Problem 1. (20 pts) What does the following program output when run?

```cpp
#include <iostream>

int main()
{
    int *p;
    int q = 20;
    p = &q;
    int *r;
    cout << "p: " << *p << endl; //Answer p:_______________________
    r = p;
    cout << "r: " << *r << endl; //Answer r:_______________________
    *p = 2 * *p;
    cout << "q: " << q << endl; //Answer q:_______________________
    int s = *r + 2;
    cout << "s: " << s << endl; //Answer s:_______________________
}
```
Problem 2. (25 pts) Write a function `bitmap` that accepts a vector $x$ of integers and an integer value $y$, and returns a new vector which replaces all values in $x$ with either 0 or 1 depending on whether $x[i] < y$ or $x[i] \geq y$, respectively. (i.e. The returned vector contains 1 in position $i$ if $x[i] \geq y$ and contains a 0 in position $i$ otherwise - if $x[i] < y$.)

Imagine your function in the following context:

```cpp
#include <iostream>
#include <vector>

int main()
{

    vector<int> nums;
    nums.pushback(9);
    nums.pushback(27);
    nums.pushback(14);
    nums.pushback(35);
    nums.pushback(16);

    vector<int> new_nums;

    new_nums = bitmap(nums, 25); // Calling bitmap

}
```

After calling `bitmap` in the above program, the value of the vector `new_nums` should be

```
new_nums[0] = 0;
new_nums[1] = 1;
new_nums[2] = 0;
new_nums[3] = 1;
new_nums[4] = 0;
```
Problem 3. (25 pts total) A two-dimensional point consists of an x-coordinate value and a y-coordinate value. Give the member functions for the Point class below:

class Point
{
    public:
        Point(); //creates the point (0,0)
        Point(int x, int y); //creates the point (x,y)
        int getX(); //returns the x coordinate
        int getY(); //returns the y coordinate
        void move(int dx, int dy); //moves the point (x,y) to (x+dx,y+dy)
    private:
        int xcoordinate;
        int ycoordinate;
};
Problem 4. (30 pts total) A polygon is a closed plane figure having three or more straight sides. A polygon can be defined by the vertices (corner points). Class Polygon is defined as follows

```cpp
class Polygon
{
    public:
        Polygon(); // empty polygon - no points
        Polygon(vector<Point> p); // polygon defined by vector p
        void move(int dx, int dy); // moves all the corners dx on x-axis and dy on y axis
    private:
        vector<Point> corners;
};
```

Using the class Point from Problem 3, provide solutions to the following:

(a) Implement the constructor `Polygon(vector<Point> p)``

(b) Implement the member function `move` which moves each corner of the polygon dx units on the x axis and dy units on the y axis.

(c) Write an `int main()` function that creates a quadrilateral polygon with points at (0,0), (0,1), (1,1) and (1,0) and then moves the quadrilateral 3 units in the x-direction and 5 units in the y-direction.