

Answers

What is the calculator doing?

Enter each of the problems below in the calculator and record the answer in the space provided. Write down a response to the question that follows each group of problems.

Experiment 1

$$12 \div 6 \times 2 = 4$$

$$18 \times 3 \div 9 = 6$$

$$12 \times 6 \div 2 = 36$$

$$18 \div 3 \times 9 = 18$$

$$24 \div 6 \times 3 \div 2 = 2$$

$$45 \div 3 \div 9 \times 2 = 3 \frac{1}{3}$$

$$24 \times 6 \div 3 \times 2 = 96$$

$$45 \times 3 \times 9 \div 2 = 607.5$$

In what order did the calculator seem to execute the operations in each of the problems above?

Multiplication and division were done in order from left to right

Let's check your conjecture. Enter a chain of four numbers using ONLY the operations of multiplication and division and see if your ideas work. Record your results.

Statement

Answer

___ **answer will vary** _____ = _____

Experiment 2

Enter each of the problems below in the calculator and record the answer in the space provided. Write down a response to the question that follows each group of problems.

$$\text{a) } 24 \div 6 \times 3 \div 2 = 6$$

$$\text{b) } 24 \div (6 \times 3) \div 2 = 2/3$$

$$\text{c) } 24 \div (6 \times 3 \div 2) = 2 \ 2/3$$

$$\text{d) } (24 \div 6) \times (3 \div 2) = 6$$

$$\text{e) } 24 \times 6 \div 3 \times 2 = 96$$

$$\text{f) } 24 \times (6 \div 3) \times 2 = 96$$

$$\text{g) } 24 \times 6 \div (3 \times 2) = 24$$

$$\text{h) } (24 \times 6) \div (3 \times 2) = 24$$

Even though all the problems above have the same numbers in the same order, some of the answers are different. Analyze problems a, b, c, and d to determine why some of the problems have different answers.

The operations inside the parentheses were completed first. Then the division and multiplication were done from left to right.

Analyze problems e, f, g, and h to determine why some of the problems have different answers.

The operations inside the parentheses were completed first. Then the division and multiplication were done from left to right.

What effect do the parentheses seem to have on the order in which the operations are performed?

The operations inside the parentheses were completed first.

Use the numbers 36, 6, 12, and 4 once and only once in each of the following problems, along with the operations of multiplication and division, in any order, with parentheses where necessary. Create one number sentence that will yield each of the following answers:

$$(36 \div 6) \times (12 \div 4) = 18$$

$$(36 \div 12) \times (6 \times 4) = 72$$

Is there more than one way to create a number sentence for each answer?

Experiment 3

Enter each of the problems below in the calculator and record the answer in the space provided. Write down a response to the question that follows each group of problems.

Group A

$$10 + 3 + 6 - 5 = 14$$

$$5 - 3 + 1 + 5 = 8$$

$$10 - 6 - 3 + 5 = 6$$

$$5 + 3 - 1 + 5 = 12$$

In what order does the calculator seem to perform the addition and subtraction?

The operations of addition and subtraction are done in order from left to right in the order they come.

Group B

$$10 + (6 + 3) - 5 = 14$$

$$5 - (3 + 1) + 5 = 6$$

$$10 - (6 - 3) + 5 = 12$$

$$5 + (3 - 1) + 5 = 12$$

Compare the answers in Group B to those in Group A. Why are some of the answers the same and some of them different?

The parentheses change the order in which the addition and subtraction are completed. The parentheses are completed first.

Use the numbers 1, 2, 3, and 6 along with addition, subtractions, and parentheses to write a number sentence that yields an answer of 4.

Expression

Answer

$$\underline{(6+2) - (3+1)} = 4$$

Experiment 4

Enter each of the problems below in the calculator and record the answer in the space provided. Write down a response to the question that follows each group of problems.

Group A

$$2 + 4 \times 3 = 14$$

$$12 - 5 \times 2 = 2$$

$$6 + 12 \div 2 = 9$$

$$5 + 10 \div 2 = 10$$

Analyze the problems and their answers above. In what order does the calculator seem to perform mixed operation expressions?

Group B

$$(2 + 4) \times 3 = 18$$

$$(12 - 5) \times 2 = 14$$

$$(6 + 12) \div 2 = 9$$

$$(5 + 10) \div 2 = 7.5$$

Analyze the problems and their answers in Group A and B. What effect does the parentheses seem to have?

Use 2, 3, 5, and 10 once and only once in any order and in any combination with +, -, x, and \div to yield the answer given below. Record your problem in the space provided.

Answer	Problem
1	$(10 \div 5) - (3 - 2)$
40	$(2 + 3) \times (10 - 2)$

Given $9 + 18 \div 3^2 - 3$. Using parentheses only, change the problem to yield the answers given below. Record your problems in the space provided.

Answer	Problem
0	$(9 + 18 \div 3^2) - 3$ or $(9 + 18) \div 3^2 - 3$
4.5	$(9 + 18) \div (3^2 - 3)$