Examples for each lesson:

Lesson 2.1

Algebra • Multiplication Comparisons

Tara has 3 times as many soccer medals as Greg. Greg has 4 soccer medals. How many soccer medals does Tara have?

Step 1 Draw a model.

Greg

Tara

Step 2 Use the model to write an equation.

\[ n = \frac{3}{\text{Step 2}} \times 4 \]

Think: \( n \) is how many soccer medals Tara has.

Step 3 Solve the equation.

\[ n = 12 \]

So, Tara has 12 soccer medals.

Lesson 2.2

Algebra • Comparison Problems

Jamie has 3 times as many baseball cards as Rick. Together, they have 20 baseball cards. How many cards does Jamie have?

Step 1 Draw a box with the letter \( n \) in it to show that Rick has an unknown number of cards. Jamie has 3 times as many cards as Rick, so draw three identical boxes to represent Jamie's cards.

Step 2 Use the model to write an equation.

Think: There are 4 equal bars. The number in each bar is represented by \( n \).

There are a total of 20 cards. So, \( 4 \times n = 20 \).

Step 3 Solve the equation to find the value of \( n \).

Think: 4 times what number is 20?

Since \( 4 \times \text{_____} = 20 \), the value of \( n \) is \( \text{_____} \).

Rick has \( \text{_____} \) cards.

Step 4 Find how many cards Jamie has.

Think: Jamie has 3 times as many cards as Rick.

So, Jamie has \( 3 \times \text{_____} = \text{_____} \) baseball cards.
Lesson 2.3

Multiply Tens, Hundreds, and Thousands

You can use a pattern to multiply with tens, hundreds, and thousands.

Count the number of zeros in the factors.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4 \times 6 = 24$</td>
<td>basic fact</td>
<td></td>
</tr>
<tr>
<td>$4 \times 60 = 240$</td>
<td>When you multiply by tens, the last digit in the product is 0.</td>
<td></td>
</tr>
<tr>
<td>$4 \times 600 = 2,400$</td>
<td>When you multiply by hundreds, the last two digits in the product are 0.</td>
<td></td>
</tr>
<tr>
<td>$4 \times 6,000 = 24,000$</td>
<td>When you multiply by thousands, the last three digits in the product are 0.</td>
<td></td>
</tr>
</tbody>
</table>

When the basic fact has a zero in the product, there will be an extra zero in the final product:

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5 \times 4 = 20$, so $5 \times 4,000 = 20,000$</td>
<td></td>
</tr>
</tbody>
</table>

More information on this strategy is available on Animated Math Model #5.

Lesson 2.4

Estimate Products

You can use rounding to estimate products.

Round the greater factor. Then use mental math to estimate the product.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6 \times 95$</td>
<td>95 rounds to 100.</td>
<td></td>
</tr>
</tbody>
</table>

**Step 1** Round 95 to the nearest hundred.

**Step 2** Use patterns and mental math.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6 \times 1 = 6$</td>
<td></td>
</tr>
<tr>
<td>$6 \times 10 = 60$</td>
<td></td>
</tr>
<tr>
<td>$6 \times 100 = 600$</td>
<td></td>
</tr>
</tbody>
</table>

Find two numbers the exact answer is between.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
<th>Think:</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7 \times 759$</td>
<td>4,900</td>
<td>$7 \times 7 = 49$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$7 \times 70 = 490$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$7 \times 700 = 4,900$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
<th>Think:</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7 \times 759$</td>
<td>5,600</td>
<td>$7 \times 8 = 56$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$7 \times 80 = 560$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$7 \times 800 = 5,600$</td>
</tr>
</tbody>
</table>

So, the product is between 4,900 and 5,600.

More information on this strategy is available on Animated Math Models #6, 7.
Lesson 2.5

**Multiply Using the Distributive Property**

You can use rectangular models to multiply 2-digit numbers by 1-digit numbers.

Find $9 \times 14$.

**Step 1** Draw a 9 by 14 rectangle on grid paper.

**Step 2** Use the Distributive Property and products you know to break apart the model into two smaller rectangles.

Think: $14 = 10 + 4$.

**Step 3** Find the product each smaller rectangle represents.

$9 \times 10 = 90$

$9 \times 4 = 36$

**Step 4** Find the sum of the products.

$90 + 36 = 126$

So, $9 \times 14 = 126$.

More information on this strategy is available on Animated Math Model #8.

Lesson 2.6

**Multiply Using Expanded Form**

You can use expanded form or a model to find products.

Multiply, $3 \times 26$

**Think and Write**

Step 1 Write 26 in expanded form.

$26 = 20 + 6$

$3 \times 26 = 3 \times (20 + 6)$

Step 2 Use the Distributive Property.

$3 \times 26 = (3 \times 20) + (\underline{3} \times \underline{6})$

Step 3 Multiply the tens. Multiply the ones.

$3 \times 26 = (3 \times 20) + (3 \times 6)$

$= \underline{60} + \underline{18}$

$60 + 18$

Step 4 Add the partial products.

$78$

So, $3 \times 26 = 78$.

**Use a Model**

Step 1 Show 3 groups of 26.

Step 2 Break the model into tens and ones.

$3 \times 26$

(3 groups of 26)

(3 tens, 6 ones)

(3 groups of 20)

(3 groups of 6)

$60$

$18$

Step 3 Add to find the total product.

$\underline{60} + \underline{18} = 78$
Lesson 2.7

Multiply Using Partial Products

Use partial products to multiply.

Multiply, \(7 \times 8332\)

Step 1 Estimate the product. \(8332\) rounds to 8000; \(7 \times 8000 = 56,000\)

Step 2 Multiply the 3 hundreds, or 300, by 7.

\[
\begin{array}{c}
832 \times 7 \\
- \quad \quad \quad 7 \\
------------------- \\
58,240 + 30 = 58,270
\end{array}
\]

Step 3 Multiply the 3 tens, or 30, by 7.

\[
\begin{array}{c}
1,660 \times 7 \\
- \quad \quad \quad 7 \\
------------------- \\
11,620 + 30 = 11,650
\end{array}
\]

Step 4 Multiply the 2 ones, or 2, by 7.

\[
\begin{array}{c}
350 \times 7 \\
- \quad \quad \quad 7 \\
------------------- \\
2,450 + 2 = 2,452
\end{array}
\]

Step 5 Add the partial products.

\(58,270 + 11,650 + 2,452 = 72,372\)

So, \(7 \times 8332 = 72,372\). Since 72,372 is close to the estimate of 56,000, it is reasonable.

Lesson 2.8

Multiply Using Mental Math

Use addition to break apart the larger factor.

Find \(8 \times 214\).
Think: \(214 = 200 + 14\)
\(8 \times 214 = (8 \times 200) + (8 \times 14)\)
\[= 1,600 + 112\]
\[= 1,712\]

Use subtraction to break apart the larger factor.

Find \(6 \times 298\).
Think: \(298 = 300 - 2\)
\(6 \times 298 = (6 \times 300) - (6 \times 2)\)
\[= 1,800 - 12\]
\[= 1,788\]

Use halving and doubling.

Find \(14 \times 50\).
Think: \(14\) can be evenly divided by 2.
\(14 \div 2 = 7\)
\(7 \times 50 = 350\)
\(2 \times 350 = 700\)

When multiplying more than two numbers, use the Commutative Property to change the order of the factors.

Find \(2 \times 9 \times 50\).
Think: \(2 \times 50 = 100\)
\(2 \times 9 \times 50 = 2 \times 50 \times 9\)
\[= 100 \times 9\]
\[= 900\]

More information on this strategy is available on Animated Math Model #8.
Lesson 2.9

Problem Solving • Multistep Multiplication Problems

Use the strategy draw a diagram to solve a multistep multiplication problem.

Amy planted 8 rows with 18 tulips in each row. In each of the 4 middle rows, there are 4 red tulips. All of the other tulips are yellow. How many of the tulips are yellow tulips?

<table>
<thead>
<tr>
<th>Read the Problem</th>
<th>Solve the Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do I need to find?</td>
<td>I draw a diagram for each color of tulip.</td>
</tr>
<tr>
<td>I need to find the total number of yellow tulips.</td>
<td></td>
</tr>
<tr>
<td>What information do I need to use?</td>
<td></td>
</tr>
<tr>
<td>There are 8 rows of tulips with 18 tulips in each row.</td>
<td></td>
</tr>
<tr>
<td>There are 4 rows of tulips with 4 red tulips in each row.</td>
<td></td>
</tr>
<tr>
<td>How will I use the information?</td>
<td></td>
</tr>
<tr>
<td>I can multiply to find the total number of tulips and the number of red tulips.</td>
<td></td>
</tr>
<tr>
<td>Then I can subtract to find the number of yellow tulips.</td>
<td></td>
</tr>
</tbody>
</table>

Next, I found the number in each section.

All Tulips | Red Tulips
---|---
8 \times 18 = 144 | 4 \times 4 = 16

Last, I subtracted the number of red tulips from the total number of tulips.

\[
144 - 16 = 128
\]

So, there are 128 yellow tulips.

Lesson 2.10

Multiply 2-Digit Numbers with Regrouping

Use place value to multiply with regrouping.

Multiply, 7 \times 63

Step 1 Estimate the product.

\[
7 \times 60 = 420
\]

Step 2 Multiply the ones. Regroup 21 ones as 2 tens 1 one. Record the 1 one below the ones column and the 2 tens above the tens column.

\[
63 \times 7
\]

\[
\begin{array}{c}
2 \\ 1
\end{array}
\]

Step 3 Multiply the tens. Then, add the regrouped tens. Record the tens.

\[
441 \times 7
\]

\[
\begin{array}{c}
44 \text{ tens} \space 4 \text{ thousands}
\end{array}
\]

\[
7 \times 6 \text{ tens} = 42 \text{ tens}
\]

Add the 2 regrouped tens.

\[
42 \text{ tens} + 2 \text{ tens} = 44 \text{ tens}
\]

So, 7 \times 63 = 441. Since 441 is close to the estimate of 420, it is reasonable.

More information on this strategy is available on Animated Math Model #9.
Lesson 2.11

Multiply 3-Digit and 4-Digit Numbers with Regrouping

When you multiply 3-digit and 4-digit numbers, you may need to regroup.

Estimate. Then find the product.  

\[ \begin{array}{c}
1,324 \\
\times 7 \\
\end{array} \]

$1,324 \text{ rounds to } 1,000; 1,000 \times 7 = 7,000.$

Step 1  Estimate the product.

Step 2  Multiply the 4 ones by 7.

\[ \begin{array}{c}
1,324 \\
\times 7 \\
\hline
8 \\
\end{array} \]

Regroup the 28 ones as 2 tens 8 ones.

Step 3  Multiply the 2 tens by 7.

\[ \begin{array}{c}
1,324 \\
\times 7 \\
\hline
68 \\
\end{array} \]

Add the regrouped tens.

Regroup the 16 tens as 1 hundred 6 tens.

Step 4  Multiply the 3 hundreds by 7.

\[ \begin{array}{c}
1,324 \\
\times 7 \\
\hline
268 \\
\end{array} \]

Add the regrouped hundred.

Regroup the 22 hundreds as 2 thousands 2 hundreds.

Step 5  Multiply the 1 thousand by 7.

\[ \begin{array}{c}
1,324 \\
\times 7 \\
\hline
9,268 \\
\end{array} \]

Add the regrouped thousands.

So, $7 \times 1,324 = 9,268.$

Since $9,268$ is close to the estimate of $7,000$, the answer is reasonable.

More information on this strategy is available on Animated Math Model #10.
Lesson 2.12

Algebra • Solve Multistep Problems Using Equations

The **Order of Operations** is a special set of rules which gives the order in which calculations are done in an expression. First, multiply and divide from left to right. Then, add and subtract from left to right.

**Use the order of operations to find the value of n.**

\[ 6 \times 26 + 3 \times 45 - 11 = n \]

**Step 1** Circle the first multiplication expression in the equation.

\[ \cancel{6 \times 26} + 3 \times 45 - 11 = n \]

**Step 2** Multiply 6 \( \times \) 26.

\[ 156 + 3 \times 45 - 11 = n \]

**Step 3** Circle the next multiplication expression in the equation.

\[ 156 + \cancel{3 \times 45} - 11 = n \]

**Step 4** Multiply 3 \( \times \) 45.

\[ 156 + 135 - 11 = n \]

**Step 5** There are no more multiplication or division expressions. Circle the first addition expression in the equation.

\[ 156 + \cancel{135} - 11 = n \]

**Step 6** Add 156 + 135.

\[ 291 - 11 = n \]

**Step 7** Subtract 291 - 11.

\[ 280 = n \]

**Vocabulary**

**Distributive Property** – the property that states that multiplying a sum by a number is the same as multiplying each addend by the number and then adding the products

**Partial product** – a method of multiplying in which the ones, tens, hundreds, and so on are multiplied separately and then the products are added together

**Estimate** – to find an answer that is close to the exact amount

**Expanded form** – a way to write numbers by showing the value of each digit

**Factor** – a number that is multiplied by another number to find a product

**Round** – to replace a number with another number that tells about how many or how much