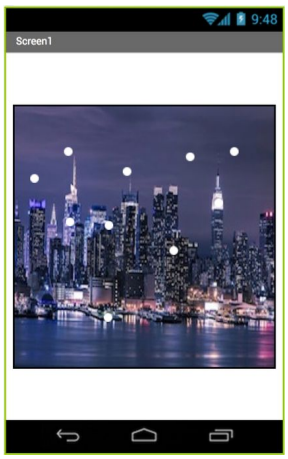


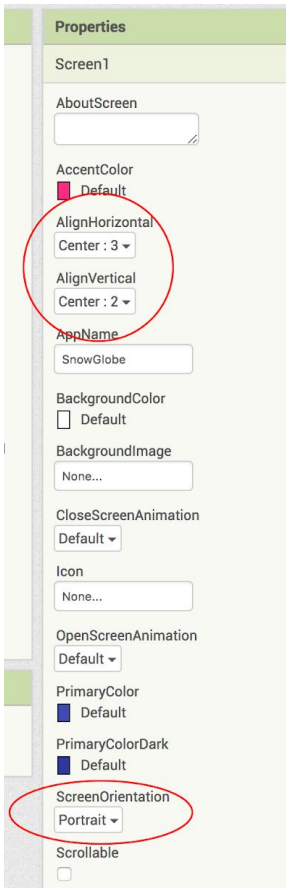
Project: Snow Globe

In this project you will create a virtual "Snow Globe" that displays snowflakes falling randomly on New York City at night whenever you shake your Android device. You will be introduced to the "Any Component" advanced feature in App Inventor which is used to give collective behaviors to components of the same type.

1) Go to the following URL: https://tinyurl.com/snowglobestarter

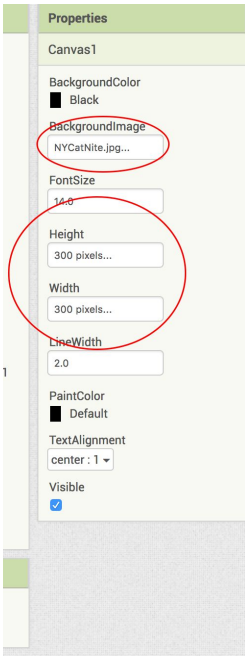
2) You will need to log in to MIT App Inventor when prompted. Open the starter file in which an image of New York City at night has already been uploaded into the Media.

3) First, change the Properties for Screen1 as follows:



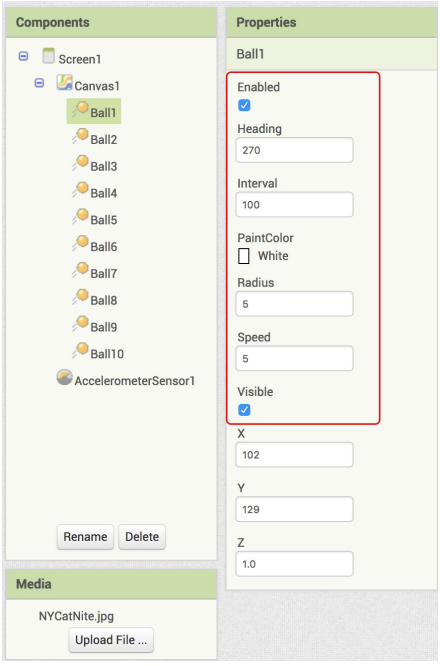
4) From the **Sensors** Palette drop an **Accelerometer** onto the screen. This non-visible component will notice and respond to when the device is shaken.

5) From the **Drawing and Animation** Palette drag a **Canvas** onto the Screen and change its Properties as follows:

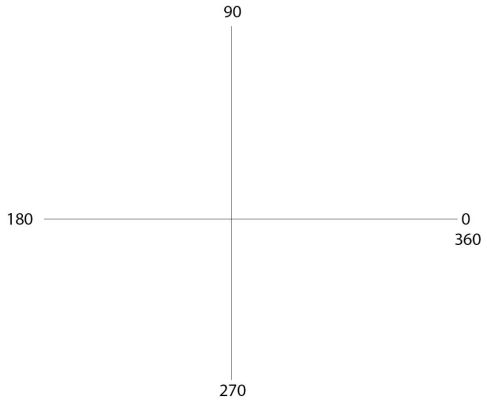


Note: The *BackgroundImage* should be the NYC image file already uploaded for you in the Media list.

6) From the **Drawing and Animation** Palette drag and drop a **Ball** sprite on the **Canvas**. Change the following Properties for the ball:



- A *Heading* of **270°** means heading downwards towards the bottom of your device.

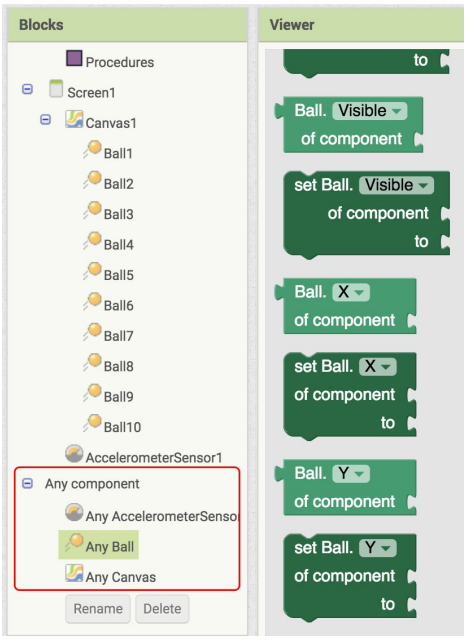


- *PaintColor* is **White** as the ball sprites represent snowflakes.
- *Speed* of **5** with *Interval* **100** means every 100 millisecond the ball moves down 5 pixels.

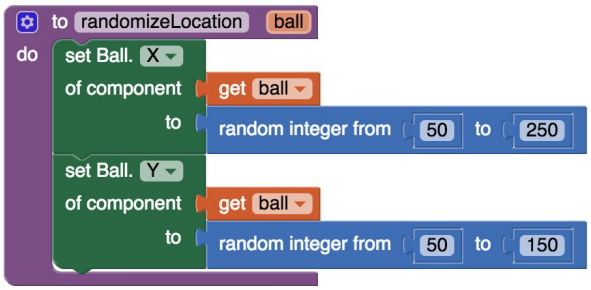
Then use the new copy-paste feature in the Designer to create more balls using the original ball: select the original ball, do the usual copy-paste commands CTRL-C, CTRL-V and drag the new ball overlapping with the original to a new location on the **Canvas**. The properties of the original ball will also be copied automatically. 10 balls are shown here but you don't need more than 5 initially.

7) Instead of coding the behavior of each ball separately we will use *abstraction* to reduce the amount of code that is repeated for each ball sprite. Instead of repeating code 10 times, abstraction allows us to initialize and set the behavior all at once when the device is shaken. Look over but ***do not create the lengthy code below*.** Notice that nearly identical code is repeated ten separate times for each of the ten ball sprites.

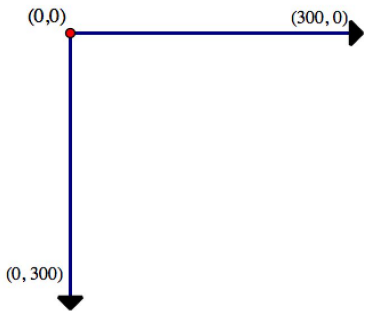
Instead you will use the abstracted methods applicable to *any* ball via the "**Any Component: Any Ball**" option in the Blocks palette.



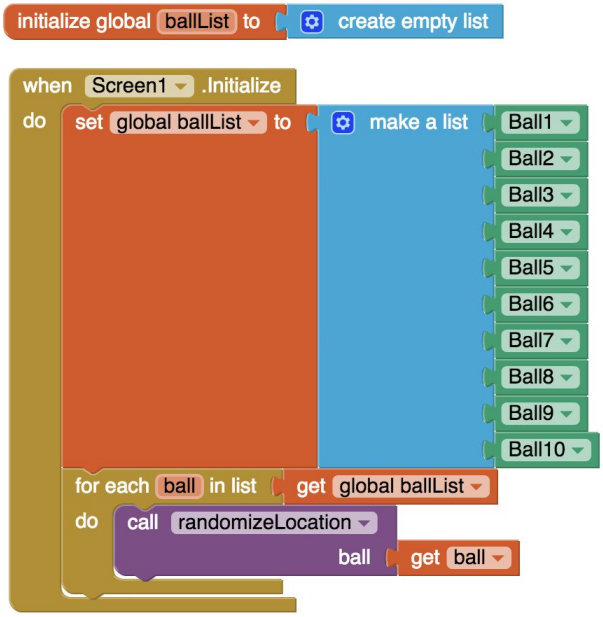
8) First, define a Procedure to randomize the location of a given ball.



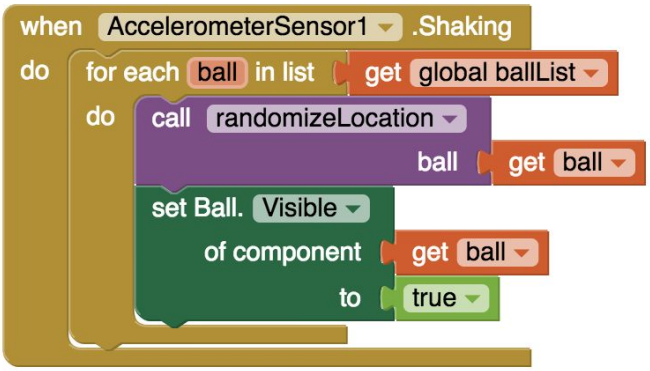
Note that the origin (0, 0) for the **Canvas** is the top left corner.



9) Then put each ball into a list that is populated when the screen is initialized.



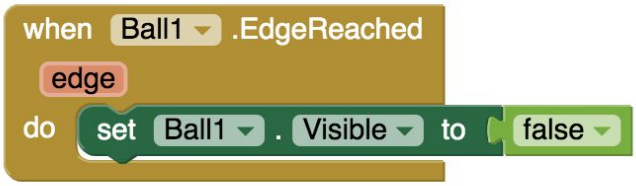
10) Here is the much simpler, less repetitive abstracted code to give each snowflake a random location and make it visible when the **Accelerometer** senses that the device is shaken.



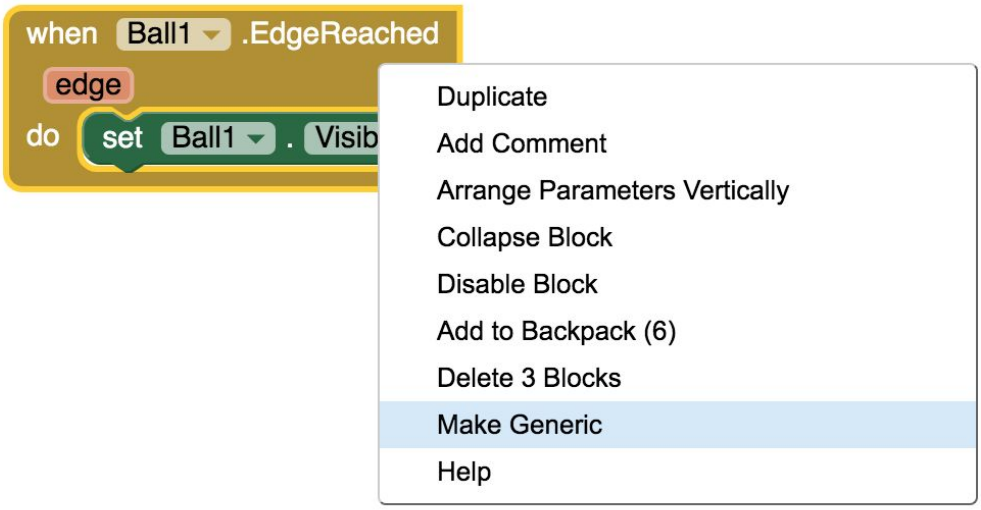
Note: The visibility of the ball sprites needs to be reset as they should disappear when they touch the bottom edge. The *Speed* and *Heading* of each ball do not need to be reset.

11) Each ball should disappear when it hits the bottom edge. It would be wonderful if we could avoid creating ten separate event handlers as shown below. Study but ***do not create the lengthy code below*** where nearly identical code is repeated ten separate times for the ten balls.

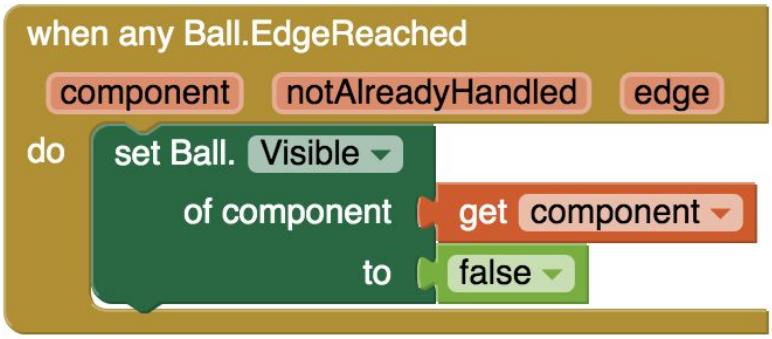
Instead, create only the first event handler for the first ball,



and then right click on the block to make it “generic”.



and you will get the following single generic event handler to make with ***any*** ball invisible when reaching an edge.



12) Test your virtual Snow Globe using the App Inventor companion and your Android tablet. Note that the Emulator simulation will not work here as we cannot shake the Emulator.

Note: If you could not finish your project, no worries. Just save what you have and continue when you have a chance at school or at home.

Extensions: Here are some ideas. Come up with your own.
1) Change the background image to a picture of Boston or Fenway Park.
2) Increase the number of snowflakes to make the simulation more realistic. Decrease the size of the ball sprites as needed to accommodate for the increase in numbers.
3) Make the ball sprites all have different random sized radii.
4) Have the snowflakes fall at different random speeds.
5) Have a holiday themed tune like "Jingle Bells" play for a few seconds when the device is shaken.
6) Have the snowflakes fall downwards with acceleration as if acting under the force of gravity or have them slow down as they fall.

7) We called the app “Snow Globe” but it has a *square* shaped canvas. See if you can simulate snow falling in a circular region enclosing the city-at-night image.
8) Here is a more advanced follow up project using the “Any Components” feature. The "Unreasonable Test" tutorial: https://tinyurl.com/unreasonable-test
and its app template: https://tinyurl.com/unreasonable-template

Link to this tutorial online: https://tinyurl.com/snowglobetutorial