

Unit 3: Expressions and Equations

Content Area: **Mathematics**
Course(s): **Math - Grade 7**
Time Period: **November**
Length: **8 Weeks**
Status: **Published**

Unit Overview

Use properties of operations to generate equivalent expressions.

Apply the properties of operations to simplify and evaluate algebraic expressions.

Use the properties of equality to solve equations algebraically. Solve inequalities.

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Benchmark Assessment 1 will be given after Unit 2.

Transfer

Students will be able to independently use their learning to solve real-world problems involving...

Variables can be used to represent numbers in any type of mathematical problem.

- Understand the difference between an expression and an equation.
- Expressions you simplify and equations you solve for the variable's value.
- Write and solve multi-step equations including all rational numbers.
- Some equations may have more than one solution and understand inequalities.
- Properties of operations allow us to add, subtract, factor, and expand linear expressions

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- The symbolic language of algebra is used to communicate and generalize the patterns in mathematics.
- Algebraic representation can be used to generalize patterns and relationships.
- Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.
- Mathematical models can be used to describe and quantify physical relationships.
- Physical models can be used to clarify mathematical relationships.
- One representation may sometimes be more helpful than another; and, used together, multiple representations give a fuller understanding of a problem.
- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
- Reasoning and/or proof can be used to verify or refute conjectures or theorems in algebra.

Essential Questions

Students will keep considering...

- Unit 2: How can you communicate mathematical ideas effectively?
- How can you use numbers and symbols to represent mathematical ideas?
- What does it mean to say two quantities are equal?

Application of Knowledge and Skill

Students will know...

Students will know...

- how to apply and extend previous understandings of arithmetic to algebraic expressions.
- how to compute with all positive and negative rational numbers (7.NS.1-2)
- how to solve real-world and mathematical problems with rational numbers (7.NS.3)
- how to apply properties of operations to add, subtract, factor and expand linear equations.

Students will be skilled at...

Students will be skilled at...

Using Commutative, Associative, Distributive, Identity, and Inverse Properties to add and subtract linear expressions with rational coefficients. (7.EE.1)

• Using Commutative, Associative, Distributive, Identity, and Inverse Properties to factor and expand linear expressions with rational coefficients. (7.EE.1)

• Rewriting an expression in a different form. (7.EE.2)

• Choose the form of an expression that works best to solve a problem. (7.EE.2)

• Explaining your reasoning for the choice of expression used to solve a problem. Use commutative, associative, distributive, identity, and inverse properties to calculate with numbers in any form (whole numbers, fractions and decimals). (7.EE.3)

• Convert between rational number forms (whole numbers, fractions and decimals) to solve problems as appropriate. (7.EE.3)

• Solve multi-step mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. (7.EE.3)

• Solve multi-step real-life problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. (7.EE.3)

ex) Mark drives a distance of 124 miles in 3 hours. He drive 45 $\frac{1}{2}$ miles during the first hour. He drove equal distances in each of the remaining 2 hours of his trip. What is the distance covered in the last hour?

• Use mental computation and estimation strategies to assess the reasonableness of the answer. (7.EE.3)

• Translate words or real-life situations into variable equations. (7.EE.4)

ex) Patty found a battery-powered toy car in her basement that moved at a speed of 23 mm per second. After she replaced the battery, the speed of the car increased by x mm per second. If it takes the car with the new battery 2 seconds to travel 50 mm, in which equation does x represent the increase in speed after the battery change?

A. $2(23 + x) = 50$

B. $2(23) + x = 50$

C. $23x + 2 = 50$

D. $23(x + 2) = 50$

• Translate words or real-life situations into variable inequalities. (7.EE.4)

• Solve one- or two-step equations with rational numbers fluently. (7.EE.4)

• Solve word problems leading to one- or two-step equations with rational numbers. (7.EE.4)

• Construct simple equations and inequalities with rational numbers to solve problems. (7.EE.4)

• Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. (7.EE.4)

- Solve word problems leading to one- or two-step inequalities with rational numbers. (7.EE.4)
- Graph the solution set of inequalities and interpret it in the context of the problem. (7.EE.4)
- Know the formulas for the area and circumference of a circle. (7.G.4)
- Use the formulas for area and circumference of a circle to solve problems. (7.G.4)
- Informally, derive the area formula for a circle based on circumference. (7.G.4)

Academic Vocabulary

Chapter 2

- Additive identity property, algebra, algebraic expression, arithmetic sequence, associative property, coefficient, commutative property, constant, counterexample, define a variable, distributive property, equivalent expressions, factor, factored form, like terms, linear expression, monomial, multiplicative identity property, multiplicative property of zero, property, sequence, simplest form, term, variable
- Addition property of equality, addition property of inequality, coefficient, division property of equality, division property of inequality, equation, equivalent equation, inequality, multiplication property of equality, multiplication property of inequality, solution, subtraction property of equality, subtraction property of inequality, two-step equation, two-step inequality

Learning Goal #1

Students will use properties of operations to add, subtract, factor, and expand linear expressions with rational coefficients.

Rewrite expressions in different forms in a problem context to demonstrate how quantities are related.

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CAEP.9.2.8.B.6	Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Target # 3.6.1 -- (Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT think of ways to solve some more complicated word problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.7.RP.A.2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
MA.K-12.4	Model with mathematics.

Target # 3.6.2 --(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT explain how a tape diagram represents parts of a situation and relationships between them.

SWBAT use a tape diagram to find an unknown amount in a situation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Target # 3.6.3 --(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT match equations and tape diagrams that represent the same situation.

SWBAT have an equation and draw a tape diagram that shows the same relationship.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Target # 3.6.4 -- (Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT draw a tape diagram to represent a situation where there is a known amount and several copies of an unknown amount and explain what the parts of the diagram represent.

SWBAT find a solution to an equation by reasoning about a tape diagram or about what value would make the equation true.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target #3.6.5 --(Level of Difficulty: Comprehension, DOK: 4 - extended thinking)

SWBAT draw a tape diagram to represent a situation where there is more than one copy of the same sum and explain what the parts of the diagram represent.

SWBAT find a solution to an equation by reasoning about a tape diagram or about what value would make the equation true.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target #3.6.6 --(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT understand the similarities and differences between the two main types of equations we are studying

in this unit.

SWBAT have a situation or a tape diagram, and represent it with an equation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Target #3.6.7 -- (Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT explain how a balanced hanger and an equation represent the same situation.

SWBAT find an unknown weight on a hanger diagram and solve an equation that represents the diagram.

SWBAT write an equation that describes the weights on a balanced hanger.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target #3.6.8 -- (Level of Difficulty: Comprehension, DOK: 4 - extended thinking)

SWBAT explain how a balanced hanger and an equation represent the same situation.

SWBAT explain why some balanced hangers can be described by two different equations, one with parentheses and one without.

SWBAT find an unknown weight on a hanger diagram and solve an equation that represents the diagram.

SWBAT write an equation that describes the weights on a balanced hanger.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
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Target # 3.6.9 -- (Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT use the idea of doing the same to each side to solve equations that have negative numbers or solutions.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target # 3.6.10 -- (Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT For an equation like $3(x+2)=15$, solve it in two different ways: by first dividing each side by 3, or by first rewriting $3(x+2)$ using the distributive property.

SWBAT For equations with more than one way to solve, choose the easier way depending on the numbers in the equation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target # 3.6.11 -- (Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT solve story problems by drawing and reasoning about a tape diagram or by writing and solving an equation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.

MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target # 3.6.12--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT solve story problems about percent increase or decrease by drawing and reasoning about a tape diagram or by writing and solving an equation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.EE.A.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Target # 3.6.13--(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT explain what the symbols \leq and \geq mean.

SWBAT represent an inequality on a number line.

SWBAT understand what it means for a number to make an inequality true.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Target # 3.6.14--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT describe the solutions to a inequality by solving a related equation and then reasoning about values that make the inequality true.

SWBAT write an inequality to represent a situation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Target # 3.6.15--(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT graph the solutions to an inequality on a number line.

SWBAT solve inequalities by solving a related equation and then checking which values are solutions to the original inequality.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Target # 3.6.16--(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT match an inequality to a situation it represents, solve it, and then explain what the solution means in the situation.

SWBAT have a situation and an inequality that represents it, and explain what the parts of the inequality mean in the situation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Target # 3.6.17--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT use what they know about inequalities to solve real-world problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.B.4b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Target # 3.6.18--(Level of Difficulty: Comprehension, DOK: 2 -skill/concept)

SWBAT organize my work when I use the distributive property.

SWBAT re-write subtraction as adding the opposite and then rearrange terms in an expression.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.NS.A.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
MA.7.NS.A.1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Target # 3.6.19--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT organize my work when I use the distributive property.

SWBAT use the distributive property to rewrite expressions with positive and negative numbers.

SWBAT understand that factoring and expanding are words used to describe using the distributive property to write equivalent expressions.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Target # 3.6.20.21.22--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT figure out whether two expressions are equivalent to each other.

SWBAT when possible, write an equivalent expression that has fewer terms.

SWBAT be aware of some common pitfalls when writing equivalent expressions, and can avoid them.

SWBAT when given an expression, use various strategies to write an equivalent expression.

SWBAT when they look at an expression, can notice if some parts have common factors and make the expression shorter by combining those parts.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Formative Assessment and Performance Opportunities

- Aleks.com
- Exit Ticket
- Interactive Notes
- Kahoot
- Quizizz
- Quizlet Live
- Student Presentation
- Student-Teacher Conference

- White Boards

Summative Assessment

- Aleks
- Benchmark Test
- Linkit
- PProject
- Quiz
- Test

21st Century Life and Careers

CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.

Accommodations / Modifications

- Algebra Tiles
- calculators
- Desmos/Online Graphing Calculator
- Fact Table
- leveled centers
- Linear Equations Picture Notes
- modifications as per IEP/504
- Online Scale
- review and practice
- small group instruction
- ST Math
- teacher conferences
- word bank

Unit Resources

- Aleks online learning
- CK12 Online Resources

- <http://achievethecore.org/page/1118/coherence-map>

Interdisciplinary Connections

- science: create a circuit with resistors and use the equations $A=V/R$ to find the amount of amps each circuit has. explain how resistors change to amperage.
- Science: create an experiment to test different materials for their density. (solving density formula)

6-8.MS-PS2	Motion and Stability: Forces and Interactions
6-8.MS-PS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
6-8.MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
6-8.MS-PS2-3.2	Cause and effect: Mechanism and explanation.
6-8.MS-PS1-3.PS1.A	Structure and Properties of Matter
6-8.MS-PS1-3.PS1.A.1	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
6-8.MS-PS2-5.PS2.B	Types of Interactions
6-8.MS-PS2-3.PS2.B.1	Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.
6-8.MS-PS2-5.PS2.B.1	Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).