INCLUSION IN TEXAS

Instructional Routines for Mathematics Intervention

The purpose of these mathematics instructional routines is to provide educators with materials to use when providing intervention to students who experience difficulty with mathematics. The routines address content included in the grades 2-8 Texas Essential Knowledge and Skills (TEKS). There are 23 modules that include routines and examples – each focused on different mathematical content. Each of the 23 modules include vocabulary cards and problem sets to use during instruction. These materials are intended to be implemented explicitly with the aim of improving mathematics outcomes for students.

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Texas Education Agency

Instructional Routines for Mathematics Intervention

MODULE 22

Representing Expressions and Equations

Module 22: Representing Expressions and Equations
Mathematics Routines

A. Important Vocabulary with Definitions

Term	Definition
base	A number that is multiplied by an exponent.
coefficient	A number that is multiplied by a variable.
constant	A term that does not change; a number on its own.
equation	A mathematical statement that two expressions are the same or equal; must have an equal sign.
exponent	The power to which a number is raised.
expression	A combination of variables, numbers, and/or operations that represents a mathematical relationship; does not have an equal sign.
grouping	A combination of variables, numbers, and/or operations grouped together in parentheses or brackets.
inequality	An algebraic relation showing that a quantity is greater or less than another quantity.
like terms	Terms that have the same variable or constant and can be combined.
operator	A symbol ($+, -, \times, \div$) that represents a mathematical operation.
term	A single number or a variable, or numbers or variables multiplied together.
variable	A symbol for an unknown value, which is usually represented by a letter.

B. Background Information

In this module, we focus on early algebraic concepts:

(1) Order of Operations
(2) Representing Expressions
(3) Representing Equations

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C. Routines and Examples

(1) Order of Operations

Routine

Materials:

- Module 22 Problem Sets
- Module 22 Vocabulary Cards
    - If necessary, review Vocabulary Cards before teaching

ROUTINE

Teacher	**Let's learn about the order of operations. What's an operation?**
Students	Add, subtract, multiply, or divide.
Teacher	**The operations we'll focus on today are adding, subtracting, multiplying, and dividing. When you see an expression like 2 + 3, you see a plus sign and add. You don't have to think about the order of operations. But if you see an expression like 2[(8 × 5) ÷ 4] – (3 + 5), we have to think about the order in which we'll do the operations. We don't always work left to right. Look at this problem.**
	(Show problem.)
Teacher	**Let's read this problem together.**
Students	__.
Teacher	**We'll simplify expressions and solve equations by applying the order of operations. Our order of operations will be Grouping, Exponents, Multiplication and Division, then Addition and Subtraction. Let's start with Grouping. What will we do first with the order of the operations?**
Students	Grouping.
Teacher	**Grouping means we will do all the math within groups. A group might be presented within parentheses or brackets. How could a group be presented?**
Students	In parentheses or brackets.
Teacher	**When we simplify an expression and solve an equation, we'll first do the math within groups presented with parentheses or brackets. The second step for applying the order of the operations is to do the math for any exponents. What will we do next for the order of the operations?**
Students	Exponents.
Teacher	**An exponent is attached to a base and describes the power to which a base should be raised. What's an example of an exponent?**
Students	$\_\_^2$.
Teacher	**Great. $\_\_^2$ is an example of an exponent. So is $\_\_^5$. The third step for applying the order of the operations is to do any multiplication and division. What's the third step?**

Students		Do multiplication and division.
Teacher		**We'll multiply or divide any parts of the expression or equation. The fourth step for applying the order of the operations is to do any addition or subtraction. What's the fourth step?**
Students		Do addition and subtraction.
Teacher		**Yes. We'll add or subtract any parts of the expression or equation. So, let's review. To simplify expressions or solve equations you apply the order of the operations. We do the Grouping, then Exponents, then Multiplication and Division, then Addition and Subtraction. What's the order of the operations?**
Students		Grouping, Exponents, Multiplication and Division, Addition and Subtraction.
Teacher		**Now, let's practice. Let's simplify this expression. What should we think about first?**
Students		Grouping.
Teacher		**Are there any groupings with brackets or parentheses?**
Students		Yes/no.
Teacher	*IF YES:*	**There is a grouping. Let's do the math within each of the groups.** (Write.)
Teacher		**What's the second step for applying the order of the operations?**
Students		Exponents.
Teacher		**Are there any exponents?**
Students		Yes/no.
Teacher	*IF YES:*	**There is an exponent. Let's do the math for each of the bases and exponents.** (Write.)
Teacher		**What's the third step for applying the order of the operations?**
Students		Multiplication and Division.
Teacher		**Is there any multiplication or division for us to do?**
Students		Yes/no.
Teacher	*IF YES:*	**There is multiplication or division. Let's do the math for the multiplication and division. Let's work the problem left to right doing all the multiplication and division.** (Write.)
Teacher		**What's the fourth step for applying the order of the operations?**
Students		Addition and Subtraction.
Teacher		**Is there any addition or subtraction for us to do?**
Students		Yes/no.
Teacher	*IF YES:*	**There is addition or subtraction. Let's do the math for the addition or subtraction. Let's work the problem left to right doing all the addition and subtraction.** (Write.)
Teacher		**Look at the problem. Did we simplify the expression or solve the equation?**
Students		Yes!
Teacher		**We followed the order of the operations to simplify or solve. Let's review. What's the order of the operations?**

Students	Grouping, Exponents, Multiplication and Division, Addition and Subtraction.
Teacher	**When do you use the order of the operations?**
Students	Whenever you have an expression or equation with more than one operator symbol.
Teacher	**How could you explain the order of operations to a friend?**
Students	First, you do the math for any groupings with brackets and parentheses. Then, you do the math for any exponents. Then, you do any of the multiplication and division. Finally, you do any of the addition and subtraction.

Example

$18 \div 6 \times (4 + 3) - 6$

EXAMPLE

Teacher	**Let's learn about the order of operations. What's an operation?**
Students	Add, subtract, multiply, or divide.
Teacher	**The operations we'll focus on today are adding, subtracting, multiplying, and dividing. When you see an expression with multiple operations, we have to think about the order in which we'll do the operations. We don't always work left to right. Look at this problem.** (Show problem.)
Teacher	**Let's read this problem together.**
Students	$18 \div 6 \times (4 + 3) - 6$.
Teacher	**We'll simplify expressions and solve equations by applying the order of operations. Our order of operations will be Grouping, Exponents, Multiplication and Division, then Addition and Subtraction. Let's start with Grouping. What will we do first with the order of the operations?**
Students	Grouping.
Teacher	**Grouping means we will do all the math within groups. A group might be presented within parentheses or brackets. How could a group be presented?**
Students	In parentheses or brackets.
Teacher	**When we simplify an expression and solve an equation, we'll first do the math within groups presented with parentheses or brackets. The second step for applying the order of the operations is to do the math for any exponents. What will we do next for the order of the operations?**
Students	Exponents.
Teacher	**An exponent is attached to a base and describes the power to which a base should be raised. What's an example of an exponent?**
Students	3^2.
Teacher	**Great. 3^2 is an example of an exponent. So is 2^5. The third step for applying the order of the operations is to do any multiplication and division. What's the third step?**
Students	Do multiplication and division.

Teacher	**We'll multiply or divide any parts of the expression or equation. The fourth step for applying the order of the operations is to do any addition or subtraction. What's the fourth step?**
Students	Do addition and subtraction.
Teacher	**Yes. We'll add or subtract any parts of the expression or equation. So, let's review. To simplify expressions or solve equations you apply the order of the operations. We do the Grouping, then Exponents, then Multiplication and Division, then Addition and Subtraction. What's the order of the operations?**
Students	Grouping, Exponents, Multiplication and Division, Addition and Subtraction.
Teacher	**Now, let's practice. Let's simplify this expression. What should we think about first?**
Students	Grouping.
Teacher	**Are there any groupings with brackets or parentheses?**
Students	Yes.
Teacher	**There is a grouping. Let's do the math within the parentheses. What's 4 + 3?**
Students	7.
Teacher	**Let's write 7 below the parentheses.** (Write 7.)
Teacher	**What's the second step for applying the order of the operations?**
Students	Exponents.
Teacher	**Are there any exponents?**
Students	No.
Teacher	**There are no exponents. What's the third step for applying the order of the operations?**
Students	Multiplication and Division.
Teacher	**Is there any multiplication or division for us to do?**
Students	Yes.
Teacher	**There is multiplication or division. Let's work the problem left to right doing all the multiplication and division. What's the first multiplication or division we need to do?**
Students	18 ÷ 6.
Teacher	**What's 18 divided by 6?**
Students	3.
Teacher	**Let's write 3 below the division to keep track of the quotient.** (Write 3.)
Teacher	**Is there more multiplication or division?**
Students	Yes.
Teacher	**What do we need to do?**
Students	3 × 7.
Teacher	**What's 3 times 7?**
Students	21.
Teacher	**Let's write 21 to keep track of the product.** (Write 21.)
Teacher	**What's the fourth step for applying the order of the operations?**

Students	Addition and Subtraction.
Teacher	**Is there any addition or subtraction for us to do?**
Students	Yes.
Teacher	**There is addition or subtraction. Let's work the problem left to right doing all the addition and subtraction. What do we need to do?**
Students	21 – 6.
Teacher	**Yes. What's 21 minus 6?**
Students	15. (Write 15.)
Teacher	**Look at the problem. Did we simplify the expression or solve the equation?**
Students	Yes!
Teacher	**We followed the order of the operations to simplify or solve. Let's review. What's the order of the operations?**
Students	Grouping, Exponents, Multiplication and Division, Addition and Subtraction.
Teacher	**When do you use the order of the operations?**
Students	Whenever you have an expression or equation with more than one operator symbol.
Teacher	**How could you explain the order of operations to a friend?**
Students	First, you do the math for any groupings with brackets and parentheses. Then, you do the math for any exponents. Then, you do any of the multiplication and division. Finally, you do any of the addition and subtraction.

(2) Representing Expressions

Routine

Materials:

- Module 22 Problem Sets
- Module 22 Vocabulary Cards
    - If necessary, review Vocabulary Cards before teaching
- A manipulative like algebra tiles

ROUTINE WITH MANIPULATIVES

Teacher	**Let's show different expressions. What's an expression?**
Students	Numbers and operator symbols.
Teacher	**An expression has numbers and operator symbols. An expression does not have an equal sign or inequality symbol. What's not in an expression?**
Students	Equal sign or inequality symbol.
Teacher	**Let's represent different expressions with these algebra tiles.** (Show manipulatives.)
Teacher	**With the algebra tiles, we'll interpret this unit to represent a constant. What's a constant?**
Students	A number or value that does not change.

Teacher		**Yes. A constant is a number or value that does not change.**
Teacher		**We'll use this unit to show the constant. The unit has a positive side. That's brown. What color is the positive side?**
Students		Brown.
Teacher		**The unit also has a negative side. That's red. What color is the negative side?**
Students		Red.
Teacher		**With the algebra tiles, we'll interpret this rod to represent our variable. What will the rod represent?**
Students		A variable.
Teacher		**And the rod has a positive side. That's green. What color is the positive side?**
Students		Green.
Teacher		**The rod also has a negative side. That's red. What color is the negative side?**
Students		Red.
Teacher		**If this rod is our variable, then this flat represents the variable squared or x^2. What does the flat represent?**
Students		The variable squared.
Teacher		**This flat represents x^2 because we can multiply x times x** (show multiplication) **to create the area of x^2. Why does the flat represent x^2?**
Students		Because the area created by multiplying x times x equals the area of x^2.
Teacher		**The flat has a positive side. That's blue. What color is the positive side?**
Students		Blue.
Teacher		**The flat also has a negative side. That's red. What color is the negative side?**
Students		Red.
Teacher		**Now, let's show an expression with the algebra tiles. Remember, we have pieces that represent the variable squared** (show)**, the variable** (show)**, and the constant** (show)**. Look at this expression.** (Show problem.)
Teacher		**Read the expression.**
Students		__.
Teacher		**How would we show the expression with the algebra tiles? First, do we have any squared variables we need to show?**
Students		Yes/no.
Teacher	*IF YES:*	**We need to show a squared variable. Which of the algebra tiles will we use?**
Students		Flat.
Teacher		**Look to see if there's a coefficient with the squared variable. The coefficient tells us how many of the flats we will show. How many flats?**
Students		__.
Teacher		**And is the squared variable positive or negative?**
Students		__.
Teacher		**Let's show __ flats to show the squared variable.** (Show tiles.)
Teacher		**Now, do we have any variables we need to show?**

Students	Yes/no.	
Teacher	*IF YES:*	**We need to show a variable. Which of the algebra tiles will we use?**
Students		Rod.
Teacher		**Look to see if there's a coefficient with the variable. The coefficient tells us how many of the rods we will show. How many rods?**
Students		__.
Teacher		**And is the variable positive or negative?**
Students		__.
Teacher		**Let's show __ rods to show the variable.** (Show tiles.)
Teacher	**Now, do we have any constants we need to show?**	
Students	Yes/no.	
Teacher	*IF YES:*	**We need to show a constant. Which of the algebra tiles will we use?**
Students		Unit.
Teacher		**How many units should we use?**
Students		__.
Teacher		**And is the constant positive or negative?**
Students		__.
Teacher		**Let's show __ units to show the constant.** (Show tiles.)
Teacher	**We used the algebra tiles to show an expression. What expression did we show?**	
Students	__.	
Teacher	**How can you use the algebra tiles to show expressions?**	
Students	Use the flats to show squared variables. Use the rods to show variables. Use the units to show the constant.	

Example

$x^2 - 3x + 4$

EXAMPLE WITH MANIPULATIVES

Teacher	**Let's show different expressions. What's an expression?**
Students	Numbers and operator symbols.
Teacher	**An expression has numbers and operator symbols. An expression does not have an equal sign or inequality symbol. What's not in an expression?**
Students	Equal sign or inequality symbol.
Teacher	**Let's represent different expressions with these algebra tiles.** (Show manipulatives.)
Teacher	**With the algebra tiles, we'll interpret this unit to represent a constant. What's a constant?**
Students	A number or value that does not change.
Teacher	**Yes. A constant is a number or value that does not change.**

Teacher	**We'll use this unit to show the constant. The unit has a positive side. That's brown. What color is the positive side?**
Students	Brown.
Teacher	**The unit also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**With the algebra tiles, we'll interpret this rod to represent our variable. What will the rod represent?**
Students	A variable.
Teacher	**And the rod has a positive side. That's green. What color is the positive side?**
Students	Green.
Teacher	**The rod also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**If this rod is our variable, then this flat represents the variable squared or x^2. What does the flat represent?**
Students	The variable squared.
Teacher	**This flat represents x^2 because we can multiply x times x** (show multiplication) **to create the area of x^2. Why does the flat represent x^2?**
Students	Because the area created by multiplying x times x equals the area of x^2.
Teacher	**The flat has a positive side. That's blue. What color is the positive side?**
Students	Blue.
Teacher	**The flat also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**Now, let's show an expression with the algebra tiles. Remember, we have pieces that represent the variable squared** (show)**, the variable** (show)**, and the constant** (show)**. Look at this expression.** (Show problem.)
Teacher	**Read the expression.**
Students	$x^2 - 3x + 4$.
Teacher	**How would we show the expression with the algebra tiles? First, do we have any squared variables we need to show?**
Students	Yes.
Teacher	**We need to show a squared variable. Which of the algebra tiles will we use?**
Students	Flat.
Teacher	**Look to see if there's a coefficient with the squared variable. The coefficient tells us how many of the flats we will show. How many flats?**
Students	1.
Teacher	**Yes, there's no coefficient so we assume the coefficient is 1. And is the squared variable positive or negative?**
Students	Positive.
Teacher	**Let's show 1 blue flat to show the squared variable.** (Show tiles.)
Teacher	**Now, do we have any variables we need to show?**
Students	Yes.
Teacher	**We need to show a variable. Which of the algebra tiles will we use?**

Students	Rod.
Teacher	**Look to see if there's a coefficient with the variable. The coefficient tells us how many of the rods we will show. How many rods?**
Students	3.
Teacher	**And is the variable positive or negative?**
Students	Negative.
Teacher	**Let's show 3 red rods to show the variable.**
Students	(Show tiles.)
Teacher	**Now, do we have any constants we need to show?**
Students	Yes.
Teacher	**We need to show a constant. Which of the algebra tiles will we use?**
Students	Unit.
Teacher	**How many units should we use?**
Students	4.
Teacher	**And is the constant positive or negative?**
Students	Positive.
Teacher	**Let's show 4 brown units to show the constant.** (Show tiles.)
Teacher	**We used the algebra tiles to show an expression. What expression did we show?**
Students	$x^2 - 3x + 4$.
Teacher	**How can you use the algebra tiles to show expressions?**
Students	Use the flats to show squared variables. Use the rods to show variables. Use the units to show the constant.

(3) Representing Equations

Routine

Materials:

- Module 22 Problem Sets
- Module 22 Vocabulary Cards
    - If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like two-color counters or multi-colored cubes

ROUTINE WITH MANIPULATIVES

Teacher	**Let's show different equations. What's an equation?**
Students	Two equal expressions with an equal sign.
Teacher	**An equation always has an equal sign. What's always in an equation?**
Students	An equal sign.
Teacher	**Let's represent different equations with these algebra tiles.** (Show manipulatives.)
Teacher	**With the algebra tiles, we'll interpret this unit to represent a constant. What's a constant?**
Students	A number or value that does not change.
Teacher	**Yes. A constant is a number or value that does not change.**
Teacher	**We'll use this unit to show the constant. The unit has a positive side. That's brown. What color is the positive side?**
Students	Brown.
Teacher	**The unit also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**With the algebra tiles, we'll interpret this rod to represent our variable. What will the rod represent?**
Students	A variable.
Teacher	**And the rod has a positive side. That's green. What color is the positive side?**
Students	Green.
Teacher	**The rod also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**If this rod is our variable, then this flat represents the variable squared or x^2. What does the flat represent?**
Students	The variable squared.
Teacher	**The flat has a positive side. That's blue. What color is the positive side?**
Students	Blue.
Teacher	**The flat also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**Now, let's show an equation with the algebra tiles. Remember, we have pieces that represent the variable squared** (show)**, the variable** (show)**, and the constant** (show)**. Look at this equation.** (Show problem.)

Teacher		**Read the equation.**
Students		__.
Teacher		**Because we're going to show an equation, let's write an equal sign in the middle of our manipulatives mat.**
		(Write equal sign.)
Teacher		**We'll show the left side of the equation on left side of the mat. We'll show the right side of the equation on the right side of the mat. How do we use the mat?**
Students		Show the left side of the equation on the left side. Show the right side of the equation on the right side.
Teacher		**Let's show the left side of the equation first. Look at the left side. First, do we have any squared variables we need to show?**
Students		Yes/no.
Teacher	*IF YES:*	**We need to show a squared variable. Which of the algebra tiles will we use?**
Students		Flat.
Teacher		**Look to see if there's a coefficient with the squared variable. The coefficient tells us how many of the flats we will show. How many flats?**
Students		__.
Teacher		**And is the squared variable positive or negative?**
Students		__.
Teacher		**Let's show __ flats to show the squared variable.**
		(Show tiles.)
Teacher		**Now, do we have any variables we need to show?**
Students		Yes/no.
Teacher	*IF YES:*	**We need to show a variable. Which of the algebra tiles will we use?**
Students		Rod.
Teacher		**Look to see if there's a coefficient with the variable. The coefficient tells us how many of the rods we will show. How many rods?**
Students		__.
Teacher		**And is the variable positive or negative?**
Students		__.
Teacher		**Let's show __ rods to show the variable.**
		(Show tiles.)
Teacher		**Now, do we have any constants we need to show?**
Students		Yes/no.
Teacher	*IF YES:*	**We need to show a constant. Which of the algebra tiles will we use?**
Students		Unit.
Teacher		**How many units should we use?**
Students		__.
Teacher		**And is the constant positive or negative?**
Students		__.
Teacher		**Let's show __ units to show the constant.**

(Show tiles.)

Teacher **Now, let's focus on the right side of the equation. First, do we have any squared variables we need to show?**

Students Yes/no.

Teacher *IF YES:* **We need to show a squared variable. Which of the algebra tiles will we use?**

Students Flat.

Teacher **Look to see if there's a coefficient with the squared variable. The coefficient tells us how many of the flats we will show. How many flats?**

Students __.

Teacher **And is the squared variable positive or negative?**

Students __.

Teacher **Let's show __ flats to show the squared variable.**

(Show tiles.)

Teacher **Now, do we have any variables we need to show?**

Students Yes/no.

Teacher *IF YES:* **We need to show a variable. Which of the algebra tiles will we use?**

Students Rod.

Teacher **Look to see if there's a coefficient with the variable. The coefficient tells us how many of the rods we will show. How many rods?**

Students __.

Teacher **And is the variable positive or negative?**

Students __.

Teacher **Let's show __ rods to show the variable.**

(Show tiles.)

Teacher **Now, do we have any constants we need to show?**

Students Yes/no.

Teacher *IF YES:* **We need to show a constant. Which of the algebra tiles will we use?**

Students Unit.

Teacher **How many units should we use?**

Students __.

Teacher **And is the constant positive or negative?**

Students __.

Teacher **Let's show __ units to show the constant.**

(Show tiles.)

Teacher **We used the algebra tiles to show this equation. What equation did we show?**

Students __.

Teacher **How can you use the algebra tiles to show equations?**

Students Use the flats to show squared variables. Use the rods to show variables. Use the units to show the constant. Place the algebra tiles for the left side of an equation on the left side of an equal sign. Place the algebra tiles for the right side of an equation on the right side of an equal sign.

Example

$2x^2 - 3x - 7 = x^2 - 3$

EXAMPLE WITH MANIPULATIVES

Teacher	**Let's show different equations. What's an equation?**
Students	Two equal expressions with an equal sign.
Teacher	**An equation always has an equal sign. What's always in an equation?**
Students	An equal sign.
Teacher	**Let's represent different equations with these algebra tiles.** (Show manipulatives.)
Teacher	**With the algebra tiles, we'll interpret this unit to represent a constant. What's a constant?**
Students	A number or value that does not change.
Teacher	**Yes. A constant is a number or value that does not change.**
Teacher	**We'll use this unit to show the constant. The unit has a positive side. That's brown. What color is the positive side?**
Students	Brown.
Teacher	**The unit also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**With the algebra tiles, we'll interpret this rod to represent our variable. What will the rod represent?**
Students	A variable.
Teacher	**And the rod has a positive side. That's green. What color is the positive side?**
Students	Green.
Teacher	**The rod also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**If this rod is our variable, then this flat represents the variable squared or x^2. What does the flat represent?**
Students	The variable squared.
Teacher	**The flat has a positive side. That's blue. What color is the positive side?**
Students	Blue.
Teacher	**The flat also has a negative side. That's red. What color is the negative side?**
Students	Red.
Teacher	**Now, let's show an equation with the algebra tiles. Remember, we have pieces that represent the variable squared** (show)**, the variable** (show)**, and the constant** (show)**. Look at this equation.** (Show problem.)
Teacher	**Read the equation.**
Students	$2x^2 - 3x - 7 = x^2 - 3$.
Teacher	**Because we're going to show an equation, let's write an equal sign in the middle of our manipulatives mat.** (Write equal sign.)

Teacher	**We'll show the left side of the equation on left side of the mat. We'll show the right side of the equation on the right side of the mat. How do we use the mat?**
Students	Show the left side of the equation on the left side. Show the right side of the equation on the right side.
Teacher	**Let's show the left side of the equation first. Look at the left side. First, do we have any squared variables we need to show?**
Students	Yes.
Teacher	**We need to show a squared variable. Which of the algebra tiles will we use?**
Students	Flat.
Teacher	**Look to see if there's a coefficient with the squared variable. The coefficient tells us how many of the flats we will show. How many flats?**
Students	2.
Teacher	**And is the squared variable positive or negative?**
Students	Positive.
Teacher	**Let's show 2 blue flats to show the squared variable.** (Show tiles.)
Teacher	**Now, do we have any variables we need to show?**
Students	Yes.
Teacher	**We need to show a variable. Which of the algebra tiles will we use?**
Students	Rod.
Teacher	**Look to see if there's a coefficient with the variable. The coefficient tells us how many of the rods we will show. How many rods?**
Students	3.
Teacher	**And is the variable positive or negative?**
Students	Negative.
Teacher	**Let's show 3 red rods to show the variable.** (Show tiles.)
Teacher	**Now, do we have any constants we need to show?**
Students	Yes.
Teacher	**We need to show a constant. Which of the algebra tiles will we use?**
Students	Unit.
Teacher	**How many units should we use?**
Students	7.
Teacher	**And is the constant positive or negative?**
Students	Negative.
Teacher	**Let's show 7 red units to show the constant.** (Show tiles.)
Teacher	**Now, let's focus on the right side of the equation. First, do we have any squared variables we need to show?**
Students	Yes.
Teacher	**We need to show a squared variable. Which of the algebra tiles will we use?**
Students	Flat.

Teacher	**Look to see if there's a coefficient with the squared variable. The coefficient tells us how many of the flats we will show. How many flats?**
Students	1.
Teacher	**And is the squared variable positive or negative?**
Students	Positive.
Teacher	**Let's show 1 blue flat to show the squared variable.** (Show tiles.)
Teacher	**Now, do we have any variables we need to show?**
Students	No.
Teacher	**Now, do we have any constants we need to show?**
Students	Yes.
Teacher	**We need to show a constant. Which of the algebra tiles will we use?**
Students	Unit.
Teacher	**How many units should we use?**
Students	3.
Teacher	**And is the constant positive or negative?**
Students	Negative.
Teacher	**Let's show 3 red units to show the constant.** (Show tiles.)
Teacher	**We used the algebra tiles to show this equation. What equation did we show?**
Students	$2x^2 - 3x - 7 = x^2 - 3$.
Teacher	**How can you use the algebra tiles to show equations?**
Students	Use the flats to show squared variables. Use the rods to show variables. Use the units to show the constant. Place the algebra tiles for the left side of an equation on the left side of an equal sign. Place the algebra tiles for the right side of an equation on the right side of an equal sign.

D. Problems for Use During Instruction

See Module 22 Problem Sets.

E. Vocabulary Cards for Use During Instruction

See Module 22 Vocabulary Cards.

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Module 22:

Representing Expressions and Equations

Problem Sets

A. Order of operations (10)
B. Expressions with 1 coefficient and 1 variable (10)
C. Expressions with 2 like variables (10)
D. Expressions with 2 like variables and 1 constant (10)
E. Expressions with squared variables (10)

For equations, use Problem Sets from Module 23.

A. $15 - (2 \times 5)$

A. $(8 \times 8) \div 6$

A. $[5 + (9 \div 3)] + 6$

A. $7 \times (2 \div 1) \div 2$

A. $29 - (2 \times 4)$

A. $(6 + 8 - 2)$

A. $(3+1)\times 4\times 5$

A. $(4 \times 6) \div 6$

A. $(6 - 1 + 7)$

A. $8 + [(9 + 4) - 2]$

B. $4x$

B.

$3r$

B. $11w$

B.

$6y$

B. $53c$

B.

$9u$

B. $14x$

B.

6s

B. 10z

B. $15t$

c. $4y + 5y$

c. $6r + 8r$

c. $2s \times 5s$

c. $11x - 5x$

c. $12d \div 3d$

c. $6k + 7k$

c. $2f \times 9f$

c. $15v - 6v$

c. $2m \times 8m$

c. $15x \div 5x$

D. $5x + 4x + 1$

D. $8z + 7z - 3$

D. $12 - 3c - 2c$

D. $9b + 6 + 8b$

D. $9w + 7 - 3w$

D. $12n - 2n + 6$

D. $5t + 4t - 10$

D. $2d + 17 - 2d$

D. $3m - 2 + 4m$

D. $10a - 8a + 2$

E. $5y^2 + 3y + 6$

E. $2s^2 + 3s - 1$

E. $x^2 + 2x + 9$

E. $3k^2 + 8k + 2$

E. $5w^2 - 4w - 2$

E. $8a^2 + 2a - 7$

E. $5x^2 + x + 10$

E. $2f^2 + 5f + 7$

E. $7b^2 + 4b + 2$

E. $4y^2 - 3y - 2$

Module 22:

Representing Expressions and Equations

Vocabulary Cards

base
coefficient
constant
equation
exponent
expression
grouping
inequality
like terms
operator
term
variable

base

A number that is multiplied by an exponent.

$$5^3$$

5 is the base

---

coefficient

A number that is multiplied by a variable.

$$5x + 9 = 24$$

5 is a coefficient

constant

A term that does not change; a number on its own.

$$5x + 9 = 24$$

9 and 24 are constants

---

equation

A mathematical statement that two expressions are the same or equal; must have an equal sign.

$$5x + 9 = 24$$

5x + 9 = 24 is an equation

(DOES have an = sign)

exponent

The power to which a number is raised.

$$5^{3}$$

3 is the exponent

---

expression

A combination of variables, numbers, and/or operations that represents a mathematical relationship; does not have an equal sign.

$5x + 9$ $\qquad$ 24

5x + 9 and 24 are expressions

(DOES NOT have an = sign)

grouping

A combination of variables, numbers, and/or operations grouped together in parentheses or brackets.

$$(15 + 4) \qquad 2[(6 + 4) \div 2]$$

---

inequality

An algebraic relation showing that a quantity is greater or less than another quantity.

$$5x + 9 > 24$$

The > makes this equation an inequality

like terms

Terms that have the same variable or constant and can be combined.

$2y \quad 4y \quad 8y$

---

operator

A symbol (+, –, × ÷) that represents a mathematical operation.

$5x + 9 = 24$

+ is an operator

term

A single number or a variable, or numbers and variables multiplied together.

$$5x + 9 = 24$$

5x, 9, and 24 are terms

---

variable

A symbol for an unknown value, which is usually represented by a letter.

$$5x + 9 = 24$$

x is a variable