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Q1. What will be the output of the following program fragments. Please note that these are partial programs and you should assume that necessary declarations of variables etc., have been done. You are required to give answers corresponding to the printing (cout) statements.

Q1.1 (2 marks)

```
count = 0;
while (count<8)
{
  if (count%3 == 0)
  {
    for (i=0; i<count; i++)
      cout << i;
    cout << "EOL" << endl;
  }
  count=count+1;
}
```

Answer:

EOL
0 1 2 EOL
0 1 2 3 4 5 EOL

(2)

Q1.2 (2 marks)

```
cin >> n;
cin >> m;

while (n != m)
{
  if (n > m)
    n = n - m;
  else
    m = m - n;
}
cout << n << endl;
```

Answer: For the inputs n=40 and m=16

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(2)

Q2.(4 marks) You are given two floating point numbers A and B. Give a strategy for performing the ADDITION operation on the two numbers for the following two cases. No need to write any program.

Example 1: The two numbers have same exponents (e) and sign (s) and different mantissas (m).

eg, $$3.2 \times 10^{-4} + 6.2 \times 10^{-4}$$

Add the mantissa's of the two numbers then multiply the result by the exponent (which is same for both

eg if $a = c \times d$ & $b = e \times d$

then $a + b = (c + e) \times d$

Example 2: The two numbers have different exponents (e) signs (s) and mantissas (m).

Convert the numbers to the decimal equivalent

(eg. if $3.24 \times 10^{-4} = 0.000324$) and then add the numbers.

final exponent & mantissa

Q3. (6 marks) Given below is an incomplete program. For a given input of an array containing elements of values either 0 or 1. The program below is supposed to rearrange the array such that all the entries with value 0 should come before the entries with value 1. For an input of the array a[10] = {0,1,1,1,0,1,0,0,1,0} as initialised in the program below, the program should produce the result as a[10] = {0,0,0,0,0,1,1,1,1,1}. Complete the program below. You are not supposed to use any additional array. You can use additional scalar variables if required. Note that the array is scanned only once i.e., each element of the array is visited only once.

Answer:

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

int main()
{
int i, low, high;
int a[10] = {0,1,1,1,0,1,0,0,1,0};
 int temp;
low = 0;
high = 9;
while (low <= high)
{
  switch (a[low])
  {
    case 0:
      ------------------------
      ------------------------
      ------------------------
        low++;
        break;
    case 1:
        temp = a[low];
        a[low] = a[high];
        a[high] = temp;
        high--;
        break;
    default:
        break;
  }
}
return 0;
}
```

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Q4. (6 marks) Numerologists map large numbers to a single digit number between 1 and 9 in order to tell your future. For example, given a number 8734, they reduce it as follows 8+7+3+4 = 22, 2+2 = 4, so the number 8734 reduces to 4. Write a program in C++, which takes a number as input and reduces it to a single digit number between 1 and 9. (Note that only the number 0 can reduce to 0, and we assume that the input will always be non-zero.)

Answer:

```cpp
#include <iostream>

using namespace std;
int main()
{
    int n, sum, x;
    cin >> n;

    while (n > 9)
    {
        sum = 0;
        while (n >= 0)
        {
            x = n % 10;
            sum = sum + x;
            n = n / 10;
        }
        n = sum;
    }

    cout << "The single digit equivalent of the given no is " << n;
    return 0;
}
```

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