Electronic Circuits
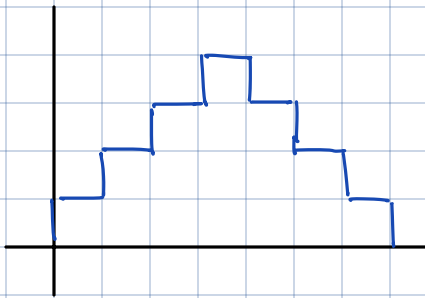
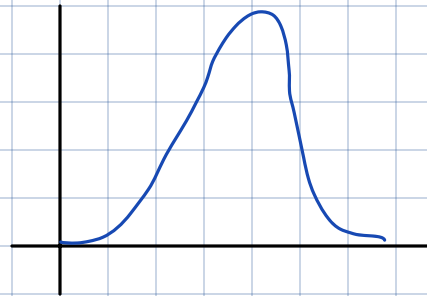## Digital
- Involves Discrete values
- Store, process & transmit more data.
- Less prone to noise
- Less power

Analog
- Involves Continous values
- More prone to noise
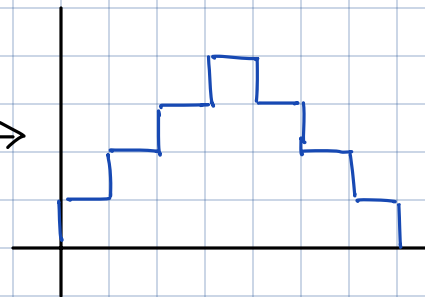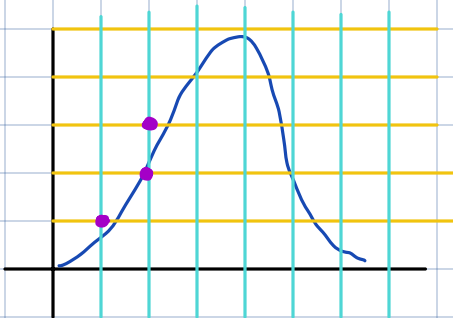- More power
- More space
- More accurate
- Detailed

- Convert Analog to Digital:
  - Quantization & Sampling
    - Discretizes signals in vertical directions
    - Discretizes signals in horizontal directions

- Electronic devices use both to get best of both worlds. CD player reads digital data & converts to analog for amplification

Binary Digits & logic levels:

⤷ Electronic devices use circuits that are represented
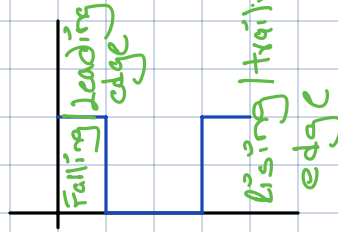by two voltage levels — High 1 or Low 0

$V_{H\,max}$

High

$V_{H\,min}$

Invalid

$V_{L\,max}$

Low

$V_{L\,min}$

Digital Waveforms:

⤷ Change between High to Low
⤷ +ev ⤴ is one that goes from low to high
⤷ -ev ⤵ is one that goes from High to low
⤷ Made up of a series of pulses

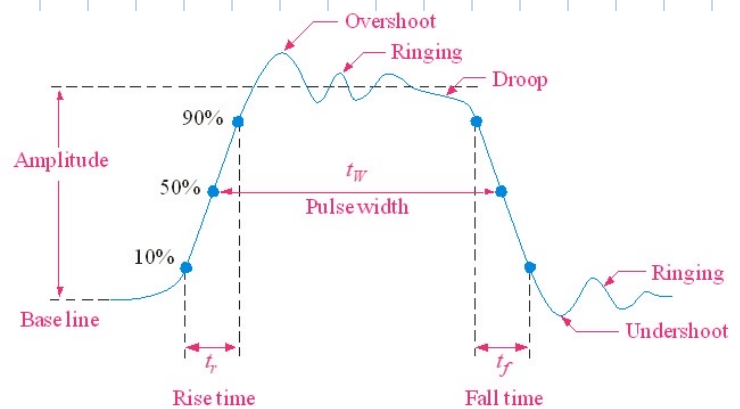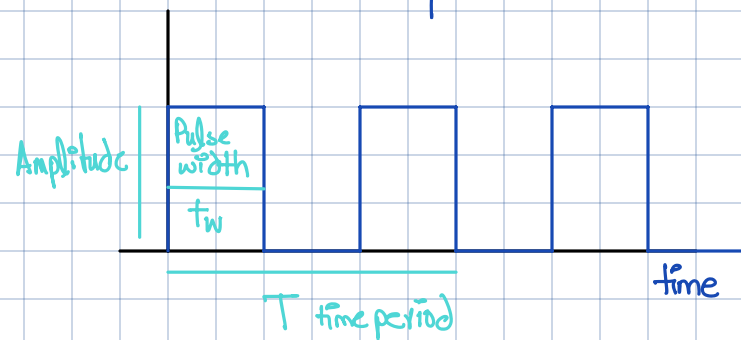rising/leading edge   Falling/trailing edge

Falling/leading edge   rising/trailing edge

(a) +ev   (b) -ev

Pulses:

⤷ Described by various characteristics
⤷ Duty cycle = $\dfrac{t_w}{T}$

Amplitude Pulse width t_w

T time period

time

Overshoot
Ringing
Droop
90%
Amplitude
50% t_W
Pulse width
10%
Base line
t_r
Rise time
Ringing
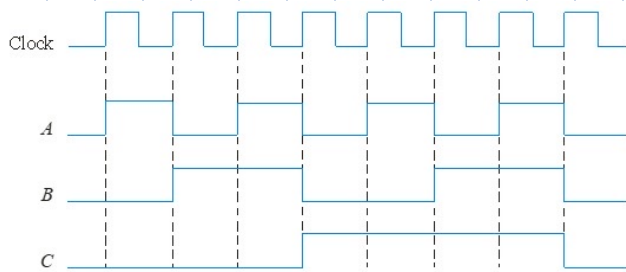Undershoot
t_f
Fall time

Periodic Pulse Waveforms:

⤷ Periodic waveforms are made of pulses that repeat over a fixed
interval called period. It repeats at the rate of frequency which
is,

$$f = \frac{1}{T}$$

Example;
clock

Timing Diagrams:

> Shows relation b/w two or more digital waveforms
> By logic analyzer

Data transfer:

> Data can be transfered by either serial or parallel transfer

Basic System functions:

> Encoding & Decoding function

> Data selection function

> Counting function

> Shift register
> Used for storage

> Comparison function

> Basic arithmetic function
> Adder

Programmable Logic:

> like fixed functions but logic can be programmed.
> Cost & use space less
> Examples
> PAL