# Program Information

## Lesson:

### *Employability Skills: Applied Academics*

## Training:

## Premises Cabling

## Time frame:

### 60 minutes

# Instruction Section

## Learning Objectives:

# Describe the importance of applied mathematics and reading skills in cabling work.

# Apply basic mathematical concepts to real-world cabling scenarios.

# Interpret technical documents and standards relevant to premises cabling.

## Assessment Tools/Methods:

# Assess understanding through active participation in class discussions and responses to targeted questions during the lesson.

## Learner Prior Knowledge:

# Basic Arithmetic Skills: Understanding and performing addition, subtraction, multiplication, and division. Ability to work with fractions, decimals, and percentages.

# Basic Geometry Knowledge: Understanding of basic geometric shapes. Ability to calculate the perimeter and area of simple shapes.

# Familiarity with Measuring Tools: Knowledge of how to use a measuring tape or ruler to measure lengths accurately.

# Basic Reading and Comprehension Skills: Ability to read and understand simple technical documents and instructions. Proficiency in reading at a high school level.

# General Technical Awareness: Basic understanding of technical and engineering concepts. Familiarity with common terms used in premises cabling industry.

## Instructional Activities:

# Begin by asking participants to think about the relevance of applied mathematics and reading skills in the cabling industry.

# Activity 1: Applying Mathematics in Premises Cabling

# Ask participants to share any experiences they have with using math or reading technical documents in their previous jobs or daily life.

# Highlight how these skills are transferable to premises cabling.

# Review basic concepts relevant to cabling, such as measuring lengths, calculating areas, and understanding ratios by providing examples from the Basic Math Problems Instructor Handout to the group on a whiteboard or display.

# Provide participants with the Cable Length Calculation Handout.

# Allow participants time to solve the problems on the handout.

# Review the calculations as a group.

# Address any questions or common mistakes, reinforcing the correct methods.

# Activity 2: Applying Reading Skills in Premises Cabling

# With the group, create a list of the types of documents technicians need to read, such as standards, installation guides, and safety manuals.

# Emphasize the importance of understanding these documents to ensure compliance and safety.

# Distribute the Reading Exercise Handout with an excerpt from the TIA/EIA standards.

# Have participants read the excerpt individually or in small groups.

# Ask questions to check comprehension, such as identifying key requirements or summarizing sections.

# Facilitate a discussion on the importance of the standards they read.

# Relate the content back to real-world applications and the significance of adhering to these standards

# Activity 3: Applying Academics Case Study

# Pass out the Applying Academics Case Study, then divide participants into small groups to discuss their calculations and plans.

# Allow groups time to read through the Case Study and work through solutions to the problems.

# Each group will present their findings and discuss how they ensured compliance with the standards.

# Facilitate a group discussion on the importance of integrating math and reading skills in real-world cabling projects.

# Recap the importance of applied mathematics and reading skills in premises cabling.

# Highlight how these skills improve efficiency, safety, and compliance in cabling work.

# Open the floor for any final questions from the participants.

## Resources:

# Whiteboard and markers

# Basic Math Problems Instructor Handout

# Cable Length Calculation Handout

# Reading Exercise Handout

# Applying Academics Case Study

# Reflection Section

# Did you encounter any challenges during the calculations presented in the lesson? If so, how did you overcome them? How does reading and interpreting TIA/EIA standards enhance your knowledge of industry requirements and best practices? What were the key takeaways from this lesson regarding the importance of applied academics in premises cabling?

*Note: AI, specifically ChatGPT 3.5, was used to generate scenarios for this contextualized lesson plan.*

**Basic Math Problems Instructor Handout**

**Example 1: Converting Measurements**

**Scenario:** You need to install a cable that runs from one end of the room to the other. The room is 15 feet long. Your cable spool measures cable in meters. You need to convert feet to meters to know how much cable to use.

**Activity:**

* Explain that 1 foot is approximately 0.3048 meters.
* Calculation: 15 feet × 0.3048 meters/foot = 4.572 meters

**Practice:** Ask participants to convert 20 feet to meters using the same conversion factor.

**Example 2: Calculating Total Cable Length**

**Scenario:** You need to install cables in an office with 4 rooms. Each room requires 12 feet of cable. Calculate the total length of cable needed.

**Activity:**

* Calculation: 4 rooms × 12 feet/room = 48 feet

**Practice:** Ask participants to calculate the total length of cable needed for 6 rooms, each requiring 10 feet of cable.

**Example 3: Understanding Ratios for Cable Segments**

**Scenario:** You have a project where the cable must be divided into sections with a 2:1 ratio. If the first section is 10 feet, how long should the second section be?

**Activity:**

* Explain that a 2:1 ratio means the second section is half the length of the first section.
* Calculation: 10 feet ÷ 2=5 feet

**Practice:** Ask participants to determine the length of the second section if the first section is 16 feet, using the 2:1 ratio.

**Detailed Explanation for Each Example**

**Example 1: Converting Measurements**

* **Explanation:**
	+ Introduce the concept of unit conversion.
	+ Explain the importance of using the correct units in cabling work to ensure accuracy and compatibility.
	+ Show the conversion factor (1 foot = 0.3048 meters) and the multiplication process.
* **Hands-On Practice:**
	+ Provide different lengths in feet and ask participants to convert them to meters.
	+ Check the calculations as a group to reinforce the correct method.

**Example 2: Calculating Total Cable Length**

* **Explanation:**
	+ Discuss the importance of calculating the total cable length accurately to avoid shortages or excess.
	+ Show the multiplication process to find the total length needed.
* **Hands-On Practice:**
	+ Provide different scenarios with varying numbers of rooms and cable lengths.
	+ Participants calculate the total length for each scenario and discuss their results.

**Example 3: Understanding Ratios for Cable Segments**

* **Explanation:**
	+ Introduce the concept of ratios and their application in dividing cable lengths.
	+ Explain how a 2:1 ratio translates into practical measurements.
* **Hands-On Practice:**
	+ Provide different initial lengths and ratios.
	+ Ask participants to calculate the corresponding lengths for the other sections.
	+ Review the answers together, ensuring understanding of the ratio concept.

**Cable Length Calculation Handout**

**Scenario:** You need to install network cables in an office with four rooms. Each room is 12 feet long and 10 feet wide. You will run the cables along the walls, connecting the rooms in a series. Additionally, you need to account for 2 feet of slack in each room to ensure proper installation and avoid tight connections.

1. **Measure the Lengths:**
	* Room 1: \_\_\_\_\_\_\_\_ feet
	* Room 2: \_\_\_\_\_\_\_\_ feet
	* Room 3: \_\_\_\_\_\_\_\_ feet
	* Room 4: \_\_\_\_\_\_\_\_ feet
2. **Calculate the Total Length (including slack):**
	* Add the length of the cable needed for each room.
	* Add 2 feet of slack for each room.
	* Total length (in feet): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Conversion to Meters:**
	* Total length in feet: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	* Conversion factor: 1 foot = 0.3048 meters
	* Total length in meters: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **Calculate the Cost:**
	* Assume the cost of cable is $0.50 per foot.
	* Total length (in feet): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	* Total cost: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. **Questions:**
	* What is the total length of cable needed in feet, including slack?
	* Convert the total length to meters. What is the result
	* What is the total cost of the cable required?

**Reading Exercise Handout**

**Excerpt from TIA/EIA-568.2-D: Commercial Building Telecommunications Cabling Standard**

**Section 4.1.2: Horizontal Cabling**

The horizontal cabling system extends from the telecommunications outlet/connector in the work area to the horizontal cross-connect in the telecommunications room. The horizontal cabling consists of the following:

* Horizontal cables
* Telecommunications outlet/connectors
* Mechanical terminations and patch cords or jumpers used in the horizontal cross-connect

**Requirements:**

1. **Cable Types:** The horizontal cabling shall be comprised of 4-pair 100-ohm twisted-pair cable (Category 5e or higher) or 2-fiber 62.5/125 micron or 50/125 micron optical fiber cable.
2. **Length:** The maximum horizontal cable length shall be 90 meters (295 feet). This length includes the horizontal cabling from the telecommunications room to the work area telecommunications outlet/connector and the length of the cable in the horizontal cross-connect.
3. **Pathways:** Horizontal cabling shall be installed in a manner that allows for easy access and maintenance. Pathways should avoid sources of electrical interference, such as fluorescent lighting fixtures and electrical cables.
4. **Performance:** All horizontal cabling components must meet or exceed the performance specifications outlined in the TIA/EIA standards for their category or class.
5. **Documentation:** All horizontal cabling installations must be thoroughly documented, including test results and cable routing information.

**Questions:**

1. **Cable Types:** What types of cables are specified for horizontal cabling in the TIA/EIA standards?
2. **Maximum Length:** What is the maximum allowable length for horizontal cabling?
3. **Installation Pathways:** What are the requirements for installing horizontal cabling pathways?
4. **Performance Specifications:** Why is it important for horizontal cabling components to meet or exceed performance specifications?
5. **Documentation:** Why is documentation critical in horizontal cabling installations?

**Applying Academics Case Study**

**Scenario:**

You are a beginning premises cabling technician tasked with installing a network in a small office building. The office has three rooms and a telecommunications room. Each room requires network connectivity, and you need to install horizontal cabling from the telecommunications room to each of the three rooms. The office layout and requirements are as follows:

1. **Room Dimensions:**
	* Room 1: 15 feet x 10 feet
	* Room 2: 20 feet x 15 feet
	* Room 3: 25 feet x 20 feet
2. **Cable Pathways:**
	* The telecommunications room is centrally located, and the cables will run along the walls.
	* You must avoid electrical interference by keeping the cables at least 3 feet away from any electrical cables and fluorescent lighting fixtures.
3. **Cabling Requirements:**
	* Use Category 6 twisted-pair cable.
	* Include 3 feet of slack in each room for future adjustments.
	* The total length of each cable run must not exceed 295 feet (90 meters).
4. **Cost Calculation:**
	* The cost of Category 6 cable is $0.60 per foot.
5. **Documentation:**
	* Document the total cable length for each room and the overall cost.
	* Ensure compliance with TIA/EIA standards.

**Tasks:**

1. **Calculate the Cable Length for Each Room:**
	* Measure the distance from the telecommunications room to each room, including the dimensions of the room.
	* Add 3 feet of slack for each room.
	* Ensure the total length does not exceed 295 feet.
2. **Convert Measurements to Meters:**
	* Convert the total cable length from feet to meters (1 foot = 0.3048 meters).
3. **Calculate the Total Cost:**
	* Multiply the total length of cable required by the cost per foot.
4. **Read and Apply Standards:**
	* Reread the Reading Exercise Handout from earlier in the lesson listing the TIA/EIA standards.
	* Ensure your installation plan complies with the standards, particularly regarding cable types, lengths, pathways, performance, and documentation.

**Discussion Points:**

1. **Compliance:**
	* How did you ensure the installation complies with TIA/EIA standards?
	* What challenges did you face in adhering to the standards?
2. **Practical Application:**
	* How did you apply mathematical skills to calculate lengths and costs?
	* How did reading and interpreting the standards help in planning the installation?