

What are operators?

An operator is like a verb: it's an "action". There are four basic operators:

Operator	Action	Symbol
Addition	Add	+
Subtraction	Subtract	-
Multiplication	Multiply	X
Division	Divide	/ or ÷

Order of operation

Some operators have precedence over others. Multiplication and division have precedence over addition and subtraction. Powers (or indices) have precedence over both multiplication and division. Brackets have the greatest precedence of all. The order of precedence determines the order in which operations MUST be carried out. This order is summarised by the acronym "BODMAS":

B	Brackets
O	Order (indices)
D	Division
M	Multiplication
A	Addition
S	Subtraction

Example 1

What is the answer to $3 + 5 \times 4$?

There are two possible ways to work this out, one of which is **WRONG**:

Method 1

Step (a): first add the "3" to the "5":

$$3 + 5 = 8 \dots\dots\dots (a)$$

Step (b): then multiply the result by "4":

$$8 \times 4 = 32 \dots\dots\dots (b) \times$$

Method 2

Step (a): first multiply the "5" by the "4":

$$5 \times 4 = 20 \dots\dots\dots (a)$$

Step (b): then add "3" to the result:

$$3 + 20 = 23 \dots\dots\dots (b) \checkmark$$

Notice that the answer to Method 1 is 32 and the answer to Method 2 is 23. **Both cannot be right.**

Method 1 is wrong. Why?

The correct answer is 23 because multiplication has precedence over addition so the “5” is first multiplied by the “4” before adding the “3”. Precedence means “comes first” or “comes before others”.

Multiplication comes before addition

Example 2

What is the answer to $8 - 3 \times 6$?

Again there are two possible ways to work this out:

Method 1

Step (a): first subtract the “3” from the “8”:

$$8 - 3 = 5 \dots\dots\dots (a)$$

Step (b): then multiply the result by “6”:

$$5 \times 6 = 30 \dots\dots\dots (b) \times$$

Method 2

Step (a): first multiply the “6” by the “3”:

$$6 \times 3 = 18 \dots\dots\dots (a)$$

Step (b): then subtract the result from “8”:

$$8 - 18 = -10 \dots\dots\dots (b) \checkmark$$

Once again both answers cannot be right. **Method 1 is wrong**. Why?

The correct answer is -10, the result obtained from Method 2, because multiplication has precedence over subtraction. The “6” is first multiplied by the “3” before subtracting that result (18) from “8”.

The result of Step (a) is called an “intermediate” result.

Multiplication comes before subtraction

Example 3

What is the answer to $3 + 5 \div 4$?

Once again there are two possible ways to work this out:

Method 1

Step (a): first add the “3” to the “5”:

$$3 + 5 = 8 \dots\dots\dots (a)$$

Step (b): then divide the result by “4”:

$$8 \div 4 = 2 \dots\dots\dots (b) \times$$

Method 2

Step (a): first divide the “5” by the “4”:

$$5 \div 4 = 1.25 \dots\dots\dots (a)$$

Step (a): then add “3” to the result:

$$3 + 1.25 = 4.25 \dots\dots\dots (b) \checkmark$$

Once again both answers cannot be right. **Method 1 is wrong.** Why?

The correct answer is 4.25, the result obtained from Method 2, because division has precedence over addition. The “5” is first divided by the “4” before adding that result (1.25) to the “3”.

As before, the result of Step (a) is called an “intermediate” result.

Division comes before addition

Example 4

What is the answer to $10 - 6 \div 4$?

Method 1

Step (a): first subtract the “10” from the “6”:

$$10 - 6 = 4 \dots\dots\dots (a)$$

Step (b): then divide the result by “4”:

$$4 \div 4 = 1 \dots\dots\dots (b) \times$$

Method 2

Step (a): first divide the “6” by the “4”:

$$6 \div 4 = 1.5 \dots\dots\dots (a)$$

Step (b): then subtract the result from “10”:

$$10 - 1.5 = 8.5 \dots\dots\dots (b) \checkmark$$

Once again, **method 1 is wrong.** Why?

The correct answer is 8.5, the result obtained from Method 2, because division has precedence over subtraction. The “6” is first divided by the “4” before subtracting that result (1.5) from “10”.

Division comes before subtraction