MATH 6

Third Edition

Teacher's Edition

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Teacher's Toolkit CD

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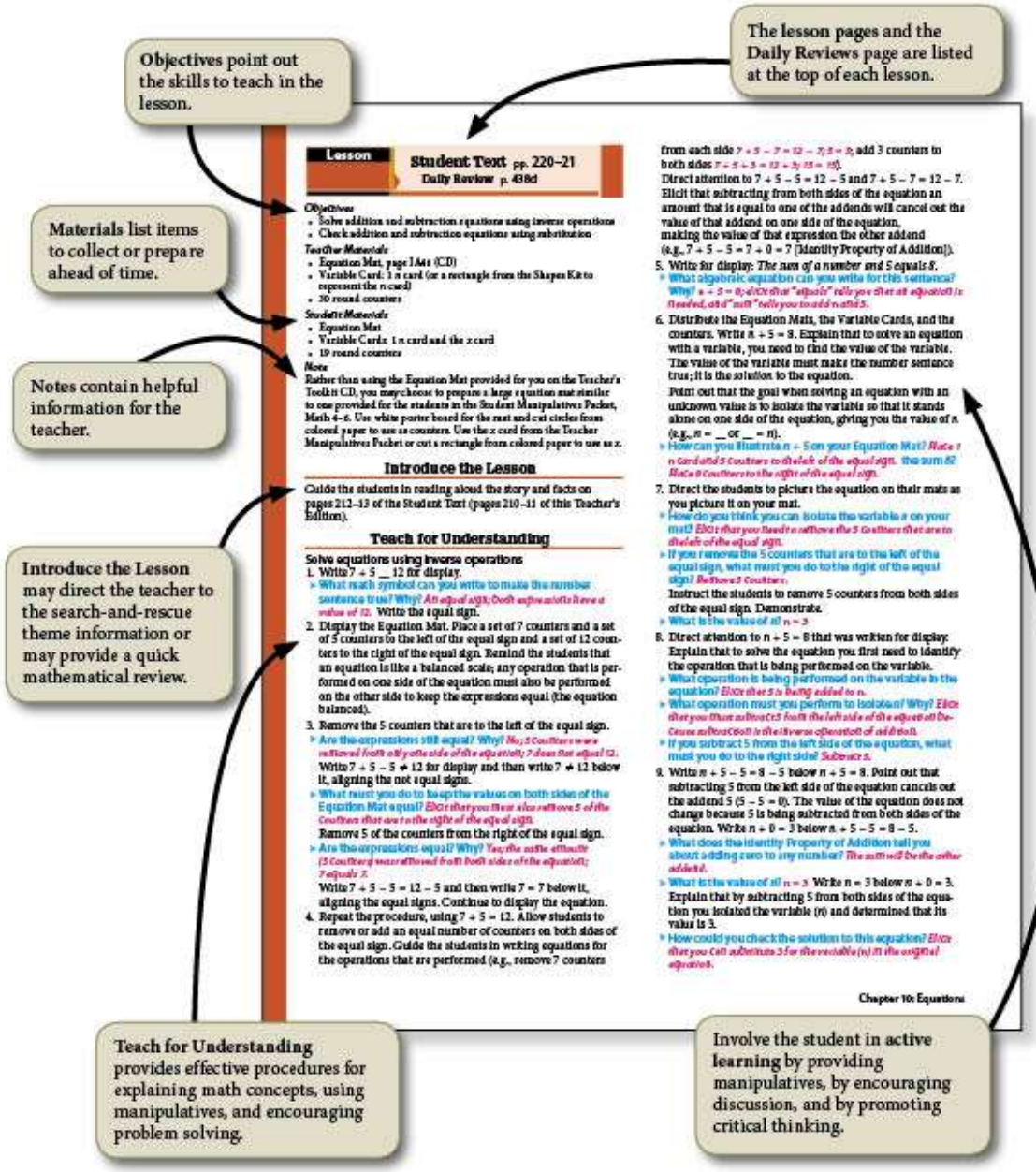
LESSON FEATURES



Lesson **Student Text** pp. 220–21
Daily Review p. 438d

Objectives
- Solve addition and subtraction equations using inverse operations
- Check addition and subtraction equations using substitution

Teacher Materials
- Equation Mat, page 1 Mat (CD)
- Variable Card: 1 *n* card (or a rectangle from the Shapes Kit to represent the *n* card)
- 30 round counters

Student Materials
- Equation Mat
- Variable Cards: 1 *n* card and the *x* card
- 19 round counters

Note
Rather than using the Equation Mat provided for you on the Teacher's Toolkit CD, you may choose to prepare a large equation mat similar to one provided for the students in the Student Manipulatives Packet, Math 4–6. Use white poster board for the mat and cut circles from colored paper to use as counters. Use the *x* card from the Teacher Manipulatives Packet or cut a rectangle from colored paper to use as *x*.

Introduce the Lesson

Guide the students in reading aloud the story and facts on pages 212–13 of the Student Text (pages 210–11 of this Teacher's Edition).

Teach for Understanding

Solve equations using inverse operations

1. Write 7 + 5 __ 12 for display.
   - What math symbol can you write to make the number sentence true? Why? *An equal sign; Both sides of it have a value of 12.* Write the equal sign.
2. Display the Equation Mat. Place a set of 7 counters and a set of 5 counters to the left of the equal sign and a set of 12 counters to the right of the equal sign. Remind the students that an equation is like a balanced scale; any operation that is performed on one side of the equation must also be performed on the other side to keep the expressions equal (the equation balanced).
3. Remove the 5 counters that are to the left of the equal sign.
   - Are the expressions still equal? Why? *No; 5 counters were removed from only one side of the equation; 7 does not equal 12.*

   Write 7 + 5 − 5 ≠ 12 for display and then write 7 ≠ 12 below it, aligning the not equal signs.
   - What must you do to keep the values on both sides of the Equation Mat equal? *Either you must also remove 5 of the counters that are to the right of the equal sign.*

   Remove 5 of the counters from the right of the equal sign.
   - Are the expressions equal? Why? *Yes; the same amount (5 counters) was removed from both sides of the equation; 7 equals 7.*

   Write 7 + 5 − 5 = 12 − 5 and then write 7 = 7 below it, aligning the equal signs. Continue to display the equation.
4. Repeat the procedure, using 7 + 5 = 12. Allow students to remove or add an equal number of counters on both sides of the equal sign. Guide the students in writing equations for the operations that are performed (e.g., remove 7 counters from each side $7 + 5 - 7 = 12 - 7$; $5 = 5$; add 3 counters to both sides $7 + 5 + 3 = 12 + 3$; $15 = 15$).

   Direct attention to 7 + 5 − 5 = 12 − 5 and 7 + 5 − 7 = 12 − 7. Elicit that subtracting from both sides of the equation an amount that is equal to one of the addends will cancel out the value of that addend on one side of the equation, making the value of that expression the other addend (e.g., 7 + 5 − 5 = 7 + 0 = 7 [Identity Property of Addition]).
5. Write for display: *The sum of a number and 5 equals 8.*
   - What algebraic equation can you write for this sentence? Why? *n + 5 = 8; elicit that "equals" tells you that an equation is needed, and "sum" tells you to add n and 5.*
6. Distribute the Equation Mats, the Variable Cards, and the counters. Write *n* + 5 = 8. Explain that to solve an equation with a variable, you need to find the value of the variable. The value of the variable must make the number sentence true; it is the solution to the equation.

   Point out that the goal when solving an equation with an unknown value is to isolate the variable so that it stands alone on one side of the equation, giving you the value of *n* (e.g., *n* = __ or __ = *n*).
   - How can you illustrate *n* + 5 on your Equation Mat? *Place 1 n Card and 5 Counters to the left of the equal sign. the sum 8? Place 8 Counters to the right of the equal sign.*
7. Direct the students to picture the equation on their mats as you picture it on your mat.
   - How do you think you can isolate the variable *n* on your mat? *Elicit that you need to remove the 5 Counters that are to the left of the equal sign.*
   - If you remove the 5 counters that are to the left of the equal sign, what must you do to the right of the equal sign? *Remove 5 Counters.*

   Instruct the students to remove 5 counters from both sides of the equal sign. Demonstrate.
   - What is the value of *n*? *n = 3*
8. Direct attention to *n* + 5 = 8 that was written for display. Explain that to solve the equation you first need to identify the operation that is being performed on the variable.
   - What operation is being performed on the variable in the equation? *Elicit that 5 is being added to n.*
   - What operation must you perform to isolate *n*? Why? *Elicit that you must subtract 5 from the left side of the equation. Because subtraction is the inverse operation of addition.*
   - If you subtract 5 from the left side of the equation, what must you do to the right side? *Subtract 5.*
9. Write *n* + 5 − 5 = 8 − 5 below *n* + 5 = 8. Point out that subtracting 5 from the left side of the equation cancels out the addend 5 (5 − 5 = 0). The value of the equation does not change because 5 is being subtracted from both sides of the equation. Write *n* + 0 = 3 below *n* + 5 − 5 = 8 − 5.
   - What does the Identity Property of Addition tell you about adding zero to any number? *The sum will be the other addend.*
   - What is the value of *n*? *n = 3* Write *n* = 3 below *n* + 0 = 3. Explain that by subtracting 5 from both sides of the equation you isolated the variable (*n*) and determined that its value is 3.
   - How could you check the solution to this equation? *Elicit that you can substitute 3 for the variable (n) in the original equation.*

Student Text pages provide practice of math skills and a tool to evaluate understanding.

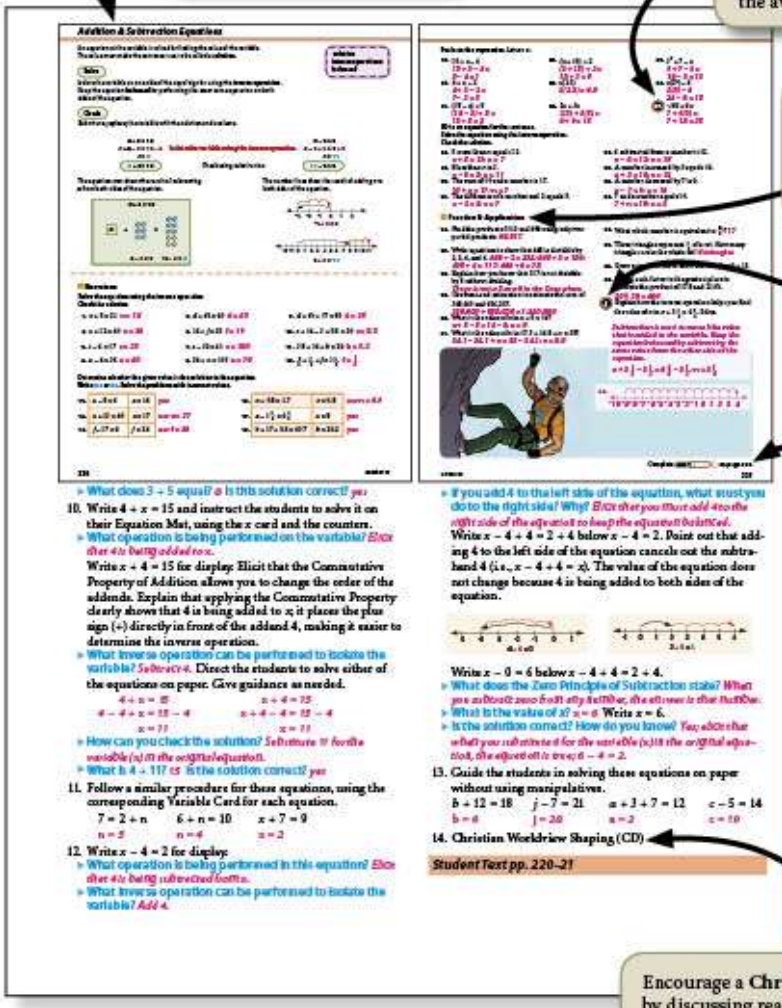
The **Challenge symbol** indicates that the activity may require application of a concept or that it may present a challenge to the average student.

Practice & Application provides review and extension of skills and concepts previously taught in the Student Text.

The **Journal symbol** indicates problems to be completed and/or explained in the journal section of the student's math notebook.

The **Daily Review** exercises provide systematic review of skills and concepts in the Student Text.

Encourage a **Christian worldview** by discussing real-life problems to show the student that math is a powerful tool for exercising dominion over the earth as commanded in Genesis 1:28.


Addition & Subtraction Equations

▸ What does 3 + 5 equal? 8 Is this solution correct? yes

10. Write 4 + x = 15 and instruct the students to solve it on their Equation Mat, using the x card and the counters.
▸ What operation is being performed on the variable? 4 is being added to x.
Write x + 4 = 15 for display. Elicit that the Commutative Property of Addition allows you to change the order of the addends. Explain that applying the Commutative Property clearly shows that 4 is being added to x; it places the plus sign (+) directly in front of the addend 4, making it easier to determine the inverse operation.
▸ What inverse operation can be performed to isolate the variable? Subtract 4. Direct the students to solve either of the equations on paper. Give guidance as needed.

4 + x = 15	x + 4 = 15
4 − 4 + x = 15 − 4	x + 4 − 4 = 15 − 4
x = 11	x = 11

▸ How can you check the solution? Substitute 11 for the variable (x) in the original equation.
▸ What is 4 + 11? 15 Is the solution correct? yes

11. Follow a similar procedure for these equations, using the corresponding Variable Card for each equation.

7 = 2 + n	6 + n = 10	x + 7 = 9
n = 5	n = 4	x = 2

12. Write x − 4 = 2 for display.
▸ What operation is being performed in this equation? Elicit that 4 is being subtracted from x.
▸ What inverse operation can be performed to isolate the variable? Add 4.

▸ If you add 4 to the left side of the equation, what must you do to the right side? Why? Elicit that you must add 4 to the right side of the equation to keep the equation balanced.
Write x − 4 + 4 = 2 + 4 below x − 4 = 2. Point out that adding 4 to the left side of the equation cancels out the subtrahend 4 (i.e., x − 4 + 4 = x). The value of the equation does not change because 4 is being added to both sides of the equation.

Write x − 0 = 6 below x − 4 + 4 = 2 + 4.
▸ What does the Zero Principle of Subtraction state? What you subtract zero from is always the answer. The answer is the number.
▸ What is the value of x? x = 6 Write x = 6.
▸ Is the solution correct? How do you know? Yes; elicit that when you substituted for the variable (x) in the original equation, the equation is true; 6 − 4 = 2.

13. Guide the students in solving these equations on paper without using manipulatives.

b + 12 = 18	j − 7 = 21	a + 3 + 7 = 12	c − 5 = 14
b = 6	j = 28	a = 2	c = 19

14. Christian Worldview Shaping (CD)

Student Text pp. 220–21