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CS 162-400 Winter 2019

Zoo Tycoon

Program flow (blue text was added after initial planning)

Welcome user
Tell user/prompt for how much money to start with (need money counter in zoo class/constructor)
~~Prompt for base food cost (need base food cost in zoo class/constructor)~~ [I will make it fixed for now, can add back if time]
Prompt user to buy animals

("There are three animals you can purchase: Tigers ($10,000), Penguins ($1,000), and Turtles ($100)" "You must buy either 1 or 2 of each animal" "How many will you buy?" "Tigers: " "Penguins: " "Turtles: ")

Store these numbers to pass to Zoo constructor
Zoo constructor creates a zoo with the above data
Game starts. Zoo:

- Ages all animals one day
- Prints cost of feeding animals last night
- Runs a random event and reports to user
- Calculates profit/payoff
- Asks user to buy adult animal
- Check if there is $0; if so, game over.
- Ask if they continue or quit
  - if quit, print zoo stats
  - if continue, loop back to top

Random events

- Birth:
  - Ensure that there are adult animals in the zoo; if not, exit function
  - Pick random number 1-3, each corresponding to animal type
  - Check animal type to ensure adults (slightly redundant with above)
    - If array is too small, grow array, update array size
  - Instantiate animals
  - Update animal count

Death:

Ensure there are animals in the zoo; if not, exit
Pick random number 1-3, each corresponding to animal type
Check animal type to ensure there are any (slightly redundant with above)
Delete last animal from array
Update animal count

Cash:

Pick random number from 250-500
Multiply by tigerCount
Add to playerCash

Class design

Zoo

Variables

Starting funds
Base food cost
Day counter
Tiger array
Tiger array size
Tiger count
Penguin array
Penguin array size
Penguin count
Turtle array
Turtle array size
Turtle count

Methods

AdvanceDay
Random events
GrowArray (as per specs)
Purchase animals
Pay for animals
animalBirth()
animalDeath()
returnFeedCost

returnRevenue
has Adults()

Animal/Tiger/Penguin/Turtle

Variables

Age – starts at 0, increments 1 for each day passed
Cost - fixed
Litter size – fixed
Base food cost – fixed
Payoff - fixed

Methods

~~hasAdults()~~ – moved to Zoo
incrementAge()
Tiger/Penguin/Turtle(bool isAdult) – constructor that takes a bool to determine adult/juvenile

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Test plan

Test case	Input Values	Affected functions	Expected outcomes	Observed outcomes
Negative input	Input < 0	Main menu game setup functions	Reprompt user for positive input	Reprompt user for positive input
Input is 0	Input == 0	Main menu game setup functions	Reprompt user for positive input	Reprompt user for positive input
Input is too high	Rounds > 10000	Main menu game setup functions	Reprompt user for smaller input	Reprompt user for smaller input
User enters float	Input = "1.1"	Main menu game setup functions	Reprompt user for correct input	Reprompt user for correct input
User enters letters after numbers	Input = "1a"	Main menu game setup functions	Reprompt user for correct input	Reprompt user for correct input
User enters spaces between numbers	Input = "1 1"	Main menu game setup functions	Reprompt user for correct input	Reprompt user for correct input
Grow array correctly doubles array size	-	growArray()	Size of passed array doubles	Array size doubles
Animals age 1 day per turn	-	incrementAge()	Animals age 1 day per turn	Animals age 1 day per turn
Zoo is created with correct user data (starting money, animals)		game setup functions	Player starts with 25000 money and 1-2 of each animal	Player starts with 25000 money and 1-2 of each animal
Presence/absence of adult animals is correctly reported		has Adults()	Returns true if there is at least 1 adult, otherwise false	Returns true if there is at least 1 adult, otherwise false
New animals are added to array, array	-	Purchase animal,	New animals are	Program crashes after array growth. Fixed by correcting wrong animal

grows as necessary		animal born event	instantiated, array grows	type in growArray().
Dead animals are deleted	-	Animal dies event	Animal count is decremented, array is not broken	Program crashes after animal death. Fixed by correcting array name error in animalDie().
Game finishes when user quits		advanceDay()	Game finishes when user quits	Game exits correctly when user quits, no memory leaks
Game finishes when user runs out of money		advanceDay()	Game finishes when user runs out of money	Game exits correctly when user runs out of money, no memory leaks

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Reflection

This project benefited from compartmentalization.

- I first created the main menu and zoo setup functions to first ensure that the game was setting up correctly.
- I then created the Animal, Tiger, Penguin, and Turtle classes. This gave me a bit of trouble because I was still not sure of the best way to set each animal's stats (I eventually hardcoded them, I'm sure there's a must more extensible way that I've overlooked).
- I then made the arrays to hold them and made sure that profit/feeding costs were calculating correctly.
- Once I had this barebones version of the game working (player initially buys animals, they cost money to feed, they generate revenue, they age. At this point there is no way to lose money because animals don't die)
- I then added features one by one: purchase animals at the end of the day, grow the array as necessary, animals die, animals are born.

A few main takeaways from this project:

- Inheritance is still a bit confusing, I'm still not 100% clear on when to create an object/array of the parent class vs. the derived class.
- I'm sure I could have made one growArray and hasAdults based on the Animal class, rather than the three overloaded versions I have for each animal type
- I discovered the power of bools as while loop conditions