Goal: vectors from scratch.

Useful tool: C++ classes.

Example:

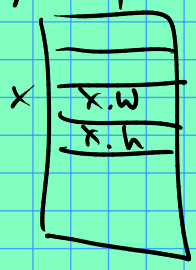
```
class rectangle{
    public:
    double w; // width
    double h; // height.
    double area();
    double perimeter();
};
```

we're defining a new type!

```
rectangle x;
x.w = 7;
x.h = 8;
cout << x.area();
    // prints 56
...
```

Behind the scenes...

main memory

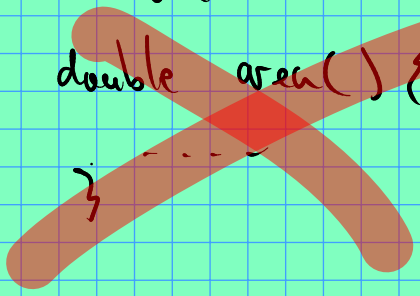



```
double area(rectangle* this);
```

x.area() ≡ area(&x)

How to define area?

```
double area(){
...
}
```



← not a part of rectangle!

```
double rectangle::area(){
    return w*h;
}

rectangle r;
r.area(); // for this call, w ≡ r.w, h ≡ r.h
```

```
double rectangle::perimeter()
{
    // now use the "this" pointer
    // this = pointer to thing whose
    // perimeter function is being called.
    // r.perimeter() ⇒ this = &r.

  return 2*(this->w + this->h);

// this->w ≡ (*this).w
}
```

```
namespace XYZ {
    double yay;
    :
} - XYZ::
```