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## Order of Operations

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## Order of Operations



This order of operations convention is as follows.

- Step 1** Evaluate any expressions in brackets first.
- Step 2** THEN evaluate any functions (e.g. powers, roots, sin, cos, log, etc.).
- Step 3** THEN evaluate any multiplications or divisions.
- Step 4** THEN evaluate additions or subtractions.
- Step 5** OTHERWISE operations of equal priority are evaluated left to right.

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## Order of Operations — examples



Try these questions without using a calculator, then check with your calculator:

1.  $10 - 8 + 2$
2.  $5 - 8(4 - 1)^2$

What answers did you get:

1.  $10 - 8 + 2 = 0$  or  $4$ ?
2.  $5 - 8(4 - 1)^2 = -27$  or  $-67$  or something else?

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## Order of Operations — Full working



1.

$$\begin{aligned}10 - 8 + 2 &= 2 + 2 \\ &= 4.\end{aligned}$$

2.

$$\begin{aligned}5 - 8(4 - 1)^2 &= 5 - 8(3)^2 \\ &= 5 - 8 \times 9 \\ &= 5 - 72 \\ &= -67.\end{aligned}$$

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## More examples:



Now try these on your calculator:

1.  $\frac{17 + 3}{17 + 23}$

2.  $\sqrt{3^2 + 4^2}$

3.  $221 - 3(3 + 12 \div (3 + 1) - 1)$

Did you get:

1.  $\frac{17 + 3}{17 + 23} = 40.176$  or 0.5?

2.  $\sqrt{3^2 + 4^2} = 19$  or 5?

3.  $221 - 3(3 + 12 \div (3 + 1) - 1) = 206$  or ?

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## Full working



1.

$$\frac{17 + 3}{17 + 23} = \frac{20}{40} = \frac{1}{2}.$$

2.

$$\begin{aligned}\sqrt{3^2 + 4^2} &= \sqrt{9 + 16} \\ &= \sqrt{25} \\ &= 5.\end{aligned}$$

3.

$$\begin{aligned}221 - 3(3 + 12 \div (3 + 1) - 1) &= 221 - 3(3 + 12 \div 4 - 1) \\ &= 221 - 3(3 + 3 - 1) \\ &= 221 - 3 \times 5 \\ &= 221 - 15 \\ &= 206.\end{aligned}$$

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## Order of Operations: Exercises



Evaluate the following without a calculator. Check your results on the calculator afterwards.

1.  $7 \times 5 + 4$

2.  $10 - 6 \times 7$

3.  $4 \times (2 + 5) \div (3 + 1)$

4.  $6 + (3 - 9)$

5.  $-2 - 2 \times -3$

6.  $9 \div 3 \times 7 + 3$

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## Order of Operations: Answers

1.

$$\begin{aligned}7 \times 5 + 4 &= 35 + 4 \\ &= 39.\end{aligned}$$

2.

$$\begin{aligned}10 - 6 \times 7 &= 10 - 42 \\ &= -32.\end{aligned}$$

3.

$$\begin{aligned}4 \times (2 + 5) \div (3 + 1) &= 4 \times 7 \div 4 \\ &= 28 \div 4 \\ &= 7.\end{aligned}$$



## Order of Operations: Answers (cont)

4.

$$\begin{aligned}6 + (3 - 9) &= 6 + -6 \\ &= 0.\end{aligned}$$

5.

$$\begin{aligned}-2 - 2 \times -3 &= -2 - -6 \\ &= -2 + 6 \\ &= 4.\end{aligned}$$

6.

$$\begin{aligned}9 \div 3 \times 7 + 3 &= 3 \times 7 + 3 \\ &= 21 + 3 \\ &= 24.\end{aligned}$$



Further help  
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