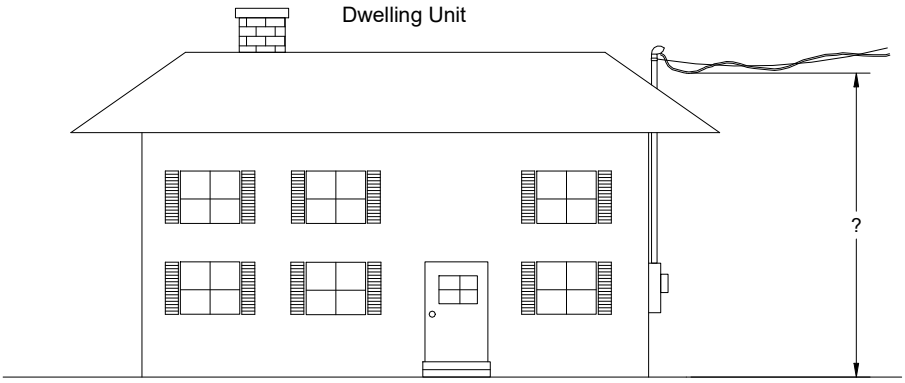
NAME:_____ DATE:_____
(Please Print)

RESIDENTIAL PRACTICE EXAM

THE USE OF THE 2020 N.E.C. BOOK IS PERMITTED
(Formulas and Worksheets on back pages)

The following questions are worth one point each.



1. Based on the drawing above, what is the minimum number of exterior outlets required, assuming no balconies, decks or porches?

   A. 1
   B. 2
   C. 3
   D. 4

   210.52(E)(1)

   Answer B

2. Based on the drawing above, what is the minimum size service for this dwelling.

   A. 100 Amp, 120 Volt
   B. 200 Amp, 120 Volt
   C. 100 Amp, 240 Volt
   D. 200 Amp, 240 Volt

   230.79(C)

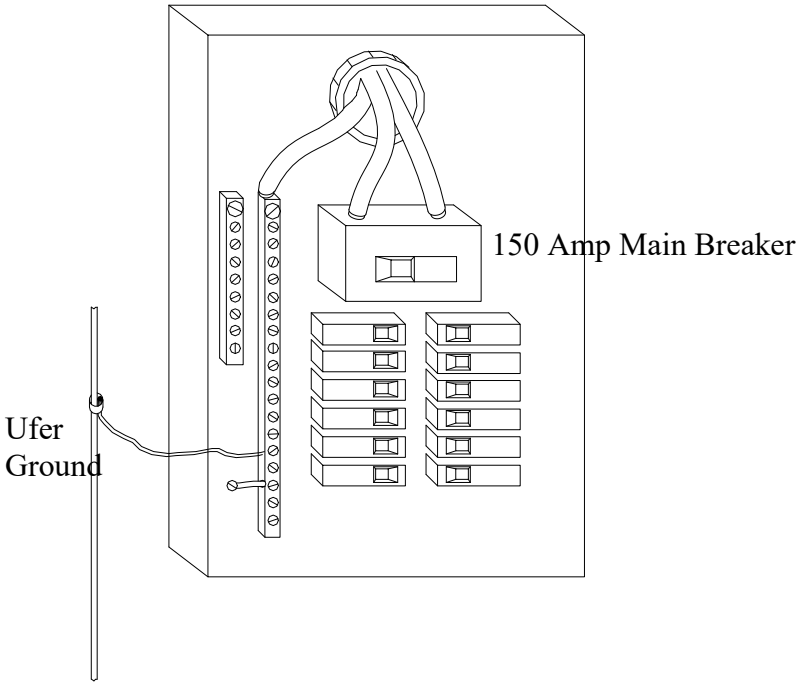
   Answer C

3. Rigid nonmetallic PVC conduit is installed underground, in the back lawn, as a raceway between a dwelling and a shed. Three 10 AWG Type THW insulated conductors and a bare 10 AWG equipment ground are pulled into the raceway. The circuit is protected by a 30 amp GFCI circuit breaker. What is the minimum burial depth permitted for the raceway?

   A. 150 mm
   B. 12 inches
   C. 450 mm
   D. 24 inches

   Table 300.5
   Column 3

   Answer C



4. Based on the drawing above, what is the ***minimum*** size ungrounded (hot) service wire required?

A. 1 Copper
B. 3 Copper
C. 4 Copper
D. 4/0 Aluminum

310.12(A)
Table 310.12

Answer A

5. Based on the drawing above, what ***minimum*** size main grounding electrode conductor is required to be run to a Concrete Encased Electrode (UFER Ground)?

A. #6 THHN Copper
B. #4 THWN Copper
C. #2 Bare Copper
D. #1/0 Bare Aluminum

250.66 (B)

Answer B

6. What is the minimum number of 15 amp lighting circuits required for a 3500 square foot residence?

A. 5
B. 6
C. 8
D. 12

220.14(J)
3500x3=10500VA
10500÷120v=87.5A
87.5A÷15A=at least 5.83. Will require at least 6 circuits

Answer B

7. What is the demand factor permitted for a household with a 11 kW range?

A. 8,000 watts
B. 9,000 watts
C. 11,000 watts
D. 20,000 watts

Table 220.55, Column C, 1 Appliance, 8kW

Answer A

8. A continuous load, such as an EV charger, is one in which maximum current is expected to continue for how many hours?

A. At least one
B. At least three
C. No more than five
D. All night long

Article 100 Definitions "Continuous Load"

Answer B

9. What is the minimum volume of a 4"x4"x1-1/2" electrical box which has no volume markings on it?

A. 254 cubic centimeters
B. 18 cubic inches
C. 24 cubic inches
D. 344 cubic centimeters

Table 314.16(A)

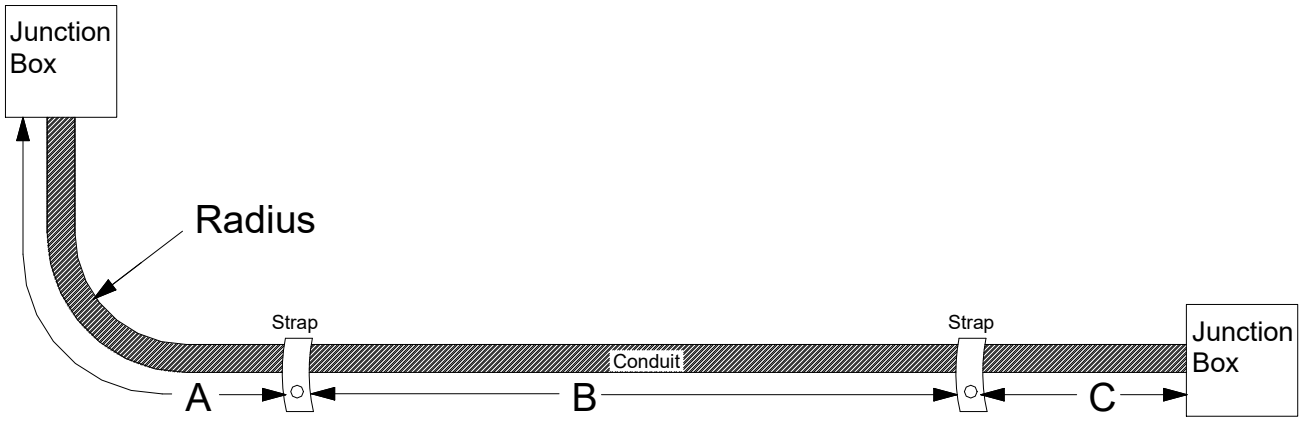
Answer D

10. What is the minimum size of Rigid Steel conduit permitted for three 2/0 AWG type THW compact stranded aluminum conductors used for a 150 amp dwelling service?

A. 1-1/2 inch
B. 1-1/4 inch
C. 1 inch
D. 2 inch

Annex C
Table C.1(A)

Answer A



11. Based on the drawing above, and assuming Flexible Metal Conduit (FMC), what is the ***maximum*** length of section "C"?

A. 6 inches
B. 1 foot
C. 24 inches
D. 3 feet

348.30(A)

Answer B

12. Based on the drawing above, and assuming Electrical Metallic Tubing (EMT), what is the ***maximum*** length of section "B"?

A. 3 meters
B. 8 feet
C. 900 millimeters
D. 3 feet

358.30(A)

Answer A

13. Based on the drawing above, and assuming 1" Rigid Metal Conduit (RMC), what is the radius of the bend when using a Full Shoe Bender?

A. 101.6 mm.
B. 5 inches.
C. 146.05 mm.
D. 8 inches.

344.24
Chapter 9, Table 2

Answer C

14. If an EMT conduit containing 3 THHN conductors is run in an attic with a possible temperature of 120°F, what is the correction factor required for determining ampacity?

A. 82 %
B. 88 %
C. 90 %
D. 91 %

310.15(B)(1)

Answer A

15. A residential dwelling with a 3200 square foot area excluding porches, garage, and unfinished spaces requires a general lighting load of not less than _____VA before application of any demand factors.

A. 3600 VA
B. 4500 VA
C. 10,000 VA
D. 9600 VA

220.14(J)

Answer D

16. Arc-fault circuit-interrupter protection for receptacle outlets shall be provided for all dwelling unit

A. Garages
B. Bathrooms
C. Living rooms
D. Furnaces
E. All of the above
F. None of the above

210.12(A)

Answer C

17. What must a room have in order to be considered a bathroom?.

A. Toilet
B. Tub
C. Shower
D. Sink
E. Urinal

100 Definitions
"Bathroom"

Answer D

18. If watts and voltage are known, how would current be calculated?

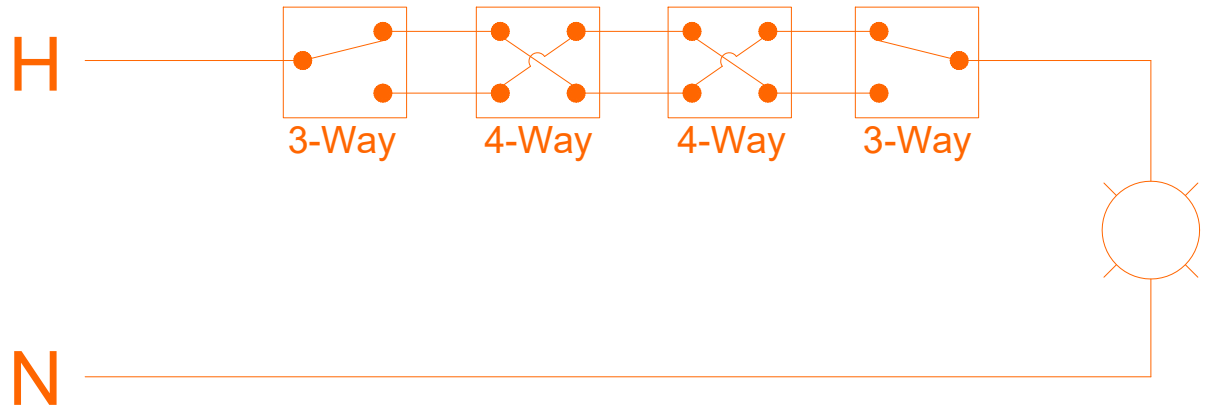
A. Voltage ÷ Wattage
B. Voltage^2 ÷ Resistance
C. Watts ÷ Voltage
D. Voltage^2 ÷ Wattage

Power Law→P=IxE
Solve for I
I=P÷V, or Watts÷Volts

Answer C

19. Draw a schematic diagram showing one light being controlled by 4 switches.

Trade Knowledge



The following question is worth 3 points.

20. A ***three-story***, single-family dwelling measures 20' x 30' on the outside of the building. Using the Standard Calculation method, what is the computed minimum size 120/240 volt service assuming a dishwasher rated at 5 amps, a garbage disposal rated at 1/3 hp (use table 430.248), a 10.5kW Range, a 3.5 kW, 240 volt water heater and a 240 volt, 10 amp air conditioner.

A. 60 Amp
B. 100 Amp
C. 150 Amp
D. 200 Amp

Show your work

20'x30'x3 (stories) =1800 sq.ft.
1800x3VA =5400VA
Small Appliance 1500x2 =3000VA
Laundry 1500x1 =1500VA
Total = **9900VA**

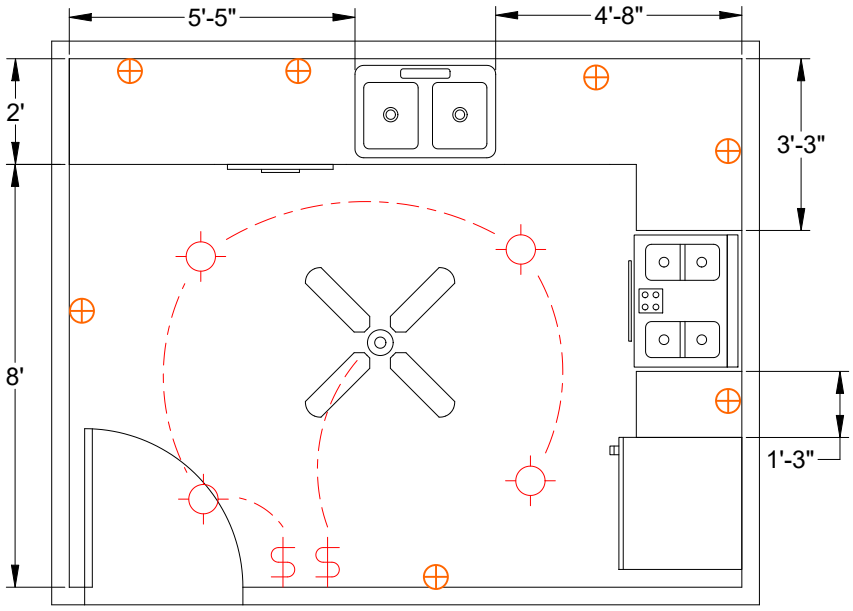
First 3000VA =3000VA
9900-3000=6900VAx35% =2415VA
Total =**5415VA**

D.W. =(5 amps x 120 volts) = 600VA
Disp. (Table 430.248) (7.2 amps x 120 volts) =864VA
Water Heater =3500VA
Total =**4964VA**

Range (Table 220.55, Column C) = 8000VA
Air Cond. (240 volts x 10 amps) = 2400VA
25% of largest motor (A/C) =600VA
Total =**11000VA**
+5415VA
+4964VA
=21379VA

21379VA÷240 volts=**89 Amps**
Minimum 100 Amp service required.

Answer B



21. Based on the drawing above, what is the minimum number of receptacle outlets required to serve the countertop?

A. 4
B. 5
C. 7
D. 8

210.52(C)(1)

Answer B

22. Based on the drawing above, the outlets that serve the countertop requires:

A. GFCI protection
B. AFCI protection
C. WR (weather-resistant) rated receptacles
D. TR (tamper-resistant) receptacles
E. A,B and D above
F. All the above
G. None of the above

210.8(A)(6)
210.12(A)
406.12

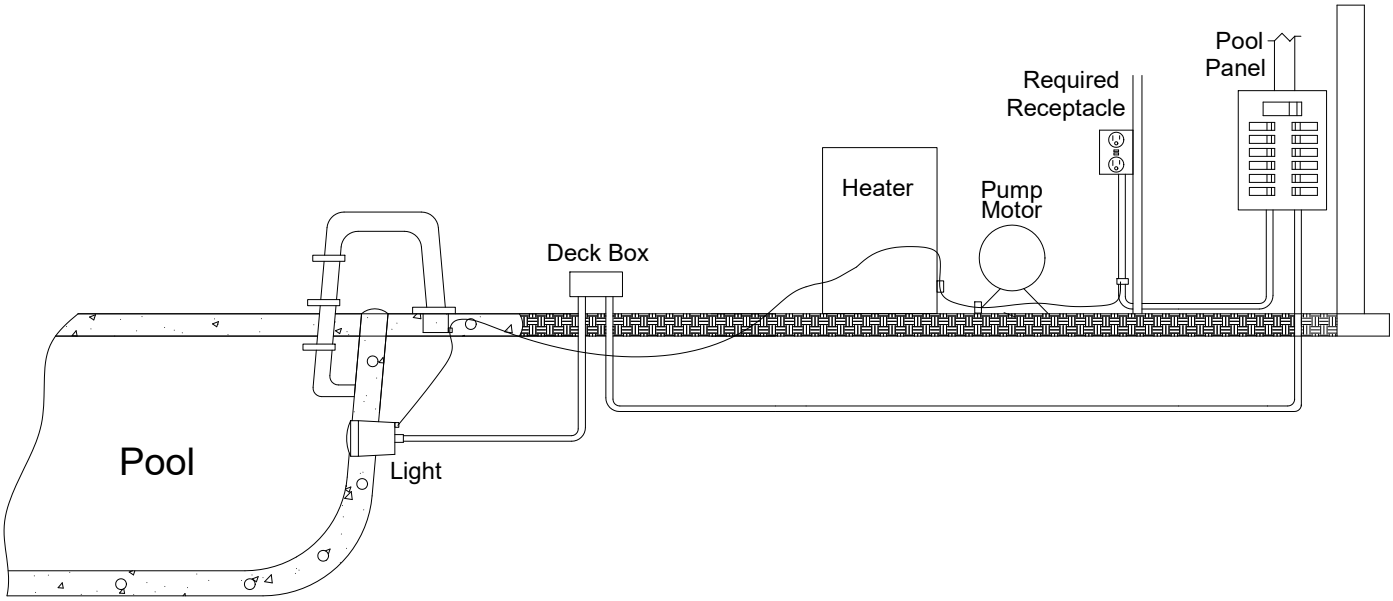
Answer E

23. What ***minimum*** size metal device box is required for eight 12 AWG Type THWN copper conductors and 2 duplex receptacle outlets?

A. 3 in. x 2 in. x 3-1/2 in.
B. 4 in. x 4 in. x 1-1/2 in.
C. 4 in. x 4 in. x 2-1/8 in.
D. 3 in. x 2 in. x 2-1/4 in.

314.16(B)
8- #12 =8 cond. @ 2.25 cubic inches
314.16(4)
2- outlets =4 cond. @ 2.25 cubic inches
12x2.25=27 cu in
Table 314.16(A)→

Answer C



24. Based on the drawing above, what is the ***maximum*** horizontal distance allowed between the inside wall of the pool and the required receptacle?

A. 5 ft
B. 6 ft
C. 10 ft
D. 20 ft

680.22(A)(1)

Answer D

25. Based on the drawing above, what is the minimum requirement for the conductor that bonds the pool, light, deck, motor, ladder, etc.?

A. 8 AWG solid copper
B. 8 AWG stranded copper
C. 8 AWG solid aluminum
D. 8 AWG stranded aluminum
E. A&B above

Answer A

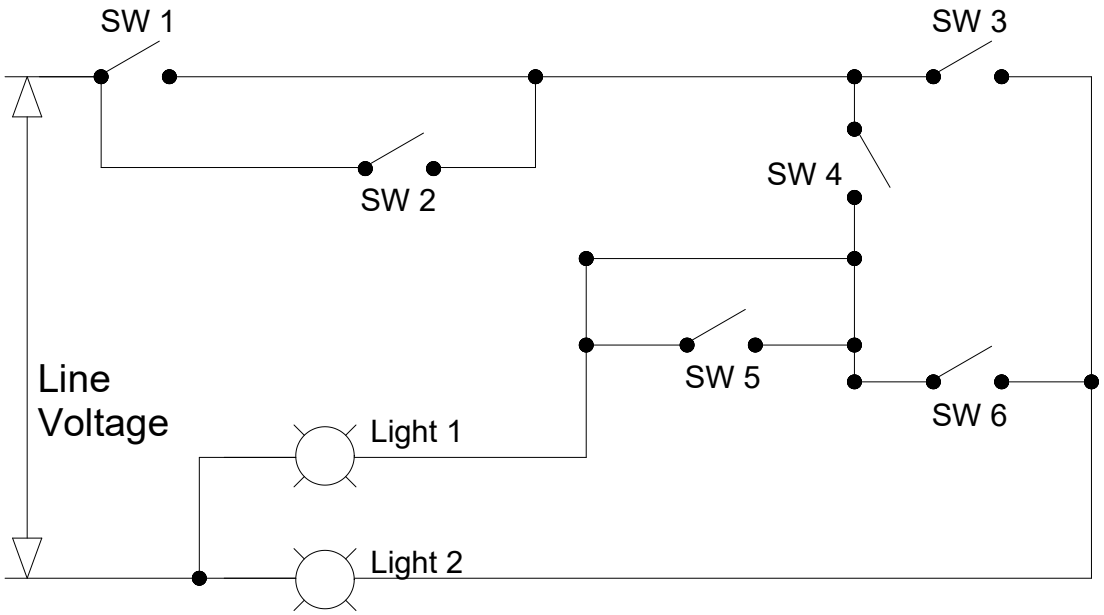
680.26(B)

26. Dwelling unit receptacles shall be located so that no point along the floor line is more than _____, measured horizontally, from an outlet in that space.

A. 12 ft.
B. 2 ft.
C. 6 ft.
D. 10 ft.

210.52(A)(1)

Answer C



The following questions are based on the drawing above.

27. Which switches may be closed for **only** light 1 to illuminate?

A. S1, S2, S3
B. S4, S5, S6
C. S1, S2, S3, S6
D. S1, S2, S4
E. C and D above
F. All of the above

A-L2 will light. B-Neither will light. C-Both will light. D-L1 will light.

Answer D

28. Which switches may be closed for **only** light 2 to illuminate?

A. S1, S4, S6
B. S1, S2, S3
C. S2, S4, S5, S6
D. S1, S2, S3, S4, S5, S6
E. None of the above
F. All of the above

A-Both will light. B-L2 will light. C-Both will light. D-Both will light.

Answer B

29. Which switches may be closed for **both** lights to illuminate?

A. S1, S2, S4
B. S1, S2, S5, S6
C. S2, S3, S6
D. S1, S5
E. All of the above
F. None of the above

A-L1 will light. B-Neither will light. C-Both will light. D-Neither will light.

Answer C

30. What happens if all the switches are closed?

A. Only light 1 illuminates
B. Only light 2 illuminates
C. Both lights illuminate
D. A short circuit is created

Answer C

All switches closed will illuminate both lights (through several paths).

Electrical Exam Formulas

1) $P = I \times E$

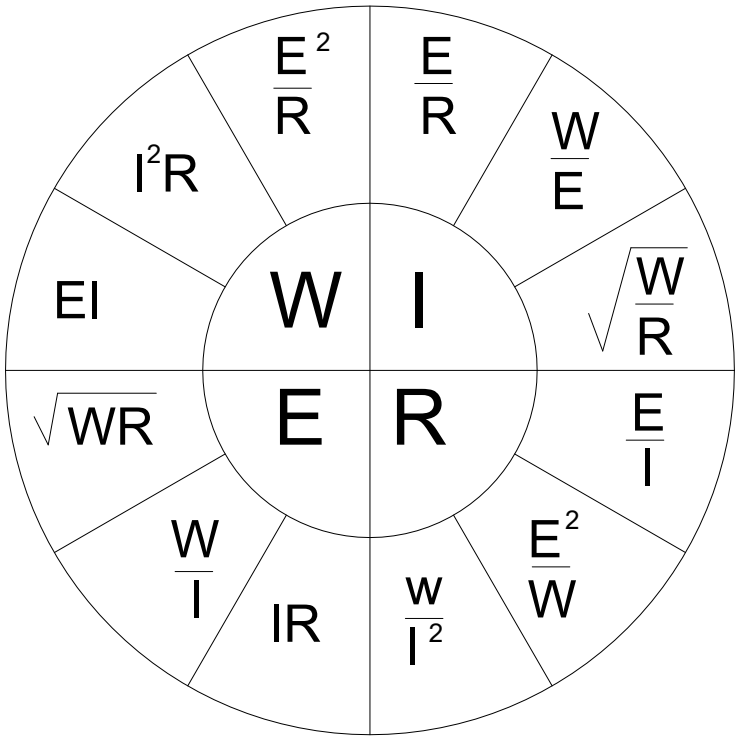
2) $E = I \times R$

3) $P = I \times E \times (PF)$

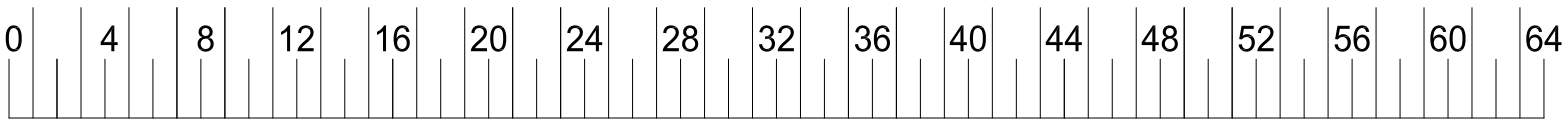
4) $VD = (2 \times K \times D \times I)/CM$

5) $VD\ (3\ Phase) = (1.73 \times K \times D \times I)/CM$

P= Power in watts
I=Current in amps
E=Voltage in volts
R=Resistance in ohms
VD=Voltage drop in volts
PF=Power factor
D=Distance (one way) in feet
CM=Circular mils of wire (NEC Ch. 9, Table 8)
K=Resistance of a circular mil-foot (Approx. 12.9 for Cu, 21.2 for Al)
HP=746 Watts



1/8” Scale



Dwelling Unit Load Calculations

Standard Calculation

Question 20

1. General Lighting Loads (220.12) 20x30x3=1800 sq. ft. x 3 VA = 5400 VA

Minimum number of circuits

_____VA ÷120 Volts = _____Amps

_____Amps ÷15 or 20 amp ckts. = ____ckts

2. Small Appliance Branch Circuits (220.52(B)) 2 x 1500 VA = 3000 VA

3. Laundry Equipment Load (220.52(A)) 1 x 1500 VA = 1500 VA

4. Total General Lighting, Small Appliance and Laundry Circuit Load (1. + 2. + 3.) 9,900 VA

5. Application of Demand Factors (Table 220.42)

5a. First 3,000 Volt-Amperes at 100% 3000 VA

5b. Line **4** minus 3000 = 6900

5c. If Line **5b** > 117,000, then 117,000 x 35% = VA

5d. If Line **5b** < 117,000, then Line **5b** x35% = 2415 VA

5e. If line **5b** > 117,000, then Line **4** minus 120,000 = _____ x 25% = VA

5f. Net general lighting and small appliance load (5a+5c+5d+5e) 5415 **VA**

6. Appliance load—Dwelling Unit(s) (220.53)

See table 430.248 for full-load current if no nameplate rating.

Appliance	Nameplate-VA (Watts)
Dishwasher	600
Disposal	864
Water Heater	3500

6a. Total (If less than four) 4964 **VA**

6a. Total (If four or more) _____ x 75% = _____ **VA**

7. Add Other Loads (Range, Dryer, Heat, A/C)

(Use largest of coincident loads)

7a. Range load (Table 220.55) 8000 **VA**

7b. Dryer load (Table 220.54) _____ **VA**

7c. Air Conditioner 2400 **VA**

7d. _____ **VA**

7e. 25% of Largest Motor from sec **6.** or **7.**(220.50) Air Conditioner (VA)x 25% = 600 **VA**

7f. Total Calculated Load (Add 5f. thru 7e.) 21379 **VA**

Minimum size of ungrounded (Hot) service conductors

(Line **7f.** above)VA ÷ 240 Volts = 89 **Amps**

8. Minimum Size of Grounded (Neutral) Service Entrance Conductors

8a. Lighting and small appliance load (**5f.**) + 120 Volt appliance loads (**6a.**)= _____ VA

8b. Range load at 70%= _____ VA

8c. Dryer load larger of 5000 or nameplate Volt-amperes at 70%= _____ VA

8d. Total for grounded service-entrance conductor _____ **VA**

(Line **8d.** above)VA ÷ 240 Volts= **Amps**