Order of Operations

The order in which maths operations like + or + are completed is very important. All over the world, mathematicians use the same convention. This ensures that everyone obtains the same answer for a given question.

Tip – look at the WHOLE expression to decide what to do first. Don't just start at the left!

e.g. using the convention, the answer to 2×3^2 is 18 and not 36!

Convention for the order of operations

Note: Each number is associated with the operation(s) immediately in front of it.

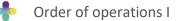
1st	Brackets If more than one set of brackets, <u>work from the inside brackets outwards</u>							
	eg $2 \times (6-3) = 2 \times \underline{3}$							
	= 6 eg 15-((8+2)÷5-3)=15-(<u>10</u> ÷5-3) =15-(<u>2</u> -3)	• We use the 3 rd order here too, ÷ before the minus						
	=15-(<u>-1)</u> =15+1 =16	 Recall, we can substitute the word "opposite" for "-" -(-1) reads as "the opposite of (-1)" that is +1 						
2nd	Operators - things like squares, cubes, powers, ro These funtions are <u>worked out first</u> eg $5 \times 3^2 = 5 \times 9$							
	= 45	$\begin{array}{c} 3^2 = 3 \times 3 \\ 3^5 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \end{array}$						
	eg $4\sqrt{25} = 4 \times \underline{5}$ =20	 Recall, no sign or operation between terms implies × 						
3rd	Multiplication and/or Division If there are only \times and/or \div in the statement then the order is to work from <u>left to right</u>							
	eg $60 \div 2 \times 3 = 30 \times 3$ = 90	$= \frac{5+9}{2}$ the vinculum acts $= \frac{14}{2}$ or 7 like brackets						

© 2021 The University of Newcastle

newcastle.edu.au/academic-learning-support CRICOS Provider 00109J







Last Addition and/or Subtraction

These operations can be performed in any order without changing the answer

eg working from left to right 6-5+7-1-5+3 = 8-1-5+3 = 5eg cancel the 6 with the -1-5 $\underline{6}-5+7\underline{-1-5}+3 = -5+7+3$ = 5

eg work out the positives and the negatives

$$\frac{6}{6} - 5 + 7 - 1 - 5 + 3 = 16 - 11$$
$$= 5$$

Exercises

- The aim is ALWAYS to get all the exercises correct which you will do when you are using the right strategy correctly and not makinig silly mistakes.
- Make sure you **understand** if you made a careless error or if you are not using the strategy correctly.
- The more we have to think about, the more likely we are to make careless errors, so write down the answers to steps along the way to **reduce what you have to remember**.
- Repeated mistakes mean you haven't nailed the strategy yet and probably don't quite understand so be sure to **ask for help**

Simplify each of the following

		0		
1.	а	15 - 5 + 10 - 2	f	4 x 2 + 3 x 6
	b	22 + 4 - 16 + 12	g	15 ÷ 3 – 18 ÷ 9
	С	3 x 2 x 5 ÷ 15	h	14 - 2 x 5 + 3
	d	18 + 12 ÷ 2	i	0 x 15 + 22 ÷ 2
	е	5 – 2 + 3 x 10	j	16 + 12 ÷ 4 + 15
2.	а	$\frac{3+4}{21}$	f	(4 x 2 – 6) - (3 + 7)
	b	$\frac{16-4}{12}$	g	(13 – 5) x (7 – 2)
	с	$\frac{3+22 \div 11}{14-3+9}$	h	50 – (2 + 4 x (7 – (3 x 2)))
	d	$\frac{14 \times 2 \div 4}{2+1}$	i	6 (8 – 3) – 3 (2 + 3)
	е	$\frac{25+5\times6}{11}$	j	$\frac{18 \div 3 + 4}{12 \div 6}$





3.	a	7 x (6 - 3)	f	40 ÷ (17 - 9)
	b	(6 + 2) x 5	g	27 - 5 x 4
	c	8 + 4 x 6	h	27 - (5 x 4)
	d	30 - 5 x 5	i	((5 + 4) x 6) ÷ 2
	e	(30 - 5) x 5	j	5 x (15 - 4 x 3)
4.	a b c d e f	$30 - (12 \div (4 \div 4))$ $\frac{9 \times 2}{13 - 7}$ $\frac{8 + 4}{4 \times 9}$ $\frac{16 + 8}{16 - 8}$ $35 - 120 \div 5$ $3^{2} \times 2$	g h j k l	$ \frac{33}{32 - 3 \times 7} \\ \frac{60}{2 \times 6 + 3} \\ \frac{32 - 8}{6 + 2} \\ 3 \times 6 + 3 \times 4 \\ 7^2 - 5 \times 4 \\ 5 \times 2^3 $

Answers

1.a	18	b	22	С	2	d	24	е	33
f	26	g	3	h	7	i	11	j	34
2. a	1/3	b	1	С	1/4	d	2 1/3	e	5
f	-8	g	40	h	44	i	15	j	5
3. a	21	b	40	С	32	d	5	е	125
f	5	g	7	h	7	i	27	j	15
4. a	18	b	3	С	1/3	d	3	e	11
f	18	g	3	h	4	i	3	j	30
k	29	Ι	40						



