Hardware to Do Division

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1 Integer Division

$$
\begin{aligned}
F &\leftarrow 0 \\
Q &\leftarrow \text{dividend} \\
d &\leftarrow \text{divisor} \\
D &\leftarrow 0 \\
\text{Count} &\leftarrow n \\
\text{Shift:} & \\
D &\leftarrow D_{n-2}D_{n-1}\ldots D_1Q_{n-1} \\
Q &\leftarrow Q_{n-2}Q_{n-1}\ldots Q_1F \\
\text{Subtract:} & \\
\text{Diff} &\leftarrow D - d \\
F &\leftarrow \overline{\text{Diff}_{n-1}} \qquad (F \text{ is the borrow bit}) \\
D &\leftarrow F \cdot \text{Diff} + \overline{F} \cdot D \\
\text{Count} &\leftarrow \text{Count} - 1 \\
\text{If Count} > 0 \text{ Goto Shift} & \\
\text{Final Shift:} & \\
Q &\leftarrow Q_{n-2}Q_{n-1}\ldots Q_1F
\end{aligned}
$$

2 Fractional Division

$$
\begin{aligned}
F &\leftarrow 0 \\
Q &\leftarrow 0 \\
d &\leftarrow \text{divisor} \\
D &\leftarrow \text{dividend} \\
\text{Count} &\leftarrow n+1 \\
\text{Initial Subtract:} & \\
\text{Diff} &\leftarrow D - d \\
F &\leftarrow \overline{\text{Diff}_{n-1}} \qquad (F \text{ is the borrow bit}) \\
\text{If } F > 0 \text{ Goto Overflow} & \\
\text{Count} &\leftarrow \text{Count} - 1 \\
\text{Test:} & \\
D &\leftarrow F \cdot \text{Diff} + \overline{F} \cdot D \\
\text{Shift:} & \\
D &\leftarrow D_{n+1} D_n \ldots D_1 Q_{n-1} \\
Q &\leftarrow Q_{n+1} Q_n \ldots Q_1 F \\
\text{Subtract:} & \\
\text{Diff} &\leftarrow D - d \\
F &\leftarrow \overline{\text{Diff}_{n+1}} \qquad (F \text{ is the borrow bit}) \\
\text{Count} &\leftarrow \text{Count} - 1 \\
\text{If Count} > 0 \text{ Goto Test} & \\
\text{Final Shift:} & \\
Q &\leftarrow Q_{n-2} Q_{n-1} \ldots Q_1 F
\end{aligned}
$$