ADC

- Analog to Digital converter
- Most of sensors (e.g. temperature, LDR, Pressure, pH, etc.) are analog.
- Types of ADC
    - "Successive Approximation" ADC -- most used in micro-controllers
    - Dual slope ADC
    - Flash ADC

ADC characteristics

- Resolution --> Number of bits
    - e.g. 8-bit ADC --> Number of steps = 256
- Reference Voltage --> Analog input is compared against Vref.
    - If only +ve voltage is allowed, then Max Vin = Vref.
        - e.g. Vref = 2.56 V
- Step size
    - Minimum voltage change that can be detected by ADC.
    - Vref / steps
    - e.g. 2.56 V / 256 = 0.01 V = 10 mV
- Conversion Time
    - Depends on ADC clock freq (Fadc)
    - Successive Approx ADC -- Number of clocks = Resolution + 1.
        - If Resolution is 8-bits, then Number of clocks 9.
        - e.g. conversion = 9 / Fadc
    - Depends on resolution of ADC.
- ADC Formuala
    - Dout = Vin / Step Size
    - Dout = Vin / (Vref / steps)
    - e.g. Vin = 1 V, Then Digital Reading = 1 / 0.01 = 100

STM32 ADC

- The 12-bit ADC is a successive approximation analog-to-digital converter.
    - 12-bit, 10-bit, 8-bit or 6-bit configurable resolution
- ADC1, ADC2, ADC3.
- ADC conversion modes
- single - Single conversion at a time.
    - Start ADC, Wait for conversion, Get reading, Stop ADC.
    - Slow applications (NO time critical reading)
    - Can use interrupt – ADC conversion completion.
- continuous – Convert at highest possible speed (as per Prescalar setting).
    - Start ADC, Keep getting readings (loop), Stop ADC
    - Also called as BURST mode.
    - Can use interrupt – ADC conversion completion.
- scan – Reading from multiple channels (multiple sensor)
    - Get readings from individual sensors.

- ADC input range: VREF– fi VIN fi VREF+
- Conversion rate: 2.4M samples per sec (max)
- ADC Clock
    - Full speed (2.4 V to 3.6 V) –> 0.6 MHz to 36 MHz