Readiness | Engagement | Mastery

Lesson 1

Chapter Opener (page 61)

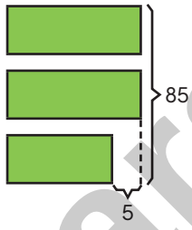
20 minutes

In Chapter 8, students write equations in one and two variables and write inequalities in one variable to solve real-world problems. They identify independent and dependent variables and use charts and graphs to draw conclusions about relationships between two variables.

The picture provides a familiar context for students to explore the concept of equations through a real-world example.

- Display the picture. Invite students to share what they see. three boys playing basketball
- Group students in pairs or small groups to discuss the picture and the questions on the page.
- You may facilitate discussions with these questions. Observe student discussions and pay attention to the language they use.
- Encourage students to talk about experiences they have had in sports where statistics are kept.

What are the boys doing? Playing basketball **Who scored the fewest points? How do you know? What information is not needed?** Ben scored the fewest points because Jim and Carlos scored the same and it was 5 points more than Ben. The information that Jim scored 5 points more than his personal best is not needed. **How can you draw a model to help you decide how many points Ben scored?** I could draw two bars of the same length and then one that is 5 shorter than those.



- Have students work together to find the solution then share their methods.

Best Practice

Encourage students to guess and check to find the answer. For example, if Jim and Carlos scored 35 points, then Ben would have scored 30 points and the three boys would score a total of 100 points, which is more than 85 points. Another guess could be that Ben scored 20 and the other two boys would then have scored the remaining 65 points. This solution is impossible because 65 points cannot be divided equally. Encourage students to guess and check until they find a working solution, which is that Ben scored 25 points, while Jim and Carlos scored 30 points each.

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Recall (page 62)

30 minutes

Have students complete the **Recall** questions to check their readiness for the chapter. After students have answered all the questions, go through each of them by facilitating the following class activities and/or discussions. You may refer to the Transition Guide for additional resources. As an option, you may refer students to the online Recall questions. These online questions will be auto-graded. For questions that require students to show their work, have them do so in the Student Book.

QUESTION 1 assesses students' ability to write an algebraic equation.

What do the terms sum, product and decrease indicate? Sum means addition, product means multiplication, and decrease means subtraction.

QUESTION 2 assesses students' ability to evaluate expressions.

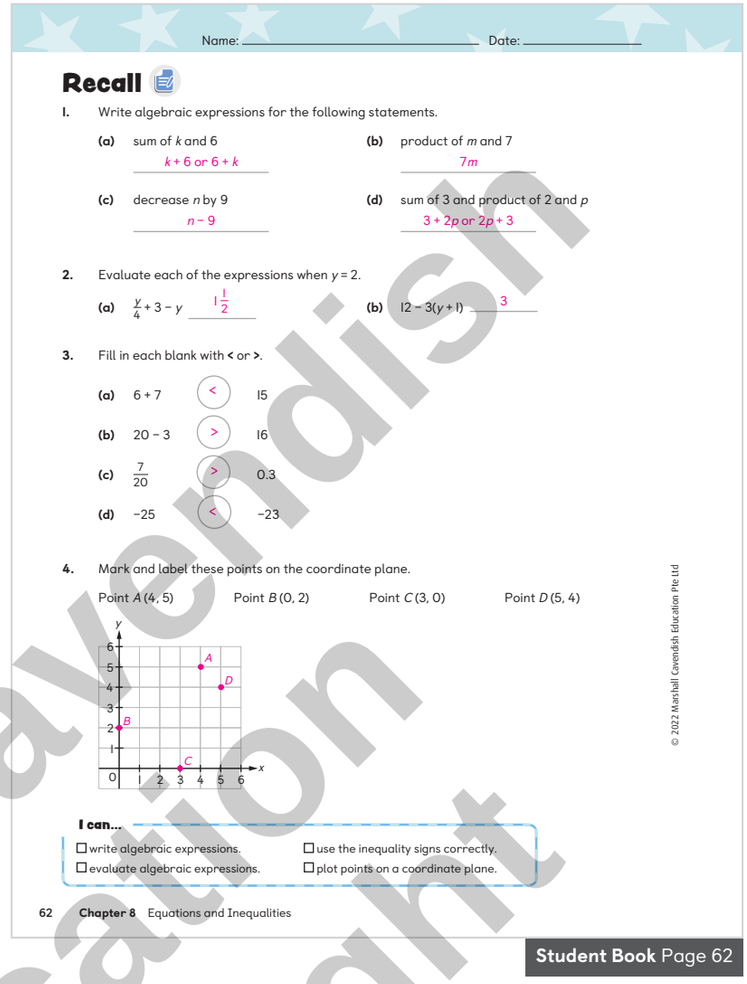
How do you evaluate an expression? I can substitute the value to y into each expression.

QUESTION 3 assesses students' ability to use inequality signs.

How do you determine which is greater? For (a) and (b), I solve the expression on the left-hand side before comparing. For (c), I convert either the fraction into a decimal or the decimal into a like fraction before comparing. For (d), I can just compare the numbers. **Why might it be important to convert fractions to decimals in the same form to compare?** It is easier to compare just decimals or fractions. **How is comparing negative numbers different from comparing positive ones?** For negative numbers, the greater number is the number with less numerical value.

QUESTION 4 assesses students' ability to plot points on the coordinate plane.

Which of the two coordinates tell you the *x*-axis? The first digit in the ordered pair. **Which tells you the *y*-axis?** The second digit in the ordered pair. **What do you notice about points B and C?** They are on the axes.



Name: _____ Date: _____

Recall

1. Write algebraic expressions for the following statements.
   - (a) sum of k and 6 — $k + 6$ or $6 + k$
   - (b) product of m and 7 — $7m$
   - (c) decrease n by 9 — $n - 9$
   - (d) sum of 3 and product of 2 and p — $3 + 2p$ or $2p + 3$
2. Evaluate each of the expressions when $y = 2$.
   - (a) $\frac{y}{4} + 3 - y$ — $1\frac{1}{2}$
   - (b) $12 - 3(y + 1)$ — 3
3. Fill in each blank with < or >.
   - (a) $6 + 7$ < 15
   - (b) $20 - 3$ > 16
   - (c) $\frac{7}{20}$ > 0.3
   - (d) -25 < -23
4. Mark and label these points on the coordinate plane.
   Point $A(4, 5)$ Point $B(0, 2)$ Point $C(3, 0)$ Point $D(5, 4)$

I can...
- ☐ write algebraic expressions.
- ☐ evaluate algebraic expressions.
- ☐ use the inequality signs correctly.
- ☐ plot points on a coordinate plane.

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Lesson 2

8A Algebraic Equations

Focus Question

How can variables be used in algebraic equations?

I CAN

- I can use models to write equations with one variable.
- I can use substitution to solve equations with one variable.

Vocabulary

- algebraic equation
- solution

Mathematical Practice(s)

- 4 Model

Material(s)

- paper strips
- I's block

ALGEBRAIC EQUATIONS (pages 63 to 66)

Lesson Opener

Task (page 63) 10 minutes

- Group students in pairs or small groups.
- Have students work on the task. Observe student discussions.
- After students have attempted the task, use the following prompts to facilitate a class discussion. Pay attention to the language students use.
- Have students consider the picture:

What do you notice? There is a sugar cube and a 1-gram weight on one side of the scale and a 5-gram weight on the other side of the scale. **What do you notice about the scale? What does it mean?** The scale is balanced so the mass of 1 sugar cube and a 1-gram weight is equal to the mass of a 5-gram weight. **What do you need to find?** how much the sugar cube weighs

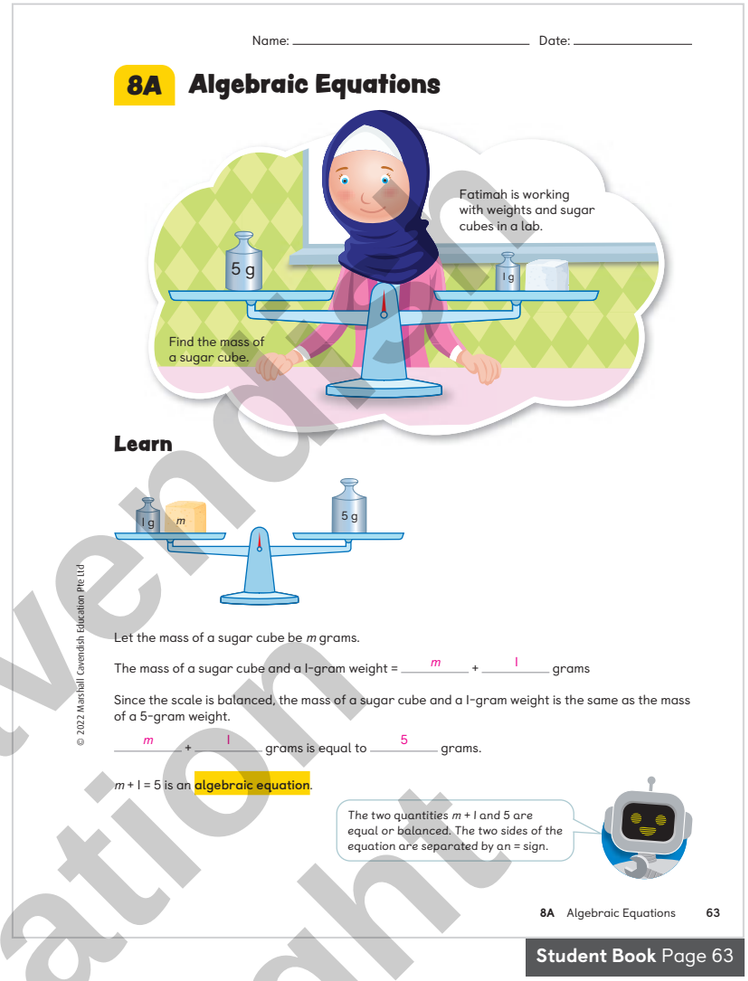
Lesson Development

Learn (page 63) 10 minutes

- Ask students to share the methods they used to find weight of the sugar cube.

How can you find the total mass on the left side of the scale? I can use a letter to represent the mass of the sugar cube and add it to 1 gram. **If we label the mass of the sugar cube as m, what algebraic expression can you write to represent the mass of the sugar cube and 1-gram weight?** $m + 1$

You might notice that the mass of the sugar cube and the 1-gram weight is equal to the mass of a 5-gram weight, how could you write an algebraic equation to show this relationship? $m + 1 = 5$ **What number can I use to represent** m **such that the equation is true?** 4 **How much does the sugar cube weigh?** 4 grams **How can you prove your solution?** 4 grams + 1 gram = 5 grams.



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8A Algebraic Equations

Fatimah is working with weights and sugar cubes in a lab.

5 g

1 g

Find the mass of a sugar cube.

Learn

1 g

m

5 g

Let the mass of a sugar cube be m grams.

The mass of a sugar cube and a 1-gram weight = m + 1 grams

Since the scale is balanced, the mass of a sugar cube and a 1-gram weight is the same as the mass of a 5-gram weight.

m + 1 grams is equal to 5 grams.

m + 1 = 5 is an algebraic equation.

The two quantities m + 1 and 5 are equal or balanced. The two sides of the equation are separated by an = sign.

8A Algebraic Equations 63

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Best Practice

This section focuses on substitution of values for a variable. Do not introduce the strategy of making zero pairs at this time.

English Language Support

What does it mean to have a solution that makes an equation true?

A true equation has a correct solution.

Cats bark is not a true statement.

Dogs bark is a true statement.

We solve the equation to find the value of m that makes the equation true.

If $m = 4$, $m + 1 = 4 + 1$
$= 5$

The two sides of the equation are equal.

The equation $m + 1 = 5$ is true when $m = 4$. We say that $m = 4$ is a **solution** to the equation.

If $m = 3$, $m + 1 = 3 + 1$
$= 4 \neq 5$)

$m = 3$ does **not** make the equation $m + 1 = 5$ true. It is **not** a solution to the equation.

Learn Together

1. Which one of the following is **not** an equation?

(A) $4 + m + n$ (B) $8 = 9 + d$

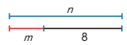
(C) $\frac{27}{y} = 5$ (D) $7m - n = 9$

2. Write the equation represented by the bar model.

$v + 3 = 5 + w$

3. Write an addition algebraic equation and a subtraction algebraic equation that represents each diagram.

(a)



$m + 8 = n$ or $8 + m = n$

$n - m = 8$ or $n - 8 = m$

(b)

$v + u = 9$ or $u + v = 9$

$9 - u = v$ or $9 - v = u$

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Name: _____ Date: _____

4. Write an equation to represent each statement.

(a) the sum of y and 7 is 24
$y + 7 = 24$

(b) the difference of m and 6 is 7
$m - 6 = 7$

(c) 8 is the product of y and 3
$8 = 3y$

(d) 6 is 250 minus p
$6 = 250 - p$

5. Does $y = 12$ make the equation $y - 8 = 14$ true?

When $y = 12$, $y - 8 =$ 12 − 8 = 4 $\neq 14$

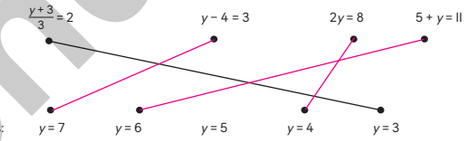
So, $y = 12$ does not make $y - 8 = 14$ true.

6. $w = 4$ is the solution to which **two** of the following equations?

(A) $w - 6 = 10$ (B) $9 - w = 5$

(C) $5 = w + 1$ (D) $5 + w = 4$

7. Match the set of values to the equations to make the equations true.



Activity!

In a magic square, the three numbers in any line (across, down, or diagonally) must add up to the given magic sum. Find the value of y and n to complete each magic square.

Magic sum = 9

y	0	$y - 1$
2	3	$y - 1$
2	$y + 1$	1

$y =$ 5

Magic sum = 12

$\frac{n}{2}$	$\frac{n}{2}$	n
7	4	1
$n - 4$	$n - 1$	5

$n =$ 6

Student Book Page 65

Learn Together (pages 64 and 65) 15 minutes

- Group students in pairs or small groups to answer Questions 1 to 7.
- **QUESTION 1** requires students to differentiate between an equation and an expression.

How are an algebraic expression and an algebraic equation the same? How are they different? They both contain variables. An equation has an equal sign and is solved while an expression does not have an equal sign and is evaluated.

- **QUESTION 2** requires students to write an equation from a bar model.

What do you notice about the two strips? They are the same length. **What expression can you write for the top strip?** $v + 3$ **What expression you can write for the bottom strip?** $5 + w$ **Since the strips have equal length, what equation can you write to compare them?** $v + 3 = 5 + w$

- **QUESTION 3** requires students to write an equation from a diagram.

Since the two lines are equal, what algebraic equation can you write to show the relationship between n and m? $n = m + 8$ or $m + 8 = n$ or $n - m = 8$ or $n - 8 = m$ **How is this similar to a part whole bar model or a number bond?** n is the whole and m and 8 are the parts.

- **QUESTION 4** requires students to write an algebraic equation from its word form.

Which part of the sentence tells you that you are writing an equation and not an expression? 'is', because it means 'equal to'.

- **QUESTION 5** requires students to determine if a given solution to an algebraic equation is true.

What does it mean to determine if a solution makes an equation true? It means to determine if the number sentence is true when the solution is substituted for the variable.

- **QUESTION 6** requires students to determine if a given solution solves an algebraic equation.

What does it mean if a value is a solution to an equation? It creates a true number sentence when it is substituted for the variable.

- **QUESTION 7** requires students to match solutions to algebraic equations.

What strategy can you use to decide which are the solutions that match the equations? I can substitute each solution into the equation to check if it makes the equation true.

Best Practice

Give students counters to represent the numbers in the first magic square. Have them find the number of counters that must be placed in each square. Remind them that y or n must have the same value throughout the magic square.

Activity! (page 65) 10 minutes

- Have student work with a partner to solve the magic square.
- **What is the magic sum of the first magic square? What does this mean?** Each diagonal, row, and column must add to 9. **What do you need to find?** The value of y that makes the magic square true. **How might you start? Why?** Solve for y in the first column because it only has one variable or solve for y in the second column because $y + 1$ must equal 6.

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Lesson Debrief

- Conclude the lesson and facilitate students' reflection by asking students to answer the **Focus Question** and share their thinking.

Focus Question

How can variables be used in algebraic equations?

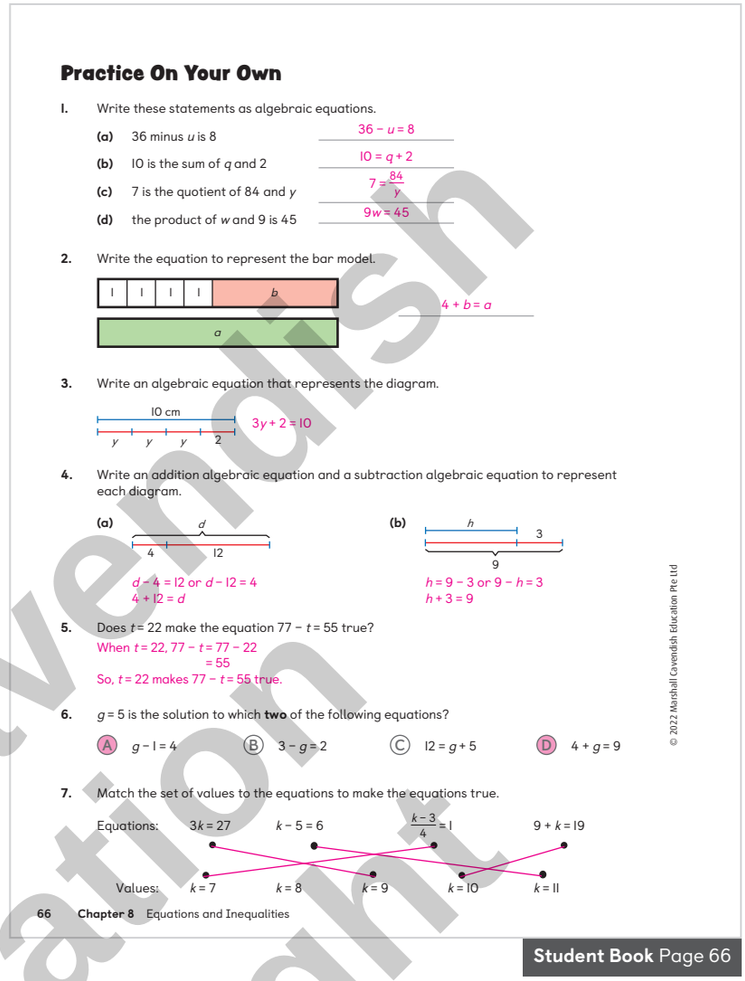
- Extend the discussion by posing the following question.
- **What does it mean to substitute to make an equation true?**

Promoting Growth

To encourage and support students to persevere in problem solving and maintain a learning mindset:

- *Allow students time to reflect on what they have learned and to ask questions about what they may be unsure of.*
- *Encourage students to share how they overcome a difficulty in the process of learning.*
- *Provide students with this prompt: Make up your own magic square involving a variable.*
- *Have them write a journal entry.*

- Display this lesson's **I CAN** statement(s) for students to reflect on their learning.
  - I can use models to write equations with one variable.
  - I can use substitution to solve equations with one variable.



Practice On Your Own

1. Write these statements as algebraic equations.
   (a) 36 minus u is 8 — $36 - u = 8$
   (b) 10 is the sum of q and 2 — $10 = q + 2$
   (c) 7 is the quotient of 84 and y — $7 = \frac{84}{y}$
   (d) the product of w and 9 is 45 — $9w = 45$
2. Write the equation to represent the bar model.

   $4 + b = a$
3. Write an algebraic equation that represents the diagram.

   $3y + 2 = 10$
4. Write an addition algebraic equation and a subtraction algebraic equation to represent each diagram.
   (a)
   $d - 4 = 12$ or $d - 12 = 4$
   $4 + 12 = d$
   (b)
   $h = 9 - 3$ or $9 - h = 3$
   $h + 3 = 9$
5. Does $t = 22$ make the equation $77 - t = 55$ true?
   When $t = 22$, $77 - t = 77 - 22$
   $= 55$
   So, $t = 22$ makes $77 - t = 55$ true.
6. $g = 5$ is the solution to which **two** of the following equations?
   (A) $g - 1 = 4$ (B) $3 - g = 2$ (C) $12 = g + 5$ (D) $4 + g = 9$
7. Match the set of values to the equations to make the equations true.
   Equations: $3k = 27$, $k - 5 = 6$, $\frac{k-3}{4} = 1$, $9 + k = 19$
   Values: $k = 7$, $k = 8$, $k = 9$, $k = 10$, $k = 11$

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Practice On Your Own (page 66) 15 minutes

If you would like the questions to be auto-graded, refer students to online **Practice On Your Own** as a lesson check. If you want students to show their work, have them do so in the Student Book.

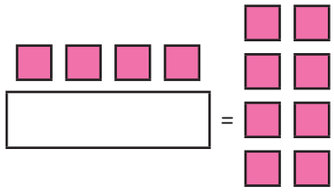
- **QUESTION 1** assesses students' ability to write an algebraic equation from its word form.
- **QUESTION 2** assesses students' ability to write an equation from a bar model.
- **QUESTION 3** assesses students' ability to write an equation from a diagram.
- **QUESTION 4** assesses students' ability to write an equation from a diagram in two ways.
- **QUESTION 5** assesses students' ability to determine if a solution to an algebraic equation is true.
- **QUESTION 6** assesses students' ability to determine if a given solution solves an algebraic equation.
- **QUESTION 7** assesses students' ability to match solutions to algebraic equations.

Refer to **Differentiated Instruction** to provide students with additional support, on-level practice, or extension.

Differentiated Instruction

Additional Support

- Material(s): paper strips, I's blocks
- Ask students to represent $4 + x = 8$ with blocks and a paper strip for x.



How many blocks would you need to place on the paper strip to make the equation true?

- Repeat with $x + 3 = 9$ and $4 = x + 2$
- Now show the equation: $5 - x = 4$

How many blocks would you need to take away to make the equation true?

- Repeat with $7 = 10 - x$

On-Level Practice

- Encourage students to summarize their learning and make connections to what they have previously learned. Invite them to give examples to show their thinking.
- Help them begin by asking the following questions.

Make up a set of equations and solutions similar to Practice on Your Own Question 8. Write the equations on one set of notecards and the solutions on another. Exchange with a partner.

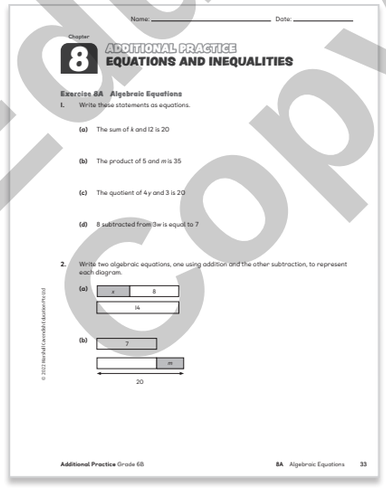
- If time permits, encourage students to discuss their work and share their ideas.
- Assign **Additional Practice 6B Exercise 8A** as appropriate to each student.

Extension

- Encourage students to summarize their learning, make connections to what they have previously learned, and challenge them to ask questions regarding what they want to learn more about.

What are some possible values of v and w in Learn Together Question 2? How did you determine which number was greater v or w?

- If time permits, encourage students to discuss their work and share their ideas.



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Chapter 8 ADDITIONAL PRACTICE
EQUATIONS AND INEQUALITIES

Exercise 8A Algebraic Equations

1. Write these statements as equations.

(a) The sum of k and 12 is 20

(b) The product of 5 and m is 35

(c) The quotient of $4y$ and 3 is 20

(d) 8 subtracted from $3w$ is equal to 7

2. Write two algebraic equations, one using addition and the other subtraction, to represent each diagram.

(a)

(b)