

MODULE 4 OVERVIEW

TEKS Addressed:

6.3D, 6.5A, 6.6A, 6.6B, **6.6C**, **6.7A**, 6.7B, 6.7C, **6.7D**, 6.8C, **6.8D**, 6.9A, 6.9B, 6.9C, **6.10A**, 6.10B, **6.11A**, 6.14A, 6.14B, 6.14C, 6.14D, 6.14E, 6.14F, 6.14G, 6.14H

*Bold TEKS = Readiness Standard

Determining Unknown Quantities

Sessions: 52

Key Skill sets

- Determine unknown values
- Write & eval. expressions
- Create equiv. expressions
- Write & solve eqs.
- Create & interpret graphs

Why is this module named *Determining Unknown Quantities*?

Determining Unknown Quantities introduces students to the formal study of algebra, which is the study of patterns and generalizing those patterns with symbols. Algebra is often seen as a set of rules and procedures to follow; instead, it should be viewed in terms of patterns and sense-making. The focus of this module is making sense of and reasoning about variables, expressions, and equations.

Throughout this module, students develop a deep understanding of unknown quantities as variables, representing either any number from a given set or a specific number from a set of numbers. Students determine unknown values

in real-world and mathematical problems by writing and evaluating expressions, creating equivalent expressions, writing and solving equations, and creating and interpreting graphs. Students use the entire set of nonnegative rational numbers as possible values for the unknown quantities.

Finally, students apply these skills, along with other skills previously learned in this course, as they engage in real-world problems about financial literacy. The financial literacy topic aims to develop an economic way of thinking and problem solving that is useful for students as future knowledgeable consumers and investors.

The Research Shows . . .

"In general, if students engage extensively in symbolic manipulation before they develop a solid conceptual foundation for their work, they will be unable to do more than mechanical manipulations (NRC 1998)."

Principles and Standards for School Mathematics | Page 39

"Be careful with 'monkey see, monkey do' MATH."

What is the mathematics of *Determining Unknown Quantities*?

Determining Unknown Quantities contains four topics: *Expressions, Equations and Inequalities*, *Graphing Quantitative Relationships*, and *Financial Literacy: Accounts, Credit, and Careers*. This module begins with the building blocks of algebra: algebraic expressions. Students develop

strategies for creating equivalent expressions. Students then equate expressions and solve for unknown values. They use a graph to represent the relationships on a coordinate plane. Finally, they expand knowledge of financial literacy by exploring accounts, credit, and careers.

possible learning objectives

13 SESSIONS

12 LEARNING • 1 ASSESSMENT

TOPIC 1 Expressions

Learning Together: 9 Sessions

TEKS: 6.3D, 6.7A, 6.7B, 6.7C, 6.7D

Students revisit working with numeric expressions.

- Students generate equivalent numeric expressions using the order of operations.
- Students formalize properties of operations and apply them to algebraic expressions to see structure.
- Students begin to view expressions as objects they can manipulate and operate with.
- Students determine whether expressions are equivalent using concrete or pictorial models, along with algebraic representations.

Learning Individually: 3 Sessions

Targeted Skills Practice for Expressions

- Students write expressions with exponents as a product of factors.
- Students rewrite expressions using the order of operations and prime factorization.
- Students write and evaluate expressions to represent problem situations.
- Students write equivalent expressions.

19 SESSIONS

18 LEARNING • 1 ASSESSMENT

TOPIC 2 Equations and Inequalities

possible learning objs

Learning Together: 13 Sessions

TEKS: 6.3D, 6.7B, 6.7D, 6.8C, 6.8D, 6.9A, 6.9B, 6.9C, 6.10A, 6.10B

Students solve one-variable equations and inequalities.

- Students explore solutions to equations, understanding that a solution is any value from a given set that makes a number sentence true.
- Students encounter equations that have one solution, no solution, or infinite solutions, not to go beyond the limits of the standards but to help them develop a robust view of solutions to equations.
- Students analyze simple algebraic inequalities and their solution sets.

Learning Individually: 5 Sessions

Targeted Skills Practice for Equations and Inequalities

- Students determine whether values make an equation true.
- Students write inequalities to represent a given number line and graph inequalities on number lines.
- Students solve one-step equations and inequalities in mathematical and real-world problems.

12 SESSIONS

11 LEARNING • 1 ASSESSMENT

TOPIC 3 Graphing Quantitative Relationships

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Learning Together: 8 Sessions

TEKS: 6.5A, 6.6A, 6.6B, 6.6C, 6.11A

Students analyze relationships between quantitative independent and dependent variables.

- Students use their prior knowledge of graphing on the coordinate plane, writing expressions and equations, and solving equations as they explore independent and dependent variables.
- Students use graphs to determine unknown values of a quantity.
- Students continue to compare additive and multiplicative relationships as they solve equations of the forms $x + b = y$ and $kx = y$, where x , b , and y are rational numbers.

Learning Individually: 3 Sessions

Targeted Skills Practice for Graphing Quantitative Relationships

- Students define variables, write equations, and identify independent and dependent variables for real-world situations.
- Student write equations given a table of values, a graph, or a real-world situation.
- Student use multiple representations to represent real-world situations.

possible learning obj's

Learning Together: 5 Sessions

TEKS: 6.14A, 6.14B, 6.14C, 6.14D, 6.14E, 6.14F, 6.14G, 6.14H

Students engage with real-world problem solving focused on financial literacy.

- Students learn the basic functionality and features of checking accounts, debit cards, and credit cards.
- Student compare the advantages and disadvantages of using debit and credit cards, especially in terms of the impact on credit score.
- Student understand why it is important to establish and maintain a positive credit history.
- Students look at different options for paying for post-secondary education and compare different school options and payment approaches.
- Students explore how decisions about education can affect future career opportunities.

Learning Individually: 2 SessionsTargeted Skills Practice for *Financial Literacy: Accounts, Credit, and Careers*

- Students use given information to write a check and determine the final balance of an account.
- Students determine whether a statement describes a credit card, a debit card, or both and decide which is most appropriate to use in a real-world situation.
- Students identify information on a credit report and analyze statements about credit scores.
- Students calculate salaries and answer questions about income and careers.
- Students identify different methods of paying for college.

How is Determining Unknown Quantities connected to prior learning?

Determining Unknown Quantities builds on student knowledge of numeric expressions, patterns, and numeric operations developed throughout previous courses. In this course, students formalize the order of operations and properties of operations and apply these skills to the entire set of rational numbers. Students then build from their understanding of numeric expressions to algebraic expressions.

Although students have been using symbols to represent and solve for unknowns in equations in previous courses, the terms *variable*, *solution*, and *equation* are formally defined.

Formal definitions for

- variable
- solution
- equation

prior knowledge

Good representation

Math Representation

to possibly model

You can use given rules to determine unknown values.

Rule: Multiply by 3.

Input (x)	2	3	4	5
Output (y)	6	9	12	15

Rule: Add 12.

Input (x)	6	8	10	11
Output (y)	18	20	22	23

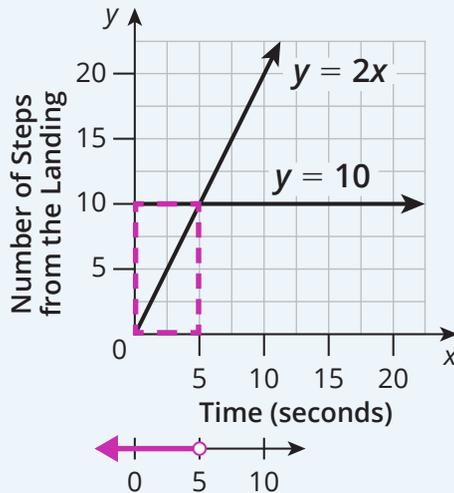
When will students use knowledge from *Determining Unknown Quantities* in future learning?

This module establishes a strong foundation of reasoning to determine unknown values. Instruction on formal algorithms is delayed until students have had ample opportunity to reason about one-step equations. Connecting reasoning with formal algorithms for solving equations helps students see mathematics as a web of interconnected topics.

Good representation to possibly model

Math Representation

The graph shows the relationship between time in seconds and the number of steps Iris travels.



The rectangle shows that Iris is fewer than 10 steps above the landing for times less than 5 seconds.

As students continue in their mathematical journeys, they may rely on procedures to solve equations, but the strategies and reasoning developed in this module—strategies for solving, judging the reasonableness of their results, and verifying their solutions—will prove invaluable in developing expertise as mathematical problem solvers.

1 Determining Unknown Quantities

MODULE 4 Assessment Summary

Topic	Topic Title	Name	Administered	TEKS*
1	Expressions	End of Topic Assessment	After Topic 1	6.3D 6.7A 6.7B 6.7C 6.7D
2	Equations and Inequalities	End of Topic Assessment	After Topic 2	6.7D 6.8C 6.9A 6.9B 6.9C 6.10A 6.10B
3	Graphing Quantitative Relationships	End of Topic Assessment	After Topic 3	6.5A 6.6A 6.6B 6.6C 6.11A
4	Financial Literacy: Accounts, Credit, and Careers	End of Topic Assessment	After Topic 4	6.14E 6.14F 6.14G 6.14H

READINESS STANDARDS

*Bold TEKS = Readiness Standard