

Student Guide

Multiplying More Than Two Factors

Questions 1–9 (SG pp. 90–95)

- 1.\* 60 apples. Strategies will vary. Possible strategy: First multiply  $3 \times 4 = 12$ , then multiply  $5 \times 12 = 60$ .
2. A.\* They both result in the same product.  
 B.\* Different pairs of numbers in the sentence are circled.  
 C.\* Different numbers are being multiplied.  
 D.\* Which numbers to multiply first.  
 E.\* No  
 F.\* No  
 G.\* Yes

**Multiplying More Than Two Factors**

1. How many apples are in the crate? Show or tell how you solved the problem.

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**Grouping and Ordering**

To find the number of apples in the crate, David, Arti, and Lin multiplied  $3 \times 4 \times 5$  three different ways.

David multiplied  $3 \times 4$  first. Arti multiplied  $4 \times 5$  first. Lin multiplied  $3 \times 5$  first.

$$\begin{array}{c} \textcircled{3} \times \textcircled{4} \times 5 \\ \swarrow \quad \searrow \\ 12 \times 5 \\ 60 \end{array}$$

$$\begin{array}{c} 3 \times \textcircled{4} \times \textcircled{5} \\ \swarrow \quad \searrow \\ 3 \times 20 \\ 60 \end{array}$$

$$\begin{array}{c} \textcircled{3} \times \textcircled{4} \times \textcircled{5} \\ \swarrow \quad \searrow \\ 15 \\ 4 \times 15 \\ 60 \end{array}$$

**Discuss**

2. Mrs. Dewey asked her class to multiply  $2 \times 4 \times 6$ . Jackie wrote this number sentence:  
 $(2 \times 4) \times 6 = 8 \times 6 = 48$ .  
 Luis wrote this number sentence:  
 $2 \times (4 \times 6) = 2 \times 24 = 48$ .

- A. What is the same about these two sentences?
- B. What is different about these two sentences?
- C. How are the middle parts different?
- D. What do you think the circles might be telling you?
- E. Does multiplying different numbers first change this answer?
- F. Does it matter what numbers you multiply first for other number sentences? Try it with  $2 \times 3 \times 6$ .
- G. Is the same thing true for any number sentence with three numbers being multiplied?

Jackie and Luis showed what they multiplied first by circling the factors. Mathematicians use **parentheses** to group factors and show which factors to multiply first. For example, Jackie's and Luis's number sentences can be written with parentheses like this.

Jackie's number sentence:  $(2 \times 4) \times 6 = 8 \times 6 = 48$ .  
 Luis's number sentence:  $2 \times (4 \times 6) = 2 \times 24 = 48$ .

Jackie  
  
  
 Luis

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\* Answers and/or discussion are included in the lesson.

3. When you find a product like  $3 \times 4 \times 5$ , you can multiply only two numbers at a time. It does not matter which two you multiply first. Multiply the following at least two different ways.

- A.  $2 \times 2 \times 3 =$                       B.  $2 \times 3 \times 3 =$   
 4. Find the products. You may use mental math, a calculator, or your multiplication tables.  
 A.  $2 \times 2 \times 5 =$                       B.  $2 \times 3 \times 5 =$   
 C.  $3 \times 3 \times 3 =$                       D.  $2 \times 5 \times 5 =$   
 E.  $4 \times 4 \times 5 =$                       F.  $4 \times 3 \times 2 =$   
 G.  $3 \times 1 \times 8 =$                       H.  $5 \times 9 \times 0 =$

Sometimes changing the order of your numbers makes it easier to solve the problem using mental math. Jessie and Frank multiplied  $3 \times 6 \times 5$  using two different methods.

**Jessie's Method**

First, I multiplied  $3 \times 6$  in my head to get 18. Then I used a calculator to multiply  $18 \times 5$ . The answer is 90.



**Frank's Method**

I did the whole problem in my head. I multiplied  $6 \times 5$  first and got 30. Then, I multiplied  $3 \times 30$ . That's  $3 \times 3$  tens. That makes 9 tens, or 90.



Frank shows how changing the order of numbers can make it easier to find products of larger factors. Frank multiplied  $20 \times 4$  this way.



$20 \times 4$  is the same as  $4 \times 20$ . That's  $4 \times 2$  tens, which is 8 tens. That makes 80.

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5. Solve these problems using Frank's strategy. Look for ways to group and order the numbers to make an easy mental math problem.

- A.  $6 \times 2 \times 3 =$                       B.  $4 \times 4 \times 5 =$   
 C.  $7 \times 5 \times 2 =$                       D.  $3 \times 3 \times 2 \times 5 =$   
 E.  $6 \times 4 \times 5 =$                       F.  $4 \times 3 \times 5 =$   
 G.  $3 \times 10 \times 6 =$                       H.  $4 \times 10 \times 2 =$   
 I.  $3 \times 10 \times 7 =$                       J.  $7 \times 3 \times 10 =$   
 K.  $8 \times 1 \times 40 =$                       L.  $4 \times 30 \times 2 =$   
 M. Choose two problems from Questions 5A–L. Show your solution strategies.

Use the *Multiplying by Multiples of 10* pages in the *Student Activity Book* to look for patterns when multiplying by ten.

**Exponents**

Mrs. Dewey asked, "If you started with two apples in your basket on Monday, and then you doubled the number of apples you had each day, how many apples would you have on Wednesday?"

John said, "On Monday you would have 2 apples. Then on Tuesday you would double it, so you would have 4 apples. Then on Wednesday you would double again, so you would have 8 apples."

Mrs. Dewey asked, "Can you write a number sentence to show how you got that answer?"

John wrote:  $2 \times 2 \times 2 = (2 \times 2) \times 2 = 4 \times 2 = 8$  apples

"Good," said Mrs. Dewey. "And can anyone write this number sentence a shorter way?"

"I can," said Jessie.

Jessie wrote:  $2^3 = 8$  apples

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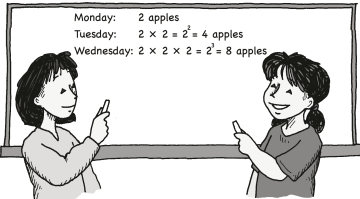
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3. A.  $(2 \times 2) \times 3 = 4 \times 3$ , so that equals 12 or  $2 \times (2 \times 3) = 2 \times 6$  so that equals 12.  
 B.  $(2 \times 3) \times 3 = 6 \times 3$ , so that equal 18 or  $2 \times (3 \times 3) = 2 \times 9$  so that equal 18.
4. A. 20  
 B. 30  
 C. 27  
 D. 50  
 E. 80  
 F. 24  
 G. 24  
 H. 0
5. Strategies can vary. Possible "in your head" strategy listed.  
 A. 36;  $2 \times 3 = 6, 6 \times 6 = 36$   
 B. 80;  $4 \times 5 = 20, 4 \times 20 = 80$   
 C. 70;  $5 \times 2 = 10, 7 \times 10 = 70$   
 D. 90;  $3 \times 3 = 9, 2 \times 5 = 10, 9 \times 10 = 90$   
 E. 120;  $4 \times 5 = 20, 6 \times 20 = 120$   
 F. 60;  $4 \times 5 = 20, 20 \times 3 = 60$   
 G. 180;  $6 \times 3 = 18, 18 \times 10 = 180$   
 H. 80;  $2 \times 4 = 8, 8 \times 10 = 80$   
 I. 210;  $3 \times 7 = 21, 21 \times 10 = 210$   
 J. 210;  $7 \times 3 = 21, 21 \times 10 = 210$   
 K. 320;  $8 \times 1 = 8, 8 \times 4 = 32, 32 \times 10 = 320$   
 L. 240;  $2 \times 4 = 8, 8 \times 3 = 24, 24 \times 10 = 240$   
 M. Responses will vary. See above.

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6.  $3^4$
7. A.  $* 3^3 = 27$   
 B.  $* 2^3 \times 3 \times 5^2 = 600$   
 C.  $* 2 \times 3^3 \times 7 = 378$   
 D.  $* 2 \times 5^3 = 250$   
 E.  $* 3^2 \times 11 = 99$
8. A.  $2 \times 2 \times 2 \times 3 = 24$   
 B.  $3 \times 3 \times 5 = 45$   
 C.  $2 \times 5 \times 5 = 50$   
 D.  $7 \times 7 \times 2 = 98$
9. A. True  
 B. False;  $2 \times 2 \times 2 \times 3 \times 3 = 72$   
 C. True  
 D. True

Mrs. Dewey explained how exponents can be used as a shortcut for writing products of the same factor:

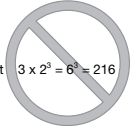


$2 \times 2 \times 2 = 2^3$  (We read this as "2 cubed" or "two to the third power.")  
 Three is the **exponent**. Two is the **base**. The exponent tells us to multiply by 2 three times.  
 $2 \times 2 \times 2 \times 2 = 2^4$  (We read this as "two to the fourth power.")  
 $2 \times 2 \times 2 \times 2 \times 2 = 2^5$  (We read this as "two to the fifth power.")

6. How would you use this shortcut to write  $3 \times 3 \times 3 \times 3$ ?

7. Rewrite the following number sentences using exponents:  
 A.  $3 \times 3 \times 3 = 27$   
 B.  $2 \times 2 \times 2 \times 3 \times 5 \times 5 = 600$   
 C.  $2 \times 3 \times 3 \times 3 \times 7 = 378$   
 D.  $2 \times 5 \times 5 \times 5 = 250$   
 E.  $3 \times 3 \times 11 = 99$

When multiplying exponents, always calculate the exponent first.  
 For example,



$3 \times 2^3 = 3 \times 8 = 24$ , not  $3 \times 2^3 = 6^3 = 216$

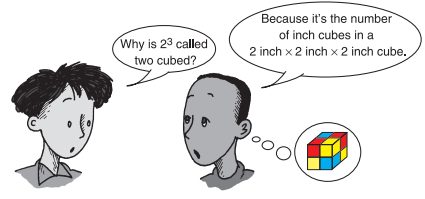
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8. Write each of the following number sentences without using exponents. Then multiply.  
 A.  $2^2 \times 3$   
 B.  $3^2 \times 5$   
 C.  $2 \times 5^2$   
 D.  $7^2 \times 2$

9. Decide if each of the following number sentences is true. If false, rewrite the sentence to make it true.  
 A.  $2 \times 3 \times 3 \times 3 \times 5 = 2 \times 3^3 \times 5$   
 B.  $2 \times 2 \times 2 \times 3 \times 3 = 24$   
 C.  $2^3 \times 3^2 = 72$   
 D.  $2^2 \times 5^2 = 100$



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\* Answers and/or discussion are included in the lesson.



**Using Factors**

1. Find the products. You may use mental math or your multiplication table.

- |                             |                             |
|-----------------------------|-----------------------------|
| A. $2 \times 3 \times 3 =$  | B. $3 \times 2 \times 3 =$  |
| C. $2 \times 2 \times 2 =$  | D. $3 \times 3 \times 5 =$  |
| E. $3 \times 3 \times 3 =$  | F. $2 \times 2 \times 5 =$  |
| G. $3 \times 0 \times 5 =$  | H. $7 \times 3 \times 2 =$  |
| I. $5 \times 4 \times 3 =$  | J. $3 \times 4 \times 2 =$  |
| K. $4 \times 1 \times 9 =$  | L. $1 \times 6 \times 0 =$  |
| M. $2 \times 3 \times 10 =$ | N. $5 \times 50 \times 2 =$ |
| O. $60 \times 4 \times 2 =$ | P. $8 \times 20 \times 1 =$ |
2. A.  $2 \times 70 =$                       B.  $60 \times 3 =$   
 C.  $10 \times 24 =$                      D.  $50 \times 8 =$   
 E.  $9 \times 40 =$                         F.  $70 \times 4 =$

**Using Exponents**

3. Rewrite the following number sentences using exponents:

- A.  $4 \times 4 \times 4 = 64$   
 B.  $2 \times 5 \times 5 \times 2 \times 2 = 200$   
 C.  $2 \times 3 \times 2 \times 5 \times 2 \times 5 = 600$   
 D.  $2 \times 2 \times 3 \times 2 \times 2 \times 5 \times 5 = 1200$   
 E.  $2 \times 5 \times 2 \times 5 \times 5 \times 3 = 1500$   
 F.  $3 \times 10 \times 10 = 300$   
 G.  $2 \times 10 \times 10 \times 10 \times 2 = 4000$

4. Write each of the following number sentences without exponents. Then multiply.

- |                     |                     |
|---------------------|---------------------|
| A. $2^2 \times 3^2$ | B. $3^3 \times 4^2$ |
| C. $2^2 \times 5^2$ | D. $2^4 \times 3$   |

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**Homework**

**Questions 1–4 (SG p. 96)**

1. A. 18  
 B. 18  
 C. 8  
 D. 45  
 E. 27  
 F. 20  
 G. 0  
 H. 42  
 I. 60  
 J. 24  
 K. 36  
 L. 0  
 M. 60  
 N. 500  
 O. 480  
 P. 160
2. A. 140  
 B. 180  
 C. 240  
 D. 400  
 E. 360  
 F. 280
3. A.  $4^3 = 64$   
 B.  $2 \times 5^2 \times 2^2 = 200$   
 C.  $2^3 \times 3 \times 5^2 = 600$   
 D.  $2^4 \times 3 \times 5^2 = 1200$   
 E.  $2^2 \times 5^3 \times 3 = 1500$   
 F.  $3 \times 10^2 = 300$   
 G.  $2^2 \times 10^3 = 4000$
4. A.  $2 \times 2 \times 3 \times 3 = 36$   
 B.  $3 \times 3 \times 3 \times 4 \times 4 = 432$   
 C.  $2 \times 2 \times 5 \times 5 = 100$   
 D.  $2 \times 2 \times 2 \times 2 \times 3 = 48$

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