## AP ${ }^{\circledR}$ Computer Science $A$ 2009 Scoring Guidelines

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# AP ${ }^{\circledR}$ COMPUTER SCIENCE A <br> 2009 SCORING GUIDELINES 

Question 1: Number Cube

| Part (a) | getCubeTosses 4 points |
| :---: | :---: |
| +1 | constructs array |
|  | +1/2 constructs an array of type int or size numTosses |
|  | +1/2 constructs an array of type int and size numTosses |
| +2 1/2 | processes tosses |
|  | +1 repeats execution of statements numTosses times |
|  | +1 tosses cube in context of iteration |
|  | +1/2 collects results of tosses |
| +1/2 | returns array of generated results |


| Part (b) $\quad$ getLongestRun | 5 points |
| :--- | :--- |

+1 iterates over values
$+\mathbf{1} / \mathbf{2}$ accesses element of values in context of iteration
$+\mathbf{1 / 2}$ accesses all elements of values, no out-of-bounds access potential
+1 determines existence of run of consecutive elements
$+\mathbf{1 / 2}$ comparison involving an element of values
$+\mathbf{1 / 2}$ comparison of consecutive elements of values
+1 always determines length of at least one run of consecutive elements
+1 identifies maximum length run based on all runs
+1 return value
$+\mathbf{1 / 2}$ returns starting index of identified maximum length run
$+\mathbf{1 / 2}$ returns -1 if no run identified

## AP ${ }^{\circledR}$ COMPUTER SCIENCE A <br> 2009 SCORING GUIDELINES

## Question 2: Stockpile Critter (GridWorld)

+1 class header
$+\mathbf{1 / 2}$ properly formed class header for StockpileCritter
+1/2 extends Critter class
+1 1/2 stockpile state
$+\mathbf{1 / 2}$ declares instance variable capable of maintaining state
$+\mathbf{1 / 2}$ private visibility
$+\mathbf{1} / \mathbf{2}$ 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
$+\mathbf{1} / \mathbf{2}$ accumulates based on number of actors passed to processActors
$+\mathbf{1 / 2}$ decrements appropriately each act
+1 1/2 removes neighboring actors from grid
$+\mathbf{1 / 2}$ removes at least one neighboring actor from grid
+1 removes all neighboring actors from grid
+2 self-removal
$+\mathbf{1 / 2}$ checks status of stockpile by using state variable in a relational expression
$+\mathbf{1 / 2}$ ever removes self from grid
+1 removes self from grid when and only when stockpile state indicates empty

# AP ${ }^{\oplus}$ COMPUTER SCIENCE A <br> 2009 SCORING GUIDELINES 

Question 3: Battery Charger
Part (a) getChargingCost 5 points
+11/2 accesses array elements
$+\mathbf{1 / 2}$ accesses any element of rateTable
$+\mathbf{1} / \mathbf{2}$ accesses an element of rateTable using an index derived from startHour
+1/2 accesses multiple elements of rateTable with no out-of-bounds access potential
+2 1/2 accumulates values
$+\mathbf{1} / \mathbf{2}$ declares and initializes an accumulator
$+\mathbf{1 / 2}$ accumulates values from elements of rateTable
$+\mathbf{1 / 2}$ selects values from rateTable using an index derived from startHour and chargeTime
+1 determines correct sum of values from rateTable based on startHour and chargeTime
+1 value returned
$+\mathbf{1 / 2}$ returns any nonconstant (derived) value
$+\mathbf{1 / 2}$ returns accumulated value

Part (b) getChargeStartTime $\quad 4$ points
+1/2 invokes getChargingCost or replicates functionality with no errors
+1 determines charging cost
$+\mathbf{1 / 2}$ considers all potential start times; must include at least $0 \ldots 23$
$+\mathbf{1} / \mathbf{2}$ determines charging cost for potential start times
Note: No penalty here for parameter passed to getChargingCost that violates its preconditions (e.g., 24)
+1 compares charging costs for two different start times
+1 determines minimum charging cost based on potential start times
Note: Penalty here for using result of call to getChargingCost that violates its preconditions (e.g., 24)
$+\mathbf{1 / 2}$ returns start time for minimum charging cost

# AP ${ }^{\circledR}$ COMPUTER SCIENCE A <br> 2009 SCORING GUIDELINES 

## Question 4: Tile Game

Part (a) getIndexForFit 6 points
+1 empty board
$+\mathbf{1 / 2}$ checks for zero-sized board
$+\mathbf{1 / 2}$ returns 0 if empty board detected
+1 accesses tiles from board
$+\mathbf{1 / 2}$ accesses any tile from board
$+\mathbf{1}$ /2 accesses all tiles of board (as appropriate) with no out-of-bounds access potential
+1 uses tile values
$+\mathbf{1} / 2$ accesses left or right value of any tile
+1/2 compares left (right) value of parameter with right (left) value of any tile from board
+2 determines tile fit
$+\mathbf{1 / 2}$ only right value of parameter compared with left value of initial tile of board
$+\mathbf{1 / 2}$ only left value of parameter compared with right value of final tile of board
+1 compares appropriate values of parameter and interior tiles of board
+1 result
$+\mathbf{1 / 2}$ returns located index if tile fits in board
$+\mathbf{1 / 2}$ returns -1 if tile does not fit in board

Part (b) insertTile 3 points
+1/2 invokes getIndexForFit or replicates functionality with no errors
+1 $1 / 2$ tile orientation
$+\mathbf{1} / \mathbf{2}$ invokes rotate on parameter
+1/2 performs all necessary rotations
$+\mathbf{1 / 2}$ invokes getIndexForFit for each necessary orientation
+1/2 adds tile correctly and only if getIndexForFit returns value other than -1
+1/2 returns true if getIndexForFit returns value other than -1 ; false otherwise

