CS2205: Theory of Computation
Problem Class XI

For each of the following algorithms, give a formula, $t(n)$, in terms of n, that defines the worst-case time complexity of the algorithm, counting only assignments to integer variable s. There is no need to justify your answers; simply give the formulae.

Here are some facts that may help you simplify your formulae.

$$\sum_{k=0}^{n} k = \frac{n(n+1)}{2}$$

$$\sum_{k=0}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$

Algorithm: A(n)

```
s := 0;
for i := 1 upto n
{   s := s + 1;
}
```

Algorithm: B(n)

```
s := 1;
for i := 1 upto 2n
{   s := s × i;
}
```


Algorithm: C(n)

```
s := 0;
for i := 1 upto n
{   for j := 1 upto n
    {   s := s + i × j
    }
}
```

Algorithm: D(n)

```
s := 0;
for i := 1 upto 2n
{   for j := 1 upto n
    {   s := s + i × j
    }
}
```

Algorithm: E(n)

```
s := 0;
for i := 1 upto n
{   for j := 1 upto i
    {   s := s + i × j
    }
}
```

Algorithm: F(n)

```
s := 0;
for i := 1 upto 2n
{   for j := 1 upto i
    {   s := s + i × j
    }
}
```

Algorithm: G(n)

$s := 0;$
for $i := 1$ **upto** n
$\{$ **for** $j := 1$ **upto** i^2
       $\{$ $s := s + i \times j;$
       $\}$
$\}$

Algorithm: H(n)

$s := 0;$
for $i := 1$ **upto** 100
$\{$ **for** $j := 1$ **upto** i
       $\{$ **for** $k := 1$ **upto** n
             $\{$ $s := s + i \times j + k;$
             $\}$
       $\}$
       for $m := 1$ **upto** n
       $\{$ $s := s + s;$
       $\}$
$\}$