

Section 1.2

Order of Operations

Order of Operations is the sequence of steps that must be taken to reduce a math expression to its simplest form, or scale down an equation to find an answer. Not following the proper order will result in the wrong answer. Understanding these rules is the key to success in algebra and beyond.

STEPS:

1. First, simplify all expressions **inside** all parentheses. If there are parentheses inside the parentheses [or brackets], work from the inside parentheses first, eliminating parentheses as you go along.
2. Next, do exponents and radicals (roots).
3. Then, do multiplication and division from left to right as they occur. Multiplication is noted with an \times , dot ($2 \cdot 3$), or parentheses, like in $3(4) = 12$. Division is noted with a slash ($/$), fraction line ($\frac{\quad}{\quad}$), or \div .
4. Lastly, do addition and subtraction.

Example: $3 + 4 \times 8 = 35$ FIRST multiply 4×8 , then add 3

If you want to add first, place the addition in parenthesis: $(3 + 4) \times 8 = 56$

Add 3 and 4, then multiply by 8. Notice the different answers.

Example:

$7 + 2 \times 5 (5 + 6^2) - 3 \times 4$	(exponent)
$7 + 2 \times 5 (5 + 36) - 3 \times 4$	(parenthesis)
$7 + 2 \times 5 (41) - 3 \times 4$	(multiplication)
$7 + 2 \times 205 - 12$	(multiplication)
$7 + 410 - 12 = 405$	(add and subtract)

Example:

$9 + 48 \div [2 (4 + 2^3)] - 15 \div 3 \times 2$	(exponent)
$9 + 48 \div [2 (4 + 8)] - 15 \div 3 \times 2$	(parenthesis)
$9 + 48 \div [2 (12)] - 15 \div 3 \times 2$	(parenthesis and bracket)
$9 + 48 \div 24 - 15 \div 3 \times 2$	(divide and multiply)
$9 + 2 - 10 = 1$	(add and subtract)

Example:

$3[22 + 36 \div 2 (10 - \sqrt{16}) + (7 - 2^2)]$	(root and exponent)
$3[22 + 36 \div 2 (10 - 4) + (7 - 4)]$	(parentheses)
$3[22 + 36 \div 2 (6) + 3]$	(division)
$3[22 + 18(6) + 3]$	(multiplication)
$3[22 + 108 + 3]$	(addition)
$3[133] = 399$	(multiplication)

Practice:

Evaluate.

1. $7 + 8 \times 2 - 9 + 8 \div 2 - 6 \div 3 \times 1$
2. $10 - 9 \div 3 + 12 + 16 \div 4 - 20 \div 4 \times 3$
3. $12(8 - 5) \div 9 + 11 - (5 \times 4 \div 2 - 3) + 2 \times 8$
4. $9 - (16 + 4 \times 12) \div [2 + 4 + (8 + 3^2 \times 2)] + 21$
5. $17 + 9 \times 3 - 4 + 12 \div 3 - 12 \div 6 \times 2$
6. $9 - \sqrt{64} \div 2 + 11 + 15 \div 3 - 21 \div 3 \times 2$
7. $20(9 - 6) \div 10 + 12 - (6 \times 5 \div 3 - 4) + 3 \times 9$
8. $7 + (10 + 6 \times 14) \div [4 + 17 + (10 + 2^2 \times 4)] + 2$
9. $15 + 6 \times 0 - 7 + 6 \div 3 - 10 \div 5 \times 3$
10. $13 - 12 \div 6 + 15 + 12 \div 4 - 28 \div 7 \times 5$
11. $20(4 - 1) \div 3 + 8 - (6 \times 1 \div 3 + 5) + 7 \times 2$
12. $12 + (9 + 3 \times 5) \div [8 + 2 + (-46 + 4^2 \times 3)] + 2$
13. $17 + 6 \times 0 - 12 + 4 \div 2 + [9 \div 3 \times 3]$
14. $14 - 15 \div 3 + 10 + 8 \div 2 - 10 \div 2 \times 3$
15. $6(9 - 3) \div 3 + 1 - (6 \times 2 \div 1 - 4) + 6 \times 5$
16. $5 - (7 + 8 \times 6) \div [4 - 19 + (6 + 2^2 \times 5)] + 14$
17. $27 + 9 \times 3 - 2 + \sqrt{36} \div 1 - 16 \div 4 \times 2$
18. $8 - 12 \div 4 + 10 + 27 \div 3 - 14 \div 7 \times 5$
19. $5(18 - 12) \div 3 + 15 - (7 \times 5 \div 5 - 4) + 6 \times 4$
20. $18 - (22 + 3 \times 21) \div [7 - 1 + (4 + 5^2 \times 3)] + 24$
21. $6 + 9 \times 3 - 10 + 10 \div 5 - 24 \div 4 \times 2$
22. $18 - 15 \div 5 + 22 + 21 \div 7 - 8 \div 2 \times 5$
23. $4(9 - 3) \div 12 + 9 - (6 \times 10 \div 4 - 2) + 6 \times 10$
24. $24 - (18 + 6 \times 5) \div [3 + 2 + (7 + 6^2 \times 1)] + 32$
25. $9 + 13 \times 3 - 5 + 18 \div 6 - 6 \div 3 \times 21$
26. $1 + 11 \div 1 + 14 + 32 \div 16 + 24 \div 2 \times 5$
27. $8(12 - 7) \div 5 + \sqrt{84 + 60} - (2 \times 8 \div 1 - 5)$
28. $10 - (12 + 6 \times 9) \div [-76 + (9 + 5^2 \times 4)] + 12$
29. $17 + 6 \times 12 - 10 + 6 \div 2 - 8 \div 2 \times 1$
30. $10 - 9 \div 3 + 12 + 16 \div 2 - 6 \div 2 \times 8$
31. $14(9 - 2) \div 7 + 10 - (7 \times 8 \div 4 - 1) + 7 \times 4$
32. $5 - (12 + 3 \times 22) \div [11 + 10 + (9 + 1^2 \times 9)] + 2$
33. $8 + 13 \times 4 - 19 + 14 \div 7 - 9 \div 3 \times 6$
34. $16 - 8 \div 4 + 13 + 15 \div 3 + 25 \div 5 \times 11$
35. $2[(9 - 3) \div 2 + 15] - (14 \times \sqrt{4} \div 4 + 4) + 7$
36. $23 - (12 + 5 \times 3) \div [20 + 6 - (12 + 1^2 \times 5)] + 8$
37. $5 + 18 \times 3 - 7 + 14 \div 2 - 6 \div 2 \times 5$
38. $28 - 5 \div 1 + 10 + 18 \div 6 - 10 \div 2 \times 2$
39. $6[16 - (8 - 2) \div 3] + 12 - (6 \times 5 \div 15 - 2) + 5$
40. $7 + (12 + 3 \times 6) \div [5 + 6 + (7 + 2^2 \times 3)] + 36$
41. $75 + 9 \times 3 - 5 + 12 \div 4 - 24 \div 6 \times 5$
42. $39 - 12 \div 6 + 12 + 21 \div 7 - 28 \div 4 \times 5$
43. $7(8 - 5) \div 3 + 42 - (10 \times 20 \div 8 - 7) + 6 \times 11$
44. $59 - (12 + 3 \times 6) \div [8 + 7 - \sqrt{5^2 \times 4}] + 35 \div 7$
45. $3 + 5 \times 4 - 7 + 12 \div 6 - 8 \div 4 \times 2$
46. $18 - 6 \div 2 + 15 + 12 \div 6 - 24 \div 8 \times 3$
47. $15(9 - 6) \div 5 + 13 - (6 \times 3 \div 9 + 4) + 6 \times 1$
48. $6 - (20 + 8 \times 14) \div [5 + 7 + (6 + 2^2 \times 3)] + 35$
49. $14 + 8 \times 6 - 5 + 16 \div 8 - 18 \div 9 \times 3$
50. $79 - \sqrt{25} \div 5 + 17 + 16 \div 8 - 36 \div 12 \times 6$
51. $2(8 - 8) \div 15 + 16 - (7 \times 6 \div 2 - 5) + 4 \times 7$
52. $3 + (12 + 3 \times 8) \div [5 + 9 + (6 + 4^2 \times 1)] + 1 \times 5$
53. $22 + 8 \times 5 - 4 + 8 \div 4 - 18 \div 6 \times 8$
54. $17 - 32 \div 8 + 14 + 30 \div 5 - 24 \div 8 \times 7$
55. $3(8 - 3) \div 10 + 6 - (9 \times 2 \div 6 + 3) + 6 \times 4$
56. $6 + (1 + 4 \times 6) \div [5 + 2 + (6 + 2^2 \times 3)] + 4$
57. $33 + 3 \times 5 - 15 + 18 \div 6 + [12 \div 4 \times 5]$
58. $21 - 35 \div 5 + 13 + 9 \div 3 - 16 \div 4 \times 7$
59. $8(8 - 6) \div 4 + 6 - (7 \times 3 \div 7 + 5) + 2 \times 3$
60. $5 + (8 + 8 \times 6) \div [7 - 5 + (3 + 1^2 \times 2)] + 5$
61. $26 + 7 \times 4 - 13 + \sqrt{81} \div 3 - 20 \div 2 \times 3$
62. $9 - 15 \div 5 + 12 + 36 \div 4 + 16 \div 2 \times 8$
63. $4(40 - 10) \div 8 + 14 - (4 \times 4 \div 4 - 1) + 7 \times 2$
64. $8 + (3 + 4 \times 3) \div [7 + 1 + (3 + 4^2 \times 4)] + 6$
65. $6 + 6 \times 2 - 18 + 12 \div 2 - 36 \div 6 \times 1$
66. $21 - 42 \div 6 + 28 + 35 \div 5 - 28 \div 14 \times 7$
67. $4(9 - 3) \div 10 + 7 - (2 \times 12 \div 3 - 1) + 3 \times 4$
68. $21 - (18 + 4 \times 3) \div [3 + 2 + (1 + 2^3 \times 3)] + 8$
69. $19 + 7 \times 6 - 6 + 21 \div 7 - 8 \div 2 \times 5$
70. $3 + 44 \div 4 + 15 + 36 \div 12 + 21 \div 3 \times 7$
71. $9(13 - 5) \div 3 + \sqrt{57 + 64} - (6 \times 4 \div 2 - 6)$
72. $1 + (13 + 7 \times 5) \div [-6 + (9 + 1^2 \times 3)] + 8$