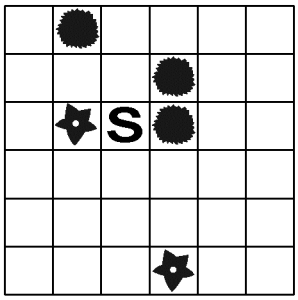
2. This question involves reasoning about the code from the GridWorld case study. A copy of the code is provided as part of this exam.

A `StockpileCritter` is a `Critter` that uses other actors as a source of energy. Each actor represents one unit of energy. The `StockpileCritter` behaves like a `Critter` except in the way that it interacts with other actors. Each time the `StockpileCritter` acts, it gathers all neighboring actors by removing them from the grid and keeps track of them in a stockpile. The `StockpileCritter` then attempts to reduce its stockpile by one unit of energy. If the stockpile is empty, the `StockpileCritter` runs out of energy and removes itself from the grid.

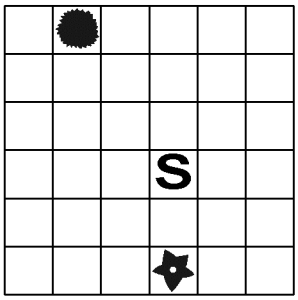
Consider the following scenario.

INITIAL WORLD



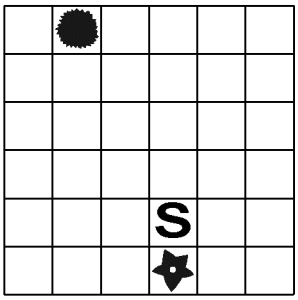
`StockpileCritter` is in location (2, 2), stockpile is empty

AFTER ONE ACT



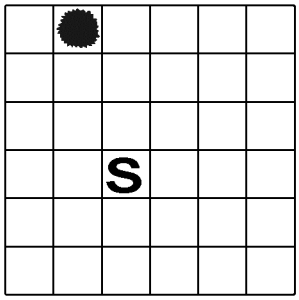
Gathered 3 actors, used 1 energy unit, 2 remaining in stockpile, moved to location (3, 3)

AFTER TWO ACTS



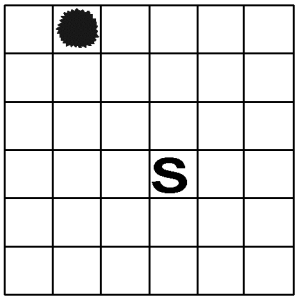
No actors gathered, used 1 energy unit, 1 remaining in stockpile, moved to location (4, 3)

AFTER THREE ACTS



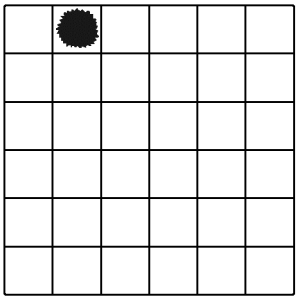
Gathered 1 actor, used 1 energy unit, 1 remaining in stockpile, moved to location (3, 2)

AFTER FOUR ACTS



No actors gathered, used 1 energy unit, 0 remaining in stockpile, moved to location (3, 3)

AFTER FIVE ACTS



Stockpile empty, removed self from grid

Write the complete `StockpileCritter` class, including all instance variables and required methods. Do NOT override the `act` method. Remember that your design must not violate the postconditions of the methods of the `Critter` class and that updating an object's instance variable changes the state of that object.

3. An electric car that runs on batteries must be periodically recharged for a certain number of hours. The battery technology in the car requires that the charge time not be interrupted.

   The cost for charging is based on the hour(s) during which the charging occurs. A rate table lists the 24 one-hour periods, numbered from 0 to 23, and the corresponding hourly cost for each period. The same rate table is used for each day. Each hourly cost is a positive integer. A sample rate table is given below.

Hour	Cost
0	50
1	60
2	160
3	60
4	80
5	100
6	100
7	120

Hour	Cost
8	150
9	150
10	150
11	200
12	40
13	240
14	220
15	220

Hour	Cost
16	200
17	200
18	180
19	180
20	140
21	100
22	80
23	60

AP® COMPUTER SCIENCE A
2009 SCORING GUIDELINES

Question 2: Stockpile Critter (GridWorld)

+1 class header
- **+1/2** properly formed class header for `StockpileCritter`
- **+1/2** extends `Critter` class

+1 1/2 stockpile state
- **+1/2** declares instance variable capable of maintaining state
- **+1/2** private visibility
- **+1/2** initialization of state appropriate to usage of variable

+1 overrides methods and maintains all necessary postconditions
(No points awarded if overrides `act` *method)*

+1 `processActors` overridden *(No points awarded if overrides* `act` *method)*

+1 stockpile state maintenance
- **+1/2** accumulates based on number of actors passed to `processActors`
- **+1/2** decrements appropriately each `act`

+1 1/2 removes neighboring actors from grid
- **+1/2** removes **at least one** neighboring actor from grid
- **+1** removes **all** neighboring actors from grid

+2 self-removal
- **+1/2** checks status of stockpile by using state variable in a relational expression
- **+1/2** ever removes self from grid
- **+1** removes self from grid when and only when stockpile state indicates empty