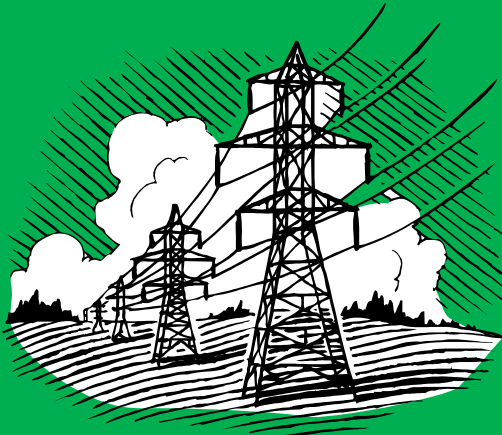


RESIDENTIAL & INDUSTRIAL ELECTRICITY



NAME:

DATE:

DUE DATE:

Schuylkill Technology
Center-
South Campus
15 Maple Avenue
Marlin, Pennsylvania 17951
(570) 544-4748

MATH WORKSHEET INCLUDED

COURSE TITLE: Residential Services and Heating

COURSE NUMBER: 7821

DUTY TITLE: Construction Math

DUTY NUMBER: 200

TASK # 13: Install, Wire and Estimate Electric Heat

PURPOSE: To Accurately Estimate and Install Electric Heat in a Residential Home.

TASKS:

201	Problem solve using whole numbers.
202	Problem solve using fractions.
203	Problem solve using decimal numbers.
204	Convert decimals, fractions and percents.
205	Problem solve using the metric system.
206	Calculate basic construction problems using geometry formulas.
207	Calculate basic construction problems using algebraic formulas.

REVISION: 2014

CORE CURRICULUM STANDARDS

ENGLISH LANGUAGE ARTS

CC.1.3.11-12.I. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade level reading and content, choosing flexibly from a range of strategies and tools.

MATH

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.

READING IN SCIENCE & TECHNOLOGY

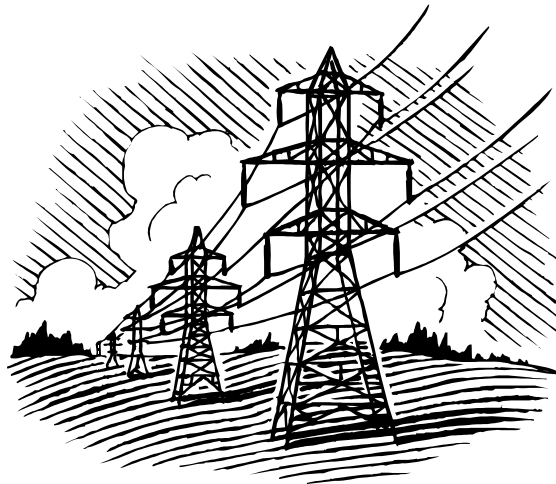
CC.3.5.11-12.B. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

WRITING IN SCIENCE & TECHNOLOGY

CC.3.6.11-12.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.



ACADEMIC STANDARDS

READING, WRITING, SPEAKING & LISTENING

- 1.1.11.A *Locate various texts, assigned for independent projects before reading.*
- 1.1.11.D *Identify strategies that were most effective in learning*
- 1.1.11.E *Establish a reading vocabulary by using new words*
- 1.1.11.F *Understanding the meaning of, and apply key vocabulary across the various subject areas*
- 1.4.11.D *Maintain a written record of activities*
- 1.6.11.A *Listen to others, ask questions, and take notes*

MATH

- 2.2.11.A *Develop and use computation concepts*
- 2.2.11.B *Use estimation for problems that don't need exact answers*
- 2.2.11.C *Constructing and applying mathematical models*
- 2.2.11.D *Describe and explain errors that may occur in estimates*
- 2.2.11.E *Recognize that the degree of precision need in calculating*
- 2.3.11.A *Selecting and using the right units and tools to measure precise measurements*
- 2.5.11.A *Using appropriate mathematical concepts for multi-step problems*
- 2.5.11.B *Use symbols, terminology, mathematical rules, Etc.*
- 2.5.11.C *Presenting mathematical procedures and results*

SCIENCE

- 3.1.12.A *Apply concepts of systems, subsystems feedback and control to solve complex technological problems*
- 3.1.12.B *Apply concepts of models as a method predict and understand science and technology*
- 3.1.12.C *Assess and apply patterns in science and technology*
- 3.1.12D *Analyze scale as a way of relating concepts and ideas to one another by some measure*
- 3.1.12.E *Evaluate change in nature, physical systems and man made systems*
- 3.2.12.A *Evaluate the nature of scientific and technological knowledge*
- 3.2.12.B *Evaluate experimental information for appropriateness*
- 3.2.12.C *Apply elements of scientific inquiry to solve multi – step problems*
- 3.2.12.D *Analyze the technological design process to solve problems*
- 3.4.12.A *Apply concepts about the structure and properties of matter*
- 3.4.12.B *Apply energy sources and conversions and their relationship to heat and temperature*
- 3.4.12.C *Apply the principles of motion and force*
- 3.8.12.A *Synthesize the interactions and constraints of science*
- 3.8.12.B *Use of ingenuity and technological resources to solve specific societal needs and improve the quality of life*
- 3.8.12.C *Evaluate the consequences and impacts of scientific and technological solutions*

ECOLOGY STANDARDS

- 4.2.10.A *Explain that renewable and non renewable resources supply energy and material.*
- 4.2.10.B *Evaluate factors affecting availability of natural resources.*
- 4.2.10.C *Analyze the use of renewable and non renewable resources.*
- 4.2.12.B *Analyze factors affecting the availability of renewable and non renewable resources.*
- 4.3.10.A *Describe environmental health issues.*
- 4.3.10.B *Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.*
- 4.3.12.C *Analyze the need for a healthy environment.*
- 4.8.12.A *Explain how technology has influenced the sustainability of natural resources over time.*

CAREER & EDUCATION

- 13.1.11.A *Relate careers to individual interest, abilities, and aptitudes*
- 13.2.11.E *Demonstrate in the career acquisition process the essential knowledge needed*
- 13.3.11.A *Evaluate personal attitudes that support career advancement*

ASSESSMENT ANCHORS

- M11.A.3.1.1 *Simplify expressions using the order of operations*
- M11.A.2.1.3 *Use proportional relationships in problem solving settings*
- M11.A.1.2 *Apply any number theory concepts to show relationships between real numbers in problem solving*

STUDENT

The student will be able to estimate and install electric heat in a residential home according to the National Electric Code.

TERMINAL PERFORMANCE OBJECTIVE

Given all the electrical tools and materials required, the student will estimate and install electric heat with various thermostats to 100% accuracy and in accordance with the National Electric Code.

SAFETY

- Always wear safety glasses when working in the shop.
- Always check with instructor before turning power on.
- Always use tools in the correct manner.
- Keep work area clean and free of debris.
- Never wire a project without the correct wiring diagram.
- Do not touch heater element with circuit energized.

RELATED INFORMATION

1. Attend lecture by instructor.
2. Obtain handout.
3. Review chapter in textbook.
4. Define vocabulary words.
5. Complete all questions in this packet.
6. Complete all projects in this packet.
7. Complete “Math for Electricians” worksheet
8. Review and Discuss MAVCC “Safe Lifting” Video
9. Complete K-W-L Literacy Assignment by Picking an Article From the “Electrical Contractor” Magazine Located in the Theory Room. You can pick any article you feel is important to the electrical trade.

EQUIPMENT & SUPPLIES

- | | |
|-----------------------|----------------------------|
| 1. Safety glasses | 11. Wire nuts |
| 2. Hammer | 12. Single pole thermostat |
| 3. Screw driver | 13. Double pole thermostat |
| 4. Awl | 14. Handy box |
| 5. Wire strippers | 15. Grounding screws |
| 6. Side cutters | 16. Wire staples |
| 7. Cable rippers | 17. Romex connectors |
| 8. Lineman pliers | 18. Four (4) foot heater |
| 9. Needle nose pliers | 19. Wood screws |
| 10. Romex cable | 20. Electrical Tape |

VOCABULARY

CC.1.3.11-12.I Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade level reading and content, choosing flexibly from a range of strategies and tools.

1.1.11.F Understanding the meaning of and apply key vocabulary

1. Single pole thermostat: _____

2. Double pole thermostat: _____

3. Baseboard heater: _____

4. Radiant floor heating: _____

QUESTIONS

1.1.11.E Establish a reading vocabulary by using new words

1. What are some advantages of using electric heat? _____

2. What are some disadvantages to using electric heat? _____

PROCEDURE

CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

1.6.11.A Listen to others, ask questions and take notes

2.5.11.A Using appropriate mathematical concepts for multi-step problems

2.5.11.B Use symbols, terminology, mathematical rules, Etc.

2.5.11.C Presenting mathematical procedures and results

3.1.12.A Apply concepts of systems, subsystems feedback and control to solve complex technological problems

3.2.12.C Apply elements of scientific inquiry to solve multi – step problems

3.2.12.D Analyze the technological design process to solve problems

1. First determine what the function of the project is following the schematic diagram in this packet.
2. Next draw the schematic and wiring diagram for the project. This will be your “blueprint” to follow during the wiring process. (See example)
3. Next list all the materials you will need to complete the project.
4. Using a screw driver and wood screw install the device box. (Consult the National Electric Code for any specific requirements.)
5. Using a screw driver install the romex connectors into the device box.
6. The next step is to run the romex cable to each box. Using the screw driver, secure the cable in the romex connectors. (Run wires in studs, neatly, to each device box.
7. Using the cable ripper’s, strip off the insulation from the romex cable.
8. Using the side cutters, cut away excess insulation from the romex cable.
9. Using the wire strippers, strip off one inch of insulation from each conductor.

(NOTE: The conductors should extend from the device box a minimum of six (6) inches.)

Now you are ready to install the devices.

10. First, using the required tools, secure the grounds to the box and the device.
11. Using the lineman pliers, perform a pigtail splice to secure the grounds to each other.
12. Install a wire nut onto the splice and tighten.
13. Following the wiring diagram, install the thermostat.

14. Following the wiring diagram, install the electric baseboard heater.

FIELD NOTES

- **IT IS A GOOD HABIT TO WRAP ELECTRICAL TAPE AROUND THE DEVICE AFTER THE WIRES ARE CONNECTED AND YOU ARE READY TO INSTALL THE DEVICE INTO THE HANDY BOX. THIS WILL HELP IN INSULATING THE WIRES SO THEY DO NOT COME IN CONTACT WITH THE METAL HANDY BOX.**
15. Using the device screws and screw driver secure the thermostat into the device box.
16. Using the required electrical tools, strip off the insulation from the romex cable and strip of the insulation from each conductor.
17. Hook up the power wire to the power supply. (Black to Black, White to White, and the Ground to Green.)
18. The final step is to ask the instructor to evaluate the project. The instructor will turn the power on if the project is safe after inspection.
19. When the project is approved, turn in the schematic and wiring diagram with the material list for final approval.

NOTE: All romex cable should be secured with the wire staples. The romex cable must be stapled within six (6) inches of the device box.

HOW TO ESTIMATE ELECTRIC HEAT

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.

M11.A.3.2 Use estimation strategies in problem solving situations

M11.A.3.2.2 Use estimation to solve problems when an exact answer is not needed

1. Find square footage of the room. (length x width)
2. Check chart for zone, this will give wattage value suggested for that zone.
3. Multiply zone watts by exterior wall factors (2 walls=1.17 or 3 walls=1.33). This will give the total watts needed for the room.
4. Next find the feet of heater needed for the room. Divide the watts per foot of the heater (rule of thumb is 250 watts per foot) into the watts needed for the room.
5. NOTE: Round up to the best nominal size heater for the room. It is better to have a slightly larger heater than to have a heater that is too small for the room.
6. Now find actual wattage for the room by multiplying the heater feet by the heater watts per foot. (This will give the actual wattage of the room when the thermostat calls for heat.
7. Divide the total wattage by 240 volts and this will give the total current draw for the room.

THIS IS THE CHART FOR THE ZONE WATTAGE

(THE LEFT NUMBER IS THE SQUARE FOOTAGE OF THE ROOM AND
THE RIGHT NUMBER IS THE WATTAGE.)

***50 FT. = 600 WATTS...*75 FT. = 850 WATTS**
***125 FT. = 1275 WATTS...*150 FT. = 1500 WATTS**
***175 FT. = 1750 WATTS...*200 FT. = 1950 WATTS**
***225 FT. = 2150 WATTS...*250 FT. = 2350 WATTS**
***275 FT. = 2575 WATTS...*300 FT. = 2750 WATTS**
***325 FT. = 2925 WATTS...*350 FT. = 3175 WATTS**
***375 FT. = 3350 WATTS...*400 FT. = 3600 WATTS**
***450 FT. = 3950 WATTS...*500 FT. = 4450 WATTS**
***550 FT. = 4800 WATTS...*600 FT. = 5300 WATTS**

PROCEDURE SHEET

(THIS IS HOW ALL THE PROJECTS MUST BE SUBMITTED FOR APPROVAL!!)

SCHEMATIC DIAGRAM

WIRING DIAGRAM

MATERIAL LIST

- 1- FOUR (4) FOOT BASEBOARD HEATER
- 1 -2"x 3" SIDE MOUNT SWITCH DEVICE BOX
- 4- 2" WOOD SCREWS
- 4- YELLOW WIRE NUTS
- 1-SINGLE OR DOUBLE POLE THERMOSTAT
- 10' OF 12/2 ROMEX CABLE WITH GROUND
- 10 - WIRE STAPLES, UNINSULATED
- 2-GROUND SCREWS

NOTE: THE MATERIAL LIST WILL CHANGE WITH EACH PROJECT.
PROJECTS

1. INSTALL AN ELECTRIC HEATER WITH A SINGLE POLE THERMOSTAT.
2. INSTALL AN ELECTRIC HEATER WITH A DOUBLE POLE THERMOSTAT.
3. ESTIMATE AND DRAW HEATER LOCATIONS IN THE FOLLOWING ROOMS.

ROOM # 1

- TOTAL WATTAGE _____
- TOTAL HEATER SIZE _____
- TOTAL CURRENT _____

ROOM # 2

- TOTAL WATTAGE _____
- TOTAL HEATER SIZE _____
- TOTAL CURRENT _____

ROOM # 3

- TOTAL WATTAGE _____
- TOTAL HEATER SIZE _____
- TOTAL CURRENT _____

ROOM # 4

- TOTAL WATTAGE _____
- TOTAL HEATER SIZE _____
- TOTAL CURRENT _____

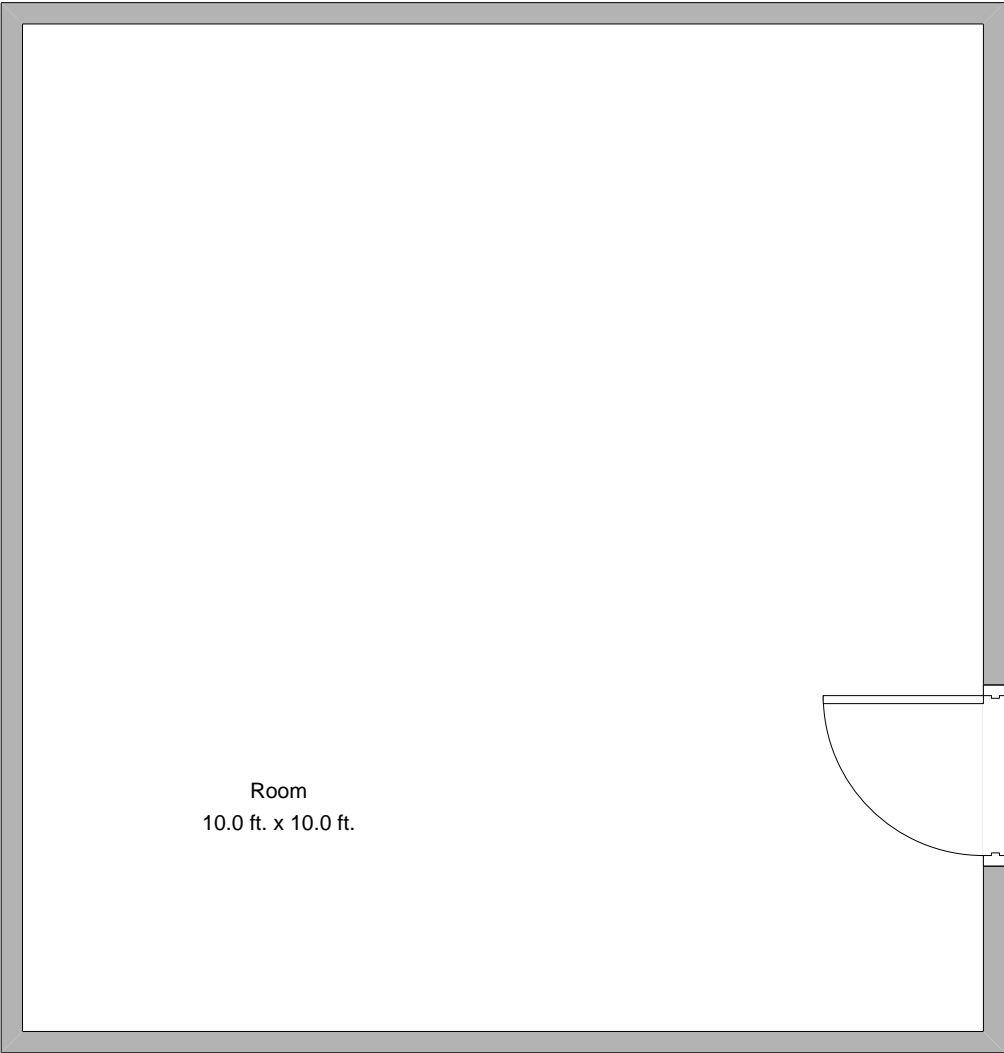
ROOM # 5

- TOTAL WATTAGE _____
- TOTAL HEATER SIZE _____
- TOTAL CURRENT _____

ROOM # 6

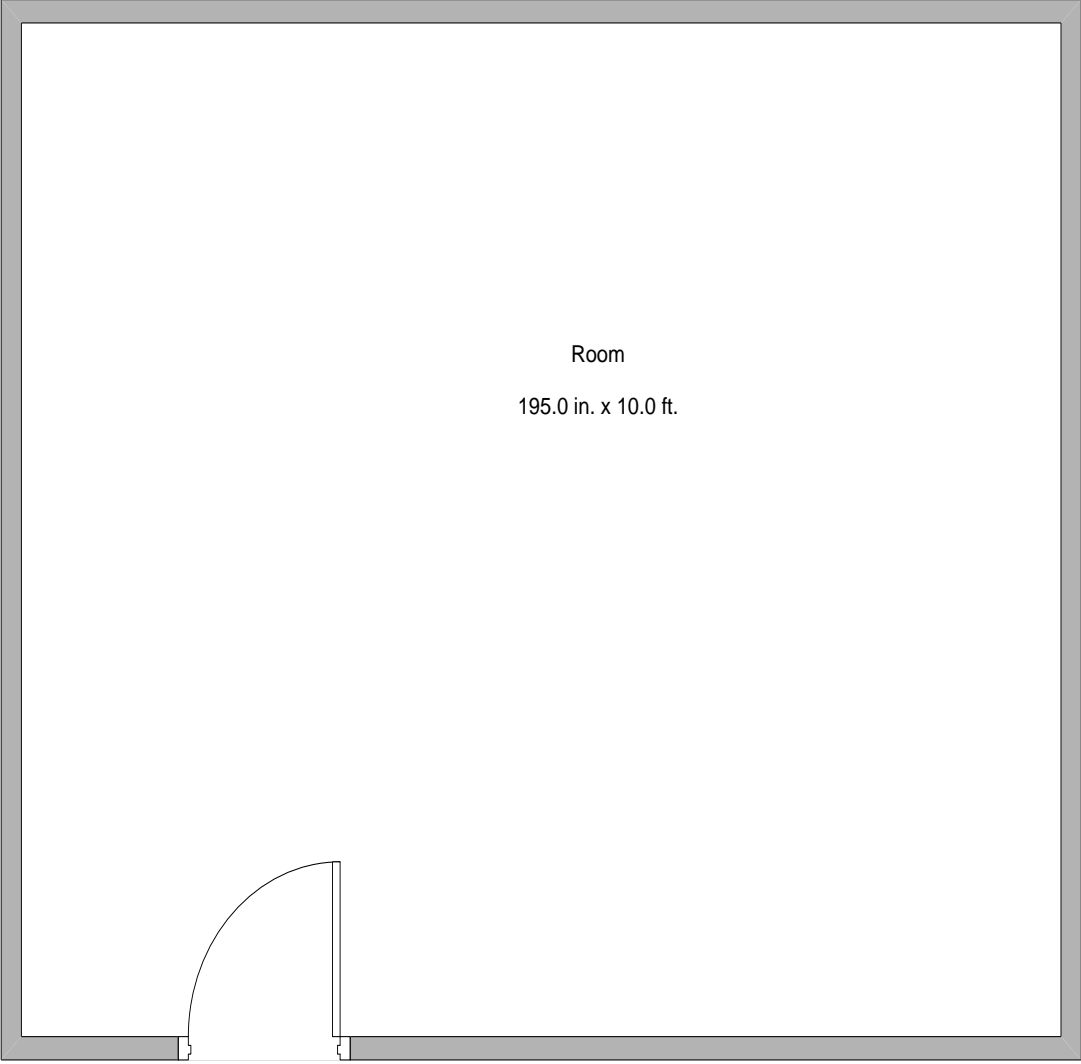
- TOTAL WATTAGE _____
- TOTAL HEATER SIZE _____
- TOTAL CURRENT _____

ROOM # 1

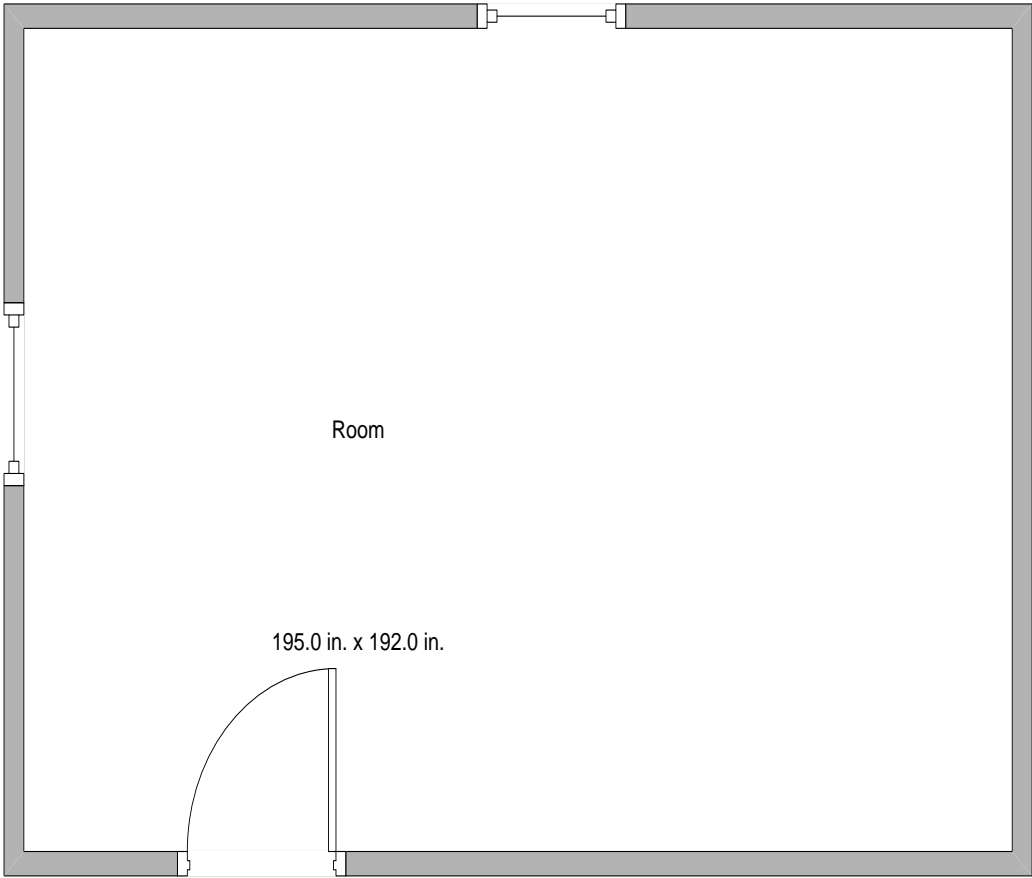


Room
10.0 ft. x 10.0 ft.

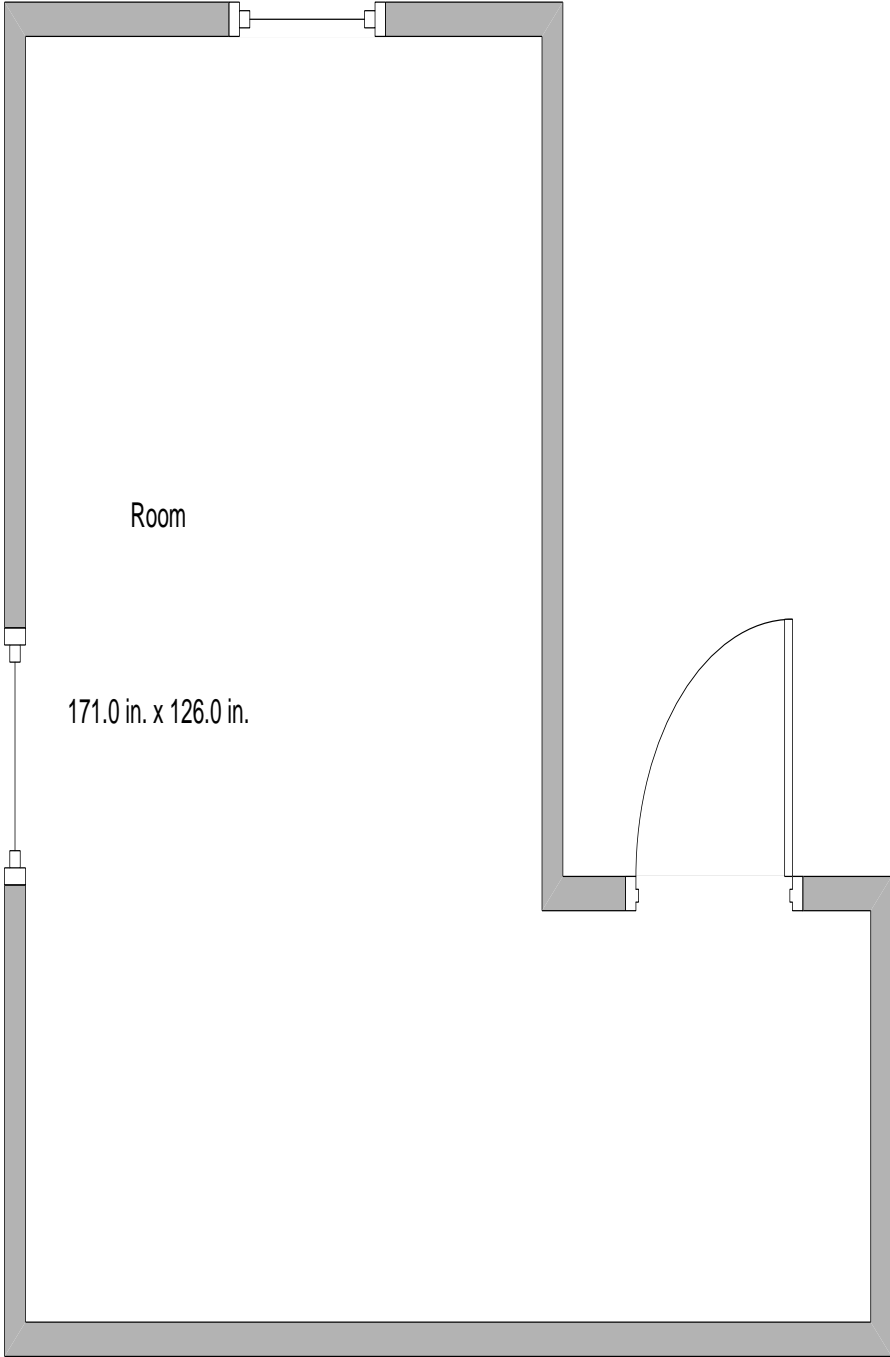
ROOM # 2



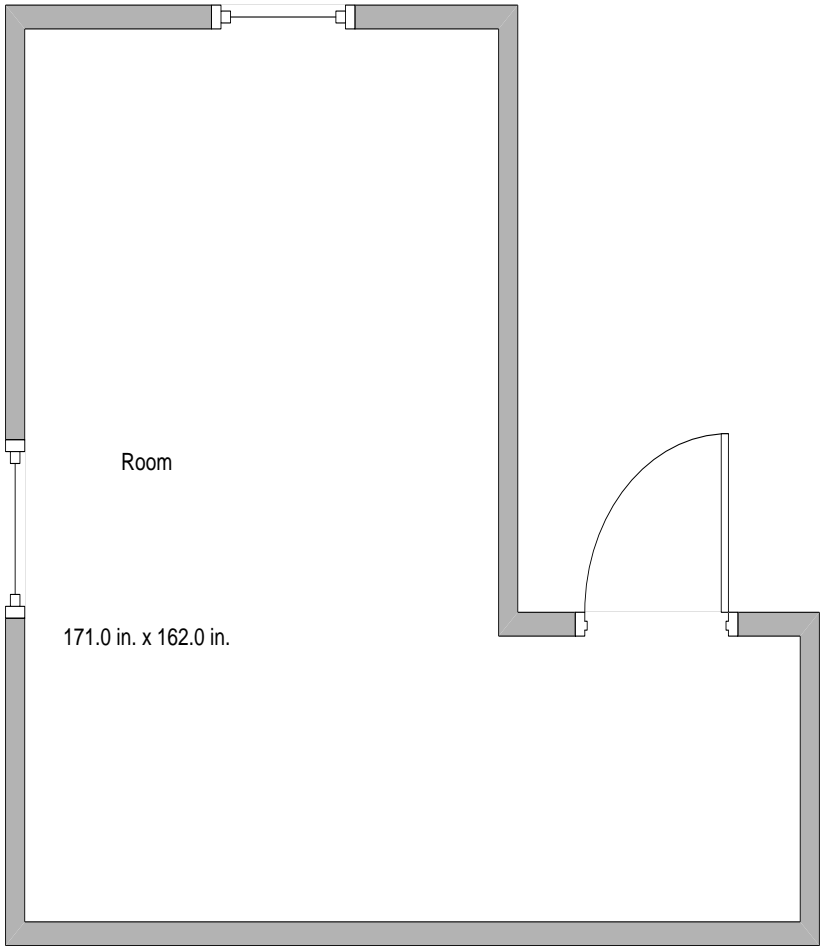
ROOM # 3



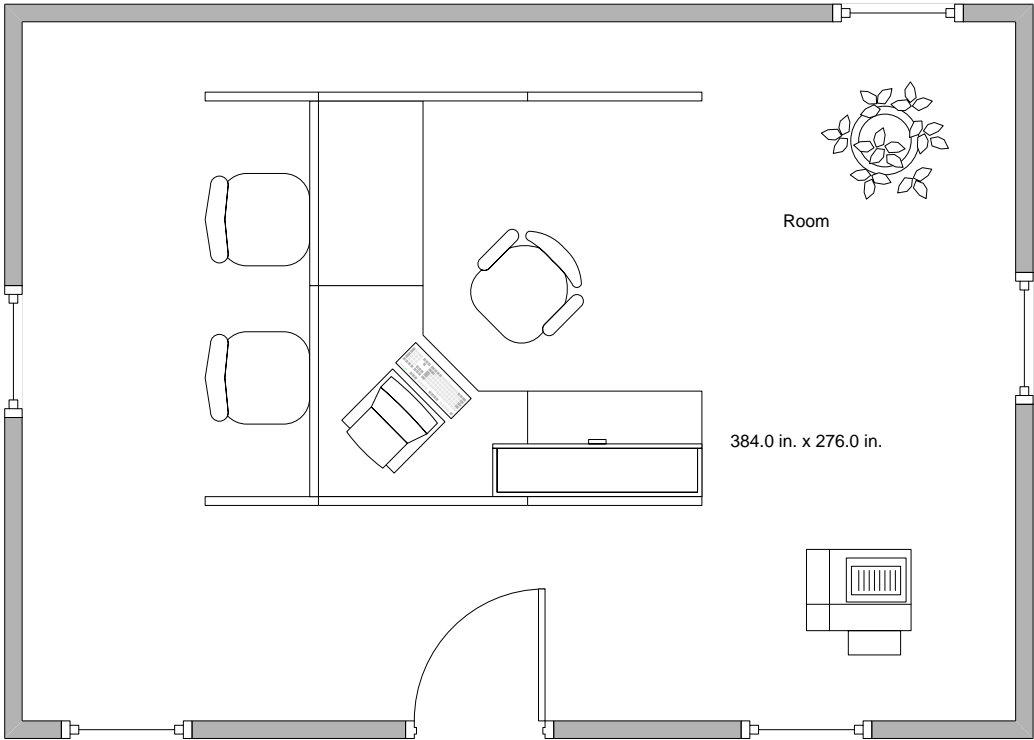
ROOM # 4



ROOM # 5



ROOM # 6



NAME: _____ DATE: _____
 FINAL GRADE: _____ % **LEVEL I**

Practical Problems in Mathematics for Electricians

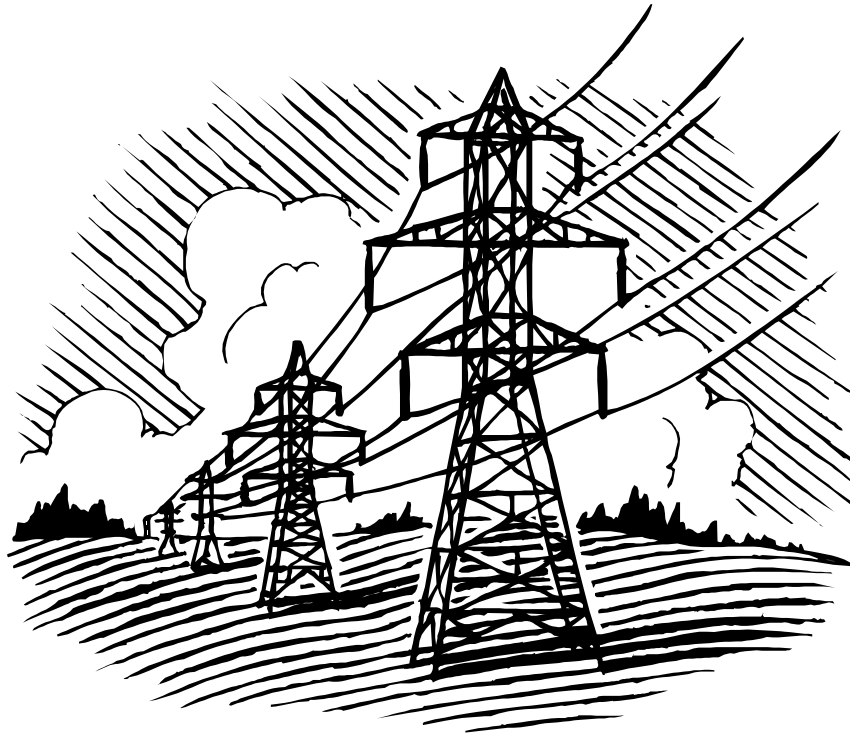
QUESTION	ANSWER
1. In wiring 8 houses, the electricians install 68, 87, 57, 74, 49, 101, 99, and 56 outlets. Find the total number of outlets that must be roughed-in.	
2. An electrician removes from stock, at different times, the following amounts of MC cable: 120', 327', 637', 302', 500', 250', 140', 75', and 789'. Find the total number of feet of MC Cable taken from stock.	
3. An electrical supply house purchases in separate lots, 30, 120, 37, 125, 103, 33, 210, and 40 pounds of solder. What is the total number of pounds of solder purchased?	
4. A school has twelve electrical circuits which have a capacity of 2-569 watts, 1-260 watts, 1-639 watts, 1- 563 watts, 1-790 watts, 1- 800 watts, 1-137 watts, 1-250 watts, 1-500 watts, 1-750 watts, 1-830 watts and 2-462 watts. What is the total number of watts consumed when all these circuits are being used to their fullest load?	
5. MC Cable in the following amounts is used on an apartment building job: 250', 71', 39', 110', 75', 87', and 560'. What is the total amount of cable used on this job?	
6. The following number of MC staples is used during a given period: 28,250, 38,108, 92, 130, 25, 36, 97, 65, and 40. Find the total number of MC staples used.	
7. An electrician takes out of stock 498 feet of MC Cable on Monday, 103 feet on Tuesday, and 78 feet on Wednesday. On Friday, 27 feet of MC Cable is returned to stock. How much MC Cable was used?	
8. An inventory sheet shows a balance of 500 outlet boxes on January 1. On January 10, 127 outlet boxes are taken out of stock. On January 14, 61 boxes are returned to stock. How many outlet boxes are left in stock?	
9. An electrical contractor charges \$350.00 for a job. The materials cost \$105.00. The cost of labor is \$139.00 and the cost of transportation is \$11.00. Find the profit of the job.	
10. A purchase of 2,500 feet of #14, double-braided, rubber-covered wire is made for a job. On November 1, 978 feet of this wire is used, and on November 3, 1,023 feet is used. How many feet of wire is left?	
11. A building contains seventy 100 watt bulbs, thirty eight 74 watt bulbs, ten 60 watt bulbs and twenty 40 watt bulbs. If all of the lights are on, what is the total amount of wattage being used?	
12. An electrical contractor employs 16 people. Five people earn \$5.00 per hour, four people earn \$7.00 per hour, and the remaining people earn \$6.00 per hour. What is the total hourly wage earned by all 16 people?	
13. A 7 floor apartment building has an average of 7 electrical circuits per apartment, and there are 8 apartments per floor. How many electrical circuits are there in the building?	

14. A wiring job requires 5,127 feet of cable. If the cable comes in 250 foot coils, how many coils of cable are required?	
15. A coil of wire is wound in 7 layers with 13 turns per layer. How many turns are on the coil?	
16. A wiring job requires 29 outlets that are to be spaced equally over 364 feet. One outlet is placed at the beginning of the 364 feet and one at the end. Find the center-to-center distance between the outlets.	
17. An order is placed for 16 coils of cable. The cable comes in 250 foot coils. How many feet of cable are received?	
18. Twenty standard cartons of octagon boxes weigh a total of 1,100 pounds. Find the weight per carton.	
19. A total load of 15,840 watts is distributed equally over 12 circuits. What is the load per circuit in watts?	
20. A company orders 1-5 HP, 2- 7 HP, 3- 10HP, and 1- 250HP AC motors. If one horsepower equals 746 watts, what are the total watts of all the motors combined?	
21. A small electromagnet is wound with 97 layers with 215 turns per layer. How many turns of wire are on the coil?	
22. What is the decimal form of $5/16$?	
23. What is the decimal form of $3/8$?	
24. What is .005 if converted to a whole number?	
25. What is 62.5 in decimal form?	

BONUS QUESTION #1	ANSWER
An electrician has a paycheck of \$1000.25. He walks into a hardware store to purchase some electrical items for a job. He gets 25 - 4"x2 1/2" junction boxes at a cost of \$1.75 each, a bag of 100 yellow wire nuts at a cost of \$10.50, 6 rolls of Scotch 33 electrical tape at a cost of \$2.97 each, a box of 10-20 amp, single pole switches at a total cost of \$12.75, and a case of 24-8 ounce water bottles at a total cost of \$3.97. If the cost of inflation puts all of the prices of the electrical materials up 20% plus PA sales tax, what is the total he will have left from his paycheck?	

BONUS QUESTION #2	ANSWER
If the electrician takes the total cost of the materials and marks them up 35%, what would be the total amount of his paycheck be with the profit?	

REFERENCE PAGES



Homeowners enjoy the comfort of radiant heat in their bathrooms, kitchens, or family rooms.

Many homeowners love the look of tile, wood, or laminates but dread stepping out of their soothing shower onto cold tile, especially during those frigid winter months. And many love tile or wood in their kitchens and living areas but worry about their little ones playing and pitter-pattering on cold floors. That's why so many are opting for electric radiant heat to warm up their floors.

The installation of electric floor heating systems is not new: heated floors have been installed under bathroom and kitchen tile in the United States for the past 10 years and the warming products continue to gain popularity. Many in the kitchen and bath industry expect electric radiant heat to continue to play a big role among homeowners who crave comfort features.

Joan McCloskey, editorial marketing director for Better Homes and Gardens magazine, told homebuilders at the 2003 International Builders Show that warm floors in the bathroom is on the list of must-have comforts.

“Our bathrooms set the mood for the day and homeowners want it light, comfortable, and cheerful,” she said. “Toys in this room and the master include heated floors, little refrigerators, steam showers with multiple shower heads, soaking tubs, towel warmers, fireplaces, and coffee nooks.

These thin electric floor heating mats have been very popular in bathrooms and kitchens for a long time. However, the installation of these systems under carpet and floating laminate floors was not practical because they needed to be embedded in a layer of thin set cement, which you normally don't use when you install a new carpet or laminate floor. As a result, very few people would opt for radiant heat under carpet or laminate. Up until now: Underwriters Laboratory (UL) has given the thumbs up to Warmly Yours' Environ II system, a radiant heating system that can be directly installed under carpets and laminate floors, without cement.

NAME: _____ LEVEL: _____ DATE: _____

CHECK LIST ELECTRIC HEAT PACKET

STEPS/TASKS	MEETS STANDARDS	NEEDS IMPROVEMENT
1) STUDENT COMPLETED ALL VOCABULARY TO 100% ACCURACY.		
2) STUDENT COMPLETED ALL WRITTEN WORK TO 100% ACCURACY.		
3) STUDENT COMPLETED ROOM # 1		
4) STUDENT COMPLETED ROOM # 2		
5) STUDENT COMPLETED ROOM # 3		
6) STUDENT COMPLETED ROOM # 4		
7) STUDENT COMPLETED ROOM # 5		
8) STUDENT COMPLETED ROOM # 6		
9) STUDENT COMPLETED PROJECT WITH A SINGLE POLE THERMOSTAT.		
10) STUDENT COMPLETED PROJECT WITH A DOUBLE POLE THERMOSTAT.		

*** ALL STEPS/TASKS MUST MEET THE STANDARDS IN ORDER TO ACHIEVE MASTERY.***

COMMENTS: _____

INSTRUCTOR SIGNATURE: _____ DATE: _____

CC.3.6.11-12.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

Residential & Industrial Electricity K-W-L WORKSHEET

NAME: _____ LEVEL: _____ DATE: _____

ARTICLE TITLE: _____

TIME START: _____ TIME FINISH: _____

<p><u>K</u> What do I already <u>KNOW</u> about this topic?</p>	
<p><u>W</u> What do I <u>WANT</u> to know about this topic?</p>	
<p><u>L</u> What did I <u>LEARN</u> after reading ABOUT this topic?</p>	

I checked the following before reading:

- Headlines and Subheadings
- *Italic*, **Bold**, and Underlined words
- Pictures, Tables, and Graphs
- Questions or other key information

I made predictions **AFTER** previewing the article.

Comments: _____

- Instructor Signature: _____
- Instructional Aide Signature: _____

Name: _____ Date: _____

Task 13 Post Test Electric Heat CH14 RHW

True/False

Indicate whether the statement is true or false.

- ___ 1. A receptacle for a gas-fired range is permitted to be connected to a small appliance circuit.
- ___ 2. A cord-and-plug-connected garbage disposal installed under the sink must be GFCI protected.
- ___ 3. In a laundry room, receptacles must be placed so that no point along the wall is more than six feet from a receptacle.
- ___ 4. If a laundry room is located in an unfinished basement, the washing machine is permitted to be plugged into a single receptacle with no GFCI protection.
- ___ 5. If a new dryer is being installed in home built before 1996 that has a three-wire cord-and-plug connection, the circuit must be replaced to accept a four-wire cord and plug.
- ___ 6. Electric water heaters must be wired with a 6/3 cable with a separate grounding conductor because the white conductor is not permitted to be used as an ungrounded conductor in this type of installation.
- ___ 7. The working space requirements of 110.26 in the NEC must be maintained when the disconnecting means for an air conditioning unit on the outside of the house is installed.
- ___ 8. The NEC permits low-voltage Class 2 doorbell wire to be run right next to nonmetallic sheathed cable.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 9. A(n) _____ circuit breaker has a trip time that gets faster as the fault current flowing through it gets larger.
 - a. dual-element
 - b. inverse time
 - c. plug fuse
 - d. type S
- ___ 10. A general lighting branch circuit protected by a 15-ampere circuit breaker must be wired with a _____ AWG conductor.
 - a. # 14 Aluminum conductor
 - b. #14 Copper conductor
 - c. #12 Copper conductor
 - d. Either a #12 or a #14 Copper conductor
- ___ 11. If the maximum number of receptacles permitted on a 15-amp rated circuit is 10, the maximum number of receptacles permitted on a 20-amp rated circuit is _____.
 - a. 12
 - b. 13
 - c. 14
 - d. 15

- ___ 12. The minimum number of small appliance circuits required by the NEC in each house is _____.
- a. 1
 - b. 2
 - c. 3
 - d. 4
- ___ 13. All electric ranges installed in new homes must be connected for _____ volts.
- a. 120
 - b. 208
 - c. 240
 - d. 120/240
- ___ 14. If a cooktop unit is rated for 7300 watts at 240 volts, it will draw _____ amperes.
- a. 30.41
 - b. 41.65
 - c. 60.83
 - d. 72.6
- ___ 15. In the NEC, a bathroom is defined as an area that has a basin and a _____.
- a. toilet
 - b. tub
 - c. shower
 - d. Any of the above
- ___ 16. The NEC requires one receptacle in a bathroom and it must be located no more than _____ inches from the edge of the basin.
- a. 8"
 - b. 12"
 - c. 30"
 - d. 36"
- ___ 17. The size of the circuit breaker and the circuit conductors is determined by the _____ of the motor.
- a. horsepower rating
 - b. current draw
 - c. voltage rating
 - d. All of the above
- ___ 18. The NEC requires the vast majority of motor applications to be protected by overload devices sized not more than _____ of the motor's nameplate rating.
- a. 100%
 - b. 115%
 - c. 125%
 - d. 150%
- ___ 19. Most residential electric water heaters usually operate on 240 volts and are protected with a _____-ampere overcurrent protection device.
- a. 20
 - b. 30
 - c. 40
 - d. 50

- ____ 20. On an individual branch circuit where no other items are served by the circuit, the air conditioner load cannot exceed _____ of the branch circuit ampacity.
- a. 50%
 - b. 70%
 - c. 80%
 - d. 100%
- ____ 21. A hydronic system is a(n) _____ heating system.
- a. forced air
 - b. gas
 - c. electric
 - d. hot water
- ____ 22. A(n) _____-colored switch cover is used to identify an oil burner safety switch.
- a. orange
 - b. red
 - c. blue
 - d. yellow

Completion

Complete each statement.

23. The chime transformer is used to transform the 120 V residential circuit voltage down to the voltage that a chime system will operate on, usually _____ volts.
24. A wall-mounted oven has a nameplate rating of 9 kW at 240 volts. The rated load is _____ amperes.
25. A _____-ampere overcurrent protection device is required for a residential circuit wired with a #12 AWG aluminum conductor

Name: _____ Date: _____

Task 13 Pre Test Electric Heat CH14 RHW

True/False

Indicate whether the statement is true or false.

- ___ 1. A receptacle for a gas-fired range is permitted to be connected to a small appliance circuit.
- ___ 2. A cord-and-plug-connected garbage disposal installed under the sink must be GFCI protected.
- ___ 3. In a laundry room, receptacles must be placed so that no point along the wall is more than six feet from a receptacle.
- ___ 4. If a laundry room is located in an unfinished basement, the washing machine is permitted to be plugged into a single receptacle with no GFCI protection.
- ___ 5. If a new dryer is being installed in home built before 1996 that has a three-wire cord-and-plug connection, the circuit must be replaced to accept a four-wire cord and plug.
- ___ 6. Electric water heaters must be wired with a 6/3 cable with a separate grounding conductor because the white conductor is not permitted to be used as an ungrounded conductor in this type of installation.
- ___ 7. The working space requirements of 110.26 in the NEC must be maintained when the disconnecting means for an air conditioning unit on the outside of the house is installed.
- ___ 8. The NEC permits low-voltage Class 2 doorbell wire to be run right next to nonmetallic sheathed cable.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 9. A(n) _____ circuit breaker has a trip time that gets faster as the fault current flowing through it gets larger.
 - a. dual-element
 - b. inverse time
 - c. plug fuse
 - d. type S
- ___ 10. A general lighting branch circuit protected by a 15-ampere circuit breaker must be wired with a _____ AWG conductor.
 - a. # 14 Aluminum conductor
 - b. #14 Copper conductor
 - c. #12 Copper conductor
 - d. Either a #12 or a #14 Copper conductor
- ___ 11. If the maximum number of receptacles permitted on a 15-amp rated circuit is 10, the maximum number of receptacles permitted on a 20-amp rated circuit is _____.
 - a. 12
 - b. 13
 - c. 14
 - d. 15

- ___ 12. The minimum number of small appliance circuits required by the NEC in each house is _____.
- a. 1
 - b. 2
 - c. 3
 - d. 4
- ___ 13. All electric ranges installed in new homes must be connected for _____ volts.
- a. 120
 - b. 208
 - c. 240
 - d. 120/240
- ___ 14. If a cooktop unit is rated for 7300 watts at 240 volts, it will draw _____ amperes.
- a. 30.41
 - b. 41.65
 - c. 60.83
 - d. 72.6
- ___ 15. In the NEC, a bathroom is defined as an area that has a basin and a _____.
- a. toilet
 - b. tub
 - c. shower
 - d. Any of the above
- ___ 16. The NEC requires one receptacle in a bathroom and it must be located no more than _____ inches from the edge of the basin.
- a. 8"
 - b. 12"
 - c. 30"
 - d. 36"
- ___ 17. The size of the circuit breaker and the circuit conductors is determined by the _____ of the motor.
- a. horsepower rating
 - b. current draw
 - c. voltage rating
 - d. All of the above
- ___ 18. The NEC requires the vast majority of motor applications to be protected by overload devices sized not more than _____ of the motor's nameplate rating.
- a. 100%
 - b. 115%
 - c. 125%
 - d. 150%
- ___ 19. Most residential electric water heaters usually operate on 240 volts and are protected with a _____-ampere overcurrent protection device.
- a. 20
 - b. 30
 - c. 40
 - d. 50

- _____ 20. On an individual branch circuit where no other items are served by the circuit, the air conditioner load cannot exceed _____ of the branch circuit ampacity.
- a. 50%
 - b. 70%
 - c. 80%
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- _____ 21. A hydronic system is a(n) _____ heating system.
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Completion

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