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# CMPSC 461: Homework 1

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## PROBLEM 1

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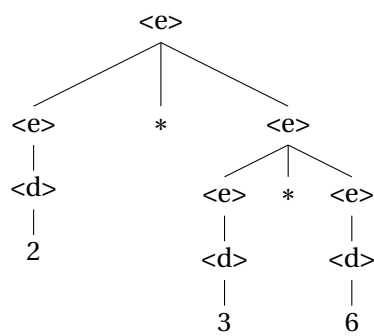
a)

$$\begin{aligned} \langle e \rangle &\rightarrow \langle e \rangle * \langle e \rangle \rightarrow \langle d \rangle * \langle e \rangle \rightarrow 2 * \langle e \rangle \rightarrow 2 * \langle e \rangle * \langle e \rangle \rightarrow 2 * \langle d \rangle * \langle e \rangle \\ &\rightarrow 2 * 3 * \langle e \rangle \rightarrow 2 * 3 * \langle d \rangle \rightarrow 2 * 3 * 6 \end{aligned}$$

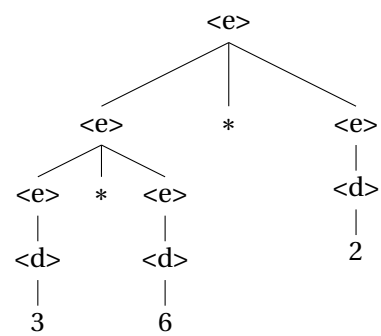
b)

$$\begin{aligned} \langle e \rangle &\rightarrow \langle e \rangle * \langle e \rangle \rightarrow \langle e \rangle * \langle d \rangle \rightarrow \langle e \rangle * 6 \rightarrow \langle e \rangle * \langle e \rangle * 6 \rightarrow \langle e \rangle * \langle d \rangle * 6 \\ &\rightarrow \langle e \rangle * 3 * 6 \rightarrow \langle d \rangle * 3 * 6 \rightarrow 2 * 3 * 6 \end{aligned}$$

c)



(a) Tree 1



(b) Tree 2

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## PROBLEM 2

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Grammar

$$\begin{aligned} \langle s \rangle &\rightarrow \langle n \rangle \mid \langle n \rangle, \langle s \rangle \\ \langle n \rangle &\rightarrow \langle d \rangle \mid \langle n \rangle \langle d \rangle \\ \langle d \rangle &\rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9 \end{aligned}$$