```
#ifndef _STUDENT_H
#define _STUDENT_H

/** base-class for a generic student
 * Owen Astrachan for CPS 100,
 * Spring 1996, revised Fall 1997, revised Spring 2000
 * Revised Fall 2000
 *
 * Student("name") -- constructs a student with given name
 *
 * void live()   --
 *                consists of eat(), work(), sleep()
 * these functions, all virtual, print a message
 * and cause energy to be lost (Work) or gained (Eat/Sleep)
 *
 *  bool isAlive()    -- returns true if alive, else false
 *                       (alive if energy > 0)
 *
 * string name()     -- returns name of student
 *
 * int    energy()   -- returns energy level
 *
 * NOTE: there are some bad design decisions in this class
 */

#include <string>
using namespace std;

class Student
{
  public:
    Student(const string & name);
    virtual ~Student();

    virtual void eat();
    virtual void work();
    virtual void sleep();
    virtual void live();

    bool   isAlive()         const;
    virtual string name()    const;
    int    energy()          const;

  protected:

    string myName;
    int    myEnergy;
};

#endif
```

```
#include <iostream.h>
#include "students.h"



class DukeStudent : public Student
{
  public:
    DukeStudent(const string & name);
    virtual void play();
    virtual void eat();
    virtual void live();

    virtual string name() const;
};

class CosmicStudent : public DukeStudent
{
   public:
    CosmicStudent(const string & s);

    virtual void eat();
};


void CosmicStudent::eat()
{
    myEnergy += 10;
    cout << "yum yum, burritos" << endl;
}

CosmicStudent::CosmicStudent(const string & name)
    : DukeStudent(name)
{

}

DukeStudent::DukeStudent(const string & name)
  : Student(name)
{

}

void DukeStudent::play()
{
    myEnergy -= 10;
    cout << "work hard/play hard" << endl;
}

void DukeStudent::eat()
{
    cout << "chick fil' a-gain!!" << endl;
    Student::eat();
}

void DukeStudent::live()
{
    Student::live();
    play();
}

string DukeStudent::name() const
{
    return "Duke " + Student::name();
}

void DoSchool(Student *s)
// goto school
{
```



```
    cout << "Starting up with " << s->name() << endl << endl;
    while (s->isAlive())
    {
        cout << endl << s->name() << ": energy = " << s->energy() << endl;
        s->live();
    }
}


int main()
{
    Student * normal  = new Student("Pat");
    Student * duke    = new DukeStudent("Chris");
    Student * cosmic  = new CosmicStudent("Sam");


    DoSchool(normal);
    DoSchool(duke);
    DoSchool(cosmic);


    delete normal;
    delete duke;
    delete cosmic;

    return 0;
}
```

```
#include <iostream>
using namespace std;

#include "students.h"

Student::Student(const string & name)
  : myName(name),
    myEnergy(100)
{
    // work done in intializer list
}

Student::~Student()
{
    // nothing needed, no dynamic memory allocated
}


void Student::eat()
{
    myEnergy += 5;
    cout << "Pizza! yum yum, glurp, gobble, burp" << endl;
}

void Student::work()
{
    myEnergy -= 20;
    cout << "study study ... panic ... study" << endl;
}

void Student::sleep()
{
    myEnergy += 10;
    cout << "Zzzzzzzzzzzz, resting sleep" << endl;
}

void Student::live()
{
    eat();
    work();
    sleep();
}

bool Student::isAlive() const
{
    return myEnergy > 0;
}

string Student::name() const
{
    return myName;
}

int Student::energy() const
{
    return myEnergy;
}
```

```
Starting up with Pat


Pat: energy = 100
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep

Pat: energy = 95
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep

Pat: energy = 90
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep

     entries here removed 85, 80, 75, 70, 65, 60, 55, ..., 20, 15

Pat: energy = 10
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep

Pat: energy = 5
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
Starting up with Duke Chris

// *******************************************************

Duke Chris: energy = 100
chick fil' a-gain!!
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard

Duke Chris: energy = 85
chick fil' a-gain!!
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard

    entries here removed 70, 55, 40

Duke Chris: energy = 25
chick fil' a-gain!!
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard

Duke Chris: energy = 10
chick fil' a-gain!!
Pizza! yum yum, glurp, gobble, burp
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard
Starting up with Duke Sam

// *******************************************************

Duke Sam: energy = 100
yum yum, burritos
study study ... panic ... study
```



```
Zzzzzzzzzzzz, resting sleep
work hard/play hard

Duke Sam: energy = 90
yum yum, burritos
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard


     entries here removed 80, 70, 60, 50, 40, 30

Duke Sam: energy = 20
yum yum, burritos
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard

Duke Sam: energy = 10
yum yum, burritos
study study ... panic ... study
Zzzzzzzzzzzz, resting sleep
work hard/play hard
```