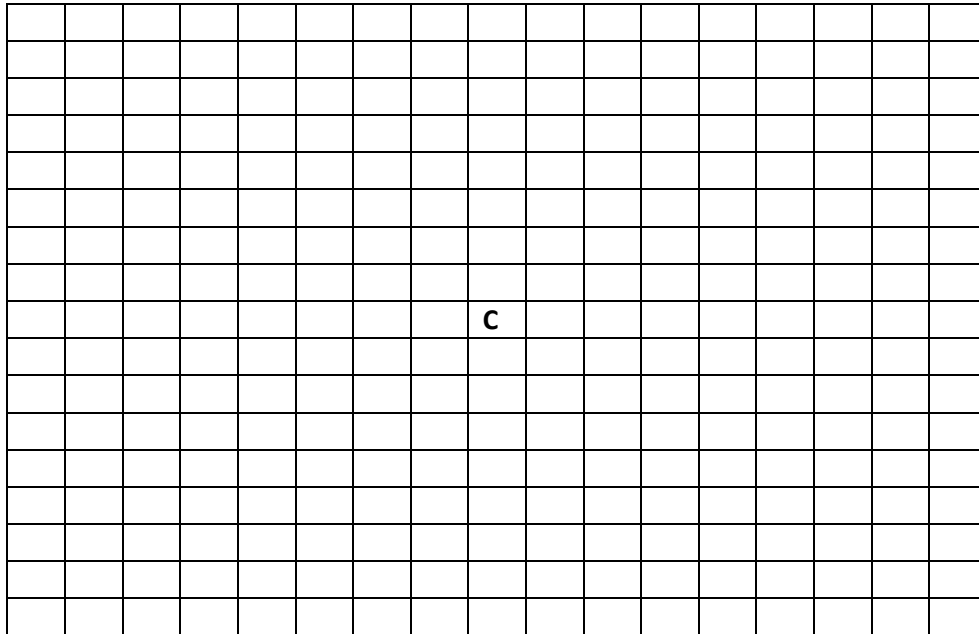


1. Show what the output of the NetLogo program would look like after the following procedure has finished. Each square you see represents on PATCH of the NetLogo grid, with the center patch being in the usual place, the center square. For your convenience, I have marked the center square with the letter C for Center. Fill in the Grid with what the output would look like. Show your answer by drawing the turtles and output they leave in the GRID here.



```

Untitled - NetLogo
File Edit Tools Zoom Tabs Help
Interface Information Procedures
Find... Check Procedures
TO QuestionOne
  CA
  CRO 4

  ASK TURTLES [
    PD
    FD 3

    PU
    FD 1

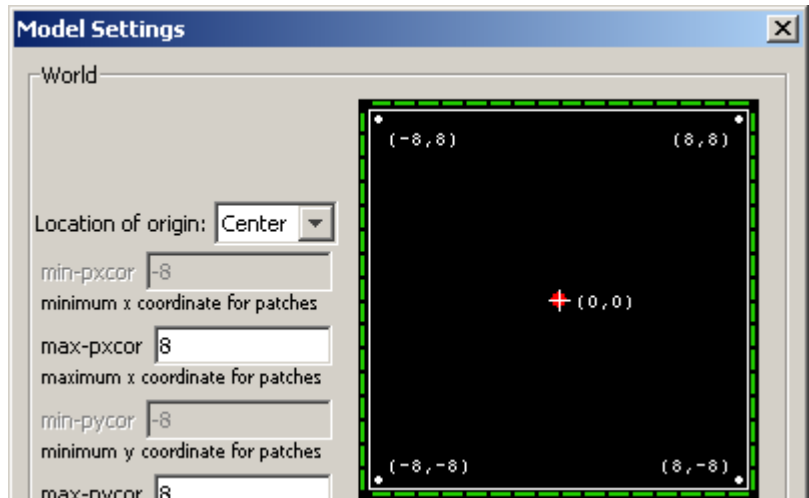
    PD
    FD 2

    PU
    FD 1

    PD
    FD 1

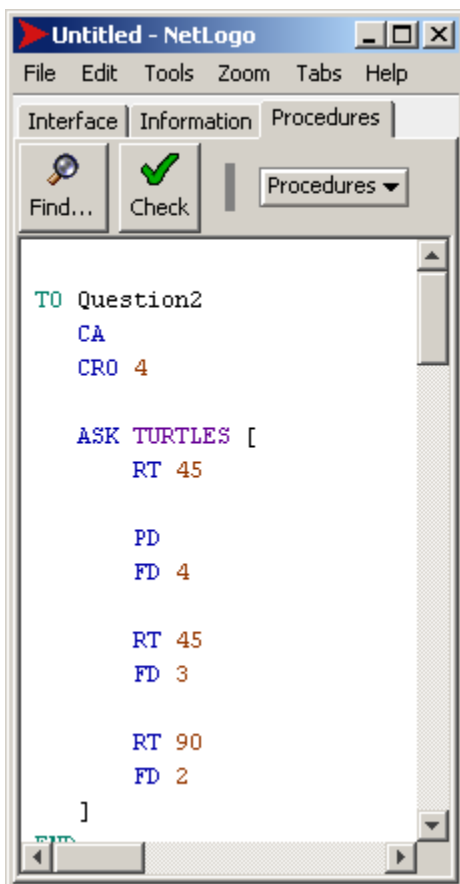
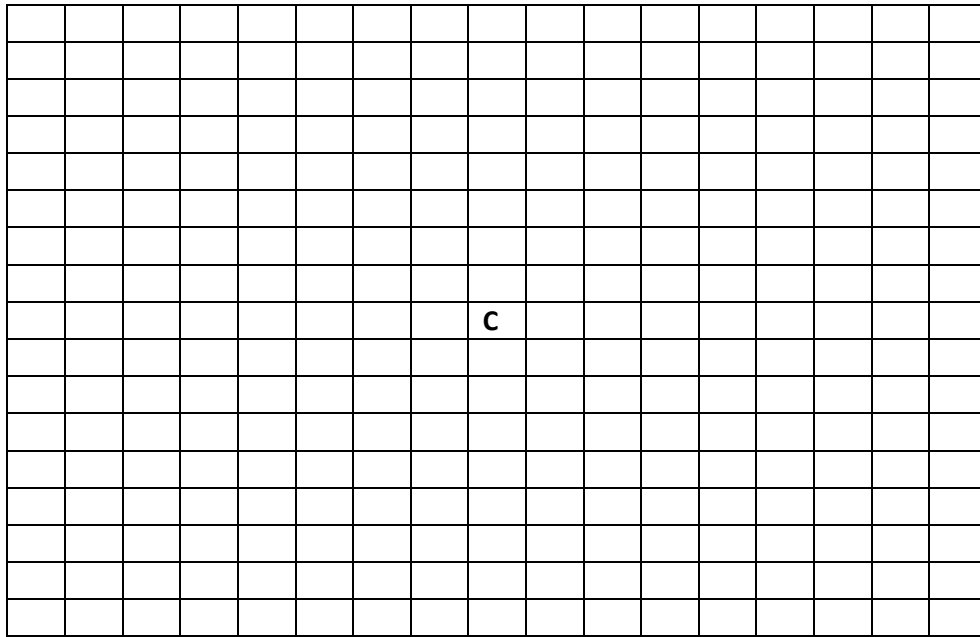
    RT 90
  ]
END
    
```

Here is the standard turtle shape you will use for this question. Be sure to clearly show what direction each of the turtles is facing when you draw what the output would look like.



2. Show what the output of the NetLogo **Question2** procedure would look like after the following procedure has finished. Again, each square you see represents on *PATCH* of the NetLogo grid, with the center patch being in the usual place, the center square. For your convenience, I have marked the center square with the letter *C* for Center.

Fill in the Grid with what the output would look like. Show your answer by drawing the turtles and output they leave in the GRID here.

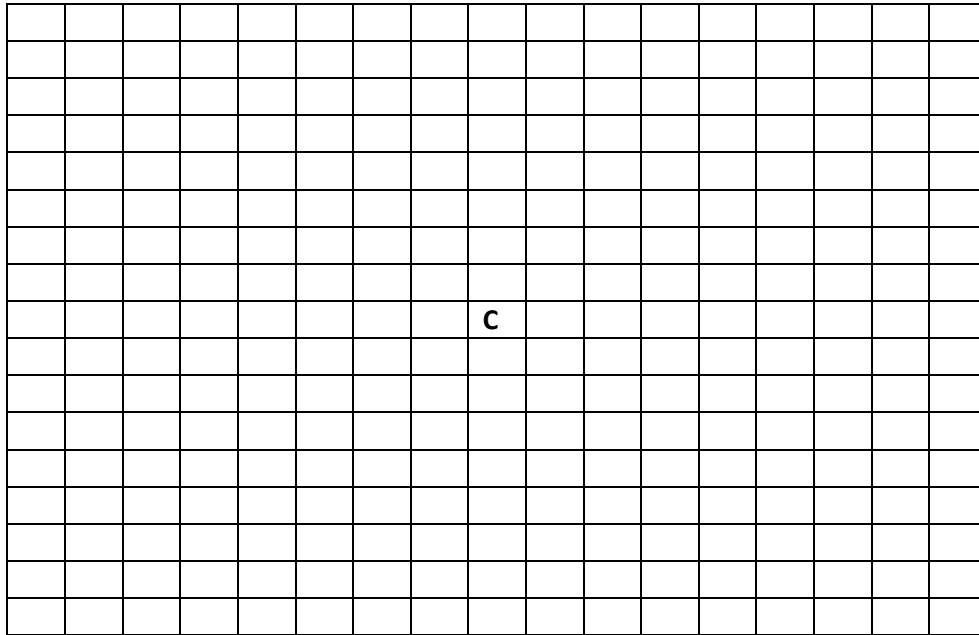


Use scratch paper **FIRST**, if you need to. Then fill in the GRID above neatly with your final answer after your solution is worked out on scratch paper.

Again, use scratch paper FIRST, if you need to and then fill in this sheet's GRID with your answer.

3. Show what the output of the NetLogo **QuestionTHREE** procedure would look like after the following procedure has finished. *Again, each square you see represents on PATCH of the NetLogo grid, with the center patch being in the usual place, the center square. For your convenience, I have marked the center square with the letter C for Center.*

Fill in the Grid with what the output would look like. Show your answer by drawing the turtles and output they leave in the GRID here. Be sure to both DRAW THE TURTLES as they would be at the end and also draw the OUTPUT the turtles left.



```

SPRING2010EXAM - NetLogo {C:\025\LOGO}
File Edit Tools Zoom Tabs Help
Interface Information Procedures
Find... Check Procedures
TO QuestionTHREE
  CA
  CRO 4

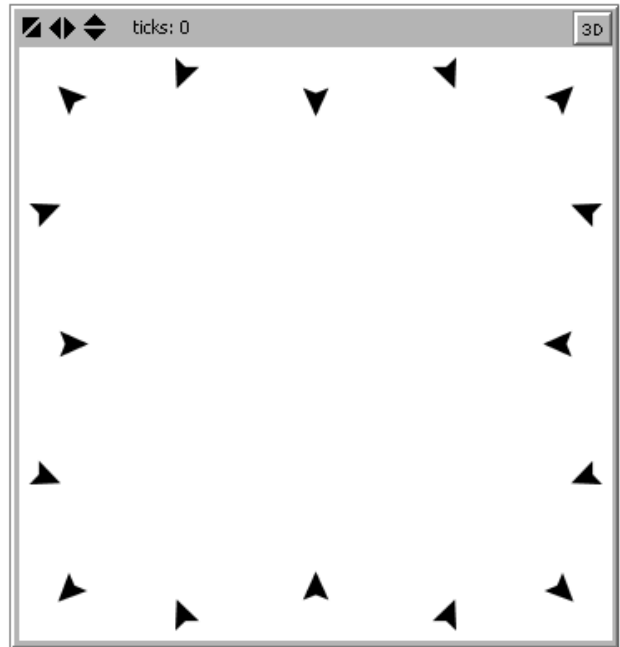
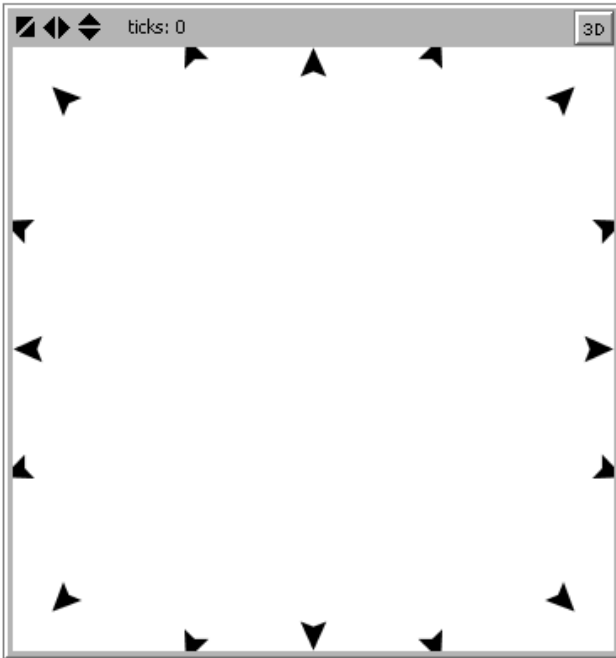
  ASK TURTLES [
    FD 3

    PD
    REPEAT 8 [ FD 2 RT 45 ]

    PU
    RT 180
    FD 2
  ]
END

```





4. Explain how the above **QuestionFOUR** procedure could be used once and produce the output on the left and then used later and produce the output on the right. Use any terms (also known as terminology) that you have learned from the class and the final exam study guide. Note: This is an ESSAY question. The depth and completeness of your explanation is VIP! Show off your knowledge of NetLogo software and its geometry.

```

TO QuestionFOUR
  ca
  cro 16

  ask turtles
  [
    FD 10
  ]
END

```

Which approach in your explanation produced the output on the **left**?

Which approach produced the output on the **right**?

5. This Monte Carlo question will seem familiar to you, but it is NOT the same one you practiced from the study guide. More dots (DARTS) have been added to it! Show your work and process of arriving at the answer. That is as important as getting the correct answer and also allows me to see if you had simple arithmetic errors or counting errors for the darts.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	x	$g(x) = x + 3$	$h(x) = 2x + 2$	The black dots represent a DART thrown randomly into the area using Monte Carlo. Count the darts! Estimate the area between the functions. Show work.												
2	0.0	3	2													
3	0.5	3.5	3													
4	1.0	4	4													
5	1.5	4.5	5													
6	2.0	5	6													
7	2.5	5.5	7													
8	3.0	6	8													
9	3.5	6.5	9													
10	4.0	7	10													
11	4.5	7.5	11													
12	5.0	8	12													
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27																
28	What is the area between functions $g(x)$ and $h(x)$ where															
29	$g(x) = x + 3$ and $h(x) = 2x + 2$ for $x \geq 1$ and $x \leq 3$?															
30	Use Monte Carlo to estimate the area.															
31																

6. Show what the GAME OF LIFE would look like next generation. Assume that the world does NOT wrap.