Q1.Which of the following declarations would allow the assignment "`*p = q;`" to be valid? Circle all that apply.

(a) **`int* p, int q;`**
(b) **`int **p, int *q;`**
(c) `int p, int &q;`
(d) `int p, int *q;`

Q2. Consider the following C++ declarations and assume int is 4 bytes, double is 8 bytes, and char is one byte:

```
struct Bar
{
  char c,d,e,g;
  double f;
  int i;
};

union Foo
{
  char c;
  double f;
  Bar b;
};

Foo a[10];
Bar b;
Foo f;
```

Give the size (in bytes and in decimal) of each of the following variables:

Answer:

- b: 16 bytes
- f : 16 bytes
- a: 160 bytes

Q3. Consider the following function: (5 marks)

```
void foo(int x, int y, int z){
     int a, b, c;
     a = x + 1;
     b = y + 2;
     c = z + 3;
}
```

When foo finishes, its local variables (*a*, *b* and *c*) no longer exist. Why don't we have to manually deallocate the space that they occupy (e.g., with a delete or free operator)?

Because a, b and c are variables whose scope or lifetime is within the block. When foo finishes, its allocated memory is automatically deallocated.

Q4. Given the following code what will be the output? (6 marks)

```
class ValHold{
     public int i = 160;
}

public class ObParm{
    public static void main(String argv[]){
        ObParm o = new ObParm();
        o.amethod();}

    public void amethod(){
        int i = 27;
        ValHold v = new ValHold();
        v.i=2;
        another(v, i);
        System.out.println( v.i );
    }//End of amethod

    public void another(ValHold v, int i){
       i=11;
       v.i = 66;
       ValHold vh = new ValHold();
       v =  vh;
       System.out.println(v.i);
       System.out.println(i);
    }//End of another
}
```

Solution:

160
11
66

Q5. What does the function **test** print if the language uses static scoping? What does it print with dynamic scoping? (6 marks)

```
int n = 10; // global

print_plus_n(int x) {
     cout << x + n;
}

increment_n() {
     n = n + 2;
     print_plus_n(n);
```

```
}

test() {
     int n;
     n = 100;
     print_plus_n(7);
     n = 50;
     increment_n();
     cout << n;
}
```

With Static Scoping:
17 22 50

With Dynamic Scoping:
107 104 50

Q6. You've been hired to write a software application for a dog-boarding kennel. Customers make a reservation for their dog(s), usually by phone, but they can drop in to make them. Dogs are boarded for the scheduled period and the staff enters daily comments about each dog, including their activity when they go out to play and such. When the owner comes to pick up the dog, they pay the bill and receive a receipt along with a "report card" that contains all of the comments about the dog. Draw a use case diagram for this system.