quiz1

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Contents

What does this function do and what is its runtime?

```
def m(n):
    t = 1
    for i in range(n-1):
        for j in range(i+1, n):
            t = 2*t
    return t
```

It returns 2^r where r is the number of times $t = 2 * t$ is called (runtime).

$$
\begin{aligned}
T(n) &= \sum_{i=0}^{n-2} \sum_{j=i+1}^{n-1} 1 && (1)\\
&= \sum_{i=0}^{n-2} (n-1) - (i+1) + 1 && (2)\\
&= \sum_{i=0}^{n-2} (n-i-1) && (3)\\
&= \sum_{i=0}^{n-2} (n-1) - \sum_{i=0}^{n-2} i && (4)\\
&= (n-1)(n-2-0+1) - \frac{(n-2)(n-1)}{2} && (5)\\
&= (n-1)(n-1) - \frac{(n-2)(n-1)}{2} && (6)\\
&= (n-1)((n-1) - \frac{n-2}{2}) && (7)\\
&= (n-2)(\frac{n}{n}) && (8)\\
&= \frac{n(n-1)}{2} && (9)
\end{aligned}
$$

Therefore, the function returns 2^r where $r = n(n-1)/2$.