

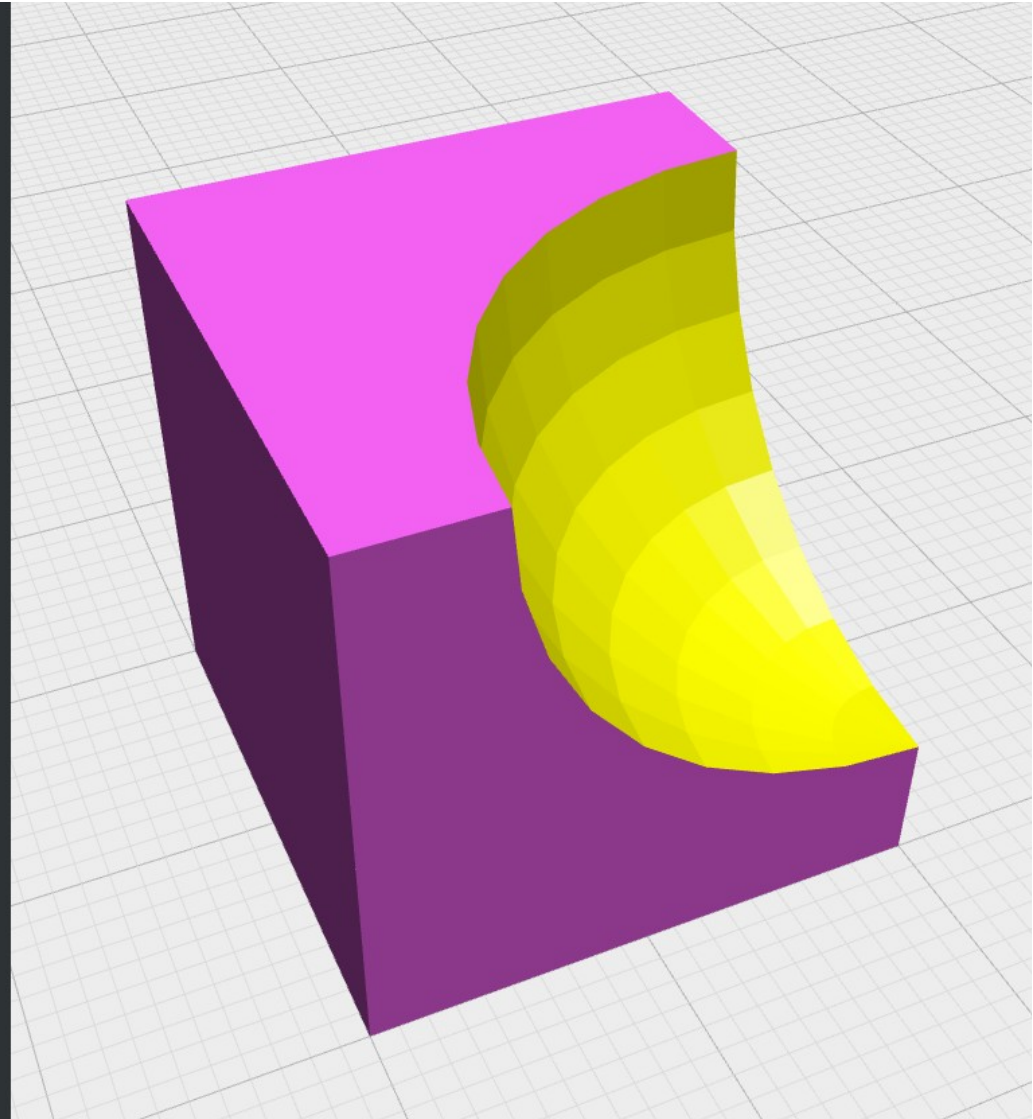
Intro to OpenSCAD

by draemmli

ZeTeCo 2017

Everything defined in code.

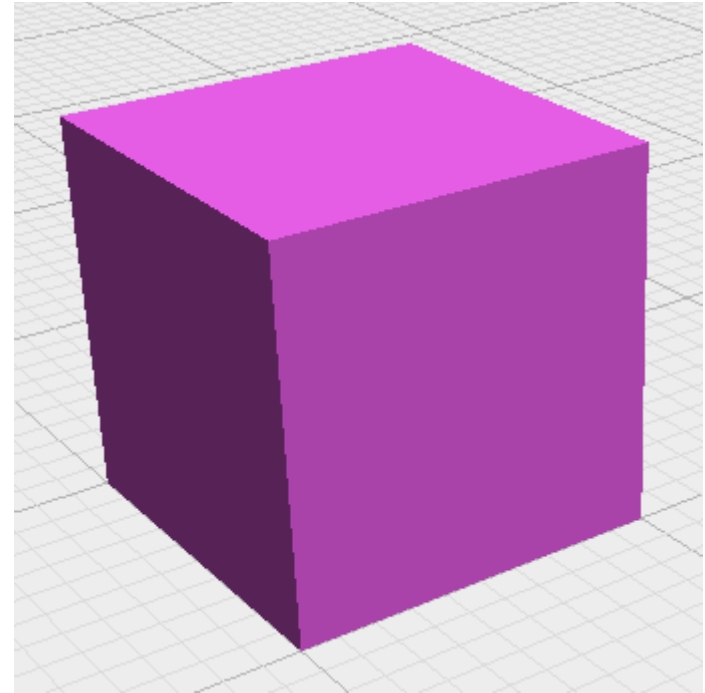
```
1  /*
2
3   This will create a cube with part
4   of a sphere cut out of one corner.
5   We'll use boolean operations to achieve this.
6
7  */
8
9  function main(){
10
11   var radius = 15;
12   var cubeSize = 20;
13
14   var ourCube = cube(cubeSize);
15   var sphereCutout = sphere({r:radius, center: true});
16
17   ourCube = difference(
18     ourCube
19     ,sphereCutout.translate([cubeSize, cubeSize, cubeSize])
20   )
21
22   return ourCube;
23 }
24
```



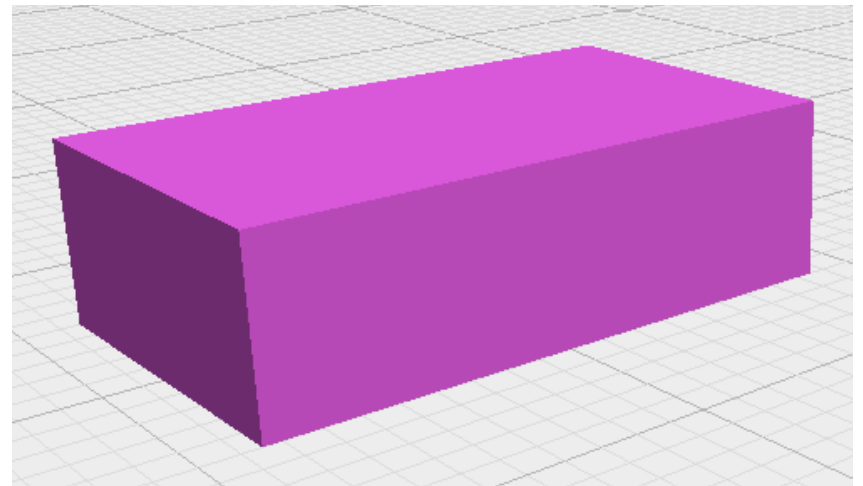
Hello, World!

→ <https://openjscad.org>

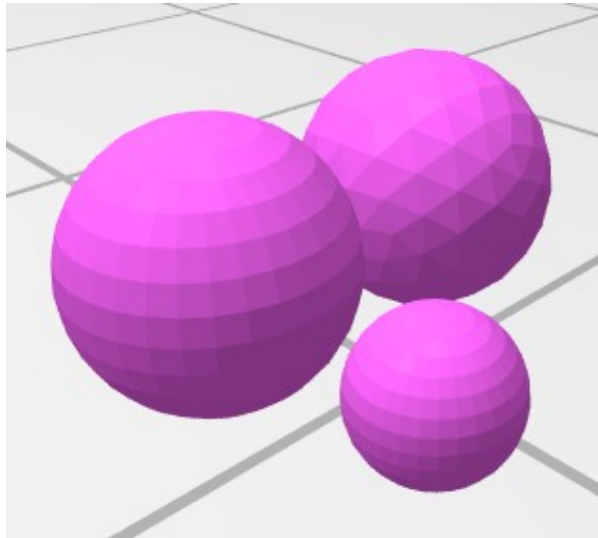
```
function main() {  
  return cube(10);  
}
```



```
function main() {  
  return cube({  
    size: [10, 17, 5],  
    center: [true, true, false]  
  });  
}
```



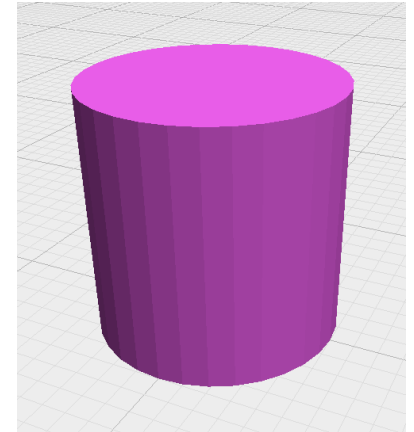
Basic Shapes: Spheres



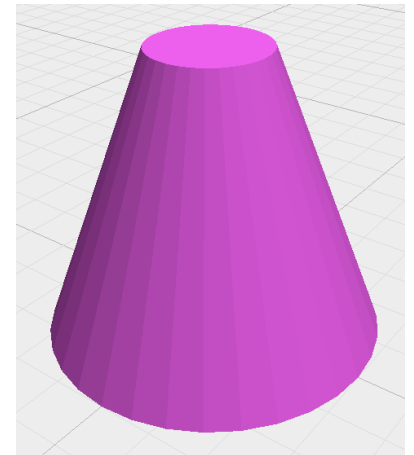
```
sphere({  
  r: 10,  
  fn: 100,  
  type: 'geodesic'  
});
```

Basic Shapes: Cylinders

```
cylinder({  
  r: 5,  
  h: 10,  
  round: false  
});
```

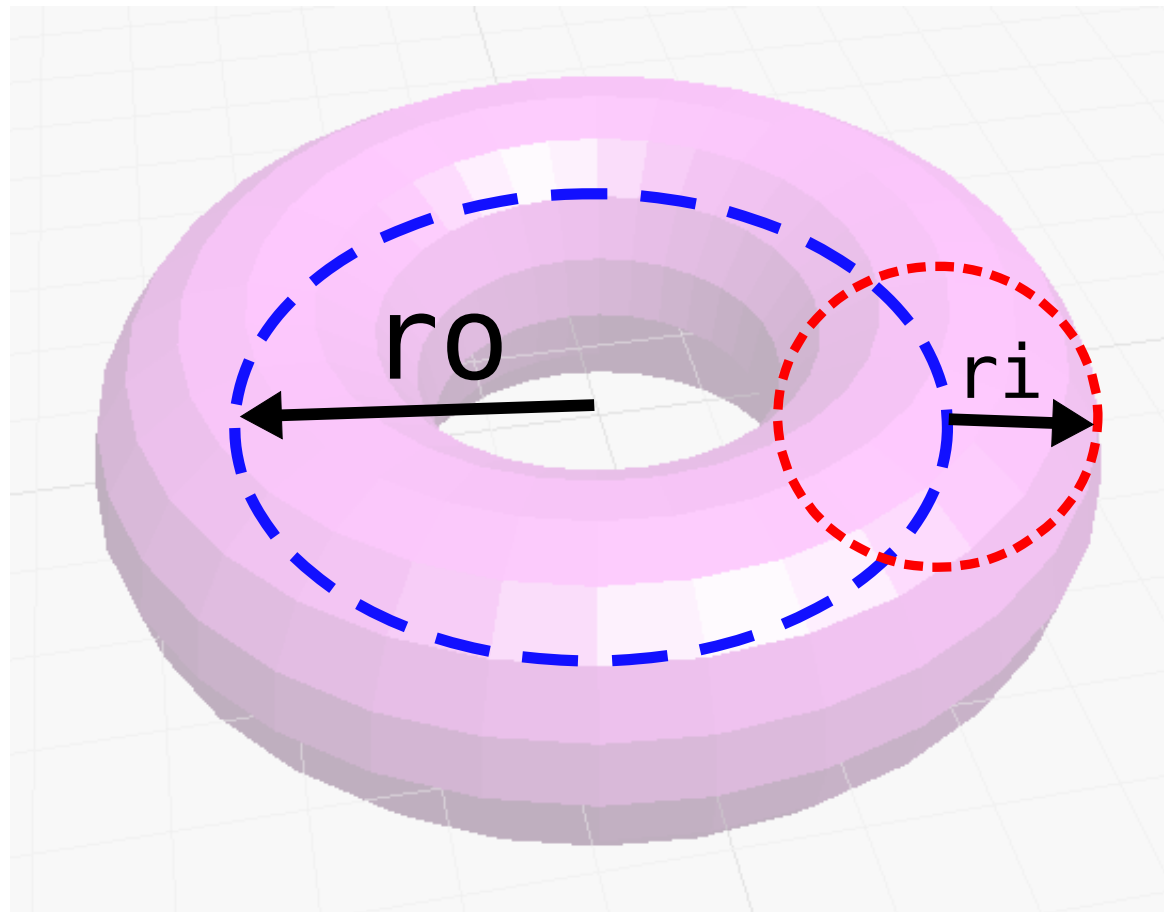


```
cylinder({  
  r1: 3,  
  r2: 1,  
  h: 5  
});
```



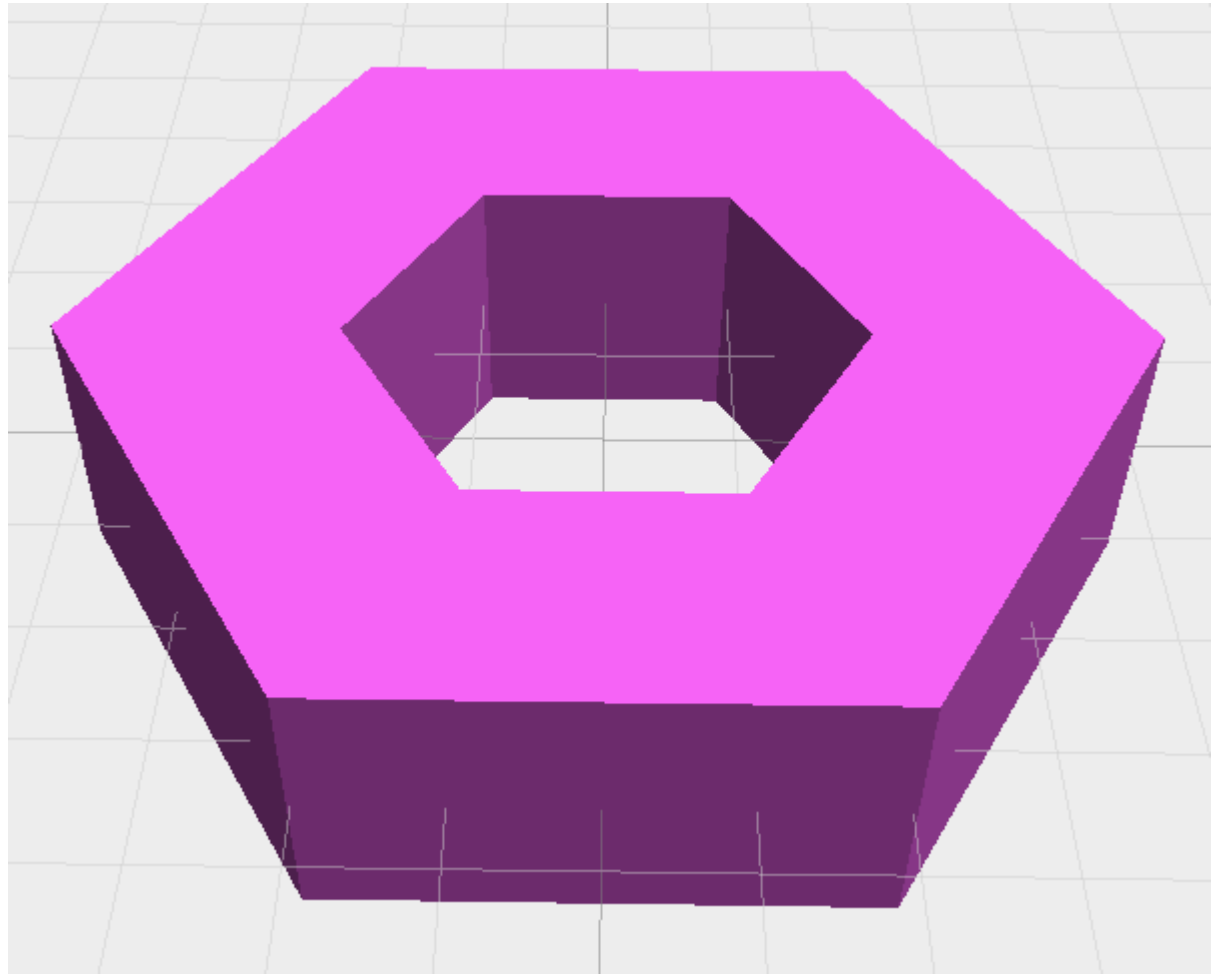
Basic Shapes: Torus

```
torus({ ri: 1.5, ro: 3 });
```



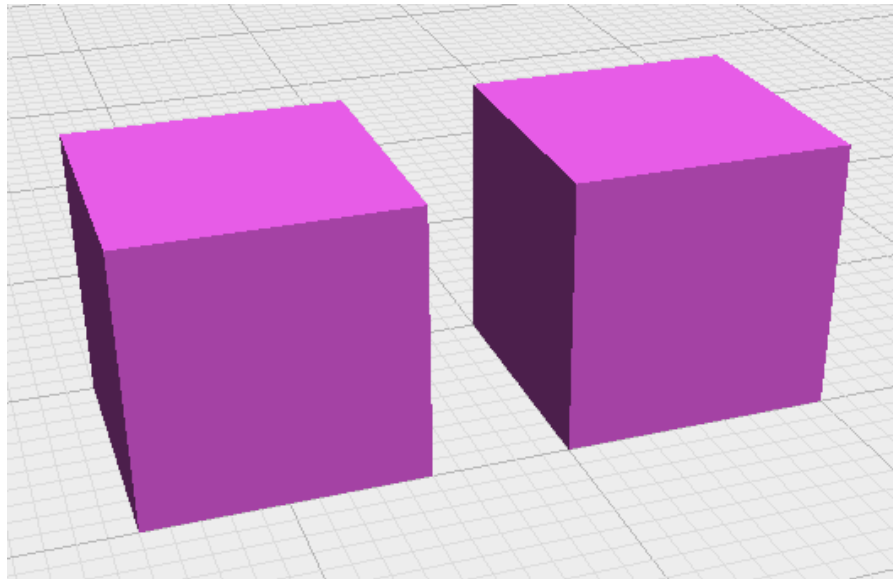
Basic Shapes: Torus

```
torus({  
  ri: 1.5,  
  ro: 3,  
  fni: 4,  
  fno: 6,  
  roti: 45  
});
```



Moving things around: Translate

```
function main() {  
  var myCube = cube(10);  
  var companionCube = myCube.translate([15, 0, 0]);  
  return [myCube, companionCube];  
}
```



Moving things around

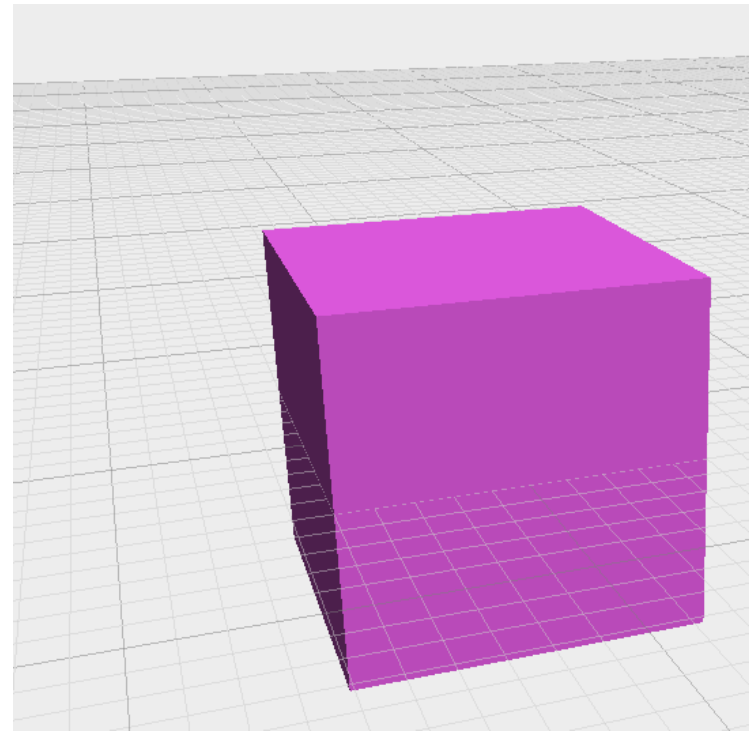
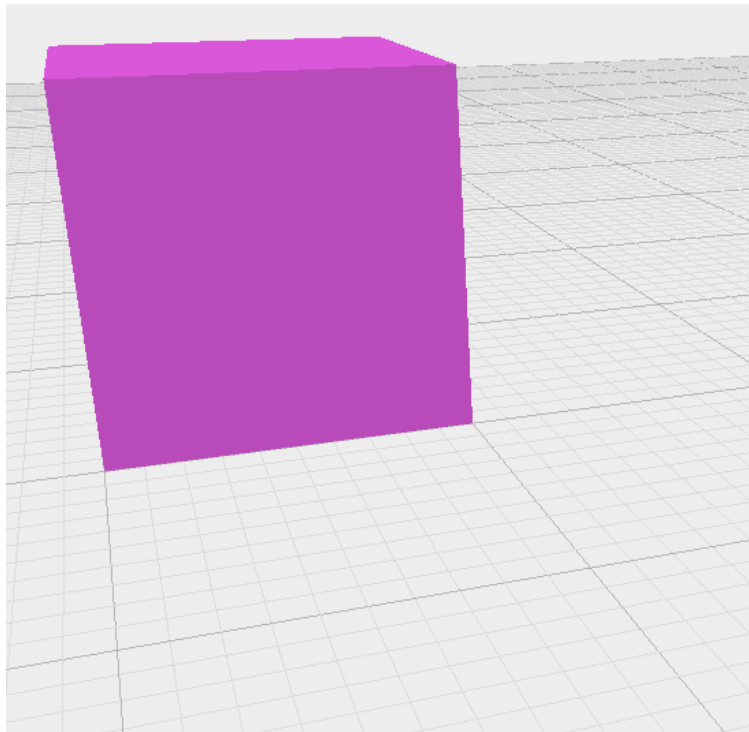
Note: Most of these functions return a new object and don't affect the old one.

```
function main() {  
  var myCube = cube(10);  
  myCube.translate([15, 0, 0]); // Doesn't affect myCube!  
  return myCube;                // Still at [0, 0, 0]  
}
```

```
function main() {  
  var myCube = cube(10);  
  myCube = myCube.translate([15, 0, 0]);  
  return myCube;                // Now at [15, 0, 0]  
}
```

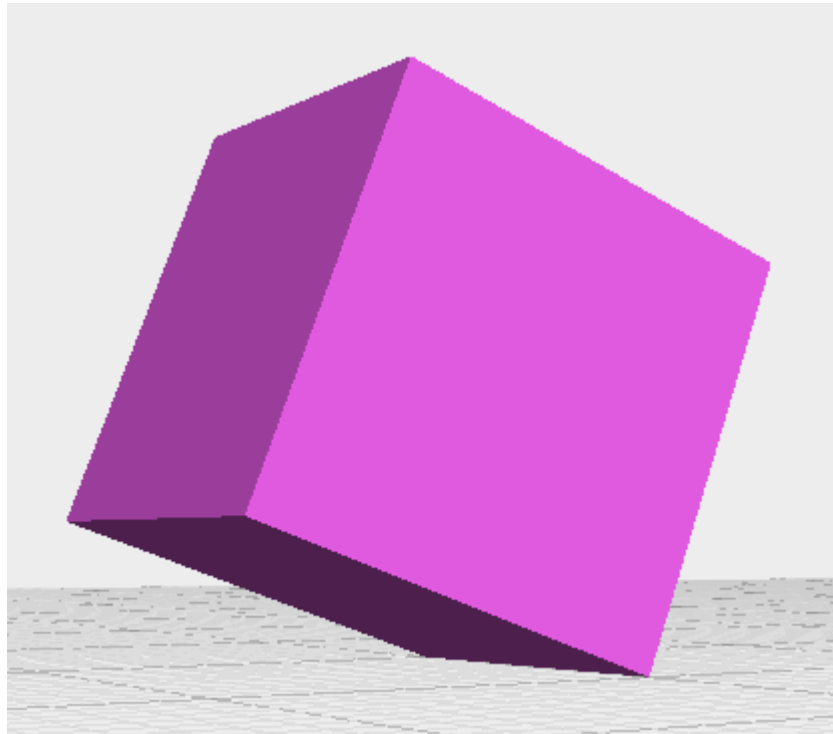
Moving things around: Center

```
cube(10).center("x", "y", "z");
```



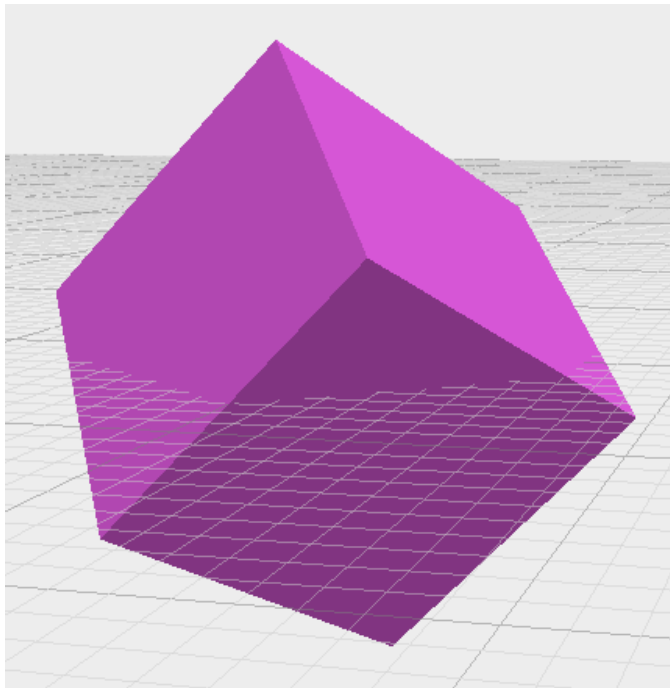
Moving things around: Rotate

```
cube(10).rotateX(20);
```



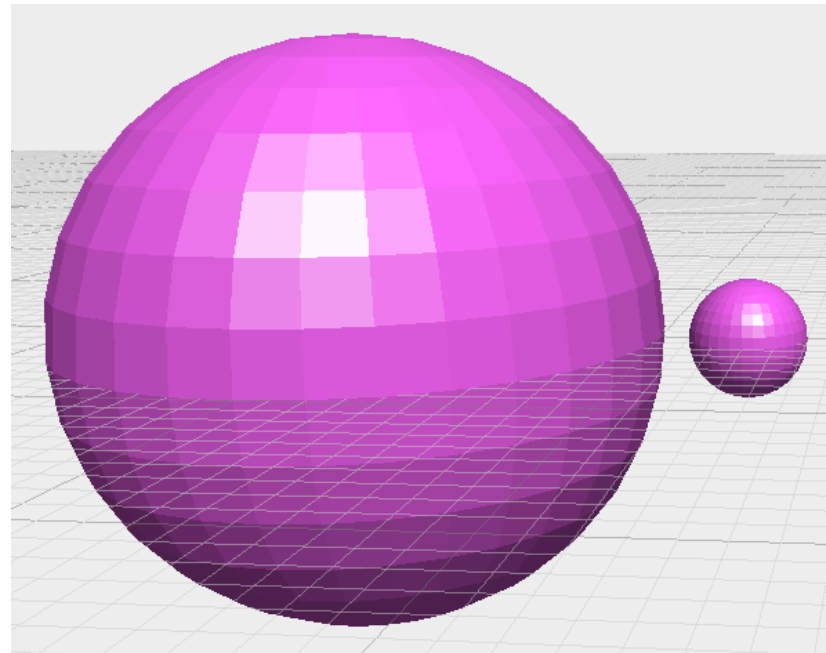
Moving things around: Rotate

```
function main() {  
  var myCube = cube(10).center("x", "y", "z");  
  return myCube.rotateX(45).rotateY(45);  
}
```



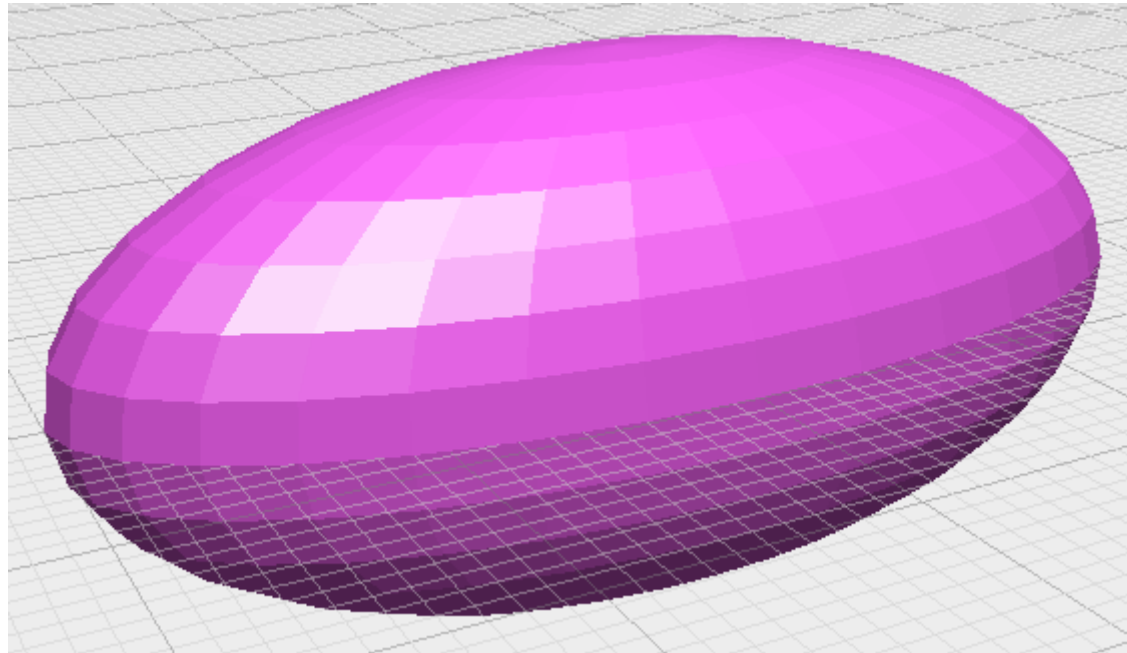
Manipulating things: Scale

```
function main() {  
  var ball = sphere(10);  
  var tinyBall = ball.scale(1/5).translate([13, 0, 0]);  
  return [ball, tinyBall];  
}
```



Manipulating things: Scale

```
sphere(10).scale([1, 2, 1]);
```

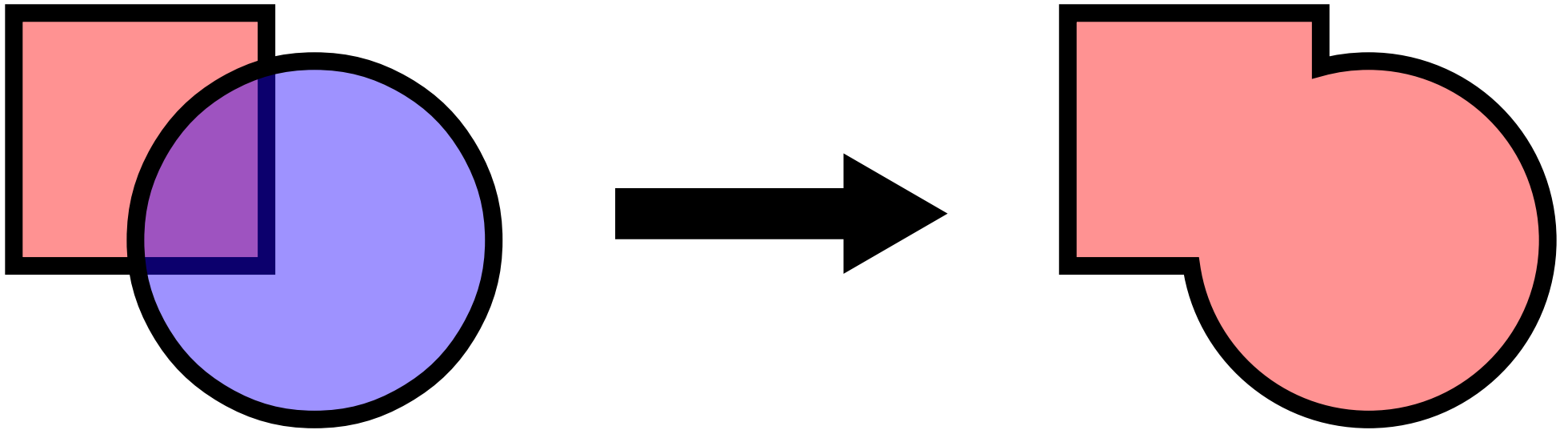


Boolean Operations

This is where the fun begins!

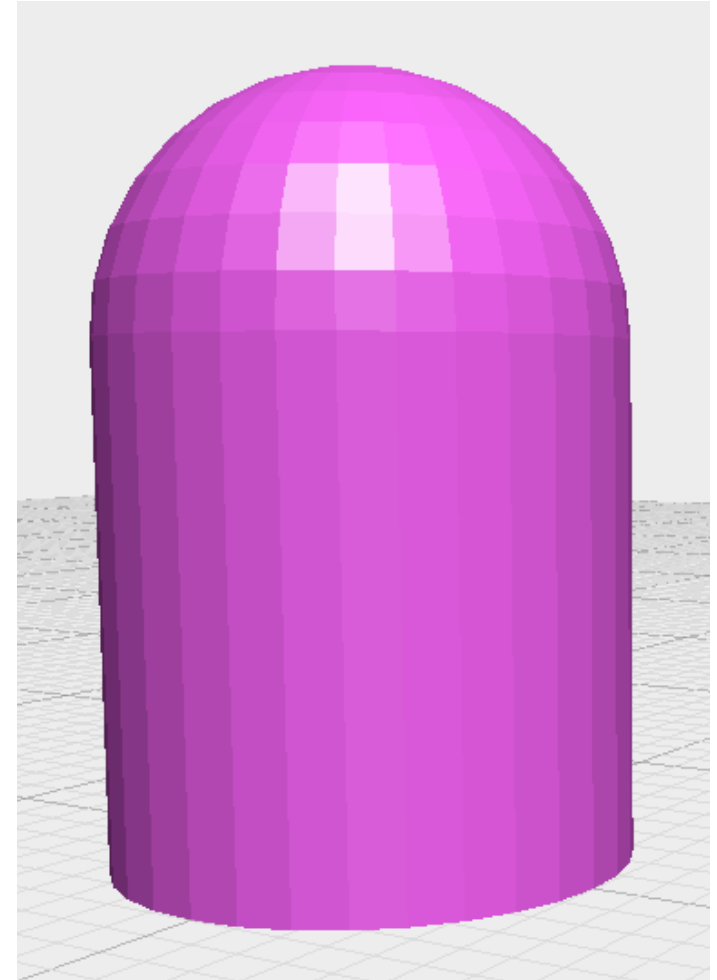
Boolean Operations: Union

$$A \cup B$$



Boolean Operations: Union

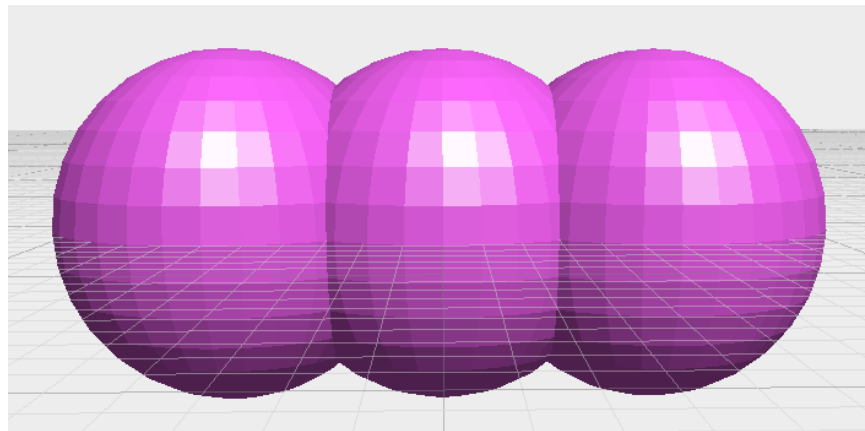
```
function main() {  
  return union(  
    cylinder({r: 5, h: 10}),  
    sphere(5).translate([0, 0, 10])  
  )  
}
```



Boolean Operations: Union

Unions can be made from any number of objects.

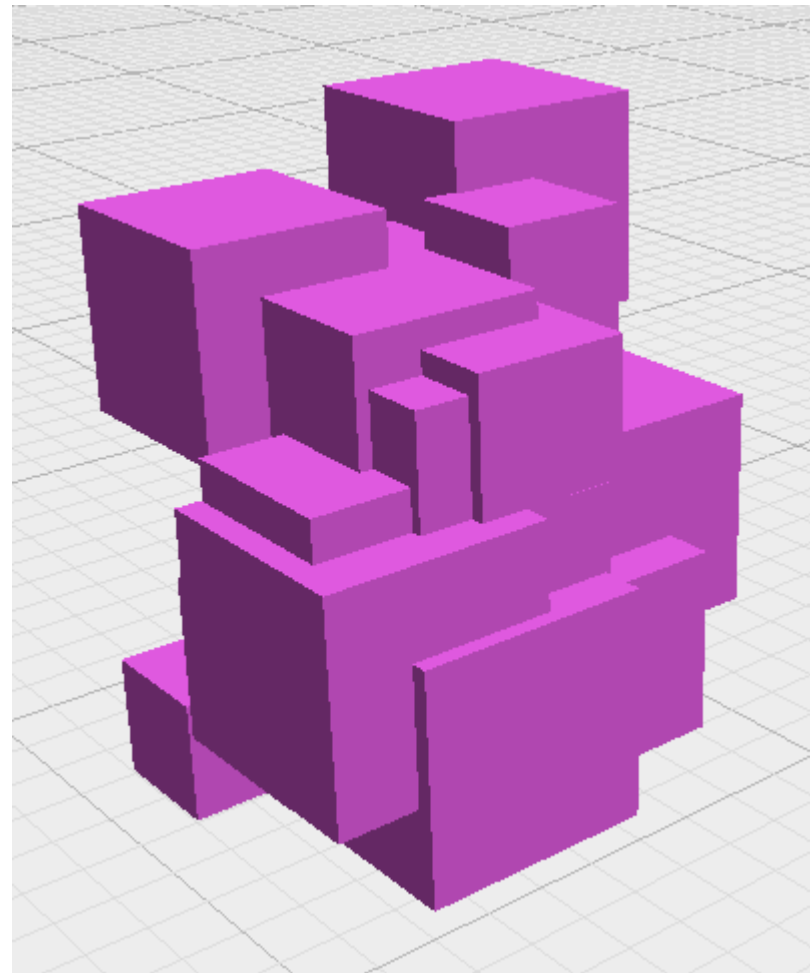
```
function main() {  
  return union(  
    sphere(5).translate([-6, 0, -4]),  
    sphere(5).translate([ 0, 0, 0]),  
    sphere(5).translate([ 6, 0, 4])  
  )  
}
```



Boolean Operations: Union

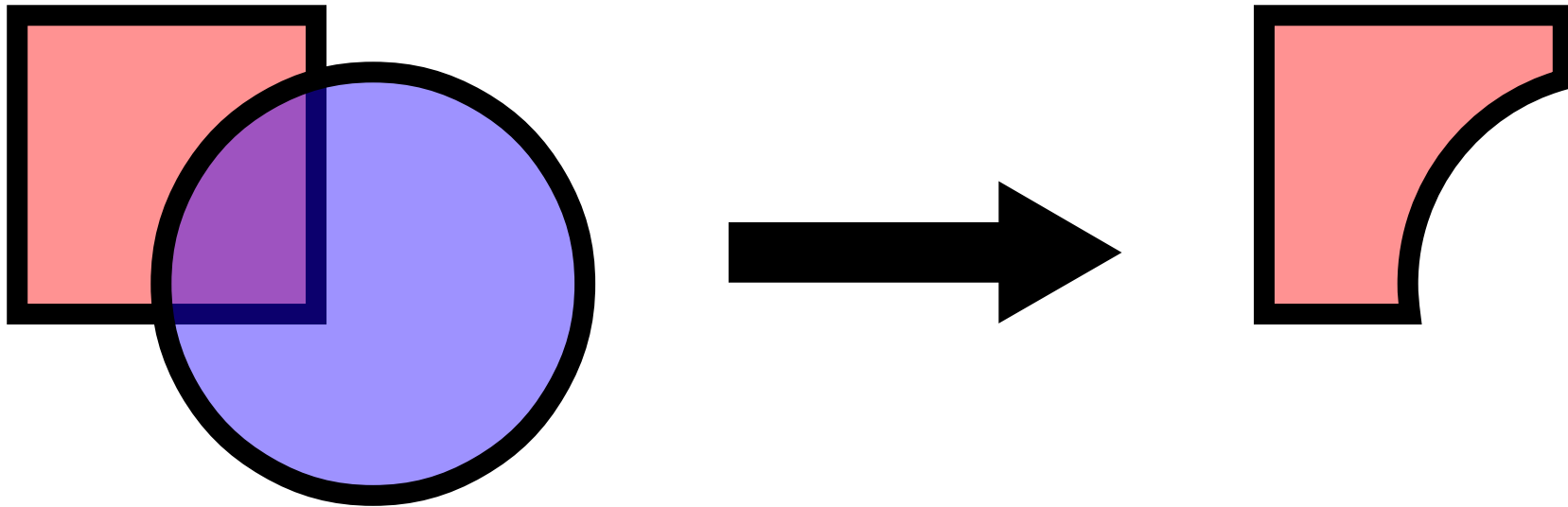
Arrays work, too!

```
function main() {  
  var cubes = [];  
  for(var i = 0; i < 20; i++){  
    cubes.push(  
      cube(1+Math.random()*3)  
      .translate([  
        Math.random()*7,  
        Math.random()*7,  
        Math.random()*7  
      ])  
    )  
  }  
  return union(cubes);  
}
```



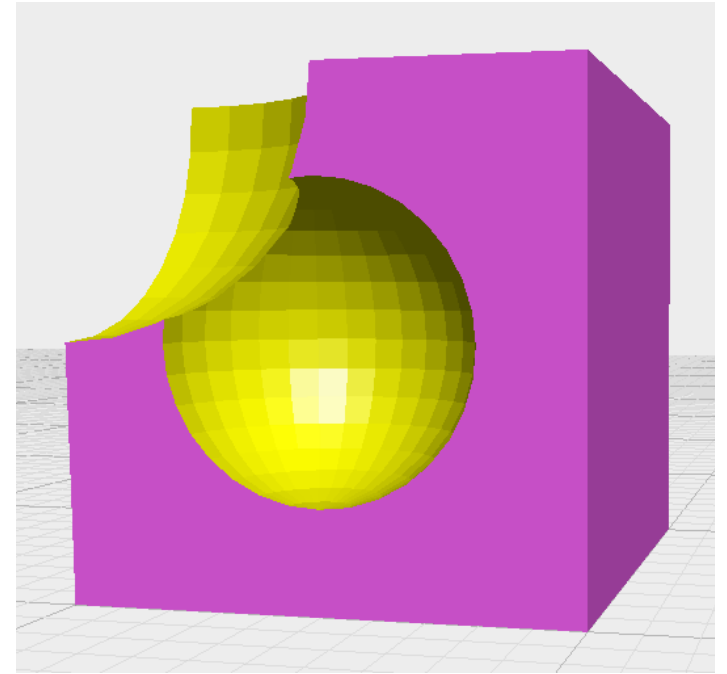
Boolean Operations: Difference

$$A \setminus B$$



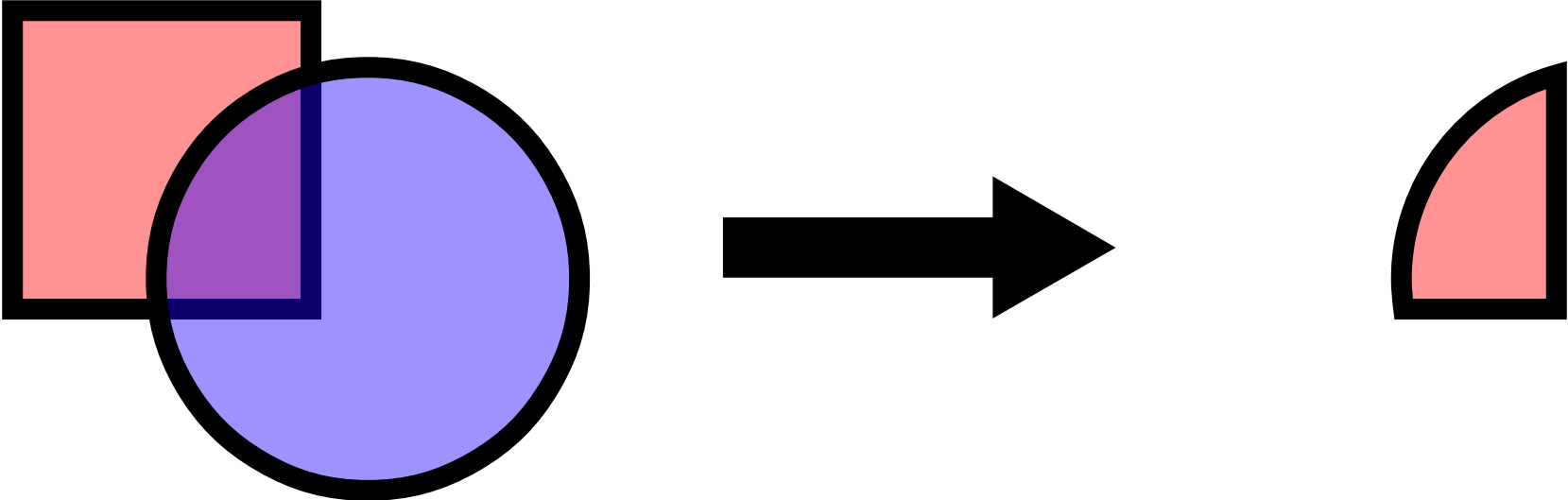
Boolean Operations: Difference

```
function main() {  
  return difference(  
    cube(10),  
    sphere(3).translate([0, 5, 5]),  
    sphere(5).translate([0, 10, 10])  
  )  
}
```



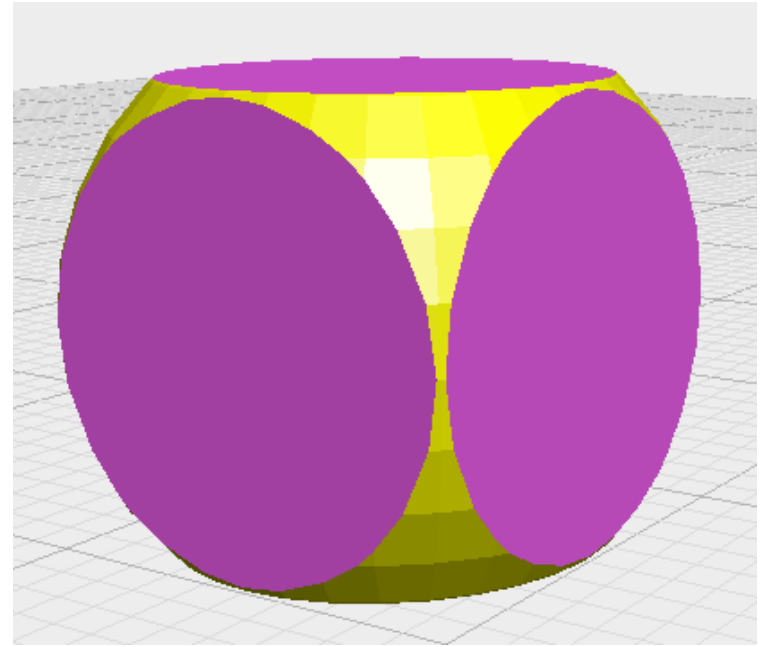
Boolean Operations: Intersection

$$A \cap B$$

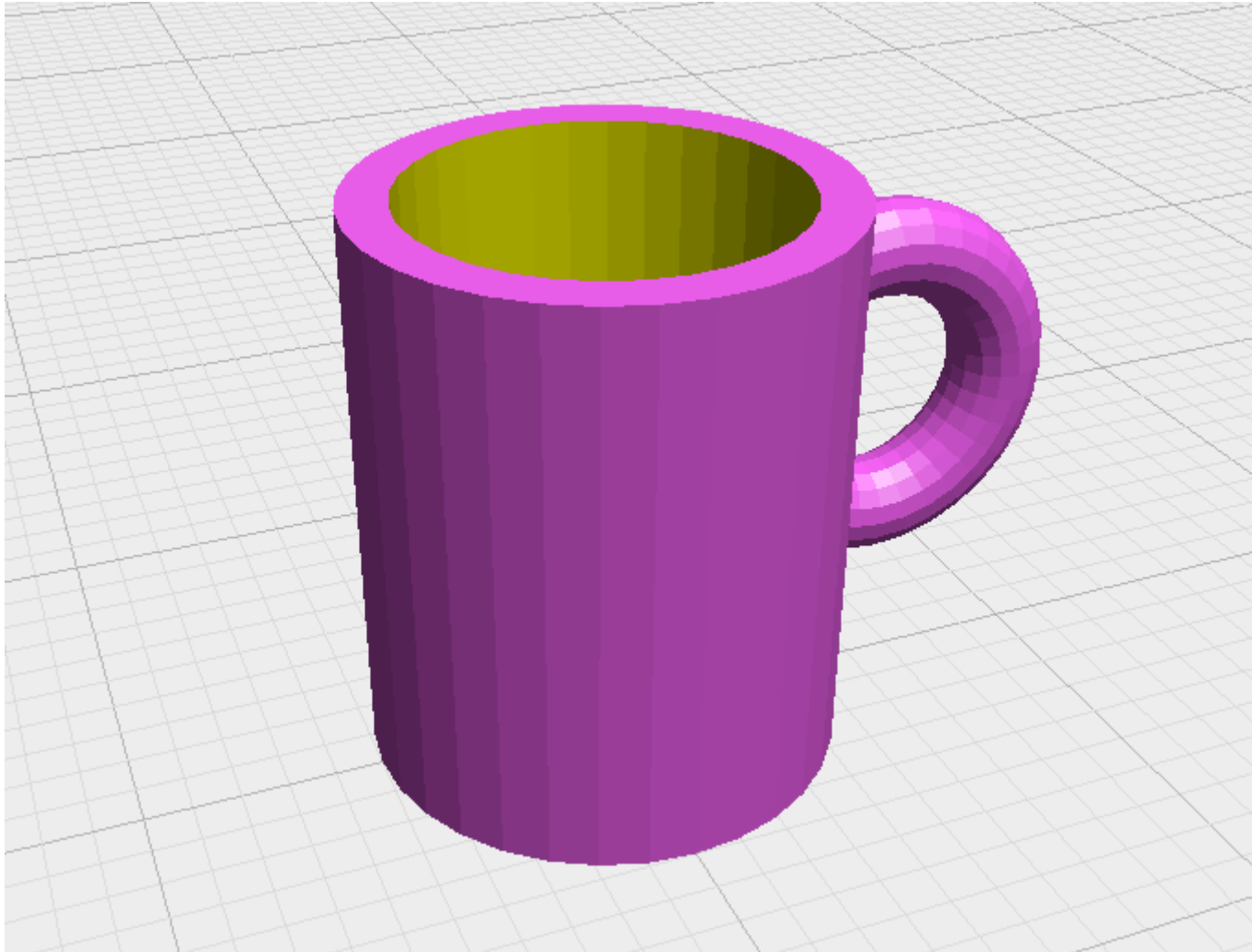


Boolean Operations: Intersection

```
function main() {  
  return intersection(  
    cube(10),  
    sphere(7).translate([5, 5, 5])  
  )  
}
```



Exercise: Let's build a cup!



Exercise: Let's build a cup!

```
function main() {  
  
    var cup = cylinder({r: 5, h: 12});  
  
    cup = union(  
        cup,  
        torus({ri: 1, ro: 3}).rotateX(90).translate([6, 0, 7])  
    );  
  
    cup = difference(  
        cup,  
        cylinder({r: 4, h: 12}).translate([0, 0, 1])  
    )  
  
    return cup;  
  
}
```

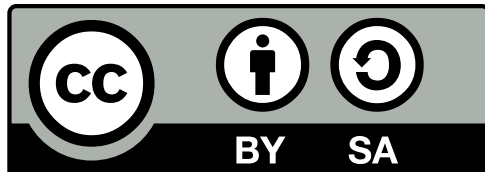
Stuff

OpenJSCAD User Guide

https://en.wikibooks.org/wiki/OpenJSCAD_User_Guide

These slides are online:

https://draemm.li/share/openjscad_slides.pdf



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