices Resource – Cards with problem solving scenarios

INTENDED LEARNING

1. **Students learn to identify factors that influence their decision-making process.**
   - List factors important to deciding where they will sit in cars and if and how they will wear seat belts.
2. **Students practice decision-making skills through role playing with classmates.**
3. **Students develop fact-based reasons explaining why being buckled up in the back seat is their safest place to be when riding in cars.**
4. **Students practice explaining to others why being buckled up in the back seat is the safest place for them to be when riding in cars.**

LESSON

Preparation

- Review Lesson 2.
- Preview script and DVD for Lesson 3.
- Prepare cards with problem solving scenarios.

Teaching

1. **Tell students:** Think of good habits you have. **Ask students**: What makes something you do a good habit? List good habits you and your classmates have in your everyday life. **Tell students**: Think of what rules you have at your house. List rules that your family has that keep you safer. **Tell students**: Think of laws that you encounter each day that keep you safer. List them. (Traffic laws might be examples.) **Ask students**: Who or what influences you when you make decisions? What do you do when someone suggests that you do something you know might not be safe for you?

2. Play video – Lesson 3 Making Choices.

3. **Tell students**: Today we will break up into smaller groups. Each group will be given a card with a situation on it having to do with wearing seat belts and/or where you should ride in a cars. Select a partner and role play one scenario. Working with your partner, decide what to say and do when someone suggests to you that you should do something you know is not safe. After the first person presents their reasons, reverse the roles so each person gets to explain where and why he or she should sit to be safe. After five minutes, each team of two will present their solutions to the small group. The small groups will pick the best team and that team will present to the class.

Evaluation

- After representatives from each small group presents, the whole class discusses which responses are the most effective and why.

- Explore with the class why it might be difficult to go against the adult's wishes in the scenarios. Explain how the role-playing they did might help them with this problem.

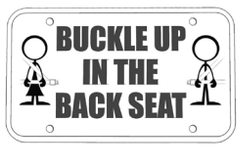
VOCABULARY

- facts
- information
- habits
- rules
- laws
- opinions
- suggestions

See Glossary for detailed definitions.

RESOURCE

Making Choices



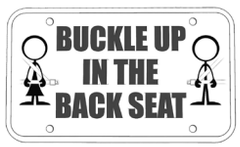
Sample Scenarios: Copy and distribute to students. Then cut out.

Mom says, "We're in a hurry.
Just get in the front seat with me."
You know it is not the safest place for you.
How can you explain to her where you
should sit and why.

Dad says, "I work so much these days.
I never get to see you. We're not going far.
Just sit up front with me."
You really miss being close to your dad.
How can you explain to him where you
should sit and why.

Grandma says, "I'm so glad everyone dressed up
to go to a fancy place for dinner on my birthday.
You look so nice. I don't want you to wrinkle your clothes.
Why don't you not put on your seat belt or at least
put the shoulder strap behind your back so your clothes
stay nice?" Explain to her where you should sit
and why you should wear your seat belt properly.

RESOURCE
Making Choices



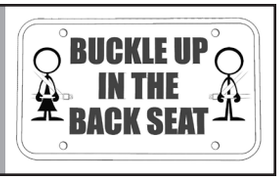
(continued)

Your favorite out-of-town aunt or uncle says, "I don't get to see you very often. Let's go out for ice cream. Sit up front with me so we can talk. The store is less than a mile away so you don't need to buckle up. Don't worry, I won't tell your folks." Explain where you should sit and why you should wear your seat belt properly.

Your sister sees you walking home from school. She pulls her car over to the curb and offers you a ride home. You start to get into the backseat and she says, "Oh no you don't. Don't sit back there. I don't want to look like a chauffeur. Sit up front with me." Explain to her where you should sit and why.

Your brother's best friend sees you walking to the store. He's one of the most popular boys in high school, and he has two cool friends with him. You are thrilled when he stops and offers you a ride. You get into the back seat and start to buckle your seat belt. The boy sitting in the back seat says, "Be cool! You don't have to buckle up." Your brother's friend agrees. You don't want to be uncool in front of the high school boys. Explain where you should it and why.

Glossary



Airbag: Vehicle safety device. An occupant restraint system consisting of a flexible envelope designed to inflate rapidly during an automobile collision.

Crash Force: Crash — to hit something hard enough to cause serious damage or destruction. Force — physical strength, power, or effect.

Crumple Zone: Structural feature mainly of automobiles. Designed to absorb the energy from the impact during an accident by controlled deformation.

Defy: To challenge or combat.

Deploy: To open up and spread out the parts of something, such as an airbag.

External Force: External — located, seen, or used on the outside or surface of something. Force — physical strength, power, or effect.

Fact: Something that truly exists or happens; something that actually exists.

Habit: Usual way of behaving; something that a person does often in a regular and repeated way.

Inertia: Resistance of any physical object to a change in its state of motion or rest or the tendency of an object to resist any change in its motion.

Information: Knowledge that you get about someone or something; facts or details about a subject.

Koi or Koifish: Japanese word for *carp*.

Law: Whole system or set of rules made by the government of a town, state or country.

Modify: To make partial changes to.

Opinion: Belief, judgment, or way of thinking about something; what someone thinks about a particular thing.

Rule: Statement that tells you what is or is not allowed in a particular game or situation.

Skeleton: Serves as a scaffold that supports organs, anchors muscles, and protects organs, such as the brain, lungs, and heart.

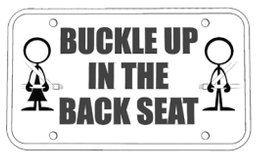
Spine: Houses and protects the spinal cord in its spinal canal, and therefore is commonly called the *spine*, or simply *backbone*.

Suggestion: (a) Idea about what someone should do or how someone should behave. (b) Something that is said in an indirect way.

Velocity: Speed of an object and a specification of its direction of motion. Speed describes only how fast an object is moving, whereas velocity gives both how fast and in what the direction the object is moving. If a car travels at 60 km/h, its speed is known. However, if the car moves at 60 km/h to the north, its velocity has now been specified.

LESSON 1

Colorado Academic Standards



Content Area: Mathematics
Grade Level Expectations: Fifth Grade
Standard: 1. Number Sense, Properties, and Operations

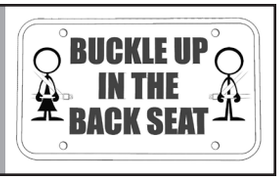
Prepared Graduates • Understand the structure and properties of our number system. At their most basic level, numbers are abstract symbols that represent real-world quantities.	
Concepts and skills students master: 1. The decimal number system describes place value patterns and relationships that are repeated in large and small numbers and forms the foundation for efficient algorithms.	
Evidence Outcomes	
Students can: d. Convert like measurement units within a given measurement system.	

Prepared Graduates • Are fluent with basic numerical and symbolic facts and algorithms and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency.	
Concepts and skills students master: 2. Formulate, represent, and use algorithms with multi-digit whole numbers and decimals with flexibility, accuracy, and efficiency.	
Evidence Outcomes	
Students can: a. Fluently multiply multi-digit whole numbers using standard algorithms.	

Prepared Graduates • Understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities.	
Concepts and skills students master: 4. The concepts of multiplication and division can be applied to multiply and divide fractions.	
Evidence Outcomes	
Students can: f. Solve real world problems involving multiplication of fraction and mixed numbers.	

LESSON 2

Colorado Academic Standards



Content Area: Science
Grade Level Expectations: Fifth Grade
Standard: 2. Life Science

Concepts and skills students master:
1. All organisms have structures and systems with separate functions.

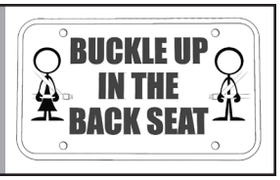
Evidence Outcomes	21st Century Skill and Readiness Competencies
Students can: b. Analyze and interpret data to generate evidence that all organisms have structures that are required for survival in both plants and animals.	**Inquiry Questions:** 3. What adaptations or characteristics help humans survive?

Concepts and skills students master:
2. Human body systems have basic structures, functions, and needs.

Evidence Outcomes	
Students can: a. Develop and communicate an evidence-based scientific explanation regarding how humans address basic survival needs. c. Assess further scientific explanations regarding basic human body system functions.	

LESSON 3

Colorado Academic Standards



Content Area: Comprehensive Health
Grade Level Expectations: Fifth Grade
Standard: 3. Emotional and Social Wellness in Health

Prepared Graduates • Utilize knowledge and skill to enhance mental, emotional, and social well being.	
Concepts and skills students master: 1. Analyze internal and external factors that influence mental and emotional health.	
Evidence Outcomes	**21st Century Skill and Readiness Competencies**
Students can: c. Explain how families and peers can influence mental and emotional health.	**Relevance and Application:** 1. Family, peers, and the media can influence a person's mental and emotional health. **Nature of:** 1. Mental and emotional health can be affected by many influences so it is important to be able to recognize both positive and negative influences on our feelings and behavior.

Content Area: Comprehensive Health
Grade Level Expectations: Fifth Grade
Standard: 4. Prevention and Risk Management in Health

Prepared Graduates • Apply personal safety knowledge and skills to prevent and treat intentional or unintentional injury.	
Concepts and skills students master: 3. Demonstrate basic first aid and safety procedures.	
Evidence Outcomes	
Students can: d. Develop and apply a decision-making process for avoiding situations that could lead to injury	