

## -----Task 2.1a-----

### Die1:

- Translate by  $(0, 0, -0.5)$  (move center to the origin)
- Rotate by  $(0, -\pi/2, 0)$
- Scale by  $(2, 2, 2)$
- Translate by  $(-1, 0, 1)$  (move to final position)

### Die2:

- Rotate by  $(0, 0, \pi/2)$
- Translate by  $(-1.5, -0.5, 1)$  (move to final position)

### Die3:

- Rotate by  $(0, 0, \pi)$
- Translate by  $(-1.5, 0.5, 0)$  (move to final position)

### Die4:

- Translate by  $(-1.5, -0.5, 0)$  (move to final position)

### Die5:

- Rotate by  $(0, 0, -\pi/2)$
- Translate by  $(-1.5, 0.5, -1)$  (move to final position)

### Die6:

- Translate by  $(0, 0, -5.5)$  (move center to the origin)
- Rotate by  $(0, \pi/2, 0)$
- Translate by  $(-2, 5, -3, 0.5)$  (move to final position)

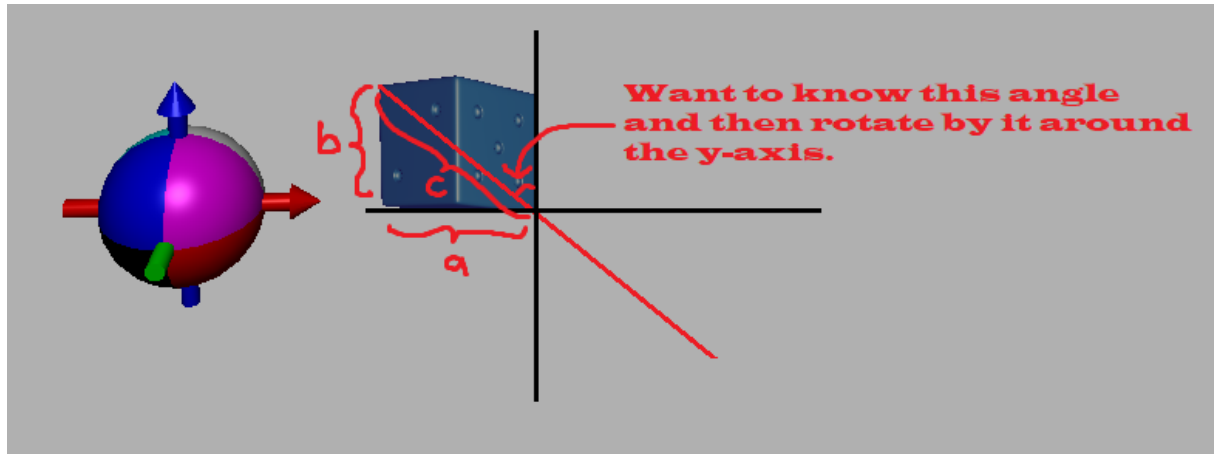
## -----Task 2.1b-----

Same as 2.1a, except Die6:

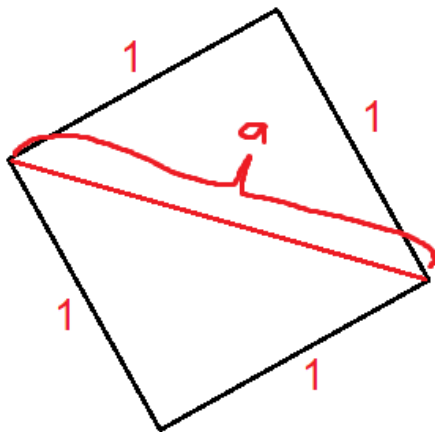
### Die6:

- Translate by  $(0, 0, -5.5)$  (move center to the origin)
- Rotate by  $(0, 0, -\pi/4)$

After the rotation, the die is orientated like this:



We see that  $b = 1$  (i.e. the length of the side of the die). From above, the die looks like this:



$$\rightarrow a = \sqrt{1^2 + 1^2} = \sqrt{2}$$

$$\rightarrow \text{angle} = \pi/2 - \arctan(b/a) = \pi/2 - \arctan(1/\sqrt{2}) = 0.9553166181$$

Therefore:

-Rotate by  $(0, 0.9553166181, 0)$

The rotation of the die is correct. Now, the die has to be moved from the origin to its final position.

The corner of the die is supposed to be located 4 units above the origin. The distance between the

center of the die and the corner is  $c/2 = (\sqrt{a^2 + b^2})/2 = \sqrt{3}/2$ .

Therefore:

Translate by  $(4 + \frac{\sqrt{3}}{2})$  along the z-axis.

The x- and y-coordinates can still be handled as if the die was not rotated since it is still centered at  $(0, 0, 0)$  after rotating at the origin:

Translate by -1.5 along the x-axis.

Translate by 0 along the y-axis (already centered from the beginning).

**So the whole procedure can be summarized as:**

- Translate by (0, 0, -5.5) (move center to the origin)
- Rotate by (0, 0,  $-\pi/4$ )
- Rotate by (0, 0.9553166181, 0)
- Translate by  $(-1.5, 0, 4 + \frac{\sqrt{3}}{2})$  (move to final position)

## -----Task 2.2-----

See Inviwo and the files containing the code.