

Diagram illustrating the structure of the  $2 \times 2$  matrix  $M$  for the  $2 \times 2$  case, showing the sequence of operations and the resulting matrix structure.

The diagram shows a sequence of operations starting from a root node  $-15-6-4-32$  and branching into four main paths, each representing a different sequence of operations:

- Path 1 (Leftmost):** Operations  $5/6$ ,  $2-1$ , and  $2-3$  lead to the sequence  $-1564-32$ .
- Path 2:** Operations  $5/6$ ,  $2-1$ , and  $2-3$  lead to the sequence  $3-46-512$ .
- Path 3:** Operations  $5/6$ ,  $2-1$ , and  $2-3$  lead to the sequence  $-15-64-32$ .
- Path 4 (Rightmost):** Operations  $5/6$ ,  $2-1$ , and  $2-3$  lead to the sequence  $18DUP-1-6-5-42$ .

The diagram further illustrates the sequence of operations for each path, showing the resulting matrix structure and the sequence of operations:

- Path 1:** Operations  $4-3$ ,  $2-1$ , and  $2-3$  lead to the sequence  $-1564-32$ .
- Path 2:** Operations  $3-4$ ,  $6-5$ , and  $5-6$  lead to the sequence  $3-46-512$ .
- Path 3:** Operations  $5-6$ ,  $4-3$ , and  $2-1$  lead to the sequence  $-15-64-32$ .
- Path 4:** Operations  $2-1$ ,  $2-3$ ,  $4-5$ ,  $5-4$ ,  $2-1$ ,  $2-3$ ,  $5-6$ ,  $6-5$ ,  $5-6$ ,  $4-5$ , and  $5-4$  lead to the sequence  $18DUP-1-6-5-42$ .

The diagram shows the sequence of operations for each path, leading to the final matrix structure  $M$ .