16.216: ECE Application Programming

Summer 2012

Lecture 7: Key Questions
July 31, 2012

1. Explain what a pointer is, and how we can use them in C.

2. Explain the use of passing function arguments by address.

1. What does the following program print?

```
#include <stdio.h>
#include <math.h>
void get_r_theta(double a, double b,
     double *adr_r, double *adr_th);

void main()
{
  double x,y,h,r,th;
  printf("Enter x, y components of vector: ");
  scanf("%lf %lf",&x,&y);
  get_r_theta(x,y,&r,&th);
  printf("Vector with x=%lf and y=%lf
      has r=%lf, theta=%lf\n",x,y,r,th);
}

void get_r_theta(double a, double b,
          double *adr_r, double *adr_th) {
  double sum;
  sum = pow(a,2)+pow(b,2); //or a*a+b*b;
  *adr_r = sqrt(sum);
  *adr_th = atan2(y,x);
}
```

2. **Example:** What does the following print?

```
int f(int *a, int *b);

int main() {
    int x = 1;
    int y = 2;
    int result1, result2, result3;
    result1 = f(&x, &y);
    result2 = f(&y, &result1);
    result3 = f(&result1, &result2);
    printf("x = %d, y = %d\n", x, y);
    printf("Result 1: %d\n", result1);
    printf("Result 2: %d\n", result2);
    printf("Result 3: %d\n", result3);
    return 0;
}

int f(int *a, int *b)
{
    int copyB = *b;
    while (*a > 1) {
        *b += copyB;
        (*a)--;
    }
    return *b;
}
```

3. Write a function that:
   - Given two integer arguments, `x` and `y`, store the quotient and remainder of `x / y` into locations specified by arguments `q` and `r`, respectively.

   - Uses pointers to swap the values of two double-precision variables

PE4: Functions

This exercise functions on the "change problem"—write a program that will, given an amount of change to be returned, determine the minimum number of coins required to fulfill that amount. In this specific problem, the amount is $2.00 or less, and the coins available are half dollars, quarters, dimes, nickels, and pennies.

Use the space below and on the following page to draw a flowchart for this program.

Extra space to draw overall program flow chart

Under what circumstances do you use functions? Identify the best opportunity to use a function in this program, and draw a flowchart that incorporates the function, as well as calls to that function.