

$$S \rightarrow aAX|bBX$$

$$X \rightarrow aAY|bBY$$

$$Y \rightarrow aAZ|bBZ$$

$$Aa \rightarrow aA \quad Ba \rightarrow aB$$

$$Ab \rightarrow bA \quad Bb \rightarrow bB$$

$$AZ \rightarrow Ca \quad AC \rightarrow Da$$

$$BZ \rightarrow Cb \quad BC \rightarrow Db$$

$$AD \rightarrow Ea \quad BD \rightarrow Eb$$

$$\epsilon \rightarrow a\epsilon|b\epsilon|\epsilon$$

$$S \rightarrow aAC\epsilon|B|\epsilon$$

$$A \rightarrow aAC|B$$

$$B \rightarrow bBc|\epsilon$$

$$cC \rightarrow \epsilon$$

$$aC \rightarrow aCD$$

$$bC \rightarrow bCD$$

$$DC \rightarrow cD$$

$$D\epsilon \rightarrow \epsilon \quad b\epsilon \rightarrow b \quad c\epsilon \rightarrow c$$

### Sencillos

$$a) S \rightarrow aX|bX|\epsilon$$

$$X \rightarrow aY|bY|\epsilon$$

$$Y \rightarrow aZ|bZ|\epsilon$$

$$Z \rightarrow a|b|\epsilon$$

$$b) S \rightarrow LY00$$

$$X \rightarrow 0X|1Y|\epsilon$$

$$Y \rightarrow 0X|\epsilon$$

$$c) S \rightarrow \epsilon$$

$$d) S \rightarrow SC|C$$

$$C \rightarrow 011|...|9|\epsilon$$

$$e) S \rightarrow aA|aBb|\epsilon$$

$$A \rightarrow aA|\epsilon$$

$$B \rightarrow aBb|\epsilon$$

$$f) S \rightarrow AC|\epsilon$$

$$A \rightarrow aAbb|\epsilon$$

$$C \rightarrow cC|\epsilon$$

$$g) S \rightarrow aSa|bSb|\epsilon$$

$$h) S \rightarrow X00x11x|x11X00X$$

$$X \rightarrow 0X|1X$$

### Medios

$$a) S \rightarrow AB$$

$$A \rightarrow 0A0|1A1|\epsilon$$

$$B \rightarrow 0B|1B|\epsilon$$

$$b) S \rightarrow ASA|C$$

$$A \rightarrow a|b|c$$

$$C \rightarrow aC|bC|cC|\epsilon$$

$$S \rightarrow ASA|c$$

$$A \rightarrow a|b|c$$

$$c) S \rightarrow 0S1|1S1|\epsilon$$

$$d) S \rightarrow Aa$$

$$A \rightarrow aAb|\epsilon$$

### Difficiles

a)  $S \rightarrow ABD$

$A \rightarrow aAC | \epsilon$

$B \rightarrow bBC | \epsilon$

$Cb \rightarrow bC$

$CD \rightarrow Dc$

$bD \rightarrow b$

b)  $111, 1110, 10101, 11100, 100011,$

$S \rightarrow x1x1x1x | \epsilon$

$x \rightarrow 0x | \epsilon$

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### EXTREMO!

a)  $S \rightarrow \epsilon | 0ACD | 1BCD | \epsilon$

$C \rightarrow \epsilon | 0AC | 1BC$

$A0 \rightarrow 0A \quad A1 \rightarrow 1A$

$B0 \rightarrow 0B \quad B1 \rightarrow 1B$

$AD \rightarrow D0 \quad BD \rightarrow D1$

$\epsilon 0 \rightarrow 0\epsilon \quad \epsilon 1 \rightarrow 1\epsilon$

$\epsilon D \rightarrow \epsilon$

b)  $S \rightarrow aA$