

# Unit 05-Linear Relationships

Content Area: **Math**  
Course(s):  
Time Period: **Full Year**  
Length: **7 weeks**  
Status: **Published**

## General Overview, Course Description or Course Philosophy

In Linear Relationships students will develop an understanding of linear relationships. Students recognize linear relationships by the constant rate of change between two variables in a contextual situation, a table, a graph, or an equation.

## OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

### Objectives:

#### Linear Relationships:

- Recognize problem situations in which two variables have a linear relationship
- Identify and describe the patterns of change between the independent and dependent variables for linear relationships represented by tables, graphs, equations, or contextual settings
- Construct tables, graphs, and symbolic equations that represent linear relationships
- Identify the rate of change between two variables and the x- and y-intercepts from graphs, tables, and equations that represent linear relationships
- Translate information about linear relationships given in a contextual setting, a table, a graph, or an equation to one of the other forms
- Write equations that represent linear relationships given specific pieces of information, and describe what information the variables and numbers represent
- Make a connection between slope as a ratio of vertical distance to the horizontal distance between two points on a line and the rate of change between two variables that have a linear relationship
- Recognize that  $y = mx$  represents a proportional relationship
- Solve problems and make decisions about linear relationships using information given in tables, graphs, and equations

#### Equivalence:

- Understand that the equality sign indicates that two expressions are equivalent
- Recognize that the equation  $y = mx + b$  represents a linear relationship and means that  $mx + b$  is an expression equivalent to  $y$
- Recognize that linear equations in one unknown,  $k = mx + b$  or  $y = m(t) + b$ , where  $k$ ,  $t$ ,  $m$ , and  $b$  are constant numbers, are special cases of the equation  $y = mx + b$
- Recognize that finding the missing value of one of the variables in a linear

relationship,  $y = mx + b$ , is the same as finding a missing coordinate of a point  $(x, y)$  that lies on the graph of the relationship

- Solve linear equations in one variable using symbolic methods, tables, and graphs
- Recognize that a linear inequality in one unknown is associated with a linear equation
- Solve linear inequalities using graphs or symbolic reasoning
- Show that two expressions are equivalent
- Write and interpret equivalent expressions

### **Essential Questions:**

- Why would one need to find equivalent forms of an expression?
- What real-world problems could be represented by equations?
- What real-world problems could be represented by inequalities?

### **Enduring Understanding:**

- Two variables are in a linear relationship if one variable is changing by a constant amount when the other variable changes by increments of 1 unit.
- The rate of change in a linear relationship is represented by the slope of the line representing the relationship.
- The equation  $y = mx$  is a particular kind of linear relationship where  $x$  and  $y$  are proportional to each other.
- Solutions for linear equations of the form  $y = mx + b$  are pairs of values  $(x, y)$  which make the equation true. Graphically, solution pairs are points on the graph of the line.
- Properties of equality can be used to maintain equivalent expressions on each side of the equation when finding a solution.

## **CONTENT AREA STANDARDS**

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### **7.RP**

**A. Analyze proportional relationships and use them to solve real-world and mathematical problems**

### **7.NS**

**A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers**

### **7.EE**

**A. Use properties of operations to generate equivalent expressions**

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

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.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.
MA.7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
MA.7.RP.A.2c	Represent proportional relationships by equations.
MA.K-12.5	Use appropriate tools strategically.
MA.7.RP.A.2d	Explain what a point $(x, y)$ on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where $r$ is the unit rate.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
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.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.
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.

## **RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)**

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9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.

TECH.K-12.P.4	Demonstrate creativity and innovation.
TECH.K-12.P.7	Plan education and career paths aligned to personal goals.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

## **STUDENT LEARNING TARGETS**

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## **Declarative Knowledge**

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Students will 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.
- only like terms can be combined.
- to factor an expression, one must factor out the greatest common factor.

## **Procedural Knowledge**

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Students will be able to:

- Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- Represent proportional relationships by equations.
- Explain what a point  $(x, y)$  on the graph of a proportional relationship means in terms of the situation, with special attention to the points  $(0, 0)$  and  $(1, r)$  where  $r$  is the unit rate.
- Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 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
- Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations in each approach.
- Interpret the graph of the inequality of a word problem in the context of the problem.

## **EVIDENCE OF LEARNING**

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### **Benchmark Assessments**

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- BOY Diagnostic Snapshot Assessment
- MP1 Quarterly Assessment
- MP2 Quarterly Assessment
- MP3 Quarterly Assessment

- MP4 Quarterly Assessment
- EOY Diagnostic Snapshot Assessment

### **Alternate Assessments**

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- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

### **Formative Assessments**

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- MathXL Assignments
- Linear Relationships Proficiency Scale
- Equations and Inequality Proficiency Scale
- Do Now Check ins
- Formative Assessments - exit tickets, student-friendly proficiency scales, skill checklists ([Google Drive Folder](#))

### **Summative Assessments**

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- Summative Assessment [Google Drive Folder](#)
- OnCourse Assessments

### **RESOURCES (Instructional, Supplemental, Intervention Materials)**

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#### **Instructional Materials:**

- CMP3 - Moving Straight Ahead ([Online link](#) - teacher and student resources)

- Resources for Unit 5 [Google Drive Folder](#)

### **Supplemental/Intervention Materials:**

- Desmos - [Lego Prices](#), [Turtle Time Trials](#), [Marbleslides: Lines](#), [Put the Point on the Line](#), [Land the Plane](#), [Equation Solving](#), [Solving Equations Review](#)
- [MathXL](#)
- [Khan Academy](#)
- [NCTM Illuminations](#)
- [Illustrative Math](#)
- [Illustrative Math Tasks](#)

### **INTERDISCIPLINARY CONNECTIONS**

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- Computations

### **ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS**

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See link to Accommodations & Modifications document in course folder.