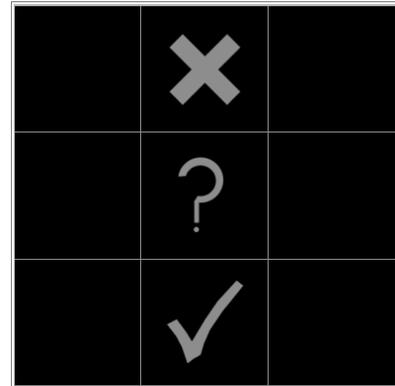


DO NOT WRITE ON THIS QUESTION SHEET.

This test is out of 50 points, with 5 points extra credit.

For Questions 1-4, we are going to create a simple traffic light for both normal-sighted people and also for those who are color-blind.

Assume that **the Netlogo world has only 3 patches horizontally and 3 patches vertically**, as in the picture (don't draw the grid, it's just there to show the positions of the patches).



1. (10p) Create the *SETUP* procedure to:
  - a. Clear everything
  - b. Create the 3 turtles using the already existent shapes: “x”, “question” and “check”, and place them in the positions shown. The “x” should be colored red, the “question” in yellow, and the “check” in green.
  - c. Create a global variable called *traffic-light*.
  - d. Call *Traffic “go”* (see #2 below)
  
2. (10p) Create a procedure called *Traffic* which takes one argument. It will be called by other procedures in the following way:
  - a. *Traffic “stop”* This will show the red “x” at the top of the light. The other turtles will not be visible.
  - b. *Traffic “slow”* This will show the yellow “question” in the middle...other turtles not visible.
  - c. *Traffic “go”* This will show the green “check” at the bottom ... other turtles not visible.
  - d. In addition, the *Traffic* procedure will also set the *traffic-light* variable to “stop”, “slow” or “go”.
  
3. (10p) Create the *Normal-Go* procedure. It will be called by a “forever” button. It will change the colors of the turtles like a normal real-world traffic light:
  - a. The light will be green (“check”) for 40 seconds
  - b. Then it will be yellow (“question”) for 4 seconds
  - c. Then it will be red (“x”) for 30 seconds.
  - d. ... and automatically start again.
  
4. (10p) Create the *CRAZY-GO* procedure, also called by a “forever” button (though not at the same time as *Normal-Go*). It will change lights randomly. Whenever it’s time for the light to change, the procedure will choose one of the other two lights to switch to at random. It will then remain green, yellow or red for the same periods of time as indicated in problem #3 above.

5. (10p) Now we've left the Traffic Light model behind. We're back in our usual Netlogo world, with 33 patches horizontally and vertically. Create the procedure *TIRED-OF-TRAFFIC* that when called, will give each patch a random one of the three colors: green or yellow or red. This procedure will be called by a "forever" button. However, once a patch has been green at least 10 times, and yellow at least 4 times, and red at least 7 times, it will be black always afterward. This procedure should run 4 times per second.
  
6. (5p) Extra credit: Create a *SETUP-RUNNERS* procedure that will clear the patches and color the central patch (at 0,0) yellow and the one just above it (at 0,1) green. Create a *Go* procedure that will appear to move the yellow patch to a randomly chosen one of its 8 neighbors 3 times per second, and will appear to move the green patch to a randomly chosen one of its 8 neighbors once every second. Of course, only the colors of the patches really move. If the colors of the patches happen to land on the same patch, it will be colored blue while they overlap.