Chapter 2 Problem Wrap-Up

Student Text Page
133

Suggested Timing
80–160 min

Tools
- computers with Internet access

Related Resources
BLM 2-16 Chapter 2 Problem Wrap-Up Rubric

Accommodations

Motor—allow students to present their research orally

Teaching Suggestions

- Have students read the Chapter Problem Wrap-Up and ensure they understand what they are being asked to do. Relate the Chapter Problem revisits to the Chapter Problem Wrap-Up scenario.
- Review the career connection on page 71. Ask students to suggest some problems that someone working in electrical power distribution might face.
- Students will need computers with Internet access for their research.
- Circulate as students complete the problem and assist them as necessary. Students can give more polished solutions if they have additional time.
- If you assigned the Chapter Problem revisits section by section, the Chapter Problem Wrap-Up can be used as part of a summative assessment.
- If you are assigning the Chapter Problem as a whole at the end of the chapter, you can use it as part of a summative assessment or as a formative assessment prior to a Chapter Test or Task.

Level 3 Sample Response

Job 1: Electrical Line Installer

Job Description

Lines installers install networks of power lines that deliver power from generating plants to the customer. Utility poles and towers are erected for hydro lines that run above ground. Alternatively, underground trenches are dug to carry the wires and cables. Line installers string cable along poles and towers or through tunnels and trenches. While working on poles and towers, installers usually use truck-mounted buckets, but they sometimes have to climb the pole or tower. Cable is pulled from large reels mounted on trucks and attached to the structure using hand and hydraulic tools. When working with electrical power lines, installers bolt or clamp insulators onto the poles before attaching the cable. Underground cable is laid directly in a trench, pulled through a tunnel, or strung through a conduit running through a trench.

Education

A line installer must have at least a high school diploma. Employers look for candidates with basic knowledge of algebra and trigonometry and good reading and writing skills. Some also prefer to hire people with training in electricity or electronics from vocational programs, community colleges, or the Armed Forces. Appropriate course include Electrical Engineering Technician and Power Engineering Techniques. Employers also require each installer to complete a four-year apprenticeship program.

Job 2: Electrician

Job Description

Electricians employed by power distribution companies are expected to perform several duties. They should be able to install, inspect, maintain, and repair both main and auxiliary equipment on the power system. This includes circuit breakers, switch gear, switchboard wiring, transformers, and other reactive equipment.

Education

An electrician must have completed an Electrician Training Program. Employers look for candidates with good computer skills. Employers may also require candidates to have a driver's licence due to the amount of travel involved.

Job 3: Electrical Engineer

Job Description

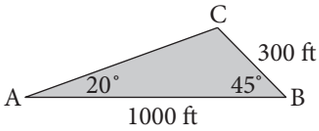
This is a very complex and challenging career. Electrical engineers are in charge of designing and improving the electrical distribution system. They need to research major issues. They need to work independently to develop new and innovative techniques, procedures, and programs to solve complex, unusual, or difficult problems. They provide expert engineering advice and work with other engineers and officials to investigate problems and apply new or special engineering methods. They may also have managerial duties such as chairing meetings to address engineering problems and addressing seminars and conferences.

Education

An electrical engineer must have completed a university degree in Electrical Engineering. Employers look for candidates with good computer skills, strong verbal and written communication skills, and well developed research and analytical skills. Leadership or management skills are also desired because often electrical engineers will need to supervise other workers to implement changes to the distribution system.

Sample problem

Sam is planning to install a power line from A to B, as shown. If the line is installed from A to C to B, she can use poles and above-ground cable. The cost will be \$43/ft. If the line is installed in a straight line from A to B, it must run in a trench underground and the cost will be \$53/ft. Which route is cheaper?



Solution

The cost for an underground line is \$53 000.

Use the sine law to calculate the distance from A to C. The measure of $\angle C$ is 115°.

Let x represent the distance from A to C, in feet.

$$\frac{x}{\sin 45°} = \frac{1000}{\sin 115°}$$

$$x = \sin 45° \times \frac{1000}{\sin 115°}$$

$$x \doteq 780.206$$

The distance from A to C is approximately 780 ft.

The total distance from A to C to B is 300 + 780.2, or 1080.2 ft.

The total cost for the above-ground installation is 43 × \$1080.2, or \$46 448.60.

The above ground installation is cheaper.

Level 3 Notes

Look for the following:

- three jobs are described in some detail
- the educational requirements for each job are listed
- a relevant problem involving trigonometry is posed and solved

What Distinguishes Level 2

Look for the following:

- fewer than three jobs are described in some detail
- the educational requirements may not be listed for each job or they may be incomplete
- a relevant problem involving trigonometry is posed but may not be solved correctly

What Distinguishes Level 4

Look for the following:

- three or more jobs are described with a high degree of detail, and details are provided about job prospects for the future
- the educational requirements for each job are listed, including where the qualifications can be obtained as well as details about costs and program duration
- an elaborate, relevant problem involving trigonometry is posed and solved; the problem likely involves multiple steps and may have multiple methods of solution

Summative Assessment

- Use **BLM 2-16 Chapter 2 Problem Wrap-Up Rubric** to assess student achievement.