



ETA® International Common Formulas

For use on all Basic Electronics Exams – Associate CET (CETa), Basic Systems Technician (BST), Electronics Modules (EM1-5), Student Electronics Technician (SET) as well as the General Communications Technician-Level 1 (GCT1) Exam

Conversion Factors

π (Pi) = 3.14	1 meter = 3.28 feet
2π = 6.28	1 inch = 2.54 centimeters
$\log \pi$ = 0.497	1 radian = 57.3°

Resonant Frequency Formulas

Where f is in kHz, L is in microhenries, C is in microfarads

$$f_{\text{kHz}} = 159.2 / \sqrt{LC}$$

Where f is in Hz, L is in Henries, C is in Farads

$$f_{\text{resonant}} = \frac{1}{2\pi\sqrt{LC}}$$

Frequency & Wavelength Formulas f = frequency, λ = wavelength

$0.5\lambda = 180^\circ$ = half wave and $0.25\lambda = 90^\circ$ = quarter wave

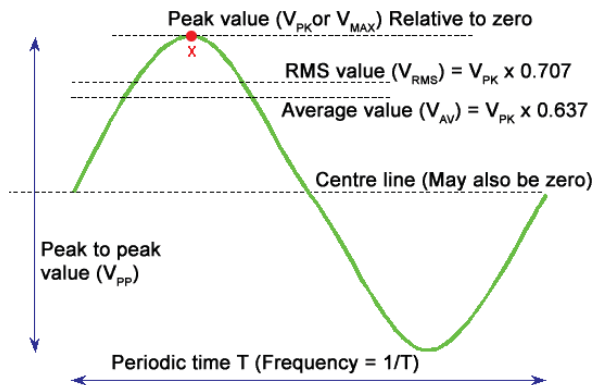
$$f_{\text{kHz}} = (3 \times 10^8) / \lambda_{\text{meters}} \quad \text{or} \quad f_{\text{MHz}} = 984 / \lambda_{\text{feet}}$$

$$\lambda_{\text{meters}} = (3 \times 10^8) / f_{\text{kHz}} \quad \text{or} \quad \lambda_{\text{feet}} = 984 / f_{\text{MHz}}$$

$c = f \times \lambda$ where c is the speed of light

Sine Wave Conversion

- Effective value (RMS) = $0.707 \times \text{Peak Value} = 1.11 \times \text{Average Value}$
- Peak Value = $1.414 \times \text{Effective Value (RMS)} = 1.57 \times \text{Average Value}$
- Average Value over positive half period = $0.637 \times \text{Peak Value} = 0.9 \times \text{Effective Value (RMS)}$
- Identify: Waveform, Peak (amplitude), RMS, 1 cycle over time period (frequency), Peak to peak, and practical average



Voltage Gain In Decibels

$$\text{Gain dB} = 20 \log (V_{\text{out}} / V_{\text{in}})$$

Ratio Of 2 Power Levels In Decibels

$$\text{Gain dB} = 10 \log_{10} (P_2 / P_1)$$

Resistors In Series

$$R = R_1 + R_2 + R_3 \dots$$

Resistors In Parallel

$$1/R = (1/R_1) + (1/R_2) + (1/R_3) \dots$$

Inductors Connected In Series

$$L = L_1 + L_2 + L_3 \dots$$

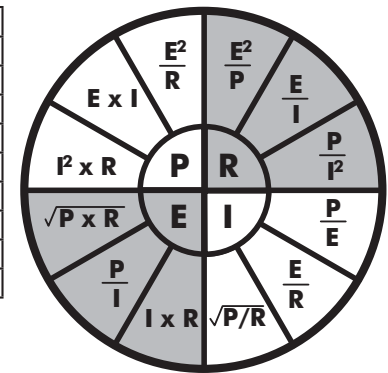
Inductors Connected In Parallel

$$1/L = (1/L_1) + (1/L_2) + (1/L_3) \dots$$

International System of Units (SI)

Prefix	Symbol	Multiplier	Power of Ten
Terra	T	trillion	10^{12}
Giga	G	billion	10^9
Mega	M	million	10^6
kilo	k	thousand	10^3
none	none	1	10^0
milli	m	1/thousandth	10^{-3}
micro	μ	1/millionth	10^{-6}
nano	n	1/billionth	10^{-9}
pico	p	1/trillionth	10^{-12}

Ohm's Law



E = Voltage **I = Current**
P = Power **R = Resistance**

PEMDAS Rule

Parentheses, Exponents, Multiplication, Division, Add, Subtract

Reactance Of Inductors

Where X_L is reactance, f is frequency, and L is inductance

$$X_L = 2 \times \pi \times f \times L$$

Time Constants

T (Greek Tau), R (ohms), C (Farads), L (Henries)

RL circuit: $1 T (\text{sec}) = L(H) / R(\Omega)$

RC circuit: $1 T (\text{sec}) = R(\Omega) \times C(F)$

Compute Charge Or Quantity of Electricity

where Q is the charge (in Coulombs), C is the capacitance (in Farads), and V is the potential difference (in Volts)

$$Q = C \times V$$

Energy Storage In A Capacitor

where W is the energy (in Joules), C is the capacitance (in Farads), and V is the potential difference (in Volts)

$$W = \frac{1}{2} C \times V^2$$

Capacitors Connected In Parallel

$$C = C_1 + C_2 + C_3 + \dots$$

Capacitors Connected In Series

$$1/C = (1/C_1) + (1/C_2) + (1/C_3) + \dots$$

Reactance Of Capacitors

$$X_C = 1 / (2 \times \pi \times f \times C)$$

Impedance For A Series Circuit

where Z is impedance

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

Impedance For R And X In Parallel

$$Z = \frac{RX}{\sqrt{R^2 + X^2}}$$

Battery Internal Resistance

$$V_{\text{out}} = \text{EMF} - (R_{\text{int}} \times I_{\text{out}})$$