

Combining objects

- A class can use another class as a member variable (a field).
- This called object composition.
- Use this when you would say "An object of class *A* ***has an*** object of class *B*."
 - A dog has an owner.
 - A car has an engine.
 - A student has an advisor.
 - A line segment has a starting point and an ending point.

```
class person {  
    // things here  
};
```

```
class dog {  
    public:  
        ...  
    private:  
        person owner;  
};
```

```
class point {  
    // things here  
};
```

```
class line {  
    public:  
        ...  
    private:  
        point start, end;  
};
```

```
class line {  
    public:  
    double getLength() {  
        return sqrt(  
            pow(start.getX() - end.getX(), 2) +  
            pow(start.getY() - end.getY(), 2));  
        }  
    private:  
        point start, end;  
};
```

- Object composition is also known as a "has-a" relationship.
- A different kind of relationship is an "is-a" relationship.
- Use this relationship to express when ***a class is a specific kind of another class.***
 - A poodle is a specific kind of dog.
 - A racecar is a specific kind of car.
- This concept is called inheritance.

Inheritance (is-a) versus composition (has-a)

- Inheritance expresses that one class can do everything another class can do, plus more:
 - A racecar is just a car that can also drive extra fast around a race track.
- Composition expresses that one class is a component of another class:
 - An engine is a piece of a car.

BEST IN SHOW



- When a derived class inherits from a base class:
 - Inside the class, the derived class has access to all the public and protected members of the base class.
 - Inside the class, the derived class cannot access private members.
 - Outside the class, the derived class has all the same public members as the base class has.
 - except constructors

- Create a pig struct (one field called energy).
- Create a bird class.
 - A bird object can be launched at a pig and decreases the pig's energy.
- Create a splitbird class that inherits from bird.
 - A splitbird object can also be launched at two pigs simultaneously.