

Question 1: Rewriting code

a) Rewrite the following program segment using "switch" (instead of "if").

```
char c;
int i;
....
if (c == 'a')
    i = 1;
else if (c == 'b')
    i = 2;
else if (c == 'c')
    i = 3;
else
    i = 4;
```

Answer:

```
switch (c)
{
    case 'a': i=1; break;
    case 'b': i=2; break;
    case 'c': i=3; break;
    default: i=4;
}
```

b) Rewrite the following program segment using "while" (instead of "do-while").

```
int value;
do
{
    System.out.print("Enter an integer (0 to quit) ");
    value = Keyboard.readInt();
} while (value != 0);
```

Answer:

```
int value;
System.out.print("Enter an integer (0 to quit) ");
value = Keyboard.readInt();
while (value != 0)
{
    System.out.print("Enter an integer (0 to quit) ");
    value = Keyboard.readInt();
}
```

c) Rewrite the following program segment using "do-while" (instead of "while").

```
int x, y = 5;

while (y < 10)
{
    x = y * 2;
    y += 2;
    System.out.println(x);
}
```

Answer:

```
if(y < 10)
  do {
    x = y*2;
    x += 2;
    System.out.println(x);
  }while (y < 10);
```

d) Rewrite the following program segment using "while" (instead of "for").

```
int i, j, k;
....
for (i=0, j=0, k=0; i<10; i++)
    if (i%2)
        j++;
    else
        k++;
```

Answer:

```
i=0;
j=0;
k=0;
while (i<10)
{
  if (i%2)
    j++;
  else
    k++;
  i++;
}
```

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Question 2: Finding the Output

a) (Arithmetic expressions)

Write down the output generated by the following program segment:

```

int i=3, j=1, k=9;
double c=4.4, d=3.7, e=-1.5;
int p, q;
double x, y;
final int DIX = 10;

/* a) */ p=i%j;           System.out.println("a) " + p);
/* b) */ p=i/k;          System.out.println("b) " + p);
/* c) */ x=DIX/(j+3);    System.out.println("c) " + x);
/* d) */ x=DIX/j+3;      System.out.println("d) " + x);
/* e) */ c=c*(++j+1);    System.out.println("e) " + c);
/* f) */ x=Math.pow(c-((int)d+c),2); System.out.println("f) " + x);
/* g) */ y=Math.abs(e)+Math.min(i*i,k++); System.out.println("g) " + y);
/* h) */ y=Math.round(c)+j/2; System.out.println("h) " + y);
/* i) */ x=i+Math.floor((double)i)+i%i; System.out.println("i) " + x);
/* j) */ y=j+Math.ceil(c)+j%j; System.out.println("j) " + y);
    
```

Answer (use one slot for each character):

| | | | | | | | | | |
|-----|--|--|---|---|---|---|--|--|--|
| a) | | | 0 | | | | | | |
| b) | | | 0 | | | | | | |
| c) | | | 2 | . | 0 | | | | |
| d) | | | 1 | 3 | . | 0 | | | |
| e) | | | 1 | 3 | . | 2 | | | |
| f) | | | 9 | . | 0 | | | | |
| g) | | | 1 | 0 | . | 5 | | | |
| h) | | | 1 | 4 | . | 0 | | | |
| i) | | | 6 | . | 0 | | | | |
| j) | | | 1 | 6 | . | 0 | | | |

b) (Nested loops)

Write down the output generated by the following program segment:

```
int i, j;
i=1;

while (i<6) {
    for (j=1; j<i; j++)
        System.out.print(" ");
    for (j=i++; j<6; j++)
        System.out.print("*");
    System.out.println();
}
```

Answer (use one slot for each character):

| | | | | | | | |
|---|---|---|---|---|--|--|--|
| * | * | * | * | * | | | |
| | * | * | * | * | | | |
| | | * | * | * | | | |
| | | | * | * | | | |
| | | | | * | | | |
| | | | | | | | |
| | | | | | | | |

c) (Conditional statements)

Consider the following program segment:

```
if (!(a!=0 || b>0))
    System.out.print ("One\n");
else
    if (a>2 || !(b<=0))
        System.out.print ("Two\n");
    else
        if (a!=2 && b!=3)
            System.out.print ("Three\n");
        else
            if (b<-1)
                System.out.print ("Four\n");
            else
                System.out.print ("Five\n");
```

What will be the output if .. ?

| | |
|-----------|---------|
| a=0, b=-5 | → One |
| a=1, b=-5 | → Three |
| a=2, b=-5 | → Four |
| a=3, b=-5 | → Two |
| a=4, b=-5 | → Two |
| a=2, b=0 | → Five |
| a=2, b=1 | → Two |
| a=3, b=-2 | → Two |
| a=2, b=-1 | → Five |
| a=0, b=-1 | → One |

Question 3: Writing code

a) Write a Java program that asks the user to input an integer and produces an empty square of characters with a border indicated by '*'s. For example, if the user enters 5, your program should display:

```
*****
*   *
*   *
*   *
*****
```

Your program must check for the input value, which must be ≥ 3 . If the user enters a value less than 3, the program should repeat the question again to allow the user to re-enter the value.

Answer:

```
import cs1.Keyboard;

public class Q3a
{
    public static void main (String[] args)
    {

        int width;

        do{
            System.out.print ("Enter an integer (0 to quit): ");
            width = Keyboard.readInt();
        } while (width < 3);

        for (int i = 0; i < width; i++){
            for (int j = 0; j < width; j++)
                if(i==0 || i==width-1 || j==0 || j==width-1)
                    System.out.print("*");
                else
                    System.out.print(" ");

            System.out.println();
        }
    }
}
```

b) Consider the checkerboard below.

| | Col 0 | Col 1 | Col 2 | Col 3 | Col 4 | Col 5 |
|-------|-------|-------|-------|-------|-------|-------|
| row 0 | Black | White | Black | White | Black | White |
| row 1 | White | Black | White | Black | White | Black |
| row 2 | Black | White | Black | White | Black | White |
| row 3 | White | Black | White | Black | White | Black |
| row 4 | Black | White | Black | White | Black | White |
| row 5 | White | Black | White | Black | White | Black |

Write a Java program that receives two integers representing the position of an object on the checkerboard (row and column) and displays (as an int) 1 if the object is on a white square, 0 if it is on a black square or -1 if the position given is outside of the checkerboard. A program that enumerates all possibilities is unacceptable.

Answer:

```
import cs1.Keyboard;

public class Q3b
{
    public static void main (String[] args)
    {
        int row, col, output;

        System.out.print("Enter the column number (between 0 and 5) ");
        col = Keyboard.readInt();

        System.out.print("Enter the row number (between 0 and 5) ");
        row = Keyboard.readInt();

        if(row<0 || row>5 || col<0 || col>5)
            output = -1;
        else
            output = (row+col)%2;

        System.out.println(output);
    }
}
```


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c) Write a short Java code to reverse an integer number. For example, an integer 123 should be reversed to 321; however, your code should work with any integer of any number of digits. Also, assume that the number is given in the variable **number** so you do not have to ask the user to input the number again.

Answer:

```
int currentDigit, reverse = 0;

do{
    currentDigit = number % 10;
    reverse = (reverse * 10) + currentDigit;
    number = number / 10;
}
while (number > 0);

System.out.print("The number reversed = " + reverse);
```