Section 1.4 Multiplying Whole Numbers

Objectives
In this section, you will learn to:

- Define the term *multiplication*.
- Write numbers in factored form.
- Multiply by 10's and 100's.
- Identify and apply the Distributive Property.
- Multiply two-digit numbers.
- Find the area of a geometric figure.

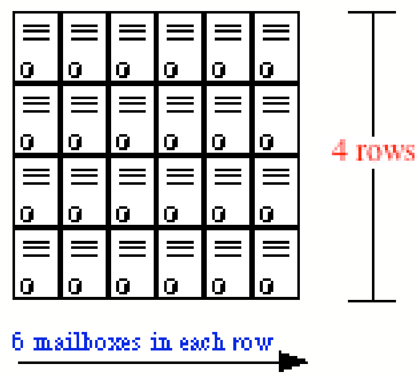
To successfully complete this section, you need to understand:

- The Commutative Property (1.2)
- The Associative Property (1.2)
- Adding whole numbers (1.3)

INTRODUCTION: WHAT IS MULTIPLICATION?

For whole numbers, **multiplication** is an abbreviation for repeated addition.

For example, in the lobby of an apartment building is a rectangular mail box center, which has 4 rows of 6 mailboxes each. How many mailboxes are there altogether?



Because there are four rows of 6 mailboxes, we can answer the question by adding the number of mailboxes in each row:

number in 1st row		number in 2nd row		number in 3rd row		number in 4th row		
6	+	6	+	6	+	6	=	24 mailboxes

We can also think of this as *four* 6's.

This sum of four 6's is an example of *repeated* addition, and it can be abbreviated using multiplication:

four 6's = *4* x 6 = **24**.

Furthermore, there is a variety of ways that multiplication can be represented. For example, *4 times 6* can be written as

4 x 6	typical arithmetic
$4 \cdot 6$, (4)6, 4(6), and (4)(6)	typical algebra

In this text, we will often (though not always) use the raised dot for multiplication.

Caution: The raised dot is *not* a decimal point, and when we get to multiplying decimals (in Section 5.4), we'll use the arithmetic multiplication sign, x, to avoid confusion.

Example 1: Write each repeating sum in words, and abbreviate it as a multiplication. Find the product.

		Repeating sum	In words	Multiplication		Product
Answer:	a)	7 + 7 + 7	three 7's	$3 \cdot 7$	=	21
	b)	11 + 11 + 11 + 11 + 11	five 11's	$5 \cdot 11$	=	55

YTI #1 Write each repeating sum in words and abbreviate it as a multiplication. Find the product. (You may refer to the multiplication table, if necessary.) Use Example 1 as a guide.

	Repeating sum	In words	Multiplication		Product
a)	5 + 5 + 5 + 5	____________	________	=	______
b)	12 + 12 + 12	____________	________	=	______
c)	2 + 2 + 2 + 2 + 2 + 2	____________	________	=	______

NUMBERS IN FACTORED FORM

Recall, from Section 1.2, that the numbers in a product are called *factors*:

factor x **factor** = **product**

Since we know, for example, that 4 x 6 = 24, we can say that 4 and 6 are factors of 24.

Also, a number is in **factored form** when it is written as a product of factors. So, we can say that 4 x 6 is a factored form of 24.

There are other factored forms of 24. In fact, in the multiplication table we can locate 24 as a product a total of six times: 2 x 12, 3 x 8, 4 x 6, and—by the Commutative Property—12 x 2, 8 x 3, and 6 x 4.

Also, because 1 is the identity for multiplication, $24 = 1 \cdot 24$

So, in factored form, $24 = 1 \cdot 24$, $2 \cdot 12$, $24 = 3 \cdot 8$, $24 = 4 \cdot 6$, and so on.

Example 2: Using the multiplication table and the identity for multiplication, find six ways to write 18 in a factored form.

Answer: $18 = 2 \cdot 9$ $18 = 9 \cdot 2$ $18 = 3 \cdot 6$ $18 = 6 \cdot 3$ $18 = 1 \cdot 18$ $18 = 18 \cdot 1$

YTI #2 Using the multiplication table, find different ways to write each number in a factored form. Use Example 2 as a guide.

a) 12 ________ ________ ________ ________ ________

b) 20 ________ ________ ________ ________ ________

MULTIPLES OF A NUMBER

THE 5 x 5 MULTIPLICATION TABLE

x	**1**	**2**	**3**	**4**	**5**
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

In this 5 x 5 multiplication table, both the row and column starting with 3 are highlighted to show you the first five **multiples** of 3:

3, 6, 9, 12, and 15.

Here is the same list of multiples with each number written in a factored form:

3	6	9	12	15.
$1 \cdot 3$	$2 \cdot 3$	$3 \cdot 3$	$4 \cdot 3$	$5 \cdot 3$.

Notice that 3 is one of the factors in each of these multiples. We can always find the next multiple of 3 by simply adding 3:

The next multiple of 3 is 18 because 15 **+ 3** = 18.

In factored form, $18 = 6 \cdot 3$.

> In general, if a and b are two whole numbers,
> then their product, $a \cdot b$, is a **multiple** of a and a **multiple** of b.

Example 3: Use the 5 x 5 multiplication table to find the first seven multiples of 2.

Procedure: We can find the first five multiples from the table, then add 2 to find the sixth, and add 2 more to find the seventh.

First five	Sixth	Seventh
2 – 10	10 + 2	12 + 2
↓	↓	↓

Answer: First seven multiples of 2: 2, 4, 6, 8, 10, 12, and 14

YTI #3 Use the 5 x 5 multiplication table to find the first *seven* multiples of each number. Use Example 3 as a guide.

a) First seven multiples of 4: ______________________________

b) First seven multiples of 5: ______________________________

YTI #4 Evaluate. Use the multiplication table—or your own memory—to multiply the following.

a) $8 \times 2 =$ b) $4 \cdot 7 =$ c) $6 \times 6 =$ d) $5 \cdot 9 =$

THE MULTIPLICATION PROPERTY OF 0

Consider this: $4 \cdot 0$ = four 0's $= 0 + 0 + 0 + 0 = 0$.

In other words, $4 \cdot 0 = 0$. This is true of any multiple of 0. Also, the Commutative Property allows us to say that $0 \cdot 4 = 0$.

> **The Multiplication Property of 0**
>
> $\mathbf{a \cdot 0 = 0}$ and $\mathbf{0 \cdot a = 0}$
>
> The product of 0 and any number is always 0.

MULTIPLICATION BY 10 AND BY 100

Recall that 1 is the multiplicative identity, so multiplying by 1 is very easy: any number times 1 is itself:

$6 \cdot 1 = 6$ and $1 \cdot 19 = 19$. In general, $a \cdot 1 = a$ and $1 \cdot a = a$.

Multiplying by 10 and multiplying by 100 is just as easy. In Section 1.2, the 12 x 12 multiplication table shows the first twelve multiples of 10.

YTI #5 Write the first twelve multiples of 10. (You may use the multiplication table.) Below each, write the number in a factored form. (The first two are given to get you started.)

10	20	____	____	____	____	____	____	____	____	____	____
$1 \cdot 10$	$2 \cdot 10$	____	____	____	____	____	____	____	____	____	____

> **Multiplying by 10**
>
> When one factor is 10, the product is the *other* factor with a 0 placed on the end.

For example, $3 \cdot 10$ is *three* 10's: $10 + 10 + 10 = 30$, so $\mathbf{3} \cdot 10 = \mathbf{3}0$.

The Commutative Property also allows us to say that $10 \cdot \mathbf{3} = \mathbf{3}0$.

> **Think about it:** In your own words, how would you explain to a classmate that numbers such as 30, 40, 110, 150, and 190 are multiples of 10?
>
> ____
>
> ____

Multiplying by 100 is similar:

Multiplying by 100
When one factor is 100, the product is the *other* factor with *two* 0's placed on the end.

Since $100 = 10 \cdot 10$, multiplying by 100 is the same as multiplying by 10 twice. That's why we place *two* 0's after the other factor.

Example 4: Evaluate. a) $16 \cdot 10$ b) $10 \cdot 30$ c) $9 \cdot 100$ d) $100 \cdot 58$

Procedure: Multiply by placing one or two zeros at the end of the other factor, whichever is appropriate.

Answer:

a) $16 \cdot 10 = 160$ (16 with one 0 placed on the end = 160)

b) $10 \cdot 30 = 300$ (30 with one 0 placed on the end = 300)

c) $9 \cdot 100 = 900$ (9 with two 0's placed on the end = 900)

d) $100 \cdot 58 = 5{,}800$ (58 with two 0's placed on the end = 5800 = 5,800)

YTI #6 Evaluate. Use Example 4 as a guide.

a) $8 \cdot 10$ = ________ b) $10 \cdot 32$ = ________ c) $604 \cdot 10$ = ________

d) $100 \cdot 7$ = ________ e) $100 \cdot 50$ = ________ f) $298 \cdot 100$ = ________

USING THE ASSOCIATIVE PROPERTY OF MULTIPLICATION

We can use the Associative Property of Multiplication to understand more about multiplication. In particular, if a number is a multiple of 10, such as 30, 40, 80, 120, and so on, then it has 10 as a factor.

We can use this information to quickly multiply two numbers where at least one of them is a multiple of 10. Consider $30 \cdot 6$:

		$30 \cdot 6$
Because $30 = 10 \cdot 3$, we can replace 30 with $(10 \cdot 3)$	=	$(10 \cdot 3) \cdot 6$
We can apply the Associative Property:	=	$10 \cdot (3 \cdot 6)$
$3 \cdot 6 = 18$, so we get	=	$10 \cdot 18$
which is, because we are now multiplying by 10, 180:	=	180

What is important to see here is that the end product is just $3 \cdot 6$ multiplied by 10: $18 \cdot 10 = 180$.

The point is this,

Multiplying by Multiples of 10
If one or more factors is a multiple of 10, such as 20, or 80, or 300 and so on, then you may temporarily ignore such (ending) zeros, and include them together in the final product.

Let's see this rule illustrated by some examples:

Example 5: Evaluate each.

a) $3 \cdot 20 = 60$ Ignore the 0 after the 2, treat the problem as $3 \cdot 2$ to get 6, then place the 0 at the end, 60.

b) $40 \cdot 7 = 280$ Ignore the 0 after the 4, treat the problem as $4 \cdot 7$ to get 28, then place the 0 at the end, 280.

c) $80 \cdot 60 = 4,800$ Ignore both 0's after the 8 and the 6, treat the problem as $8 \cdot 6$ to get 48, then place the two 0's at the end, 4800 = 4,800.

d) $300 \cdot 90 = 27,000$ Ignore all of the 0's—there are three of them in all—and treat the problem as $3 \cdot 9$ to get 27; then place all three 0's at the end, 27000 = 27,000.

e) $500 \cdot 400 = 200,000$ Ignore all of the 0's—there are four of them in all—and treat the problem as $5 \cdot 4$ to get 20; then place all four 0's at the end. Notice that the 0 in 20 is not counted as one of the four 0's—they were all placed *after* the 20. This gives the number a total of five 0's. This will sometimes happen when 5's (as in 500) are involved.

YTI #7 Evaluate each. Use Example 5 as a guide.

a) $3 \cdot 50 =$ ________ b) $90 \cdot 7 =$ ________ c) $50 \cdot 8 =$ ________

d) $300 \cdot 30 =$ ________ e) $800 \cdot 200 =$ ________ f) $6,000 \cdot 500 =$ ________

THE DISTRIBUTIVE PROPERTY OF MULTIPLICATION OVER ADDITION

As you learned in Section 1.2, parentheses group a quantity and make it one value. For example, in the expression $3 \cdot (10 + 2)$, the parentheses suggest that $(10 + 2)$ should be treated as one value, 12.

The expression can become $3 \cdot (12)$ which is just three 12's: $12 + 12 + 12 = 36$. This means that $3 \cdot 12 = 36$.

Treating $3 \cdot (12)$, though, as $3 \cdot (10 + 2)$ suggests that we have three 10's and three 2's:

$$3 \cdot (10 + 2) = (10 + 2) + (10 + 2) + (10 + 2)$$

$$3 \cdot (10 + 2) = (10 + 10 + 10) + (2 + 2 + 2)$$

$$3 \cdot (10 + 2) = (\text{three } 10\text{'s}) + (\text{three } 2\text{'s})$$

$$3 \cdot (10 + 2) = 3 \cdot 10 + 3 \cdot 2$$

$$3 \cdot (10 + 2) = 30 + 6$$

$$3 \cdot (10 + 2) = 36$$

The Commutative and Associative Properties allow us to rearrange the numbers into groups of three 10's and three 2's.

We can say that the multiplier 3 is being distributed to both the 10 and the 2.

This diagram is a shortcut to the work shown above:

$$3 \cdot (10 + 2) = 3 \cdot 10 + 3 \cdot 2$$
$$= 30 + 6$$
$$= 36$$

This idea helps to introduce an important property of mathematics, the Distributive Property, formally known as the **Distributive Property of Multiplication over Addition**.

> **The Distributive Property of Multiplication over Addition**
>
> We can distribute a multiplier, **a**, over a sum (b + c) so that it multiplies both numbers in the sum.
>
> $$a \cdot (b + c) = a \cdot b + a \cdot c$$
>
> In other words, **a** is a multiplier of both b and c.

Usually, when evaluating an expression, we evaluate within the parentheses first. However, when specifically applying the Distributive Property, we multiply first.

The notion of the Distributive Property is quite useful in multiplying by numbers with two or more digits. We'll use the fact that every two-digit number can be separated into the sum of its tens and ones.

For example, $14 = 10 + 4$ and $59 = 50 + 9$. We can use this information and the Distributive Property when multiplying horizontally, as in Example 6.

Example 6: Multiply. a) $6 \cdot 14$ b) $7 \cdot 59$

Procedure: Treat 14 as $(10 + 4)$ and 59 as $(50 + 9)$ and use the Distributive Property:

Answer:

a) $6 \cdot 14$

$= 6 \cdot (10 + 4)$

b) $7 \cdot 59$

$= 7 \cdot (50 + 9)$

Apply the Distributive Property:

$$6 \cdot (10 + 4) = 6 \cdot 10 + 6 \cdot 4$$
$$= 60 + 24$$
$$= 84$$

$$\begin{array}{r} 60 \\ +\ 24 \\ \hline 84 \end{array}$$

$$7 \cdot (50 + 9) = 7 \cdot 50 + 7 \cdot 9$$
$$= 350 + 63$$
$$= 413$$

$$\begin{array}{r} 350 \\ +\ 63 \\ \hline 413 \end{array}$$

YTI #8 Multiply using the technique demonstrated in Example 6.

a) $4 \cdot 18 = 4 \cdot (10 + 8)$

b) $5 \cdot 46 = 5 \cdot (40 + 6)$

c) $7 \cdot 19 = 7 \cdot (\qquad)$

d) $8 \cdot 73 = 8 \cdot (\qquad)$

TRADITIONAL MULTIPLICATION BY A SINGLE-DIGIT NUMBER

Because multiplication is an abbreviation for repeated addition, multiplication and addition are really inseparable. Notice that we needed to add at the end of each multiplication problem, above.

Also, in addition, we sometimes have to carry from one column to the next, as in the sum of 24 and 38, shown as the right.

$$\begin{array}{r} +1 \\ 24 \\ +\ 38 \\ \hline 62 \end{array}$$

First, the ones column adds to 12 (more than 9), so we write the 2 in the ones place and carry a 1 into the tens column. Next, we added the tens column, including the 1 that we carried there. (The plus sign is shown with the 1 to remind us that we need to add the carried 1.)

The same idea applies when we multiply. We start by multiplying the ones column numbers together, and if the product is more than 9, then we carry the tens number to the next column.

Consider $26 \cdot 3$, set up as

$$\begin{array}{r} 26 \\ \times\ 3 \\ \hline \end{array}$$

Remember, this is equivalent to

$$\begin{aligned} & 3 \cdot (20 + 6) \\ = \ & 3 \cdot 20 + 3 \cdot 6 \\ = \ & 60 + 18 = 78 \end{aligned}$$

The actual step-by-step process of multiplying 26 x 3 is ..... $6 \cdot 3 + 20 \cdot 3$

$$= 18 + 60 = 78$$

(A) Multiplying the ones, we get $6 \times 3 = 18$. Just as in addition, we can put the 8 in the ones place (in the answer) and carry the 1 to the next column.

$$\begin{array}{r} +1 \\ 26 \\ \times\ 3 \\ \hline 8 \end{array}$$

(B) We now multiply 2×3 and add the 1 that we carried:

$$(2 \times 3) + 1 = 6 + 1 = 7$$

and we put the 7 in the tens place in the answer.

$$\begin{array}{r} +1 \\ 26 \\ \times\ 3 \\ \hline 78 \end{array}$$

The reason the 7 belongs in the tens place is:

(1) the 1 we carried is really **10** (from 18 = **10** + 8), and

(2) the 2 we multiplied by the 3 is really **20**.

So, in part (**B**) the actual multiplication is $(\mathbf{20} \cdot 3) + \mathbf{10} = 60 + 10 = \mathbf{70}$.

YTI #9 Multiply using the technique demonstrated above.

a) $\begin{array}{r} 23 \\ \times\ 4 \\ \hline \end{array}$

b) $\begin{array}{r} 19 \\ \times\ 5 \\ \hline \end{array}$

c) $\begin{array}{r} 37 \\ \times\ 2 \\ \hline \end{array}$

If we need to multiply a three-digit number by a one-digit number, the procedure is the same, it just continues one more place.

YTI #10 Multiply.

a)	b)	c)
286 × 3	429 × 5	581 × 9

TWO-DIGIT BY TWO-DIGIT MULTIPLICATION

The multiplication process learned above can be extended to two-digit by two-digit multiplication. For example, if we are to multiply $57 \cdot 63$, also written as

$$\begin{array}{r} 57 \\ \times\ 63 \\ \hline \end{array}$$

then we can multiply the tens place digit, 6 (which is really 60), in the same manner as we multiply the ones place digit, 3.

This is a three-step process, giving us two partial products that we'll add to get the final product:

(1 Multiply $57 \cdot 3$ (this will give us the first partial product);

(2) multiply $57 \cdot 60$ (this will give us the second partial product); and

(3) add the two partial products together to get the final product.

Here is the step-by-step outline for $57 \cdot 63$:

(A) Multiplying the ones, we get 7 x 3 = 21. So, place the 1 and carry the 2.

$$\begin{array}{r} +2 \\ 5\,7 \\ \times\ 6\,3 \\ \hline 1 \end{array}$$

(B) We now multiply 5 x 3 and add the 2:

(5 x 3) + 2 = 17

There's no more to multiply by the 3, so we place 17 into the answer.

$$\begin{array}{r} +2 \\ 5\,7 \\ \times\ 6\,3 \\ \hline 1\,7\,1 \end{array}$$

First partial product → 1 7 1

(C) We now multiply 7 x 60 giving us 420.

We put the 0 in the ones place, the 2 in the tens place, and carry the 4:

$$\begin{array}{r} +4\ \ \not{+2} \\ 5\,7 \\ \times\ 6\,3 \\ \hline 1\,7\,1 \\ 2\,0 \end{array}$$

(D) We now multiply 5 x 6 and add the 4 to get 34, which is placed in the second partial product:

(E) Then we add the partial products:

$$\begin{array}{r} +4\ \ \not{+2} \\ 5\,7 \\ \times\ 6\,3 \\ \hline 1\,7\,1 \\ +\,3\,4\,2\,0 \\ \hline 3\,5\,9\,1 \end{array}$$

Second partial product → 3 4 2 0

Final product → 3 5 9 1

This is what your work probably looks like, altogether:

$$\begin{array}{r} {}^{+4}\ {}^{\cancel{+2}} \\ 5\,7 \\ \times\ 6\,3 \\ \hline 1\,7\,1 \\ +\ 3\,4\,2\,0 \\ \hline 3{,}5\,9\,1 \end{array}$$

YTI #11 Multiply.

a) $\begin{array}{r} 17 \\ \times\ 25 \\ \hline \end{array}$

b) $\begin{array}{r} 41 \\ \times\ 33 \\ \hline \end{array}$

c) $\begin{array}{r} 534 \\ \times\ 46 \\ \hline \end{array}$

APPLICATIONS OF MULTIPLICATION

There are many situations to which multiplication can apply. Since multiplication is an abbreviation for repeated addition, we use it whenever the same number is added over and over a certain number of times.

For each of these word problems:

- Read it through carefully (maybe two or three times).
- Think about the situation (imagine yourself in the situation).
- Remember that in multiplication, there are two numbers:
    1) One number that will be repeated, and
    2) another number that indicates the number of times it is repeated.
- Multiply appropriately.
- Write a sentence answering the question.

Example 7: Bindee just completed her associate's degree and is now looking for a job. Searching the Internet, she found a job as an entry level secretary that pays $1783 per month. If she is hired for that job, how much would she earn in 12 months?

Procedure: Here, the monthly wage is the same each month—and Bindee would earn that wage 12 *times*—so multiplication is the operation to use.

Multiply the monthly wage ($983) by the number of months (12).

Answer:

Bindee monthly wage: ➔ 1 7 8 3

Times 12 months: ➔ x 1 2

$$\begin{array}{r} 1783 \\ \times\ 12 \\ \hline 3566 \\ 17830 \\ \hline 21{,}396 \end{array}$$

Sentence: If Bindee gets the job, she will earn $21,396 in 12 months.

YTI #12 George sells sports cards. In each Upper Deck *Stars* box there are 24 packs of cards. If George has 5 of these boxes, how many packs of Upper Deck *Stars* does he have?

Show your work over here:

Sentence: ______________________________

YTI #13 At the restaurant where Leilani is a waitress, there is a buffet special for $8 per person. A group of 15 patrons came in one afternoon and they all ordered the buffet special. Before tax and tip, what was the total amount of their bill?

Sentence: ______________________________

YTI #14 Sam, a truck driver, is asked to pick up 93 boxes, each weighing 38 pounds. What is the total weight of this load?

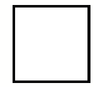
Sentence: ______________________________

MULTIPLICATION IN GEOMETRY: AREA

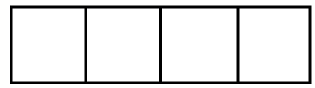
In geometry, **area** is the amount of surface in an enclosed region. Area is always measured in square units, such as square feet (*sq ft*) and square centimeters (*sq cm*).

We can use the area of a rectangle to illustration of the idea that multiplication is repeated addition. This illustration will also develop the formula for the area of a rectangle.

First, consider the single centimeter square, at right. (A *centimeter* is a unit of measure and is abbreviated *cm*. It takes about $2\frac{1}{2}$ centimeters to make an inch.)



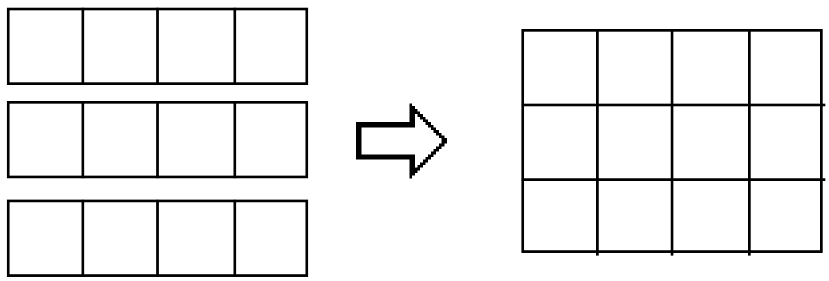
It can be put together with other such centimeter squares to form a horizontal row of 4 centimeter squares:



From there, we can build a rectangle with three of these rows, one on top of the other; this is repeated addition coming together as one value:

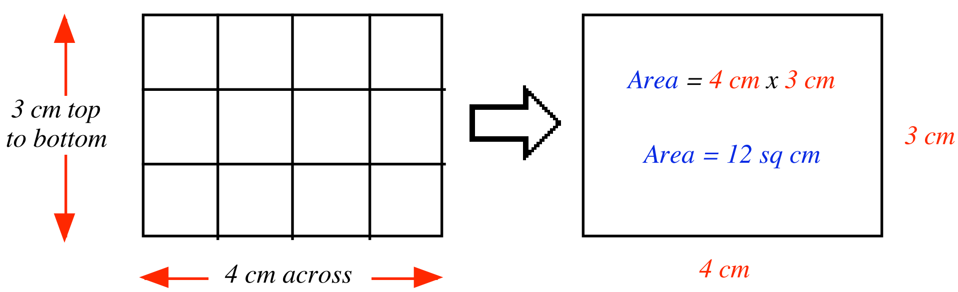
$4 + 4 + 4 = 12$ cm squares

$3 \cdot 4 = 12$

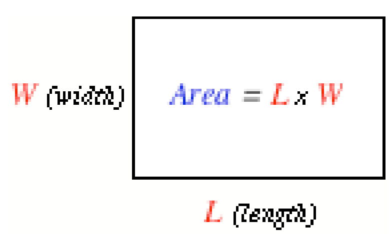


We see the rectangle that is formed with the individual centimeter squares; we can count them to verify that there are, indeed, 12 unit squares.

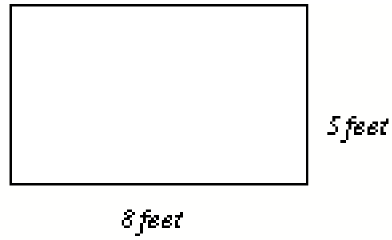
The illustration below also shows the area formula for a rectangle:



In general, **Area of a rectangle = Length x Width**.



Example 8: Find the area of the rectangle at right.



Answer:

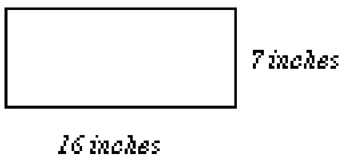
Area = Length x Width

Area = 8 feet x 5 feet

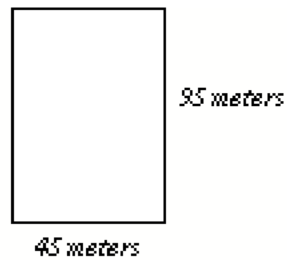
Area = 40 sq ft

YTI #15 Find the area of each rectangle. Use Example 8 as a guide.

a)



b)



You Try It Answers

		In words	Multiplication		Product
YTI #1:	a)	four 5's	$4 \cdot 5$	=	20
	b)	three 12's	$3 \cdot 12$	=	36
	c)	six 2's	$6 \cdot 2$	=	2

YTI #2: a) $2 \cdot 6$, $6 \cdot 2$, $3 \cdot 4$, $4 \cdot 3$, $1 \cdot 12$, and $12 \cdot 1$

b) $2 \cdot 10$, $10 \cdot 2$, $4 \cdot 5$, $5 \cdot 4$, $1 \cdot 20$, and $20 \cdot 1$

YTI #3: a) 4, 8, 12, 16, 20, 24, and 28
b) 5, 10, 15, 20, 25, 30, and 35

YTI #4: a) 16 b) 28 c) 36 d) 45

YTI #5:

10	20	30	40	50	60	70	80	90	100	110	120
$1 \cdot 10$	$2 \cdot 10$	$3 \cdot 10$	$4 \cdot 10$	$5 \cdot 10$	$6 \cdot 10$	$7 \cdot 10$	$8 \cdot 10$	$9 \cdot 10$	$10 \cdot 10$	$11 \cdot 10$	$12 \cdot 10$

YTI #6: a) 80 b) 320 c) 6,040 d) 700
e) 5,000 f) 29,800

YTI #7: a) 150 b) 630 c) 400 d) 9,000
e) 160,000 f) 3,000,000

YTI #8: a) $40 + 32 = 72$ b) $200 + 30 = 230$
c) $7 \cdot (10 + 9) = 70 + 63 = 133$ d) $8 \cdot (70 + 3) = 560 + 24 = 584$

YTI #9: a) 92 b) 95 c) 74

YTI #10: a) 858 b) 2,145 c) 5,229

YTI #11: a) 425 b) 1,353 c) 24,564

YTI #12: George has 120 packs of Upper Deck *Stars*.

YTI #13: The total amount of the bill, before tax and tip, was $120.

YTI #14: The total weight of the load is 3,534 pounds.

YTI #15: a) 112 square inches b) 4,275 square meters

Focus Exercises

Multiply.

1. $5 \cdot 4$ **2.** $6 \cdot 3$ **3.** $4 \cdot 7$ **4.** $8 \cdot 5$

5. $9 \cdot 4$ **6.** $3 \cdot 8$ **7.** $9 \cdot 6$ **8.** $8 \cdot 7$

9. $9 \cdot 3$ **10.** $8 \cdot 4$ **11.** $7 \cdot 5$ **12.** $6 \cdot 8$

13. $8 \cdot 8$ **14.** $9 \cdot 8$ **15.** $7 \cdot 7$ **16.** $9 \cdot 9$

Multiply.

17. $3 \cdot 80$ **18.** $4 \cdot 90$ **19.** $60 \cdot 7$ **20.** $50 \cdot 9$

21. $6 \cdot 50$ **22.** $80 \cdot 5$ **23.** $6 \cdot 400$ **24.** $8 \cdot 200$

25. $900 \cdot 7$ **26.** $500 \cdot 5$ **27.** $30 \cdot 90$ **28.** $70 \cdot 40$

29. $600 \cdot 60$ **30.** $400 \cdot 50$ **31.** $600 \cdot 800$ **32.** $200 \cdot 900$

Multiply.

33. $\begin{array}{r} 18 \\ \times\ 19 \\ \hline \end{array}$ **34.** $\begin{array}{r} 26 \\ \times\ 15 \\ \hline \end{array}$ **35.** $\begin{array}{r} 43 \\ \times\ 43 \\ \hline \end{array}$ **36.** $\begin{array}{r} 62 \\ \times\ 62 \\ \hline \end{array}$

37. $\begin{array}{r} 218 \\ \times\ 45 \\ \hline \end{array}$ **38.** $\begin{array}{r} 307 \\ \times\ 92 \\ \hline \end{array}$ **39.** $\begin{array}{r} 425 \\ \times\ 209 \\ \hline \end{array}$ **40.** $\begin{array}{r} 528 \\ \times\ 303 \\ \hline \end{array}$

41. $\begin{array}{r} 153 \\ \times\ 112 \\ \hline \end{array}$ **42.** $\begin{array}{r} 216 \\ \times\ 144 \\ \hline \end{array}$ **43.** $\begin{array}{r} 256 \\ \times\ 128 \\ \hline \end{array}$ **44.** $\begin{array}{r} 1{,}153 \\ \times\ 224 \\ \hline \end{array}$

Which property is being demonstrated?

45. $6 \cdot 9 = 9 \cdot 6$ **46.** $3 \cdot (5 + 8) = 3 \cdot 5 + 3 \cdot 8$

47. $4 \cdot (7 \cdot 2) = (4 \cdot 7) \cdot 2$ **48.** $18 \cdot 0 = 0$

Work each application and answer the question with a complete sentence.

49. The parking lot at the Hillside Christmas Craft Fair has 14 rows of parking with 12 parking spaces in each row. How many cars can fit in the parking lot?

50. Monica has a one year lease on her apartment and pays a monthly rent of $835. How much rent will Monica pay for the entire year (12 months)?

51. Ignacio's truck gets 13 miles per gallon of gas. He just filled the gas tank to a total of 28 gallons. How many miles can Ignacio's truck go before it runs out of gas?

52. Sandy is counting inventory at The Office Station. In the pen and pencil section, there are 33 boxes of *Script Magic* gel pens. If each box holds 18 pens, how many *Script Magic* gel pens does The Office Station have in its inventory?

53. A jumbo jet is flying from San Francisco to Australia and is averaging 492 miles per hour. How many miles will the jet travel in 16 hours?

54. Rico spends $25 every week on lottery tickets. How much does Rico spend in a year (52 weeks) on lottery tickets?

55. Diane is a massage therapist. During her first week working for Dr. Kent's chiropractic office, she saw 33 patients. If she earns $18 for every patient, how much did Diane earn that first week?

56. Toby is preparing a 23-pound turkey for his family's Thanksgiving gathering. The recipe he's using says to roast the turkey 12 minutes per pound. For how many minutes should Toby roast the turkey?

57. There are 306 families in the Magnolia Elementary PTA. Each family must contribute $18 throughout the year to support the PTA's field trip program. What will be the total income for the PTA's field trip program for one year?

58. Soo works for the purchasing department of a mid-sized company. Last week she bought 12 computers for their new West Valley office, which opens in two months. Each computer is priced at $1,289. What is the total price for the 12 computers?

59. A youth soccer field is in the shape of a rectangle. The length is 60 yards and the width is 28 yards. What is the area of this soccer field?

60. An official college basketball court is 94 feet long and 50 feet wide. What is the area of this basketball court?

61. The state of Wyoming is in the shape of a rectangle. It is 357 miles long and 274 miles wide. Round each of these dimensions to the nearest ten. Use the rounded numbers to approximate the area of Wyoming.