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 ÷ 6 x 2 = _____	18 x 3 ÷ 9 = _____
12 x 6 ÷ 2 = _____	18 ÷ 3 x 9 = _____
24 ÷ 6 x 3 ÷ 2 = _____	45 ÷ 3 ÷ 9 x 2 = _____
24 x 6 ÷ 3 x 2 = _____	45 x 3 x 9 ÷ 2 = _____

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

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
_____=	_____

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.

a) 24 ÷ 6 x 3 ÷ 2 = _____ b) 24 ÷ (6 x 3) ÷ 2 = _____

c) 24 ÷ (6 x 3 ÷ 2) = _____ d) (24 ÷ 6) x(3 ÷ 2) = _____

e) 24 x 6 ÷ 3 x 2 = _____ f) 24 x (6 ÷ 3) x 2 = _____

g) 24 x 6 ÷ (3 x 2) = _____ h) (24 x 6) ÷ (3 x 2) = _____

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.

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

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

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:

_____= 18

_____= 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 = _____ 5 - 3 + 1 + 5 = _____

10 - 6 - 3 + 5 = _____ 5 + 3 - 1 + 5 = _____

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

Group B

10 + (6 + 3) - 5 = _____ 5 - (3 + 1) + 5 = _____

10 - (6 - 3) + 5 = _____ 5 + (3 - 1) + 5 = _____

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

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

Expression		Answer
_____	=	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

$2 + 4 \times 3 =$ _____ $12 - 5 \times 2 =$ _____

$6 + 12 \div 2 =$ _____ $5 + 10 \div 2 =$ _____

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

Group B

$(2 + 4) \times 3 =$ _____ $(12 - 5) \times 2 =$ _____

$(6 + 12) \div 2 =$ _____ $(5 + 10) \div 2 =$ _____

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 ÷ to yield the answer given below. Record your problem in the space provided.

Answer	Problem
1	
40	

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	
4.5	