1. Create a NetLogo model. In your model create 16, 32, 48 or 64 turtles by using a SLIDER. Have the "**odd**" turtles take 5 steps forward. Have the "**even**" turtles take 10 steps forward. Save your NetLogo model and send it to <u>jacobson@cs.uni.edu</u> as an attachment. Have each of the **odd** turtles draw some type of Polygon, such as a square or pentagon or octagon or triangle. Have all of the **even** turtles draw a different polygon type of polygon than the odd ones did. *You certainly may add additional features to this, if you wish. Different color for the odd and for the even, different shapes than the default turtle shape, spiral of polygons, etc.*

remainder

remainder *number1 number2*

Reports the remainder when *number1* is divided by *number2*. This is equivalent to the following NetLogo code:

```
number1 - (int (number1 / number2)) * number2
```

```
show remainder 62 5
=> 2
show remainder -8 3
=> -2
```

2. In the NetLogo models library, open File->Models Library; Sample Models -> Chemistry & Physics ->
   GasLab -> GasLab Maxwells Demon.

   • Click on the Information tab and read the sections on "**What is it?**" and "**How it works.**" Answer these questions.
     o Who is "Maxwell's Demon," and what does the demon do?
     o How does the model detect when two balls "hit" each other?

   • Click on the Interface tab. Change the number of particles to 500, click "setup," and then click on "go."
     o In the middle interface, balls with numbers appear. What do these represent?
     o What does the color of the balls represent?
     o The balls are not always the same color as when the simulation started out. What makes them change their color?
     o Describe what happens when your models is allowed to run over a long period of time (you may want to increase the speed).   *(SPEED **increase** or **decrease** from NORMAL SPEED in NETLOGO are very useful.)*

3. Create the NetLogo model that will play the song **Twinkle Twinkle Little Star** once when the user of your model clicks a button. Give the user choices for the length of a quarter note in the song to be any of the following: 0.1, 0.2, 0.3, 0.4, 0.5 or 0.6 for the various TEMPO choices. Send the NetLogo model file as an attachment to <u>jacobson@cs.uni.edu</u> on or before the due date deadline. Use any musical instrument that you like.

Twin-kle, twin-kle, lit - tle star, how I won - der what you are!

Up a - bove the world so high, like a dia-mond in the sky.

Twin-kle, twin-kle, lit - tle star, how I won - der what you are!

Using the list approach (using a **foreach** statement with two lists, one for note, one for duration of the note) is encouraged, but not required. See the http://www.cs.uni.edu/~jacobson/025/logo/bday.html page for more details. And use the 01/12/2012 first day class handouts.

Much improved use of NetLogo to "sing" Happy Birthday

```
extensions [sound]

to playHappyBirthday
    ( foreach [ 60 60 62 60 65 64    60 60 62 60 67 65    60 60 72 69 65 64 62    70 70 69 65 67 65 ]
              [ .3 .1 .4 .4 .4 .8    .3 .1 .4 .4 .4 .8    .3 .1 .4 .4 .4 .4 .4    .3 .1 .4 .4 .4 .8 ]
        [
            playNote ?1 ?2
        ]
    )
end

to playNote [ theNote theLength ]

    sound:start-note "TRUMPET" theNote 65
    wait theLength
    sound:stop-note "TRUMPET" theNote

end
```

Note that the Twinkle Twinkle Little Star song has only quarter notes and half notes. A quarter note gets 1 count and a half note gets two counts. There are 36 quarter notes in the song and 6 half notes in the song. 32 plus 2 times 6 = 48 counts or 48 beats in the song.

```
extensions [sound]

to playScale
  ( foreach [ 60 62 64 64 65 67 69 71 71 72 60   64 67 72 ]
            [ 1  1  .5 .5 1  1  1  .5 .5 1  2    1  1  4 ]
      [

          playNote ?1 ?2
      ]
  )
end

to playNote [ theNote theLength ]

    sound:start-note "TRUMPET" theNote 65

    wait theLength * quarterNoteLength

    sound:stop-note "TRUMPET" theNote

end
```

PlayAtDifferentTempos - NetLogo {C:\1025}

File Edit Tools Zoom Tabs Help

Interface | Information | Procedures

Edit   Delete   Add   abc Button ▼   normal speed   ☑ view up
                                                                      continuous

ticks: 0

quarterNoteLength   0.3

playScale

Command Center   Clear

observer> playScale
observer> playScale
observer> playScale

observer>