

LATHROP ENGINEERING

Name: _____

UNIT 9: GRIDWORLD

















AP Computer Science A

Unit Due Date: **March 6, 2020**

Welcome to the ninth unit of *AP Computer Science*! This unit pulls together all the things we've been learning about this year – from variables, arrays, and ArrayLists to classes, inheritance, and interfaces – into one cool program: **Gridworld**. The Gridworld is a lot like if you combined Jeroo with Tron... and made it 10 times cooler. In the end, the expectation is that you learn the following:

- How a professional program is organized
- How to use the ideas of inheritance and polymorphism to add functionality to an existing program
- How to use control structures and data types to solve problems

As we move through this unit, you are responsible for making adequate progress through the assignments, and for being done by the Unit Due Date (**March 6, 2020**). You are also responsible for completing each part before moving on to the next. Our unit is broken up into three main parts:

Part 1: Observing & Experimenting (10 pts) Approx. 1 days			
This unit starts with an introduction to Gridworld. You'll get Gridworld all installed and then follow a short activity to explore how the Gridworld system is designed to work! You'll get to take some simple notes and record your answers to a few investigative questions in your notebook.			Gridworld Notes
			Part 1 Activity
			Do You Know Set 1
			Exercises
Part 2: Bug Variations (20 pts) Approx. 2 days			
We continue by looking at the Bug class and we begin extending it into our own types of Bugs in the Gridworld. After taking some brief notes, you'll create the CircleBug, SpiralBug, ZBug, and DancingBug classes!			Gridworld Notes
			Part 2 Activity
			Do You Know Set 2
			4 Gridworld Challenges
Part 3: Gridworld Classes/Interfaces (20 pts) Approx. 2 days			
In the third part of this unit you get to look into how the classes are connected and what some of the interfaces are designed to do. You'll investigate how the Gridworld program is set up, and then work with a partner to complete the Gridworld Jumper Bug Challenge.			Gridworld Notes
			Part 3 Activity
			Do You Know Sets 3,4,5,6
			Gridworld Challenge: Jumper
Part 4: Interacting Objects (20 pts) Approx. 2 days			
The final part of this unit is about making objects actually interact with each other. Critters could eat bugs, bugs could eat rocks, or crabs could make things explode. This is when you really get to become a Gridworld Jedi Master as you create Bugs and Critters that can interact in different ways!			Gridworld Notes
			Part 4 Activity
			Do You Know Sets 7,8,9
			4 Gridworld Challenges







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PART1: OBSERVING & EXPERIMENTING

(10 pts) Approx. 1 days

The first part of our unit is a simple introduction to Gridworld. You'll start by getting Gridworld installed in your BlueJ setup, and then explore it a little to see how things work. Part 1 is really just a "Getting to Know You" kind of activity where you'll see how some of the basic functions work before getting into the nitty-gritty details in Part 2.

1. Watch the *Download and Install Gridworld* presentation and the *Gridworld Part 1* video. Work through the steps to get things running on your computer. To make things easier, you can download Gridworld right from our class website (rather than the link described in the video). The install steps should be followed as described.
2. Get the *Part 1: Observing & Experimenting with Gridworld* handout. Read through the text and follow the steps as they are described. The goal is to get used to where the different options and menus are.
3. Answer the **Do You Know Set 1** questions in your engineering notebook (add your answers to your notes)
4. Answer the **Exercises** questions in your engineering notebook (adding these answers to your notes too!)

Part 1: Tasks	10-8 points	7-4 points	3-0 points
 Gridworld Notes	+ You took a full page of notes (for all of Part 1) on Gridworld Basics	- Less than a full page of notes on Gridworld	- Very brief or no notes in your notebook
 Part 1 Activity	+ You read through and completed the Part 1: Observing & Experimenting	- You completed some of the activity	- You did not complete the activity
 Do You Know Set 1	+ You answered the "Do You Know Set 1" questions in your engineering notebook	- You answered most of the questions	- You did not answer the questions
 Exercises	+ You completed the quick exercises from the Part 1 Activity	- You did most of the exercises	- You did not do any of the exercises




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PART2: BUG VARIATIONS

(20 pts) Approx. 2 days

The second part of our unit is equally quick as we get into looking at the Bug class and how we can make it do special things. For most of this work, we'll extend the Bug class to make our own bugs do what we want them to do. Take good notes and have fun making your own bugs!

1. Watch the *Gridworld Part 2* video and start a page of notes on the ideas presented here. Include information on the class structure of Gridworld, in particular how the Bug, Rock, and Flower class all fit together as Actors.
2. Get the *Part 2: Bug Variations* handout. Read through the text and follow the steps as they are described. The goal is to see how Bugs work and then to make some of your own bugs!
3. Answer the **Do You Know Set 2** questions in your engineering notebook (add your answers to your notes)
4. Complete Gridworld Challenges 2, 3, 4, and 5!

Part 2: Tasks	2 points	1 points	0 points
 Gridworld Notes	+ You took a full page of notes (for all of Part 2) on Gridworld Bugs	- Less than a full page of notes on Gridworld Bugs	- Very brief or no notes in your notebook
 Do You Know Set 2	+ You answered the "Do You Know Set 2" questions in your engineering notebook	- You answered most of the questions	- You did not answer the questions
	16-12 points	11-8 points	7-0 points
 Gridworld Challenges 2-5	+ You completed Gridworld Challenges 2-5	- You did not complete all the Challenges	- You only completed 0 or 1 challenge







(20 pts) Approx. 2 days

Moving into our third part of the unit, we finally hit some of the more technical parts that require some careful reading. As you start this work, take the time to read the handout carefully. It will introduce Locations, Grids, and Actors. Each of these is essential to understand thoroughly if you want to use Gridworld to make a 2D game next quarter! Takes some good notes and dig through the challenge!

1. Watch this part's presentations on Gridworld Part 3 and start a page of notes. Add to those notes as you read the Part 3 Activity Handout. Make sure that your notes include details on the Location class, the Grid interface, and the Actor class. A good understanding of these three things will be the key to a successful Gridworld game later on!
2. Get the *Part 3: Gridworld Classes & Intrefaces* handout. Read through the text and follow the steps as they are described. The goal is to understand what the Location, Grid, and Actor classes and interfaces are designed to do.
3. Answer the **Do You Know Sets 3,4,5,6** questions in your engineering notebook (add your answers to your notes) as you work through the different explorations and mini activities.
4. Work with a partner (if you'd like) to complete the Gridworld Challenge 6: Jumper. This challenge is slightly more complex than previous challenges, so a partner can make the job easier and more fun.

This part explores a good problem-solving process (similar to our engineering design process, but for computer science specifically). As you complete the Gridworld Challenge 6: Jumper, try to work through these steps:




- a. Discuss & Clarify the problem (*define the problem*)
- b. Design your solution (*brainstorm & pick a solution*)
- c. Code (*prototype*)
- d. Test (*test & evaluate*)

Part 3: Tasks	4 points	3-2 points	1-0 points
 Gridworld Notes	+ You took a full page of notes (for all of Part 3) on Gridworld Classes & Interfaces	- Less than a full page of notes on Gridworld	- Very brief or no notes in your notebook
 Part 3 Activity	+ You read through and completed the Part 3: Gridworld Classes & Interfaces"	- You completed some of the activity	- You did not complete the activity
 Do You Know Sets 3-6	+ You answered all "Do You Know" questions in your engineering notebook	- You answered most of the questions	- You did not answer the questions
	8-5 points	4-2 points	1-0 points
 Gridworld Jumper Challenge	+ Mr. Benshoof got to see your complete Jumper Challenge!	- Your Jumper does not work as intended	- You did not do the Jumper Challenge

(20 pts) Approx. 3 days

The final part of this unit is probably the coolest. Here you'll be able to make different things (Bugs, Critters, Crabs) that interact with other things (Rocks, Flowers, Bugs, Critters, Crabs). This interaction – while tricky to setup at times – is the center of many games. In Super Mario Bros, when Mario jumps and hits a coin, a Goomba, a power 'shroom, or a question-mark block, he interacts with that object. Programming that interaction requires considering which types of things are interacting and what the intended interaction is. When it works, really cool and complex things are possible! Here you get to see how that works within Gridworld.

1. Watch this part's presentations on Gridworld Part 4 and start a page of notes. Add to these notes as you go through the activity and learn how different aspects of Gridworld work.
2. Get the *Part 4: Gridworld Interacting Objects* handout. Read through the text and follow the steps as they are described. The goal is to understand how Actors like Critters and Bugs can tell other actors (like other Flowers, Rocks, Critters, or Bugs) what to do. This interaction requires calling the methods of other objects, and being able to do so makes awesome stuff happen.
3. Answer the **Do You Know Sets 7,8,9** questions in your engineering notebook (add your answers to your notes) as you work through the different explorations and mini activities.
4. Complete Gridworld Challenge 7: ChameleonCriticDarken by editing the ChameleonCritic class. The ChameleonCritic class is provided for you in the Gridworld code, and here all you need to do is change the processActors method. To do this, simply make a ChameleonCriticDarken class that extends ChameleonCritic. Then, all you need to do is override the processActors method!
5. From the remaining challenges (7A-7E), pick 3 and complete them. They are listed in increasing order of difficulty, but each only requires extending an existing class and overriding one or two methods. Nothing too crazy! Get them working properly and have Mr. Benshoof check off your completed challenges.

Part 4: Tasks	4 points	3-2 points	1-0 points
 Gridworld Notes	+ You took a full page of notes (for all of Part 4) on Gridworld objects and how they interact	- Less than a full page of notes on Gridworld	- Very brief or no notes in your notebook
 Do You Know Sets 7-9	+ You answered all "Do You Know" questions in your engineering notebook	- You answered most of the questions	- You did not answer the questions
	12-6 points	5-2 points	1-0 points
 Gridworld Challenges 7+	+ You completed Gridworld Challenge 7 + You completed an additional 3 challenges of your choice from the list	- You completed 2-3 Gridworld challenges	- You completed 0 or 1 challenges