Journeyman Practical Handout

The Practical exam for Journeyman electrical consists of the following subsections. The wiring portions of the exam require every wire to be correctly terminated, or NO credit will be given.

Remember to make all your connctions as secure as possible, using the equipment given by the testing facility.

!!! The diagrams given in this handout will NOT be provided for the exam, for study purposes only do NOT take into Test Site !!!

Test	%Points	Grading Scale
Simple Conduit Bending	10 Points	Pass/Fail only
Complex Conduit Bending	10 Points	Pass/Fail only
Transfomers	10 Points	Pass/Fail only
Multiple Light Switches	10 Points	Pass/Fail only
Multiple Receptacles	10 Points	Pass/Fail only
Motor Controll hookup	10 Points	Pass/Fail only
Start/Stop Station	10 Points	Pass/Fail only

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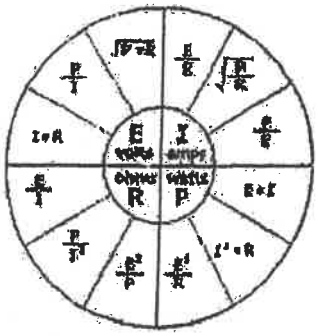
Common Equations:



Power (3Ø) = E(I)($\sqrt{3}$)

Vd (3Ø) = [$\sqrt{3}$ (K)(L)(I)]/CM

Vd = Voltage drop on the conductor

I = Current draw

L = Length of the conductor (between source and the load

K = 12.9 for copper (21.2 for aluminum)

CM = Circular Mils (found in NEC Chp. 9 Tbl. 8)

L = (Vd x CM)/(2 x K x I) use to solve for the max length between source and load

1 HP = 746 Watts

Power = E(I) (consumed) Power = E(I)(PF) Power Factor (PF) = [Watts]/[V(I)($\sqrt{3}$)(eff)] (if 3Ø)

PF = [OUTPUT POWER]/[INPUT POWER] = W/VA = REAL/APPARENT

Total Resistance in Series = Rt = R1 + R2 + R3 +R...

Total Resistance in Parallel = Rt = [R1R2]/[R1 + R2] (only 2 resistors)

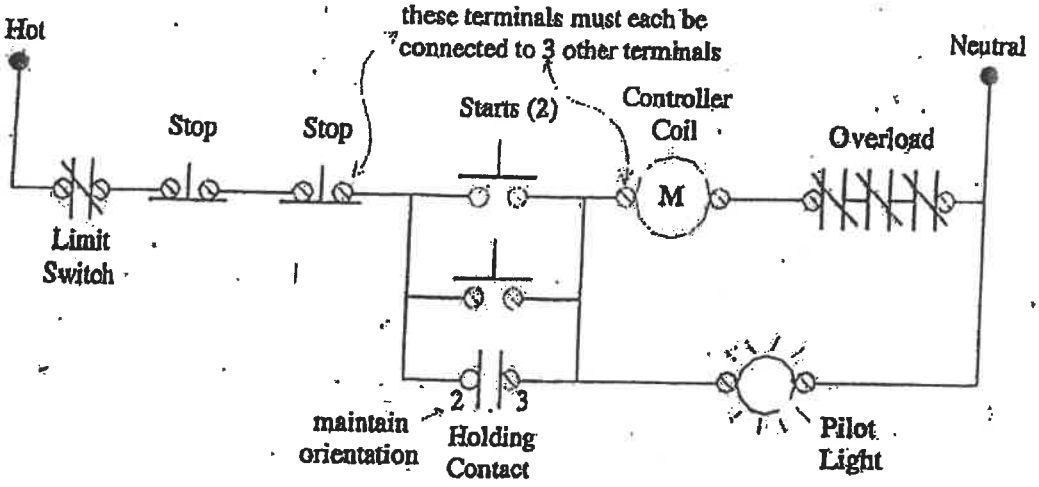
1/RT = [1]/[R1 + R2 + R3 + 1/R...] (for more than 2 resistors)

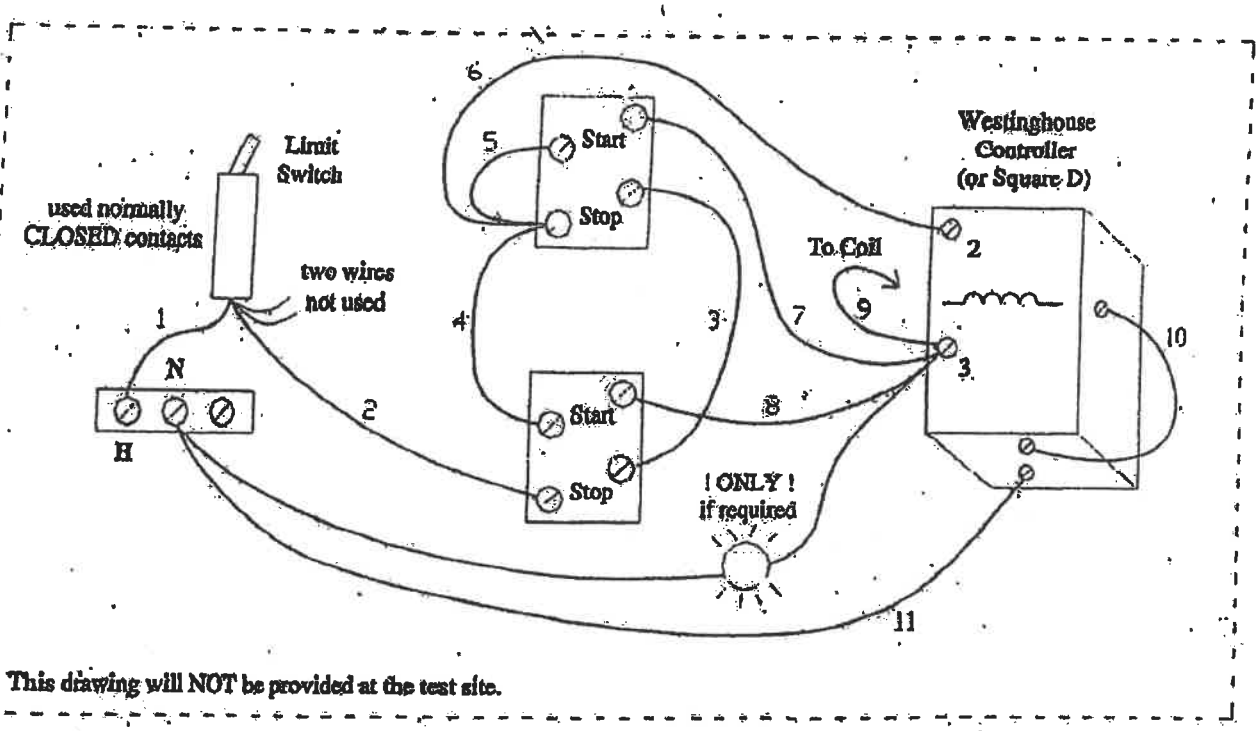
Frequency of T.V. = 6 MHz

Conduit Bend Multipliers 10° = 5.76, 15° = 3.86, 22-1/2° = 2.61, 30° = 2.0, 45° = 1.41

Motor Controller

Versions #1

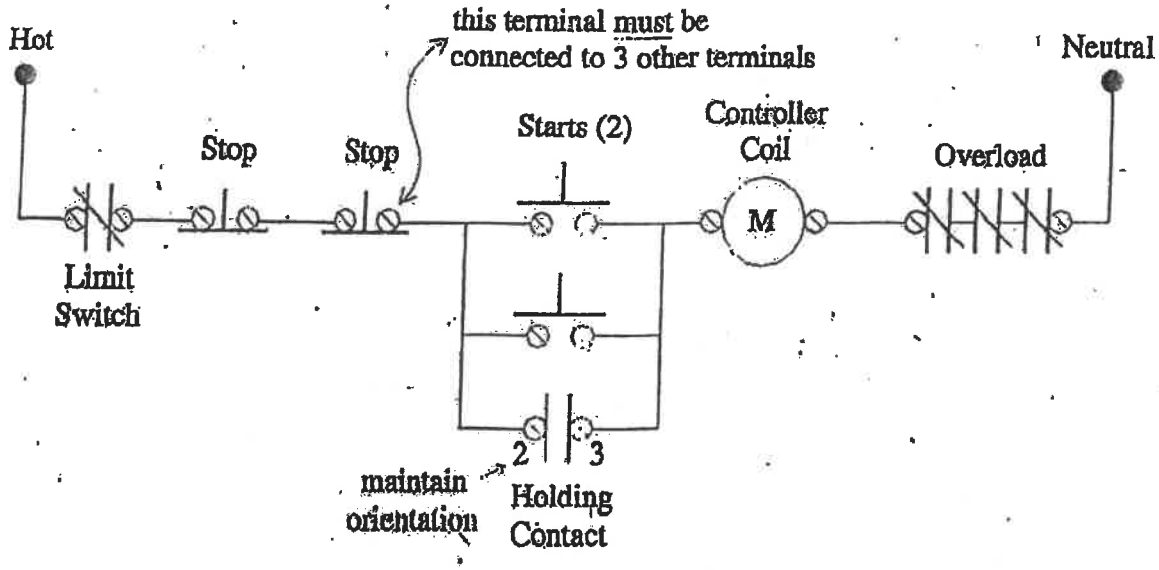




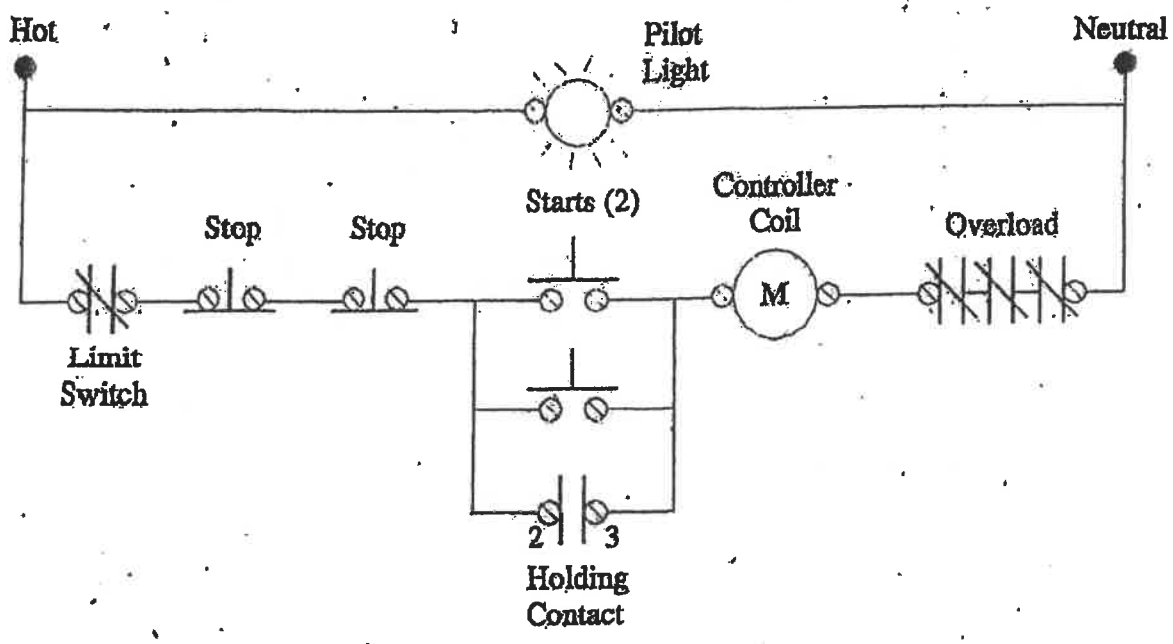
This drawing will NOT be provided at the test site.

Motor Controller

Versions #2



Versions #3



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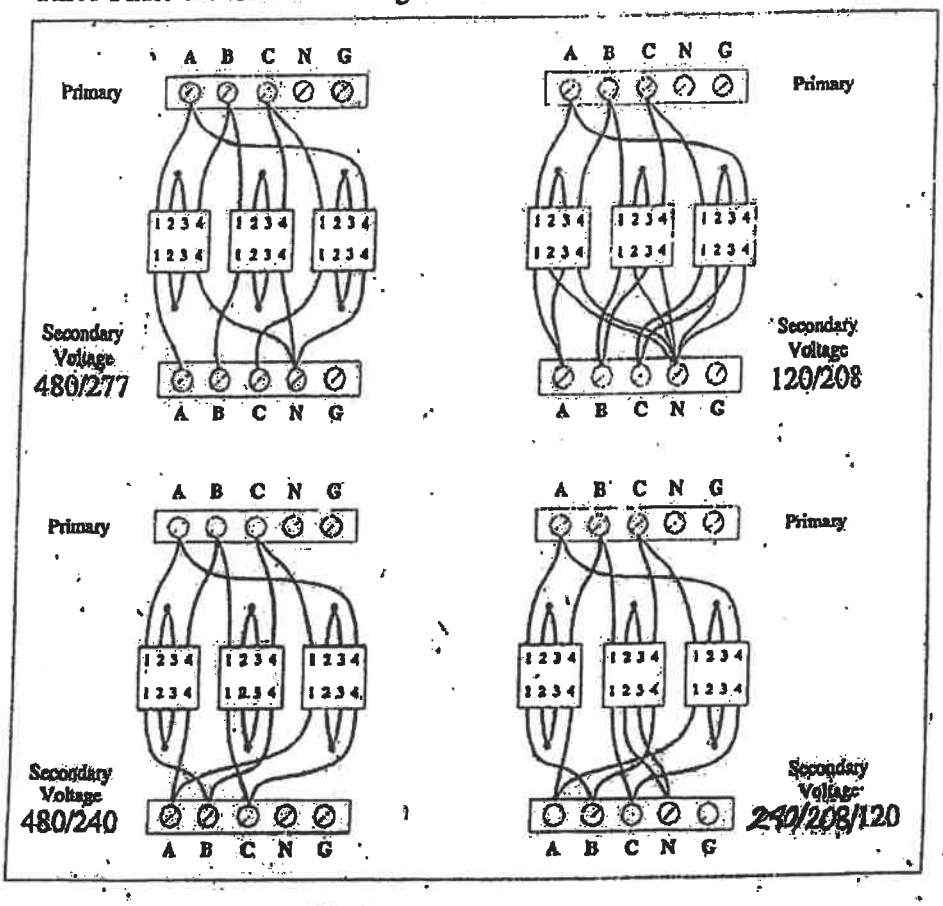
Do NOT use additional jumpers for this project !!

Three-Phase Transformer Configurations



$120v \times 1.73 = 208V$

$277 \times 1.73 = 480V$

Line

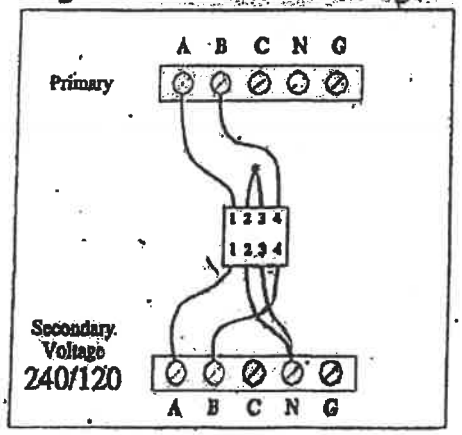
$Y = V_{winding} \times 1.73$

of $V_{winding} = V_L / 1.73$

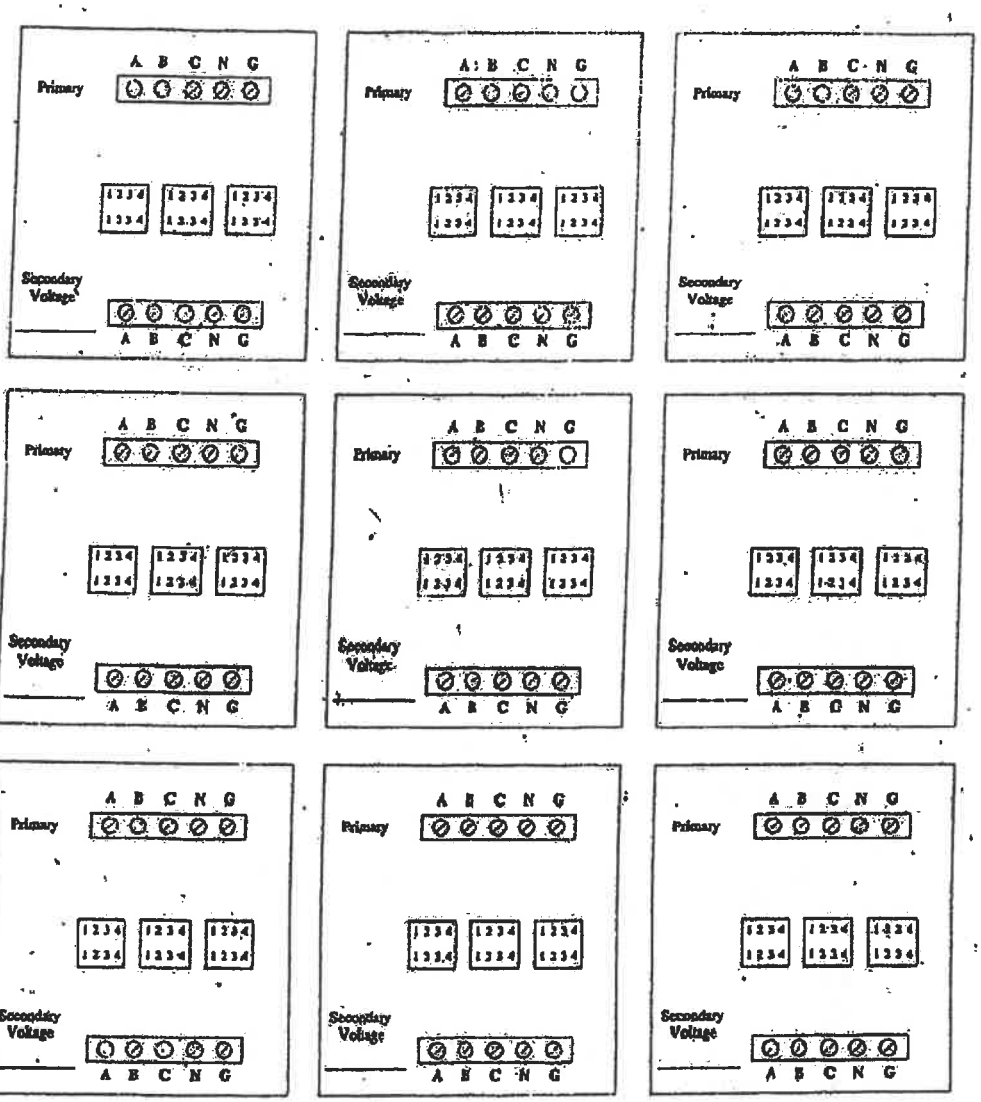
$\frac{480V}{1.73} = 277V$ winding

$\frac{208V}{1.73} = 120V$

Single-Phase Transformer Configurations



Transformer Project
Practice Drawing Each Conductor For Each Secondary Voltage



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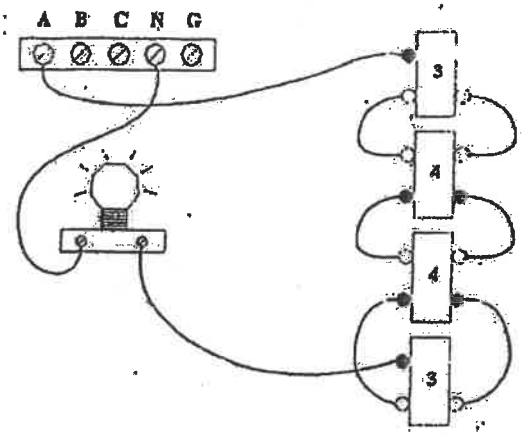
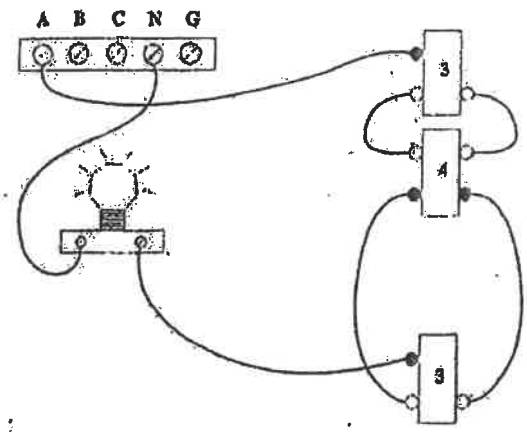
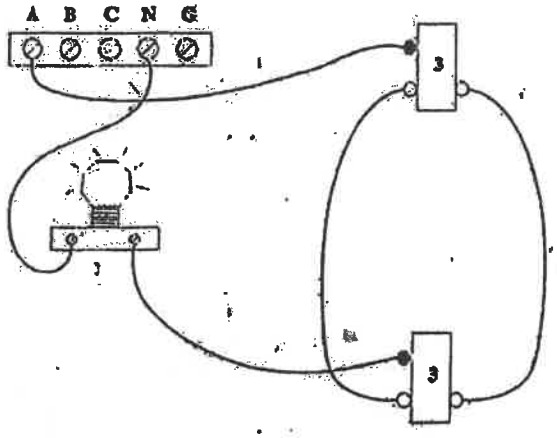




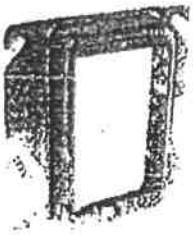


Note that the question will state in words (no diagram) to hook up a light to be controlled from either two, three, or four locations.

A

B

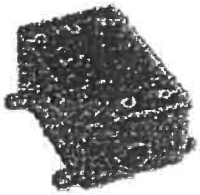
C



D

E

F



G

H

I

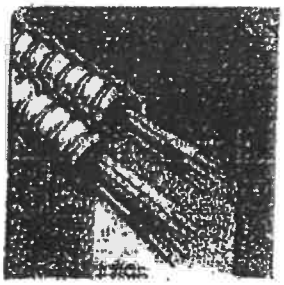
J

K

L

M

N

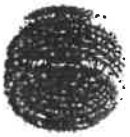


O

P

Q

R

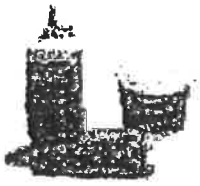


S

T

U

V



W

X

Y

Z

CLOSED BOOK

Transformer has a primary voltage of 460 at 120 amps and a secondary current of 240 amps. The secondary voltage of this transformer is how many volts?

Primary = 460V ; 120A Secondary = 240A

(V1)(I1) = (V2)(I2)
(460V)(120A) = (V2)(240A)
230 = V2

A dwelling has a 120/240 volt single-phase service with a balanced net computed load of 28 KVA. At full load, what would be the measured current in each ungrounded conductor?

28 KVA = 28,000W
P = (I)(E)
28,000W = (240V)(I)
117A = I

The identification of terminals on a duplex receptacle to which a grounded conductor is to be connected must be substantially what color? WHITE

The light output of an incandescent lamp is expressed in LUMENS.

Classify a security fire alarm system if current flows continuously, except when the circuit is open to allow a signal to be sent. CLOSED

One 30 amp, single-pole, 230 volt branch circuit supplies only fixed electric space heaters. If the power, including derating, required by the N.E.C. for each heater is 1250 watts, what is the maximum number of heaters this branch circuit may supply?

P = (I)(E)
P =(30A)(230V)
P = 6900W

6900W/1250W = 5

Switch S1 is in the on position, but light L does not come on. Voltage across S1 is measured to be 120V. Voltage across L1 is measured to be 0V. The light does not come on because: THE LAMP IS GOOD BUT THE SWITCH DOES NOT MAKE CONTACT

What is the calculated current through a 15 KW heater operating at 240V?

15 KW = 15,000W

P = (I)(E)
15,000W = (240V)(I)

What effect would a large motor load have on available short circuit current during a fault condition? THE LOAD WOULD INCREASE THE AVAILABLE SHORT CIRCUIT CURRENT

Two resistors R1 and R2 are connected in parallel. R1 = 6 ohms and R2 = 3 ohms. What is the combined total resistance?

(R1)(R2)/(R1+R2)
(6)(3)/6+3 = 2 ohms

OR

1/ 1/R1 + 1/R2
1/ 1/6 + 1/3 = 2 ohms

The transformer secondary supplies 120/240V, 60 hertz, single-phase power. All loads are 120V. Line one to neutral is 5,760 VA. Line two to neutral is 3,720 VA. What is the current in the neutral?

5,760 VA/120V – 3,720VA/120V
48 – 31 = 17A

The voltage drop in a conductor may be lowered by reducing its length or increasing its DIAMETER.

If a size 18 AWG conductor has a resistance of 7.95 ohms per 1,000 ft. What is the total resistance of 350 ft of the conductor?

7.95/1,000 = x/350
2.7825 = x

A length of coax used for data is terminated at one end with a 50 ohm terminator. The resistance between the shield and the center conductor at the other end of the cable is 0 ohms. This indicated the cable continuity is SHORTED.

A 1,000W, 120V lamp uses electrical energy at the same rate as what resistor?

I = P/E
I = 1,000W/120V
I = 8.333A

R = P/I
R = 1,000W/8.333A
R = 14.4 ohms

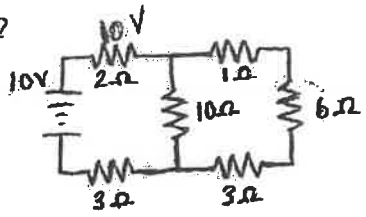
The cross section area of a conductor is increased by 4 times. What is the resistance decrease in the new conductor? ¼

A single length of #14 copper conductor in a control circuit has a voltage drop of 3V. An additional #14 copper conductor of the same length and material is than connected in parallel. What is the total voltage drop on both? 3 VOLTS (voltage stays the same in parallel)

What is the potential difference between two conductors? VOLTAGE

A ½" EMT conduit is to have a 15" high (end to back) stub. At what measurement do you set the star on the bender? 15"-5" = 10"

What is the current in the 2 ohm resistor?



I = E/R
I = 10v/2ohm
I = 5.0A

What does the symbol S3 mean in a drawing? 3-WAY SWITCH

Ohms law states that the current is inversely proportional to the RESISTANCE. (I = E/R)

A 240V source has a 20A load. What is the KVA of the circuit?

(240V)(20A)/KVA or 1,000 = 4.80

Eight equal resistors are connected in series to a 48V source. What is the voltage drop across each resistor?

48/8 = 6V

What is the formula to determine the current in a circuit when the voltage and the resistance are known?

I = E/R

Two lamps are connected in parallel to a 120V source. The current though each lamp is 0.62A. What is the total power consumed in this circuit?

P = (I)(E)
P = (120V)(0.62A)
P = 74.4W

(74.4W)(2 lamps)
148.80W

Six equal resistors are connected in series to a 24V source. What is the voltage drop across each resistor?

24/6 = 4V

What is the classification for a low voltage electrical system which current flows through continuously, except when the circuit is opened to allow a signal to be sent? CLOSED

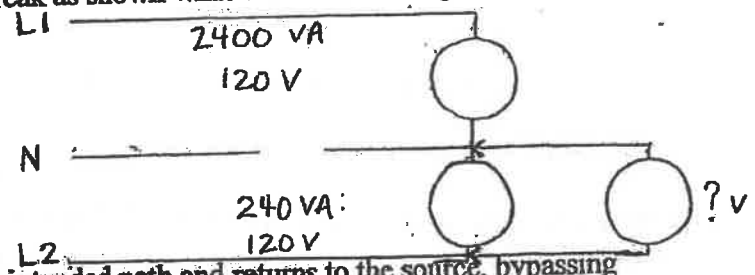
A resistive load supplied by spliced conductors draws 40A. One bad splice is found to have a measured resistance of 0.1 ohms. How much power is lost at this splice?

P = (I)(R)
P = (40) (.1)
P = 160W

An electrical installation requires a total of 200 ft of conductor with a maximum line resistance of 0.5 ohms. What is the maximum resistance allowable for this conductor?

X/1,000 = 0.5/200
X = 2.5 ohms

If the neutral conductor develops a break as shown what will be the voltage imposed on the 240VA rated load? 218.40V



When the electrical current leaves its intended path and returns to the source, bypassing the load, the current is SHORTED.

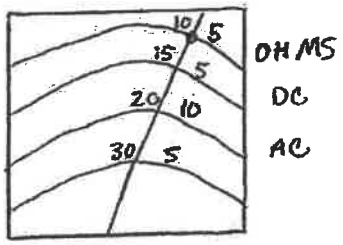
A three-phase squirrel cage motor supplied by a three wire circuit runs counter clockwise by: REVERSING THE CONNECTION OF ANY TWO WIRES

Given the following electrical load: 2,000W, 120V, 85% PF. What is the current draw by this load?

(120V)(.85)
102V

I = P/E
I = 2,000W/120V
I = 19.6A

The switches on the multimeter are set to Rx1. This meter indicates a reading of: 7.0 OHMS



The output VA of a transformer is 100VA. The transformer efficiency is 90%. What is the transformer input?

100VA/0.9 = 110W

When changing a percent value to a decimal or whole number, simply move the decimal point two places to the LEFT.

The decimal equivalent of 75% is: .75

The decimal equivalent of 225% is: 2.25

The decimal equivalent of 300% is: 3

How many devices are allowed in a branch circuit, per N.M. Code? 8

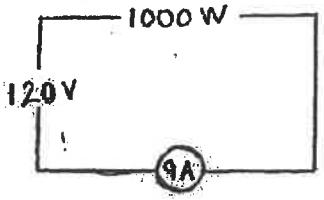
When is knob and tube wiring permitted? ONLY WITH SPECIAL WRITTEN PERMISSION

Identify the ground or grounding conductor? GREEN or BARE

What is the basic unit of measure for inductance? HENRY

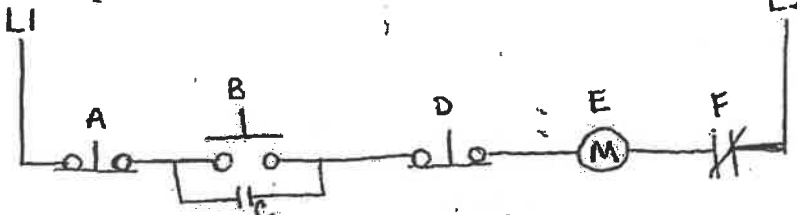
What is your power factor when you have 120V, 1,000W, and 9A?

PF = OUT/IN
= 1,000/(120)(9)
= .9259 or 92.6

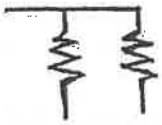


When installing a rigid pipe for a service mast what trade size conduit must be used? 2"

Which point in this diagram indicates the holding contacts? C

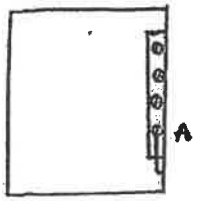


What type of circuit is this? PARALLEL

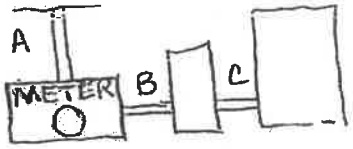


Which low voltage classification is assigned to a remote control safety control equipment circuit failure of the EQ. introduces fire or life hazard? CLASS 1

Which wire is the main bonding jumper?



Which pipe is the service entrance pipe? B



Flat cable is permitted only as follows: THE RATING OF THE BRANCH CIRCUIT SHALL NOT EXCEED 30 AMPS

What is the sole purpose of the green grounding screw in a box?

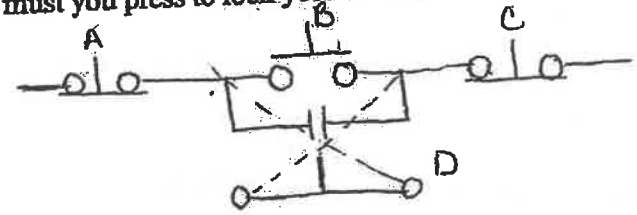
A ground electrode shall be installed at least 8" in contact with the soil.

What is the smallest fixture wire allowable? 18 AWG

If you want to decrease, you increase. (increase like when you build a capacitor bank)

¼" of air space is needed

Which button must you press to lock your contact even after you have released the button? B



CURRENT stays the same in SERIES.
VOLTAGE stays the same in PARALLEL

3-phase induction motor with 9 leads is: A DUAL VOLTAGE MOTOR

Total opposition to current flow is IMPEDANCE.

AVAILABLE SHORT CIRCUIT: the maximum amount of a circuit current present if a zero "short circuit" occurs. (A large motor will increase the available short circuit)

A THERMOCOUPLING will transform heat into electrical energy.

On a transformer, the capital letter H stands for HIGH VOLTAGE.

More turns without changing will cause the coils of a magnetic field to INCREASE.

Ampacity of #14 AWG: 17A

Open book test

Voltage Drop Formula 3phase VD= $\frac{(EX1.73) \times 12.9 \times I \times L}{CM \text{ of conductor}}$

230.71 Maximum Number of Disconnects

230.95(A) Setting

240.6 Fuse Sizes

241.21(B)(1)&(2)

250.52(A)(3) concrete encased Electrode.

250.52(A)(4) Ground Ring (20ft not smaller than 2awg

250.66 & 250.122

T300.5 Direct burial requirements

300.5(D)(1) Emerging from grade

314.16 memorize how to calculate box fill

And T314.16 (A)

314.28(A) 1&2 Straight, Angle and U pulls

368.17(B) EX

430.22(A) Single Motor

430.24 Several Motors

430.81(A) (Disconnecting means shall be permitted to serve as the controller.

450.24 Nonflammable fluid insulated transformers 35000 volts in a vault

Know class 1 2 and 3 locations

504.70 Sealing

590.4(B) Feeders for Temp Installation type NM and NMC shall be permitted

620 question on lighting in elevators (how many cars can be suppiled by 1 circuit. I think it's only one)

680.22 swimming pools etc