



# CS7029 LAB 3: CONSTRUCTIVE SOLID GEOMETRY

12/10/16

# PRE-FACE

The lab looks at using CSG operations to create more complex shapes from primitives

Before you do this you need to be comfortable with...

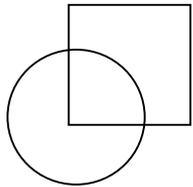
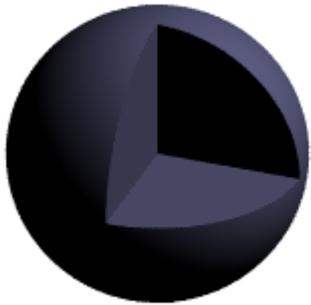
- ✧ Placing objects
- ✧ Transforming objects
- ✧ Colouring objects (to some degree)

This lab is not marked so you should use it to familiarise it with the above operations

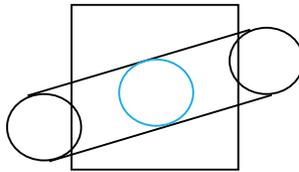
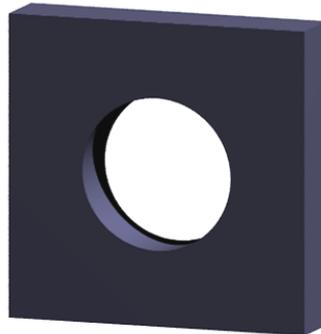
N.B. The main goal is try to figure out general modelling steps to achieve a certain result. Correct syntax (code) is not the main outcome so we're here to help fix coding issues. Please ask if you're stuck

# THE LAB TASK

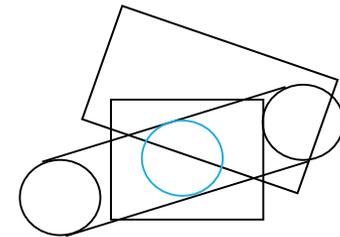
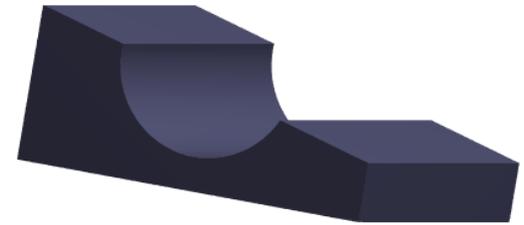
Model (at least one of) the following shapes using CSG operations in POV-Ray



1. Corner of a box cut out of a sphere

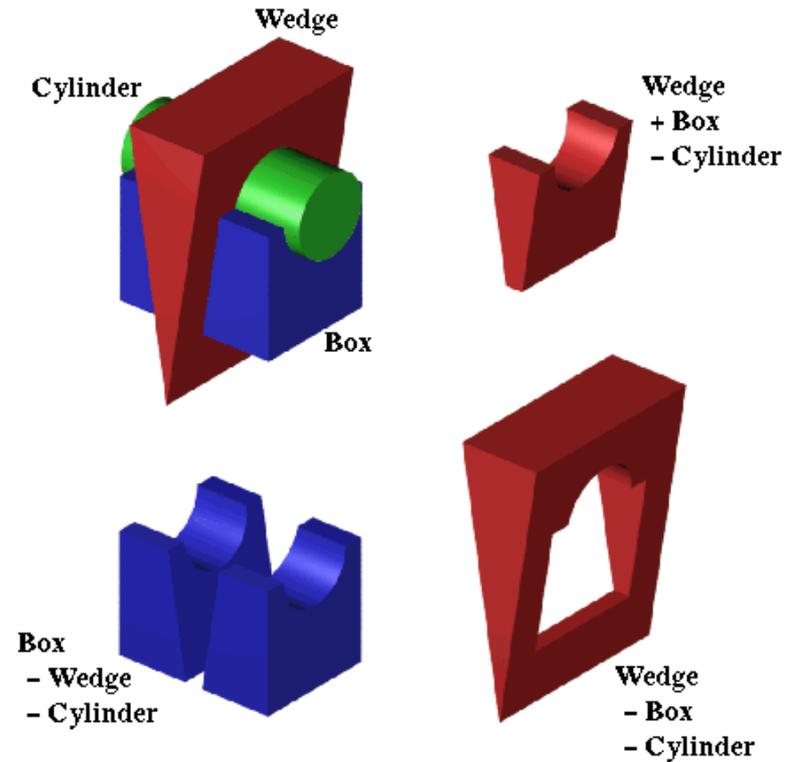
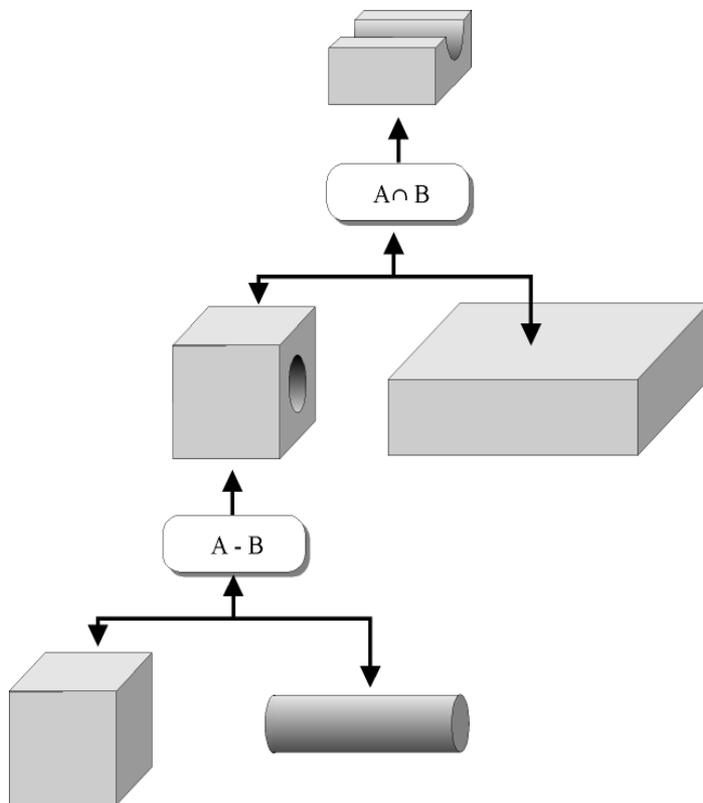


2. Cylinder cut out of a box

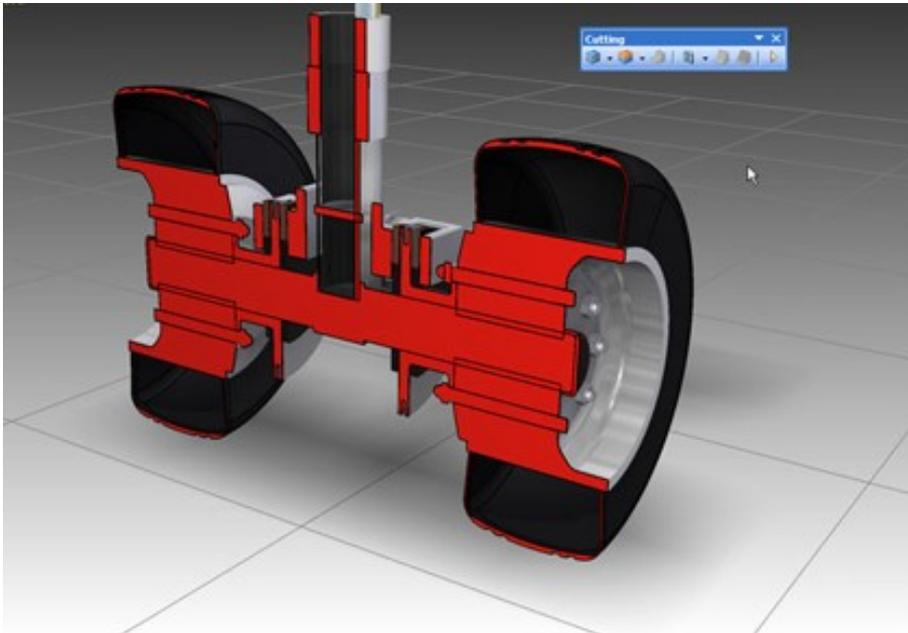
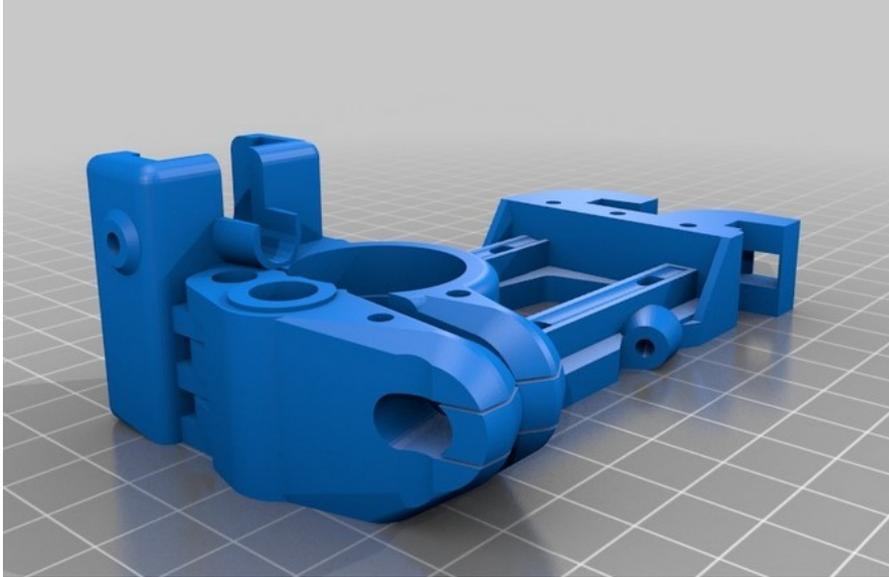


3. A rotated box is cut out of 2.

# CONSTRUCTIVE SOLID GEOMETRY (CSG)

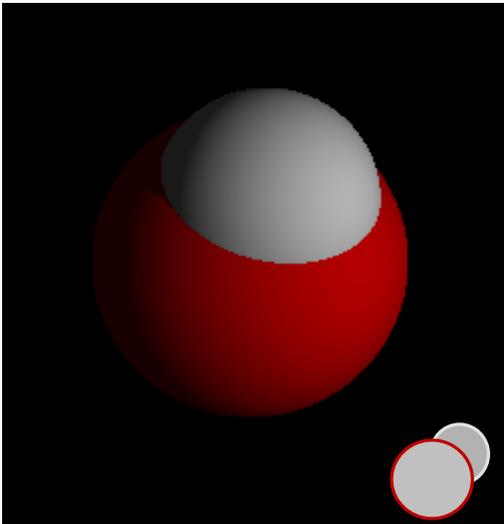


Construction of more complex objects using basic shapes combined using some clever operators



# CONSTRUCTIVE SOLID GEOMETRY

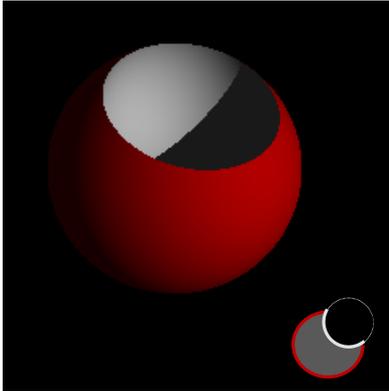
POV-Ray supports Union, Intersection and Difference



```
union
{
  sphere
  {
    <0, 0, 0> 1.5
    pigment { rgb <1, 0, 0> }
  }
  sphere
  {
    <0, .8, -.3> 1
    pigment { rgb <1, 1, 1> }
  }
}
```

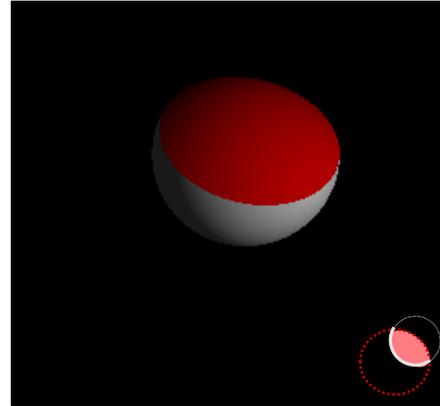
Union of two spheres (the other variables are simply the center, radius and color of the spheres).

# OTHER CSG OPERATIONS



## difference

```
{
  sphere
  {
    <0, 0, 0> 1.5
    pigment {rgb <1, 0, 0>}
  }
  sphere
  {
    <0, .8, -.3> 1
    pigment { rgb <1, 1, 1> }
  }
}
```



## intersection

```
{ sphere
  {
    <0, 0, 0> 1.5
    pigment {rgb <1, 0, 0>}
  }
  sphere
  {
    <0, .8, -.3> 1
    pigment { rgb <1, 1, 1> }
  }
}
```

# OTHER THINGS TO TRY

Familiarise yourself with the following POV-Ray objects

- ✧ *pigment*
- ✧ Transforms: *translate, rotate, scale*
- ✧ *camera*
- ✧ *light\_source*