



# Object-Oriented Fun

## Educator's Guide

### Overview

CS Hands-On is a 501(c)(3) nonprofit teaching computational thinking skills through technology-free lessons and activities. This curriculum is built to teach fundamental computer science concepts in an engaging, hands-on way. In this mission, students use object-oriented programming to play a card game.

### Prerequisite Knowledge

Students should have completed the Conditional Schedule activity, which introduces the concept of if-then statements.

### Lesson Details

At Decomosphere, students will learn to break problems down into smaller parts with Dot. Students will learn the fundamentals behind object-oriented programming using variables, functions, and classes. Then, students will play a Mystical Elements card game, where each card represents a card object with its own traits and attributes.

This lesson was developed for students ages 8 to 13, and can be modified for students of all skills and ages. This lesson takes around 30 minutes.

### Learning Objectives

#### Key Question

How can we use object-oriented programming to create different objects?

#### Key Terms

**Object-oriented programming:** A programming model used to break down objects into their own unique variables and functions

#### Curriculum Standards

Students should be able to...

- Explain how object-oriented programming is used (Decomposition)
- Read, write, and interpret objects (Literacy)
- Use object-oriented programming to play a card game (Creative Arts)

[View standards addressed here](#)

## Lesson Plan

### Materials

- Object-Oriented Fun worksheet (per student)

### Setup

- Hand out an Object-Oriented Fun worksheet to each student
- Set up your classroom to form students in groups of 2

## ANSWER KEY & LESSON ANNOTATIONS

## Object-Oriented Fun

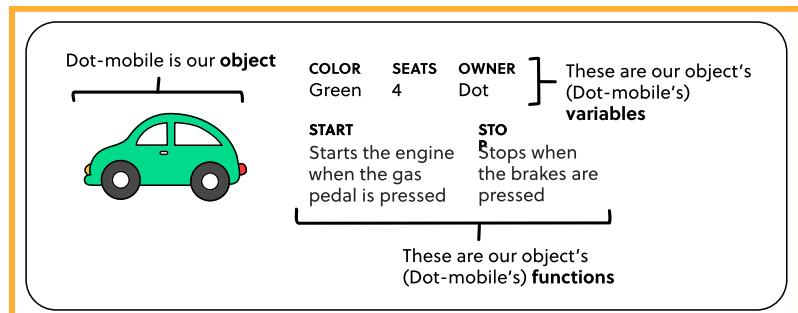
### Drivin' Around Decomosphere

Welcome back to the scenic landscape of Decomosphere! Get ready to follow Dot around in his Dot-mobile to learn about object-oriented programming.

### Vroom Vroom...

We can use **object-oriented programming** to model objects using variables and functions. We can represent just about anything using variables and functions, from cars to dogs to houses!

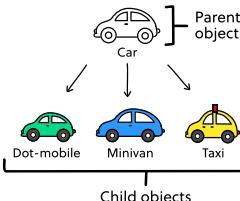
In Decomosphere, Dot and his friends love driving around town and catching the summer breeze. Let's take a deeper look at object-oriented programming through Dot's car: the Dot-mobile!



### More cars!

On the right, we can see that the Dot-mobile, minivan, and taxi are all different types of cars.

Looking at the complete picture, Dot-mobile belongs to a large **group** of cars. Since all of these cars share **similar features**, we can create specific types of vehicles like the



### Reflect

Using our Dot-mobile object, how can we change the properties to create our own Dot-mobile?

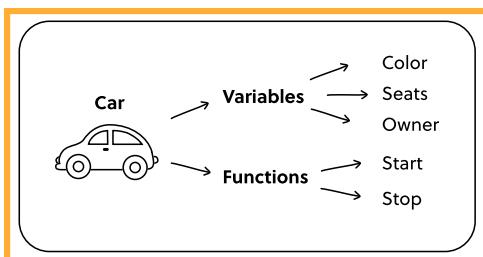
We can change the object's variables (color, seats, owner) and functions (start, stop) to create our own personalized Dot-mobile.

Decomposphere  
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Dot-mobile, Minivan, and Taxi (these are called child objects) from the car (this is called the parent object).

We call the car our parent object because it **passes down shared variables and functions** to its child objects.

Let's take a closer look at the parent object:



Since all cars have a specific color, number of seats, owner, and can start and stop, **every child car** (the Dot-mobile, Minivan, and Taxi) **shares the same structure as the parent car**.

### Reflect

Can you think of other variables and functions that a car would pass down to its child objects?

Ex. Variables: Number of windows, price, brand

Functions: Honk, wiping windows, turning on headlights



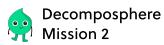
### Why is Object-Oriented Programming useful?

Programs often have lots of code, which can become **messy and complicated**. When we have similar objects that share similar qualities but are not exactly the same, we can use inheritance (the passing down of features) in object-oriented programming to take the features of a parent object and apply them to its child objects. This template saves us time when creating child objects.

Referencing back to our car example, we can use our parent car object to create other cars like limousines or electric cars!

### Educator's Note

Object-oriented programming can be used to describe many different scenarios and objects. Encourage your students to brainstorm different objects that this thinking can be applied to.



## Let's Review Functions!

A **function** includes **actions** used to complete a task. Here's a quick refresher on how we can create our own functions:

Write the **steps** necessary to accomplish our function

**Honk a Car Horn** Include a descriptive **title**

Press the button at the middle of the steering wheel

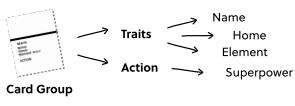
 Decomosphere  
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### Mystical Elements: The Game

Use your knowledge of object-oriented programming to play a fun game of Mystical Elements with a friend! The first six cards each represent an object (a character from our six planets) with its unique variables and functions on your Card sheet. Each function is a superpower that relates to water, snow, or fire.

#### Setup

- Customize three different child objects on your Card sheet from the parent Card object. Assign your child objects variables (name and home) and a superpower function!



Once you finish customizing your child object cards, carefully cut the cards out along dashed lines.

#### How to Play

- From your nine cards, pick one card to play and place it face down.
- Once both of you have placed your cards down, flip them face up and compare your object's **element** variable to decide the winner! Water puts out fire, fire melts snow, and snow freezes water.
- The player who wins the round takes both cards.
- The player with the most cards wins!



Ex. Water beats fire

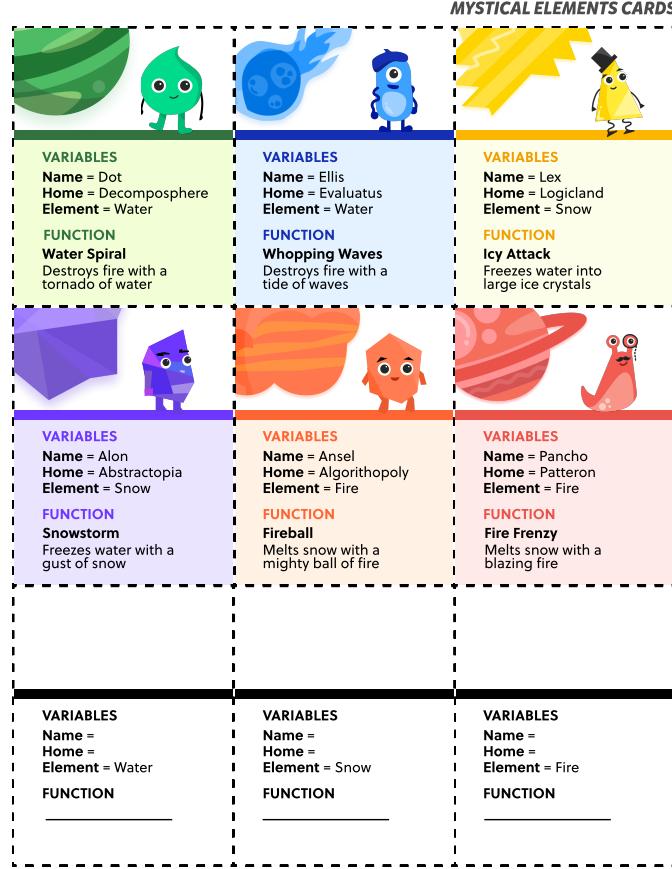




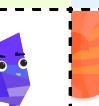
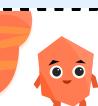
WATER BEATS FIRE  
FIRE BEATS SNOW  
SNOW BEATS WATER

WINNER

4



**MYSTICAL ELEMENTS CARDS**

 <b>VARIABLES</b> Name = Dot Home = Decomosphere Element = Water <b>FUNCTION</b> Water Spiral Destroys fire with a tornado of water	 <b>VARIABLES</b> Name = Ellis Home = Evaluatus Element = Water <b>FUNCTION</b> Whopping Waves Destroys fire with a tide of waves	 <b>VARIABLES</b> Name = Lex Home = Logicland Element = Snow <b>FUNCTION</b> Icy Attack Freezes water into large ice crystals
 <b>VARIABLES</b> Name = Alon Home = Abstractopia Element = Snow <b>FUNCTION</b> Snowstorm Freezes water with a gust of snow	 <b>VARIABLES</b> Name = Ansel Home = Algorithopoly Element = Fire <b>FUNCTION</b> Fireball Melts snow with a mighty ball of fire	 <b>VARIABLES</b> Name = Pancho Home = Patteron Element = Fire <b>FUNCTION</b> Fire Frenzy Melts snow with a blazing fire
<b>VARIABLES</b> Name = Home = Element = Water <b>FUNCTION</b> 	<b>VARIABLES</b> Name = Home = Element = Snow <b>FUNCTION</b> 	<b>VARIABLES</b> Name = Home = Element = Fire <b>FUNCTION</b> 

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## Wrap up & reflect

Group students into pairs and have them discuss the following reflection questions. Afterwards, have students share their ideas as a class.

- Can you think of another parent object that we could model using object-oriented programming? What features would it pass down to its child objects?

Parent object: House

Child objects: Specific houses

Features to pass down: Number of bedrooms, Number of bathrooms, Location, Price, Color

- Imagine you were tasked to create objects for every cat on the planet. How would using parent and child objects help in this scenario?

Using a parent object as a template for the child objects would speed up the process of creating these objects. As we can pass down properties to child objects (Name, Breed, Number of paws, Meow, Play), we don't have to write out each variable or function for every single cat!