6th Math Lab

Roughing a House

Subject Area: Math Lab Grade Levels: 6th Date: November 26 – November 30

Lesson Overview

Students will have the opportunity to learn a general overview about wiring a house. One task is to correctly place switches, plugs and light fixtures as it relates to the building code. Through the process of learning how to read blueprints and the importance of proper placement students will learn about proportions and measurement. They will read and convert measurements as they relate to a blue print/mini blue print. They will also put their conversions to the test and draw the actual converted measurements on the blacktop and along with proper placement of switches, plugs and fixtures.

Materials Included in this Lesson

- Smartboard Presentation
- Blue Prints/ Worksheets

Other Materials for this Lesson

- Chalk
- Measuring Device

Skills the Student will Learn

- Read a blueprint and legend
- Find proportions (Equivalent Fractions)
- Lay out trim work on a blue print
- Lay out, measure and place correct codes for trim work

Student Deliverables

- Completed Blue Prints conversion worksheet
- Chalk drawing on black top

Length of Lesson: 3-5 Days (A/B Schedule)

Activity Day One

Students will learn about the Electrical Contracting Business. Smart Lesson with photos of different stages: The Bid, Trenching, Roughing, Trim. They will also get a chance to look at a blueprint and read the key/legend. Students will also begin learning about writing proportions and using a scale factor.

Activity Day Two

Students will learn about writing proportions and using a scale factor. Students will receive a blueprint and use proportional reasoning to calculate the actual measurements of the building.

Activity Day Three

Students will learn about building code and requirements for placing light switches and plugs. They will also calculate how many light switches, plugs, lights etc. are needed to furnish the

building from the blue prints.

Activity Day Four and Five

Students will use chalk to draw a mock up of the blue marking the correct placement of all fixtures, plugs and switches

Enrichment Suggestions

- Learn the basics of making a bid and as a group calculate the cost of completing the blueprint building and learn about Day 5 Activity.
- Field trip to see a house in the process of being "roughed".
- Use blue prints for an entire house, larger house, apartment building etc.

Student Resources

Smart lesson notes, pictures, worksheets.

Foundation Academic Standards

Building Trades and Construction Industry Sector
1.1 Mathematics
Specific applications of Number Sense standards (grade seven):
(1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
(1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
5.0 Problem Solving and Critical Thinking
5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
5.3 Use critical thinking skills to make informed decisions and solve problems.

CTE Pathway Standards

B. Engineering and Heavy Construction Pathway
B1.3 Understand the conversion of scaled blueprint measurements to full-size, on-site parameters
C. Mechanical Construction Pathway
C1.3 Convert scaled blueprint drawing measurements to the full dimensions for a given mechanical construction project.
D. Residential and Commercial Construction Pathway
D1.3 Convert scaled blueprint drawing measurements to full dimensions for a given construction project.

Lesson Plan Relevance To Externship

Working with H&D Electric I spent nearly all of my time in the field. My favorite day was the day spent roughing a house. I was able to use the blueprints to properly layout the switches, plugs and light fixtures in the house. I also used the measurements on the blueprints to calculate placement for each. The electricians I worked with shared that many interns had trouble calculating the math to correctly place the light fixtures in the center of the room. I felt this experience would best lead to the applicable math in 6th grade.

Rubric for the "Roughing" Project

Student Deliverables	3 Exceeds Expectations	2 Meets Expectations	1 Approaches Expectations	0 Fails to meet Expectations
Blueprint worksheet Conversions	90-100%	70-89% accuracy	60-69% accuracy	No attempt or 0 to 1 conversions correct
Group Drawing	All measurements are perfectly accurate and placed with precise exactness and color coded.	Outline is complete w/correct measurements. All fixtures, switches and plugs are correctly placed	Outline is complete but may not be correct measurements. Some fixtures, switches and plugs but missing 1 or 2	No attempt to complete drawing

Ideas and Information for the Smart Lesson

The Electrical Contracting Business
H&D Electic
Rayco
Elite Power
Frickes
Griffin
Apex

Why does anyone need an electrical contractor?

- Proper installation of electrical equipment is a skilled craft
- Safety must be maintained and rules must be followed because electricity is dangerous and should be manipulated by trained individuals
- Building homes and businesses or any other work spaces that rely on electricity to function in today's society and econonmy

What does an electrical contracting business do exactly?

- Provide electricity to buildings both commercial and residential
- Install lighting and various electrical outlets
- Work alongside other contractual businesses everyday in community and business developments
- Allow safe and regulated usage of electric power.

When and where are electrical contractors needed?

- Whenever a home or community is being built
- Whenever a business is established
- Wherever there is a need to power appliances or electrically dependent machinery
- Where roads, railways, or airways needing lights or accessible electricity

How do electrical contractors work?

Electrical Contract work can be consolidated into 3 simple steps:

- Step 1 Employer/Builder proposes job to several contractors
- Step 2 Contractors design/submit bids
- Step 3 Employer hires a contractor for the job

The 3 Stages of an Electrical Contract Following a Bid

Trenching: the beginning stage of making trenches in the ground and installing the main panel
Rouging: wiring throughout the entire facility or development and stage of planning changes or alterations
Trimming: installation of all of the fixtures
*none of this occurs without the acceptance of a bid

What's Next?
After an electrical contractor is notified that their bid has been accepted; the builder notifies all other contracting parties about deadlines, schedules, and alterations necessary to complete building. Schedule planning is possibly the most challenging part of completing a job site due to the construction errors and other unforeseen circumstances which may arise during the building process.

The Bid
The bi is an estimated value amount which the contractor will agree to complete the electrical installation job that was proposed.

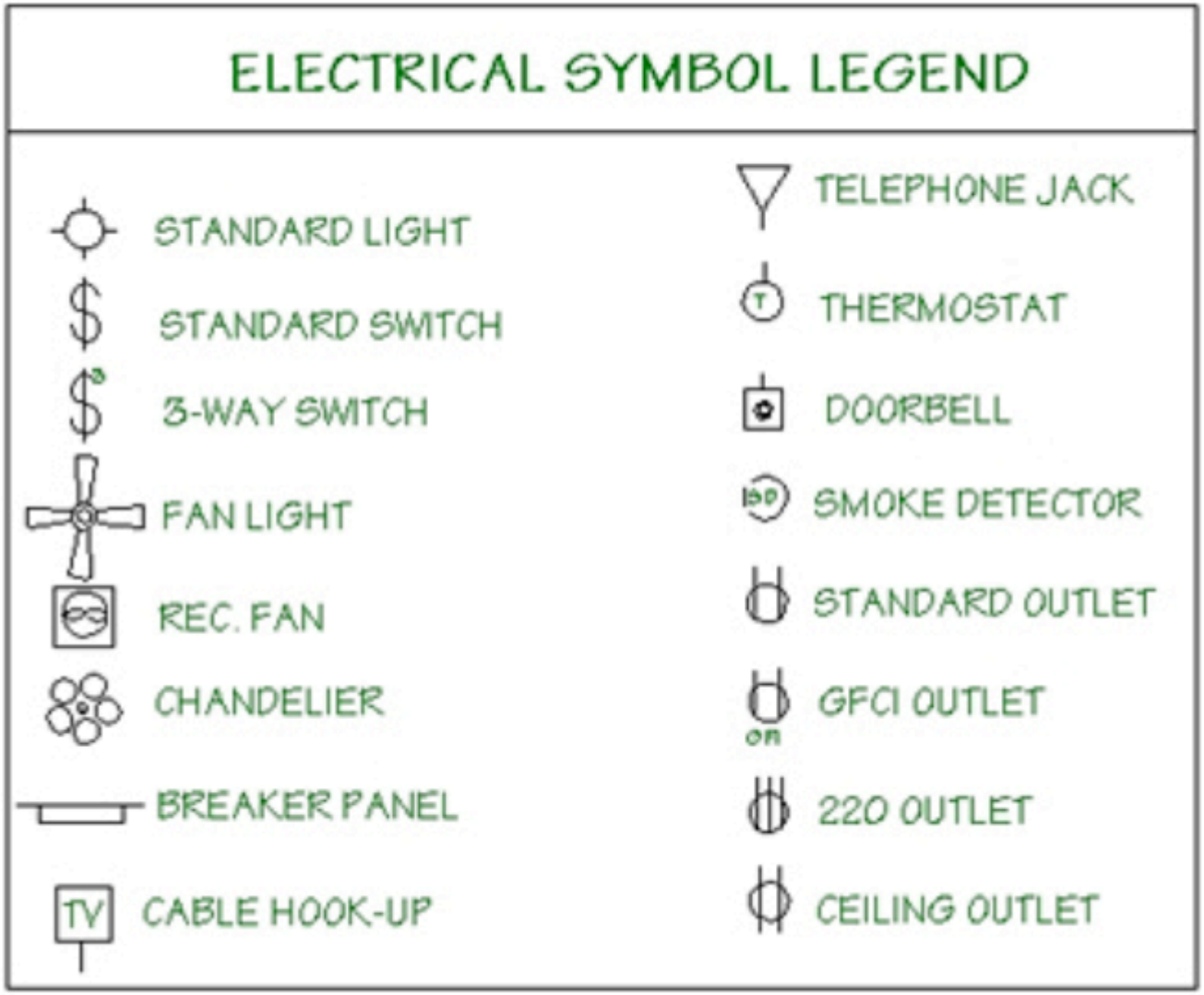
(Recall that the builders invited contractors to calculate bids, contractors design/ submit those estimates, and then the contractor is chosen by the builder.)

Cost of a Bid
- Labor Costs
- Material Costs
- Overhead Costs
- Insurances
- Taxes
- Profit

Blue prints

The Formula
Let m=raw material cost
L=labor hours
R=hourly rate peace rate $18
B=burden % (state mandated insurance for employers)
T=tax % 7.5%

O= overhead % (state mandated insurance for employers)
P= profit % 2%
Price of the bid =
[[[m(1+t)]+[lr(1+b)]](1+0)](1+p)


ELECTRICAL SYMBOL LEGEND
STANDARD LIGHT
STANDARD SWITCH
3-WAY SWITCH
FAN LIGHT
REC. FAN
CHANDELIER
BREAKER PANEL
TV
CABLE HOOK-UP
TELEPHONE JACK
T
THERMOSTAT
DOORBELL
SD
SMOKE DETECTOR
STANDARD OUTLET
GFCI OUTLET
on
220 OUTLET
CEILING OUTLET