ECE608, Fall 2013, Quiz 1

First Name: ___________________ Last Name: ____________________

I certify that I have neither given nor received unauthorized aid on this quiz.
Signed: ___________________

Use only the space provided on this page to answer the following questions.

1. Find the size of the input to the following algorithm.
2. Write an expression for the number of primitive operations that the algorithm performs in the worst case as a function of the size of the input.
   You do not need to simplify the expression.
   Use the same approximations that we used in class. If you are unsure about which approximations are allowed, write them as assumptions. All reasonable assumptions will be accepted.

```
1  for i ← 1 to n do
2      ind ← i
3      for j ← i+1 to n do
5              ind ← j
6          key ← A[i] 
8      A[ind] ← key 
9      for i ← 1 to m do
10         B[i] ← 0
```

Answers:

1. Size of the input: $n+m$

2. Expression for the number of primitive operations:

$$m + \sum_{i=1}^{n} (4+n-i)$$
1. Find the size of the input to the following algorithm.
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   You do not need to simplify the expression.
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1 for \( i \leftarrow 1 \) to \( k \) do
2 \( A[i] \leftarrow 0 \)
4 for \( i \leftarrow 1 \) to \( m \) do
4 for \( j \leftarrow i+1 \) to \( m \) do
5 if \( B[i] > B[j] \)
6 \( key \leftarrow B[i] \)
7 \( B[i] \leftarrow B[j] \)
8 \( B[j] \leftarrow key \)

Answers:

1. Size of the input: \( k+m \)

2. Expression for the number of primitive operations:

\[
k + \sum_{i=1}^{m} 3(m-i)
\]
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1 for \( i \leftarrow m \) down to 1 do
  2 \( ind \leftarrow i \)
  3 for \( j \leftarrow i-1 \) down to 1 do
      5 \( ind \leftarrow j \)
    6 \( key \leftarrow A[i] \)
    7 \( A[i] \leftarrow A[ind] \)
    8 \( A[ind] \leftarrow key \)
  9 for \( i \leftarrow 1 \) to \( r \) do
10 \( B[i] \leftarrow 0 \)

Answers:

1. Size of the input: \( m + r \)

2. Expression for the number of primitive operations:

\[
\begin{align*}
  r + \sum_{i=1}^{m} (4+i-1) &= r + \sum_{i=1}^{m} (3+i) \\
  &= r + \sum_{i=1}^{m} (4+i) - \sum_{i=1}^{m} \end{align*}
\]
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```plaintext
for i ← 1 to n do
    A[i] ← 0
for i ← r down to 1 do
    for j ← i−1 down to 1 do
        if B[i] < B[j]
            key ← B[i]
            B[i] ← B[j]
            B[j] ← key
```

Answers:

1. Size of the input: \(n+r\)

2. Expression for the number of primitive operations:

\[
\sum_{i=1}^{r} 3(i-1) + n
\]