6)

Calculating work done in strassens' multiplication
Multiplication

level	Instance	Size of instance	workdone
0	1	N	0
1	7	n/2	0
K=log n	7^k	$n/2^k=1$	7^k

Total work done in multiplication = $7^k=n^{\log_2 7}$

Addition

Level	**Instances**	**Size of instance**	**workdone**
0	1	n	$(10/4)n^2$
1	7	n/2	$7(10/4)(n/2)^2$
i	7^i	$n/2^i$	$7^i(10/4)(n/2)^{2i}$
K	7^k	1	0

Total work done in addition = $\sum_{i=0}^{k-1} \left(\frac{10}{4}\right)(n^2)7^i/4^i$

$= \sum_{i=0}^{k-1} \left(\frac{10}{4}\right)n^2\,(7/4)^i$

$= (10/4)n^2\,([7/4]^k -1)/((7/4)-1)$

$= (10/3)n^2\,(7^{\log_2 n} - n^2)/n^2$

$= (10/3)(n^{\log_2 7} - n^2)$

Total work done = $2n^{\log_2 7} + (10/3)(n^{\log_2 7} - n^2)$ ----> Equation 1

Considering multiplication takes twice as long as addition.

Work done in iterative matrix multiplication = $2n^3 + n^3 = 3n^3$ **----->** Equation 2

Again considering multiplication takes twice as long as addition.

For all values of n lesser than the point where Equation 1 = Equation 2 meet, iterative performs better.
For values of n greater than the point of intersection, strassens' multiplication takes lesser time.

$2n^{\log_2 7} + (10/3)(n^{\log_2 7} - n^2) - 3n^3 = 0$

Solving for n, we get n=12.9118
Rounding upto the next power of n, we get n = 16