

1.3 Subtraction of Whole Numbers

The operation subtraction combines two numbers to get the difference between them. We use the notation $7 - 3$ to represent the difference of 7 and 3. Recall that in section 1.2, we modeled the addition $3 + 4 = 7$ as follows.

$$\begin{array}{ccc} \square\square\square\square & \square\square\square & = & \square\square\square\square\square\square\square \\ 4 & 3 & & 7 \end{array}$$

We can model the subtraction $7 - 3$ by removing three squares from seven.

$$\begin{array}{ccc} \square\square\square\square & \square\square\square & = & \square\square\square\square \\ 7 & - & 3 & = & 4 \end{array}$$

For large numbers, we can subtract the two numbers by subtracting the numbers in each column of the expanded notation of the numbers as follows:

Consider $8,489 - 3,426$.

8,000	+	400	+	80	+	9	=	8,489
- 3,000	+	- 400	+	- 20	+	- 6	=	- 3,426
5,000	+	0	+	60	+	3	=	5,063

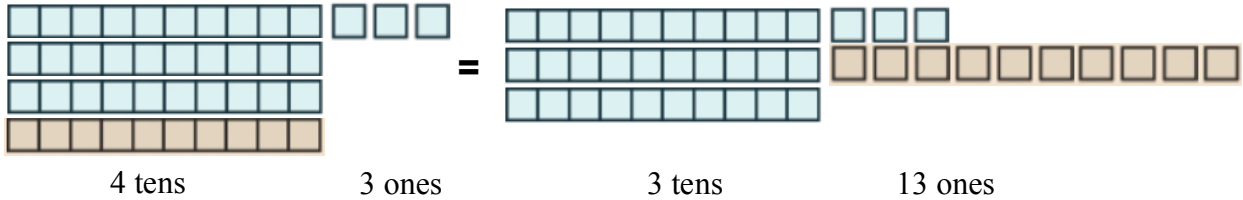
Again, this would be a tedious method for subtracting large numbers, so we will use the shorthand notation of aligning the numbers by place value and subtracting the digits as shown at right:

8,	4	8	9
- 3,	4	2	6
5,	0	6	3

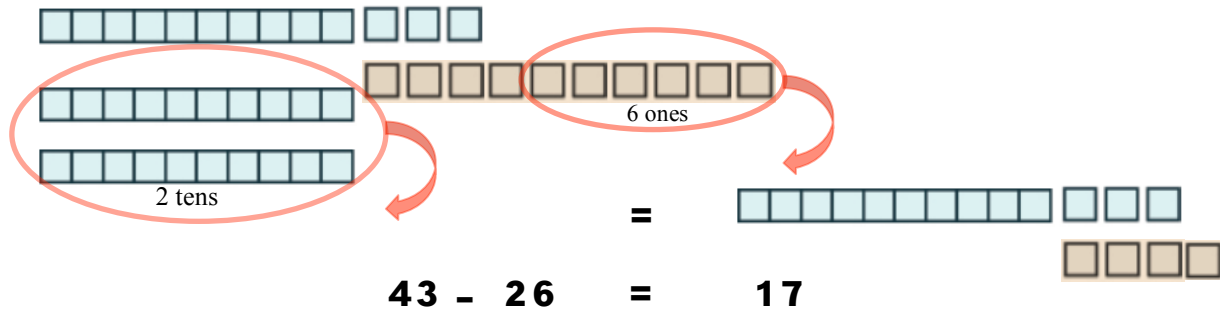
<i>Demonstration Problems</i>	<i>Practice Problems</i>
<p>1. (a) $53 - 41 =$</p> <p>2. (a) $786,559 - 2,038 =$</p>	<p>1. (b) $37 - 12 =$</p> <p>2. (b) $1,572,205 - 51,201 =$</p>
<p>Answers: 1. (b) 25; 2. (b) 1,521,004</p>	

Borrowing

Now let's model $43 - 26$. That is, we will take 2 tens and 6 ones from 4 tens and 3 ones. This will require borrowing from one of our tens and exchanging it for 10 ones.



Now we can circle 2 tens and 6 ones more easily:



And now consider $7,631 - 152$:

We cannot subtract 2 from 1 or 50 from 30, so we must make an adjustment.

7,000	+	600	+	30	+	1	=	7,631
		- 100		- 50		- 2	=	- 3,426
				?		?		

We can rearrange the numbers in the expanded notation to accommodate the subtraction in each column:

7,000	+	600	+	30	+	1	=	7,631
7,000	+	500 + 100	+	20 + 10	+	1	=	
7,000	+	500	+	120	+	11	=	
		- 100		- 50		- 2	=	- 152
7,000	+	400	+	70	+	9	=	7,479

We will always use the conventional shorthand notation as shown as right, but it is good to know that expanded form is the underlying concept used in all operations on whole numbers.

7,	5	12	11
-	1	5	2
7,	4	7	9

<i>Demonstration Problems</i>	<i>Practice Problems</i>
3. (a) $55 - 29 =$	3. (b) $80 - 37 =$
4. (a) $40,000 - 23,582 =$	4. (b) $50,000 - 15,389 =$
Answers: 3. (b) 43; 4. (b) 34,611	

Vocabulary and Properties

The result of a subtraction problem is called a *difference*.
 The number being diminished is called the *minuend* and
 the number being subtracted is the *subtrahend*.

$$\begin{array}{r} 8 \text{ minuend} \\ -3 \text{ subtrahend} \\ \hline 5 \text{ difference} \end{array}$$

Subtraction Properties of 0

The difference of any number and that same number is 0.
 That is, $a - a = 0$

The difference of any number and 0 is that same number.
 That is, $a - 0 = a$

Identifying Key Words used in Problem Solving

Subtraction		
<i>Key Words or Phrases</i>	<i>Examples</i>	<i>Mathematical Expressions</i>
subtract	subtract 5 from 8	$8 - 5$
difference	the difference of 10 and 2	$10 - 2$
less	17 less 3	$17 - 3$
less than	2 less than 20	$20 - 2$
take away	14 take away 9	$14 - 9$
decreased by	7 decreased by 5	$7 - 5$
subtracted from	9 subtracted from 12	$12 - 9$

<i>Demonstration Problems</i>	<i>Practice Problems</i>
<p>5. (a) Subtract 9 from 21.</p> <p>6. (a) Find 25 less 12.</p>	<p>5. (b) What is 15 less than 30?</p> <p>6. (b) Find 14 decreased by 10.</p>
<i>Answers:</i> 5. (b) 15; 6. (b) 4	