

# 15-1

## Multiplication Algorithm-2

### Multiplication of Tens

**Example 1** Calculate  $5 \times 30$ .

$$\begin{array}{r} 5 \times 3 = 15 \\ \text{10 times} \downarrow \qquad \downarrow \text{10 times} \\ 5 \times 30 = 150 \\ 5 \times 30 = \boxed{150} \end{array}$$

When the number in the multiplier becomes 10 times as much, the answer also becomes 10 times as much.



The answer for  $5 \times 30$  is the same as 10 times as much as  $5 \times 3$ . Therefore, the answer is the same as placing a 0 to the right of 15.

**1** Calculate the following multiplication problems.

- 1**  $5 \times 50 = \boxed{\phantom{00}}$      
 **2**  $4 \times 30 = \boxed{\phantom{00}}$      
 **3**  $6 \times 60 = \boxed{\phantom{00}}$   
**4**  $8 \times 40 = \boxed{\phantom{00}}$      
 **5**  $9 \times 70 = \boxed{\phantom{00}}$      
 **6**  $7 \times 20 = \boxed{\phantom{00}}$

**Example 2** Calculate  $12 \times 30$ .

$$\begin{array}{r} 12 \times 3 = 36 \\ \text{10 times} \downarrow \qquad \downarrow \text{10 times} \\ 12 \times 30 = 360 \\ 12 \times 30 = \boxed{360} \end{array}$$

When the number in the multiplier becomes 10 times as much, the answer also becomes 10 times as much. This is the same as in example 1.



The answer for  $12 \times 30$  is the same as 10 times as much as  $12 \times 3$ . Therefore, the answer is the same as placing a 0 to the right of 36.

**2** Calculate the following multiplication problems.

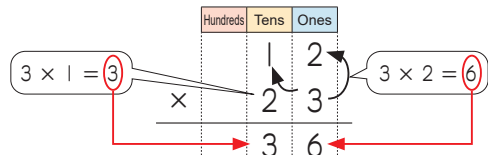
- 1**  $12 \times 40 = \boxed{\phantom{00}}$      
 **2**  $23 \times 20 = \boxed{\phantom{00}}$      
 **3**  $32 \times 30 = \boxed{\phantom{00}}$   
**4**  $26 \times 30 = \boxed{\phantom{00}}$      
 **5**  $31 \times 40 = \boxed{\phantom{00}}$      
 **6**  $60 \times 30 = \boxed{\phantom{00}}$

# 15 - 2

## Multiplication Algorithm-2

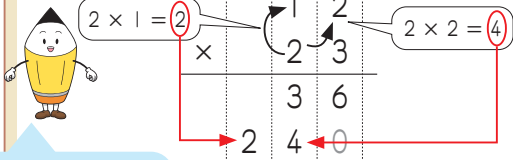
### Multiplication by 2-Digit Numbers (1)

**Example** Calculate  $12 \times 23$  by using the algorithm.



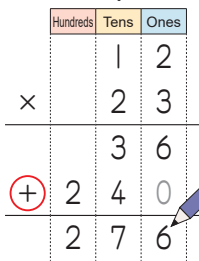
Line up the numbers vertically in each place.

3 times 12 is 36.  
(This is actually  $12 \times 3 = 36$ .)



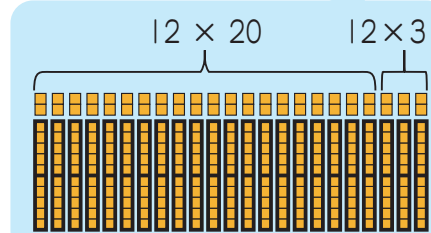
2 times 12 is 24.  
(This is actually  $12 \times 20 = 240$ .)

In this chapter, the "+" symbol is written, but this does not have to be written.



Do the addition.  
 $36 + 240 = 276$

$$12 \times 23 = 276$$



Calculate the following multiplication problems by using the algorithm.

1

Hundreds	Tens	Ones
	1	2
	3	3
×		
-----		
+		
-----		

Callouts:  $12 \times 30$ ,  $12 \times 3$

2

Hundreds	Tens	Ones
	2	1
	3	2
×		
-----		
+		
-----		

Callouts:  $21 \times 30$ ,  $21 \times 2$

3

Hundreds	Tens	Ones
	1	3
	2	2
×		
-----		
+		
-----		

4  $21 \times 14$

5  $31 \times 12$

6  $41 \times 12$

7  $23 \times 21$

8  $33 \times 11$

9  $24 \times 21$

10  $14 \times 22$

11  $42 \times 11$

4		5		6		7	
8		9		10		11	

# 15 - 3

## Multiplication Algorithm-2

### Multiplication by 2-Digit Numbers (2)

**Example** Calculate  $13 \times 24$  by using the algorithm.

	Hundreds	Tens	Ones
$4 \times 1 = 4$	1	3	
×	2	4	
	5	2	
↓			
$2 \times 1 = 2$	1	3	
×	2	4	
	5	2	
	2	6	0
↓			
	1	3	
×	2	4	
	5	2	
+	2	6	0
	3	1	2

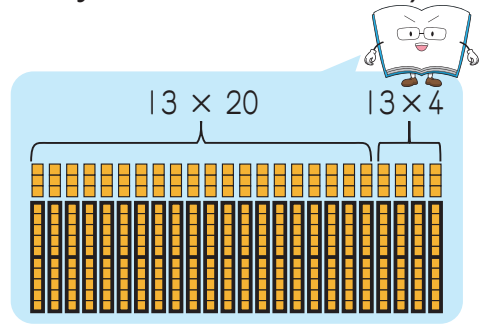
Line up the numbers vertically in each place.

4 times 13 is 52.  
(This is actually  $13 \times 4 = 52$ .)

2 times 13 is 26.  
(This is actually  $13 \times 20 = 260$ .)

Do the addition.  
 $52 + 260 = 312$

$13 \times 24 = 312$



Calculate the following multiplication problems by using the algorithm.

**1**

	Hundreds	Tens	Ones
	1	3	
×	3	5	
-----			
+			
-----			

$13 \times 30$        $13 \times 5$

**2**

	Hundreds	Tens	Ones
	1	4	
×	2	4	
-----			
+			
-----			

$14 \times 20$        $14 \times 4$

**3**

	Hundreds	Tens	Ones
		1	8
×		1	5
-----			
+			
-----			

**4**  $24 \times 23$

**5**  $47 \times 12$

**6**  $26 \times 13$

**7**  $23 \times 34$

**8**  $25 \times 13$

**9**  $27 \times 12$

**10**  $39 \times 12$

**11**  $19 \times 14$

<b>4</b>		<b>5</b>		<b>6</b>		<b>7</b>	
<b>8</b>		<b>9</b>		<b>10</b>		<b>11</b>	

# 15-4

## Multiplication Algorithm-2

### Multiplication by 2-Digit Numbers (3)

**Example** Calculate  $13 \times 75$  by using the algorithm.

The diagram illustrates the multiplication algorithm for  $13 \times 75$  in three stages:

- Step 1:** Multiply 13 by 5.  $5 \times 1 = 5$  (ones place),  $5 \times 3 = 15$  (tens place, with a carry of 1 to the hundreds place). The result is 65.
- Step 2:** Multiply 13 by 70.  $7 \times 1 = 7$  (tens place),  $7 \times 3 = 21$  (hundreds place, with a carry of 2 to the thousands place). The result is 910.
- Step 3:** Add the partial products:  $65 + 910 = 975$ .

Line up the numbers vertically in each place.

5 times 13 is 65.  
(This is actually  $13 \times 5 = 65$ .)

7 times 13 is 91.  
(This is actually  $13 \times 70 = 910$ .)

Do the addition.  
 $65 + 910 = 975$

$$13 \times 75 = 975$$

Calculate the following multiplication problems by using the algorithm.

1

	Hundreds	Tens	Ones
		1	3
$\times$		7	4
<hr/>			
$+$			
<hr/>			

2

	Hundreds	Tens	Ones
		2	9
$\times$		2	3
<hr/>			
$+$			
<hr/>			

3

	Hundreds	Tens	Ones
		3	8
$\times$		2	2
<hr/>			
$+$			
<hr/>			

4  $19 \times 34$

5  $15 \times 36$

6  $28 \times 32$

7  $37 \times 22$

8  $17 \times 44$

9  $18 \times 35$

10  $27 \times 33$

11  $14 \times 57$

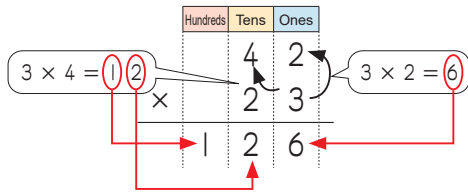
4		5		6		7	
8		9		10		11	

# 15-5

## Multiplication Algorithm-2

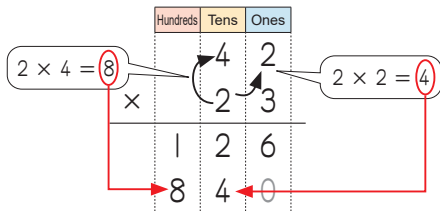
### Multiplication by 2-Digit Numbers (4)

**Example** Calculate  $42 \times 23$  by using the algorithm.

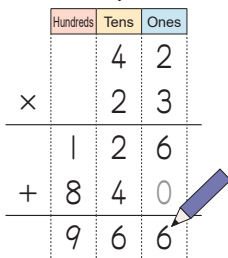


Line up the numbers vertically in each place.

3 times 42 is 126.  
(This is actually  $42 \times 3 = 126$ .)

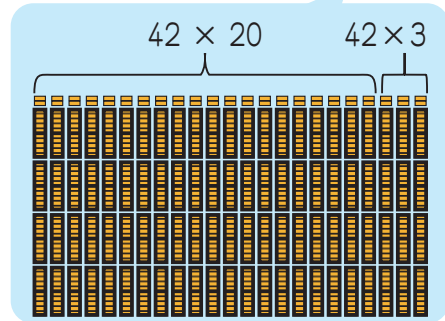


2 times 42 is 84.  
(This is actually  $42 \times 20 = 840$ .)



Do the addition.  
 $126 + 840 = 966$

$42 \times 23 = 966$



Calculate the following multiplication problems by using the algorithm.

1

	Hundreds	Tens	Ones
		3	2
$\times$		2	4
<hr/>			
$+$			
<hr/>			

2

	Hundreds	Tens	Ones
		3	9
$\times$		1	5
<hr/>			
$+$			
<hr/>			

3

	Hundreds	Tens	Ones
		1	7
$\times$		4	6
<hr/>			
$+$			
<hr/>			

4  $24 \times 37$

5  $43 \times 19$

6  $56 \times 14$

7  $42 \times 18$

8  $38 \times 26$

9  $18 \times 36$

10  $27 \times 37$

11  $54 \times 13$

4		5		6		7	
8		9		10		11	

# 15-6

## Multiplication Algorithm-2

### Multiplication by 2-Digit Numbers (5)

**Example** Calculate  $36 \times 47$  by using the algorithm.

The diagram illustrates the multiplication algorithm for  $36 \times 47$  using place value charts. It shows the partial products for  $7 \times 36 = 252$  and  $4 \times 36 = 1440$ , and then the final addition  $252 + 1440 = 1692$ .

Line up the numbers vertically in each place.

7 times 36 is 252.  
(This is actually  $36 \times 7 = 252$ .)

4 times 36 is 144.  
(This is actually  $36 \times 40 = 1440$ .)

Do the addition.  
 $252 + 1440 = 1692$

$$36 \times 47 = 1692$$

Calculate the following multiplication problems by using the algorithm.

1

One Thousands	Hundreds	Tens	Ones
		3	7
×		4	6
-----			
+			
-----			

2

One Thousands	Hundreds	Tens	Ones
		6	7
×		5	7
-----			
+			
-----			

3

One Thousands	Hundreds	Tens	Ones
		8	6
×		4	9
-----			
+			
-----			

4  $52 \times 38$

5  $63 \times 76$

6  $77 \times 44$

7  $38 \times 56$

8  $65 \times 47$

9  $89 \times 36$

10  $58 \times 49$

11  $76 \times 63$

4		5		6		7	
8		9		10		11	

# 15 - 7

## Multiplication Algorithm-2

### Multiplication by 2-Digit Numbers (6)

**Example** Calculate  $28 \times 30$  by using the algorithm.

	Hundreds	Tens	Ones
$0 \times 2 = 0$	2	8	
$\times$	3	0	
	0	0	
$3 \times 2 = 6$	2	8	
$\times$	3	0	
	8	4	
$+ 2$	8	4	0
	8	4	0

Line up the numbers vertically in each place.

0 times 28 is 0.  
(This is actually  $28 \times 0 = 0$ .)

3 times 28 is 84.  
(This is actually  $28 \times 30 = 840$ .)

Write a 4 in the tens place and a 8 in the hundreds place.

Do the addition.  
 $0 + 840 = 840$

$$28 \times 30 = 840$$

Calculate the following multiplication problems by using the algorithm.

1

	Hundreds	Tens	Ones
	2	9	
$\times$	3	0	
$+$			

2

	Hundreds	Tens	Ones
	4	3	
$\times$	2	0	
$+$			

3

	One Thousands	Hundreds	Tens	Ones
		7	2	
$\times$		3	0	
$+$				

4  $47 \times 60$

5  $74 \times 60$

6  $86 \times 40$

7  $27 \times 80$

8  $76 \times 90$

9  $63 \times 70$

10  $83 \times 50$

11  $64 \times 50$

Regarding problem (11), pay attention to the number of 0s.



4	5	6	7
8	9	10	11

# 15-8

## Multiplication Algorithm-2

### 3-Digit × 2-Digit Calculation (1)

**Example** Calculate  $123 \times 32$  by using the algorithm.

The diagram shows the multiplication of 123 by 32 using the standard algorithm. It is divided into three stages:

- Step 1:** Multiplying 123 by 2.
 

One Thousands	Hundreds	Tens	Ones
	1	2	3
		3	2
<hr/>			
	2	4	6

 Calculations shown:  $2 \times 1 = 2$ ,  $2 \times 3 = 6$ ,  $2 \times 2 = 4$ .
- Step 2:** Multiplying 123 by 30.
 

One Thousands	Hundreds	Tens	Ones
	1	2	3
		3	2
<hr/>			
	3	6	9
		0	0

 Calculations shown:  $3 \times 1 = 3$ ,  $3 \times 3 = 9$ ,  $3 \times 2 = 6$ .
- Step 3:** Adding the two partial products.
 

		1	2	3
			3	2
<hr/>				
		2	4	6
	3	6	9	0
<hr/>				
	3	9	3	6

Line up the numbers vertically in each place.

2 times 123 is 246.  
(This is actually  $123 \times 2 = 246$ .)

3 times 123 is 369.  
(This is actually  $123 \times 30 = 3690$ .)

Do the addition.  
 $246 + 3690 = 3936$

$$123 \times 32 = 3936$$

Calculate the following multiplication problems by using the algorithm.

1

One Thousands	Hundreds	Tens	Ones
	1	3	2
		2	2
<hr/>			

2

One Thousands	Hundreds	Tens	Ones
	3	2	4
		1	2
<hr/>			

3

One Thousands	Hundreds	Tens	Ones
	2	1	3
		2	3
<hr/>			

4  $221 \times 34$

5  $112 \times 53$

6  $144 \times 21$

7  $331 \times 21$

8  $133 \times 12$

9  $243 \times 22$

10  $342 \times 12$

11  $233 \times 23$

4		5		6		7	
8		9		10		11	



# 15-9

## Multiplication Algorithm-2

### 3-Digit × 2-Digit Calculation (2)

**Example** Calculate  $218 \times 34$  by using the algorithm.

	One Thousands	Hundreds	Tens	Ones
×		2	1	8
		3	4	
<hr/>				
		8	7	2
		6	5	4
<hr/>				
	6	5	4	0
<hr/>				
		2	1	8
		3	4	
<hr/>				
		8	7	2
+	6	5	4	0
<hr/>				
	7	4	1	2

Line up the numbers vertically in each place.

4 times 218 is 872.  
(This is actually  $218 \times 4 = 872$ .)

3 times 218 is 654.  
(This is actually  $218 \times 30 = 6540$ .)

Do the addition.  
 $872 + 6540 = 7412$

$$218 \times 34 = 7412$$

Calculate the following multiplication problems by using the algorithm.

**1**

	One Thousands	Hundreds	Tens	Ones
×		3	2	6
		2	3	
<hr/>				
<hr/>				
<hr/>				
<hr/>				

**2**

	One Thousands	Hundreds	Tens	Ones
×		2	3	8
		2	4	
<hr/>				
<hr/>				
<hr/>				
<hr/>				

**3**

	One Thousands	Hundreds	Tens	Ones
×		2	1	6
		3	6	
<hr/>				
<hr/>				
<hr/>				
<hr/>				

- 4**  $129 \times 45$     **5**  $145 \times 56$     **6**  $359 \times 27$     **7**  $229 \times 23$   
**8**  $368 \times 26$     **9**  $156 \times 38$     **10**  $374 \times 26$     **11**  $167 \times 29$

<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>

# 15-10

## Multiplication Algorithm-2

### 3-Digit × 2-Digit Calculation (3)

**Example** Calculate  $576 \times 38$  by using the algorithm.

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			5	7	6
			3	8	
<hr/>					
		4	6	0	8
			5	7	6
			3	8	
<hr/>					
		1	7	2	8
			5	7	6
			3	8	
<hr/>					
+		4	6	0	8
		1	7	2	8
		2	1	8	8

Line up the numbers vertically in each place.

8 times 576 is 4608.  
(This is actually  $576 \times 8 = 4608$ .)

3 times 576 is 1728.  
(This is actually  $576 \times 30 = 17280$ )

Do the addition.  
 $4608 + 17280 = 21888$

$$576 \times 38 = 21888$$

Calculate the following multiplication problems by using the algorithm.

1

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			5	6	6
			3	4	
<hr/>					
+					
<hr/>					

2

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			3	6	7
			3	2	
<hr/>					
+					
<hr/>					

3

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			1	7	6
			6	4	
<hr/>					
+					
<hr/>					

- 4  $748 \times 15$     5  $458 \times 67$     6  $567 \times 49$     7  $386 \times 48$   
 8  $169 \times 87$     9  $768 \times 35$     10  $687 \times 49$     11  $183 \times 96$

4	5	6	7
8	9	10	11

# 15 - 11

## Multiplication Algorithm-2

### 3-Digit × 2-Digit Calculation (4)

**Example** Calculate  $304 \times 52$  by using the algorithm.

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			3	0	4
			6	0	8
304 × 2					
×			3	0	4
			6	0	8
	1	5	2	0	0
304 × 50					
×			3	0	4
			6	0	8
+	1	5	2	0	0
	1	5	8	0	8

Line up the numbers vertically in each place.

2 times 304 is 608.  
(This is actually  $304 \times 2 = 608$ .)

5 times 304 is 1520.  
(This is actually  $304 \times 50 = 15200$ )

Do the addition.  
 $608 + 15200 = 15808$

$$304 \times 52 = 15808$$

Calculate the following multiplication problems by using the algorithm.

**1**

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			3	0	7
			5	3	
+					

**2**

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			5	0	2
			6	4	
+					

**3**

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			4	0	7
			7	6	
+					

**4**  $706 \times 83$

**5**  $809 \times 94$

**6**  $608 \times 47$

**7**  $506 \times 47$

**8**  $409 \times 38$

**9**  $705 \times 75$

**10**  $808 \times 88$

**11**  $605 \times 37$

<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>

# 15-12

## Multiplication Algorithm-2

### 3-Digit × 2-Digit Calculation (5)

**Example 1** Calculate  $609 \times 30$  by using the algorithm.

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			6	0	9
			0	0	0
609 × 0					
×			6	0	9
			0	0	0
+	1	8	2	7	0
	1	8	2	7	0
609 × 30					

Line up the numbers vertically in each place.

0 times 609 is 0.  
(This is actually  $609 \times 0 = 0$ .)

3 times 609 is 1827.  
(This is actually  $609 \times 30 = 18270$ .)

Do the addition.  
 $0 + 18270 = 18270$ .

$$609 \times 30 = 18270$$

Calculate the following multiplication problems by using the algorithm.

1

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			6	0	7
				4	0
+					

2  $506 \times 80$       3  $407 \times 90$

4  $308 \times 70$       5  $704 \times 50$

2		3		4		5	
---	--	---	--	---	--	---	--

**Example 2** Calculate  $600 \times 75$  by using the algorithm.

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			6	0	0
			3	0	0
600 × 5					
×			6	0	0
			3	0	0
+	4	2	0	0	0
	4	5	0	0	0
600 × 75					

Line up the numbers vertically in each place.

5 times 600 is 3000.  
(This is actually  $600 \times 5 = 3000$ .)

7 times 600 is 4200.  
(This is actually  $600 \times 70 = 42000$ .)

Do the addition  
 $3000 + 42000 = 45000$

$$600 \times 75 = 45000$$

Calculate the following multiplication problems by using the algorithm.

1

	Ten Thousands	One Thousands	Hundreds	Tens	Ones
×			6	0	0
				8	5
+					

2  $700 \times 48$       3  $800 \times 37$

4  $500 \times 68$       5  $400 \times 97$

2		3		4		5	
---	--	---	--	---	--	---	--

### Mental Calculation

**Example** Think about how to calculate these problems in your head.

1  $25 \times 3 = \boxed{75}$

2  $2 \times 35 = \boxed{64}$

$$\begin{array}{r}
 25 \times 3 \\
 \swarrow \quad \searrow \\
 (20) \quad (5) \\
 \text{First } 20 \times 3 = 60 \\
 \text{Second } 5 \times 3 = 15 \\
 \hline
 \text{Altogether} \quad 75
 \end{array}$$



$$\begin{array}{r}
 2 \times 32 \\
 \swarrow \quad \searrow \\
 (30) \quad (2) \\
 \text{First } 2 \times 30 = 60 \\
 \text{Second } 2 \times 2 = 4 \\
 \hline
 \text{Altogether} \quad 64
 \end{array}$$

Think about how to calculate the following multiplication problems in your head.

1  $23 \times 3 = \boxed{\phantom{00}}$

$$\begin{array}{r}
 23 \\
 \swarrow \quad \searrow \\
 20 \quad 3
 \end{array}$$

2  $42 \times 2 = \boxed{\phantom{00}}$

$$\begin{array}{r}
 42 \\
 \swarrow \quad \searrow \\
 40 \quad 2
 \end{array}$$

$$\begin{array}{r}
 20 \times 3 = \\
 3 \times 3 =
 \end{array}$$

$$\begin{array}{r}
 40 \times 2 = \\
 2 \times 2 =
 \end{array}$$

3  $15 \times 3 = \boxed{\phantom{00}}$

$$\begin{array}{r}
 15 \\
 \swarrow \quad \searrow \\
 10 \quad 5
 \end{array}$$

4  $21 \times 4 = \boxed{\phantom{00}}$

$$\begin{array}{r}
 21 \\
 \swarrow \quad \searrow \\
 20 \quad 1
 \end{array}$$

$$\begin{array}{r}
 10 \times 3 = \\
 5 \times 3 =
 \end{array}$$

$$\begin{array}{r}
 20 \times 4 = \\
 1 \times 4 =
 \end{array}$$

5  $25 \times 2 = \boxed{\phantom{00}}$

6  $33 \times 3 = \boxed{\phantom{00}}$

7  $32 \times 4 = \boxed{\phantom{00}}$

8  $3 \times 25 = \boxed{\phantom{00}}$

9  $4 \times 23 = \boxed{\phantom{00}}$

10  $5 \times 13 = \boxed{\phantom{00}}$

11  $2 \times 34 = \boxed{\phantom{00}}$

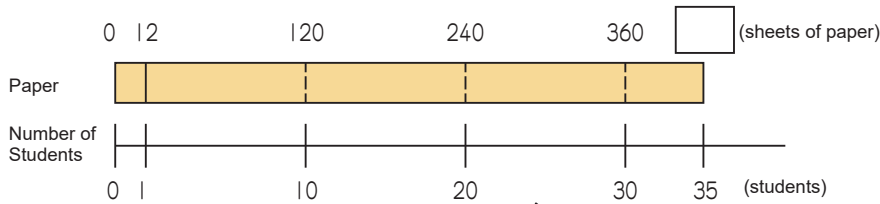
12  $6 \times 12 = \boxed{\phantom{00}}$

# 15-14

## Multiplication Algorithm-2

### Multiplication Problems

**Example** There are 35 students in my class. The teacher will give 12 sheets of paper to each student. How many sheets of paper does the teacher need?



		1	2
×		3	5
		6	0
+	3	6	
	4	2	0

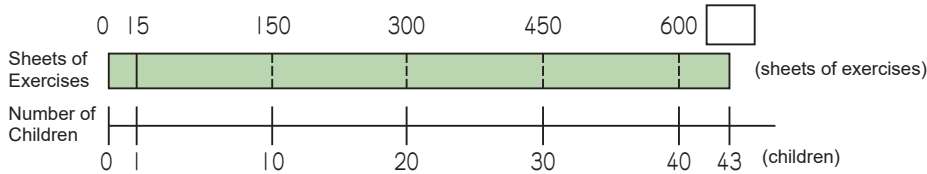
Math Sentence

$$12 \times 35 = 420$$

Answer  sheets of paper

Answer the following problems.

- 1 There are 43 children in the class. The teacher will provide 15 sheets of exercises to each child. How many sheets of exercises does the teacher need?



Math Sentence

Answer  sheets of exercises

×			
+			

- 2 The length of one train car is 25 m. How long is the total length of a train with 17 cars?

Math Sentence

Answer  m

×			
+			

# 15-15

## Multiplication Algorithm-2

### Review

**1** Calculate the following problems in your head.

- 1**  $6 \times 70 = \square$     **2**  $4 \times 40 = \square$     **3**  $8 \times 60 = \square$   
**4**  $12 \times 30 = \square$     **5**  $32 \times 20 = \square$     **6**  $60 \times 40 = \square$   
**7**  $25 \times 3 = \square$     **8**  $32 \times 3 = \square$     **9**  $2 \times 36 = \square$

**2** Calculate these multiplication problems by using the algorithm.

- 1**  $32 \times 13$     **2**  $26 \times 15$     **3**  $28 \times 23$     **4**  $56 \times 13$

×			
+			

×			
+			

×			
+			

×			
+			

- 5**  $46 \times 38$     **6**  $224 \times 21$     **7**  $359 \times 26$     **8**  $576 \times 35$

×				
+				

×				
+				

×				
+				

×				
+				

**3** There are 32 boxes containing 24 cans of orange juice each. How many cans of orange juice are there altogether?

Math Sentence

--	--	--	--	--

Answer

--

cans of orange juice

×			
+			