Master-Slave D flip-flop

The output $Q$ acquires the value of $D$, only when one complete pulse is applied to the clock input.
Register

A 8-bit register is an array of 8 D-flip-flops.

Abstract view of a register
Binary counter

Observe how Q3 Q2 Q1 Q0 change when pulses are applied to the clock input of the leftmost flip-flop.
State diagram of a counter

A register file

How does it work? See diagrams B.18, B.19, B.20
A shift register

A shift register can be used

• To divide (or multiply) a number by $2^k$;
• To generate control signals for a sequence of operations
• For serial-to-parallel and parallel-to-serial data conversion

When the output of the rightmost FF is connected to the input of the leftmost FF, it becomes a circulating register.

A circulating register that contains exactly a single 1 is called a ring counter.