

### QUESTION ONE: Recursion

a)

i.

In-fix:  $30 + 12 * 3 + 2$

Post-fix:  $30\ 12\ 3\ * + 2\ +$

Token	Postfix	Stack
30	30	30
30 12	12	30 12
30 12 3	3	30 12 3
30 12*3	*	30 36
3+12*3	+	66
3+12*3 2	2	66 2
3+12*3+2	+	68

ii.

In-fix:  $(30+12) * 3 + (4+5)*7$

Post-fix:  $30\ 12\ +\ 3\ *\ 4\ 5\ +\ 7\ *\ +$

Token	Postfix	Stack
30	30	30
12	12	30 12
30+12	+	42
30+12 3	3	42 3
(30+12)*3	*	126
(30+12)*3 4	4	126 4
(30+12)*3 4 5	5	126 4 5
(30+12)*3 4+5	+	126 9
(30+12)*3 4+5 7	7	126 9 7
(30+12)*3 (4+5)*7	*	126 63
(30+12) * 3 + (4+5)*7	+	189