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Quiz #4 – Solution

We implement a leftward *bit rotator* using tri-states. Given a 4-bit input $\{x3 \ x2 \ x1 \ x0\}$ and a one-hot-encoded rotation amount $\{s3 \ s2 \ s1 \ s0\}$, the bit rotator produces output $\{y3 \ y2 \ y1 \ y0\}$ as follows:

Rotation	Output
{s3 s2 s1 s0}	{y3 y2 y1 y0}
0001	{x3 x2 x1 x0}
0010	{x2 x1 x0 x3}
0100	{x1 x0 x3 x2}
$1\ 0\ 0\ 0$	{x0 x3 x2 x1}

Tri-state buffers are useful for implementing a *shared bus*, *i.e.* a line with many writers, only one of which may write at any given time. For the bit rotator, we create a shared bus for each output, with the writers being tri-stated copies of the inputs. The rotation amount {s3 s2 s1 s0} controls the tri-states to determine which input writes to which output.

