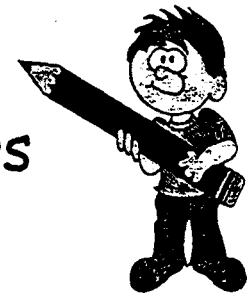
Name:_____



Multiplying 2-Digit Numbers

Find the product. Use models to help you.

1)
$$\begin{array}{r} 22 \\ \times\ 4 \\ \hline \end{array}$$

2)
$$\begin{array}{r} 34 \\ \times\ 2 \\ \hline \end{array}$$

3)
$$\begin{array}{r} 28 \\ \times\ 3 \\ \hline \end{array}$$

4)
$$\begin{array}{r} 16 \\ \times\ 5 \\ \hline \end{array}$$

5)
$$\begin{array}{r} 37 \\ \times\ 2 \\ \hline \end{array}$$

6)
$$\begin{array}{r} 44 \\ \times\ 2 \\ \hline \end{array}$$

7)
$$\begin{array}{r} 21 \\ \times\ 4 \\ \hline \end{array}$$

8)
$$\begin{array}{r} 12 \\ \times\ 8 \\ \hline \end{array}$$

9) 16 x 4

10) 24 x 3

11) 39 x 2

12) Mrs. Sagato gave her son $2 each day in February for helping around the house. If February has 28 days, how much money did her son earn that month?

$$\$\$\$\$\$\$$$

13) My sister bought 7 new shirts at the store. Each shirt cost $13 dollars. How much did my sister have to pay for all her shirts?

Objective 6: Multiply 1- and 2-digit numbers by powers and multiples of ten. Use sampling to estimate large quantities.

Vocabulary

estimate
multiple
sample
sampling
shortcut

Materials

overhead base ten blocks

Transparencies:

Multiplying by Ten
Estimating Large Amounts
Mental Math Shortcuts

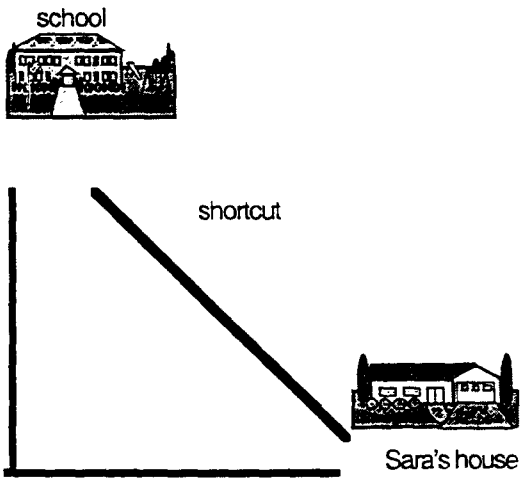
Student Copies:

Multiplying by Ten Cards(Set A and B)
Practice With Tens
How Many Do You Think?
Multiply by 10 or 100 or 1,000
Let's Multiply With Zeros
Fun Factors

Language Foundation

1. Explain to students that when stores want customers to buy a certain product or food, they will sometimes give out or serve a small portion or **sample** of the product. This sample is a small example of what the product tastes like when cooked. **Sampling** is a way of trying out a certain product before buying it. If you like the sample, you might buy the product.

2. Explain that a **shortcut** is a way of doing something that will make it faster or easier. For example, put a small map on the board showing a shortcut from Sara's house to school (see sample below). In this lesson, students will be using shortcuts to do mental math.

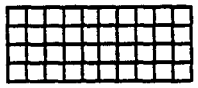


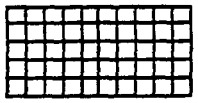
Mathematics Component

1. Place the Multiplying by Ten transparency on the overhead.
   - Point to 1 x 10 and say, "I can use a base ten rod to represent a 1 x 10 array." Place an overhead tens rod in the workspace provided on the transparency.
   - Have students give the product and record it beside the problem. (10)
   - Repeat this procedure for 2 x 10, 3 x 10, 4 x 10, and 5 x 10, using the workspace to build an array for each multiplication sentence and then recording the product beside the problem.

2 x 10 = 20 ---------- 

3 x 10 = 30 ---------- 

4 x 10 = 40 ---------- 

5 x 10 = 50 ---------- 

   - Ask students to talk with a partner about any patterns they see.
   - Point to the last multiplication sentence on the transparency (15 x 10) and ask students to discuss the product with their partner. When students have had time to talk, allow several groups to share their thinking. (Pattern: To get the product, a zero is added to each number being multiplied by ten. For example, when 15 is multiplied by 10 the product is 150. **HINT**: 10 has one zero, so add one zero to the other number!)
   - Record 150 beside 15 x 10.
   - Ask students to verbalize the pattern of multiplying by 10 as you write on the transparency.
   - Write the following problems on the board. Have students discuss the answers with their partners and then come up to write their responses on the board.

     1) 9 x 10 = 2) 26 x 10 = 3) 11 x 10 = 4) 39 x 10 = 5) 60 x 10 =

   - Make a copy of Multiplying by Ten Cards (Set A (white) and Set B (colored) for each pair of students. Cut the cards apart on the dotted lines and give each pair of students one stack of each set.
     - Tell students that there are two types of cards - multiplication sentences and answer cards. (Be sure the cards are separated into these two groups.)
     - Have students mix up one of the two piles of cards without looking at them and place them face down on the desk in arrays. Repeat this procedure with the second pile of cards placing them face down on another desk.
     - Explain that students will take turns turning over two cards - one from **each** desk.
     - If the multiplication sentence matches the answer, the student keeps the two cards and chooses two new cards. If they do not match, the cards are returned to the piles and it is the other student's turn.

- When all cards have been picked up, the winner is the student with the greatest number of matching pairs.

- The activity sheet Practice With Tens may be completed in class or for homework.

2. Place the transparency Estimating Large Amounts on the overhead.
   - Review the verb *estimate*. Estimate means to find an answer that is close but not exact.
   - Ask students if they can estimate the number of dots on the transparency. Be sure to point out that just making a wild guess is not estimating. They need to explain why they think their answer is close.
   - Allow several students to give an answer and explain their thinking.
   - Write the word **sample** on the board. Ask students if they have gone to a store that was giving out a sample of something. Lead students to understand that a sample is a small amount of something taken from a larger amount. For example, a sample of ice cream might be a spoonful from a large container.
   - Write the word **sampling** on the transparency. Tell students that sampling is one way of estimating large amounts.
   - Explain that sampling is counting a small amount (sample) and using that to make an estimate of the larger amount.
   - Tell students that you can use any number for sampling.
   - Count ten dots out loud and draw a circle around them. Say, "I will use 10 as my sample."
   - Ask students how you can use the circle with ten dots to estimate the total number of dots on the transparency. Lead students to understand that you can estimate how many circles it would take to group all of the dots into 10s.
   - Demonstrate drawing circles around approximately every 10 dots. (Do not count the dots.)
   - Count the total number of circles and say, "I have ( ) circles with about 10 in each circle. About how many dots altogether?" Lead students to see that a multiplication sentence can be written to find the answer. For example, if there are 7 circles it would be 7 x 10 = 70.
   - After you have determined a good estimate for the number of dots on the page, erase the circles and count the exact number. Compare the estimate to the exact number to show that it is close.
   - Ask students why they think you chose 10 to do your sampling? (Because it is easy to multiply by 10.)
   - Have students suggest other numbers which might be easy to use when sampling. Lead them to understand that the total number of items will affect which number they use for sampling. For example, counting by 5s is easy but might take a long time if there are many items.
   - The activity page How Many Do You Think? is provided for additional practice with sampling.

3. Write 24 x10 on the board and ask students to give the answer and explain why it is easy to find the product mentally. (The answer is 240 because one 0 is added to 24 when multiplying by 10.)

- Tell students that now you will look to see if there is a pattern when multiplying by 100.
- Begin by writing 1 x 100 on the board and asking students what the product is and why. (The product is 100. Lead students to remember that any number multiplied by 1 is the number itself.)
- Record the product beside the problem and make the following list beneath the first problem.

1 x 100 = 100
2 x 100 =
3 x 100 =
4 x 100 =
5 x 100 =

- Ask students for suggestions on how we might find the answers (products) for these multiplication sentences. Lead students to understand that building arrays would be difficult because of the size of the numbers. Repeated addition might be an easier model to use.
- Point to 2 x 100 and say, "We have 2 equal groups of 100." On the board, write:

100
+100

- Ask a student to come up and record the sum. Say, "100 plus 100 equals 200 so 2 equal groups of 100 equals 200." Record the product beside 2 x 100.
- Repeat this procedure for 3 x 100, 4 x 100, and 5 x 100. Add another problem to the list as shown below.

1 x 100 = 100
2 x 100 = 200
3 x 100 = 300
4 x 100 = 400
5 x 100 = 500

18 x 100 = ?

- Have students talk with a partner and see if they can find any pattern that would help them find the product of the new multiplication sentence. Allow students to share their thinking and then write the new product and the pattern on the board.

1 x 100 = 100
2 x 100 = 200
3 x 100 = 300
4 x 100 = 400
5 x 100 = 500

18 x 100 = 1,800

Pattern: Add two 0s to a number being multiplied by 100 to get the product.
HINT: 100 has two zeros, so add two 0s to the other number!

- Write 306 x 100 and have students discuss the product and their reasoning. (30,600)
- Write 13 x 1,000 = ? on the board and ask students if they can give the product. (13,000) Lead students to understand that the pattern for adding ending 0s continues for larger powers of ten.
- Ask students to each make up a multiplication sentence multiplying any number by 10, 100, or 1,000 and write it on a piece of paper. Have them switch papers and tell their partners the product of their problem. (Papers may be rotated around the room for additional practice.)
- The activity page Multiply by 10, 100, 1,000 will provide further practice.

4. Lead a discussion with students about **shortcuts.** Explain that shortcuts make us faster at certain things. For example, you may want to start by telling students that when you were a child, you left your shoes tied all the time so that you could just slip your feet into them quickly in the morning. Leaving your shoes tied was a shortcut.
   - Tell students that there are also shortcuts that we can learn to make math faster! Some of these shortcuts help us find answers in our head so that we don't have to write the problem on paper. Explain that math we do in our head without writing is called **mental math.**
   - Place the transparency Mental Math Shortcuts on the overhead.
   - Go over the two examples at the top of the page, explaining each of the steps involved in this multiplication shortcut.
   - Have different students come up and write answers for the problems at the bottom of the page, explaining how they got their answers.
   - The activity sheets Let's Multiply With Zeros, and Fun Factors may be assigned for additional practice.

Note: Encourage students to use mental math strategies throughout the year. One way to accomplish this is by placing a few warm-up problems on the board each day. Warm-ups help students get focused and can be tailored to review concepts students have learned throughout the year. Making sure some of the warm-ups are mental math with no writing will give students practice and strengthen their mental math skills.

Multiplying by Ten

1 x 10 =

2 x 10 =

3 x 10 =

4 x 10 =

5 x 10 =

15 x 10 =

Workspace

Pattern: _____

_____

_____

_____

Multiplying by Ten Cards

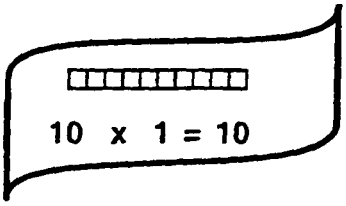
8 x 10	25 x 10
37 x 10	43 x 10
55 x 10	62 x 10
71 x 10	80 x 10
99 x 10	13 x 10

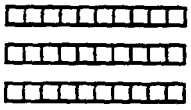
80	250
370	430
550	620
710	800
990	130

Name: _____

Practice With Tens!

Write a multiplication sentence and solve:



1) 

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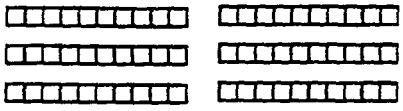
2) 

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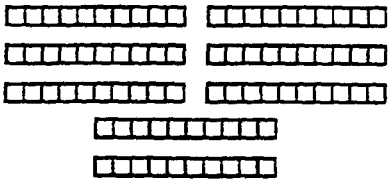
3) 

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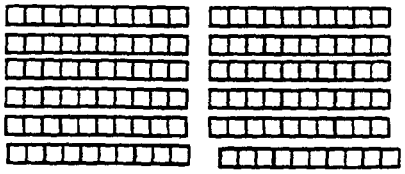
4) 

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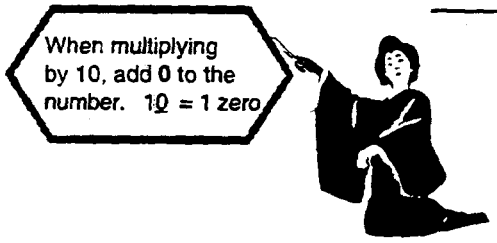


Find the product:

1) 10 x 4 = _____

2) 10 x 7 = _____

3) 31 x 10 = _____

4) 137 x 10 = _____

5) 11 x 10 = _____

6) 5 x 10 = _____

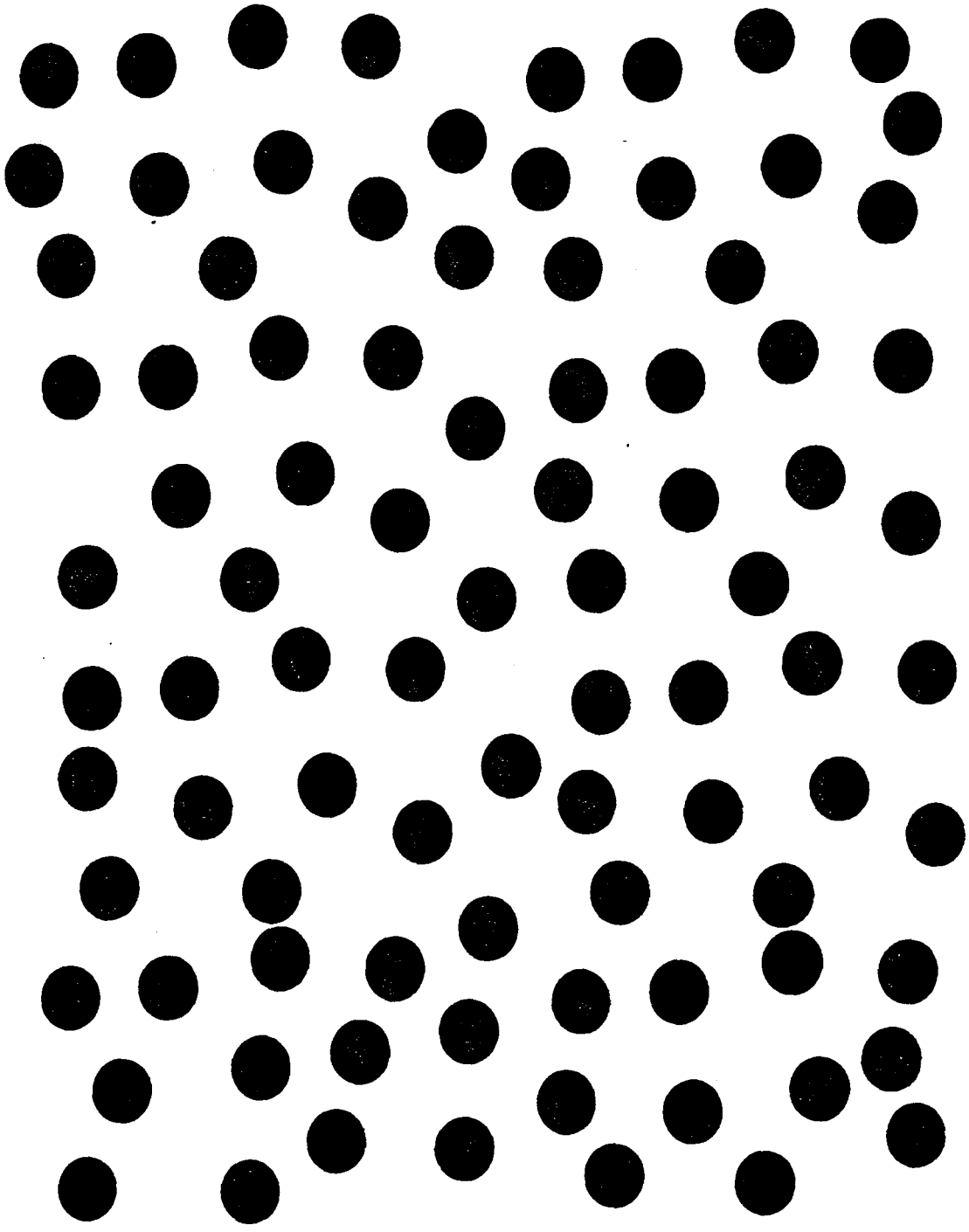
7) 234 x 10 = _____

8) 87 x 10 = _____

9) 49 x 10 = _____

10) 176 x 10 = _____

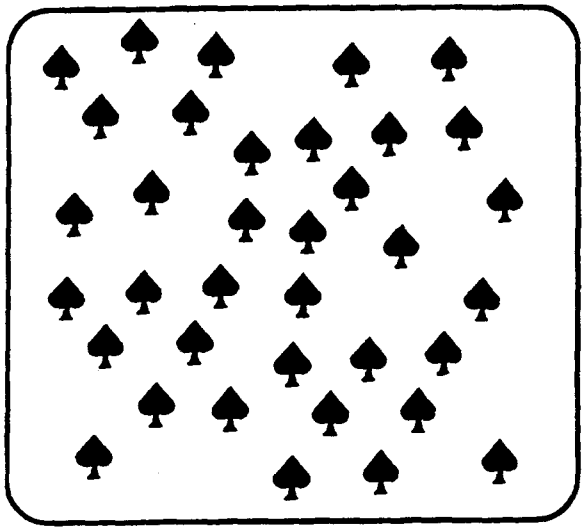
Estimating Large Amounts



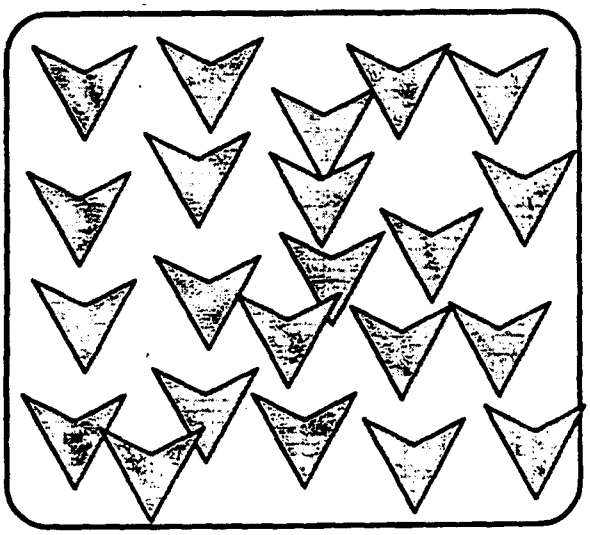
Name:_____

How Many Do You Think?

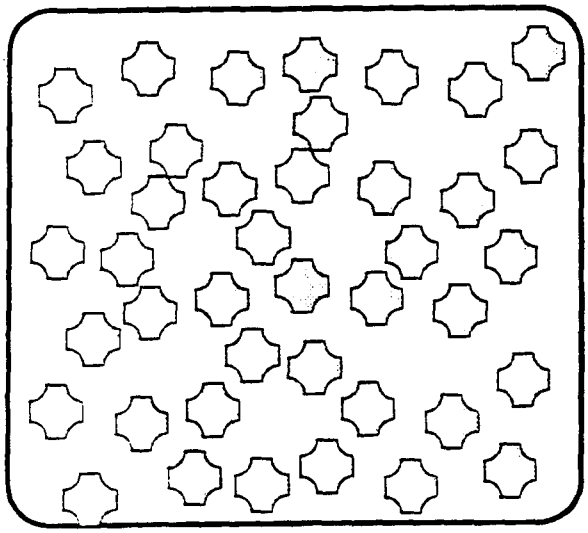
Use sampling to estimate how many are in each group.
Count to find the exact number.



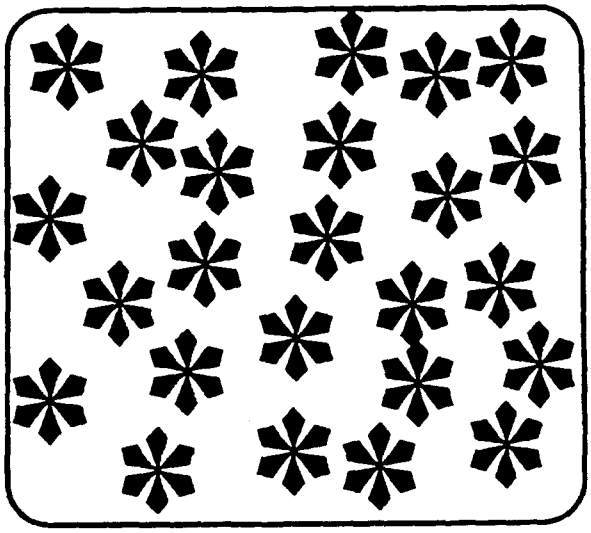
Estimate:_____ Exact:_____



Estimate:_____ Exact:_____



Estimate:_____ Exact:_____



Estimate:_____ Exact:_____

Name:_____

Multiply by 10 or 100 or 1,000

Hint: To multiply a number by
10 Add 1 zero
100 Add 2 zeros
1,000 Add 3 zeros
to the number.

Example: 5 x 10= 50
5 X 100 = 500
5 X 1,000 = 5,000

8 x 10 = _____ 23 x 10 = _____

8 X 100 = _____ 23 X 100 = _____

8 X 1,000 = _____ 23 X 1,000 = _____

1) 7 X 10 = _____

2) 9 X 100 = _____

3) 15 X 1,000 = _____

4) 10 X 33 = _____

5) 100 X 11 = _____

6) 19 X 10 = _____

7) 100 x 64 = _____

8) 3 X 1,000 = _____

9) 10 X 77 = _____

10) 1,000 X 20 = _____

Find the products and compare. Write >, <, or =

1) 40 x 10 ☐ 100 x 3

2) 100 x 17 ☐ 1,000 x 2

3) 20 x 100 ☐ 100 x 20

4) 1,000 x 10 ☐ 100 x 100

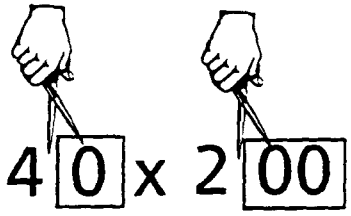
5) 780 x 10 ☐ 100 x 68

6) 10 x 79 ☐ 100 x 83

Mental Math Shortcuts

40 x 200

Here is how to multiply this quickly in your head.



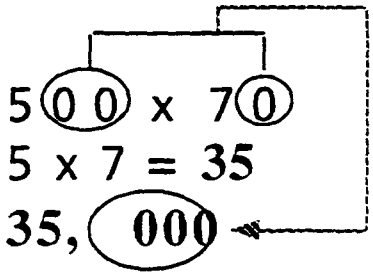
- Cut off the ending zeros.

4 x 2 = 8

- Multiply the other numbers.

- Count all the zeros and put them on your answer.

Let's try another one!



Now, you try to do these in your head.

1) 30 X 20 =

2) 400 X 80 =

3) 500 X 500 =

4) 70 X 80 =

5) 2,000 X 300 =

6) 90 X 50 =

Name: _____

Let's Multiply With Zeros!

1) $30 \times 30 =$ _____

2) $40 \times 20 =$ _____

3) $600 \times 800 =$ _____

4) $40 \times 4{,}000 =$ _____

5) $500 \times 1{,}000 =$ _____

6) $90 \times 10 =$ _____

7) $700 \times 50 =$ _____

8) $20 \times 400 =$ _____

9) $3{,}000 \times 70 =$ _____

10) $80 \times 60 =$ _____

11) $\begin{array}{r} 600 \\ \times\ 50 \\ \hline \end{array}$

12) $\begin{array}{r} 2{,}000 \\ \times\ 30 \\ \hline \end{array}$

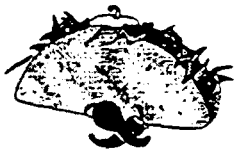
13) $\begin{array}{r} 20 \\ \times\ 90 \\ \hline \end{array}$

14) $\begin{array}{r} 3{,}000 \\ \times\ 200 \\ \hline \end{array}$

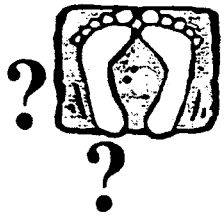
15) $\begin{array}{r} 800 \\ \times\ 40 \\ \hline \end{array}$

16) $\begin{array}{r} 100 \\ \times 500 \\ \hline \end{array}$

There are 50 taco shells in a box. How many taco shells are there in 40 boxes?



If each student has 10 toes, how many toes are there on 220 students ?

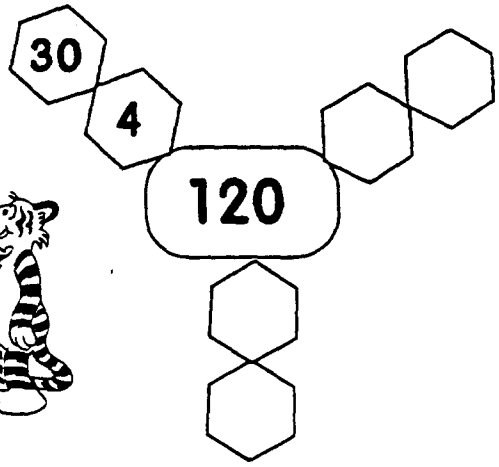


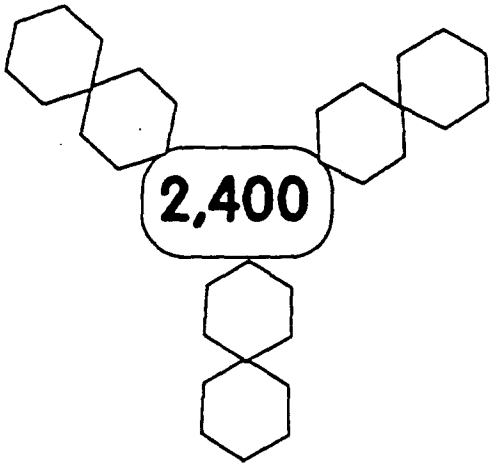
Name_____

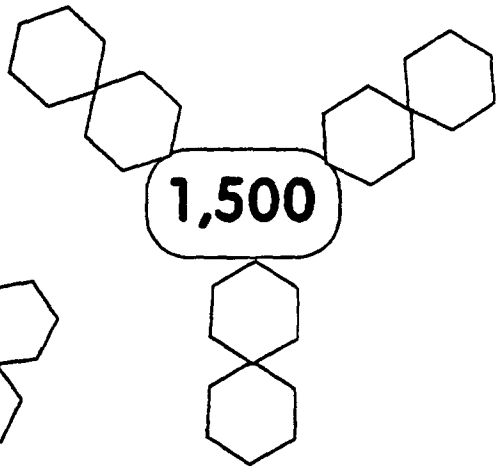
Fun Factors

Use the numbers in the box to find pairs of factors for the product.
(You can use the factors more than once.)

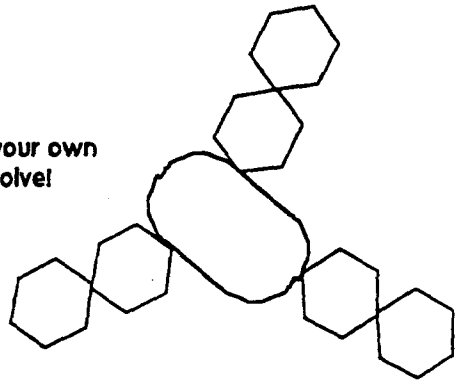
2	3	4	5	6	7	8	9
20	30	40	50	60		80	90
200		300		400		500	
	600		800		900		







Now, make one of your own for your partner to solve!



Objective 7: Estimate, model, and multiply 2-digit numbers by 2-digit numbers.

Vocabulary

horizontal
vertical
estimate
digit
about
distributive
product
factor
array
actual
round
compare

Materials

base ten blocks
index cards

Student Copies:

- Estimating Products Practice
- Break Them Up Multiplication
- Two-Digit Multiplication Practice
- More Two-Digit Multiplication Practice
- Practicing Multiplication Skills
- Find the Missing Digit
- Write-a-Problem

Language Foundation

1. This lesson contains a lot of vocabulary which the students have previously studied. It might be helpful to review the words with them either before or during the lesson.

2. Tell students **actual** means real. Actual answer means the real answer or the correct answer.

3. Remind students that a **round** number is a number that ends in zero. Rounding means changing numbers to the nearest number that ends in zero. i.e. 345 would be rounded to 300. 57 would be rounded to 60.

4. Students may not remember how to write a word problem. Teacher may need to model this before asking students to do the Write-a-Problem activity sheet.

Mathematics Component

1. Estimate products.
   - Review multiplying with zeros. If necessary, use transparency Mental Math Shortcuts (Mult. and Div. Obj. 5).
   - Ask students to mentally solve a few problems. Write problems on the board. (30 x 70, 40 x 60, 80 x 50, 60 x 90, etc.) Ask students to give answers and write their responses on the board.
   - Write 23 x 13 on the board in horizontal format. Tell students mental math shortcuts will be used to estimate the product of these two numbers.
   - Ask students to round 23 to the nearest ten. (20) Write 20 on the board.
   - Ask students to round 13 to the nearest ten. (10) Write 10 on the board.
   - Ask students what 20 x 10 equals. (200) Write 200 on the board.
   - Tell students the estimated product of 23 and 13 is 200.

   23 x 13 ↓ ↓ 20 x 10 = 200

   - Ask students if the estimated answer is more or less than the actual answer. (Less)
   - Ask students to explain why. (Both factors are rounded down so the estimated answer is less than the actual answer.)

   - Write 26 x 87 on the board in vertical format. Ask students to estimate the product.
   - Ask students to round 26 to the nearest ten. (30) Write 30 on the board.
   - Ask students to round 87 to the nearest ten. (90) Write 90 on the board.
   - Ask students what 30 x 90 equals. (2,700)
   - Tell students the estimated product of 26 and 87 is 2,700.

26	→	30
x 87	→	x 90
		2,700

   - Ask students if the estimated answer is more or less than the actual answer. (More)
   - Ask students to explain why. (Both factors are rounded up so the estimated answer is more than the actual answer.)

   - Write 48 x 39 on the board in vertical format. Ask students to estimate the product.
   - Ask students to explain first step. (Round 48 to 50) Write 50 on the board.
   - Ask students to explain next step. (Round 39 to 40) Write 40 on the board.
   - Ask students to explain final step. (Multiply 50 x 40 to find estimated product of 2,000.)
   - Ask students if the estimated answer is more or less than the actual answer. (More)
   - Ask students to explain why. (Both factors are rounded up so the estimated answer is more than the actual answer.)

48	→	50
x 39	→	x 40
		2,000

Note: Some students might question how to determine if an estimated answer is more or less than an actual answer if one factor is rounded up and one factor is rounded down. Tell them it depends on the amount each factor was rounded either up or down. For example, in the problem 34 x 18, 34 rounds down to 30 and 18 rounds up to 20. 30 is 4 less than 34; 20 is 2 more than 18 so the amount rounded down is more than the amount rounded up. Therefore, the estimated product

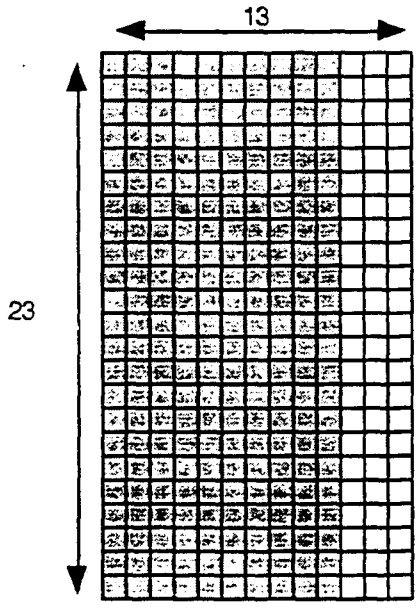
is less than the actual answer. It is not important for students to master the more/less relationship between the estimated answer and actual answer, but they do need to explore the concept.

- Do a few more examples on the board with the students. Make sure you use both vertical and horizontal formats. Have students verbalize as they complete each step. Remind students that the product is the estimated answer for the original multiplication problem. (23 x 13 is about 200; 34 x 87 is about 2,700, 48 x 39 is about 2,000)
- Distribute Estimating Products Practice. Go over the example with students. Have them complete the activity page.

2. Use base ten blocks to model multiplication of 2-digit numbers by 2-digit numbers.
   - Put students into small groups (2 - 3 students per group)
   - Distribute a bag of base ten blocks (27 tens and 69 ones) to each group of students.
   - Tell students arrays will be used to solve multiplication problems involving 2-digit numbers.
   - On an overhead transparency, write 23

     x 13

   - Ask students how to build an array to represent the problem. (An array with 23 rows of 13 in each row.)
   - As the teacher builds the array on the overhead, students build the array at their desks.

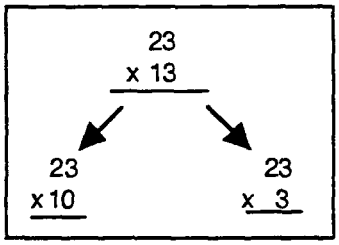



= 1 ten block

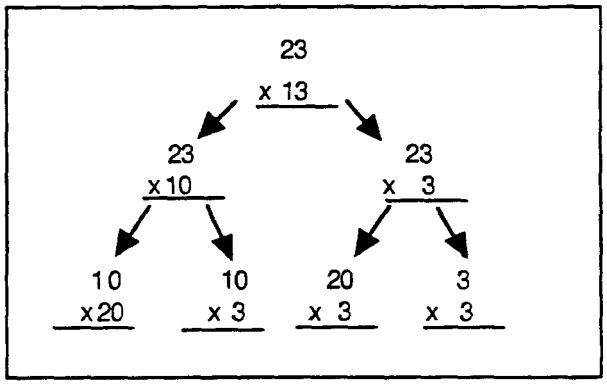
□ = 1 unit (ones) block

   - Ask students how the array might help them solve the problem. (Possible answers include counting all the units to find the product; trading smaller units to make larger units.)
   - Since counting the units would take too much time, tell students the product will be determined by dividing the large array into smaller arrays and then finding the sum of all the areas of the smaller arrays.

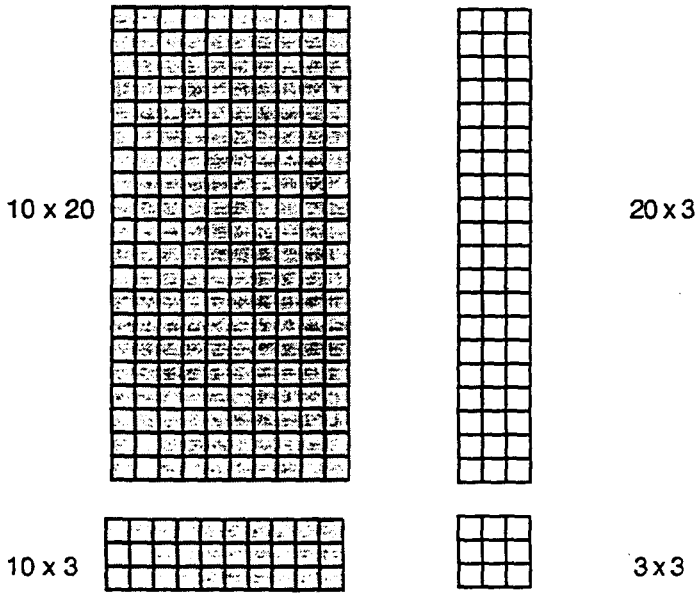
- Tell students the distributive property of multiplication will help determine the size of the smaller arrays.
- Ask students to state the distributive property of multiplication (Mult and Div. Obj. 4). The distributive property says numbers can be broken apart to make them easier to multiply. For example, 6 x 4 can rewritten as 6 x 2 + 6 x 2.
- Ask students how to use the distributive property to rewrite the multiplication problem 23 x 13. Guide them to say 23 x 10 (tens blocks) and 23 x 3 (ones blocks). Write on the board. Make sure they understand and can verbalize why problem is 23 x 10 and not 23 x 1. (The digit 1 is in the tens place, making its value 1 ten or 10.)



- Tell students the distributive property will be used <u>again</u> to break the new multiplication problems (23 x 10 and 23 x 3) into problems that are easier to solve.
- Ask students to rewrite 23 x 10 using the distributive property. Write on board 10 x 20 and 10 x 3.
- Ask students to rewrite 23 x 3 using the distributive property. Write on board 20 x 3 and 3 x 3.



- Ask students how many multiplication problems they have now. (4)
- Instruct students to divide the large array into 4 smaller arrays that match the 4 multiplication problems. Allow students to work with their groups.
- After students finish, have one student rearrange the overhead blocks to make the four smaller arrays. Write the multiplication problem next to the corresponding array.



- Have students use mental math to find the products of the 4 multiplication problems. Write the products on the board.

10	10	20	3
x 20	x 3	x 3	x 3
200	30	60	9

- Ask students how to find the product of the original problem, 23 x 13. (Add together the areas/products of the 4 small arrays.)
- On the board, write

	200
	30
	60
+	9

Find the sum (299) and write it on the board.

	200
	30
	60
+	9
	299

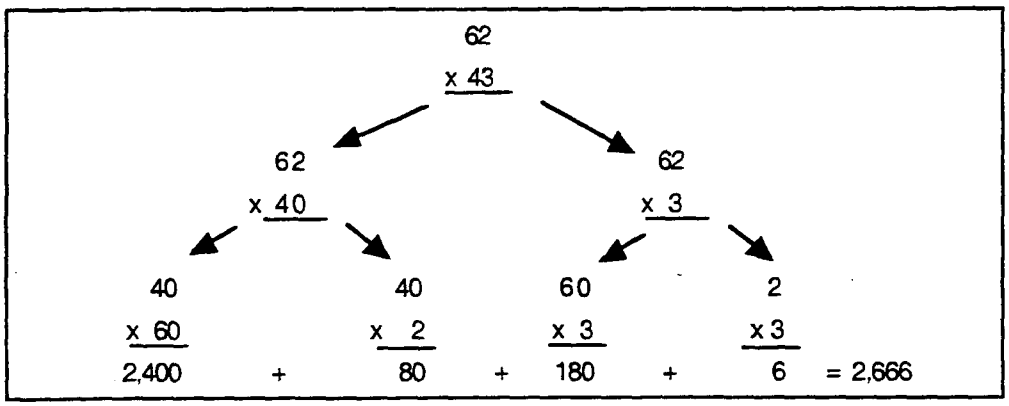
- Review the steps in solving a 2-digit by 2-digit multiplication problem using the base ten blocks.
  a. Build an array.
  b. Use the distributive property to rewrite the problem into 2 new problems.
  c. Use the distributive property to rewrite the 2 new problems into 2 problems each. Now there are 4 problems.
  d. Divide the array into 4 smaller arrays representing the 4 new problems.
  e. Find the area of each new array.
  f. Add together the areas of the 4 small arrays to find the area of the original large array.
- Do another example together. On the board, write 24

  x 12
- Make the array on the overhead as students make the array at their desks.
- Work together to use the distributive property to break the problem into 4 new problems.

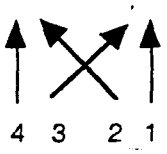
(10 x 20; 10 x 4; 20 x 2; 4 x 2)

- Work together to break the array into the 4 smaller arrays, find the areas of the smaller arrays and add the areas together to find the total area, which is the product of the original problem. (24 x 12)
- Distribute Break Them Up Multiplication. Go over the example. Have students work in groups to complete activity sheet.

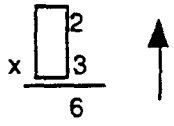
3. Multiply 2-digit numbers by 2-digit numbers without regrouping.
   - On the board, write
     62
     x43
   - Ask students how they could find the product. (Possible answers include building an array and counting the units, dividing the array into 4 smaller arrays and finding the sum of the areas of the arrays, using a calculator, etc.)
   - Ask students to evaluate the possible solutions. Is there always a calculator available? Are there enough base ten materials to make the array? Is there a quicker way to find the product than making an array and breaking it into four smaller arrays? How can the problem be solved with no tools other than paper and pencil?
   - Tell students the first step in solving the problem with just paper and pencil is to estimate the product. Ask them why estimating the product first is important. (To know if answer is reasonable.)
   - Ask a student volunteer to do the estimation on the board.
     62 → 60
     x43 → 40
     2,400
   - Tell students that since the estimated product is 2,400, then the actual product of 62 and 43 will be about 2,400.
   - Ask students if the estimated product is more or less than actual product. (Estimated product is less than actual product because both factors were rounded down.)
   - Ask students to verbalize how the product can be found using the arrays. Remind students that the original multiplication problem/array was broken down into 4 easier-to-solve problems/smaller arrays.
   - Ask students to break down the problem into the 4 easier-to-solve problems. Write the 4 problems on the board. (See diagram below.)
   - Solve the problems with students. Write the answers on the board.
   - Ask students how to find product of 62 and 43. (Add 2,400, 80, 180 and 6) Have students complete the addition. (2,666)



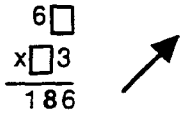
- Refer students back to original estimation. Is 2,666 about 2,400? (Yes) Is 2,666 a reasonable answer? (Yes)
- Leave the above problem on board so students can use it for comparison after the computational method is demonstrated.
- Draw this pattern of arrows on the board. Make sure to place numbers under arrows.



- Tell students that this pattern can be used to make sure the four areas, or small arrays, are computed and added together to find the product.
- On the board, again write the problem 62
  x 43
- Ask students if they can see a pattern involving the original problem and the four easier-to-solve problems. To assist in the connection, use a large index card to cover up the 6 and 4 so only the 2 and 3 show. Ask students what problem is showing. (2 x 3) Ask them the product of 2 x 3 and place product (6) in ones place.



- Use two index cards to cover the 2 and the 4 so only the 6 and the 3 show. Ask students which problem is showing. (6 x 3) Ask them the product of 6 x 3 and place the product (18) in the answer with the 8 in the tens place.



- Use 2 index cards to cover the 6 and the 3 so only the 2 and the 4 show. Ask students which problem is showing. (4 x 2) Ask them the product of 4 x 2 and place the product (8) in the tens place under the 8. Tell students the product must be placed in the tens place since the 4 is in the tens place. The value of the 4 is 40; 40 x 2 = 80. Tell students that since there isn't any number

under the 6, put a 0 there.

$$\begin{array}{r} \square 2 \\ \times\ 4\square \\ \hline 186 \\ 80 \end{array}$$

- Use an index card to cover the 2 and the 3 so only the 6 and the 4 show. Ask students which problem is showing. (4 x 6) Ask them the product of 6 x 4 and place the product (24) in the answer with the 4 directly under the 1.

$$\begin{array}{r} 6\square \\ \times\ 4\square \\ \hline 186 \\ 2480 \end{array}$$

- Tell students that the two partial products (186 and 2480) must be added together to find the product of 62 x 43.

$$\begin{array}{r} 62 \\ \times\ 43 \\ \hline 186 \\ +2480 \\ \hline 2{,}666 \end{array}$$

- Compare the array method of finding the product and the computational problem. Make sure students see the product is the same.
- Do a few more examples (33 x 13; 82 x 21; 51 x 36) on the board. Have the students estimate first. You may have to use the index cards to assist some students in following the pattern. Emphasize the placement of the 0 in the second partial product.
- Distribute Two-Digit Multiplication Practice. Go over the example. Have students complete the activity sheet independently. If students are having difficulty with the pattern, have them use the tips of their fingers to cover up the numbers so they are only seeing 2 numbers at a time.

4. Multiply 2-digit numbers by 2-digit numbers with regrouping.
   - On the board, write $\begin{array}{r} 46 \\ \times 28 \\ \hline \end{array}$
   - Have students estimate the product.

$$\begin{array}{rl} 46 & \rightarrow\ 50 \\ \times 28 & \rightarrow\ 30 \\ \hline & 1{,}500 \end{array}$$

   - Ask students to explain the first step in solving this problem. (Multiply 6 x 8) Ask them the product of 6 x 8. (48) Ask students where we should place the 48. Allow time for students to make suggestions.
   - Tell students that 48 is 8 ones and 4 tens. The 8 should be placed in the ones column and the 4 tens need to be regrouped and placed over the tens column in the original problem.

$$\begin{array}{r} \boxed{4} \\ 56 \\ \times 28 \\ \hline 8 \end{array}$$

- Ask students the next step. (Multiply 8 x 5) Ask students the product of 8 x 5. (40) Tell students the 4 that was placed above the 5 must be added to the product of 8 x 5 before the answer is recorded. Say it as you write on the board: 8 x 5 = 40 + 4 = 44.

$$\begin{array}{r} \boxed{4} \\ 56 \\ \times 28 \\ \hline 448 \end{array}$$

- Tell students we are done with the 4 so we need to mark it off as it has been used. Cross out the 4 that was regrouped so it will not confuse the students.

$$\begin{array}{r} \cancel{4} \\ 56 \\ \times 28 \\ \hline 448 \end{array}$$

- Ask students the next step. (Multiply 6 x 2) Ask students the product of 6 x 2. (12) Remind students that you are really multiplying by 20 since the 2 is in the tens place so the answer must be in the tens place. The 2 should be in the tens column and the 1 should be placed over the crossed-out 4. Remind them to place a **0** under the 8.

$$\begin{array}{r} \boxed{1} \\ \cancel{4} \\ 56 \\ \times 28 \\ \hline 448 \\ 20 \end{array}$$

- Ask students the next step. (Multiply 2 x 5) Ask students the product of 2 x 5. (10) Tell students that the 1 that was placed above the 5 must be added to the product before the answer is recorded. Say it as you write on the board: 2 x 5 = 10 + 1 = 11.

$$\begin{array}{r} \boxed{1} \\ \cancel{4} \\ 56 \\ \times 28 \\ \hline 448 \\ 1120 \end{array}$$

- Ask students the next step. (Add the 2 partial products together to get the answer.) Complete the problem on the board. Remind students to compare the answer to the estimate to check for reasonableness.

$$\begin{array}{r} \boxed{1} \\ \not{5}\not{6} \\ \times 28 \\ \hline 448 \\ +1120 \\ \hline 1{,}568 \end{array}$$

- Do a few more examples (43 x 27; 32 x 19; 85 x 46) on the board. Have students estimate first and compare the estimate to the final answer to check for reasonableness. Make sure students cross out the first number that is placed over the tens column so they will not get it confused with the second number. Continue to check for the placement of the 0 in the second partial product.
- Distribute More Two-Digit Multiplication Practice. Go over the example. Have students complete the activity sheet independently.
- Practicing Multiplication Skills, Find the Missing Digit and Write-a-Problem are included for further practice.

Name

Name _____

ESTIMATING PRODUCTS PRACTICE

Round each **factor** to the **nearest ten**. Then **estimate** the **product**.

Example: 46 → 50
x 31 → 30
1,500

1. 74 →
   x 52 →

2. 68 →
   x 29 →

3. 12 →
   x 35 →

4. 46 →
   x 8 →

5. 89 →
   x 58 →

6. 83 →
   x 41 →

7. 76 →
   x 23 →

8. 57 →
   x 44 →

9. 64 →
   x 61 →

10. There are <u>about</u> **27** students in each class at Kennedy Middle School.

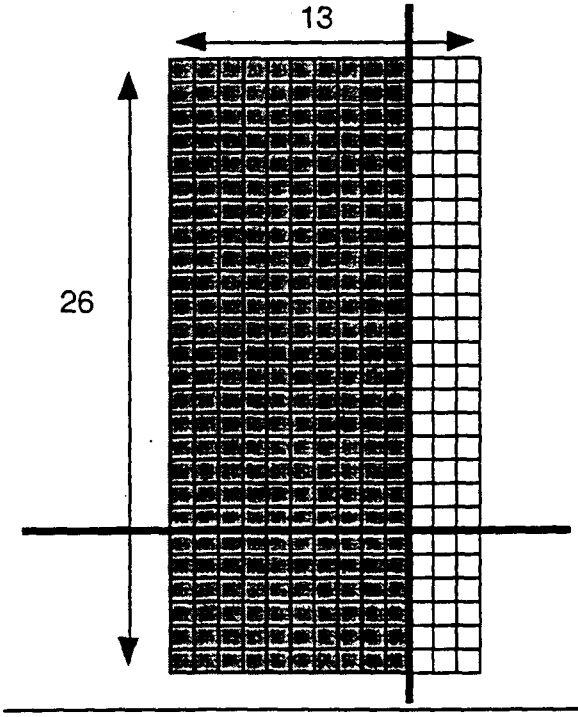
There are **49** classroom teachers. **Estimate** the number of students in the school.

Name _____

Break Them Up Multiplication

1. Use the arrays to solve the multiplication problem.
2. Rewrite the multiplication problem using the distributive property.
3. Use lines to divide the array into four smaller arrays.
4. Find the area of each smaller array.
5. Add the smaller arrays to find the area of the original array.

EXAMPLE:



26
x 13

26
x 10

26
x 3

10
x 20

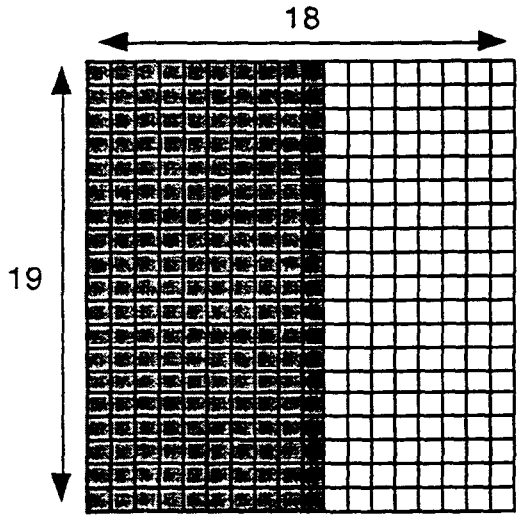
10
x 6

20
x 3

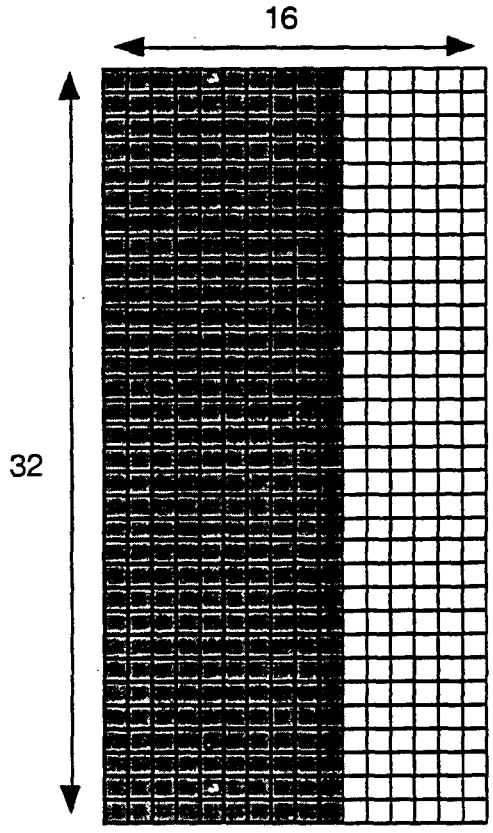
6
x 3

200 + 60 + 60 + 18 = 338

1.



2.



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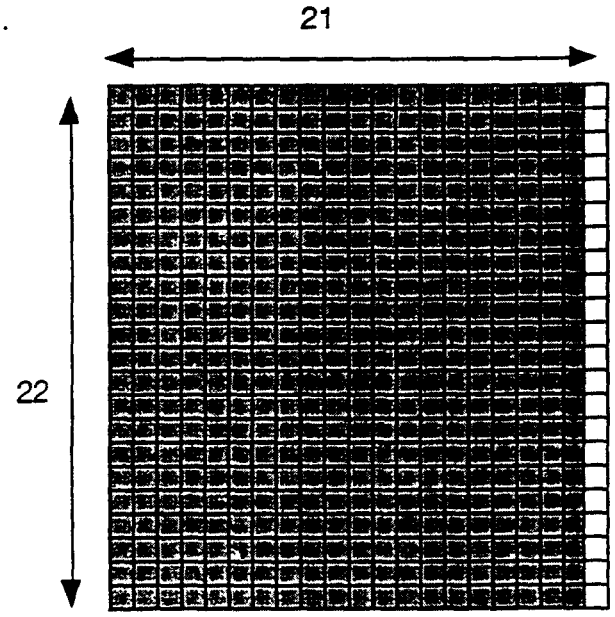


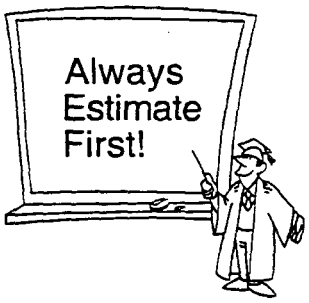
Name _____

Two-Digit Multiplication Practice

Estimate, then **solve**.

Example:

41 → 40
x 71 → x 70
41 2,800
+ 2870
2,911



1. 71 →
x 71 →
□□
+□□□ —
□□
□□
□□□□

2. 42 →
x 43 →
□□
+□□□ —

3. 36 →
x 21 →

4. 94 →
x 22 →

5. 81 →
x 72 →

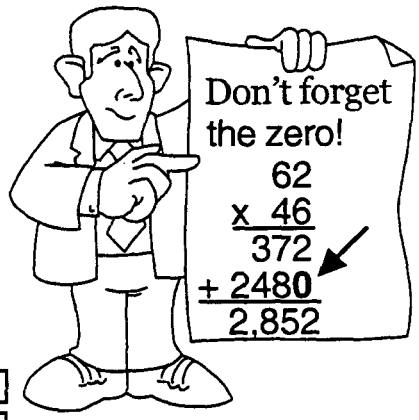
6. 53 →
x 33 →

Name _____

More Two-Digit Multiplication Practice

Estimate, then **solve**.

4
4
38 → 40
x 62 → x 60
76 2,400
+ 2280
2,356



1. 24 → □□
x 56 → □□
□□□ □□□□
+□□□ __
__

2. 47 →
x 34 →
□□□
+□□□ __
__

3. 66 →
x 37 →

4. 87 →
x 43 →

5. 49 →
x 24 →

6. 73 →
x 65 →

7. $\begin{array}{r} 76 \\ \times\ 48 \\ \hline \end{array}$

8. $\begin{array}{r} 25 \\ \times\ 69 \\ \hline \end{array}$

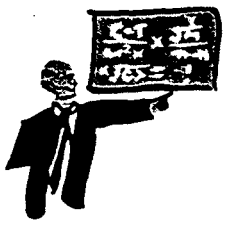
9. If there are **12** rosebushes in each row of a garden, how many rosebushes are in **25** rows?

10. Mrs. Rams has **28** students in her reading class. If each student reads **15** books a year, how many **total books** does the class read?

11. Rosa's father is going on a trip. The gas tank in his car holds **19** gallons. The car can travel **22** miles on one gallon of gas. **Estimate** how far Rosa's father can travel using one tank of gas.

Name _____

Practicing Multiplication Skills



Estimate, then **solve**.

1) 51 x 24

2) 44 x 22

3) 81 x 34

4) 57 x 23

5) 67 x 38

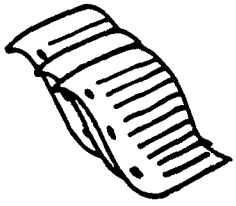
6) 49 x 34

7) 46 x 61

8) 75 x 25

9) 94 x 45

10) There are **29** students in Roberto's class. Each student puts **14 pieces** of paper in a box on the table. How many pieces of paper are in the box?



11) Each school can have about **68** students in the summer program. There are **17** schools. **About** how many students can be in the summer program?

12) David's soccer team is selling candy bars. If each of the **14** boys on the team sells **28** candy bars, how many candy bars will the team sell?

14) The movie theater has **35** rows of seats. Each row has **16** seats. What is the total number of seats in the movie theater?

Estimate the products. Then **compare** the products. Use **<** or **>.**

Example: 93 x 42 **(<)** 64 x 78

90 x 40 < 60 x 80

3600 < 4800

15) 37 x 81 ◯ 52 x 41

16) 45 x 66 ◯ 78 x 39

17) 44 x 93 ◯ 58 x 84

18) 74 x 34 ◯ 63 x 28

Name _____

Find the Missing Digit

Fill in the missing digit to complete each problem.

1)
$$\begin{array}{r} \square 0 \\ \times\ 3\square \\ \hline 1{,}800 \end{array}$$

2)
$$\begin{array}{r} 6\square \\ \times\ 70 \\ \hline \square{,}\square 0\square \end{array}$$

3)
$$\begin{array}{r} \square\square \\ \times\ 8\square \\ \hline 7{,}200 \end{array}$$

4)
$$\begin{array}{r} 33 \\ \times\ 2\square \\ \hline 66 \\ +\ 6\square\square \\ \hline 726 \end{array}$$

5)
$$\begin{array}{r} \square 7 \\ \times\ 42 \\ \hline 74 \\ +\square 28\square \\ \hline 1{,}3\square\square \end{array}$$

6)
$$\begin{array}{r} 24 \\ \times\ 5\square \\ \hline 144 \\ +\ 1\square 0\square \\ \hline 1{,}3\square\square \end{array}$$

7)
$$\begin{array}{r} 62 \\ \times\ \square 9 \\ \hline \square 58 \\ +\square\square 0\square \\ \hline \square{,}6\square\square \end{array}$$

8)
$$\begin{array}{r} \square\square \\ \times\ 71 \\ \hline 84 \\ +\square 8\square\square \\ \hline 5{,}\square 6\square \end{array}$$

9)
$$\begin{array}{r} \square 8 \\ \times\ 45 \\ \hline \square 9\square \\ +\ 31\square\square \\ \hline 3{,}\square 10 \end{array}$$

Name _____

Write-a-Problem

1. Write a multiplication word problem that uses estimation. Use two-digit numbers. Label and circle your answer.

2. Using the numbers 55 and 22, make up a multiplication word problem. Label and circle your answer.

Answer Key
Mult. and Div. - Obj.7

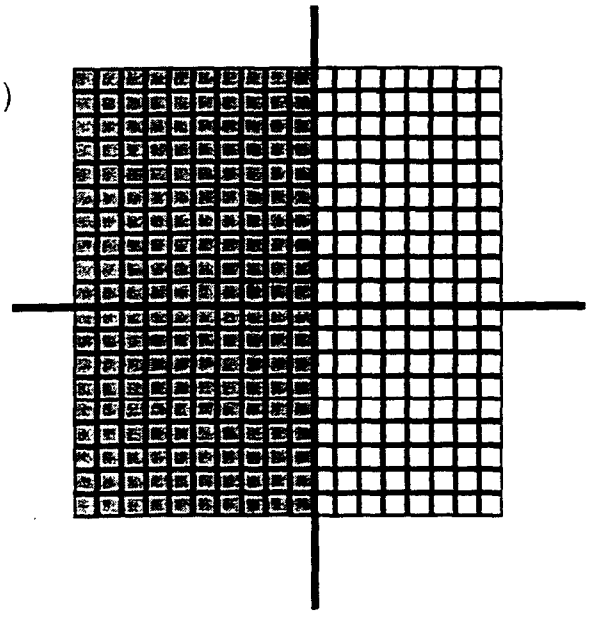
Estimating Products Practice

1) 70 x 50 = 3,500	2) 70 x 30 = 2,100	3. 10 x 40 = 400
4) 50 x 10 = 500	5) 90 x 60 = 5,400	6) 80 x 40 = 3,200
7) 80 x 20 = 1,600	8) 60 x 40 = 2,400	9) 60 x 60 = 3,600

10) 30 x 50 = 1,500 students

Break Them Up Multiplication

1)



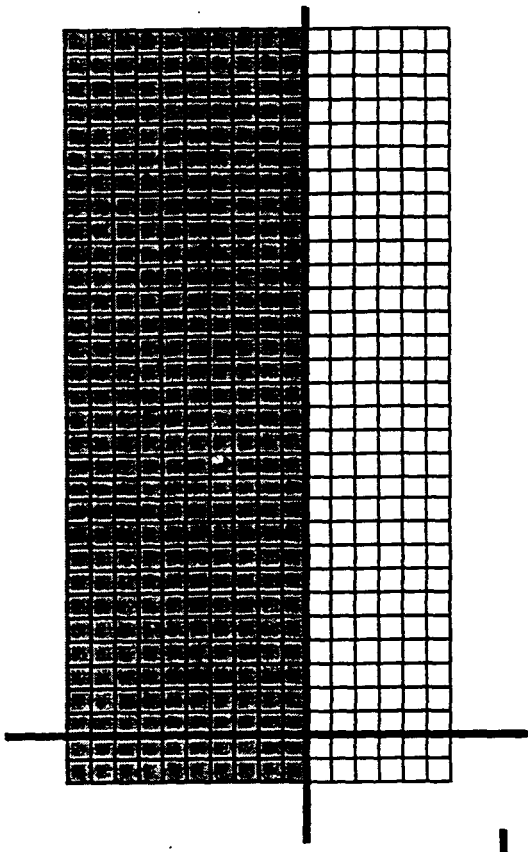
19
x 18

19 x10 → 10 x10 = 100; 10 x9 = 90

19 x8 → 10 x8 = 80; 9 x8 = 72

100 + 90 + 80 + 72 = 342

2)



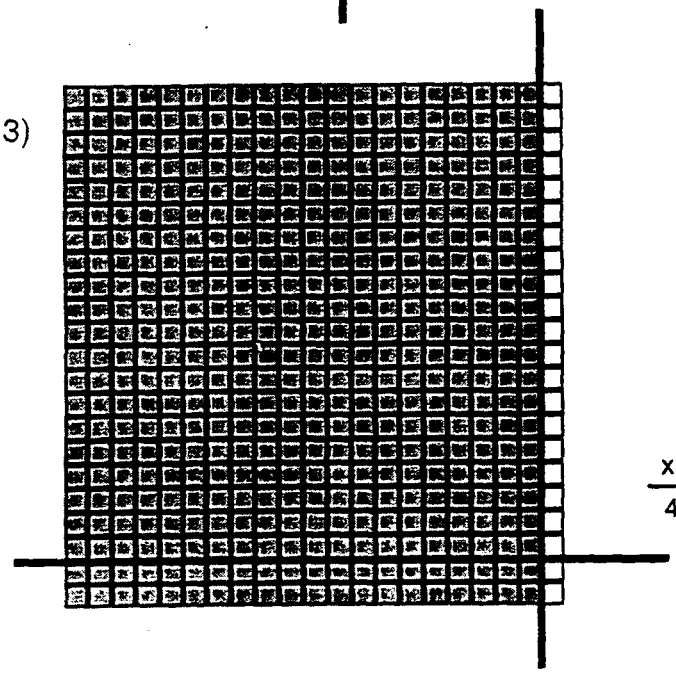
32
x 16

32 | 32
x 10 | x 6

30 | 10 | 30 | 2
x 10 | x 2 | x 6 | x 6

300 + 20 + 180 + 12 = 512

3)



22
x 21

22 | 22
x 20 | x 1

20 | 20 | 20 | 2
x 20 | x 2 | x 1 | x 1

400 + 40 + 20 + 2 = 462

Two-Digit Multiplication Practice

1) 71 → 70
x 71 → 70
71 4,900
4970
5,041

2) 42 → 40
x43 → 40
126 1,600
1680
1,806

3) 36 → 40
x 21 → 20
36 800
720
756

4) 94 → 90
x22 → 20
188 1,800
1880
2,068

5) 81 → 80
x72 → 70
162 5,600
5670
5,832

6) 53 → 50
x33 → 30
159 1,500
1590
1,749

More Two-Digit Multiplication Practice

1) 24 → 20
x56 → x60
144 1,200
1200
1,344

2) 47 → 50
x34 → 30
188 1,500
1410
1,598

3) 66 → 70
x37 → 40
462 2,800
1980
2,442

4) 87 → 90
x43 → 40
261 3,600
3480
3,741

5) 49 → 50
x 24 → 20
196 1,000
980
1,176

6) 73 → 70
x65 → 70
365 4,900
4380
4,745

7) 76 → 80
x48 → 50
608 4,000
3040
3,648

8) 25 → 30
x69 → 70
225 2,100
1500
1,725

9) 300 rosebushes

10) 420 books

11) 20 x 20 = 400 miles

Practicing Multiplication Skills

	Answer	Estimate		Answer	Estimate		Answer	Estimate
1)	1,224	1,000	2)	968	800	3)	2,754	2,400
4)	1,311	1,200	5)	2,564	2,800	6)	1,666	1,500
7)	2,806	3,000	8)	1,875	2,400	9)	4,230	4,500

10) 406 pieces of paper

11) 70 x 70 = 1,400 students

12) 392 candy bars

13) 560 seats

15) 40 x 80 > 50 x 40
3200 > 2000

16) 50 x 70 > 80 x 40
3500 > 3200

17) 40 x 90 < 60 x 80
3600 < 4800

18) 70 x 30 > 60 x 30
2100 > 1800

Find the Missing Digit

1) [6] 0
x 3 [0]
1,8 0 0

2) 6 [0]
x 7 0
4, [2] 0 [0]

3) [9] [0]
x 8 [0]
7, 2 0 0

4)
$$\begin{array}{r} 33 \\ \times\ 2\boxed{2} \\ \hline 66 \\ +6\boxed{6}\boxed{0} \\ \hline 726 \end{array}$$

5)
$$\begin{array}{r} \boxed{3}7 \\ \times\ 42 \\ \hline 74 \\ +\boxed{1}48\boxed{0} \\ \hline 1{,}5\boxed{5}\boxed{4} \end{array}$$

6)
$$\begin{array}{r} 24 \\ \times\ 5\boxed{6} \\ \hline 144 \\ +\ 1\boxed{2}0\boxed{0} \\ \hline 1{,}3\boxed{4}\boxed{4} \end{array}$$

7)
$$\begin{array}{r} 62 \\ \times\ \boxed{5}9 \\ \hline \boxed{5}58 \\ +\boxed{3}\boxed{1}0\boxed{0} \\ \hline \boxed{3},6\boxed{5}\boxed{8} \end{array}$$

8)
$$\begin{array}{r} \boxed{8}\boxed{4} \\ \times\ 71 \\ \hline 84 \\ +\boxed{5}\boxed{8}8\boxed{0} \\ \hline 5,\boxed{9}64 \end{array}$$

9)
$$\begin{array}{r} \boxed{7}8 \\ \times\ 45 \\ \hline \boxed{3}9\boxed{0} \\ +\ 3\ 1\boxed{2}\boxed{0} \\ \hline 3,\boxed{5}10 \end{array}$$

Objective 8: Estimate and multiply 3-digit numbers by 2-digit numbers.

Vocabulary

horizontal
vertical
round
estimate
column

Materials

graph paper (optional)

Transparencies:

Multiplication/Columns - Problem 1
Multiplication/Columns - Problem 2

Student Copies:

Estimation Practice
Stay in Line
Name That Product
Multiplication Puzzle

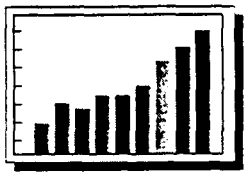
Language Foundation

1. Review vocabulary previously learned in Obj.7.

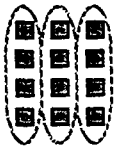
2. Remind students that **column** is a word that has several meanings in English. It usually refers to an object with a vertical orientation.

- A column is a part of a building.

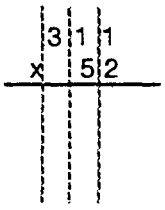
- A graph has columns.



- An array has columns.



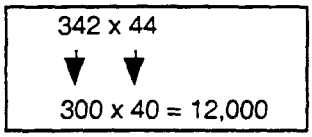
When multiplying 3-digit numbers by 2-digit numbers, it is important to keep the numbers in the problem lined up in columns to avoid errors when adding up partial products.



Mathematics Component

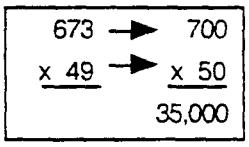
Note: Students should have extensive practice multiplying 2-digit numbers by 2-digit numbers before moving on to 3-digit numbers. If the easier skill is mastered, then extending the skill with larger numbers should be less difficult for the students.

1. Estimate products.
   - Review multiplying with zeros.
   - Ask students to mentally solve a few problems. Write problems on the board. (50 x 70, 80 x 70, 300 x 20, 600 x 40, 900 x 20, etc.) Make sure some problems have 3-digit numbers in them. Ask students to give answers and write responses on the board.
   - Write 342 x 44 on the board in horizontal format. Tell students mental math shortcuts will be used to estimate the product of these two numbers.
   - Ask students to round 342 to the nearest hundred. (300) Write 300 on the board.
   - Ask students to round 44 to the nearest ten. (40) Write 40 on the board.
   - Ask students what 300 x 40 equals. (12,000) Write 12,000 on the board.
   - Tell students the estimated product of 342 and 44 is 12,000.



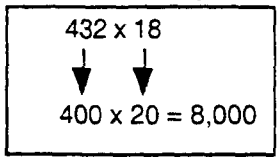
   - Ask students if the estimated answer will be more or less than the actual answer. (Less)
   - Ask students to explain why. (Both factors were rounded down so the estimated answer will be less than the actual answer.)

   - Write 673 x 49 on the board in vertical format. Ask students to estimate the product.
   - Ask students to round 673 to the nearest hundred. (700) Write 700 on the board.
   - Ask students to round 49 to the nearest ten. (50) Write 50 on the board.
   - Ask students what 700 x 50 equals. (35,000) Write 35,000 on the board.
   - Tell students the estimated product of 700 and 50 is 35,000.



   - Ask students if the estimated product is more or less than the actual product. (More)
   - Ask students to explain why. (Both factors were rounded up so the estimated answer will be more than the actual answer.)

   - Write 432 x 18 on the board in horizontal format. Ask students to estimate the product.
   - Ask students to explain the first step. (Round 432 to 400) Write 400 on the board.
   - Ask students to explain the next step. (Round 18 to 20) Write 20 on the board.
   - Ask students to explain the final step. (Multiply 400 x 20 to find the estimated product of 8,000) Write 8,000 on the board.



- Ask students if the estimated product is more or less than the actual answer. (Less) This question might be difficult for students since one factor is rounded down and one factor is rounded up. Remind them to look at the amount each factor was rounded either up or down. (400 is 32 less than 432; 20 is only 2 more than 18 so the amount rounded down is more than amount rounded up. Therefore, the estimated sum is less than the actual answer.)
- Do a few more examples with the students. (658 x 46; 834 x 67; 324 x 51; etc.) Make sure you use both vertical and horizontal formats. Have students verbalize as they complete each step.
- Distribute Estimation Practice. Go over the example with the students. Have them complete the activity page.

2. Multiply 3-digit numbers by 2-digit numbers.
   - Display the overhead transparency, Multiplication/Columns - Problem 1
   - Ask students what should be the first step in solving this problem. (Estimate the product.)
   - Ask students why estimating the product first is important. (To know if answer is reasonable.)
   - Ask a student volunteer to do the estimation on the transparency.

	3	2	1	→	300
x		4	2	→	40
					12,000

   - Tell students that since the estimated product is 12,000, then the actual product will be about 12,000.
   - Ask students if the estimated product is less or more than the actual product. (Estimated product is less than the actual product since both factors are rounded down.)
   - Tell students that multiplying a 3-digit number by a 2-digit number is the same as multiplying a 2-digit number by a 2-digit number, only one step is added since there is one additional digit in the first factor. To help keep the columns straight, thin lines are placed between each place value column. Tell students that keeping the columns straight is the key to solving the problem correctly.
   - Ask students what the first step is. (Multiply 2 x1; the product is 2. Place the 2 in the ones column.) Write 2 on the transparency.

	3	2	1
x		4	2
			2

   - Ask the students the next step. (Multiply 2 x 2; the product is 4. Place the 4 in the tens column.) Write 4 on the transparency.

	3	2	1
x		4	2
		4	2

   - Ask students the next step. (Multiply 2 x 3; the product is 6. Place the 6 in the hundreds column.)

Write 6 on the transparency.

		3	2	1
x			4	2
		6	4	2

- Ask students the next step. (Multiply 4 x 1; the product is 4. Place the 4 in the tens column. Put a 0 in the ones column.) Write 4 and 0 on the transparency.

		3	2	1
x			4	2
		6	4	2
			4	**0**

- Ask students the next step. (Multiply 4 x 2; the product is 8. Place the 8 in the hundreds place.) Write 8 on the transparency.

		3	2	1
x			4	2
		6	4	2
	8	4	0	

- Ask students the next step. (Multiply 4 x 3; the product is 12. Place the 2 in the hundreds place and the 1 in the thousands place.) Write 12 on the transparency.

			3	2	1
	x			4	2
			6	4	2
1	**2**	8	4	0	

- Ask students the next step. (Add 642 and 12,840 to find the final product. Product is 13,482) Write 13,482 on the transparency.

			3	2	1
		x		4	2
			6	4	2
+	1	2	8	4	0
1	**3,**	**4**	**8**	**2**	

- Ask students to compare estimated answer (12,000) to actual answer (13,482). Is it reasonable? (Yes) Some students may think that since there is almost a 1,500 difference between the estimated answer and the exact answer that the answer isn't reasonable. Remind them that the 3-digit number is rounded to the nearest hundred which makes for an estimation that is not as close. Tell them that the larger the number, the less accurate the estimation is going to be when the number is rounded to the largest place in that number.
- Display the transparency, Multiplication/Columns - Problem 2
- Ask students the first step. (Estimate)
- Have a student volunteer do the estimation on the transparency.

	4	7	3	→ 500
x		5	6	→ 60
				30,000

- Tell students that since the estimated product is 30,000, then the actual product will be about 30,000.
- Ask students if the estimated product is less or more than the actual product. (Estimated product is more than the actual product since both factors are rounded up.)
- Ask students why the lines are placed between the columns. (Helps keep the columns straight and the place value correct.)
- Ask students the first step in solving the problem. (Multiply 6 x 3; the product is 18. Place the 8 in the ones column and regroup the 1 over the tens column.) Say as you write on the transparency: 6 x 3 = 18. Put the 8 in the ones column and regroup the 1 by placing it over the tens column.

		1	
	4	7	3
x		5	6
			8

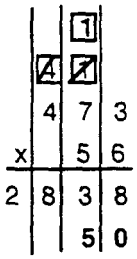
- Ask students what the next step is. (Multiply 6 x 7; the product is 42. Add the 1 to the product; now you have 43. Place the 3 in the tens column and regroup the 4 over the hundreds column.) It is important to cross out the 1 after it has been added to the product. Students may forget this important step. Failure to cross out the already regrouped number will lead to confusion when another number is regrouped in the next step. Say as you write on the transparency: 6 x 7 = 42 + 1 = 43. Cross out the 1. Put the 3 in the tens column and regroup the 4 by placing it over hundreds column.

	4	~~1~~	
	4	7	3
x		5	6
		3	8

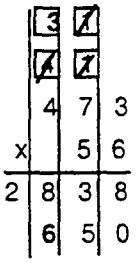
- Ask students what the next step is. (Multiply 6 x 4; the product is 24. Add the 4 to the product; now you have 28. Cross out the 4. Place the 8 in the hundreds column and the 2 in the thousands column.) Say as you write on the transparency: 6 x 4 = 24 + 4 = 28. Cross out the 4. Put 28 in the answer, with the 8 in the hundreds column and the 2 in the thousands column.

	~~4~~	~~1~~		
		4	7	3
x			5	6
2	8	3		8

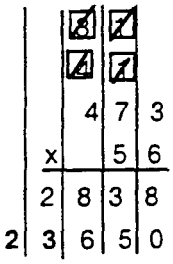
- Ask students the next step. (Multiply 5 x 3; the product is 15. Place the 5 in the tens column and regroup the 1 over the tens column. Put a 0 in the ones column.) Say as you write on the transparency: 5 x 3 = 15. Put the 5 in the tens column and regroup the 1 by placing it over the tens column. Put a 0 in the ones column.



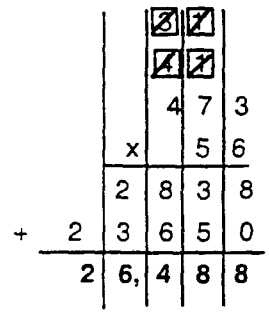
- Ask students the next step. (Multiply 5 x 7; the product is 35. Add the 1 that was regrouped; now the total is 36. Cross out the 1. Place the 6 in the hundreds column and regroup the 3 by placing it over the hundreds column.) Say as you write on the transparency: 5 x 7 = 35 + 1 = 36. Cross out the 1. Put the 6 in the hundreds column and regroup the 3 by placing it over the hundreds column.



- Ask students the next step. (Multiply 5 x 4; the product is 20. Add the 3 that was regrouped; now the total is 23. Cross out the 3. Place the 3 in the thousands place and the 2 in the ten thousands place.) Say as you write on the transparency: 5 x 4 = 20 + 3 = 23. Cross out the 3. Put the 23 in the answer, with the 3 in the thousands place and the 2 in the ten thousands place.



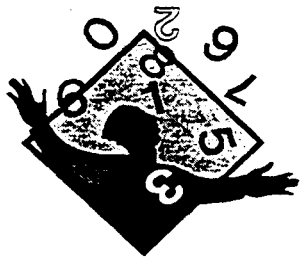
- Ask students the next step. (Add 2,838 and 23,650 to get the final answer.) Work the addition problem out loud as you write on the transparency the final answer of 26,488.



- Ask students to compare estimated answer (30,000) to actual answer (26,488). Is the estimate reasonable? (Yes) Why? (Estimated answer should be more than actual answer since both factors were rounded up before estimate was made.)
- Do a few more examples (693 x 26; 844 x 52; 738 x 46) with the students. The product should be estimated first and the estimation compared to the final product to check for reasonableness. Make sure the numbers stay aligned in the proper columns. You may need to draw lines to separate the different place values or do some of the examples on the overhead using graph paper to keep the numbers lined up.
- Distribute Stay in Line. Go over the example with students. Have students complete the activity sheet.
- Monitor students' work for these common errors:
    a. numbers not lined up
    b. no placement of 0 in the ones place of the second partial product
    c. not adding the regrouped numbers
    d. not crossing off the regrouped numbers after using them
- Distribute Name That Product. Go over the first problem with students. Have students complete the activity page. If students are having difficulty keeping the columns straight, have them work the problems on graph paper.
- Multiplication Puzzle is included for further practice. Again, if students are having difficulty keeping the columns straight, have them work the problems on graph paper.

Name_____

Estimation Practice



Use **mental math** to choose the **best** estimate.
Circle **a**, **b**, or **c**.

1.	839 x 46	a. 4,000	b. 40,000	c. 45,000
2.	452 x 67	a. 35,000	b. 24,000	c. 28,000
3.	134 x 52	a. 10,000	b. 500	c. 5,000
4.	773 x 26	a. 16,000	b. 24,000	c. 32,000
5.	249 x 38	a. 1,200	b. 600	c. 8,000

Estimate to **compare**. Use < or >.

6. 376 x 44 ◯ 18,000

7. 564 x 31 ◯ 15,000

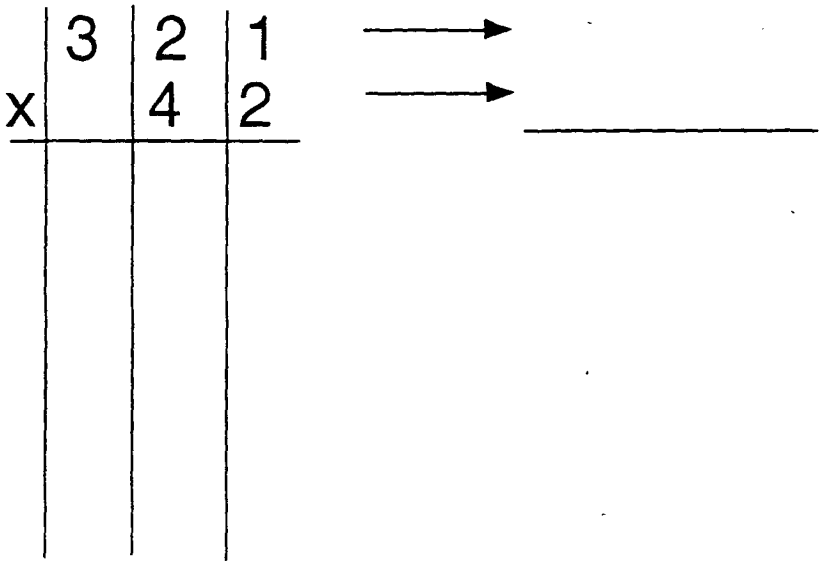
8. 138 x 26 ◯ 4,000

9. 762 x 59 ◯ 42,000

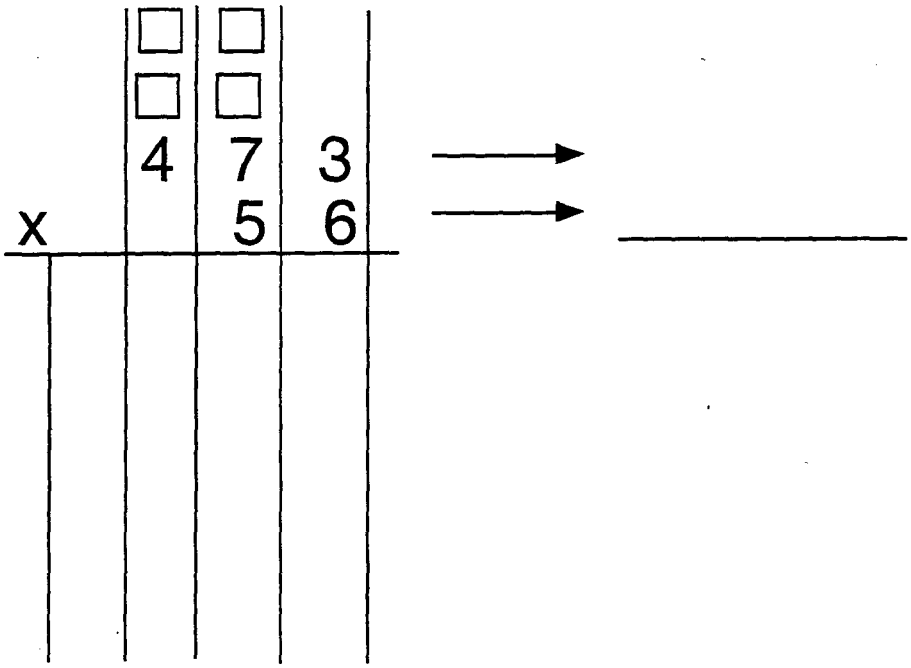
10. The school cafeteria has **142** boxes of cookies. Each box holds **24**

cookies. **About** how many cookies does the cafeteria have?

Multiplication/Columns - Problem 1

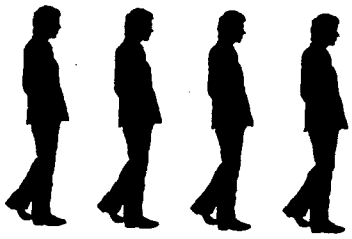


Multiplication/Columns - Problem 2



Name _____

Stay in Line



EXAMPLE

	3	2		
	~~6~~	~~4~~		
	1	7	6 →	200
x	4	8 →		50
1	4	0	8	10,000
+7	0	4	0	
8,	4	4	8	

Estimate, then **solve**.

1)

	3	8	1 →
x		4	2 →
+			

2)

	6	4	5 →
x		3	3 →
+			

3)

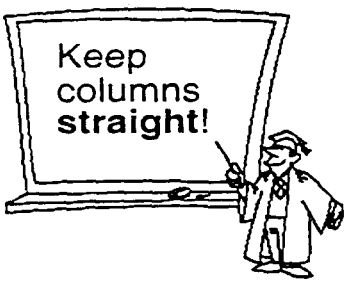
	4	8	6 →
x		5	7 →
+			

4)

	7	3	4 →
x		2	9 →
+			

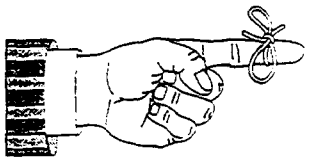
Name _____

Name That Product



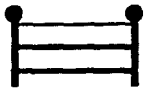
Estimate, then **solve**.

1) 416 x 78	**2)** 635 x 44
3) 270 x 65	**4)** 914 x 57
5) 479 x 83	**6)** 827 x 39



Remember to **label** your answer!

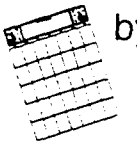
7) Mrs. Chavez is buying sections of fencing so she can fence her yard. Each section of fencing is **12** feet long. Mrs. Chavez buys **110** sections. How many <u>feet</u> of fencing does she buy?



8) There are **36** inches in a yard. How many <u>inches</u> are there in **245** yards?

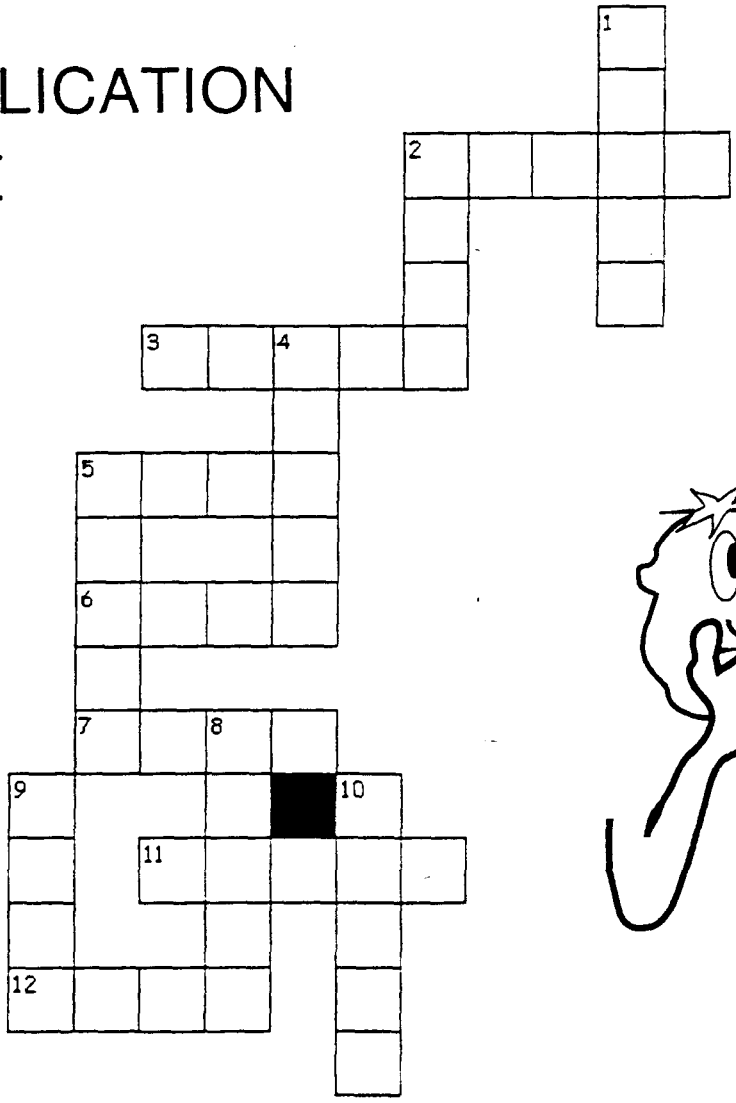
9) An airplane travels **625** miles an hour. How many <u>miles</u> will the plane travel in **47** hours?

10) How many **days** old are you? Multiply your **age** (in years) by **365** (number of days in a year).



Name _____

MULTIPLICATION PUZZLE



Solve each problem.
Put the answer in the puzzle.

Across →

2. 389 x 66
3. 147 x 92
5. 49 x 36
6. 98 x 55
7. 183 x 27
11. 326 x 44
12. 176 x 49

Down ↓

1. 631 x 63
2. 122 x 22
4. 652 x 85
5. 268 x 43
8. 687 x 72
9. 54 x 42
10. 859 x 63

Answer Key
Mult. and Div. - Obj. 8

Estimation Practice

1) 800 x 50 = 40,000 (c)
2) 500 x 70 =35,000 (a)
3) 100 x 50 = 5,000 (c)
4) 800 x 30 = 24,000 (b)
5) 200 x 40 = 8,000 (c)
6) 400 x 40 < 18,000
   16,000 < 18,000
7) 600 x 30 > 15,000
   18,000 > 15,000
8) 100 x 30 < 4,000
   3,000 < 4,000
9) 800 x 60 > 42,000
   48,000 > 42,000
10) 100 x 20 = 2,000 cookies

Stay in Line

1)
```
  3
  1
  381  →  400
x 42   →   40
 762       16,000
15240
16,002
```

2)
```
 1 1
 1 1
  645  →  600
x 33   →   30
 1935      18,000
19350
21,285
```

3)
```
 4 3
 6 4
  486  →  500
x 57   →   60
 3402      30,000
24300
27,702
```

4)
```
 3 3
  734  →  700
x 29   →   30
 6606      21,000
14680
21,286
```

Name That Product

	Answer	Estimate
1)	32,448	32,000
3)	17,550	21,000
5)	39,757	40,000
7)	1,320 feet	
9)	29,375 miles	

	Answer	Estimate
2)	27,940	24,000
4)	52,098	54,000
6)	32,253	32,000
8)	8,820 inches	
10)	answers will vary	

Multiplication Puzzle

Across

2) 25674
3) 13524
5) 1764
6) 5390
7) 4941
11) 14344
12) 8624

Down

1) 39753
2) 2684
4) 55420
5) 11524
8) 49464
9) 2268
10) 54117

Objective 9: Multiply whole numbers with 3 digits in each factor.

Vocabulary

round trip

Language Foundation

1. Students should be familiar with all the vocabulary in this lesson.

Materials

graph paper (optional)
index cards or small tiles

Transparencies:

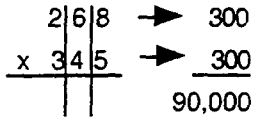
Multiplying Large Numbers
Multiplication Madness

Student Copies:

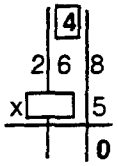
Multiplication Madness
Solve That Problem

Mathematics Component

1. Multiply 3-digit numbers by 3-digit numbers.
   - Display the overhead transparency, Multiplying Large Numbers.
   - Tell students multiplication of a 3-digit number by a 3-digit number is an extension of multiplying a 3-digit number by a 2-digit number. The process is the same but an extra step is added.
   - Ask students the first step. (Estimation)
   - Ask students why estimation is important. (To check for reasonableness)
   - Ask students to round 268 to the nearest hundred. (300) Write 300 on the transparency,
   - Ask students to round 345 to the nearest hundred. (300) Write 300 on the transparency.
   - Ask students to estimate the product of 300 and 300. (90,000) Write 90,000 on the transparency.

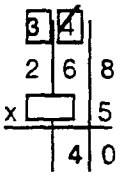


   - Tell students that the estimated product of 268 and 345 is 90,000. The estimate for a 3-digit number multiplied by a 3-digit number will not be extremely close to the actual answer since the rounding is to the largest place value (hundreds). However, the estimated answer is still important as it indicates the number of digits in the actual answer.
   - Tell students that the actual product will have 5 digits in the answer. Tell students that since the actual product is a large number, it will be extremely important to keep the columns straight.
   - Cover the 3 and the 4 in the second factor with a small piece of index card or a small tile.
   - Ask students what the first step is. (Multiply 5 x 8; the product is 40. Place the 0 in the ones column and regroup the 4 by placing it over the tens column.) As you write on the transparency say, "5 x 8 = 40. Put the 0 in the ones column and regroup the 4 by placing it over the tens column."

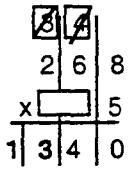


You are multiplying by 5 ones - the answer must start in the ones column.

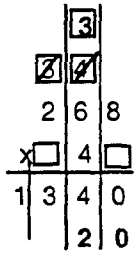
   - Ask students the next step. (Multiply 5 x 6; the product is 30. Add the 4 to the product; now the total is 34. Cross out the 4. Place the 4 in the tens column and regroup the 3 by placing it over the hundreds column.) Say as you write on the transparency, "5 x 6 = 30 + 4 = 34. Cross out the 4. Put the 4 in the tens column and regroup the 3 by placing it over the hundreds column."



- Ask students the next step. (Multiply 5 x 2; the product is 10. Add the 3 that was regrouped; the total is 13. Cross out the 3. Place the 3 in the hundreds column and the 1 in the thousands column.) Say as you write on the transparency, "5 x 2 = 10 + 3 = 13. Cross out the 3. Put the 3 in the hundreds column and the 1 in the thousands column."

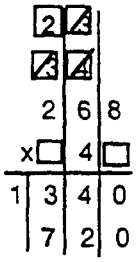


- Cover the 3 and 5 in the second factor with small pieces of index cards or small tiles.
- Ask students the next step. (Multiply 4 x 8; product is 32. Place the 2 in the tens column and regroup the 3 over the tens column.) Ask students what number goes in the ones column. (0) Say as you write on the transparency, "4 x 8 = 32. Put the 2 in the tens column and regroup the 3 over the tens column. Place a 0 in the ones column. "

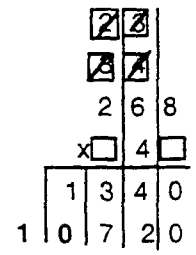


You are multiplying by 4 tens -
the answer must start in the tens column

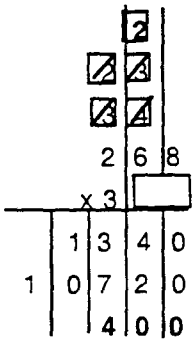
- Ask students the next step. (Multiply 4 x 6; the product is 24. Add the 3 that was regrouped; now the total is 27. Cross out the 3. Place the 7 in the hundreds column and regroup the 2 in the hundreds column.) Say as you write on the transparency, "4 x 6= 24 + 3 = 27. Cross out the 3. Put the 7 in the hundreds column and regroup the 2 over the hundreds column."



- Ask students the next step. (Multiply 4 x 2; the product is 8. Add the 2 that was regrouped; now the total is 10. Cross out the 2. Place the 0 in the thousands column and the 1 in the ten thousands column.) Say as you write on the transparency, "4 x 5 = 20 + 2 = 22. Cross out the 2. Put the 0 in the thousands place and the 1 in the ten thousands place."

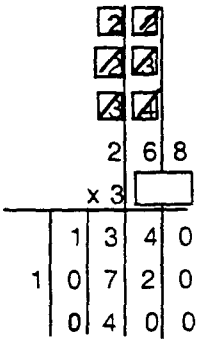


- Cover the 4 and the 5 in the second factor with small pieces of index cards or small tiles.
- Ask students what the next step is. (Multiply 3 x 8; the product is 24. Place the 4 in the hundreds column and regroup the 2 over the tens column. Put a 0 in both the ones column and the tens column.) Say as you write on the transparency, "3 x 8 = 24. Put the 4 in the hundreds column and regroup the 2 by placing it over the tens column. Put a 0 in both the ones column and the tens column."

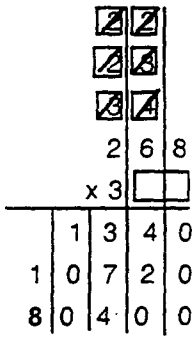


You are multiplying by 3 hundreds - the answer must start in the hundreds column.

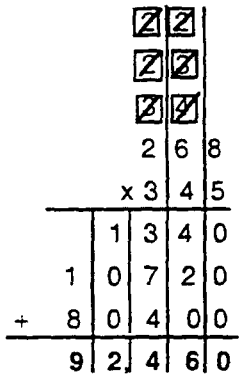
- Ask students what the next step is. (Multiply 3 x 6; the product is 18. Add the 2 that was regrouped; now the total is 20. Cross out the 2. Place the 0 in the thousands column and regroup the 2 over the hundreds column.) Say as you write on the transparency, "3 x 6 = 18 + 2 = 20. Cross out the 2. Put the 0 in the thousands column and regroup the 2 by placing it over the hundreds column."



- Ask students what the next step is. (Multiply 3 x 2; the product is 6. Add the 2 that was regrouped; the total is 8. Place the 8 in the ten thousands column.) Say as you write on the transparency, "3 x 2 = 6 + 2 = 8. Cross out the 2. Put the 8 in the ten thousands column."

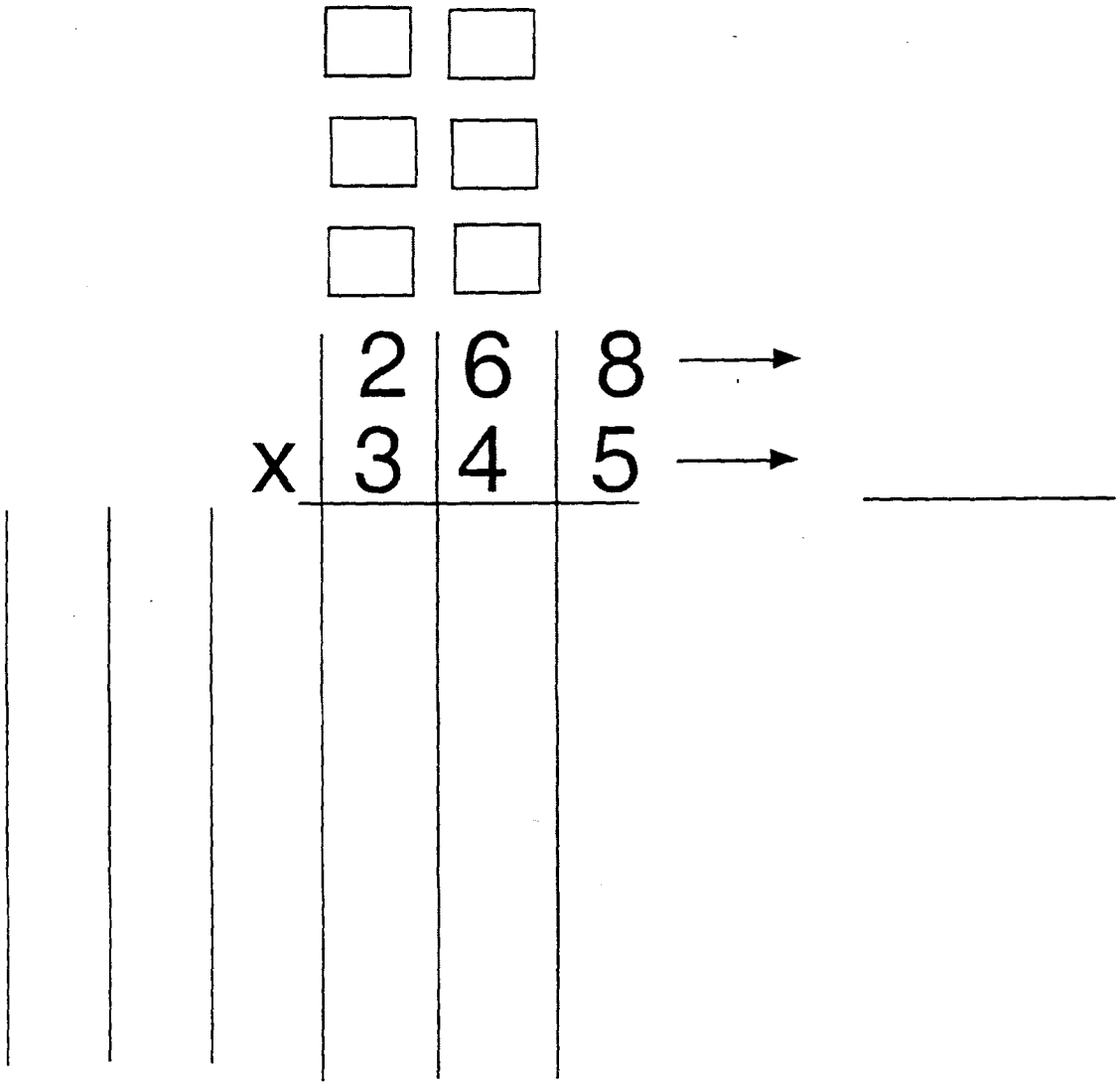


- Ask the students what the next step is. (Add together the three partial products.) Do the addition out loud as you write on the transparency the final answer of 92,460.



- Ask students to compare the estimated answer (90,000) to the actual answer (92,460). Is the estimate reasonable? (Yes) Why? (The estimated answer and actual answer both have 5 digits.) Remind students that estimated answers involving 3-digit numbers will not be as close to the actual answer as estimated answers involving 2-digit numbers since the rounding is to a greater place value. (Rounding to the hundreds place as opposed to rounding to the tens place)
- Do a few more examples (764 x 321; 492 x 564; 753 x 284) with the students. The product should be estimated first and the estimated answer compared to the final answer to check for reasonableness. Make sure the numbers stay aligned in the proper columns. You will need to draw lines to keep the columns straight or do the problems on the overhead using a graph paper transparency.
- Distribute Multiplication Madness. Use the transparency to complete the first problem with students. Have students finish the activity sheet.
- Solve That Problem is included for further practice. The problems on this activity sheet use a variety of multiplication skills (2-digit, 3-digit, estimation). Numbers are expressed in digits and in word names. There are some 2-step problems; #10 (marked with an asterisk) is more difficult and might require some language explanation (round trip). If students have difficulty keeping the columns straight while doing multiplication, have them work the problems on graph paper.

Multiplying Large Numbers



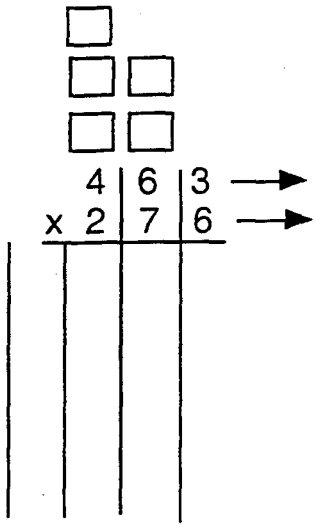
Name _____ Transparency/Student Copy

Multiplication Madness

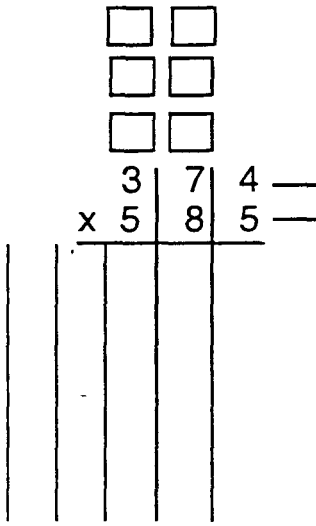
Cross out the regrouped number after adding it to the product! 2

Estimate, then solve.

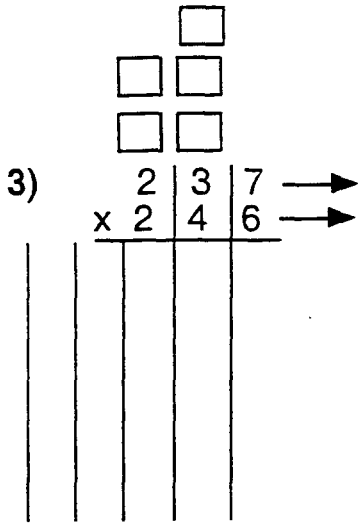
1) 4 6 3 →
x 2 7 6 → _____



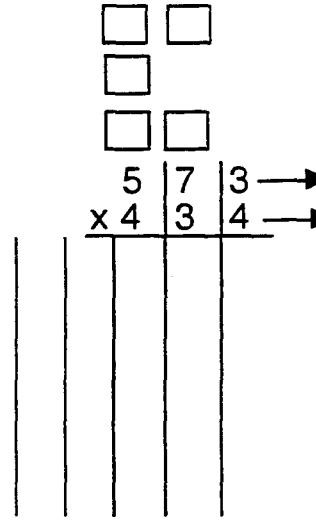
2) 3 7 4 →
x 5 8 5 → _____



3) 2 3 7 →
x 2 4 6 → _____



4) 5 7 3 →
x 4 3 4 → _____



Name _____

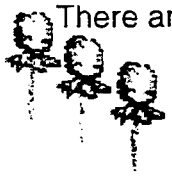
Solve That Problem!

1. The workers at the Pepsi plant can fill <u>about</u> **27** boxes of soda in one minute. **Estimate** the number of boxes they can fill in **90** minutes.

2. David has been collecting stamps for **13** years. Each year he collects **134** stamps. Find the <u>total</u> number of stamps David has.

3. The train from Washington to New York has **64** cars. Each car holds **178** people. How many <u>people</u> can the train hold?

4. There are **162** boxes of lollipops at the grocery store. Each box holds **144** lollipops. How many <u>lollipops</u> are there at the grocery store?

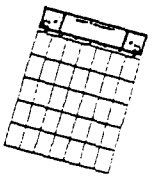


5. There are **264** apples in a large box. How many <u>apples</u> are in **65** boxes?

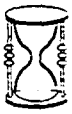
6. The school prints **125** copies of the school newspaper. Each paper has **54** sheets of paper. Will **6,000** sheets of paper be enough? If not, how many more sheets are needed?

7. Each bookcase in the library holds **about 475** books. There are **89** bookcases in the library. **About** how many books does the library hold?

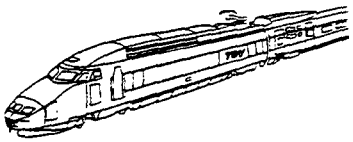
8. Mr. Tran is **48** years old. How many **weeks** old is Mr. Tran? (Hint: There are **52** weeks in one year.)



9. How many days are there in **twenty-five** years if there are **365** days in each year?



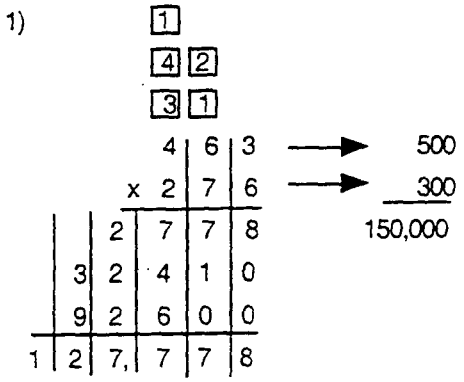
*10. The distance from Washington to New York is **242** miles. The distance from New York to Washington is the same. (**242** miles) The train makes a round trip from Washington to New York and back to Washington **18** times a week. Find the total miles the train travels in one week.



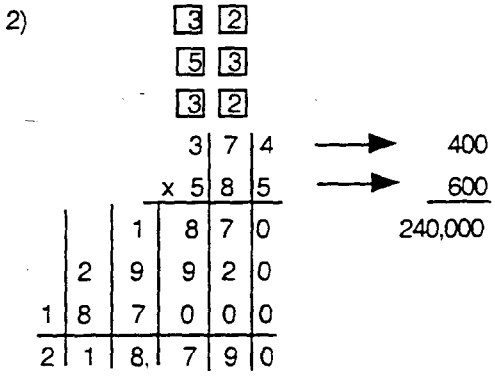
Answer Key
Mult. and Div. - Obj. 9

Multiplication Madness

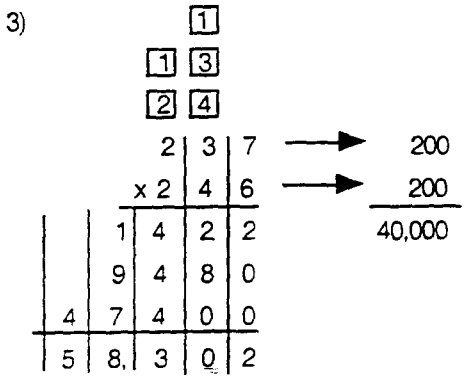
1)



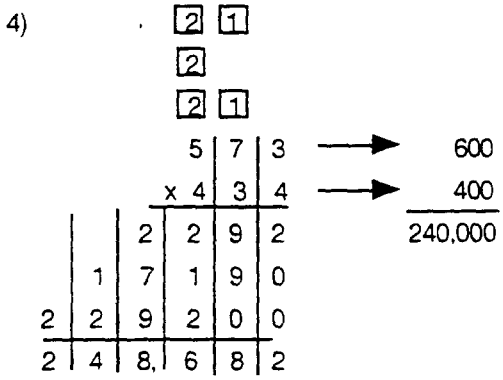
2)



3)



4)



Solve That Problem

1) 30 x 90 = 270 boxes
2) 1,742 stamps
3) 11,392 people
4) 23,328 lollipops
5) 17,160 apples
6) No. 125 x 54 = 6,750. 6,750 - 6,000 = 750 more sheets
7) 500 x 90 = 45,000 books
8) 2,496 weeks
9) 9,125 days
10) 242 + 242 = 484. 484 x 18 = 8,712 miles

Objective 10: Write and evaluate numbers in exponential form.

Vocabulary

exponent
base
exponential form
factor
squared
cubed
to the power of
value

Materials

calculators
a cube

Transparencies:

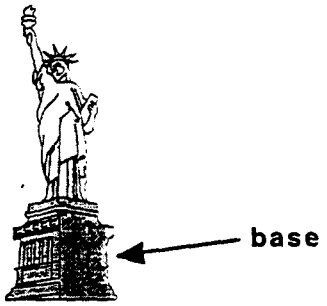
Multiplying by Ten
Exponential Form
Ten Chart
Exponential Form - Example Two

Student Copies:

Take Ten
Exponent Extravaganza

Language Foundation

1. Tell students that the word **base** has several meanings in English. Students might be familiar with first base, second base, base hit, etc. from the game of baseball. The base of an object is the bottom part or foundation of an object. The Statue of Liberty sits on a brick base. In this lesson, the term **base** refers to part of an exponential expression.



2. Show students the cube shape from a set of geometric solids. Ask them if they can name any objects with the shape of a cube. (ice cube, sugar cube, number cube) Explain to students that they will study about cubes in geometry, and that in this lesson they will learn the word **cubed** when they study exponents.

3. Explain to students the word **value** means how much something is worth. When shopping, an item on sale is a good value. The adjective valuable means something is worth a lot. Gold and diamonds are valuable.

Mathematics Component

1. Explore relationships between multiples of ten.
   - Place the transparency Multiplying by Ten on the overhead. Cover the chart on the bottom, leaving only the base ten blocks showing.
   - Distribute calculators to students. Tell students that calculators will be used later in the lesson.
   - Ask a student volunteer to point to the block on the transparency that shows 10 x 1. (ten block) Point to the corresponding sides of the block as you say, "10 x 1."
   - Ask a student volunteer to point to the block that shows 10 x 10. (hundred block) Point to the corresponding sides of the flat as you say, "10 x 10."
   - Ask a student volunteer to point to the block that shows 10 x 10 x 10. (thousand cube) Point to the corresponding sides of the cube as you say, "10 x 10 x 10."
   - Point out to students that as you go from 10 to 100 to 1,000, each number is 10 times more than the previous number.
   - Uncover the chart at the bottom of the transparency. Tell students they may use their calculators.
   - Ask students the product of 10 x 1. (10) Write 10 on the chart.
   - Ask students the product of 10 x 10. (100) Write 100 on the chart.
   - Ask students the product of 10 x 10 x 10. (1,000) Write 1,000 on the chart.
   - Ask students the product of 10 x 10 x 10 x 10. (10,000) Write 10,000 on the chart.
   - Ask students the product of 10 x 10 x 10 x 10 x 10. (100,000) Write 100,000 on the chart.
   - Ask students the product of 10 x 10 x 10 x 10 x 10 x 10. (1,000,000) Write 1,000,000 on the chart.
   - Ask students if they can see a pattern in the products. (When multiplying 10 by 10, the product is a 1 followed by 2 zeros; when multiplying 10 by 10 by 10, the product is a 1 followed by 3 zeros; etc.) Tell students that when 10 is used repeatedly as the factor in a multiplication problem, the product is a 1 followed by zeros equal to the number of tens in the problem.

2. Define the terms exponent, base, and exponential form.
   - Tell students that a shorter way can be used to write problems in which all factors are the same. Tell them **exponents** are used.
   - Display Exponential Form transparency.
   - Tell students that 10 x 10 x 10 x 10 can be written as 10^4. Tell students that this is read as 10 to the fourth power. Have students repeat "ten to the fourth power" several times. The 10 is called the **base**. The **base** is the factor or the number to be multiplied. Have students repeat the word **base** as you point to it on the transparency. The 4 is the **exponent**. The **exponent** tells how many times the **base** is used as a factor. Have the students repeat the word **exponent** as you point to it on the transparency. As you point to it on the transparency, say, "10^4 (10 to the fourth power) means 10 x 10 x 10 x 10."

- Tell students that a number written with a **base** and an **exponent** is written in **exponential form**. Point to 10^4 as you tell students that 10^4 is an example of **exponential form**. Have the students repeat the words **exponential form** as you circle 10^4 with your finger on the transparency.

3. Practice with powers of ten.
   - Display Ten Chart transparency. Use a cover sheet so only the first line of the chart is visible to students.
   - Tell students the calculators are not to be used during this part of the activity.
   - Ask a student volunteer to read the first number. (100)
   - Ask a student volunteer to read the multiplication or factor form. (10 x 10)
   - Tell students that this number, 100, or 10 x 10, will be written using an **exponent**.
   - Point out the 10 which is already on the chart. Ask students if anyone remembers what it is called. (**base**)
   - Ask students what the **exponent** is or what number goes in the empty box. (2) Write the 2 on the chart. You might have to remind students that the **exponent** tells how many times the base is used as a factor.
   - Uncover the next line on the chart. Tell students that only the multiplication (factor form) is given. The number and the exponent need to be found.
   - Ask a student volunteer to read the multiplication. (10 x 10 x 10)
   - Ask students how many times 10 is used as a factor. (3)
   - Ask students how to write the exponential form. (10^3) You might have to prompt students by saying the exponential form is the base and the exponent. Write 10^3 on the chart.
   - Ask students what the number is. (1,000) Write 1,000 on the chart. Ask students to explain how they got 1,000. (If 10 is the base, the exponent names the number of zeros in the product. 10^3 is a 1 followed by 3 zeros or 1,000.)
   - Uncover the next line on the chart. Ask a student to read the multiplication. (10 x 10 x 10 x 10)
   - Ask students how many times 10 is used as a factor. (4)
   - Ask students how to write the exponential form. (10^4) Write 10^4 on the chart.
   - Ask students what the number is. (10,000) Write 10,000 on the chart. Ask students to explain how they got 10,000. (If 10 is the base, the exponent names the number of zeros in the product. 10^4 is a 1 followed by 4 zeros or 10,000.)
   - Uncover the next line on the chart. Ask a student to read the multiplication. (10 x 10 x 10 x10 x10)
   - Ask students how many times 10 is used as a factor. (5)
   - Ask students how to write the exponential form. (10^5) Write 10^5 on the chart.

- Ask students what the number is. (100,000) Write 100,000 on the chart. Ask students to explain how they got 100,000. (If 10 is the base, the exponent names the number of zeros in the product. 10^5 is a 1 followed by 5 zeros.)
- Continue in the same manner until the chart is completed. See completed chart below.

Number	Multiplication (Factor Form)	Exponential Form
100	10 x 10	10^2
1,000	10 X 10 X 10	10^3
10,000	10 X 10 X 10 X 10	10^4
100,000	10 X 10 X 10 X 10 x 10	10^5
1,000,000	10 x 10 x 10 x 10 x 10 x 10	10^6
10,000,000	10 x 10 x 10 x 10 x 10 x 10 x 10	10^7
100,000,000	10 x 10 x 10 x 10 x 10 x 10 x 10 x 10	10^8
1,000,000,000	10 x 10 x 10 x 10 x 10 x 10 x 10 x 10 x 10	10^9

- Ask students if the pattern could be extended - if we had 10 used as a factor 10 times, what would the exponential form be? (10^{10})
- Ask students why we use exponential form. (Answers may vary but should include the observation that the exponential form is a much shorter and often less confusing way of writing large numbers)
- Review the vocabulary by pointing to each exponential form on the completed chart and having the students identify the base and the exponent. (10^2; the 10 is the base the 2 is the exponent, etc.) Have students read each exponential form out loud to practice the language. (10 to the second power, 10 to the third power, etc.)
- Distribute Take Ten activity sheet. Go over the directions with students and complete the first problem together. Have students finish independently. Calculators should not be used.

4. Extend the concept of exponents.
   - Display the Exponential Form - Example Two transparency with only the title showing. Tell students that other numbers besides 10 can be written in exponential form.
   - Tell students calculators can be used.
   - Uncover the transparency so only 3^4 shows. Ask students how to read this. (3 to the fourth power.) Ask students what number is the base. (3) Ask students what number is the exponent. (4)

- Ask students what 3^4 means. (3 is used as a factor 4 times or 3 x 3 x 3 x 3) Uncover the next line on the transparency, 3 x 3 x 3 x3, as you say, "3^4 means 3 x 3 x 3 x 3."
- Ask students to use their calculators to find the product of 3 x 3 x 3 x 3. (81) Uncover the 81 on the transparency.
- Uncover problem #2, 4^5. Ask students how to read this. (4 to the fifth power) Ask students what number is the exponent. (5) Ask students what number is the base. (4)
- Ask students what 4^5 means. (4 is used as a factor 5 times or 4 x 4 x 4 x 4 x 4) Uncover the next line on the transparency as you say, "4^5 means 4 x 4 x 4 x 4 x 4."
- Ask students to use their calculators to find the product of 4 x 4 x 4 x4 x 4 . (1024) Uncover the 1024 on the transparency.
- Uncover problem #3, 8^2. Tell the students that when the exponent is 2, it is commonly read as **squared** instead of to the second power. Have the students repeat out loud, 8 **squared.** Ask students why they think the term **squared** is used. (Responses may vary. Let students speculate and tell them that the reason will be shown in the next step.)
- Ask students what 8^2 means. (8 used as a factor 2 times or 8 x 8) Uncover the 8 x 8 on the transparency as you say, "8^2 means 8 x 8."
- Ask students what kind of shape an 8 by 8 array makes. (a square) If students have difficulty recalling the word array or visualizing the 8 by 8 arrangement, make an 8 by 8 array using overhead counters or tiles. Remind them that if there are two factors that are the same, the array will have an equal number of rows and columns. The shape will be a square; thus the term squared describes the exponent 2. A squared number (any number with 2 as an exponent) is the product of the number times itself.
- Ask students to find the product of 8 x 8. (64) Uncover the 64 on the transparency.
- Display page 2 of the transparency, Exponential Form - Example Two.
- Uncover problem # 4, 7^2. Ask a student to read the problem out loud. (7 to the second or 7 squared. Make sure you get both responses and the students understand that either way is correct.)
- Ask students what 7^2 means. (7 used as a factor 2 times or 7 x 7) Uncover the 7 x 7 on the transparency as you say, "7^2 means 7 x 7."
- Ask students to find the product of 7 x 7. (49) Uncover the 49 on the transparency.
- Uncover problem # 5, 6^3. Tell students that when the exponent is 3, it is sometimes read as **cubed** instead of to the third power. Show students a cube (a thousands base ten cube or any cube you have in the classroom) Show that the cube has 3 dimensions (point to them) and say that **cubed** means 3.
- Ask students what 6^3 means. (6 used as a factor 3 times or 6 x 6 x 6) Uncover the 6 x 6 x 6 on the

transparency as you say, "6^3 means 6 x 6 x 6."

- Ask students to use their calculators to find the product of 6 x 6 x 6. (216) Uncover the 216 on the transparency.
- Uncover problem # 6, 5^3. Ask a student to read the problem out loud. (5 to the third or 5 cubed. Make sure you get both responses and the students understand that either way is correct.)
- Ask students what 5^3 means. (5 used as a factor 3 times or 5 x 5 x 5) Uncover the 5 x 5 x 5 on the transparency as you say, "5^3 means 5 x 5 x 5."
- Ask students to use their calculators to find the product of 5 x 5 x 5. (125) Uncover the 125 on the transparency.
- Distribute Exponent Extravaganza. Tell students calculators can be used. Go over the directions and examples. Have students complete the activity sheet independently.

Note: If the calculators used by the students have exponent keys, it would be appropriate to teach the students how to use the key before beginning Exponent Extravaganza. The use of the exponent key enables the students to find values of larger exponents quickly and lessens the chance of making an error by multiplying too many or too few factors.

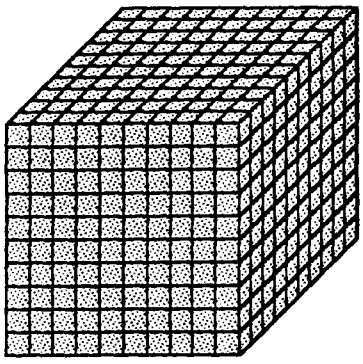
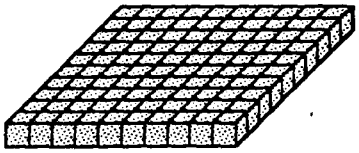
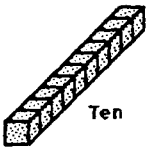
On the Texas Instruments Math Explorer calculator, the exponent key is marked y^x.

To find the value of 8^4:

- press the 8 key
- press the exponent key (y^x)
- press the 4 key
- press the equals sign

The number displayed (4,096) is the value of 8^4.

Multiplying by Ten

Thousands	Hundreds	Tens	Ones
 Thousand	 Hundred	 Ten	 One

10 x 1	=	
10 x 10	=	
10 x 10 x 10	=	
10 x 10 x 10 x 10	=	
10 x 10 x 10 x 10 x 10	=	
10 x 10 x 10 x 10 x 10 x 10	=	

Exponential Form

Exponent - tells how many times the base is used as a factor

$$10^4$$

Base - factor in multiplication problem

$$10 \times 10 \times 10 \times 10 = 10^4$$

Ten Chart

Number	Multiplication (Factor Form)	Exponential Form
100	10 x 10	$10^{\square}$
	10 x 10 x 10	
	10 x 10 x 10 x 10	
	10 x 10 x 10 x 10 x 10	
	10 x 10 x 10 x 10 x 10 x 10	
	10 x 10 x 10 x 10 x 10 x 10 x 10	
	10 x 10 x 10 x 10 x 10 x 10 x 10 x 10	
	10 x 10 x 10 x 10 x 10 x 10 x 10 x 10 x 10	

Name _____

Take Ten

Fill in the bank boxes in the chart below.

Word	Number	Multiplication (Factor Form)	Exponential Form
	10		10^1
		10 x 10	
one thousand			10^3
ten thousand		10 x 10 x 10 x 10	
	100,000		10^5
		10 x 10 x 10 x 10 x 10 x 10	

Exponential Form - Example Two

1. 3^4

   3 x 3 x 3 x 3

   81

2. 4^5

   4 x 4 x 4 x4 x4

   1024

3. 8^2

   8 x 8

   64