1. Код

```cpp
#include <iostream>

#define PI 3.14159256

class Shape {
public:
    double x, y, z; //anchor point
    Shape();
    Shape(double, double, double);
    void printAnchor();
    void moveAnchor(double, double, double);
    virtual double voulume();
    virtual void scale(double);
};

class Sector :public Shape {
public:
    double radius;
    double angle; //cone angle (width) of sector
    double theta, phi; //inclination and azimuth angles of sector axis
    Sector();
    Sector(double, double, double, double, double, double, double);
    void printParameters();
    double volume();
    void scale(double);
    void reflect();
};

Shape::Shape() {
    x = 0;
    y = 0;
    z = 0;
}

Shape::Shape(double x_, double y_, double z_) {
    x = x_;
    y = y_;
    z = z_;
}

void Shape::printAnchor() {
    std::cout << "Anchor point is (" << x << ", " << y << ", " << z << ")\n";
}

void Shape::moveAnchor(double x_, double y_, double z_) {
    x = x_;
    y = y_;
    z = z_;
}

double Shape::voulume() {
    return 0;
}

void Shape::scale(double s) {
```

```cpp
}

Sector::Sector() :Shape() {
    radius = 0;
    angle = 0;
    theta = 0;
    phi = 0;
}

Sector::Sector(double x_, double y_, double z_, double r_, double angle_, double theta_ =
0, double phi_ = 0) :Shape(x_, y_, z_) {
    radius = r_;
    angle = angle_;
    theta = theta_;
    phi = phi_;
}

void Sector::printParameters() {
    printAnchor();
    std::cout << "Radius is " << radius << "\n";
    std::cout << "Cone angle is " << angle << "\n";
    std::cout << "Sector axis inclination and azimuth angles are " << theta << ", " <<
phi << "\n\n";
}

double Sector::volume() {
    return (2. / 3.) * PI * pow(radius, 3) * (1 - cos(angle));
}

void Sector::scale(double s) {
    if (s < 1) {
        radius *= s;
    }
    else {
        std::cerr << "Scale factor should be <1\n\n";
    }
}

void Sector::reflect() {
    theta = PI - theta;
    if (phi < PI) {
        phi += PI;
    }
    else {
        phi -= PI;
    }
}
int main()
{
    Sector a{ 0.,0.,1.,10.,0.1, 0.66 };
    a.printParameters();
    a.moveAnchor(2, 2, 2);
    a.reflect();
    a.scale(1.3);
    a.printParameters();
    return 0;
}
```
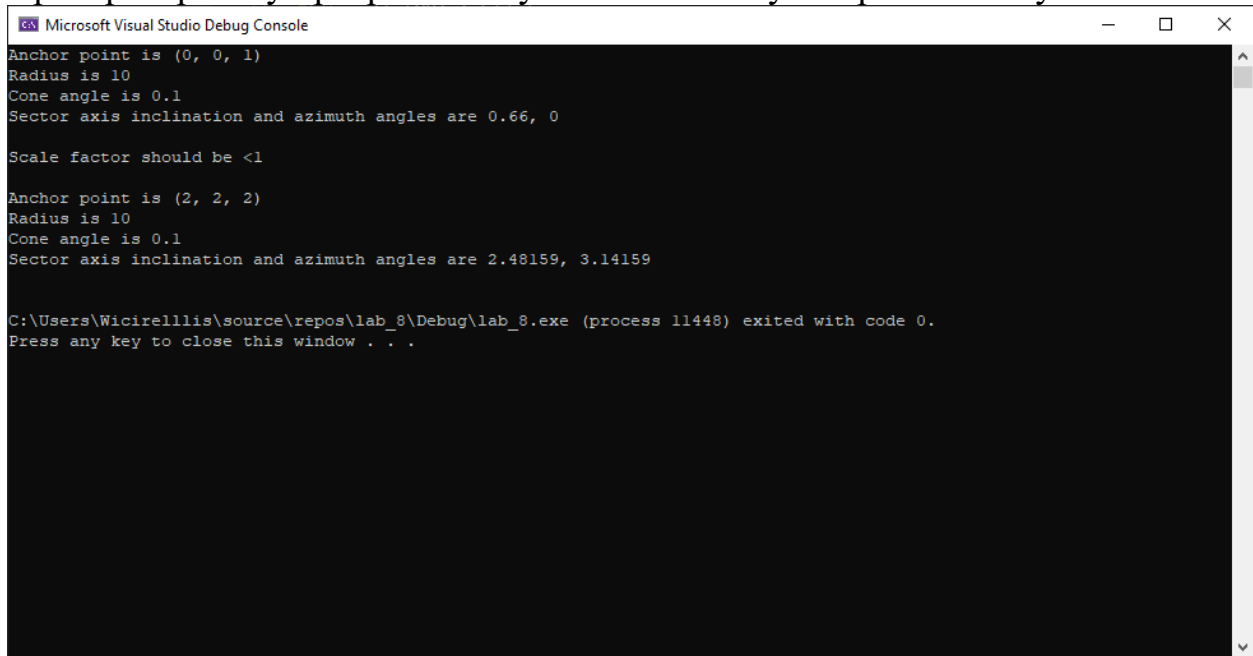
2.

Проверим работу программы. Кусок в мейне служит ровно этому.


```
Anchor point is (0, 0, 1)
Radius is 10
Cone angle is 0.1
Sector axis inclination and azimuth angles are 0.66, 0

Scale factor should be <1

Anchor point is (2, 2, 2)
Radius is 10
Cone angle is 0.1
Sector axis inclination and azimuth angles are 2.48159, 3.14159


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Press any key to close this window . . .
```
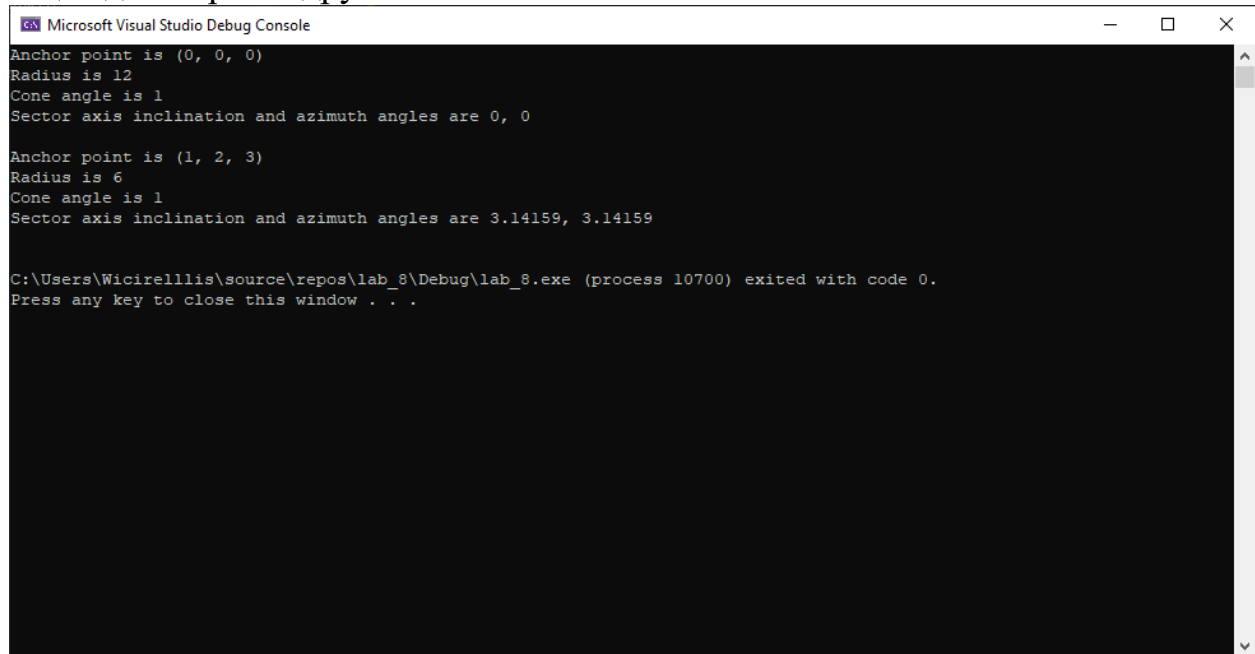
Работает (по крайней мере на таких данных) верно.

3.

Еще один скрин с другими числами.

```
Anchor point is (0, 0, 0)
Radius is 12
Cone angle is 1
Sector axis inclination and azimuth angles are 0, 0

Anchor point is (1, 2, 3)
Radius is 6
Cone angle is 1
Sector axis inclination and azimuth angles are 3.14159, 3.14159


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```

4. Вопросы

1) Что такое виртуальная функция? Зачем она нужна?
Виртуальные функции можно переопределять в классах-наследниках.

2) К каким данным базового класса имеет доступ порожденный класс?
К public и protected полям\методам. Доступа к private нет.