



Applied Mathematics – Part 1

Michigan State Mathematics Content Expectations

Course Description

Applied Mathematics, Part 1 will cover the fundamental mathematics necessary to a broad range of skills. Although problems in this course apply to a variety of areas, the emphasis has been given to applications in the building construction field.

Text Book

Judy, Kathryn B. and Webster, Alfred P. *Mathematics for Carpentry and the Construction Trades, Second Edition*. New Jersey: Prentice Hall, 2002.

Unit 1 Description

This unit will introduce students to whole numbers and fractions.

Essential Content and Skills

The learner will:

- Identify whole numbers.
 - Determine place value of numerals.
 - Round whole numbers to a given place value.
 - Solve problems using the proper order of operations.
 - Add, subtract, multiply, and divide numbers using a calculator.
 - Identify equivalent fractions.
 - Find the Lowest Common Denominator (LCD) of two or more non-zero denominators.
 - Add fractions and mixed numbers and reduce to lowest terms.
 - Subtract fractions and mixed numbers and express answers in simplest terms.
 - Multiply fractions and mixed numbers.
 - Divide any combination of mixed numbers and fractions.
 - Use the fraction key on a calculator.
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Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 1 Michigan State Content Expectations

[Click here to view the Michigan DOE Curriculum Content Standards.](#)

Unit 1 Lesson 1: Place Value and Rounding of Whole Numbers

State Standard	Description
N.ME.04.01	Read and write numbers to 1,000,000; relate them to the quantities they represent; compare and order.
N.ME.04.02	Compose and decompose numbers using place value to 1,000,000's, e.g., 25,068 is 2 ten thousands, 5 thousands, 0 hundreds, 6 tens, and 8 ones.
N.ME.04.03	Understand the magnitude of numbers up to 1,000,000; recognize the place values of numbers and the relationship of each place value to the place to its right, e.g., 1,000 is 10 hundreds.

Unit 1 Lesson 2: Order of Operations

State Standard	Description
N.FL.06.15	Solve applied problems that use the four operations with appropriate decimal numbers.
A.FO.06.05	Use standard conventions for writing algebraic expressions, e.g., $2x + 1$ means "two times x , plus 1" and $2(x + 1)$ means "two times the quantity $(x + 1)$."

Unit 1 Lesson 3: Basic Calculator Usage

State Standard	Description
N.FL.06.15	Solve applied problems that use the four operations with appropriate decimal numbers.

Unit 1 Lesson 4: Equivalent Fractions

State Standard	Description
N.ME.04.20	Understand fractions as parts of a set of objects.
N.MR.04.21	Explain why equivalent fractions are equal, using models such as fraction strips or the number line for fractions with denominators of 12 or less, or equal to 100.
N.ME.05.10	Understand a fraction as a statement of division, e.g., $2 \div 3 = \frac{2}{3}$, using simple fractions and pictures to represent.
N.ME.05.11	Given two fractions, e.g., $\frac{1}{2}$ and $\frac{2}{3}$, express them as fractions with a common denominator, but not necessarily a least common denominator, e.g., $\frac{3}{6}$ and $\frac{4}{6} = \frac{2}{3}$; use denominators less than 12 or factors of 100.

Unit 1 Lesson 5: Finding the Lowest Common Denominator

Course Name - Part

Michigan State Curriculum Content Standards (continued)

State Standard	Description
N.ME.04.20	Understand fractions as parts of a set of objects.
N.MR.04.21	Explain why equivalent fractions are equal, using models such as fraction strips or the number line for fractions with denominators of 12 or less, or equal to 100.
N.ME.05.10	Understand a fraction as a statement of division, e.g., $2 \div 3 = \frac{2}{3}$, using simple fractions and pictures to represent.
N.ME.05.11	Given two fractions, e.g., $\frac{1}{2}$ and $\frac{1}{3}$, express them as fractions with a common denominator, but not necessarily a least common denominator, e.g., $\frac{2}{4}$ and $\frac{1}{3} = \frac{1}{3}$; use denominators less than 12 or factors of 100.

Unit 1 Lesson 6: Addition of Fractions and Mixed Numbers

State Standard	Description
N.MR.04.27	Add and subtract fractions less than 1 with denominators through 12 and/or 100, in cases where the denominators are equal or when one denominator is a multiple of the other, e.g., $1/12 + 5/12 = 6/12$; $1/6 + 5/12 = 7/12$; $3/10 - 23/100 = 7/100$.
N.MR.04.28	Solve contextual problems involving sums and differences for fractions where one denominator is a multiple of the other (denominators 2 through 12, and 100).
N.MR.04.29	Find the value of an unknown in equations such as $\frac{a}{b} + x = \frac{c}{d}$ or $\frac{a}{b} - y = \frac{c}{d}$.
N.FL.05.18	Use mathematical statements to represent an applied situation involving addition and subtraction of fractions.
N.MR.05.19	Solve contextual problems that involve finding sums and differences of fractions with unlike denominators using knowledge of equivalent fractions.*
N.FL.05.20	Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness.

Unit 1 Lesson 7: Subtraction of Fractions and Mixed Numbers

State Standard	Description
N.MR.04.27	Add and subtract fractions less than 1 with denominators through 12 and/or 100, in cases where the denominators are equal or when one denominator is a multiple of the other, e.g., $1/12 + 5/12 = 6/12$; $1/6 + 5/12 = 7/12$; $3/10 - 23/100 = 7/100$.
N.MR.04.28	Solve contextual problems involving sums and differences for fractions where one denominator is a multiple of the other (denominators 2 through 12, and 100).
N.MR.04.29	Find the value of an unknown in equations such as $\frac{a}{b} + x = \frac{c}{d}$ or $\frac{a}{b} - y = \frac{c}{d}$.
N.FL.05.18	Use mathematical statements to represent an applied situation involving addition and subtraction of fractions.
N.MR.05.19	Solve contextual problems that involve finding sums and differences of fractions with unlike denominators using knowledge of equivalent fractions.*
N.FL.05.20	Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness.

Unit 1 Lesson 8: Multiplication of Fractions and Mixed Numbers

Course Name - Part

Michigan State Curriculum Content Standards (continued)

State Standard	Description
N.ME.05.12	Find the product of two unit fractions with small denominators using an area model.

Unit 1 Lesson 9: Division of Fractions and Mixed Numbers

State Standard	Description
N.MR.05.13	Divide a fraction by a whole number and a whole number by a fraction, using simple unit fractions.

Unit 1 Lesson 10: Using the Calculator's Fraction Keys

State Standard	Description
N.MR.04.27	Add and subtract fractions less than 1 with denominators through 12 and/or 100, in cases where the denominators are equal or when one denominator is a multiple of the other, e.g., $1/12 + 5/12 = 6/12$; $1/6 + 5/12 = 7/12$; $3/10 - 23/100 = 7/100$. Solve contextual problems involving sums and differences for fractions where one denominator is a multiple of the other (denominators 2 through 12, and 100). Find the value of an unknown in equations such as $\quad + x = \quad$ or $\quad - y = \quad$ Use mathematical statements to represent an applied situation involving addition and subtraction of fractions. Solve contextual problems that involve finding sums and differences of fractions with unlike denominators using knowledge of equivalent fractions.* Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness.
N.MR.04.28	
N.MR.04.29	
N.FL.05.18	
N.MR.05.19	
N.FL.05.20	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Description

This unit will introduce students to decimal fractions, weights, measures, and conversions.

Essential Content and Skills

The learner will:

- Identify the place value of a decimal number.
 - Round decimal numbers to a specified place.
 - Add and subtract decimal numbers.
 - Multiply decimal numbers.
 - Divide decimal numbers.
 - Multiply and divide by powers of 10.
 - Convert fractions and decimal numbers.
 - Convert fractions and decimals using a calculator.
 - Solve problems involving units of length.
 - Convert from one unit of length to an equivalent unit.
 - Solve addition and subtraction problems involving mixed units.
 - Solve multiplication and division problems involving mixed units.
 - Solve problems involving unit conversions.
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Unit 2 Michigan State Content Expectations

Unit 2 Lesson 1: Place Value and Rounding of Decimals

State Standard	Description
N.ME.05.08	Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., one is 10 tenths, one tenth is 10 hundredths.

Unit 2 Lesson 2: Addition of Fractions and Decimals

State Standard	Description
N.ME.04.18 N.ME.04.19	Read, write, interpret, and compare decimals up to two decimal places. Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths.
N.FL.06.15	Solve applied problems that use the four operations with appropriate decimal numbers.

Unit 2 Lesson 3: Multiplication of Decimals

State Standard	Description
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Course Name - Part

Michigan State Curriculum Content Standards (continued)

N.ME.04.18 N.ME.04.19 N.FL.06.15	Read, write, interpret, and compare decimals up to two decimal places. Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths. Solve applied problems that use the four operations with appropriate decimal numbers.
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Unit 2 Lesson 4: Division of Decimals

State Standard	Description
N.ME.04.18 N.ME.04.19 N.FL.06.15	Read, write, interpret, and compare decimals up to two decimal places. Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths. Solve applied problems that use the four operations with appropriate decimal numbers.

Unit 2 Lesson 5: Multiplying and Dividing by Powers of 10

State Standard	Description
N.ME.04.03	Understand the magnitude of numbers up to 1,000,000; recognize the place values of numbers and the relationship of each place value to the place to its right, e.g., 1,000 is 10 hundreds.

Unit 2 Lesson 6: Decimal and Fraction Conversions

State Standard	Description
N.ME.04.18 N.ME.04.19 N.ME.05.08 N.FL.05.20 N.FL.06.15	Read, write, interpret, and compare decimals up to two decimal places. Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths. Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., one is 10 tenths, one tenth is 10 hundredths. Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness. Solve applied problems that use the four operations with appropriate decimal numbers.

Unit 2 Lesson 7: Converting Fractions and Decimals Using The Calculator

State Standard	Description
N.ME.04.18 N.ME.04.19 N.ME.05.08 N.FL.05.20 N.FL.06.15	Read, write, interpret, and compare decimals up to two decimal places. Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths. Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., one is 10 tenths, one tenth is 10 hundredths. Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness. Solve applied problems that use the four operations with appropriate decimal numbers.

Unit 2 Lesson 8: Linear Measure

State Standard	Description
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Course Name - Part

Michigan State Curriculum Content Standards (continued)

M.NU.03.02	Measure in mixed units within the same measurement system for length, weight, and time: feet and inches, meters and centimeters, kilograms and grams, pounds and ounces, liters and milliliters, hours and minutes, minutes and seconds, years and months.
M.UN.04.01 M.PS.04.02	Measure using common tools and select appropriate units of measure. Give answers to a reasonable degree of precision in the context of a given problem.

Unit 2 Lesson 9: Operations with Mixed Units

State Standard	Description
M.NU.03.02	Measure in mixed units within the same measurement system for length, weight, and time: feet and inches, meters and centimeters, kilograms and grams, pounds and ounces, liters and milliliters, hours and minutes, minutes and seconds, years and months.
M.UN.04.01 M.PS.04.02	Measure using common tools and select appropriate units of measure. Give answers to a reasonable degree of precision in the context of a given problem.

Unit 2 Lesson 10: Unit Conversions

State Standard	Description
M.TE.04.05	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations).
M.UN.05.04	Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Description

This unit will introduce students to area, volume, ratio, proportion, and angles.

Essential Content and Skills

The learner will:

- Convert from one unit of area to another.
- Convert from one unit of volume to another.
- Convert rates from one unit to another.
- Identify and express ratios in several forms.
- Express ratios in simplest terms.
- Solve problems involving ratios.
- Solve for the unknown in a proportion.
- Convert decimals to fractions.
- Convert fractions to decimals.
- Analyze percent problems.
- Solve word problems involving percents.
- Identify different types of angles.
- Identify congruent and similar triangles.
- Solve right triangles using the Pythagorean Theorem.

Unit 3 Michigan State Content Expectations

Unit 3 Lesson 1: Area and Volume Conversions

State Standard	Description
M.TE.04.05	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations). Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers. Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.
M.UN.05.04	
M.TE.06.03	

Unit 3 Lesson 2: Rate Conversion Problems

State Standard	Description
M.TE.04.05	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations). Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers.
M.UN.05.04	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 3: Ratio

State Standard	Description
N.ME.05.23 N.ME.06.11	Express ratios in several ways given applied situations, e.g., 3 cups to 5 people, 3 : 5; recognize and find equivalent ratios. Find equivalent ratios by scaling up or scaling down.

Unit 3 Lesson 4: Proportion

State Standard	Description
N.FL.07.05	Solve proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$; know how to see patterns about proportional situations in tables.

Unit 3 Lesson 5: Conversion of Fractions and Decimals

State Standard	Description
N.ME.04.18 N.ME.04.19 N.ME.05.08 N.FL.05.20 N.FL.06.15	Read, write, interpret, and compare decimals up to two decimal places. Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths. Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., one is 10 tenths, one tenth is 10 hundredths. Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness. Solve applied problems that use the four operations with appropriate decimal numbers.

Unit 3 Lesson 6: Percent Problems

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Unit 3 Lesson 7: Construction Applications Involving Percent

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 8: Angle Measure

State Standard	Description
G.GS.03.01 G.TR.05.01	Identify points, line segments, lines, and distance. Associate an angle with a certain amount of turning; know that angles are measured in degrees; understand that 90° , 180° , 270° , and 360° are associated respectively, with 14 , 12 , and 34 , and full turns.
G.GS.05.02	Measure angles with a protractor and classify them as acute, right, obtuse, or straight.
G.GS.05.03	Identify and name angles on a straight line and vertical angles.
G.GS.05.04	Find unknown angles in problems involving angles on a straight line, angles surrounding a point, and vertical angles.
G.GS.05.05	Know that angles on a straight line add up to 180° and angles surrounding a point add up to 360° ; justify informally by “surrounding” a point with angles.
G.GS.05.06	Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360° , and use these properties to solve problems.

Unit 3 Lesson 9: Congruent and Similar Triangles

State Standard	Description
G.TR.07.03	Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.
G.TR.07.04	Solve problems about similar figures and scale drawings.
G.TR.07.05	Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments.

Unit 3 Lesson 10: The Pythagorean Theorem

State Standard	Description
N.ME.06.16	Understand and use integer exponents, excluding powers of negative bases; express numbers in scientific notation.
N.MR.07.06	Understand the concept of square root and cube root, and estimate using calculators.
N.ME.08.01	Understand the meaning of a square root of a number and its connection to the square whose area is the number; understand the meaning of a cube root and its connection to the volume of a cube.
N.FL.08.05	Estimate and solve problems with square roots and cube roots using calculators.
G.GS.08.01	Understand at least one proof of the Pythagorean Theorem; use the Pythagorean Theorem and its converse to solve applied problems including perimeter, area, and volume problems.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Description

This unit will introduce students to triangles, quadrilaterals, circles, octagons, composite figures, rectangular solids, prisms, cylinders, cones, and spheres.

Essential Content and Skills

The learner will:

- Solve 45-45-90 degree triangles.
 - Solve 30-60-90 degree triangles.
 - Determine the perimeter of triangles.
 - Solve for the area of triangles.
 - Identify quadrilaterals.
 - Find the circumference of a circle.
 - Find the area of a circle.
 - Find the area of a regular octagon.
 - Analyze composite figures.
 - Find the volume of rectangular solids and right prisms.
 - Find the lateral surface area and total surface area of rectangular solids and right prisms.
 - Find the volume of right cylinders and cones.
 - Find the lateral surface area and total surface area of right cylinders.
 - Find the lateral surface area of cones.
 - Find the volume and surface area of a sphere.
 - Find the volume and surface area of composite shapes.
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Unit 4 Michigan State Content Expectations

Unit 4 Lesson 1: Special Right Triangles

State Standard	Description
G.GS.05.06	Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360° , and use these properties to solve problems. Solve problems about geometric shapes Find unknown angles and sides using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids.
G.GS.05.07	

Unit 4 Lesson 2: Perimeters and Areas of Triangles

State Standard	Description
M.TE.05.06	Understand and know how to use the area formula of a triangle: $A = \frac{1}{2}bh$ (where b is length of the base and h is the height), and represent using models and manipulatives. Solve problems using analytic geometry.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 3: Quadrilaterals

State Standard	Description
M.TE.04.06	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas. Understand and know how to use the area formula for a parallelogram: $A = bh$, and represent using models and manipulatives.
M.TE.05.07	

Unit 4 Lesson 4: Circles

State Standard	Description
G.SR.08.03	Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.

Unit 4 Lesson 5: Octagons

State Standard	Description
M.TE.04.06	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas. Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360° , and use these properties to solve problems. Solve problems about geometric shapes Find unknown angles and sides using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids.
G.GS.05.06	
G.GS.05.07	

Unit 4 Lesson 6: Composite Figures

State Standard	Description
M.TE.04.06	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas. Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360° , and use these properties to solve problems. Solve problems about geometric shapes Find unknown angles and sides using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids.
G.GS.05.06	
G.GS.05.07	

Unit 4 Lesson 7: Rectangular Solids and Prisms

State Standard	Description
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Course Name - Part

Michigan State Curriculum Content Standards (continued)

M.TE.06.03	Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.
G.SR.08.06	Know the volume formulas for generalized cylinders (area of base) x height), generalized cones and pyramids ((area of base) x height), and spheres ($\frac{4}{3}\pi r^3$) and apply them to solve problems.
G.SR.08.07	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.

Unit 4 Lesson 8: Cylinders and Cones

State Standard	Description
M.TE.06.03	Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.
G.SR.08.06	Know the volume formulas for generalized cylinders (area of base) x height), generalized cones and pyramids ((area of base) x height), and spheres ($\frac{4}{3}\pi r^3$) and apply them to solve problems.
G.SR.08.07	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.

Unit 4 Lesson 9: Spheres

State Standard	Description
M.TE.06.03	Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.
G.SR.08.06	Know the volume formulas for generalized cylinders (area of base) x height), generalized cones and pyramids ((area of base) x height), and spheres ($\frac{4}{3}\pi r^3$) and apply them to solve problems.
G.SR.08.07	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.

Unit 4 Lesson 10: Volume and Surface Area of Composite Shapes

State Standard	Description
M.TE.06.03	Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.
G.SR.08.06	Know the volume formulas for generalized cylinders (area of base) x height), generalized cones and pyramids ((area of base) x height), and spheres ($\frac{4}{3}\pi r^3$) and apply them to solve problems.
G.SR.08.07	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.