9. (i) $x^2 > 2$ and $x^3 > 3 \Rightarrow x^5 > 6$ so statement is false for $n = 5$ hence, $n \leq 4$

(ii) The series $\frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{n^2}$ has $n^2 - n$ termseach of which is $\geq \frac{1}{n^2}$

so the sum $> \frac{n^2-1}{n^2} = 1 - \frac{1}{n}$ aso $\frac{1}{n} + \frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{n^2} > \frac{1}{n} + 1 - \frac{1}{n} = 1$

$\sum_{n=1}^{N} \frac{1}{n}$ may be written as $1 + \frac{1}{2} + \left(\frac{1}{3} + \frac{1}{4}\right) = \left(\frac{1}{5} + \ldots + \frac{1}{8}\right) + \ldots + \left(\frac{1}{2^{r-2}+1} + \ldots + \frac{1}{2^{r-1}}\right)$

giving r brackets each of which has a sum $> \frac{1}{2}$ so taking 19 of these brackets gives a sum > 10

hence, we may take $N = 2^{18}$