Q1 Suppose you have the following program

```cpp
#include <iostream.h>

int square(int x)
{
    int s;
    s = x * x;
    return (s);
}

int sum(int y)
{
    int sum3 = 3;
    Sum3 = sum3 + square(y);
    return (sum3);
}

void main()
{
    int z, total, a, b;
    cin >> z;
    total = sum(z);
    cout << total;
    cin >> a;
    b = square(a);
    cout << b;
}
```

a) Determine local and nonlocal variables for each function. [5 marks]

b) Determine formal and actual parameters for each function. [5 marks]

c) Draw subprogram call-return diagram if the CPU execute subprogram `square`. [10 marks]
Q2
a) Draw an algorithm or Forth Generation Language (4GL) required to find the sum of negative numbers among 50 numbers entered by the user. [10 marks]
b) Draw a flowchart for the above algorithm [10 marks]

Q3 Assume that the store is as shown below

\[
\begin{array}{|c|c|}
\hline
\text{x} & 10 \\
\hline
\text{y} & 7 \\
\hline
\text{q} & \\
\hline
\text{z} & \\
\hline
\text{t} & \\
\hline
\end{array}
\]

Integer
Integer
Integer
Real
Truth value

a) After the processor executes the following three statements, what will the store look like?
\[
y \leftarrow \frac{y}{x}
\]
\[
z \leftarrow \frac{y}{x}
\]
\[
t \leftarrow x > y
\]

b) Given the store as modified by (a), what will the store look like after the processor executes the following three statements?
\[
x \leftarrow x \uparrow 3
\]
\[
q \leftarrow y + y * y
\]
\[
t \leftarrow (x > y) \text{ and } (q > y)
\]

Q4 Define computer program, list the steps of developing computer programs and then describe the purposes of each step. [20 marks]