The last question is for those who want more practice, and we might not have time to cover it during the tutorial session.

1. Let A be the set of digits in the base-10 expression of the rational number $\frac{41}{333}$, let B be the same for $\frac{44}{333}$. Prove that A = B.

2. Find the cardinality (number of elements) of the set $S = \{p/q : p, q \in N^+, p, q, \leq 3\}$.

3. Generalize De Morgan's laws for n sets and prove the laws by induction.

4. We define the following relations on $\mathbf{Z}$. Determine whether they are reflexive, symmetric or transitive.

    (a) $R = \{(a, b) : a + b \text{ is even}\}$
    (b) $R = \{(a, b) : a + b \text{ is odd}\}$
    (c) $R = \{(a, b) : a < b\}$
    (d) $R = \{(a, b) : |a - b| < 2\}$

5. Order the following functions in order of their growth rate. If $f(x)$ is $O(g(x))$, but $g(x)$ is not $O(f(x))$, then put $f(x)$ above $g(x)$. If they are each big-O of each other, then place them on the same level.

    $x^3 \quad 3^x \quad x! \quad x \log x \quad 2^{x \log x} \quad \log x^2 \quad \log \log x \quad 2^{x^2} \quad \log^2 x$