**Calculations**

To compute the gravitational force in relation to the x and y axises between 2 objects the first step is to calculate the distance between the objects along both the x and y axises. This is found by subtracting object B’s x position from object A’s x position, and likewise to find the distance for the y axis. Next the distance between the objects, ***r***, is found by using the pythagorean theorem.

Now the gravitaional force between the objects can be found by using Newton’s equation of gravity.

Where ***G*** is the gravitaional constant ( *6.67 \* 10 ^ -11)*, ***m1*** and ***m2*** are the masses of object A and B respectedly and ***r***is the distance between the two objects. Now that the force between the two objects is found it must be split into its component vectors.

First angle ***θ*** is found by using the function *atan2(y,x)* where y is the distance between the objects along the y axis, and x is the distance between the objects along the x axis. Then *Fx* and *Fy* are found by using *cos* and  *sin.*

This process to find the vector components in terms of x and y is repeated with every object in the simulation in order to find the total force acting on the object in terms of *x* and *y*.

Once the total force along the x-axis and the total force along the y-axis has been found the velocity along the x-axis and y-axis is found.

and

are rearanged such that,

Where ***m***is the mass of object A and ***t*** is the timestep (a half day : 60 \* 60 \* 10s). Once the Velocity along both x and y-axises is found the distance travelled can be found.

Where ***d***is the distance travelled and ***t*** is the timestep. ***d*** in terms of x and y can be added to the objects x and y coordinates respectedly. The object has now moved to the new position.

To increase the accuracy of the simulation ***t*** can be reducded to a smaller time intervel, however this slows down the simulation as more calculations are required.