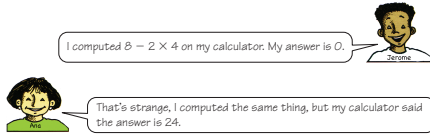


1. For each of these problems, circle the calculations that you should do first. Then find the answer.

- A.  $2 + 3 \times 7$     B.  $14 - 3 \times 4$     C.  $6 \times 2 + 1$   
 D.  $3 + 8 \div 4$     E.  $8 - 4 \div 2$     F.  $6 \div 3 - 1$   
 G.  $4 - 2 + 1$     H.  $12 \div 4 \times 2$     I.  $3 \times 6 \div 2$

**Are You Smarter Than Your Calculator?**



Which calculator is correct?

Some simple calculators do not "know" the correct order of operations. Check whether your calculator uses the correct order by using it to solve a problem like Jerome's.

2. For each of these problems, first find the answer. Then, if possible, check your answer using a calculator that follows the order of operations.
- A.  $10 - 2 \times 3$     B.  $15 - 8 + 6 - 4$     C.  $4 + 3 \times 2$   
 D.  $4 + 9 - 3 \times 2$     E.  $5 \times 2 + 3$     F.  $3 + 5 \times 2$   
 G.  $5 + 2 \times 3$     H.  $6 \div 3 \times 2$     I.  $4 \times 4 - 4 \div 4$   
 J.  $4 + 4 \times 4 - 4$     K.  $4 \times 4 - 4 - 4$     L.  $4 \times 4 \div 4 - 4$   
 M.  $10 + 6 \times 8$     N.  $10 - 24 \div 6$     O.  $8 \times 7 - 6$

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**Student Guide - Page 254**

**Parentheses**

**Parentheses** say that the calculations inside should be done first. Here the parentheses say to subtract first:

$$\begin{aligned} (6 - 2) \times 3 &= ? \\ 4 \times 3 &= 12 \end{aligned}$$

In the example below, the parentheses say to multiply first. That is the same order the operations would be done if there were no parentheses, so the parentheses aren't needed. They can be used to help avoid confusion.

$$\begin{aligned} 6 - (2 \times 3) &= ? \\ 6 - 6 &= 0 \end{aligned}$$

**Order of Operations**

- Do calculations in parentheses first.
- Do all multiplications and divisions in order from left to right.
- Then do all additions and subtractions in order from left to right.

3. Find the values of the following expressions:

- A.  $(6 \times 3) + 4$     B.  $6 \times (3 + 4)$   
 C.  $(12 \div 4) - 2$     D.  $12 \div (4 - 2)$   
 E.  $(24 \div 4) \times 2$     F.  $24 \div (4 \times 2)$   
 G.  $(12 - 4) \div 2 + 3$     H.  $12 - 4 \div 2 + 3$

4. Suppose you have a calculator but you don't know whether it uses the correct order of operations. Explain how you can find out. Show example expressions.

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**Student Guide - Page 255**

**Student Guide**

**Questions 1–10 (SG pp. 254–256)**

1. A.  $2 + (3 \times 7) = 23$   
 B.  $14 - (3 \times 4) = 2$   
 C.  $(6 \times 2) + 1 = 13$   
 D.  $3 + (8 \div 4) = 5$   
 E.  $8 - (4 \div 2) = 6$   
 F.  $(6 \div 3) - 1 = 1$   
 G.  $(4 - 2) + 1 = 3$   
 H.  $(12 \div 4) \times 2 = 6$   
 I.  $(3 \times 6) \div 2 = 9$
2. A. 4    B. 9    C. 10  
 D. 7    E. 13    F. 13  
 G. 11    H. 4    I. 15  
 J. 16    K. 8    L. 0  
 M. 58    N. 6    O. 50
3. A. 22    B. 42  
 C. 1    D. 6  
 E. 12    F. 3  
 G. 7    H. 13
4. Explanations and examples will vary. Students could suggest solving the problem with paper and pencil first (e.g.,  $4 + 3 \times 2 - 1 = 9$ ) applying the order of operations and then using the calculator to see if it computes the same answer. An answer of 13 would be incorrect, and would not follow the order of operations.

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5. **A.\***  $91$ ;  $9 \times 5 \times 2 + 1 = 91$   
**B.\***  $0$ ;  $5 \times 2 - 9 - 1 = 0$   
**C.** Answers will vary. Possible answers:  
 $0 = 5 \times 2 - 9 - 1$   
 $1 = 9 - 5 - 2 - 1$   
 $2 = 5 \times 2 - 9 + 1$   
 $3 = 9 - 5 - 2 + 1$   
 $4 = (9 - 5) \times (2 - 1)$   
 $5 = 9 + 2 - 5 - 1$   
 $6 = 9 - 5 \times 1 + 2$   
 $7 = 9 + 1 - 5 + 2$   
 $8 = (9 - 5) \times 2 \times 1$   
 $9 = (9 - 1) \div 2 + 5$   
**D.** Answers will vary. For example, three number sentences that make 1 are:  
 $1 = 9 - 5 - 2 - 1$  and  $1 = 5 \times 2 - 9 \times 1$   
and  $1 = 2 \times 5 \div 1 - 9$ . Here are two number sentences that make 5:  
 $5 = 9 + 2 - 5 - 1$  and  
 $5 = 9 - 1 + 2 - 5$
6. Answers will vary.  
7. Answers will vary. Two examples are:  
 $4 \times 3 - 2 \times 1$  and  $4 + 3 + 2 + 1$   
8. Answers will vary. The numbers in the following sentence can be written in any order:  
 $4 \times 3 \times 2 \times 1$   
9. Answers will vary. Two possible solutions are:  
 $5 \times 3 - 7 \times 1$  and  $7 + 5 - 3 - 1$ .  
10. Answers will vary.

**Teacher Guide**

**Questions A–K (TG)**

- |              |              |
|--------------|--------------|
| <b>A.</b> 17 | <b>B.</b> 10 |
| <b>C.</b> 7  | <b>D.</b> 27 |
| <b>E.</b> 8  | <b>F.</b> 9  |
| <b>G.</b> 60 | <b>H.</b> 0  |
| <b>I.</b> 6  | <b>J.</b> 36 |
| <b>K.</b> 3  | <b>L.</b> 9  |

**Operation Target**

The goal is to use four digits and the operations  $+$ ,  $-$ ,  $\times$ , and  $\div$  to make as many different whole numbers as you can. This is a cooperative contest for two or three people.

**Materials**

- One or two pieces of paper for each player
- Pencil for each player
- Calculator that uses order of operations



**Directions**

- You must use each of the four digits 9, 5, 2, and 1 exactly once.
- You can use the operations  $+$ ,  $-$ ,  $\times$ , and  $\div$  once, more than once, or not at all.
- Parentheses are allowed.
- Make as many whole numbers as you can. For example,  $9 + 5 \times 2 - 1 = 18$ .
- All division operations must give whole numbers. For example,  $9 \div 2 = 4.5$  is not allowed.
- List the numbers you make and show how you made them.

**Variations**

- Play with different digits. For example, play with 3, 4, 5, and 9.
  - Allow the digits to be arranged to make fractions and decimals.
  - Allow the digits to be arranged into 2-digit numbers. For example, using the digits 9, 5, 2, and 1, the following is permitted:  $12 \times 95 = 1140$ .
- Use 9, 5, 2, and 1 and the directions for Operation Target to answer the following questions.
    - What is the largest whole number you can make?
    - What is the smallest whole number you can make?
    - How many whole numbers less than 10 can you make?
    - What whole numbers can you make in more than one way? Show at least two number sentences for each.
  - Pick four different digits. Make as many whole numbers as you can using your four new digits and  $+$ ,  $-$ ,  $\times$ , and  $\div$ . List the numbers you make and show how you made them.
  - Use 1, 2, 3, and 4 to make 10. Can you think of another way?
  - Luis used 1, 2, 3, and 4 to make 24. How could he have done it?
  - Romesh used 1, 3, 5, and 7 to make 8. How could he have done it?
  - Make up your own problem like those in Questions 7, 8, and 9.

**Student Guide - Page 256**

Name \_\_\_\_\_ Date \_\_\_\_\_

**Order of Operations Quiz**

Solve the following problems using the correct order of operations:

- |   |                                       |
|---|---------------------------------------|
| <b>A.</b> $5 + 4 \times 3 =$            | <b>B.</b> $6 + 8 \div 2 =$            |
| <b>C.</b> $5 \times 2 - 6 \div 2 =$     | <b>D.</b> $(5 + 4) \times 3 =$        |
| <b>E.</b> $3 \times 3 - 3 \div 3 =$     | <b>F.</b> $3 + 3 \times 3 - 3 =$      |
| <b>G.</b> $2 \times (5 + 5) \times 3 =$ | <b>H.</b> $8 \times 3 - 8 \times 3 =$ |
| <b>I.</b> $2 + 2 \times 2 =$            | <b>J.</b> $18 \div 3 \times 6 =$      |
| <b>K.</b> $5 - 3 + 1 =$                 | <b>L.</b> $8 - 4 \div 2 + 3 =$        |

**Teacher Guide -**

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