試題一：〈15 分〉
Consider a two-level memory hierarchy, \( M_1 \) and \( M_2 \). Denote the hit ratio of \( M_1 \) as \( h \). Let \( c_1 \) and \( c_2 \) be the costs per kilobyte, \( s_1 \) and \( s_2 \) the memory capacities, and \( t_1 \) and \( t_2 \) the access times, respectively.

(a) What is the average cost \( c \) of the entire memory system?
(b) What is the effective memory-access time \( t_a \) of this hierarchy?
(c) Let \( r = t_2 / t_1 \) be the speed ratio of the two memories. Let \( E = t_1 / t_a \) be the access efficiency of the memory system. Express \( E \) in terms of \( r \) and \( h \).

試題二：〈15 分〉
Consider \( n \) tasks are presented to a \( k \)-stage linear-pipeline processor with clock period \( \tau \).
(a) What is the speedup \( s \) of a \( k \)-stage linear pipeline processor over an equivalent nonpipelined processor?
(b) Determine the efficiency \( E \) of the \( k \)-stage linear pipeline processor.
(c) Find the throughput \( H \) of the \( k \)-stage linear pipeline processor.
試題三：(20 分)
Finish the following Boolean equations:
(a) \( \overline{A} + AB = \) ____________________________ .
(b) \( \overline{AB} \oplus 1 = \) ____________________________ .
(c) \( x \oplus 1 = \) ____________________________ .
(d) \( f(A,B,C) = \sum m(1,4,5,6,7) = \) ____________________________ .

試題四：(30 分)

What does the following program print?

```java
import javax.swing.*;
public class TriSelect3 {
    public static void main( String args[] ) {
        String input;
        TriBank callTri3=new TriBank();
        TriBank callTri5=new TriBank(5);
        callTri5.drawRU();
        callTri3.drawLU();
        System.exit(0);  }
    }
}
public class TriBank {
    int row, column, space, size;
    public TriBank() {
        size=3;
    }
    public TriBank(int psize) {
        size=psize;
    }
    void drawLU() {
        for ( row = 1; row <=size; row++ ) {
            for ( column = 1; column <= row; column++ )
                System.out.print( '*' );
            System.out.println();
        }
    }
    void drawRU() {
        for ( row = size; row >=1; row-- ) {
            for (space = 1; space < row; space++ )
                System.out.print( ' ' );
            System.out.println();
        }
    }
```
System.out.print(' '); 
for (column = size; column >= row; column--) 
  System.out.print('*'); 
System.out.println(); }
}
void drawRD() {
  for( row = size; row >= 1; row-- ) {
    for( space = size; space > row; space-- )
      System.out.print(' ');
    for( column = 1; column <= row; column++ )
      System.out.print('*');
    System.out.println();}
    System.out.println();}

試題五：〈20 分〉

Find the error in the following recursive method and explain how to correct it:

public int love(int points) 
{
  if (points==0)
    return 0;
  else
    return points*love(points);