


5•1 Extended Multiplication Facts

 **Objective** To extend basic multiplication facts to products of ones and tens and products of tens and tens.

Technology Resources

www.everydaymathonline.com



ePresentations



eToolkit



Algorithms Practice



EM Facts Workshop Game™



Family Letters



Assessment Management



Common Core State Standards



Curriculum Focal Points



Interactive Teacher's Lesson Guide

1 Teaching the Lesson


Key Concepts and Skills

- Solve basic multiplication facts.
[Operations and Computation Goal 3]
- Use basic multiplication facts to compute fact extensions.
[Operations and Computation Goal 3]
- Use repeated addition and arrays to model multiplication.
[Operations and Computation Goal 7]
- Describe rules to solve problems involving products of ones and tens and products of tens and tens.
[Patterns, Functions, and Algebra Goal 1]

Key Activities

Students use multiple methods to solve extended multiplication facts. They play *Beat the Calculator* to practice solving extended facts.

 **Ongoing Assessment: Informing Instruction** See page 316.

 **Ongoing Assessment: Recognizing Student Achievement**
Use journal page 107.
[Operations and Computation Goal 3]

Key Vocabulary

extended multiplication facts

Materials

Math Journal 1, pp. 106 and 107

Student Reference Book, p. 233

Math Masters, p. 461

per group: 4 each of number cards 1–10 ♦
slate ♦ base-10 blocks ♦ Multiplication/
Division Facts Table (optional) ♦ calculator

2 Ongoing Learning & Practice

Finding Personal References for Customary Units of Length

Math Journal 1, p. 98
tape measure or ruler
Students use tape measures or rulers to find personal references for customary units of length.



Math Boxes 5•1

Math Journal 1, p. 108
Students practice and maintain skills through Math Box problems.



Study Link 5•1

Math Masters, p. 139
Students practice and maintain skills through Study Link activities.

3 Differentiation Options

READINESS

Playing *Multiplication Top-It*

Student Reference Book, p. 264
Math Masters, p. 506
per partnership: 4 each of number cards 1–10 (from the Everything Math Deck, if available), calculator (optional)
Students practice multiplication facts.

EXTRA PRACTICE

Solving Multiplication/Division Puzzles

Math Masters, p. 430
Students practice extended multiplication and division facts.

ELL SUPPORT

Building a Math Word Bank

Differentiation Handbook, p. 140
Students add the term *extended fact* to their Math Word Banks.

Advance Preparation

 **Teacher's Reference Manual, Grades 4–6** pp. 16, 107–111

Getting Started



Mathematical Practices
SMP1, SMP2, SMP3, SMP4, SMP5, SMP6, SMP7, SMP8
Content Standards
4.OA.1, 4.OA.2, 4.NBT.1, 4.NBT.5, 4.MD.1, 4.MD.2

Mental Math and Reflexes



Pose multiplication facts and extended facts.
Suggestions:

- | | |
|------------------|--------------------|
| ●○○ $3 * 3 = 9$ | ●●● $70 * 5 = 350$ |
| 9 * 2 = 18 | 8 * 40 = 320 |
| 8 * 5 = 40 | 90 * 50 = 4,500 |
| 6 * 4 = 24 | 70 * 30 = 2,100 |
| ●●○ $9 * 4 = 36$ | |
| 6 * 8 = 48 | |
| 7 * 7 = 49 | |
| 8 * 9 = 72 | |

Math Message



Solve the problems.

- 6 apples cost 40¢ each. What is the total cost?
- There are 40 cans of tennis balls, with 3 balls per can. How many balls are there in all?

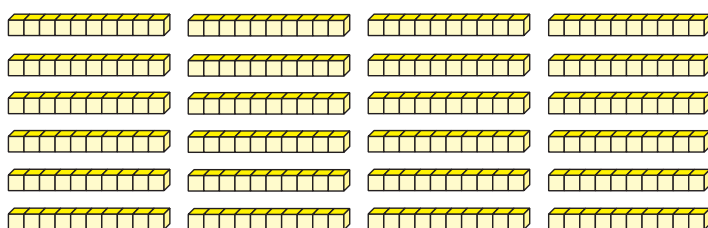
1 Teaching the Lesson

Math Message Follow-Up



Discuss students' solutions. Try to include a variety of explanations, such as:

- ▶ Repeated addition: Each apple costs 40 cents, so 6 apples cost $40¢ + 40¢ + 40¢ + 40¢ + 40¢ + 40¢$; that is 240¢, or \$2.40.
- ▶ Array pictures: Using base-10 blocks, show 6 rows with 4 longs (tens) in each row. Or, draw an array with 6 rows and 40 dots in each row.



$$6 * 40 = 240$$

- ▶ “10-times-as-many” language: If the apples cost 4¢ each, then 6 apples would cost $6 * 4¢$, or 24¢. Because the apples cost 40¢ each, 6 apples must cost 10 times as much; that is $10 * 24¢ = 240¢$, or \$2.40.
- ▶ Multiplication comparison: What amount is 6 times as much as 40¢? 240¢, or \$2.40.

Tell students that in this lesson they will extend their work with basic multiplication facts to develop a shortcut for working with multiples of 10.

Interactive whiteboard-ready ePresentations are available at www.everydaymathonline.com to help you teach the lesson.

Adjusting the Activity ELL
As students share their strategies, record them on the board and leave them up for reference throughout the lesson.
AUDITORY ♦ KINESTHETIC ♦ TACTILE ♦ VISUAL

Links to the Future
In Lesson 5-5 students review the partial-products algorithm for multiplication of multidigit numbers. In Unit 6 students are introduced to the partial-quotients algorithm. For both algorithms, automaticity with extended multiplication facts is essential.


Student Page

Date _____ Time _____



LESSON 5-1 Multiplying Ones by Tens

You can extend a multiplication fact by making one of the factors a multiple of ten.



Example:
Original fact: $2 \times 3 = 6$
Extended facts: $2 \times 30 = 60$, or $20 \times 3 = 60$



Write a multiplication fact for each Fact Triangle shown below. Then extend this fact by changing one factor to a multiple of ten.

1.  **Sample answers:** 

Original fact: $6 \times 8 = 48$ Original fact: $9 \times 5 = 45$
Extended fact: $6 \times 80 = 480$ Extended fact: $9 \times 50 = 450$

3.  4. 

Original fact: $4 \times 7 = 28$ Original fact: $8 \times 9 = 72$
Extended fact: $4 \times 70 = 280$ Extended fact: $8 \times 90 = 720$

5. What shortcut can you use to multiply ones by tens, such as 3×60 ?
Sample answer: Solve the basic fact: $3 \times 6 = 18$.
Then add one zero to the answer: $3 \times 60 = 180$.

Math Journal 1, p. 106



Ongoing Assessment: Informing Instruction

Watch for students who simply attach zeros to the product without understanding why. Point out that 3×20 , for example, is equivalent to $3 \times 2 \times 10$ and to 6×10 .

▶ Developing a Rule for Multiplying Ones by Tens

(Math Journal 1, p. 106)



Ask students to turn to the example at the top of journal page 106. To support English language learners, discuss the meanings of the terms *original fact* and *extended fact*. Then have students solve the two extended facts.

Students may use explanations like those suggested in the Math Message Follow-Up or as shown below.

- ▶ Think money: $30¢ = 3$ dimes. 2×3 dimes = 6 dimes, or 60¢.
- ▶ Rewrite multiples of 10 as “tens”: Write 2×30 as 2×3 tens, which equals 6 tens, or 60.
- ▶ Ask themselves: *What number is 2 times as many as 30?*



Adjusting the Activity

ELL

Have students use base-10 blocks to model the multiplication with arrays. For example, for the extended fact 2×30 , first have students make an array consisting of 2 rows with 3 cubes in each row to show 2×3 . Then ask students to make an array consisting of 2 rows with 3 longs in each row to show 2×30 .

AUDITORY • KINESTHETIC • TACTILE • VISUAL

Have students complete the journal page. They should write an **extended multiplication fact** (either ones \times tens or tens \times ones) for each basic fact shown by a Fact Triangle. Partners then work together to write a shortcut rule for multiplying ones by tens.

Bring the class together to share students' shortcuts. **Sample answer:** Solve the basic fact and attach one zero to the answer. For example, to solve 3×20 , solve the basic fact $3 \times 2 = 6$, and then attach one zero to get 60. Have students stand up if they wrote a similar shortcut.

Pose several extended-facts problems for students to solve on their slates. To ensure that they use the shortcut rule, give them very little time to write their answers.

▶ Developing a Rule for Multiplying Tens by Tens

(Math Journal 1, p. 107)



Ask students to turn to the example at the top of journal page 107 and solve the extended fact.

Some of the ways used earlier to model the multiplication of ones and tens are too cumbersome to model the multiplication of tens and tens. For example, an array of base-10 blocks for 30×50 would be huge. To find this product using repeated addition would require using 50 as an addend 30 times.

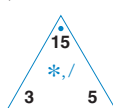
Student Page

Date _____ Time _____



LESSON 5-1 Multiplying Tens by Tens

You can extend a multiplication fact by making both factors multiples of ten.



Example:
Original fact: $3 \times 5 = 15$
Extended fact: $30 \times 50 = 1,500$



Write a multiplication fact for each Fact Triangle shown below. Then extend this fact by changing both factors to multiples of ten.

1.  **Sample answers:** 

Original fact: $4 \times 6 = 24$ Original fact: $8 \times 2 = 16$
Extended fact: $40 \times 60 = 2,400$ Extended fact: $80 \times 20 = 1,600$

3.  4. 

Original fact: $3 \times 3 = 9$ Original fact: $7 \times 9 = 63$
Extended fact: $30 \times 30 = 900$ Extended fact: $70 \times 90 = 6,300$

5. What shortcut can you use to multiply tens by tens, such as 40×60 ?
Sample answer: Solve the basic fact: $4 \times 6 = 24$.
Then add two zeros to the answer: $40 \times 60 = 2,400$.

Math Journal 1, p. 107

Encourage explanations like the following:

- ▷ Think money: $50¢ = 5$ dimes. $30 * 5$ dimes = 150 dimes. 150 dimes equals 1,500 cents, so $30 * 50 = 1,500$.
- ▷ Use “10-times-as-much” language: Three 5s equals 15, so three 50s is 10 times as much, or 150. Thirty 50s is 10 times as much as 150, or 1,500.
- ▷ Ask themselves: *What number is 30 times as many as 50?*

Have students complete the journal page. They should write an extended multiplication fact (tens * tens) for each basic fact shown by a Fact Triangle. Students then work independently to write a shortcut rule for multiplying tens by tens.

Pose several extended-facts problems for students to solve on their slates. To ensure that they use the shortcut rule, give them very little time to write their answers.



Ongoing Assessment: Recognizing Student Achievement

Journal
page 107
Problem 5



Use **journal page 107, Problem 5** to assess students' ability to explain how to use basic facts to compute fact extensions. Students are making adequate progress if their shortcut mentions solving the basic fact and then attaching as many zeros to the product as there are in the factors. Some students may mention that this shortcut can also be used when multiplying tens by hundreds, hundreds by hundreds, and so on.

[Operations and Computation Goal 3]

▶ Playing *Beat the Calculator*

(*Student Reference Book*, p. 233;
Math Masters, p. 461)

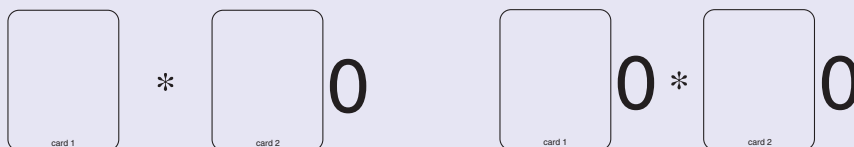


Have students play *Beat the Calculator* to practice solving extended multiplication facts.



Adjusting the Activity

Cut apart the gameboard on *Math Masters*, page 461 so some students can first focus on multiplying ones by tens and later tens by tens. Additionally, encourage students to use the Multiplication/Division Facts Table as necessary.



A U D I T O R Y ♦ K I N E S T H E T I C ♦ T A C T I L E ♦ V I S U A L

Student Page

Games

Beat the Calculator

Multiplication Facts

- Materials**
- number cards 1–10 (4 of each)
 - 1 calculator
 - Beat the Calculator* Gameboard (optional) (*Math Masters*, p. 461)

Players 3

Skill Mental multiplication skills

Object of the game To multiply numbers without a calculator faster than a player using one.

Directions

1. One player is the “Caller,” one is the “Calculator,” and one is the “Brain.”
2. Shuffle the deck and place it number-side down on the table.
3. The Caller draws 2 cards from the number deck and asks for their product.
4. The Calculator solves the problem using a calculator. The Brain solves it without a calculator. The Caller decides who got the answer first.
5. The Caller continues to draw 2 cards at a time from the number deck and ask for their product.
6. Players trade roles every 10 turns or so.



Example The Caller draws a 10 and a 5 and calls out “10 times 5.” The Brain and the Calculator each solve the problem. The Caller decides who got the answer first.



Extended Multiplication Facts

In this version of the game, the Caller:

- ♦ Draws 2 cards from the number deck.
- ♦ Attaches a 0 to either one of the factors, or to both factors, before asking for the product.

Example If the Caller turns over a 4 and an 8, he or she may make up any one of the following problems:

$4 * 80$ $40 * 8$ $40 * 80$



Student Reference Book, p. 233

2

Ongoing Learning & Practice

Finding Personal References for Customary Units of Length

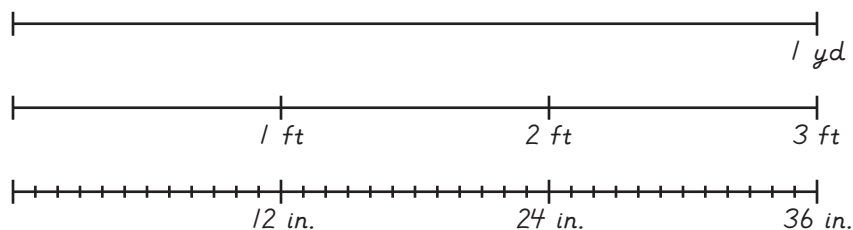


PARTNER
ACTIVITY

(Math Journal 1, p. 98)

Have students use their rulers or tape measures to find common objects that are approximately 1 inch, 1 foot, and 1 yard in length. Remind them to look for objects that are easy to find or readily available. For example, body parts are especially useful as personal references for certain units of length.

Then ask students to draw a diagram to show how the measurement units—_inches, feet, and yards—are related. Diagrams may look similar to the following:



Other students may find it helpful to record measurement quantities in a table. For example:

Yards	Feet	Inches
	1	12
	2	24
1	3	36

Student Page

Date _____ Time _____

LESSON 5-1 Math Boxes

- A number has
6 in the tenths place,
9 in the hundreds place,
2 in the thousands place,
7 in the ones place,
3 in the tens place, and
5 in the hundredths place.
Write the number.
2,937.65
- Solve mentally.
a. $40 \times 50 = \underline{2,000}$
b. $70 \times 300 = \underline{21,000}$
c. $60 \times \underline{3} = 180$
d. $90 \times \underline{9} = 810$
e. $\underline{800} \times 9 = 7,200$
- Solve mentally or with a paper-and-pencil algorithm.
a. $\begin{array}{r} 4,500 \\ 540 \\ 100 \\ + 12 \\ \hline 5,152 \end{array}$ b. $\begin{array}{r} 2,100 \\ 420 \\ 90 \\ + 18 \\ \hline 2,628 \end{array}$
- List all the factors of 28.
1, 2, 4, 7, 14, 28
Which of these factors are prime?
2 and 7
- If 1 inch on a map represents 300 miles, then
a. 6 in. \rightarrow **1,800** miles
b. 10 in. \rightarrow **3,000** miles
c. **3** in. \rightarrow 900 miles
d. **2½** in. \rightarrow 750 miles
e. $8\frac{1}{2}$ in. \rightarrow **2,550** miles
- Five children share 27 tennis balls equally.
Each child gets **5** balls.
There are **2** balls left over.
There are 32 cookies for 6 friends.
Each friend gets **5** cookies.
There are **2** cookies left over.

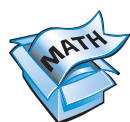
Math Journal 1, p. 108

Math Boxes 5-1



INDEPENDENT
ACTIVITY

(Math Journal 1, p. 108)



Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 5-3. The skill in Problem 6 previews Unit 6 content.

Writing/Reasoning Have students write a response to the following: *One comparison statement for Problem 2a is 2,000 is 40 times as many as 50. Write another comparison statement to match the multiplication equation you wrote in Problem 2a. 2,000 is 50 times as many as 40. Now write two comparison statements to match the multiplication equation in Problem 2b. 21,000 is 300 times as many as 70. 21,000 is 70 times as many as 300.*

Study Link 5•1

(Math Masters, p. 139)



Home Connection Students find products and quotients involving multiples of 10, 100, and 1,000.

INDEPENDENT ACTIVITY



3 Differentiation Options

READINESS

Playing Multiplication Top-It

(Student Reference Book, p. 264;
Math Masters, p. 506)

PARTNER ACTIVITY

5–15 Min



To provide practice with basic multiplication facts, have students play *Multiplication Top-It*.

NOTE For facts practice through 12×12 , have students include number cards 11 and 12.

EXTRA PRACTICE

Solving Multiplication/Division Puzzles

(Math Masters, p. 430)

INDEPENDENT ACTIVITY

5–15 Min



To provide practice with extended facts, have students solve multiplication/division puzzles. Use *Math Masters*, page 430 to create multiplication/division puzzles that meet individual needs, or have students create and solve their own problems.

ELL SUPPORT

Building a Math Word Bank

(Differentiation Handbook, p. 140)

SMALL-GROUP ACTIVITY

5–15 Min

To provide language support for multiplication facts, have students use the Word Bank Template found on *Differentiation Handbook*, page 140. Ask students to write the term *extended fact*, draw pictures or give examples that represent the term, and write other words that describe it. See the *Differentiation Handbook* for more information.

Study Link Master

Name _____ Date _____ Time _____

STUDY LINK 5•1 Multiplication/Division Puzzles

Solve the multiplication/division puzzles mentally. Fill in the blank boxes.

Examples:

*, /	300	2,000
2	600	4,000
3	900	6,000

*, /	80	50
4	320	200
8	640	400

1.

*, /	70	400
8	560	3,200
9	630	3,600

2.

*, /	5	7
80	400	560
600	3,000	4,200

3.

*, /	9	4
50	450	200
7,000	63,000	28,000

4.

*, /	500	600
7	3,500	4,200
4	2,000	2,400

5.

*, /	90	80
30	2,700	2,400
700	63,000	56,000

6.

*, /	4,000	500
9	36,000	4,500
20	80,000	10,000

Make up and solve some puzzles of your own. **Answers vary.**

7.

*, /		

8.

*, /		

Practice

9. $1.48 = 0.56 + 0.92$ 10. $1.13 = 2.86 - 1.73$

11. $19.11 - 10.94 = 8.17$ 12. $0.77 = 0.52 + 0.25$

Math Masters, p. 139

Teaching Aid Master

Name _____ Date _____ Time _____

Multiplication/Division Puzzles

Solve the multiplication/division puzzles mentally. Fill in the blank boxes.

Examples:

*, /	400	6,000
5	2,000	30,000
8	3,200	48,000

*, /	90	20
3	270	60
7	630	140

Answers vary.

1.

*, /		

2.

*, /		

3.

*, /		

4.

*, /		

5.

*, /		

6.

*, /		

Make up and solve some puzzles of your own.

7.

*, /		

8.

*, /		

Math Masters, p. 430