

1. What does the following print? (4 points each)

```
int a[5] = {1,4,9,16,25};
int *p = a+2;
cout << a[1];
cout << p[1];
cout << p - a;
cout << --*p;
cout << **p;
```

ANSWERS

4

16

2

8

16

2. Write a function that takes as its argument the area of a circle and returns its radius (20 points).

```
// ANSWER
double radius(double area)
{
    return sqrt(area / M_PI);
}
```

3. Write a function **add** that takes two strings of digits of equal length and returns their sum as a string. For example, add("950", "198") would return a string "1148". Strings may be arbitrarily long. (30 points).

```
// ANSWER
string add(string a, string b)
{
    string sum = "";
    int carry = 0;
    for (int i=int(a.size())-1; i>=0; --i)
    {
        int digit =
            (a[i]-'0')+(b[i]-'0')+carry;
        if (digit > 9)
        {
            digit -= 10;
            carry = 1;
        }
        else
            carry = 0;
        sum = char(digit+'0') + sum;
    }
    if (carry == 1)
        sum = "1" + sum;
    return sum;
}
```

4. Write a function **array2map** that takes a pointer to an array of int and the number of elements and returns a map<int, int> such that if m is the returned map then m[x] is the number of times x occurs in the array. For example (30 points)

```
int a[6] = {5,2,4,5,3,5};
map<int, int> m = array2map(a, 6);
cout << m[3]; // 1
cout << m[5]; // 3
cout << m[10]; // 0
```

```
// ANSWER 1
map<int, int> array2map(int* a, int n)
{
    map<int, int> m;
    while (n--)
        ++m[*a++];
    return m;
}
```

```
// ANSWER 2
map<int, int> array2map(int* a, int n)
{
    map<int, int> m;
    for (int i=0; i<n; ++i)
        ++m[a[i]];
    return m;
}
```