







# EXPLORATION

# 2017-2018









**CTScienceCenter.org** 250 Columbus Blvd. Hartford, CT 06103

..... NAME: \_

## FORCES: EXPLORING PUSH AND PULL

Activity: Design a Race Car Level 4, Square Wheels Exhibit, Forces in Motion Gallery



TEST your car:

# OF BLOCKS ON CAR	TRIAL 1	TRIAL 2
0 BLOCKS		
2 BLOCKS		
BLOCKS		
BLOCKS		

(continued)





..... NAME: \_

## FORCES: EXPLORING PUSH AND PULL

Activity: Design a Race Car Level 4, Square Wheels Exhibit, Forces in Motion Gallery (continued)

DRAW a picture of your fastest car.



(continued)

CONNECTICUT SCIENCE CENTER ..... NAME:

## FORCES: EXPLORING PUSH AND PULL

Activity: Design a Race Car Level 4, Square Wheels Exhibit, Forces in Motion Gallery (continued)





I Spy: DRAW a picture or use your words to describe other push and pull forces you saw today.

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# FORCES: EXPLORING PUSH AND PULL

## Objectives

- Students will explore what it means for an object to be at rest or in motion.
- Students will examine different examples of the forces of push and pull.
- Students will look at different sources of forces, ranging from gravity, to the human body, to combustion.
- Students will investigate variables that affect the strength of forces.

#### Overview

*Getting Started:* Hold up a pencil and demonstrate "push" and "pull" as you present the introduction to your students. This could occur in the classroom, or on the bus ride, when preparing students for the field trip.

*Introduction:* Objects like this pencil are set into motion by "forces." A "push" is when force moves an object away. A "pull" is when a force moves an object closer. Some forces can be seen, like my hand moving the pencil. And some forces are invisible, like the gravity that holds our feet onto the Earth. The way an object moves—or stays still—is controlled by the strength and direction of the forces around it. As we go through the museum today, be on the look out for:

## Focus Questions

- What types of forces make objects move?
- When are objects at rest?
- Are forces pushing or pulling objects?
- What affects the strength of the forces?

HINT: These are great questions to use while exploring the galleries with your group to help them think about forces.

# FORCES: EXPLORING PUSH AND PULL

## Visit Debrief

On the bus ride home, or back in your classroom, ask your students to reflect on what they learned:

- What are some examples of push and pull forces that they see in the classroom? In their homes? In their neighborhoods?
- What are some examples of things at rest, when push and pull forces are in balance so that an object remains still.
- What are some ways to make push and pull forces stronger? (i.e., more fuel, steeper hills, making the best use of muscles.)

## Concept Summary

- A force is a power that can make things move. It can come from a variety of sources, in many directions.
- A push is when a force moves an object away.
- A pull is when a force moves an object closer.
- When an object is not in motion, it is at rest. This occurs when the forces that push and pull on an object from various directions are in balance.

## Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES Planning and Carrying Out Investigations Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Engaging in Argument from Evidence

#### DISCIPLINARY CORE IDEAS PS2.A Forces and Motion

PS2.A Forces and Motion PS2.B Types of Interactions PS3.C Relationship Between Energy and Forces

CROSSCUTTING CONCEPTS Patterns Cause and Effect Structure and Function

## CONNECTICUT SCIENCE CENTER

## Focus Questions

- What types of forces make objects move?
- When are objects at rest?
- Are forces pushing or pulling objects?
- What affects the strength of the forces?

## Chaperone name:

## Students in my group:



#### GETTING STARTED:

Chaperones, these activities can be done in any order as you move through the galleries. For grades K-2, we recommend working as a group, with an adult writing down students' answers, except where specified.



#### **TRIP TIP:** Giving your students some free exploration time when entering a new exhibit area will help them concentrate when you invite them to a focal point.

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**TRIP TIP:** When you record students' answers to questions, they see that their learning is valued, which is strong motivator.

#### Activity: Design a Race Car Level 4, Square Wheels Exhibit, Forces in Motion Gallery



DESIGN: Use the blocks to create cars with different weights and shapes.





PREDICT: Which car do you think will be the fastest? Why?

Record students' predictions:



#### GETTING STARTED: These

cars don't have engines, so they rely on the force of gravity to PULL them down the hill. Let's find out what makes a car go fast down the hill.



**DESIGN:** Use the blocks to create cars with different weights and shapes.

**PREDICT:** Which car do you think will be the fastest? Why? Record students' predictions:

(continued)

## Activity: Design a Race Car

Level 4, Square Wheels Exhibit, Forces in Motion Gallery (continued)



TEST: Record the 1st-place, 2nd-place, etc. race winners on this chart. Optional: Students can also complete their own chart on their handout.



# OF BLOCKS ON CAR	TRIAL 1	TRIAL 2
0 BLOCKS		
2 BLOCKS		
BLOCKS		
BLOCKS		

## Activity: Design a Race Car

Level 4, Square Wheels Exhibit, Forces in Motion Gallery (continued)

Invite students to draw a picture of the winning car, showing how many blocks are on the front and back:



## Activity: Design a Race Car

Level 4, Square Wheels Exhibit, Forces in Motion Gallery (continued)



ANALYZE: Why do you think the winner was the fastest?

Record students' conclusions:





#### HINT: The

fastest cars will have more weight to increase the force of gravity's pull. Weight added to the back of the car will have more impact than weight added to the front.

## CONNECTICUT SCIENCE CENTER

#### Activity Station: Ride the Wind Level 4, Heliflyers Exhibit, Forces in Motion Gallery

1. What provides the force that pushes these flyers up? Record students' observations:



GETTING STARTED: Invite students to follow the instructions to create their own paper flyers.

HINT: Before students test their flyers- have them hold their hand over the wind tunnels to feel the force of the air.



HINT:

Encourage students to think about their own homes and outside surroundings. Examples: trees swaying, fans blowing, soccer balls going off-course.

2. Brainstorm together. Name 5 things that move when they are pushed or pulled by wind. Record students' observations:

## CONNECTICUT SCIENCE CENTER

#### Activity Station: Improve Your Jump Level 5, Biomechanics Exhibit, Sports Lab Gallery

1. Stand with your feet flat on the ground, your legs straight, and your arms at your sides. Jump. How high did you go?

Record students' observations:



#### GETTING STARTED: When

we stand still, the forces of push and pull are in balance and our bodies are at rest. When we jump, however, we use extra force to push our bodies away from the ground.

#### Activity Station: Improve Your Jump Level 5, Biomechanics Exhibit, Sports Lab Gallery (continued)

2. Now keep your arms at your sides, but bend your knees and push off the ground. What happened to your jump? Why?

Record students' observations:

3. Now try to get even more force into your jump. What does the Biomechanics coach suggest you do to increase your vertical jump? Record students' observations:

## CONNECTICUT SCIENCE CENTER

#### Activity Station: Launch a Rocket Level 6, in Atrium near elevators

1. What other machines can you think of that use engines and fuel to lift an object away from the Earth?

Record students' responses:



2. What other machines use engines to push or pull an object in other directions?

Record students' responses:

#### GETTING STARTED:To get

to space, rockets must PUSH away from Earth long enough to get beyond the reach of Earth's PULL. Rocket engines use lots of fuel, which releases huge amounts of gasses when it burns. The force of these gasses PUSHES the rocket up into the atmosphere.

## Activity: I Spy - Push and Pull Forces

What examples of PUSH and PULL forces did you see in any exhibit today? Record students' responses:

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