Student Guide

Order of Operations with Exponents (SG pp. 446–448) Questions 1–9

1.* Shannon and Roberto wrote true number sentences. Ming did not. Change Ming's number sentence to $(1 + 3) \div 2 + 4 = 6$ to make it true.

2. Some may have more than one possible solutions.

   A. $1 + 2 + 3 + 4 = 10$; $3 + 4 \times 2 - 1 = 10$

   B. $3 \times 4 + 2 \times 1 = 14$; $1 \times 3 \times 4 + 2 = 14$

   C. $(4 + 2 + 1) \times 3 = 21$;
   $4 \times (2 + 3) + 1 = 21$

   D. $4 - 3 + 2 \div 1 = 3$; $(3 \times 2) - (4 - 1) = 3$

3. Possible solution:

   The largest whole number is 36;
   $4 \times 3 \times (2 + 1) = 36$

   The smallest whole number is 0:
   $1 + 4 - 3 - 2 = 0$

4. Yes, her number sentence is true.

5.* Shannon and Ming wrote true number sentences. Roberto did not. Change Roberto's number sentence to $4^2 \div (1 + 3) = 4$ to make it true.

6. There may be more than one possible solution:

   A. $4^2 + 3^1 = 19$; $4^2 + 3 \times 1 = 19$

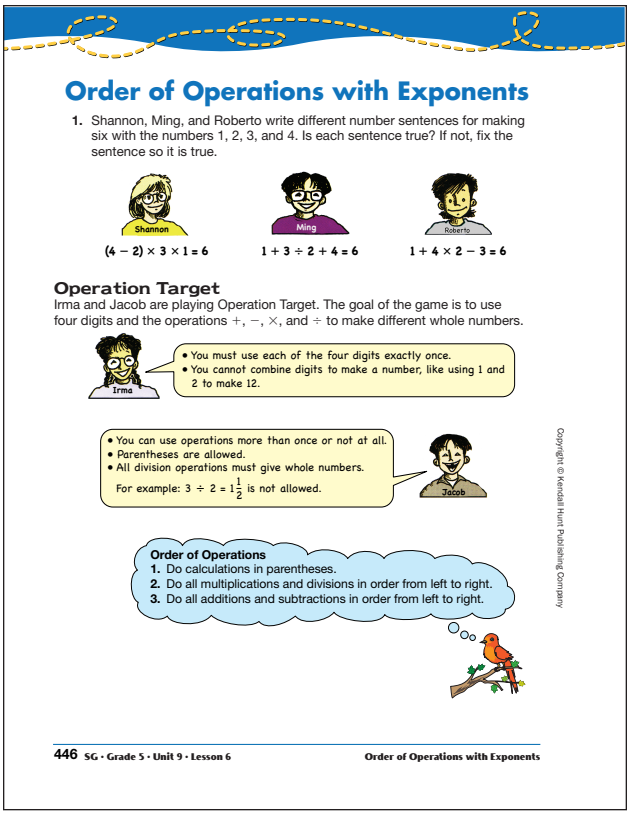
   B. $2^3 - 1^4 = 7$

   C. $2^3 + 4 + 1 = 13$

   D. $3^2 - 4^1 = 5$

   E. $3^2 \times 4^1 = 36$; $3^2 \times 4 \times 1 = 36$

7. Answers will vary.



Order of Operations with Exponents

1. Shannon, Ming, and Roberto write different number sentences for making six with the numbers 1, 2, 3, and 4. Is each sentence true? If not, fix the sentence so it is true.

Shannon: $(4 - 2) \times 3 \times 1 = 6$ Ming: $1 + 3 \div 2 + 4 = 6$ Roberto: $1 + 4 \times 2 - 3 = 6$

Operation Target

Irma and Jacob are playing Operation Target. The goal of the game is to use four digits and the operations +, −, ×, and ÷ to make different whole numbers.

Irma: • You must use each of the four digits exactly once. • You cannot combine digits to make a number, like using 1 and 2 to make 12.

Jacob: • You can use operations more than once or not at all. • Parentheses are allowed. • All division operations must give whole numbers. For example: $3 \div 2 = 1\frac{1}{2}$ is not allowed.

Order of Operations
1. Do calculations in parentheses.
2. Do all multiplications and divisions in order from left to right.
3. Do all additions and subtractions in order from left to right.

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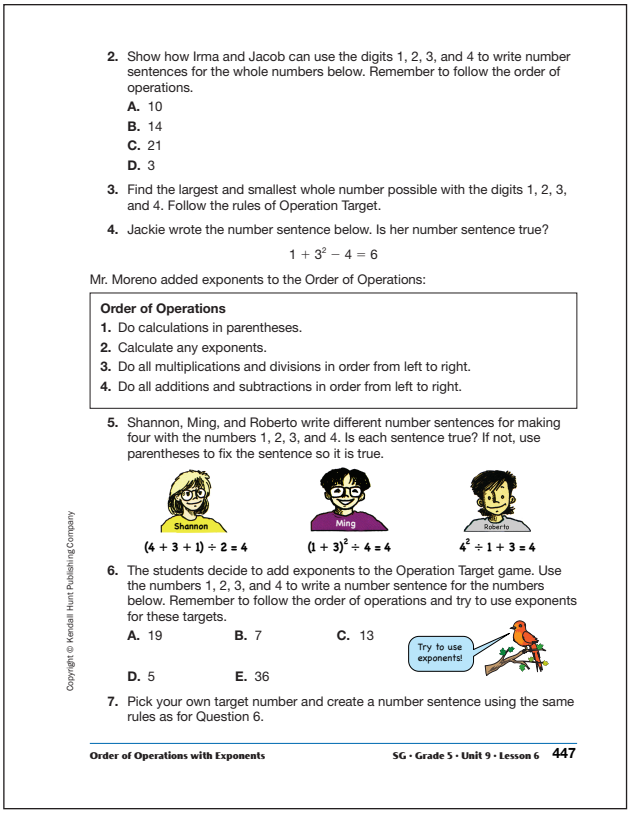

2. Show how Irma and Jacob can use the digits 1, 2, 3, and 4 to write number sentences for the whole numbers below. Remember to follow the order of operations.
   A. 10
   B. 14
   C. 21
   D. 3

3. Find the largest and smallest whole number possible with the digits 1, 2, 3, and 4. Follow the rules of Operation Target.

4. Jackie wrote the number sentence below. Is her number sentence true?

$1 + 3^2 - 4 = 6$

Mr. Moreno added exponents to the Order of Operations:

Order of Operations
1. Do calculations in parentheses.
2. Calculate any exponents.
3. Do all multiplications and divisions in order from left to right.
4. Do all additions and subtractions in order from left to right.

5. Shannon, Ming, and Roberto write different number sentences for making four with the numbers 1, 2, 3, and 4. Is each sentence true? If not, use parentheses to fix the sentence so it is true.

Shannon: $(4 + 3 + 1) \div 2 = 4$ Ming: $(1 + 3)^2 \div 4 = 4$ Roberto: $4^2 \div 1 + 3 = 4$

6. The students decide to add exponents to the Operation Target game. Use the numbers 1, 2, 3, and 4 to write a number sentence for the numbers below. Remember to follow the order of operations and try to use exponents for these targets.
   A. 19 **B.** 7 **C.** 13 **D.** 5 **E.** 36

Try to use exponents!

7. Pick your own target number and create a number sentence using the same rules as for Question 6.

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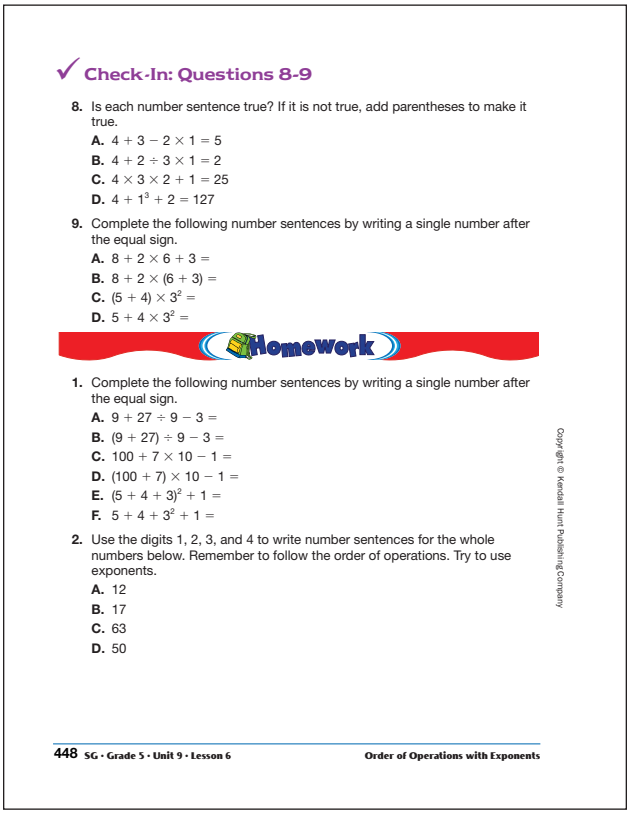
*Answers and/or discussion are included in the lesson.



✓ Check-In: Questions 8–9

8. Is each number sentence true? If it is not true, add parentheses to make it true.
   - **A.** $4 + 3 - 2 \times 1 = 5$
   - **B.** $4 + 2 \div 3 \times 1 = 2$
   - **C.** $4 \times 3 \times 2 + 1 = 25$
   - **D.** $4 + 1^3 + 2 = 127$
9. Complete the following number sentences by writing a single number after the equal sign.
   - **A.** $8 + 2 \times 6 + 3 =$
   - **B.** $8 + 2 \times (6 + 3) =$
   - **C.** $(5 + 4) \times 3^2 =$
   - **D.** $5 + 4 \times 3^2 =$

Homework

1. Complete the following number sentences by writing a single number after the equal sign.
   - **A.** $9 + 27 \div 9 - 3 =$
   - **B.** $(9 + 27) \div 9 - 3 =$
   - **C.** $100 + 7 \times 10 - 1 =$
   - **D.** $(100 + 7) \times 10 - 1 =$
   - **E.** $(5 + 4 + 3)^2 + 1 =$
   - **F.** $5 + 4 + 3^2 + 1 =$
2. Use the digits 1, 2, 3, and 4 to write number sentences for the whole numbers below. Remember to follow the order of operations. Try to use exponents.
   - **A.** 12
   - **B.** 17
   - **C.** 63
   - **D.** 50

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8. **A.** True
   B. Not true; $(4 + 2) \div 3 \times 1 = 2$
   C. True
   D. Not true; $(4 + 1)^3 + 2 = 127$
9. **A.** 23
   B. 26
   C. 81
   D. 41

Homework (SG p. 448)
Questions 1–2

1. **A.** 9
   B. 1
   C. 169
   D. 1069
   E. 145
   F. 19
2. There may be more than one possible solution:
   A. $4 \times 2 + 3 + 1 = 12$;
   $4^2 - 3 - 1 = 12$;
   $1 \times 2^3 + 4 = 12$
   B. $2^4 + 1^3 = 17$
   C. $4^3 - 1^2 = 63$
   D. $(3 + 4)^2 + 1 = 50$

Teacher Guide

Rachel's Problems (TG pp. 1–2)
Questions 1–2

1. A.

$S = 4 + N \times 3$	
N Input Number	**S Output Number**
1	7
2	10
3	13
4	16
10	34
50	154

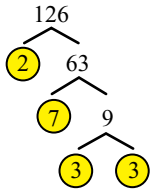
B.

$S = 24 \div N \times 3$	
N Input Number	**S Output Number**
1	72
2	36
3	24
4	18
6	12
8	9

C.

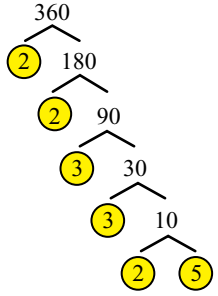
$S = (2 + N)^2 \times 3$	
N Input Number	**S Output Number**
1	27
2	48
3	75
4	108
6	192
12	588

2. A.



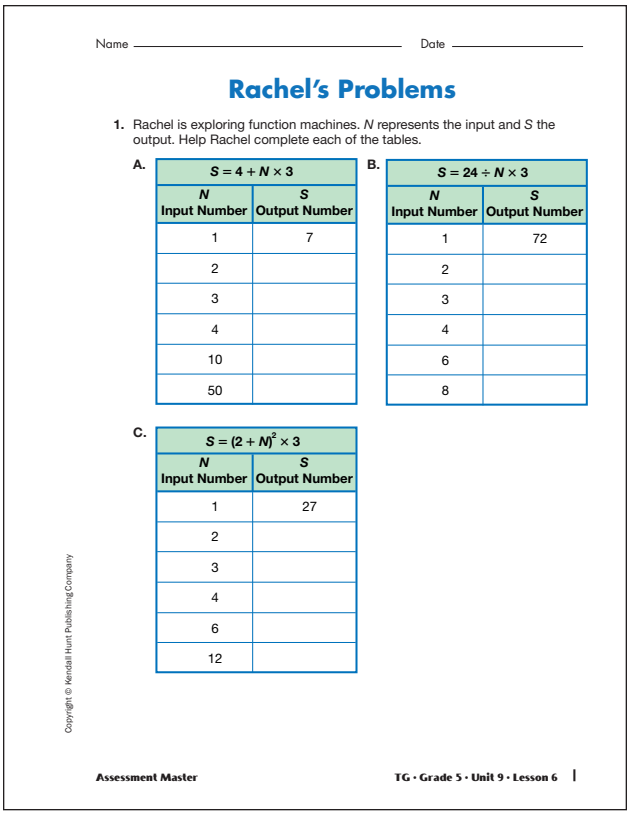
$2 \times 3^2 \times 7 = 126$

B.



$2^3 \times 3^2 \times 5 = 360$

C. 2 ^ 3 × 3 ^ 2 × 5 =



Name _____ Date _____

Rachel's Problems

1. Rachel is exploring function machines. *N* represents the input and *S* the output. Help Rachel complete each of the tables.

A.

$S = 4 + N \times 3$	
N Input Number	**S Output Number**
1	7
2	
3	
4	
10	
50	

B.

$S = 24 \div N \times 3$	
N Input Number	**S Output Number**
1	72
2	
3	
4	
6	
8	

C.

$S = (2 + N)^2 \times 3$	
N Input Number	**S Output Number**
1	27
2	
3	
4	
6	
12	

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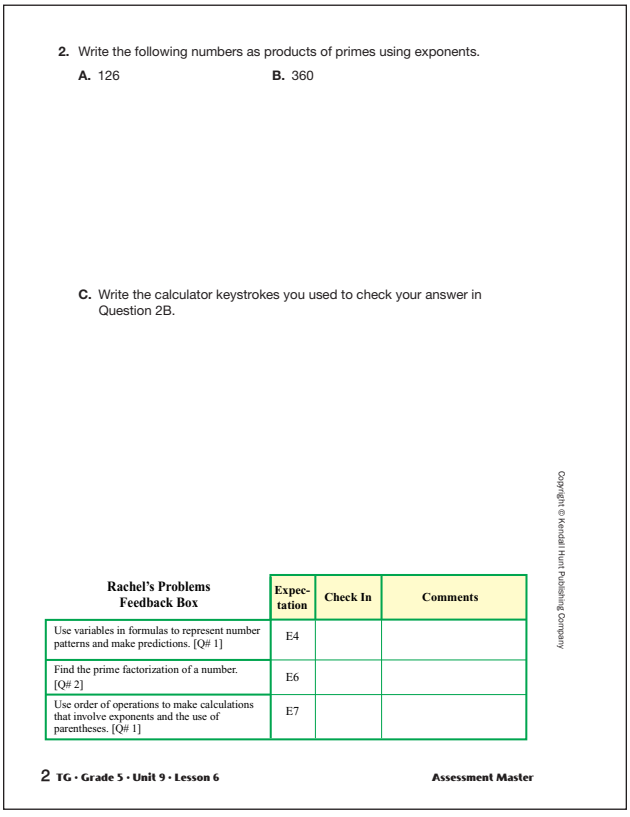

2. Write the following numbers as products of primes using exponents.

A. 126 B. 360

C. Write the calculator keystrokes you used to check your answer in Question 2B.

Rachel's Problems Feedback Box	Expectation	Check In	Comments
Use variables in formulas to represent number patterns and make predictions. [Q# 1]	E4		
Find the prime factorization of a number. [Q# 2]	E6		
Use order of operations to make calculations that involve exponents and the use of parentheses. [Q# 1]	E7		

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