

pesudo code for 1b

```
solution_to_1b(x_initial, y_initial, x_v_initial, y_v_initial, time_step, end_time, r){
```

```
    x_coordinate = [];
```

```
    y_coordinate = [];
```

```
        //size of x_coordinate and y_coordinate should be = to size of time
```

```
    x_new_initial = x_initial;
```

```
    x_new_v_initial = x_v_initial;
```

```
    y_new_initial = y_initial;
```

```
    y_v_initial = y_v_initial;
```

```
    time = arange(0, end_time, time_step);
```

```
    for i in range(0, time.size()){
```

```
        //Stop at time.size - 1, so the amount of steps will be the same
```

```
        x = x_new_initial + x_new_v_initial * time_step - ((G * M * x_new_initial)/(r**3)) *  
time_step**2; //Calculate the new step value for x
```

```
        y = y_new_initial + y_new_v_initial * time_step - ((G * M * y_new_initial)/(r**3)) *  
time_step**2; //Calculate the new step value for y
```

```
        x_v = x_new_v_initial - ((G * M * x_new_initial)/(r**3)) * time_step;  
        //Calculate the new value for new velocity at new x
```

```
        y_v = y_new_v_initial - ((G * M * y_new_initial)/(r**3)) * time_step;  
        //Calculate the new value for new velocity at new y
```

```
        x_coordinate.append(x);
```

```
            // add new coordinates to list
```

```
        y_coordinate.append(y);
```

```
x_new_initial = x;  
// update starting position values  
y_new_initial = y;
```

```
x_new_v_initial = x_v;  
// update starting velocity values  
y_new_v_initial = y_v;
```

```
}
```