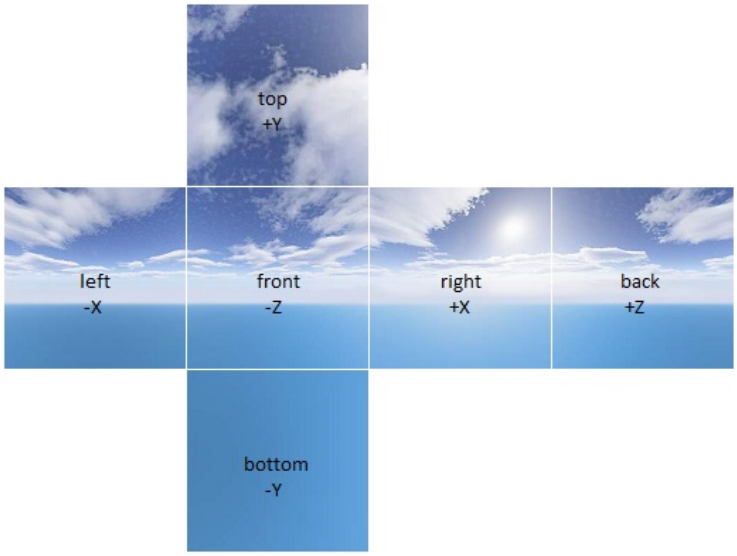
CS 418: Interactive Computer Graphics Spring 2019
In-class Worksheet: Environment Mapping

# Cube Maps

## 1. Sampling a Cube Map




At run time, a cube map is sampled using a reflection vector.
For this question, use a reflection vector of $R = \langle 2,4,1 \rangle$
This vector is used to:

**a. Determine which cube map wall to sample**
Which wall in the image above would be sampled using $R$ ?

**b. Determine what (u,v) coordinates to use when sampling the wall**
What (u,v) coordinates are generated using $R$ ?

2. **Transparency**
   Imagine you are writing a shader for a transparent material. You need to write code to calculate a refraction vector which will be used to sample a cube map.
   a. Will the code to calculate the refraction vector be in the vertex shader or fragment shader?

   b. What data are needed to calculate the refraction vector?

   c. The GLSL function refract requires a variable `iorefr` representing the index of refraction. If we are simulating light entering water from air, what is the value of `iorefr`?

| **Speed of Light Relative to the Speed of Light in a Vacuum** |
| --- |
| Air: 99.97% |
| Glass: 52.2% to 59% |
| Water: 75.19% |
| Sapphire: 56.50% |
| Diamond: 41.33% |

3. **Semi-random Questions**
   a. If you have 2 reflective objects in a scene, how many cube maps are needed?

   b. If a reflective object is moving, how does the movement affect the cube map associated with the object?

   c. Name a visual effect related to reflection that is not supported by a cube map?