# ADC FUNDAMENTALS

INTRODUCTION

➢ Arduino Uno board has 6 channel 10-bit Analog to digital Converter (ADC).

➢ It will map the i/p voltage b/w (0 to 5 Volts) into integer values b/w (0 to 1023).

➢ Resolution of ADC is (5/1023) = 4.9mV per unit

➢ Arduino uno board ADC channels are labeled from A0 to A5.

➢ ADC of ATMega328P is based on Successive Approximation ADC principle.

Arduino Analog Channels
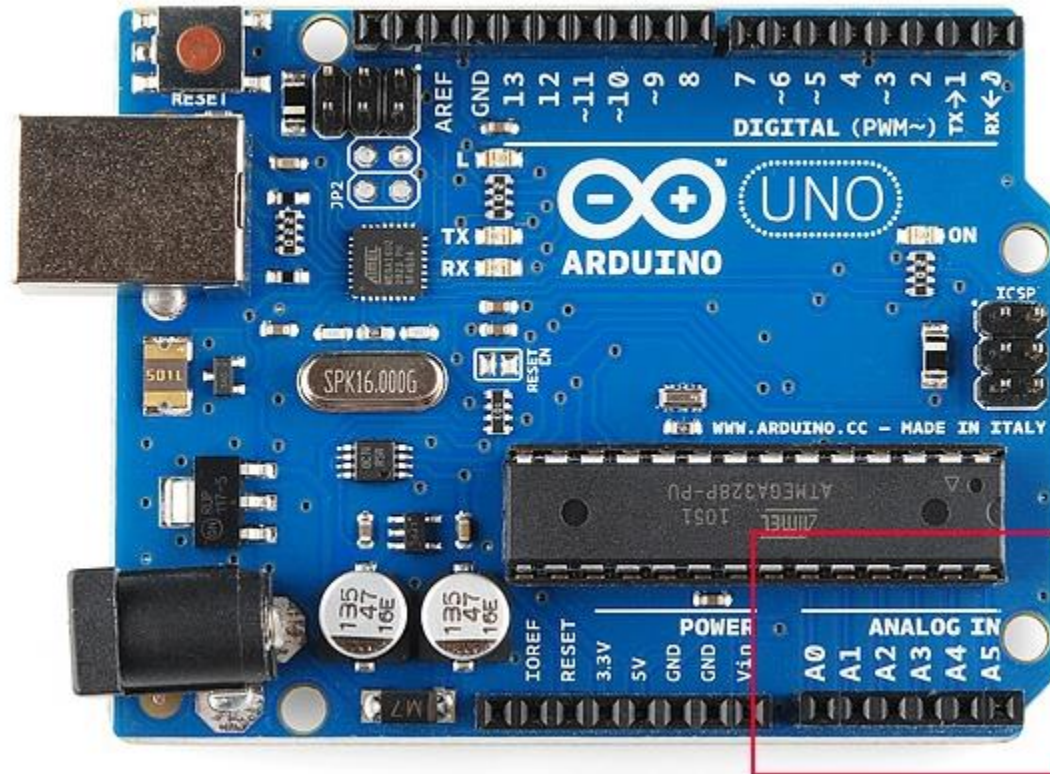
RESOLUTION OF ADC?

➢The ADC on the Arduino is a 10-bit ADC meaning it has the ability to detect 1,024 (2^{10}) discrete analog levels.

➢Some microcontrollers have 8-bit ADCs (2^8 = 256 discrete levels) and some have 16-bit ADCs (2^{16} = 65,535 discrete levels).
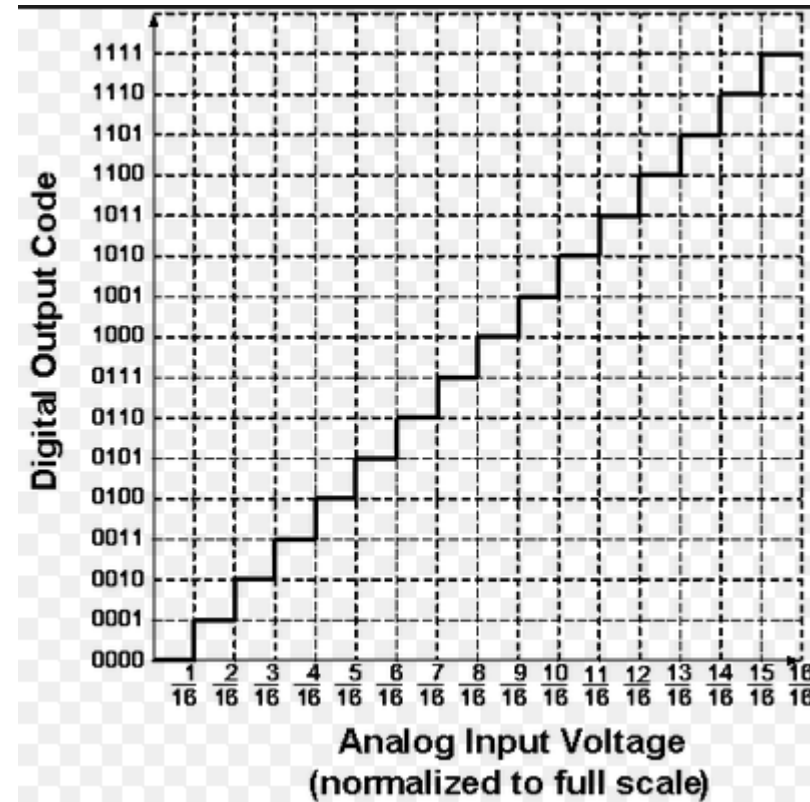
analogRead( ) Function

➢Reads the value from the specified analog pin. It will map input voltages between 0 and 5 volts into integer values between 0 and 1023.

➢It takes about 100 microseconds (0.0001 s) to read an analog input, so the maximum reading rate is about 10,000 times a second.

Syntax

analogRead(pin)

Parameters

pin: the number of the analog input pin to read from (0 to 5 on most boards, 0 to 7 on the Mini and Nano, 0 to 15 on the Mega)

Returns

int (0 to 1023)

CODING CONCEPT

➢ADC reports a ratiometric value. For analog voltage of 5 volt the integer o/p value is 1023 and anything less than 5 volt will be a ratio b/w 5V and 1023.

$$\frac{Resolution\ of\ the\ ADC}{System\ Voltage} = \frac{ADC\ Reading}{Analog\ Voltage\ Measured}$$

$$\frac{1023}{5} = \frac{ADC\ Reading}{Analog\ Voltage\ Measured}$$

Example

If analog voltage is 2.12V then ADC value will be?

$$\frac{1023}{5.00V} = \frac{x}{2.12V}$$

$$\frac{1023}{5.00V} * 2.12V = x$$

$$x = 434$$