00102-15

Introduction to Construction Math

Module Two

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Your feedback is welcome. You may email your comments to **curriculum@nccer.org,** send general comments and inquiries to **info@nccer.org**, or fill in the User Update form at the back of this module.

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Module Two (00102-15) introduces trainees to basic math skills needed in the construction environment. The module reviews whole numbers and fractions; working with decimals; the four primary math operations; reading rulers and tape measures; the Imperial and metric units of measurement; basic geometric figures; and area and volume calculations for two-dimensional and three-dimensional objects.

Objectives

Learning Objective 1

- Identify whole numbers and demonstrate how to work with them mathematically.
  - a. Identify different whole numbers and their place values.
  - b. Demonstrate the ability to add and subtract whole numbers.
  - c. Demonstrate the ability to multiply and divide whole numbers.

Learning Objective 2

- Explain how to work with fractions.
  - a. Define equivalent fractions and show how to find lowest common denominators.
  - b. Describe improper fractions and demonstrate how to change an improper fraction to a mixed number.
  - c. Demonstrate the ability to add and subtract fractions.
  - d. Demonstrate the ability to multiply and divide fractions.

Learning Objective 3

- Describe the decimal system and explain how to work with decimals.
  - a. Describe decimals and their place values.
  - b. Demonstrate the ability to add, subtract, multiply, and divide decimals.
  - c. Demonstrate the ability to convert between decimals, fractions, and percentages.

Learning Objective 4

- Identify various tools used to measure length and show how they are used.
  - a. Identify and demonstrate how to use rulers.
  - b. Identify and demonstrate how to use measuring tapes.

Learning Objective 5

- Identify and convert units of length, weight, volume, and temperature between the imperial and metric systems of measurement.
  - a. Identify and convert units of length measurement between the imperial and metric systems.
  - b. Identify and convert units of weight measurement between the imperial and metric systems.
  - c. Identify and convert units of volume measurement between the imperial and metric systems.
  - d. Identify and convert units of temperature measurement between the imperial and metric systems.

Learning Objective 6

- Identify basic angles and geometric shapes and explain how to calculate their area and volume.
  - a. Identify various types of angles.
  - b. Identify basic geometric shapes and their characteristics.
  - c. Demonstrate the ability to calculate the area of two-dimensional shapes.
  - d. Demonstrate the ability to calculate the volume of three-dimensional shapes.

Performance Tasks

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

Teaching Time: 10 hours

(Four 2.5-Hour Classroom Sessions)

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

Prerequisites

Core Curriculum Module 00101-15.

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 written examinations and performance profile sheets from **www.nccerirc.com**. The passing score for submission into NCCER's Registry is 70% or above for the written examination; performance testing is graded pass or fail.

Safety Considerations

During the course of this module, trainees may be in the vicinity of electrical energy sources and potentially hazardous tools, equipment, and materials. In those instances, trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to the hazards associated with the energy sources, tools, equipment, and materials.

Classroom Equipment and Materials

Whiteboard/chalkboard

Markers/chalk

Pencils and paper

Core Curriculum PowerPoint® Presentations

DVD player

LCD projector and screen

Computer

Internet access during class (*optional*)

Copies of the Module Examination

Equipment and Materials for Laboratories and Performance Testing

Calculators

Rulers

Tape measures

Additional Resources

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

Applied Construction Math: A Novel Approach. NCCER. 2006. Upper Saddle River, NJ: Prentice Hall.

Mathematics for Carpentry and the Construction Trades. Alfred P. Webster; Kathryn B. Judy. 2001. Upper Saddle River, NJ: Prentice Hall.

Mathematics for the Trades: A Guided Approach. Robert A. Carman Emeritus; Hal M. Saunders. 2014. Pearson Learning.

Metric-conversion.org : Metric Conversion Charts and Calculators.

There are a number of on-line resources available for trainees who would like more information on trade-related math skills. The instructor's package for this module comes with a companion workbook offering additional math problems that can be provided to trainees needing additional practice.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. Well-produced videos can provide learning approaches that may be helpful to some trainees. Be prepared to stop the videos at appropriate times to point out and discuss the topic.

Instructors are encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.

Introduction to Construction Math

The Lesson Plan for this module is divided into four 2.5-hour sessions.
This time includes 10 minutes for administrative tasks and a 10-minute break per session.

Session One

Session One reviews basic numbers and the four primary mathematical operations of addition, subtraction, multiplication, and division. These four operations are also applied to fractions.

1. Show the Session One PowerPoint® presentation.

2. Use the Kickoff Activity to stimulate interest in math.

3. Identify whole numbers and place values.

4. Apply the four primary operations to whole numbers.

5. Introduce fractions and mixed numbers.

6. Apply the four primary operations to fractions.

Session Two

Session Two Introduces mixed numbers in the form of decimals. The four operations are applied to decimal numbers, along with the conversion of fractions, decimals, and percentages. The session concludes with instruction on measuring with and reading with rulers and tape measures.

1. Show the Session Two PowerPoint® presentation.

2. Introduce decimal numbers and expand on place values.

3. Apply the four operations to decimal numbers.

4. Show trainees how to convert fractions, decimals, and percentages.

5. Introduce rulers and tape measures and have trainees practice reading and taking measurements.

Session Three

Session Three presents Imperial and metric units of measurement for length, weight, volume, and temperature. In addition, basic geometry is introduced.

1. Show the Session Three PowerPoint® presentation.

2. Introduce the most common units of measure in the imperial and metric systems.

3. Demonstrate how unit conversions are made, both within and between the two systems.

4. Introduce basic geometric shapes and their characteristics.

5. Demonstrate how to calculate are and volume for various shapes.

Session Four

Session Four is a review and testing session. Have trainees complete the Module Review and Trade Terms Quiz. Alternatively, the Module Review and Trade Terms Quiz may be assigned as homework. Go over the Module Review and Trade Terms Quiz in class prior to the exam and answer any questions that the trainees may have.

1. Have trainees complete the written examination.

2. Record the testing results on the Registration of Training Modules Form, and submit the report to your Training Program Sponsor.

Materials Checklist for Module 00102-15, Introduction to Construction Math

Equipment and Materials				
Personal protective equipment:	Calculators			
None	Rulers			
Whiteboard/chalkboard	Tape measures			
Markers/chalk				
Pencils and paper				
Core Curriculum PowerPoint® Presentation Slides				
DVD player				
LCD projector and screen				
Computer				
Internet access during class (*optional*)				
Copies of the Module Examination				

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

Safety Considerations

The following safety consideration should be emphasized when introducing trainees to the construction environment:

Remind trainees that some forms of PPE may be required any time they are in the shop or on a job site.

Safety Equipment

The use of specific safety equipment is not anticipated for this session.

Classroom and/or Lab Equipment

Calculators

Resources

No specific resources are required for this session.

Kickoff Activity

Amaze the trainees with your ability to quickly look at a series of five three-digit numbers and add them in your head. Have a trainee write three three-digit numbers on the whiteboard as if they are going to be added. Then tell them you will add two more numbers to make it challenging. Quickly determine what number must be added to the first number to make 999, and casually write it as your fourth number. For the fifth number, determine what number must be added to the second number to make it 999 also. The fourth and fifth number must be determined quickly yet casually to make it believable; spend a very limited time looking at the series of numbers. You now know the answer to the problem: it is (2,000 + the third number) minus 2. See if any of the trainees can figure out your secret.

Session Objectives

When trainees have completed this session, they should be able to do the following:

1. Identify whole numbers and demonstrate how to work with them mathematically.
   a. Identify different whole numbers and their place values.
   b. Demonstrate the ability to add and subtract whole numbers.
   c. Demonstrate the ability to multiply and divide whole numbers.
2. Explain how to work with fractions.
   a. Define equivalent fractions and show how to find lowest common denominators.
   b. Describe improper fractions and demonstrate how to change an improper fraction to a mixed number.
   c. Demonstrate the ability to add and subtract fractions.
   d. Demonstrate the ability to multiply and divide fractions.

Session Performance Requirements

This is a knowledge-based module; there are no Performance Tasks.

Instructional Outline

Research has shown that varying instructional methods periodically throughout class sessions helps to engage and hold trainees' attention. The *Core Curriculum* PowerPoint® presentation that you received with this lesson plan is keyed to the sections of the Trainee Guide indicated below and has been designed for use with this lesson plan.

Teaching Tip

Most of the major sections in the Trainee Guide provide study problems for concept practice. When used in class following lecture and demonstrations, engage trainees in working these study problems by having them work at the whiteboard or direct another's actions at the whiteboard. Take steps to ensure that each trainee is grasping the math concepts and can complete the study problems successfully.

Classroom: Section 1.0.0

Explain the importance of math skills in the construction workplace. Use various examples of the need for math in the workplace.

Classroom: Sections 1.1.0–1.1.1

Define *digit* and *place value*. Use the figure to demonstrate the assignment of place values. Explain the meaning of positive and negative numbers.

Review the individual study problems related to place values of whole numbers.

Classroom: Sections 1.2.0–1.2.1

Define *sum*. Demonstrate how to align digits for addition. Use the example to demonstrate addition. Explain what *difference* means, in math terms. Demonstrate how to align numbers for subtraction. Use the example to demonstrate subtraction.

Review the individual study problems related to adding and subtracting whole numbers.

Classroom: Section 1.3.0

Describe multiplication in simple terms and define *product*. Demonstrate how to align digits for multiplication. Use the example to demonstrate multiplication. Define *quotient*, *dividend*, *divisor*, and *remainder*. Demonstrate how to write a division problem. Use the example to demonstrate long division.

Classroom: Sections 1.3.1–1.3.2

Define *equation* and explain the importance of using a specific order of operations. Present the two acronyms to help trainees remember.

Review the individual study problems related to multiplying and dividing whole numbers.

Classroom: Section 2.0.0

Define *fractions* and show how they are written. Point out the numerator and the denominator. Explain that all fractions with equal numbers top and bottom are equal to one.

Classroom: Sections 2.1.0–2.1.2

Describe and demonstrate equivalent fractions. Introduce the concept of a lowest common denominator.

Show how math is used to determine a lowest common denominator. Make the connection between these fractions and taking measurements. Show how to change the denominator of fractions. Demonstrate how to reduce fractions to their lowest terms.

Classroom: Sections 2.1.3–2.1.4

Present the practical example of comparing fractions to determine which fraction represents a larger value. Point out the advantage of changing fractions to a common denominator for comparison. Review the steps to finding common denominators for fractions.

Review the individual study problems related to finding equivalent fractions.

Classroom: Sections 2.2.0–2.2.1

Define *improper fractions* and *mixed numbers*. Remind trainees that fractions are another way of writing a division problem. Show how to change an improper fraction to a mixed number.

Review the individual study problems related to improper fractions and mixed numbers.

Classroom: Sections 2.3.0–2.3.1

Review the steps for adding and subtracting fractions. Demonstrate how to change a mixed number to an improper fraction for adding and subtracting.

Review the individual study problems related to adding and subtracting fractions.

Classroom: Sections 2.4.0–2.4.1

Point out that common denominators are not needed to multiply and divide fractions. Demonstrate the steps required to multiply and divide fractions.

Review the individual study problems related to multiplying and dividing fractions.

Wrap Up

Review one or more study problems from each major section covered during this session to work on the whiteboard with trainees. Call on individual trainees to provide the steps, one step at a time.

Homework

Have trainees read Sections 2.0.0 through 4.2.4 to prepare for the next session. Have trainees complete the 1.0.0, 2.0.0, 3.0.0, and 4.0.0 Section Reviews as they complete the reading assignment.

Safety Considerations

The following safety consideration should be emphasized when introducing trainees to the construction environment:

Remind trainees that some forms of PPE may be required any time they are in the shop or on a job site.

Safety Equipment

The use of specific safety equipment is not anticipated for this session.

Classroom and/or Lab Equipment

Calculators
Rulers
Tape measures

Resources

No specific resources are required for this session.

Session Objectives

When trainees have completed this session, they should be able to do the following:

3. Describe the decimal system and explain how to work with decimals.
   a. Describe decimals and their place values.
   b. Demonstrate the ability to add, subtract, multiply, and divide decimals.
   c. Demonstrate the ability to convert between decimals, fractions, and percentages.
4. Identify various tools used to measure length and show how they are used.
   a. Identify and demonstrate how to use rulers.
   b. Identify and demonstrate how to use measuring tapes.

Session Performance Requirements

This is a knowledge-based module; there are no Performance Tasks.

Instructional Outline

Research has shown that varying instructional methods periodically throughout class sessions helps to engage and hold trainees' attention. The *Core Curriculum* PowerPoint® presentation that you received with this lesson plan is keyed to the sections of the Trainee Guide indicated below and has been designed for use with this lesson plan.

Review

Review the answers to the 1.0.0 through 4.0.0 Section Reviews.

Teaching Tip

Most of the major sections in the Trainee Guide provide study problems for concept practice. When used in class following lecture and demonstrations, engage trainees in working these study problems by having them work at the whiteboard or direct another's actions at the whiteboard. Take steps to ensure that each trainee is grasping the math concepts and can complete the study problems successfully.

Classroom: Sections 3.0.0–3.1.0

Emphasize that the decimal system is based on the number 10. Point out that the decimal system and the place value of numbers are parts of the same concept.

Use the figure to show additional place values not previously shown. Explain how a decimal number is spoken.

Classroom: Sections 3.1.1–3.1.3

Describe how to round decimal numbers to fewer digits. Demonstrate how to compare two decimal numbers.

Review the individual study problems related to decimals.

Classroom: Sections 3.2.0–3.2.1

Explain that working with decimals is not very different than working with whole numbers Demonstrate how to align and add/subtract decimal numbers.

Classroom: Sections 3.2.2–3.2.3

Use the practical example provided to demonstrate how decimal numbers are multiplied. Demonstrate how long division is done with decimals.

Classroom: Sections 3.2.4–3.2.5

Demonstrate how to work with decimals using a calculator. Have trainees follow along with their own calculator.

Review the individual study problems related to decimals.

Classroom: Sections 3.3.0–3.3.1

Explain that changing numbers from one form to another is often necessary to work with them on equal terms. Use examples such as the dollar to explain percentages. Point out that decimals and fractions all represent parts of a whole, or less than 100 percent. Review the steps in changing decimals to percentages and vice versa.

Classroom: Sections 3.3.2–3.3.3

Review the steps to convert fractions to decimals. Demonstrate the process of converting decimals to fractions.

Classroom: Section 3.3.4

Introduce the metric system, and explain how it aligns to the decimal system. Point out that Imperial measurements must sometimes be converted to decimals. Demonstrate the conversion process.

Classroom: Sections 3.3.5–3.3.6

Review the individual study problems and the practical applications related to conversions.

Classroom: Sections 4.0.0–4.1.0

Introduce common measurement tools used by the construction trade. Explain how to read measurement tools. Emphasize the importance of accuracy in all measurements.

Classroom: Sections 4.1.1–4.1.3

Use the figure to show the fractional values on a standard ruler. Review how to call out fractional measurements. Use the figure to show the increments on a metric ruler. Explain how millimeter and centimeter measurements are read.

Review the individual study problems related to reading rulers as found on the figures.

Classroom: Section 4.2.0

Introduce measuring tapes. Review both the Imperial and metric markings. Discuss the common lengths of measuring tapes in both systems.

Classroom: Sections 4.2.1–4.2.2

Review the English measuring tape in detail. Point out its unique markings and explain how they are used by carpenters. Show how foot markings are used in conjunction with sequential inch markings Explain that metric-only measuring tapes are common outside of the United States. Discuss the absence of the unique markings found on English models.

Classroom: Sections 4.2.3–4.2.4

Discuss why the measuring tape is shaped as it is. Review the steps for using a measuring tape. Show how to use the tape to make inside measurements.

Review the individual study problems related to reading measuring tapes as found on the figures.

Wrap Up

Have trainees use tape measures to measure various items within the room and record their measurements. Then ask them to speak the measurements they recorded for one or more items to practice the language of measurement.

Homework

Have trainees read Sections 5.0.0 through 6.4.6 to prepare for the next session. Trainees should also complete the 5.0.0 and 6.0.0 Section Reviews.

Safety Considerations

The following safety considerations should be emphasized when introducing trainees to the construction environment:

   Remind trainees that some forms of PPE may be required any time they are in the shop or on a job site.

Safety Equipment

The use of specific safety equipment is not anticipated for this session.

Classroom and/or Lab Equipment

   Calculators
   Tape measures

Resources

No specific resources are required for this session.

Session Objectives

When trainees have completed this session, they should be able to do the following:

5. Identify and convert units of length, weight, volume, and temperature between the imperial and metric systems of measurement.
   a. Identify and convert units of length measurement between the imperial and metric systems.
   b. Identify and convert units of weight measurement between the imperial and metric systems.
   c. Identify and convert units of volume measurement between the imperial and metric systems.
   d. Identify and convert units of temperature measurement between the imperial and metric systems.
6. Identify basic angles and geometric shapes and explain how to calculate their area and volume.
   a. Identify various types of angles.
   b. Identify basic geometric shapes and their characteristics.
   c. Demonstrate the ability to calculate the area of two-dimensional shapes.
   d. Demonstrate the ability to calculate the volume of three-dimensional shapes.

Session Performance Requirements

This is a knowledge-based module; there are no Performance Tasks.

Instructional Outline

Research has shown that varying instructional methods periodically throughout class sessions helps to engage and hold trainees' attention. The *Core Curriculum* PowerPoint® presentation that you received with this lesson plan is keyed to the sections of the Trainee Guide indicated below and has been designed for use with this lesson plan.

Review

Review the answers to the 5.0.0 and 6.0.0 Section Reviews.

Teaching Tip

Most of the major sections in the Trainee Guide provide study problems for concept practice. When used in class following lecture and demonstrations, engage trainees in working these study problems by having them work at the whiteboard or direct another's actions at the whiteboard. Take steps to ensure that each trainee is grasping the math concepts and can complete the study problems successfully.

Classroom: Section 5.0.0

Introduce the metric system and emphasize its popularity and simplicity. Emphasize the need to understand both the Imperial and metric systems in a global economy. Identify the most common metric units of measure. Review the metric unit prefixes and explain that they work the same for all units of metric measurement. Ask trainees to identify which metric values have already become familiar to them and how that occurred.

Classroom: Sections 5.1.0–5.1.1

Introduce the topic of length-related units of measurement.

Review the Imperial units of length measurement. Identify common symbols and abbreviations for each unit. Explain how to convert units within the Imperial system.

Classroom: Section 5.1.2

Identify the most common metric units of length measurement. Review the abbreviations for the units. Demonstrate how to convert values within the metric system. Point out that moving a decimal point has the same effect as multiplication.

Classroom: Sections 5.1.3–5.1.4

Describe the math required to make length unit conversions across the two systems. Explain that many tables and charts exist to assist with conversion, but understanding the mathematical process is essential. Demonstrate how a simple conversion is made.

Review the individual study problems related to converting measurement units.

Classroom: Sections 5.2.0–5.2.1

Introduce the topic of units for weight measurement.

Define *weight*, *force*, and *mass*. Review the abbreviations for these units. Demonstrate how to make a conversion within the Imperial system from one unit to another.

Classroom: Sections 5.2.2–5.2.4

Identify the most common metric units of weight and their abbreviations. Demonstrate how to convert weight units within the metric system.

Use the table to review the conversion factors for various units of weight in both systems. Use the practical examples to demonstrate how to convert weight units from one system to another.

Review the individual study problems related to converting weight units.

Classroom: Sections 5.3.0–5.3.1

Point out that the units of volume measurement as discussed here apply to three-dimensional objects rather than liquid measures. Explain how volume measurements are determined. Discuss the use of the word *cubic* as applied to volume measurements.

Review the common Imperial units of volume and their abbreviations. Demonstrate a simple conversion within the Imperial system.

Classroom: Sections 5.3.2–5.3.4

Introduce metric units of volume measurement. Remind trainees that metric prefixes remain the same and have the same relationship to each other. Review the common abbreviations for these units.

Refer to the table for factors used to convert volume measurements between the two systems. Use the practical applications provided to help demonstrate the conversion process.

Review the individual study problems related to converting volume units.

Classroom: Sections 5.4.0–5.4.1

Discuss the temperature units used in different countries for one application or another. Define *temperature* and point out that cold is the absence of heat. Talk about the development of temperature scales. Compare and contrast the four temperature scales. Point out that numerous charts are available for easy temperature conversions. Review the formulas for converting between the Fahrenheit and Celsius scales.

Review the individual study problems related to converting temperature units.

Classroom: Sections 6.0.0–6.1.0

Introduce geometry. Define *plane* and *solid geometry*.

Define *angle*. Review angle terminology and angle units of measure (degrees). Use the figure to present the bulleted list of angle types.

Classroom: Sections 6.2.0–6.2.2

Define *rectangle*. Point out the 90-degree angles at all the corners.

Define *square* and explain how squares compare to rectangles. Discuss perimeter calculations and explain how to easily calculate the perimeter of a square.

Classroom: Sections 6.2.3–6.2.4

Define *triangle* and describe the angle characteristics of different triangles. Use the figure to point out the various triangle types.

Define *circle* and explain the terminology and characteristics of circles. Point out that circles are composed of 360 equal degrees.

Classroom: Sections 6.3.0–6.3.1

Define *area* and describe area units of measure. Review the formulas for calculating the area of various shapes. Demonstrate each calculation on the whiteboard.

Review the individual study problems related to calculating area.

Classroom: Section 6.4.0

Define *volume*. Identify the units of measure for the volume of three-dimensional shapes. Emphasize that the units used in volume calculations must be the same; provide examples of significant errors that can otherwise result. Refer trainees to the formulas for calculating volume in the *Appendix*.

Classroom: Sections 6.4.1–6.4.3

Describe three-dimensional rectangles. Use the example problem to demonstrate the volume calculation.

Describe the cube and demonstrate how to calculate its volume.

Describe cylinders. Demonstrate how to calculate the volume of a cylinder using the formula.

Classroom: Sections 6.4.4–6.4.6

Describe a triangular prism. Point out the difference between this shape and a pyramid. Demonstrate how to calculate its volume.

Review the individual study problems related to calculating volume.

Use the practical applications here to show how the math skills learned in this session can be applied.

Wrap Up

Select one study problem or practical application problem from each topic covered in this session and review on the whiteboard to strengthen trainee understanding. Alternatively, have them measure various two- or three-dimensional objects in the room that match the geometric shapes covered in this session. Be prepared to present the formulas for other shapes if trainees show extended interest in more unique shapes found in the classroom.

Homework

Assign a review of the complete module to prepare for the module exam. Have trainees complete the Module Review and Trade Terms Quiz as homework.

This session is reserved for a brief review of the module and administering the module examination.

Safety Considerations

The following safety consideration should be emphasized when introducing trainees to the construction environment:

Remind trainees that some forms of PPE may be required any time they are in the shop or on a job site.

Safety Equipment

The use of specific safety equipment is not anticipated during this session.

Classroom and/or Lab Equipment

Copies of the Module Examination

Have the Review Question and Trade Terms Quiz answer key available for review prior to administering the module exam.

Resources

No specific resources are required for this session

Review

Ask the trainees if they wish to review any particular information from the module. Have the trainees complete the Module Review and Trade Terms Quiz. Alternatively, if the Module Review and Trade Terms Quiz were assigned as homework, have them retrieve their answers. Review the answers to the Module Review and Trade Terms Quiz prior to administering the module exam. Ask again if the trainees need clarification on any particular knowledge areas.

Examination

Administer the Module Exam. As they begin, remind trainees that they must answer at least 70 percent of the questions correctly to pass the module exam.

Wrap Up

Ask the trainees if there were any trouble areas on the exam and to identify a favorite and least favorite part of this module. As an alternate or if time allows, briefly introduce the next topic in your planned teaching sequence.

Homework

Assign the reading of the next module in the teaching sequence.

Instructor

Record the testing results on the Registration of Training Modules Form, and submit the report to your Training Program Sponsor.

SECTION REVIEW ANSWERS

*The math calculations for these answers are provided below the answer keys.

SECTION 1.0.0

Answer		Section Reference	Objective
1.	d	1.1.0	1a
2.	c*	1.2.0	1b
3.	b*	1.3.0	1c

2. $46 + 8 + 8 + 30 + 8 + 10 + 20 + 10 + 8 + 10 + 8 + 10 + 10 + 38 = 224$ feet

3. 224 feet ÷ 16 inches per block = 224 feet ÷ 1.333 feet = 168.04 blocks per course
   A 24-inch-high foundation requires 3 courses of 8-inch block;
   therefore, 3×168.04 blocks = 504.12 blocks, rounded up to 505 blocks

SECTION 2.0.0

Answer		Section Reference	Objective
1.	b*	2.1.0	2a
2.	b*	2.2.0	2b
3.	c*	2.3.0	2c
4.	d*	2.3.0	2c
5.	a*	2.4.0	2d
6.	c*	2.4.0	2d

1. $\frac{1}{2} \times \frac{32}{32} = \frac{32}{64}$

2. $\frac{76}{64} = 76 \div 64 = 1$, with a remainder of 12 or $\frac{12}{64}$
   To change the fraction to a decimal: $12 \div 64 = .1875$,
   making the decimal equivalent of $\frac{76}{64} = 1.1875$

3. Convert $\frac{3}{8}$ to a common denominator with $\frac{11}{16}$:
   $\frac{3}{8} \times \frac{2}{2} = \frac{6}{16}$
   $\frac{11}{16} + \frac{6}{16} = \frac{17}{16}$, or $1\frac{1}{16}$

4. Convert $1\frac{1}{4}$ to a common denominator with $\frac{7}{16}$:
   $1\frac{1}{4} = \frac{5}{4}$; $\frac{5}{4} \times \frac{4}{4} = \frac{20}{16}$
   $\frac{20}{16} - \frac{7}{16} = \frac{13}{16}$

5. $\frac{1}{8} \times \frac{1}{10} = 1 \times \frac{1}{8} \times 10 = \frac{1}{80}$

6. Invert the divisor and multiply: $\frac{7}{16} \div \frac{7}{8} = \frac{7}{16} \times \frac{8}{7} = 7 \times \frac{8}{16} \times 7 = \frac{56}{112}$
   Using a factor of 56, reduce to lowest terms:
   $56 \div \frac{56}{112} \div 56 = \frac{1}{2}$

SECTION 3.0.0

Answer		Section Reference	Objective
1.	c	3.1.0	3a
2.	a	3.1.0	3a
3.	b*	3.2.1	3b
4.	a*	3.2.1	3b
5.	d*	3.2.2	3b
6.	a*	3.2.3	3b
7.	c	3.3.1	3c
8.	c*	3.3.2	3c
9.	a*	3.3.2	3c

3. $3.625 + 4.9 = 8.525$

4. $42.58 - 7.577 = 35.003$

5. $9.64 \times 12 = 115.68$

6. $123.82 \div 6.5 = 19.049$

8. $\frac{7}{8} = 7 \div 8 = 0.875$

9. $\frac{2}{3} = 2 \div 3 = 0.666.$
   Convert 0.666 to a percentage by moving the decimal 2 places to the right: 66.6%
   66.6% is greater than 65%

SECTION 4.0.0

Answer		Section Reference	Objective
1.	a	4.1.2	4a
2.	b	4.2.3	4b

SECTION 5.0.0

Answer		Section Reference	Objective
1.	b	5.1.2	5a
2.	d	5.2.1	5b
3.	c	5.3.2	5c
4.	b	5.4.0	5d

SECTION REVIEW ANSWERS

(Continued)

SECTION 6.0.0

Answer	Section Reference	Objective
1. d	6.1.0	6a
2. b	6.2.2; 6.2.4	6b
3. c*	6.3.0	6c
4. c*	6.4.1	6d

3. Area $= l \times w$
   Area $= 27.3$ meters $\times 9.3$ meters
   Area $= 253.89 \text{ m}^2$

4. Volume $= l \times w \times d$
   Volume $= 26$ feet $\times 13.66$ feet $\times 3$ feet
   Volume $= 1{,}065.48 \text{ ft}^3$

ANSWERS TO REVIEW QUESTIONS

	Answer	Section Reference
1.	b	1.1.0
2.	a*	1.2.0
3.	c*	1.2.0
4.	d*	1.3.0
5.	c*	1.3.0
6.	c*	2.1.1
7.	a	2.1.3
8.	d*	2.3.0
9.	a*	2.3.0
10.	b	3.1.2
11.	a*	3.2.1
12.	b*	3.2.2
13.	b*	3.2.2
14.	a*	3.2.3
15.	c	3.3.1
16.	c*	3.3.3
17.	a	4.1.1
18.	d	4.1.2
19.	c	4.2.1
20.	a	5.0.0
21.	a	5.1.2
22.	c*	5.1.3
23.	b	5.2.3
24.	d*	5.2.3
25.	a*	5.4.0
26.	d	6.1.0
27.	b	6.2.1
28.	a	6.3.0
29.	d*	6.4.3
30.	a*	6.4.4

*The math calculations for these answers are provided on the following page.

REVIEW QUESTION CALCULATIONS

2. Total bricks laid = 649 bricks + 632 bricks + 478 bricks
   Total bricks laid = 1,759

3. 1,478 feet − 489 feet installed = 989 feet of cable remaining

4. 15 scaffolds × 26 sites = 390 scaffolds

5. 400 rolls insulation ÷ 5 sites = 80 rolls per site

6. $3/8 \times 8/8 = 24/64$

8. $3/8 \times 2/2 = 6/16$
   $6/16 + 9/16 = 15/16$

9. $2/8 \times 4/4 \times 8/32$
   $11/32 - 8/32 = 3/32$

11. 51.5 nanometers + 89.7 nanometers = 141.2 nanometers

12. 3.53 × 9.75 = 34.4175, rounded up to 34.42

13. 864.5 square feet × $2.37 per square foot = $2,048.865, rounded up to $2,048.87

14. 89.435 ÷ 0.05 = 1,788.7

16. $14.75 = 1475/100 = 1475 \div 25/100 \div 25 = 59/4$

22. 1 inch = 2.54 centimeters
    67 inches × 2.54 centimeters per inch = 170.18 centimeters

24. 1 ounce = 28.35 grams
    49 ounces × 28.35 grams = 1389.15 grams

25. $°C = 5/9 (15°F − 32°) = 5/9 \times −17° = −9.4°C$

29. Volume of cylinder = pi × r^2 × h
    = 3.14 × 6.25 feet × 23 feet
    = 3.14 × 39.06 × 23
    = 2,821 cu ft

30. Volume of triangular prism = 0.5 × base × height × depth
    = 0.5 × 7 centimeters × 4 centimeters × 3 centimeters
    = 42 cm^3

ANSWERS TO TRADE TERMS QUIZ

1. Radius
2. Acute angle
3. Bisect
4. Area
5. Angle
6. Circle
7. Degree
8. Plane geometry
9. Loadbearing
10. Numerator
11. Denominator
12. Diagonal
13. Diameter
14. Stud
15. Difference
16. Solid geometry
17. Digits
18. Place value
19. Equivalent fractions
20. Formula
21. Fractions
22. Vertex
23. Improper fractions
24. Invert
25. Sum
26. Remainder
27. Obtuse angle
28. Mixed number
29. Adjacent angles
30. Base
31. Perimeter
32. Whole numbers
33. Negative numbers
34. Positive numbers
35. Scalene triangle
36. Right triangle
37. Equilateral triangle
38. Isosceles triangle
39. Right angle
40. Straight angle
41. Pi
42. Triangle
43. Volume
44. Product
45. Quotient
46. Unit
47. Circumference
48. Square
49. Cube
50. Dividend
51. Divisor
52. Rectangle
53. Force
54. Decimal
55. Mass
56. Opposite angles
57. Joists
58. Equation

ANSWERS TO STUDY PROBEMS

*The math calculations for these answers are provided on the pages that follow these answer keys.

SECTION 1.1.1   PLACE VALUES OF WHOLE NUMBERS

1. a
2. b
3. b

4. b
5. c

SECTION 1.2.1   ADDING AND SUBTRACTING WHOLE NUMBERS

*1. $1,472
*2. R$2,278
*3. 156 hours

*4. $216
*5. Rub891,135

SECTION 1.3.2   MULTIPLYING AND DIVIDING WHOLE NUMBERS

*1. 12 bags

*2. a. (520) 2 × 4s
    b. (360) 2 × 8s
    c. (200) 2 × 10s

*3. 13 lengths of pipe needed;
    3 meters left over

*4. a. $2,400
    b. $8,400
    c. $18,100

SECTION 2.1.4   FINDING EQUIVALENT FRACTIONS

1. b*
2. c*
3. d*
4. a*
5. c*

6. ⅛*
7. ¼*
8. ⅜*
9. ½*
10. ¹⁄₁₆*

11. c*
12. b*
13. d*
14. b*
15. d*

SECTION 2.2.1   CHANGING IMPROPER FRACTIONS TO MIXED NUMBERS

*1. 4⅜
*2. 6¹⁄₁₆
*3. 3¼

*4. 2⅖
*5. 3

SECTION 2.3.1   ADDING AND SUBTRACTING FRACTIONS

1. ⅜*	6. ¹⁄₁₆*	11. 7¼*
2. ⅞*	7. ¹⁄₁₆*	12. 11⅜*
3. 1¼*	8. ⁵⁄₁₂*	13. d*
4. 1*	9. ⁵⁄₁₂*	14. b*
5. 1¼*	10. ³⁄₁₆*	15. a*

SECTION 2.4.1   MULTIPLYING AND DIVIDING FRACTIONS

1. ⁵⁄₃₂*	5. ¼*	9. a*
2. ²¹⁄₃₂*	6. ⅛*	10. d*
3. 3¾*	7. 1¼*	
4. 21*	8. 2*	

SECTION 3.1.3   WORKING WITH DECIMALS

1. b	5. d	9. b
2. c	6. c	10. b
3. a	7. d	
4. c	8. a	

SECTION 3.2.5   DECIMALS

1. 11.70*	12. 0.41*	23. 52*
2. 10.48*	13. 5.20*	24. 53.74
3. 92.83*	14. 20*	25. 0.91
4. b*	15. 216.88*	26. 629.52
5. b*	16. 220*	27. 1.98
6. c*	17. 40.8*	28. 38.4
7. a*	18. 520*	29. b*
8. b*	19. 4.91*	30. d*
9. 2.52*	20. 10.51*	31. d*
10. 0.25*	21. 22*	32. c*
11. 0.03*	22. 40.8*	33. b*

SECTION 3.3.5 CONVERTING DIFFERENT VALUES

1. 62%*	8. 0.125*	15. $\frac{9}{20}$*
2. 47.5%*	9. 0.3125*	16. 0.75 feet*
3. 70%*	10. 0.3125*	17. 0.83 feet*
4. 0.72*	11. ½*	18. 0.17 feet*
5. 0.125*	12. $\frac{3}{25}$*	19. 0.33 feet*
6. 0.25*	13. ⅛*	20. 1.42 feet*
7. 0.75*	14. ⅘*	

SECTION 3.3.6 PRACTICAL APPLICATIONS

1. a. 321.67 feet
    b. $382.79
    c. $45.93
    d. $336.86
    e. $20.21
    f. $357.07

2. a. 50.2%
    b. 43%
    c. 6.8%

SECTION 4.1.3 READING RULERS

1. ½ in	6. ⅝ in	11. 0.1 cm
2. 1⅞ in	7. 1$\frac{9}{16}$ in	12. 1.1 cm
3. 2¾ in	8. 2$\frac{5}{16}$ in	13. 1.9 cm
4. 3¾ in	9. 3¼ in	14. 29 mm
5. 4⅝ in	10. 4$\frac{7}{16}$ in	15. 38 mm

SECTION 4.2.4 READING MEASURING TAPES

1. 8$\frac{13}{16}$ in	5. 4$\frac{11}{16}$ in	9. 11 cm
2. 9$\frac{13}{16}$ in	6. 4.4 cm	10. 11.8 cm
3. 10⅞ in	7. 5.9 cm	
4. 3¼ in	8. 9.9 cm	

SECTION 5.1.4   CONVERTING MEASUREMENTS

1. 45 cm*	5. 0.01 m*	9. 17.37 m*
2. 108 in*	6. 167.64 cm*	10. 185.04 in*
3. 12 yards*	7. 14.33 m*	
4. 2.5 yards*	8. 1.79 feet*	

SECTION 5.2.4   CONVERTING WEIGHT UNITS

*1. 22.68 kilograms	*3. 450.76 grams
*2. 110.25 pounds	*4. 3.32 ounces

SECTION 5.3.4   CONVERTING VOLUME UNITS

*1. 6.7 cubic feet	*4. 198,218 cubic centimeters
*2. 1,900,000 cubic centimeters	*5. 7.1 cubic feet
*3. 669.7 cubic yards	

SECTION 5.4.1   CONVERTING TEMPERATURES

*1. 82.2°C	*3. −14.8°F
*2. 18.9°C	*4. 159.8°F

SECTION 6.3.1   CALCULATING AREA

1. c*	4. a*
2. a*	5. c*
3. c*	

SECTION 6.4.5   CALCULATING VOLUME

1. d*	4. a*
2. d*	5. b*
3. b*	

SECTION 6.4.6   PRACTICAL APPLICATIONS

*1.	653.12 in^3
*2.	109 ft^3

STUDY PROBLEM CALCULATIONS

SECTION 1.2.1 ADDING AND SUBTRACTING WHOLE NUMBERS

1.
$$\begin{array}{r} 847 \\ 456 \\ +169 \\ \hline 1,472 \end{array}$$

2. $10,236 - (2,477 + 2,263 + 3,218)$
$10,236 - 7,958 = 2,278$

3. Crew 1: $10 + 9 + 11 + 12 + 9 = 51$
Crew 2: $9 + 12 + 12 + 9 + 9 = 51$
Crew 3: $12 + 12 + 10 + 9 + 11 = 54$
Total: $51 + 51 + 54 = 156$

4. Step 1.
$$\begin{array}{r} 874 \\ 67 \\ +93 \\ \hline 1,034 \end{array}$$

   Step 2.
$$\begin{array}{r} 1,250 \\ -1,034 \\ \hline 216 \end{array}$$

5. Step 1. $850,360 + 119,980 = 970,340$

   Step 2. $970,340 - 79,205 = 891,135$

SECTION 1.3.2 MULTIPLYING AND DIVIDING WHOLE NUMBERS

1.
$$\begin{array}{r} 12 \\ 15\overline{)180} \\ -15 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

2. Step 1.
$$\begin{array}{r} 4 \\ \times 2 \\ \hline 8 \text{ locations} \end{array}$$

   Step 2.
$$\begin{array}{r} 65 \\ \times 8 \\ \hline 520 \end{array} \ 2 \times 4s$$

   Step 3.
$$\begin{array}{r} 45 \\ \times 8 \\ \hline 360 \end{array} \ 2 \times 8s$$

   Step 4.
$$\begin{array}{r} 25 \\ \times 8 \\ \hline 200 \end{array} \ 2 \times 10s$$

3. Step 1. $45 + 30 = 75$
   Step 2. $75 \div 6 = 12.5$; round up to 13
   Step 3. $13 \times 6 = 78$
   Step 4. $78 - 75 = 3$

4. a. $3 \times 800 = 2,400$

   b. Step 1. $2 \times 3,400 = 6,800$
      Step 2. $2 \times 800 = 1,600$
      Step 3. $6,800 + 1,600 = 8,400$

   c. Step 1. $1 \times 10,500 = 10,500$
      Step 2. $2 \times 3,400 = 6,800$
      Step 3. $1 \times 800 = 800$
      Step 4. $10,500 + 6,800 + 800 = 18,100$

SECTION 2.1.4   FINDING EQUIVALENT FRACTIONS

1. $\dfrac{1 \times 4}{4 \times 4} = \dfrac{4}{16}$

2. $\dfrac{2 \times 2}{16 \times 2} = \dfrac{4}{32}$

3. $\dfrac{3 \times 2}{4 \times 2} = \dfrac{6}{8}$

4. $\dfrac{3 \times 16}{4 \times 16} = \dfrac{48}{64}$

5. $\dfrac{3 \times 2}{16 \times 2} = \dfrac{6}{32}$

6. $\dfrac{2 \div 2}{16 \div 2} = \dfrac{1}{8}$

7. $\dfrac{2 \div 2}{8 \div 2} = \dfrac{1}{4}$

8. $\dfrac{12 \div 4}{32 \div 4} = \dfrac{3}{8}$

9. $\dfrac{4 \div 4}{8 \div 4} = \dfrac{1}{2}$

10. $\dfrac{4 \div 4}{64 \div 4} = \dfrac{1}{16}$

11. $\dfrac{2}{6}, \dfrac{3}{4}$

$\dfrac{2 \times 2}{6 \times 2} = \dfrac{4}{12}$

$\dfrac{3 \times 3}{4 \times 3} = \dfrac{9}{12}$

$\dfrac{4}{12}, \dfrac{9}{12}$

12

12. $\dfrac{1}{4}, \dfrac{3}{8}$

$\dfrac{1 \times 2}{4 \times 2} = \dfrac{2}{8}$

$\dfrac{2}{8}, \dfrac{3}{8}$

8

13. $\dfrac{1}{8}, \dfrac{1}{2}$

$\dfrac{1 \times 4}{2 \times 4} = \dfrac{4}{8}$

$\dfrac{1}{8}, \dfrac{4}{8}$

8

14. $\dfrac{1}{4}, \dfrac{3}{16}$

$\dfrac{1 \times 4}{4 \times 4} = \dfrac{4}{16}$

$\dfrac{4}{16}, \dfrac{3}{16}$

16

15. $\dfrac{4}{32}, \dfrac{5}{8}$

$\dfrac{4 \div 4}{32 \div 4} = \dfrac{1}{8}$

$\dfrac{1}{8}, \dfrac{5}{8}$

8

SECTION 2.2.1   CHANGING IMPROPER FRACTIONS TO MIXED NUMBERS

1. $3\frac{5}{8} = 35 \div 8 = 4$, r3 or $4\frac{3}{8}$

2. $\frac{97}{16} = 97 \div 16 = 6$, r1 or $6\frac{1}{16}$

3. $\frac{13}{4} = 13 \div 4 = 3$, r1 or $3\frac{1}{4}$

4. $\frac{14}{5} = 14 \div 5 = 2$, r4 or $2\frac{4}{5}$

5. $\frac{48}{16} = 48 \div 16 = 3$

SECTION 2.3.1   ADDING AND SUBTRACTING FRACTIONS

1. $\dfrac{1}{8} + \dfrac{4}{16}$

$\dfrac{4 \div 2}{16 \div 2} = \dfrac{2}{8}$

$\dfrac{1}{8} + \dfrac{2}{8} = \dfrac{3}{8}$

2. $\dfrac{4}{8} + \dfrac{6}{16}$

$\dfrac{6 \div 2}{16 \div 2} = \dfrac{3}{8}$

$\dfrac{4}{8} + \dfrac{3}{8} = \dfrac{7}{8}$

3. $\dfrac{2}{4} + \dfrac{3}{4} = \dfrac{5}{4}$

$5 \div 4 = 1$, r1 or $1\frac{1}{4}$

4. $\dfrac{3}{4} + \dfrac{2}{8}$

$\dfrac{2 \div 2}{8 \div 2} = \dfrac{1}{4}$

$\dfrac{3}{4} + \dfrac{1}{4} = \dfrac{4}{4}$

$\dfrac{4}{4} = 1$

5. $\dfrac{14}{16} + \dfrac{3}{8}$

$\dfrac{14 \div 2}{16 \div 2} = \dfrac{7}{8}$

$\dfrac{7}{8} + \dfrac{3}{8} = \dfrac{10}{8}$

$\dfrac{2 \div 2}{8 \div 2} = \dfrac{1}{4}$

$1\frac{1}{4}$

6. $\dfrac{3}{8} - \dfrac{5}{16}$

$\dfrac{3 \times 2}{8 \times 2} = \dfrac{6}{16}$

$\dfrac{6}{16} - \dfrac{5}{16} = \dfrac{1}{16}$

7. $\dfrac{11}{16} - \dfrac{5}{8}$

$\dfrac{5 \times 2}{8 \times 2} = \dfrac{10}{16}$

$\dfrac{11}{16} - \dfrac{10}{16} = \dfrac{1}{16}$

SECTION 2.3.1 ADDING AND SUBTRACTING FRACTIONS

(Continued)

8. $\dfrac{3}{4} - \dfrac{2}{6}$

$\dfrac{3 \times 3}{4 \times 3} = \dfrac{9}{12}$

$\dfrac{2 \times 2}{6 \times 2} = \dfrac{4}{12}$

$\dfrac{9}{12} - \dfrac{4}{12} = \dfrac{5}{12}$

9. $\dfrac{11}{12} - \dfrac{4}{8}$

$\dfrac{11 \times 2}{12 \times 2} = \dfrac{22}{24}$

$\dfrac{4 \times 3}{8 \times 3} = \dfrac{12}{24}$

$\dfrac{22}{24} - \dfrac{12}{24} = \dfrac{10}{24}$

$\dfrac{10 \div 2}{24 \div 2} = \dfrac{5}{12}$

10. $\dfrac{11}{16} - \dfrac{1}{2}$

$\dfrac{1 \times 8}{2 \times 8} = \dfrac{8}{16}$

$\dfrac{11}{16} - \dfrac{8}{16} = \dfrac{3}{16}$

11. $8 - \tfrac{3}{4}$
$7 + 1 - \tfrac{3}{4}$
$7 + \tfrac{4}{4} - \tfrac{3}{4}$
$7 + \tfrac{1}{4} = 7\tfrac{1}{4}$

12. $12 - \tfrac{5}{8}$
$11 + 1 - \tfrac{5}{8}$
$11 + \tfrac{8}{8} - \tfrac{5}{8}$
$11 + \tfrac{3}{8} = 11\tfrac{3}{8}$

13. Two punches $= 4\tfrac{1}{64} + 4\tfrac{3}{32}$

$\dfrac{4}{32} \times \dfrac{2}{2} = \dfrac{6}{64}$

$4\tfrac{1}{64} + 4\tfrac{6}{64} = 8\tfrac{7}{64}$

$9\tfrac{7}{16} - 8\tfrac{7}{64}$

$\dfrac{7}{16} \times \dfrac{4}{4} = \dfrac{28}{64}$

$9\tfrac{28}{64} - 8\tfrac{7}{64} = 1\tfrac{21}{64}$

14. $20\tfrac{3}{4} - 12\tfrac{1}{16}$

$\dfrac{3}{4} \times \dfrac{4}{4} = \dfrac{12}{16}$

$20\tfrac{12}{16} - 12\tfrac{1}{16} = 8\tfrac{11}{16}$

15. $36\tfrac{3}{8} - 35\tfrac{15}{16}$

$\dfrac{3}{8} \times \dfrac{2}{2} = \dfrac{6}{16}$

$36\tfrac{6}{16} - 35\tfrac{15}{16}$

$35 + 1 + \dfrac{6}{16}$

$35 + \dfrac{16}{16} + \dfrac{6}{16}$

$35 + \dfrac{22}{16}$

$35\tfrac{22}{16} - 35\tfrac{15}{16} = \dfrac{7}{16}$

SECTION 2.4.1   MULTIPLYING AND DIVIDING FRACTIONS

1. $\frac{4}{16} \times \frac{5}{8} = \frac{20}{128} \div \frac{4}{4} = \frac{5}{32}$

2. $\frac{3}{4} \times \frac{7}{8} = \frac{21}{32}$

3. $\frac{2}{8} \times \frac{15}{1} = \frac{30}{8} \div \frac{2}{2} = \frac{15}{4}$

4. $\frac{3}{7} \times \frac{49}{1} = \frac{147}{7} \div \frac{7}{7} = \frac{21}{1} = 21$

5.
$$\frac{8}{16} \times \frac{32}{64}$$

$$\frac{8 \div 8}{16 \div 8} = \frac{1}{2} \qquad \frac{32 \div 32}{64 \div 32} = \frac{1}{2}$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

or $\frac{8 \times 32}{16 \times 64} = \frac{256}{1{,}024} \div \frac{256}{256} = \frac{1}{4}$

6. $\frac{3}{8} \div 3 = \frac{3}{8} \times \frac{1}{3} = \frac{3}{24} \div \frac{3}{3} = \frac{1}{8}$

7. $\frac{5}{8} \div \frac{1}{2} = \frac{5}{8} \times \frac{2}{1} = \frac{10}{8} \div \frac{2}{2} = \frac{5}{4}$ or $1\frac{1}{4}$

8. $\frac{3}{4} \div \frac{3}{8} = \frac{3}{4} \times \frac{8}{3} = \frac{24}{12} \div \frac{12}{12} = \frac{2}{1} = 2$

9. $8\frac{1}{2} \div \frac{1}{4} = \frac{17}{2} \div \frac{1}{4} = \frac{17}{2} \times \frac{4}{1} = \frac{68}{2} \div \frac{2}{2} = \frac{34}{1} = 34$

10. $7 \div \frac{7}{8} = \frac{7}{1} \times \frac{8}{7} = \frac{56}{7} \div \frac{7}{7} = \frac{8}{1} = 8$

SECTION 3.2.5   DECIMALS

1.
```
   2.50
   4.20
 + 5.00
  11.70
```

2.
```
    ¹
   1.82
   3.41
 + 5.25
  10.48
```

3.
```
    ¹
   6.43
 + 86.40
  92.83
```

4.
```
    ¹
   0.078
 + 0.250
   0.328
```

5.
```
   6.7
 − 2.3
   4.4
```

6.
```
      3
 × 0.3
    0.9
```

7.
```
   6.18
 − 0.90
   5.28
```

8.
```
     128
  × 4.75
     640
    8960
 + 51200
  608.00
```

9.
```
         2.52
  18 ) 45.36
     − 36
       093
     − 090
      0036
    − 0036
      0000
```

SECTION 3.2.5 DECIMALS

(Continued)

10.
$$18\overline{)4.536}$$ quotient 0.252, rounded to 0.25
```
        0.252,  rounded to 0.25
18 ) 4.536
    − 36
      093
    − 090
      0036
    − 0036
      0000
```

11.
```
        0.0252,  rounded to 0.03
18 ) 0.4536
    − 00
      045
    − 036
      0093
    − 0090
      00036
    − 00036
      00000
```

12.
```
        0.408,  rounded to 0.41
25 ) 10.200
    − 100
      0020
    − 0000
      00200
    − 00200
      00000
```

13.
```
      5.2
6 ) 31.2
  − 30
    012
  − 012
    000
```

14.
```
                      20
14.1 ) 282  =  141 ) 2820
                   − 282
                     00
                   − 00
                      0
```

15.
```
                      216.875,  rounded to 216.88
3.2 ) 694  =  32 ) 6940.000
                 − 64
                   054
                 − 032
                   0220
                 − 0192
                   00280
                 − 00256
                   000240
                 − 000224
                   0000160
                 − 0000160
                   0000000
```

16.
```
                  220
0.45 ) 99  =  45 ) 9900
                − 90
                  90
                − 90
                  00
                − 00
                   0
```

17.
```
                   40.8
2.5 ) 102  =  25 ) 1020.0
                 − 100
                   0020
                 − 0000
                   00200
                 − 00200
                   00000
```

18.
```
                  520
0.6 ) 312  =  6 ) 3120
               − 30
                 12
               − 12
                 00
               − 00
                  0
```

SECTION 3.2.5   DECIMALS

(Continued)

19.
$$4.24 \overline{)20.82} = 424 \overline{)2082.000}$$
$$\begin{array}{r} 4.910 \\ -\ 1696 \\ \hline 03860 \\ -\ 03816 \\ \hline 000440 \\ -\ 000424 \\ \hline 0000160 \\ -\ 0000000 \\ \hline 160r \end{array}$$

20.
$$3.7 \overline{)38.9} = 37 \overline{)389.000}$$
10.513, rounded to 10.51
$$\begin{array}{r} -\ 37 \\ \hline 019 \\ -\ 000 \\ \hline 0190 \\ -\ 0185 \\ \hline 00050 \\ -\ 00037 \\ \hline 000130 \\ -\ 000111 \\ \hline 19r \end{array}$$

21.
$$0.45 \overline{)9.9} = 45 \overline{)990}$$
22
$$\begin{array}{r} -\ 90 \\ \hline 90 \\ -\ 90 \\ \hline 0 \end{array}$$

22.
$$0.25 \overline{)10.20} = 25 \overline{)1020.0}$$
40.8
$$\begin{array}{r} -\ 100 \\ \hline 0020 \\ -\ 0000 \\ \hline 00200 \\ -\ 00200 \\ \hline 00000 \end{array}$$

23.
$$0.6 \overline{)31.2} = 6 \overline{)312}$$
52
$$\begin{array}{r} -\ 30 \\ \hline 12 \\ -\ 12 \\ \hline 0 \end{array}$$

29.
$$3.75 \overline{)90.5} = 375 \overline{)9050.00}$$
24.13, rounded to 24.1
$$\begin{array}{r} -\ 750 \\ \hline 1550 \\ -\ 1500 \\ \hline 00500 \\ -\ 00375 \\ \hline 001250 \\ -\ 001125 \\ \hline 000125r \end{array}$$

30.
$$151.8 \overline{)1001} = 1518 \overline{)10010.00}$$
6.59, rounded to 6.6
$$\begin{array}{r} -\ 09108 \\ \hline 009020 \\ -\ 007590 \\ \hline 0014300 \\ -\ 0013662 \\ \hline 160r \end{array}$$

31.
$$4.30 \overline{)120.95} = 430 \overline{)12095.000}$$
28.127, rounded to 28.13
$$\begin{array}{r} -\ 0860 \\ \hline 03495 \\ -\ 03440 \\ \hline 000550 \\ -\ 000430 \\ \hline 0001200 \\ -\ 0000860 \\ \hline 00003400 \\ -\ 00003010 \\ \hline 390r \end{array}$$

32.
$$0.37 \overline{)115.38} = 37 \overline{)11538.00}$$
311.83, rounded to 311.8
$$\begin{array}{r} -\ 111 \\ \hline 0043 \\ -\ 0037 \\ \hline 00068 \\ -\ 00037 \\ \hline 000310 \\ -\ 000296 \\ \hline 0000140 \\ -\ 0000111 \\ \hline 29r \end{array}$$

SECTION 3.2.5   DECIMALS

(Continued)

33.

$$0.48\overline{)115.38} = 48\overline{)11538.000} \quad \begin{array}{l}240.375, \text{ rounded to } 240.4\end{array}$$

```
          240.375,  rounded to 240.4
48 ) 11538.000
   − 096
     0193
   − 0192
     00018
   − 00000
     000180
   − 000144
     0000360
   − 0000336
     00000240
   − 00000240
     00000000
```

SECTION 3.3.5   CONVERTING DIFFERENT VALUES

1. $0.62 = 0.62 \times 100 = 62\%$

2. $0.475 = 0.475 \times 100 = 47.5\%$

3. $0.7 = 0.7 \times 100 = 70\%$

4. $72\% = 72 \div 100 = 0.72$

5. $12.5\% = 12.5 \div 100 = 0.125$

6.
```
       0.25
   4 ) 1.00
     − 08
       020
     − 020
       000
```

7.
```
       0.75
   4 ) 3.00
     − 28
       020
     − 020
       000
```

8.
```
       0.125
   8 ) 1.000
     − 08
       020
     − 016
       0040
     − 0040
       0000
```

9.
```
        0.3125
   16 ) 5.0000
      − 48
        020
      − 016
        0040
      − 0032
        00080
      − 00080
        00000
```

10.
```
         0.3125
   64 ) 20.0000
      − 192
        0080
      − 0064
        00160
      − 00128
        000320
      − 000320
        000000
```

11. $0.5 = \dfrac{5}{10} \dfrac{\div\ 5}{\div\ 5} = \dfrac{1}{2}$

12. $0.12 = \dfrac{12}{100} \dfrac{\div\ 4}{\div\ 4} = \dfrac{3}{25}$

SECTION 3.3.5   CONVERTING DIFFERENT VALUES

(Continued)

13. $0.125 = \dfrac{125}{1000} \ \dfrac{\div \ 125}{\div \ 125} = \dfrac{1}{8}$

14. $0.8 = \dfrac{8}{10} \ \dfrac{\div \ 2}{\div \ 2} = \dfrac{4}{5}$

15. $0.45 = \dfrac{45}{100} \ \dfrac{\div \ 5}{\div \ 5} = \dfrac{9}{20}$

16. $\dfrac{9}{12} \ \dfrac{\div \ 3}{\div \ 3} = \dfrac{3}{4}$

$$
\begin{array}{r}
0.75 \\
4\overline{)3.00} \\
-28 \\
\hline
020 \\
-020 \\
\hline
000
\end{array}
$$

17. $\dfrac{10}{12} \ \dfrac{\div \ 2}{\div \ 2} = \dfrac{5}{6}$

$$
\begin{array}{r}
0.833 \\
6\overline{)5.000} \\
-48 \\
\hline
020 \\
-018 \\
\hline
0020 \\
-0018 \\
\hline
2r
\end{array}
$$

Rounded to the nearest hundredth = 0.83

18. $\dfrac{2}{12} \ \dfrac{\div \ 2}{\div \ 2} = \dfrac{1}{6}$

$$
\begin{array}{r}
0.166 \\
6\overline{)1.000} \\
-06 \\
\hline
040 \\
-036 \\
\hline
0040 \\
-0036 \\
\hline
4r
\end{array}
$$

Rounded to the nearest hundredth = 0.17

19. $\dfrac{4}{12} \ \dfrac{\div \ 4}{\div \ 4} = \dfrac{1}{3}$

$$
\begin{array}{r}
0.333 \\
3\overline{)1.000} \\
-09 \\
\hline
010 \\
-009 \\
\hline
1r
\end{array}
$$

Rounded to the nearest hundredth = 0.33

20.
$$
\begin{array}{r}
1.416 \\
12\overline{)17.000} \\
-12 \\
\hline
050 \\
-048 \\
\hline
0020 \\
-0012 \\
\hline
00080 \\
-00072 \\
\hline
8r
\end{array}
$$

Rounded to the nearest hundredth = 1.42

SECTION 5.1.4 CONVERTING MEASUREMENTS

1. $.45 \times 100 = 45$

2. 3×36 in/yd $= 108$

3. $36 \div 3$ ft/yd $= 12$

4. $90 \div 36$ in/yd $= 2.5$

5. $1 \div 100 = 0.01$

6. 66×2.54 conversion factor $= 167.64$

7. 47×0.3048 conversion factor $= 14.33$

8. 54.5×0.03281 conversion factor $= 1.79$

9. 19×0.9144 conversion factor $= 17.37$

10. 4.7×39.37 conversion factor $= 185.04$

SECTION 5.2.4 CONVERTING WEIGHT UNITS

1. 50×0.4536 conversion factor $= 22.68$

2. 50×2.205 conversion factor $= 110.25$

3. 15.9×28.35 conversion factor $= 450.76$

4. 94×0.03527 conversion factor $= 3.32$

SECTION 5.3.4 CONVERTING VOLUME UNITS

1. 11600×0.0005787 conversion factor $= 6.7$

2. $1.9 \times 1,000,000$ conversion factor $= 1,900,000$

3. 512×1.308 conversion factor $= 669.7$

4. $7 \times 28,316.85$ conversion factor $= 198,218$

5. 0.2×35.315 conversion factor $= 7.1$

SECTION 5.4.1 CONVERTING TEMPERATURES

1. $°C = \frac{5}{9}(180 - 32)$
   $°C = \frac{5}{9}(148)$
   $°C = \frac{5}{9} \times \frac{148}{1} = \frac{740}{9}$
   $°C = 82.2$

2. $°C = \frac{5}{9}(66 - 32)$
   $°C = \frac{5}{9}(34)$
   $°C = \frac{5}{9} \times \frac{34}{1} = \frac{740}{9}$
   $°C = 18.9$

3. $°F = (\frac{9}{5} \times -26) + 32$
   $°F = (\frac{9}{5} \times \frac{-26}{1}) + 32$
   $°F = \frac{-234}{5} + 32$
   $°F = -46.8 + 32$
   $°F = -14.8$

4. $°F = (\frac{9}{5} \times 71) + 32$
   $°F = (\frac{9}{5} \times \frac{71}{1}) + 32$
   $°F = \frac{639}{5} + 32$
   $°F = 127.8 + 32$
   $°F = 159.8$

SECTION 6.3.1   CALCULATING AREA

1. Area = length × width = 8 × 4 = 32 sq ft

2. Area = length × width = 16 × 16 = 256 sq cm

3. radius = ½ diameter
   radius = ½ × 14 = 7 ft
   Area = pi × radius^2 = 3.14 × 7 × 7 = 3.14 × 49

   $$
   \begin{array}{r}
   {}^{1}_{1}\ {}^{3} \\
   3.14 \\
   \times\ 49\ \\
   \hline
   2826 \\
   +\ 12560\ \\
   \hline
   153.86 \text{ sq ft}
   \end{array}
   $$

2. $$
   \begin{array}{r}
   {}^{1} \\
   1.82 \\
   3.41 \\
   +\ 5.25\ \\
   \hline
   10.48
   \end{array}
   $$

4. Area = 0.5 × base × height = 0.5 × 4 × 6 = 0.5 × 24 = 12 sq cm

   $$
   \begin{array}{r}
   {}^{2} \\
   24 \\
   \times 0.5\ \\
   \hline
   12.0
   \end{array}
   $$

5. Area = base × height = 14 × 5 = 70 sq m

SECTION 6.4.5   CALCULATING VOLUME

1. Volume = length × width × depth = 5 × 6 × 13 = 30 × 13 = 390 cu ft

   $$
   \begin{array}{r}
   30 \\
   \times\ 13\ \\
   \hline
   90 \\
   +\ 300\ \\
   \hline
   390
   \end{array}
   $$

2. Volume = length × width × depth = 3 × 3 × 3 = 27 cu cm

3. Volume = 0.5 × base × height × depth = 0.5 × 6 × 2 × 4 = 24 cu in

SECTION 6.4.5   CALCULATING VOLUME

(*Continued*)

4. Radius = ½ diameter = ½ × 6 = ⁶⁄₂ ÷ ²⁄₂ = ³⁄₁ = 3 m
    Height = 60 cm = 0.6 m
    Volume = pi × radius² × h = 3.14 × 3 × 3 × 0.6 = 3.14 × 9 × 0.6

$$\begin{array}{r} 9 \\ \times\ 0.6 \\ \hline 5.4 \end{array}$$

Volume = 3.14 × 5.4

$$\begin{array}{r} {}^{1}_{2} \\ 3.14 \\ \times\ 5.4 \\ \hline 1256 \\ +\ 15700 \\ \hline 16.956 \end{array}$$

Volume = 16.956 cu m

5. Depth = 6 in
    ⁶⁄₁₂ = ½ = 0.5 ft
    Volume = length × width × depth = 17 × 17 × 0.5 =

$$\begin{array}{r} {}^{4} \\ 17 \\ \times\ 17 \\ \hline 119 \\ +\ 170 \\ \hline 289 \end{array}$$

Volume = 289 × 0.5

$$\begin{array}{r} {}^{4\ 4} \\ 289 \\ \times\ 0.5 \\ \hline 144.5 \end{array}$$

Volume = 144.5 cu ft
1 yd = 3 ft
1 cu yd = 3 × 3 × 3 = 27 cu ft

144.5 cu ft × $\dfrac{1\ \text{cu yd}}{27\ \text{cu ft}}$ = 144.5 ÷ 27

$$\begin{array}{r} 5.35 \\ 27\ \overline{)\ 144.50} \\ -\ 135 \\ \hline 95 \\ -\ 81 \\ \hline 140 \\ -\ 135 \\ \hline 5r \end{array}$$

5.35 cu yds

SECTION 6.4.6   PRACTICAL APPLICATIONS

1. Volume $\pi \times 4^2 \times 13$ in $= 653.12$ cu in

2. Area of upper rectangle $= 39.666$ feet $\times 6$ feet $= 237.996$
    Area of remaining rectangle $= 6$ feet $\times 13$ feet $= 78$
    Area of remaining triangle $= \frac{1}{2} \times 4 \times 6 = 12$.
    Total is 327.996 sq ft $\times 0.333$ feet (thickness of the concrete) $= 109$ cu ft

Module 00102-15 Exam
Introduction to Construction Math

Trainee Name: _____

Social Security Number: _____ Date: _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. In the number 123.456, what is the place value of the 5?
   a. 5/10ths
   b. 50/100ths
   c. 50/1000ths
   d. 5

2. Forty-five thousand, six hundred twelve pipe fittings have been ordered for a large project. How would you write this number as a whole number using digits?
   a. 4,561
   b. 4,562
   c. 45,612
   d. 450,612

3. Add the following numbers together: 811, 901, 88, and 5. The sum is _____.
   a. 1,705
   b. 1,775
   c. 1,795
   d. 1,805

4. Your job as a carpenter pays $20/hour and you worked 40 hours last week. The taxes withheld from your wages were $83 federal tax and $19 state tax. Your total check is _____.
   a. $698
   b. $720
   c. $810
   d. $912

5. A package containing 12 electrical locks, each with a unique key, must be delivered to 16 job site superintendents. How many unique keys will result from the distribution?
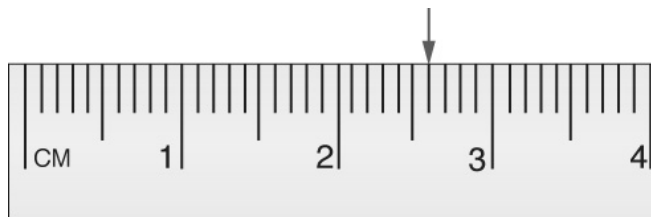   a. 192
   b. 180
   c. 48
   d. 28

6. You have 5,814 meters of rope that you need to cut into 27 meter sections. How many 27 meter sections of rope will you be able to create, and how much rope will be left over as waste?
   a. 215 sections with 3 meters left over
   b. 215 sections with 8 meters left over
   c. 215 sections with 9 meters left over
   d. 218 sections with 3 meters left over

7. An equivalent fraction to 5/16 is _____.
   a. 5/32
   b. 10/32
   c. 1/2
   d. 10/16

8. When reduced to its lowest terms, the fraction 12/16 would read as _____.
   a. 3/4
   b. 5/8
   c. 8/12
   d. 12/8

9. The improper fraction 37/6 can be changed to the mixed number _____.
   a. 6
   b. 5-7/16
   c. 6-1/16
   d. 37

10. 1/4 + 3/8 = _____. Reduce your answer to the lowest terms.
    a. 4/8
    b. 1/2
    c. 5/8
    d. 5/4

11. 8/12 – 4/8 = _____. Reduce your answer to the lowest terms.
    a. 4/24
    b. 2/14
    c. 1/7
    d. 1/6

12. 7/8 × 3/9 = _____. Reduce your answer to the lowest terms.
    a. 21/72
    b. 24/63
    c. 7/24
    d. 8/21

13. 7/8 ÷ 7/16 = _____. Reduce your answer to the lowest terms.
    a. 7/32
    b. 7/2
    c. 1
    d. 2

14. In a number such as 52.25, any numbers shown to the right of the decimal point represent
    _____.
    a. that part of the number that is greater than 1
    b. that part of the number that is less than 1
    c. an improper number
    d. an improper fraction

15. Of the following series of numbers, which is the higher number? 0.04671; 0.04761; 0.4761; 0.4671.
    a. 0.04671
    b. 0.04761
    c. 0.4761
    d. 0.4671

16. One sheet of drywall weighs 48.7 pounds. If 50 sheets are ordered, the total weight of the order would be _____.
    a. 2,532.0 pounds
    b. 2,435.0 pounds
    c. 2,430.0 pounds
    d. 243.5 pounds

17. You need to mix 42 kilograms of mortar. Each kilogram of mortar mix requires 0.03 liters of water. How many liters of water do you need? (Round your answer to the nearest tenth of a liter.)
    a. 1.2 liters
    b. 1.3 liters
    c. 12.6 liters
    d. 13.2 liters

18. When a number is stated as a percentage, it means that number represents a portion of _____.
    a. 50
    b. 100
    c. 250
    d. 1,000

19. When converting decimals to a percentage, simply move the decimal point _____.
    a. one place to the left
    b. one place to the right
   c. two places to the left
    d. two places to the right

20. Convert 0.86 into a fraction and reduce the answer to lowest terms.
    a. 86/100
    b. 14/100
    c. 43/50
    d. 7/50

1/16THS
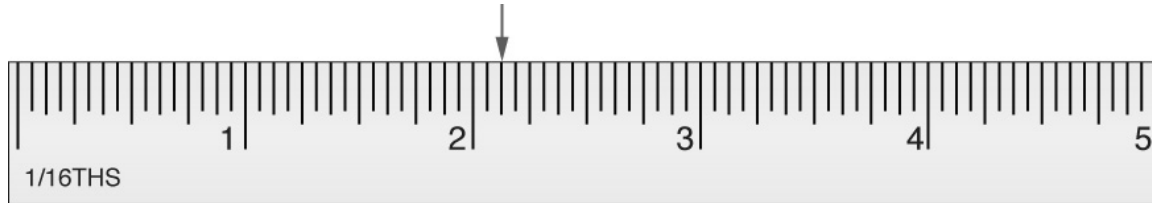
21. The marked measurement in the figure above indicates _____.
    a. 2-1/8 inches
    b. 2-3/16 feet
    c. 2-1/4 inches
    d. 2-1/2 feet

CM

22. The marked measurement in the figure above indicates _____.
    a. 2-3/10 centimeters
    b. 2.35 meters
    c. 2.5 meters
    d. 2.6 centimeters

23. The metric ruler is typically divided into _____.
    a. inches and half inches
    b. centimeters and millimeters
    c. millimeters and decimeters
    d. eighth inches and sixteenth inches
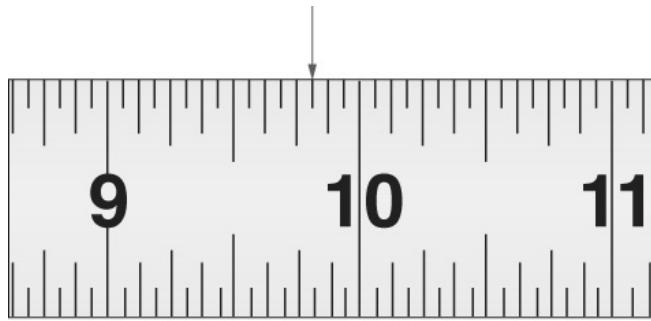
24. The marked measurement in the figure above indicates _____.
    a. 9-11/16 centimeters
    b. 9-11/16 inches
    c. 9-13/16 inches
    d. 9-13/16 centimeters

25. An inside measurement can be taken with a tape measure by _____.
    a. adding the length of the tape measure case
    b. subtracting the length of the tape measure case
    c. removing the tape from the case
    d. adding the thickness of the tape hook

26. In the metric system, each millimeter increment is equal to _____.
    a. 1/1000 of a centimeter
    b. 1/100 of a centimeter
    c. 1/10 of a centimeter
    d. 10 centimeters

27. Convert 612 feet to meters using the following information: 1 meter = 3.28 feet. Round your answer to the nearest one-hundredth.
    a. 186.58 meters
    b. 200.79 meters
    c. 1865.85 meters
    d. 2007.97 meters

28. Converting 165 pounds to the metric system results in a weight of _____.
    a. 10.3 centimeters
    b. 74.8 kilograms
    c. 149.6 milligrams
    d. 363.8 kilometers

29. One ounce is equal to 28.35 grams. Convert 16 ounces to grams. Round your answer to the nearest tenth.
    a. 1.8 grams
    b. 12.4 grams
    c. 44.4 grams
    d. 453.6 grams

30. One cubic meter represents a cube shape that measures 1 meter in all three dimensions. How long is each side in centimeters?
    a. 1 cm
    b. 10 cm
    c. 100 cm
    d. 1,000 cm

31. On the Fahrenheit scale, how many degrees are there between the freezing and boiling point of water?
    a. 60 degrees
    b. 100 degrees
    c. 180 degrees
    d. 212 degrees

32. Convert 70°F to Celsius using the following formula: °C = 5/9 (°F-32). Round your answer to the nearest degree.
    a. 21°C
    b. 53°C
    c. 126°C
    d. 158°C

33. If an angle is not acute, straight, or obtuse, it must be a(n) _____.
    a. metric angle
    b. opposite angle
    c. right angle
    d. adjacent angle

34. While the measurement of the individual angles in a triangle can vary, their sum is always _____.
    a. 45
    b. 90
    c. 180
    d. 360

35. What does a square have in common with a rectangle?
    a. All four sides are equal in length.
    b. All four corners are 90 degree angles.
    c. The sum of all four angles is always 180 degrees.
    d. The area can be found by multiplying pi times the length of any side.

36. The circumference of a circle represents _____.
    a. the distance around the outside
    b. the length of a straight line passing across the center to both sides
    c. the length of a line from the center to any point on the circle
    d. another name for the mathematical constant pi

37. Given the equation 1/2(b × h), the area of a triangular roof section with a base of 7 feet and a height of 3.5 feet is _____.
    a. 7 cu ft
    b. 12 sq ft
    c. 12.25 sq ft
    d. 24.5 sq ft

38. A floor for a 4-meter square shed must be fabricated. The area of the floor is _____.
    a. 16 m³
    b. 16 m²
    c. 64 m²
    d. 64 m³

39. The volume of a shape in the metric system is stated in terms of _____.
    a. cu m
    b. sq m
    c. cu ft
    d. sq ft

40. The volume of a 9-inch cube is _____.
    a. 243 cu yd
    b. 729 cu in
    c. 818 sq in
    d. 1,243 cu in

Module 00102-15 Answer Key

Introduction to Construction Math

Question	Answer	Section Reference	Objective
1.	B	1.1.0	1a
2.	C	1.1.0	1a
3.	D	1.2.0	1b
4.	A	1.2.0, 1.3.0	1b
5.	A	1.3.0	1c
6.	C	1.3.0	1c
7.	B	2.1.0	2a
8.	A	2.1.2	2a
9.	C	2.2.0	2b
10.	C	2.3.0	2c
11.	D	2.3.0	2c
12.	C	2.4.0	2d
13.	D	2.4.0	2d
14.	B	3.1.0	3a
15.	C	3.1.2	3a
16.	B	3.2.0	3b
17.	B	3.2.0	3b
18.	B	3.3.1	3c
19.	D	3.3.1	3c
20.	C	3.3.2	3c
21.	A	4.1.1	4a
22.	D	4.1.2	4a
23.	B	4.1.2	4a
24.	C	4.2.1	4b
25.	A	4.2.3	4b
26.	C	5.1.2	5a
27.	A	5.1.3	5a
28.	B	5.2.3	5b
29.	D	5.2.3	5b
30.	C	5.3.2	5c
31.	C	5.4.0	5d
32.	A	5.4.0	5d
33.	C	6.1.0	6a
34.	C	6.2.0	6b
35.	B	6.2.1; 6.2.2	6b
36.	A	6.2.4	6b
37.	C	6.3.0	6c
38.	B	6.3.0	6c
39.	A	6.4.0	6d
40.	B	6.4.0	6d

Core Curriculum Math Calculations

Module 00102-15 Exam

Question 3:
Add the following numbers together: 811, 901, 88, and 5. The sum is _____.

Calculation:
811 + 901 + 88 + 5 = 1,805

Question 4:
Your job as a carpenter pays $20/hour and you worked 40 hours last week. The taxes withheld from your wages were $83 federal tax and $19 state tax. Your total check is _____.

Calculation:
$20 × 40 = $800; $800 − ($83 + $19) = $698

Question 5:
A package containing 12 electrical locks, each with a unique key, must be delivered to 16 job site superintendents. How many unique keys will result from the distribution?

Calculation:
12 × 16 = 192

Question 6:
You have 5,814 meters of rope that you need to cut into 27 meter sections. How many 27 meter sections of rope will you be able to create, and how much rope will be left over as waste?

Calculation:
5,814 ÷ 27 = 215, with a remainder of 9 meters

Core Curriculum Math Calculations

Question 7:
An equivalent fraction to 5/16 is _____.

Calculation:
5/16 × 2/2 = 10/32

Question 8:
When reduced to its lowest terms, the fraction 12/16 would read as _____.

Calculation:
12 ÷ 4 = 3
16 ÷ 4 = 4

Question 9:
The improper fraction 37/6 can be changed to the mixed number _____.

Calculation:
37 ÷ 6 = 6, with a remainder of 1/16

Question 10:
1/4 + 3/8 = _____. Reduce your answer to the lowest terms.

Calculation:
1 × 2 = 2
4 × 2 = 8

2/8 + 3/8 = 5/8

Question 11:
8/12 – 4/8 = _____. Reduce your answer to the lowest terms.

Calculation:
 8 × 2 = 16; 4 × 3 = 12
12 × 2 = 24; 8 × 3 = 24

16/24 – 12/24 = 4/24. Using 4 as a factor, reduces to 1/6.

Core Curriculum Math Calculations

Question 12:
7/8 × 3/9 = _____. Reduce your answer to the lowest terms.

Calculation:
$\frac{7 \times 3 = 21}{8 \times 9 = 72}$

Using 3 as a factor, reduces to 7/24.

Question 13:
7/8 ÷ 7/16 = _____. Reduce your answer to the lowest terms.

Calculation:
7/8 ÷ 7/16 = 7/8 × 16/7 = 112/56. Using 56 as a factor, reduces to 2.

Question 16:
One sheet of drywall weighs 48.7 pounds. If 50 sheets are ordered, the total weight of the order would be _____.

Calculation:
48.7 pounds × 50 = 2,435 pounds

Question 17:
You need to mix 42 kilograms of mortar. Each kilogram of mortar mix requires 0.03 liters of water. How many liters of water do you need? (Round your answer to the nearest tenth of a liter.)

Calculation:
42 × 0.03 liters = 1.26 liters, rounded up to 1.3 liters

Question 20:
Convert 0.86 into a fraction and reduce the answer to lowest terms.

Calculation:
0.86 = 86/100. Using a factor of 2, 86/100 reduces to 43/50

Core Curriculum Math Calculations

Question 27:
Convert 612 feet to meters using the following information: 1 meter = 3.28 feet. Round your answer to the nearest one-hundredth.

Calculation:
612 ÷ 3.281 = 186.528, rounded up to 186.53 meters

Question 28:

Converting 165 pounds to the metric system results in a weight of _____.

Calculation:
165 pounds ÷ 2.205 = 74.829, rounded down to 74.8 kilograms

Question 29:
One ounce is equal to 28.35 grams. Convert 16 ounces to grams. Round your answer to the nearest tenth.

Calculation:
16 × 28.35 = 453.6

Question 32:
Convert 70°F to Celsius using the following formula: °C = 5/9 (°F-32). Round your answer to the nearest degree.

Calculation:
$°C = 5/9 \ (70 - 32)$
$°C = 5/9 \times 38$
$°C = 190/9$
°C = 21.11, rounded down to 21°C

Core Curriculum Math Calculations

Question 37:
Given the equation 1/2(b × h), the area of a triangular roof section with a base of 7 feet and a height of 3.5 feet is _____.

Calculation:
1/2 (b × h) = 1/2 (7 feet × 3.5 feet) = 1/2 × 24.5 = 12.25 ft^2

Question 40:
The volume of a 9-inch cube is _____.

Calculation:
9 in × 9 in × 9 in = 729 cu in

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