Note: This formula sheet is provided as a resource. The sheet may not include all necessary formulas and may contain formulas not required for this exam. Apprentices must apply the formulas to demonstrate their understanding.

Powerline Technician (2025) – Level 1 - 3 Formula Sheet

Measurement Unit Abbreviations	
A	adjacent
C	capacitor/capacitance
E	voltage
f	frequency
H	height
H	hypotenuse
I	current
KVA	kilo-volt amperes
L	inductor/inductance
L	length
O	opposite
P	power
pp	pole pairs
R	resistor/resistance
rpm	revolutions per minute
X	reactance
Z	impedance

Constants

π	3.14

Formulas

#	Description	Full Formula	Abbreviated
1.	Compressive force	tension x $\frac{\text{height}}{\text{length}}$	

2.	Conductor tension	$\frac{\text{conductor weight x span}^2}{8 \text{ x sag}}$	
3.	Conductor weight	$\frac{\text{span A + span B}}{2}$ x weight per unit	
4.	kVA	$\frac{(V1 \text{ x } I1) + (V2 \text{ x } I2)}{1\,000}$	
5.	Pull	$\frac{\text{weight + (10\% weight x \# of sheaves)}}{MA}$	
6.	Ratio	$\frac{\text{primary voltage}}{\text{secondary voltage}}$	
7.	Ruling span	average span + $\frac{2}{3}$ (maximum span – average span)	
8.	WYE phase-to-phase voltage	phase-to-ground voltage x 1.73	
9.	Voltage root-mean-square		VRMS = Voltmax x 0.707
10.	Effective value		IRMS = Imax x 0.707
11.	Voltage	resistance x current	E = R x I
	Voltage	$\frac{\text{power}}{\text{current}}$	$E = \frac{P}{I}$
	Voltage	$\sqrt{\text{power x current}}$	$E = \sqrt{P \text{ x } I}$
12.	Inductors in parallel	$\frac{1}{\frac{1}{\text{inductor}_1} + \frac{1}{\text{inductor}_2} + \frac{1}{\text{inductor}_3} + \ldots}$	$L_T = \frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \ldots}$
13.	Resistance	$\frac{\text{voltage}}{\text{current}}$	$R = \frac{E}{I}$
	Resistance	$\frac{\text{voltage}^2}{\text{power}}$	$R = \frac{E^2}{P}$

	Resistance	$\frac{\text{power}}{\text{current}^2}$	$R = \frac{P}{I^2}$
14.	Resistors in parallel	$\frac{1}{\frac{1}{\text{resistor}_1} + \frac{1}{\text{resistor}_2} + \frac{1}{\text{resistor}_3} + \ldots}$	$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots}$
15.	Resistors in series	$\text{resistor}_1 + \text{resistor}_2 + \text{resistor}_3, + \ldots$	$R_T = R_1 + R_2 + R_3 + \ldots$
16.	Cos Θ	$\frac{\text{opposite}}{\text{hypotenuse}}$	$C = \frac{A}{H}$
17.	Total current	$\frac{\text{voltage}}{\text{resistance}}$	$I_T = \frac{E}{R}$
18.	Resistors in parallel		$\frac{R_1 \times R_2}{R_1 + R_2}$
19.	Sin Θ	$\frac{\text{opposite}}{\text{hypotenuse}}$	$S = \frac{O}{H}$
20.	Tan Θ	$\frac{\text{opposite}}{\text{adjacent}}$	$T = \frac{O}{A}$
21.	Neutral conductor current	$\text{line current}_1 - \text{line current}_2$	$I_N = I_{L1} - I_{L2}$
22.	Current	$\sqrt{\frac{\text{power}}{\text{resistance}}}$	$I = \sqrt{\frac{P}{R}}$
	Current	$\frac{\text{power}}{\text{voltage}}$	$I = \frac{P}{E}$
	Current	$\frac{\text{voltage}}{\text{resistance}}$	$I = \frac{E}{R}$
23.	Total voltage in series	$\text{voltage}_1 + \text{voltage}_2 + \text{voltage}_3, + \ldots$	$E_T = E_1 + E_2 + E_3 + \ldots$

24.	Frequency	$\frac{\text{revolutions per minute x pole pairs}}{60}$	$F = \frac{rpm \times pp}{60}$
25.	Total current	$current_1 + current_2 + current_3 + \ldots$	$I_T = I_1 + I_2 + I_3 + \ldots$
26.	Power	voltage x current	$P = E \times I$
	Power	resistance x $current^2$	$P = R \times I^2$
	Power	$\frac{voltage^2}{resistance}$	$P = \frac{E^2}{R}$
27.	Capacitors in series	$\frac{1}{\frac{1}{capacitor_1} + \frac{1}{capacitor_2} + \frac{1}{capacitor_3} + \ldots}$	$C_T = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots}$
28.	Capacitors in parallel	$capacitor_1 + capacitor_2 + capacitor_3, + \ldots$	$C_T = C_1 + C_2 + C_3 + \ldots$
29.	Instantaneous voltage		$V_{inst} = V_{MAX} \times \text{Sin } \Theta$ $E_{inst} = E_{PEAK} \times \text{Sin } 65°$ $E_{inst} = E_{PEAK} \times \text{Sin } \Theta$
30.	Guy tension	$\frac{\text{line tension}}{\text{anchor distance}}$ x guy length	
31.	Guy length	$\sqrt{Length^2 + height^2}$	Guy length = $\sqrt{L^2 + H^2}$
32.	Guy tension	$\frac{\text{line tension x } \sqrt{length^2 + height^2}}{\text{length}}$	Guy Tension = $\frac{\text{Line Tension} \times \sqrt{L^2+H^2}}{L}$
33.	Inductive reactance	2 x 3.14 x frequency x inductance	$X_L = 2\pi fL$
34.	Power factor	$\frac{\text{true power}}{\text{apparent power}}$	$PF = \frac{P}{VA}$

35.	Inductors in series	$inductor_1 + inductor_2 + inductor_3, + \ldots$	$L_T = L_1 + L_2 + L_3 + \ldots$
36.	Capacitive reactance	$\frac{1}{2 \times \pi \times \text{frequency} \times \text{capacitance}}$	$X_C = \frac{1}{2\pi fc}$
37.	Total impedance of a series circuit	$\sqrt{\text{resistance}^2 + (\text{inductive reactance} - \text{capacitive reactance})^2}$	$Z = \sqrt{R^2 + (X_L - X_C)^2}$
38.	Pythagorean theorem		$a^2 + b^2 = c^2$
39.	Power factor	cos theta	$PF = \cos \Theta$
40.	Turn ratio	$\frac{\text{number of primary turns}}{\text{number of secondary turns}} =$ $\frac{\text{primary voltage}}{\text{secondary voltage}} =$ $\frac{\text{current in the secondary}}{\text{current in the primary}}$	$\frac{N_p}{N_s} = \frac{E_p}{E_s} = \frac{I_s}{I_p}$
41.	Replacement rating		$\frac{\text{KVA}}{\text{KV primary}} \times 1\frac{1}{2}$
42.	Total voltage		$E_T = \sqrt{E_R{}^2 + E_L{}^2}$
43.	Impedance in series		$Z = \sqrt{R^2 + X_C{}^2}$
44.	Capacitive reactance in series		$X_{CT} = X_{C1} + X_{C2} + X_{C3}$
45.	RLC parallel circuits (Impedance)	$\frac{1}{\sqrt{\left(\frac{1}{\text{resistance}}\right)^2 + \left(\frac{1}{\text{inductive reactance}} - \frac{1}{\text{capacitive reactance}}\right)^2}}$	$Z = \frac{1}{\sqrt{\left(\frac{1}{R}\right)^2 + \left(\frac{1}{X_L} - \frac{1}{X_C}\right)^2}}$

46.	Total current	$\sqrt{\text{resistive current}^2 + (\text{inductive current} - \text{capacitive current})^2}$	$IT = \sqrt{I_R^2 + (I_L - I_C)^2}$
47.	Power factor	$\frac{\text{resistance}}{\text{impedance}}$	$PF = \frac{R}{Z}$
48.	Power factor		$PF = \frac{I_R}{I_T}$
49.	Volt-ampere	voltage x current	VA = E x I