

Lesson Plans for Module 02301-14

APPLIED MATH

Module 02301-14 introduces trainees to math concepts they will use on the job, including weights and measures, area and volume, temperature, pressure, and force. It also describes the six simple machines: inclined planes, levers, pulleys, wedges, screws, and wheels and axles.

Objectives

Learning Objective 1

- Identify the weights and measures used in the English and metric systems.
 - a. Explain the English system of weights and measures.
 - b. Explain the metric system of weights and measures.
 - c. Explain how to convert measurements.

Learning Objective 2

- Describe how to measure area and volume.
 - a. Describe how to measure area.
 - b. Describe how to measure volume.

Learning Objective 3

- Describe the practical applications of area and volume in plumbing.
 - a. Describe how to perform area calculations in plumbing.
 - b. Describe how to perform volume calculations in plumbing.
 - c. Describe how to perform load calculations.

Learning Objective 4

- Explain the concepts of temperature and pressure and how they apply to plumbing installations.
 - a. Explain the concept of temperature and how it applies to plumbing installations.
 - b. Explain the concepts of pressure and force and how they apply to plumbing installations.

Learning Objective 5

- Explain the functions and applications of six simple machines: inclined plane, lever, pulley, wedge, screw, and wheel and axle.
 - a. Explain how inclined planes work.
 - b. Explain how levers work.
 - c. Explain how pulleys work.
 - d. Explain how wedges work.
 - e. Explain how screws work.
 - f. Explain how wheels and axles work.

Performance Tasks

This is a knowledge-based module; there is no performance testing.

Teaching Time: 17.5 hours

(Seven 2.5-hour Classroom sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites

Core Curriculum, Plumbing Level One, and Plumbing Level Two.

Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the Module Examinations from www.nccerirc.com. The passing score for submission into NCCER's Registry is 70 percent or above for the Module Examination.



Safety Considerations

Safety is paramount in the plumbing trade, and safe habits and practices must be emphasized whenever possible.

Classroom Equipment and Materials

Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Calculator
Plumbing Level Three PowerPoint®
Presentation Slides
Computer
Copies of the Module Examination
Vendor-supplied videos/DVDs showing simple machines (*optional*)
TV/DVD player

Equipment and Materials for Laboratories and Performance Testing

Lab scale
Chisels
Cold water
Hot water
Ice
Infrared thermometer
Liquid thermometer
Bimetal thermometer
Construction drawings
Roof plan
Manufacturer catalogs and brochures for plumbers
Pulleys
Rope
Screws
Tape measure
Water hammer arrestor
Weights

Additional Resources and References

This module presents thorough resources for task training. The following resource material is suggested for further study:

Code Check Plumbing: A Field Guide to Plumbing. 2000. Redwood Kardon, Michael Casey, and Douglas Hansen. Newtown, CT: Taunton Press.

Fundamentals of Temperature, Pressure and Flow Measurements. 1984. Robert P. Benedict. New York: John Wiley & Sons.

International Plumbing Code®, Latest Edition. Falls Church, VA: International Code Council.

Math to Build On: A Book for Those Who Build. 1993. Johnny and Margaret Hamilton. Clinton, NC: Construction Trades Press.

Mechanics of Materials. 2011. Ferdinand Baer. Science, Engineering & Math Publishing.

There are a number of online resources available for trainees who would like more information on the use of applied math in the plumbing industry. A search for additional information may be assigned as homework to interested trainees.

APPLIED MATH

The lesson plan for this module is divided into seven 2.5-hour sessions. Each session includes 10 minutes for administrative tasks and one 10-minute break.

SESSION ONE

Session One introduces weights and measures.

1. Show Session One PowerPoint® presentation slides.
2. Discuss the English system of weights and measures.
3. Discuss the metric system of weights and measures.
4. Discuss and demonstrate how to convert measurements.

SESSION TWO

Session Two introduces area calculations.

1. Show Session Two PowerPoint® presentation slides.
2. Discuss and demonstrate how to calculate rectangular area.
3. Discuss and demonstrate how to calculate triangular area.
4. Discuss and demonstrate how to calculate circular area.

SESSION THREE

Session Three introduces volume calculations.

1. Show Session Three PowerPoint® presentation slides.
2. Discuss and demonstrate how to calculate volume for a rectangular prism.
3. Discuss and demonstrate how to calculate volume for a right triangular prism.
4. Discuss and demonstrate how to calculate volume for a cylinder.

SESSION FOUR

Session Four introduces area and volume in plumbing.

1. Show Session Four PowerPoint® presentation slides.
2. Identify and discuss plumbing applications in which area calculations are required.
3. Identify and discuss plumbing applications in which volume calculations are required.
4. Discuss and demonstrate load calculations for pipe and fittings.



APPLIED MATH

SESSION FIVE

Session Five introduces temperature and pressure.

1. Show Session Five PowerPoint® presentation slides.
2. Explain why the concepts of temperature, pressure, and force are important as related to plumbing systems.
3. Discuss different temperature scales and how to convert between each scale.
4. Explain the concept of thermal expansion.
5. Discuss how water pressure is affected by height.

SESSION SIX

Session Six introduces simple machines.

1. Show Session Six PowerPoint® presentation slides.
2. Identify the six simple machines and how each works.
3. Describe applications for each simple machine.

SESSION SEVEN

Session Seven is a review and testing session. Have trainees complete the module Review Questions and Trade Terms Quiz. (Alternatively, these may be assigned as homework at the end of Session Six.) Answer any questions that trainees may have.

1. Have trainees complete the Module Examination.
2. Record the testing results on Training Report Form 200 and submit the report to your Training Program Sponsor.

Materials Checklist for Module 02301-14, Applied Math

Equipment and Materials			
Personal protective equipment:		Calculator	Lab scale
None Required		Chisels	Construction drawings
Copies of the Module Examination		Manufacturer catalogs and brochures for plumbers	Roof plan
<i>Plumbing Level Three</i> PowerPoint® Presentation Slides		Cold water	Water hammer arrestor
Whiteboard/chalkboard		Hot water	Rope
Markers/chalk		Ice	Screws
Pencils and paper		Infrared thermometer	Tape measure
Computer		Liquid thermometer	Weights
Vendor-supplied videos/DVDs showing simple machines (<i>optional</i>)		Bimetal thermometer	Pulleys
TV/DVD player			

To the extent possible, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.

