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

```
#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 three-dimensional point consists of an $x$-coordinate value, $y$-coordinate value and a $z$-coordinate value. Give the member functions for the Point class below:

```cpp
class Point
{
public:
    Point(); // creates the point (0,0)
    Point(int x, int y, int z); // creates the point (x,y)
    int getX(); // returns the x coordinate
    int getY(); // returns the y coordinate
    int getZ(); // returns the z coordinate
    void move(int dx, int dy, int dz); // moves the point (x,y,z) to (x+dx,y+dy,z+dz)

private:
    int xcoordinate;
    int ycoordinate;
    int zcoordinate;
};
```
Problem 4. (20 pts total) A polyhedron is a geometrical object having flat sides. A polyhedron can be defined by the vertices (corner points). Class Polyhedron is defined as follows

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

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

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

(b) Implement the member function `move` which moves each corner of the polyhedron dx units on the x axis, dy units on the y axis and dz on the z-axis.
Problem 5. *(10 pts total)* Write an `int main()` function that creates a Polyhedron with points at (0,0,0), (2,0,0), (0,2,0), (2,2,0) and (1,1,2) and then moves the Polyhedron 3 units in the x-direction, 5 units in the y-direction, and 10 units in the z-direction.

Bonus: What is the Polyhedron?