

Furthermore, to simplify the explanation, we will assume that one second must pass after starting a step before the circuit starts the next step. Thus, we desire a circuit that, once it has been started, will perform the six steps in sequence, at one-second intervals with no further changes in input.

For now, we will focus on the essence of the circuit, and consider how it can be started later. A circuit to handle the task of performing six steps in sequence can be built from three building blocks: a clock, a binary counter, and a device known as a *decoder/demultiplexer*†, often abbreviated *demux*. We have already considered a counter, and we will assume that a clock is available that generates digital output at a rate of exactly one cycle per second. The last component, a decoder/demultiplexer, is a single integrated circuit that uses a binary value to map an input to a set of outputs. We will only use the decoding function to select an output. That is, a decoder takes a binary value as input, and uses the value to choose an output. Only one output of a decoder is on at any time; all others are off — when the input lines represent the value i in binary, the decoder selects the i^{th} output. Figure 2.14 illustrates the concept.

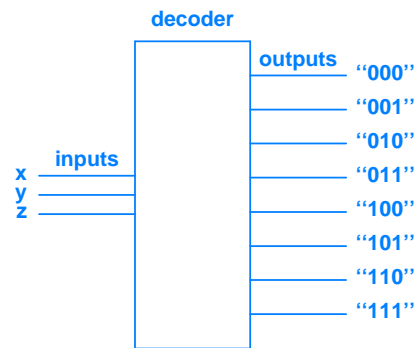


Figure 2.14 Illustration of a decoder with three input lines and eight output lines. When inputs x , y , and z have the values 0, 1, and 1, the fourth output from the top is selected.

A decoder provides the last piece needed for our simplistic sequencing mechanism — if we combine a clock, counter, and decoder, the resulting circuit can execute a series of steps. For example, Figure 2.15 shows the interconnection in which the output of a clock is used as input to a binary counter, and the output of a binary counter is used as input to a decoder.

†An alternate spelling of *demultiplexer* is also used.