COSC363 Assignment 1

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1 Scene description

The scene contains a building with a pyramid roof, inside of which are five animated models. There is a scoop of icecream falling out of an icecream cone, a rocket taking off and falling back to earth, a fish swimming in a circle, a bowl falling down then bouncing back up, and three marbles rolling around a track. The whole scene is encompassed in a skybox of a beach.

2 Screenshots

Screenshots of the interior and exterior of the building are shown in Figures 1 and 2.
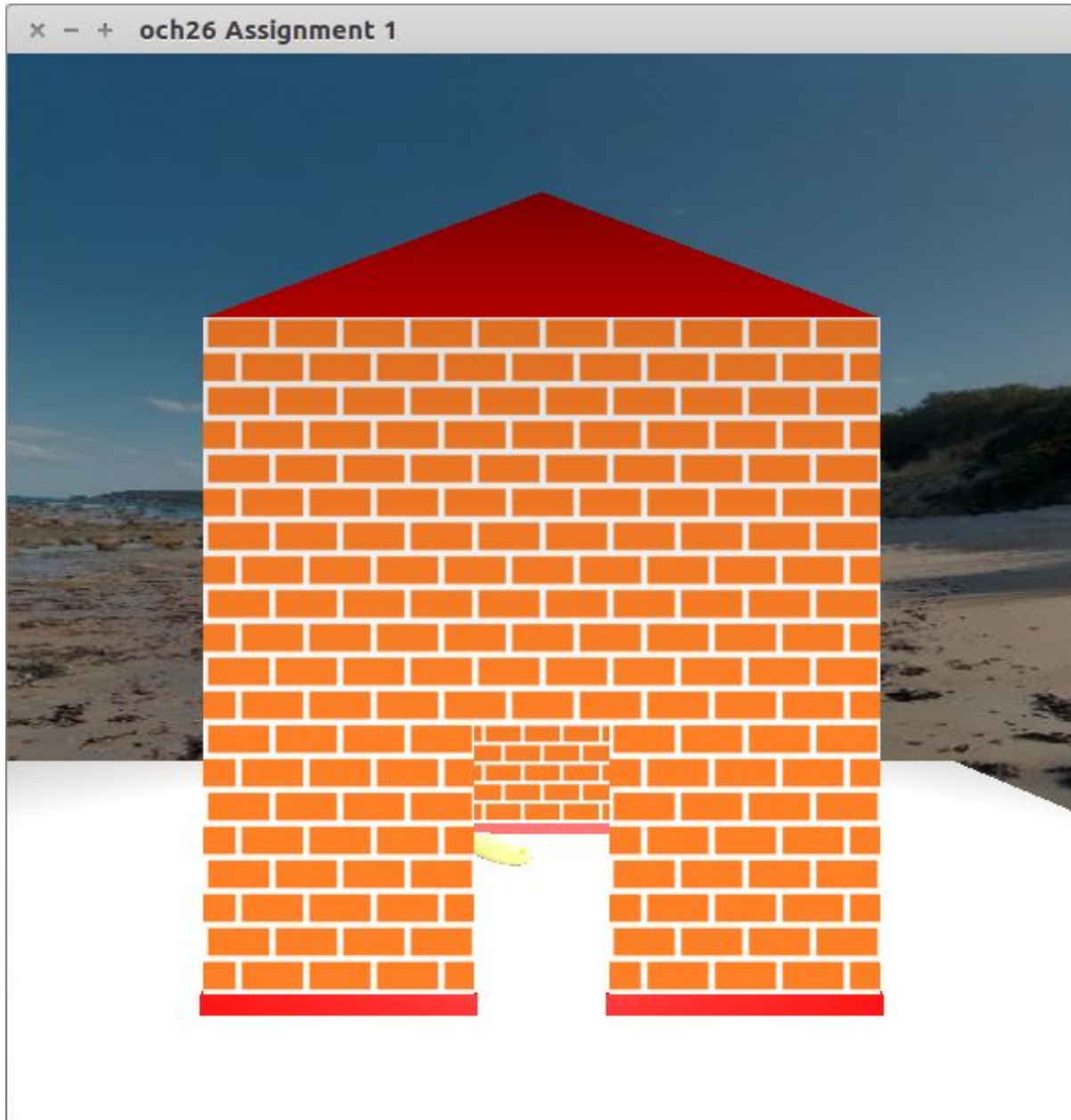
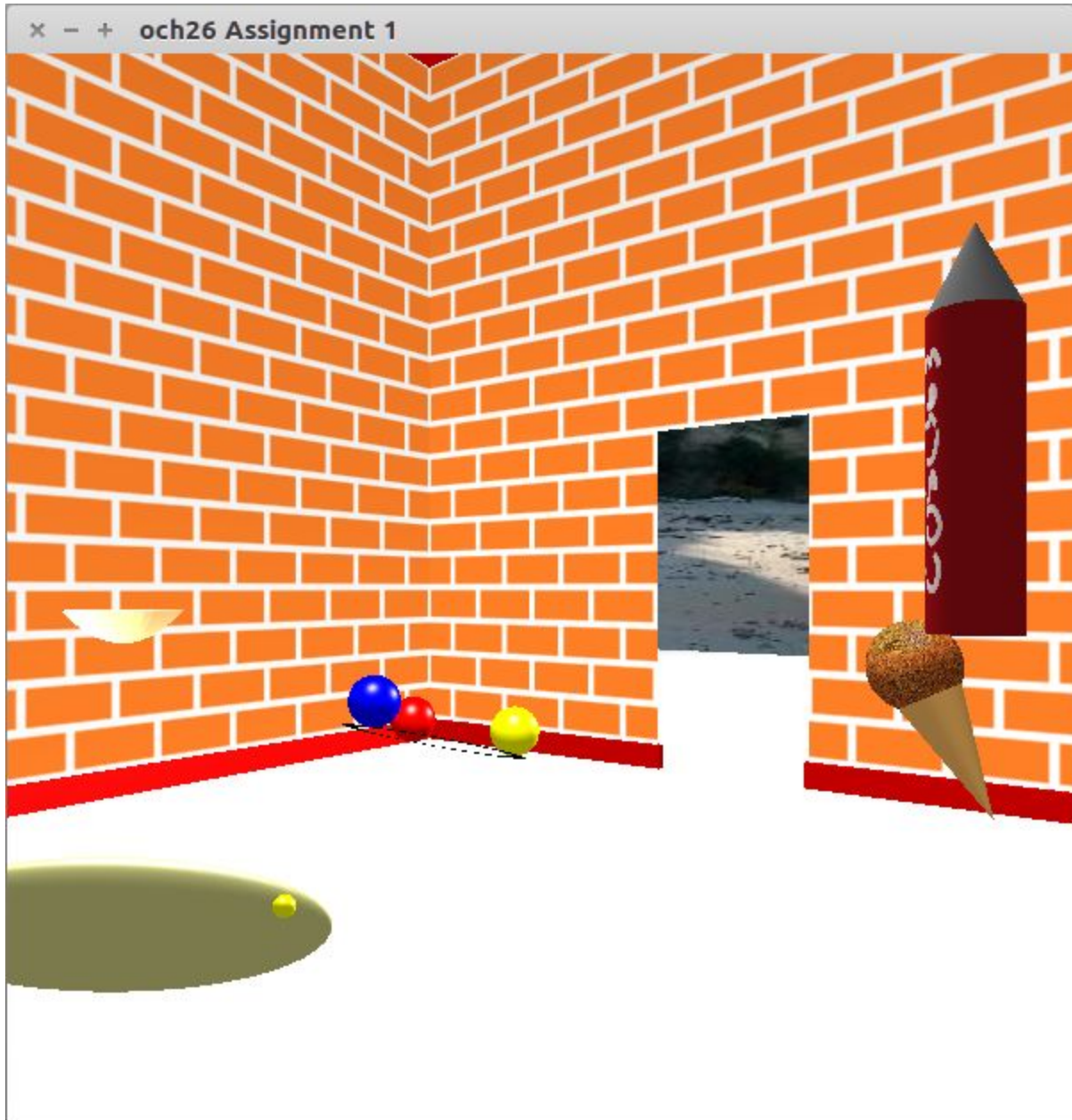Figure 1: A screenshot of the exterior of the model gallery.

Figure 2: A screenshot of the interior of the model gallery, with all five models in sight.

3 Extra features

- A surface shape generated using a mathematical formula: the bowl is a paraboloid generated from the parabola $y = \frac{2}{17}x^2, \ where \ x <= 5$.

4 Models

To create my animations, I used a global variable `theta`, which incremented at least every 30 milliseconds, and reset at 360. I used this as both input to trigonometric functions, such as `sin()` and `cos()`, and to time the animation loops.

4.1 Icecream in a cone

The icecream in a cone is a scoop of chocolate icecream (created using a texture) in a cone. The texture was generated using the licence-free image of a wall that looks like icecream at https://upload.wikimedia.org/wikipedia/commons/9/97/Gelato%3F.jpg, cropping to the "chocolate" section, then reflecting it into four quarters so that it could be wrapped around a sphere without having any seams where one side of the image joined the other, The scoop was created using `gluSphere` and the cone was created using `glutSolidCone`. I designed a sequence of animations, where the cone rotated, the scoop fell out, the cone kept rotating until it was upright, then it reset. I sketched the six stages (each stage lasted for 60 increments of `theta`); this is shown in Figure 3.
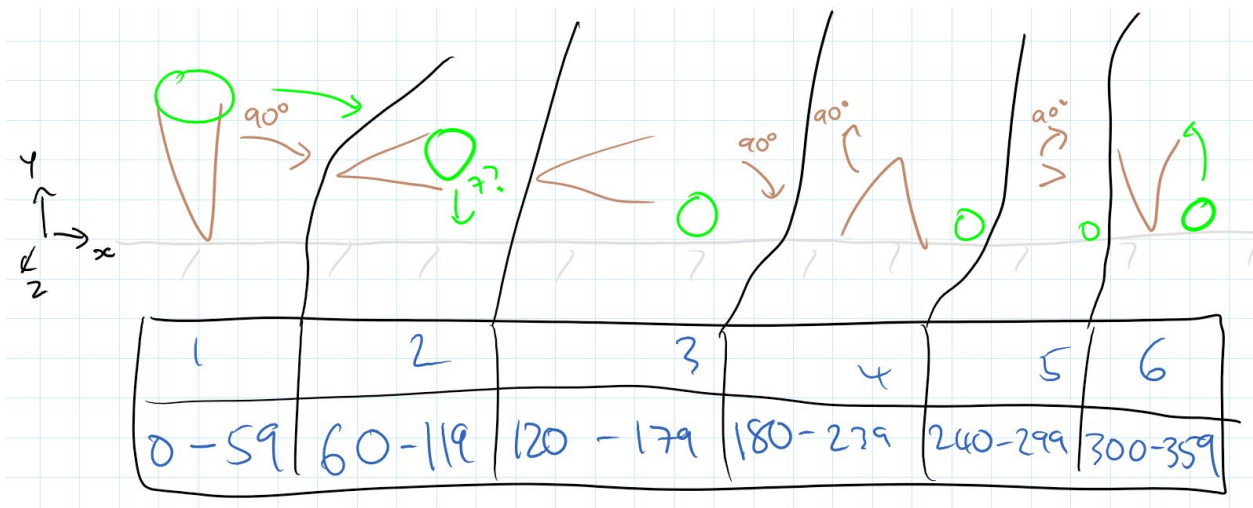

Figure 3: The six stages of the icecream animation.

4.2 Rocket

The rocket was created using `gluCylinder` for the body (which was created using a texture), `gluDisk` for the base, and `gluSolidCone` for the nose. I designed a sequence of animations where the rocket flew up to near the roof of the gallery, then rotated 180° about a point outside the rocket, then fell back down to the ground, landing on its nose. It falls onto its side, then rights itself, effectively resetting the animation. Like the icecream, I split this into 6 stages, as shown in Figure 4.
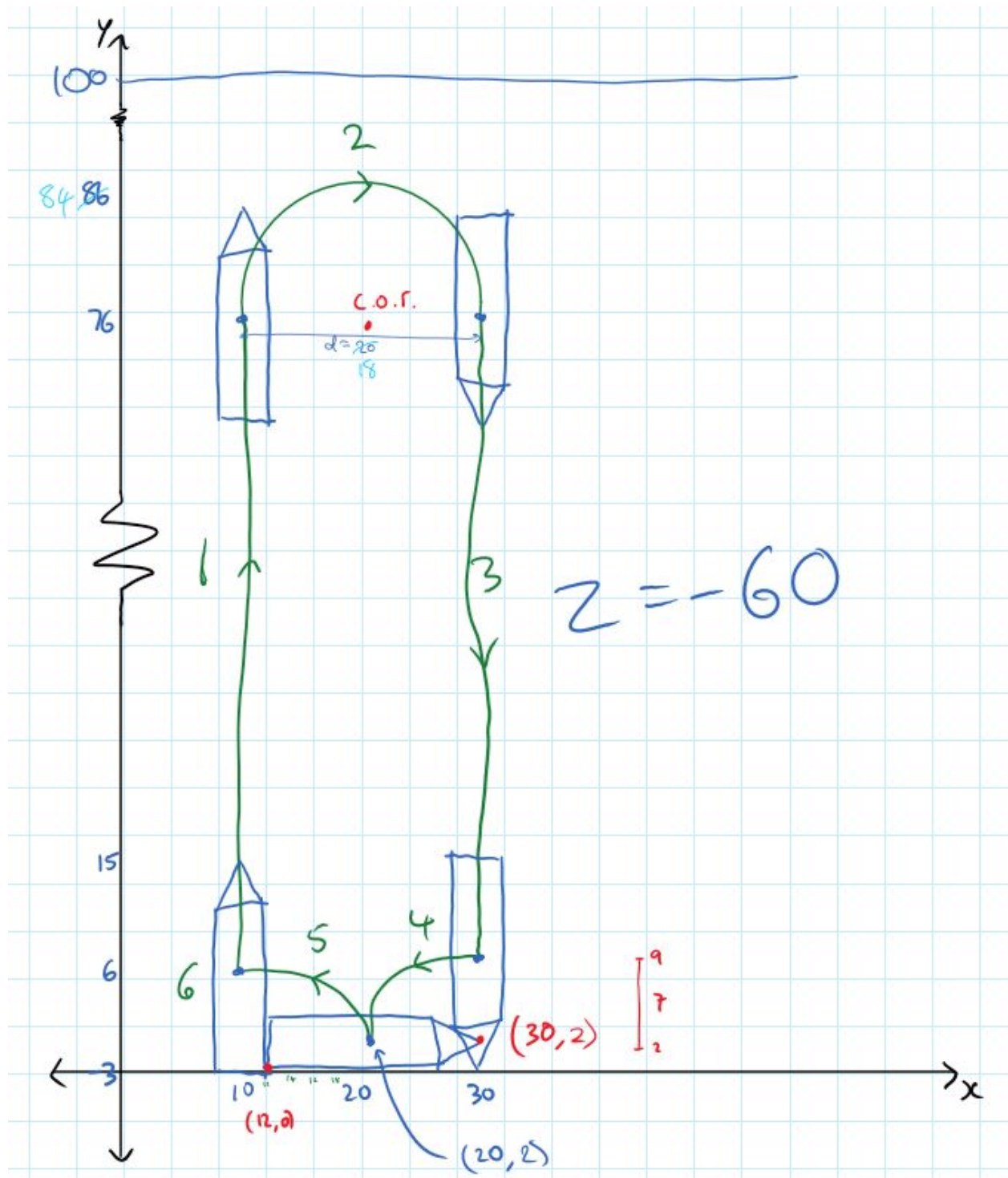
Figure 4: The six stages of the rocket animation.

4.3 Fish

The character model I designed was a fish. It was created using a (distorted) sphere for the body, two spheres for the eyes, and a pyramid for the tail. The fish swims around in a circle, and

its tail waves back and forth up to 30° in relation to its body. A diagram of the fish, as it is intially generated by the fish() and tail() functions I created, is shown in Figure 5.
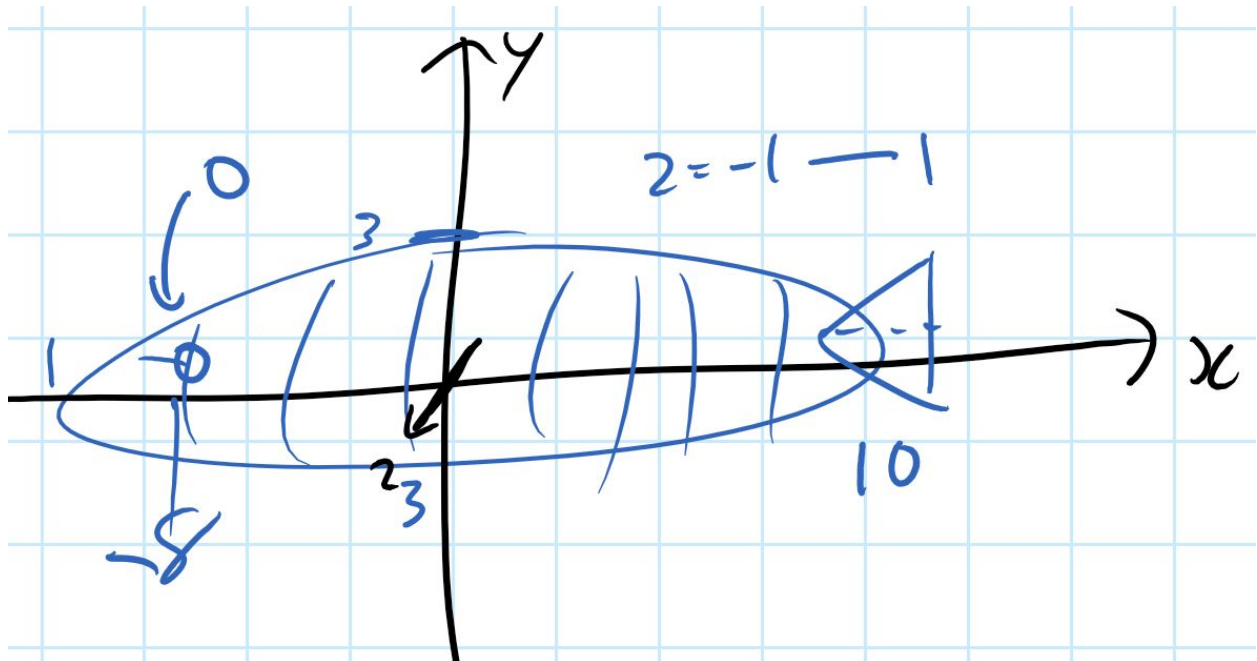

Figure 5: A diagram of the fish, showing its size and initial position.

4.4 Marbles

The marbles going around a track was created using three spheres and a disc, angled up slightly. A diagram showing their change in height and rotation in the x-z plane is shown in Figure 6.
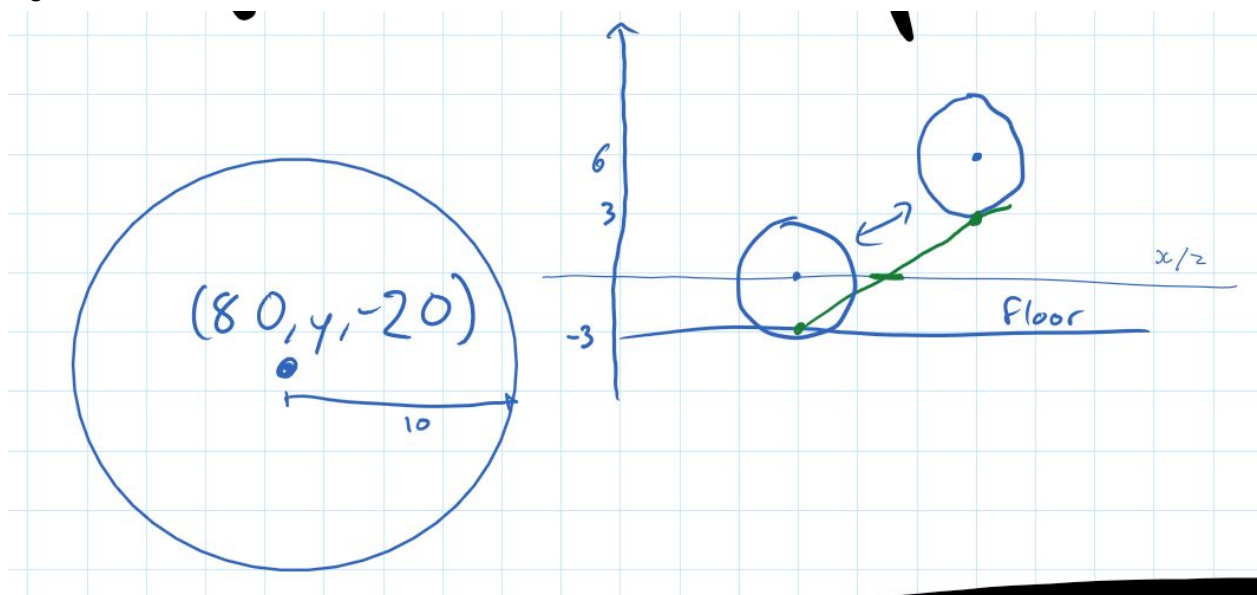

Figure 6: The marbles rotation and change in height.

4.5 Bowl

The bowl was generated using a surface of revolution. It bounces up and down.

5 Special challenges

5.1 Creating the skybox

To create the skybox, I downloaded a photosphere I created using Google Camera in 2015, at a beach near Shag Point in Otago. I then used a python script on GitHub (github.com/seiferteric/cubemap), which uses the NumPy, SciPy, and Python Imaging libraries, to convert that into six 512-by-512-pixel JPG images. I converted them into TGA images using the website convertio.co/image-converter. I then modified code from the skybox lab to use the images as a skybox in the scene; this included setting the skybox's position so that the camera was always at the center to avoid any distortions.

6 Controls

The up and down arrow keys move the camera forwards and backwards. The left and right arrow keys tilt the camera left and right. The page up and page down keys move the camera up and down. The insert and home keys move the camera left and right.
F1 and F2 turn on and off the two lights.