Problem 1  Write title lines for the functions that are called by the following main program. Do not supply blocks for the functions.

```c
int main() {
    int x = 0, y = 1, z = 2;
    double b[3] = {1.9, 2.3, 3.0};

    x = larger(x + y, z);               // (a) sets x as the larger
    x = largest(x, y, y, z);            // (b) sets x as the largest
    printAll(b, x, y);                  // (c) print them all
    boost(x, y);                        // (d) increase x by the value of y
    boost(y, mystery(y, z));            // (e) boosts y by a mystery amount
    return 0;
}
```

(a) Title line for `larger`.
Answer:

```c
int larger(int a, int b)
```

(b) Title line for `largest`.
Answer:

```c
int largest(int a, int b, int c, int d)
```

(c) Title line for `printAll`.
Answer:

```c
void printAll(double a[], int b, int c)
```

(d) Title line for `boost`.
Answer:

```c
void boost(int &a, int b)
```

(e) Title line for `mystery`.
Answer:

```c
int mystery(int a, int b)
```

Problem 2  Write blocks of code to perform the functions used in the following main program. Your blocks must match the given title lines. Each block should be a short function of only a few lines.

```c
int main() {
    int b = 1, c = 2, a[4] = {3, 1, 4, 1};
    // (a) Prints the sum of 3 things, here 6
    cout << sum3(1,3,c) << endl;
    // (b) Prints decimal form of fraction b/c, here 0.5
    cout << fraction(b, c) << endl;
    // (c) Fill array with random integers
    randomFill(a, 4);
    // (d) Print array backwards, with entries separated by spaces
    backPrint(a, 4);
```
// (e) Print the first digit, assume argument is positive. Here 1.
    firstDigit(19683);
    cout << endl;
    return 0;
}

Answer:
(a)

int sum3(int x, int y, int z) {
    return x + y + z;
}

(b)

double fraction (int x, int y) {
    return ((double) x) / y;
}

(c)

void randomFill(int x[], int cap) {
    for (int i = 0; i < cap; i++) x[i] = rand();
}

(d)

void backPrint(int x[], int cap) {
    for (int i = cap - 1; i >= 0; i--)
        cout << x[i] << " ";
    cout << endl;
}

(e)

void firstDigit(int x) {
    if (x < 10) cout << x;
    else firstDigit(x / 10);
}

Problem 3  Write a function called \textit{gcd} that returns the greatest common divisor of two positive integers.
For example, a program that uses the function \textit{gcd} follows.

int main() {
    cout << gcd(10, 15) << endl;  // prints 5
    cout << gcd(11, 15) << endl;  // prints 1
    cout << gcd(0, 15) << endl;  // prints 15
    return 0;
}

Answer:

int gcd(int x, int y) {
    if (y == 0) return x;
    return gcd(y, x \% y);
}
Problem 4  Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter to enter 250 integers.
2. It computes the average of the 250 integers that the user supplies.
3. It prints out exactly those numbers entered by the user that differ from the average by no more than 10.

Answer:

```cpp
#include <iostream>
using namespace std;

int main() {
    int data[250];
    int count = 250;

    cout << "Enter 250 integers: ";
    for (int i = 0; i < count; i++) cin >> data[i];

    int sum = 0;
    for (int i = 0; i < count; i++) sum = sum + data[i];
    double average = sum / ((double) count);

    for (int i = 0; i < count; i++)
        if ((average - data[i]) <= 10.0 && (data[i] - average) <= 10.0)
            cout << data[i] << endl;

    return 0;
}
```
Problem 1  Write title lines for the functions that are called by the following main program. Do not supply blocks for the functions.

Problem 2  Write blocks of code to perform the functions used in the following main program. Your blocks must match the given title lines. Each block should be a short function of only a few lines.
Answer:

(a)

double average3(int x, int y, int z) {
    return (x + y + z) / 3.0;
}

(b)

double percentage(int x, int y) {
    return 100.0 * x / y;
}

c)

void randomFill(int x[], int cap) {
    for (int i = 0; i < cap; i++)
        x[i] = rand() % 9 + 1;
}

de)

void print(int x[], int cap) {
    for (int i = 0; i < cap; i++)
        cout << x[i] << " ";
    cout << endl;
}

e)

int secondDigit(int x) {
    if (x < 100) return x % 10;
    else return secondDigit(x / 10);
}

Problem 3    Write a function called removeFirst that removes the first digit of a positive integer and returns the result (or returns 0 if the integer has only one digit).
For example, a program that uses the function removeFirst follows.

int main() {
    cout << removeFirst(19683) << endl;  // prints 9683
    cout << removeFirst(11) << endl;     // prints 1
    cout << removeFirst(1) << endl;      // prints 0
    return 0;
}

Answer:

int removeFirst(int x) {
    if (x < 10) return 0;
    return 10 * removeFirst(x/10) + x % 10;
}

Problem 4    Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)
1. It asks the user to enter to enter 250 integers.
2. It prints out exactly the negative numbers entered by the user in the reverse of their order of input.

Answer:
#include <iostream>
using namespace std;

int main() {
    int data[250];
    int count = 250;

    cout << "Enter 250 integers: ";
    for (int i = 0; i < count; i++) cin >> data[i];

    for (int i = count - 1; i >= 0; i--)
        if (data[i] < 0)
            cout << data[i] << endl;

    return 0;
}