COS 212 Tutorial 2: Version A

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- 2 questions for a total of 23 marks.

Name and Surname:_____

Student/Staff Nr:_____

Instructions

1. This tutorial sheet must be completed individually.
2. You are allowed to make use of any material.
3. Answer all of the questions in the space provided.
4. Be sure to hand in your completed sheet at the end of the tutorial class.

Question 1 Complexity ..... (9 marks)

1.1 Assume that only assignments to variables are counted. Give the worst case big-O notation complexity for each of the following pseudo code segments.

1.2 (1)

```
for(i = 0; i < n; ++i)
    for(j = 0; j < n; ++j)
        for(m = i-2; m <= i; ++m)
            for(k = 0; k < n; ++k)
                b = i + j + k + m
```

1.3 (1)

```
method(arr[])
    for(i = 1; i < arr.length; ++i)
        el = arr[i]
        for(j = i; j > 0 && el < arr[j-1]; --j)
            arr[j] = arr[j-1]

        arr[j] = el
```

1.4 (1)

```
for(i = 0; i < n; ++i)
    for(j = 0; j < n; ++j)
        for(m = i-2; m <= i; ++m)
            for(k = 0; k < n; ++k)
                b = i + j + k + m
```

1.5 (1)

```
for(i = 0; i < 10; ++i)
    for(j = 0; j < n; ++j)
        k+=6
```

Answer:

1.6 (1)

```
int test(n)
{
    int j = 0;
    for(int i = n; i >= 1; i/=2)
        j*=j+i;
    return j;
}
```

Answer:

1.7
```
for(i = 0; i < n; ++i)
    for(j = 0; j < n; ++j)
        for(m = i-2; m <= i; ++m)
            for(k = 0; k < n; ++k)
                b = i + j + k + m
```
(1)

Answer:

1.8
```
int i = 0;
int j = n;

while(j != i && i < n)
{
        ++j;
        i=j;
}
```
(1)

Answer:

1.9
```
boolean method(int k, int[] arr, int i, int j)
{
        if(i > j)
                return false;

        if(arr[(i+j)/2] == k)
                return true;

        if(arr[(i+j)/2] < k)
                return method(k,arr,i,((i+j)/2)-1);

        else
                return method(k,arr,((i+j)/2)+1,j);
}
```
(1)

Answer:

1.10
```
int calculation(int n)
{
        if(n <= 0)
                return 0;

        else if(n > 10)
                return n;
```
(1)

```
        else
                return calculation(5 + calculation(5*n));
}
```

Answer:

Question 2 Recursion ..... (14 marks)

Consider the following recursive method:

```
public int method(int x, int y)
{
        if((y <= x) && (x % y == 0))
                return y;

        if(x < y)
                return method(y,x);

        return method(y, x % y);
}
```

2.1 Write down the series of method calls (first to last) in the form of `method(x,y)`, where `x` and `y` are substituted for parameter values, should this method be called initially with the parameters 43 and 34: (5)

Answer:

2.2 Is this method an example of tail recursion? Motivate your answer. Answer: (2)

2.3 Translate this method into an iterative version. (7)

Answer: