Write on supplied long paper and hand in at the end of the hour with your name and student number. Total of marks, indicated in brackets, is 36.

1. List the vertex numbers of the tree below in the order in which they are processed in a preorder traversal of the tree.

2. Prove by induction on \( m \geq 1 \) for general \( n \geq 1 \) the identity

\[
\binom{n+m}{m} = \binom{n-1}{0} + \binom{n}{1} + \binom{n+1}{2} + \ldots + \binom{n+m-1}{m}.
\]

3. The following questions are separate; doing one does not depend on being able to do the others correctly or at all. Consider a round table partially set up for a meal with 7 places. Answer the questions in as much detail as possible without actually doing any arithmetic. Perform cancellations, for instance, to cut down on arithmetic to be done; just don't do it.

2. (a) How many ways can 7 plates be selected from large (\( \geq 7 \)) stacks of 3 sorts of plate?

2. (b) How many ways can 7 distinctive chairs be selected from a supply of 25 to place around the table?

2. (c) How many ways can the 7 chairs selected be placed around the table at the places set?

2. (d) How many ways can 6 or 7 persons (automatically distinctive) be seated in the 7 distinctive chairs at the table from a party of 13 persons?

4. [2] (a) Using a suitable notation, write out the group table of \( \sigma(2) \).

5. (b) Using the same notation, write out the group table of \( \sigma(2) \times \sigma(2) \).

4. (c) Write out all the subgroups of \( \sigma(2) \times \sigma(2) \) in your notation for that group.