Announcements

MP2 available, due 9/15, 11:59p.

```
class sphere{

public:

sphere();

sphere(const sphere & orig);

…

private:

    double theRadius;

    int numAtts;

    string * atts;

};
```

Copy Constructor discussion:

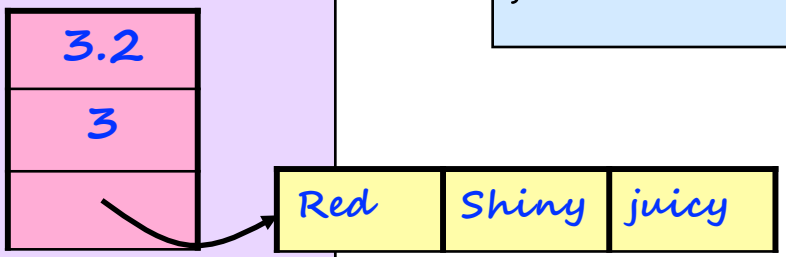
1. Why is the cctor's param pbr?

2. What does it mean that the cctor's param is const?

3. Why did we need to write a custom cctor?

Destructors:

```
class sphere{
public:
sphere();
sphere(double r);
sphere(const sphere & orig);
~sphere();
…
private:
double theRadius;
int numAtts;
string * atts;
};
```



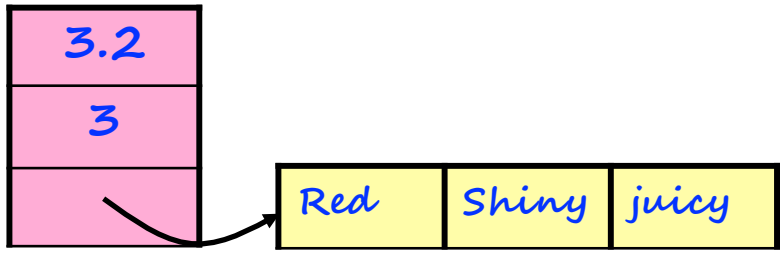

```
void myFun(sphere s){
   sphere t(s);
   …
   // play with s and t
   …
}

int main(){
   sphere a;
   myFun(a);
}
```

```
//destructor
sphere::~sphere(){



}
```

Destructors:

```
class sphere{
public:
sphere();
sphere(double r);
sphere(const sphere & orig);
~sphere();
…
private:
double theRadius;
int numAtts;
string * atts;
};
```

```
int main(){
   sphere * b = new sphere;
   delete b;
   return 0;
}
```




```
//destructor
sphere::~sphere(){



}
```

The destructor, a summary:

1. Destructor is never “called.” Rather, we provide it for the system to use in two situations:

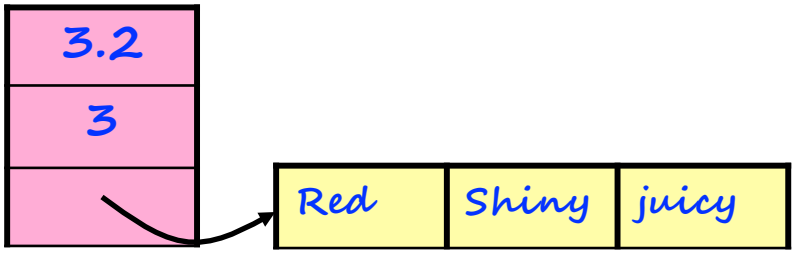
   a) _____

   b) _____

2. If your constructor, _____, allocates dynamic memory, then you need a destructor.

3. Destructor typically consists of a sequence of delete statements.

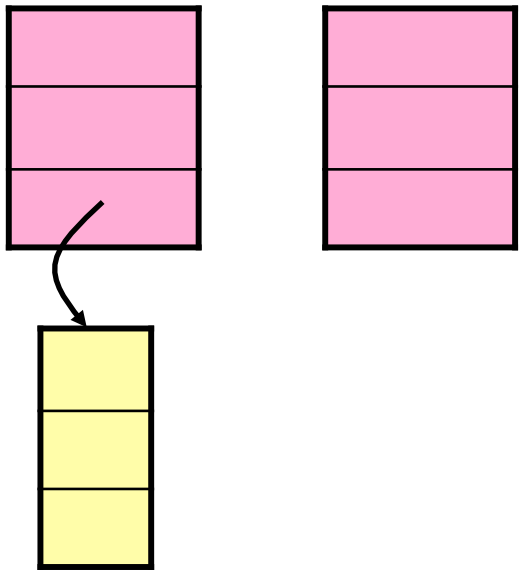
```
class sphere{
public:
   //tons of other stuff
   ~sphere();
private:
   double theRadius;
   int numAtts;
   string * atts;
};
```



One more problem:

```
class sphere{
public:
sphere();
sphere(double r);
sphere(const sphere & orig);
~sphere();
…
private:
double theRadius;
int numAtts;
string * atts;
};
```

```
int main(){
   sphere a, b;
   // initialize a
   b = a;
   return 0;
}
```



Overloaded operators:

```
int main(){
   // declare a,b,c









   // initialize a,b
   c = a + b;
   return 0;
}
```

```
// overloaded operator
sphere & sphere::operator+
    (const sphere & s){




}
```

Overloaded operators: what can be overloaded?

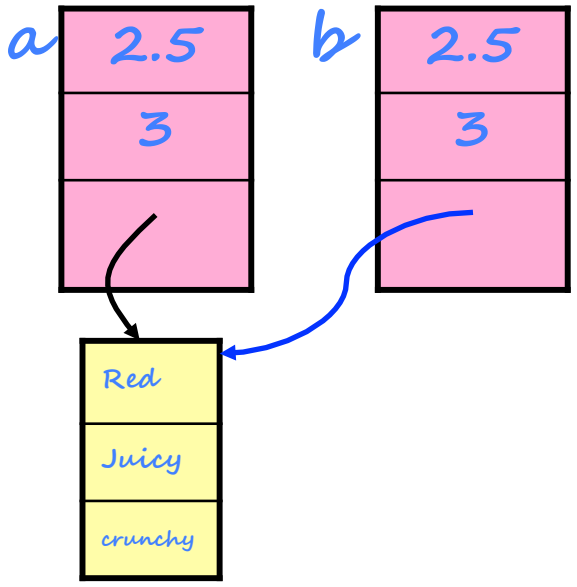
arithmetic operators, logical operators, I/O stream operators

```
      +     -     *     /     =     <     >     +=    -=    *=    /=
<<    >>      <<=   >>=   ==    !=    <=    >=    ++    --    %     &     ^
              !     |  ~     &=    ^=    |=    &&    ||    %=
                       []    ()    ,     ->*   ->
                  new   delete    new[]     delete[]
```

One more problem: *default assignment is memberwise, so we redefine =.*

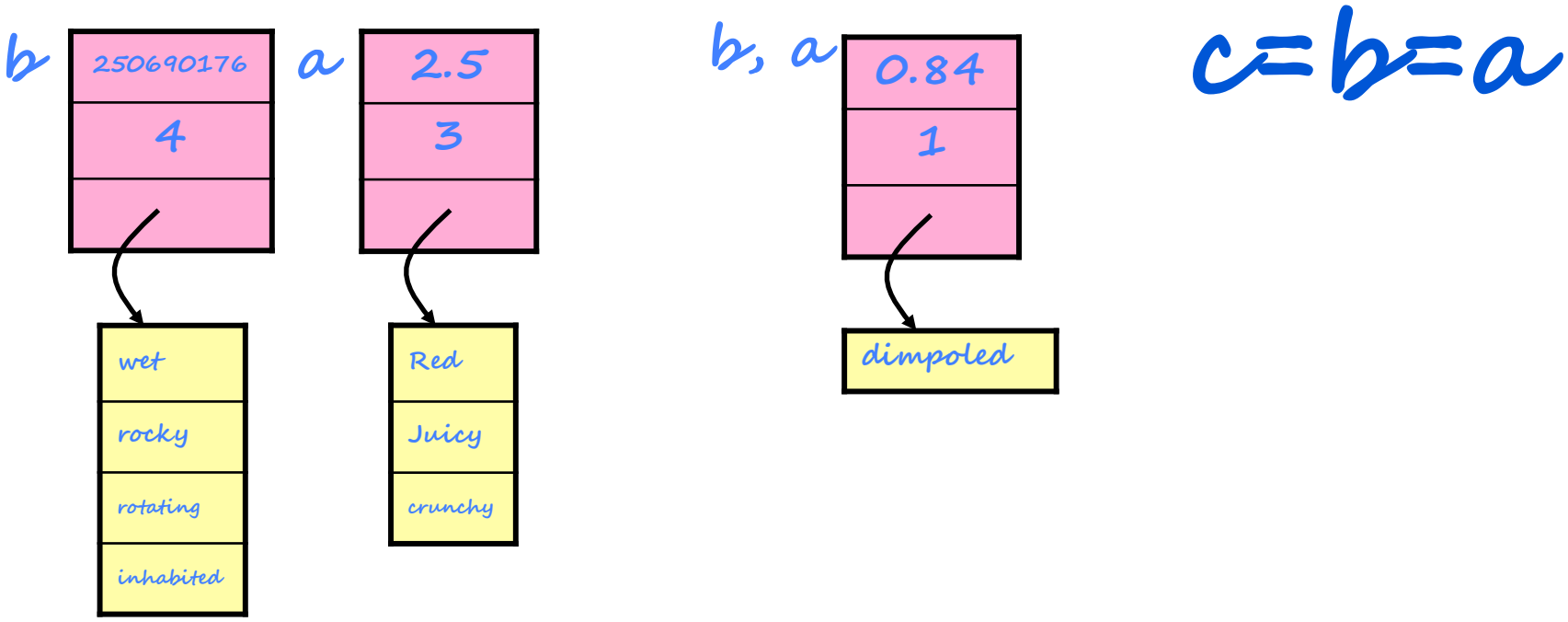
```
class sphere{

public:

sphere();

sphere(double r);

sphere(const sphere & orig);

~sphere();

_________ operator=(___________________);

…

private:

double theRadius;

int numAtts;

string * atts;

};
```

```
int main(){
   sphere a, b;
   // initialize a
   b = a;
   return 0;
}
```



Some things to think about...

b=a



Operator=, the plan:

```
…
// overloaded =
sphere & sphere::operator=(const sphere & rhs){

}
```

```
c
p
sp
sp
sp
~s
…
p
dc
int numAtts;
string * attributes;
};
```

```
int main(){
  sphere a, b;
   // initialize a
   b = a;
   return 0;
}
```