

Simplifying Expressions

Objectives:

- ...to simplify numerical expressions using the order of operations
- ...to evaluate algebraic expressions using substitution of values

Assessment Anchor:



7.A.2.1 – Complete calculations by applying the order of operations

7.D.2.1 – Select and/or use appropriate strategies to solve or represent equations or expressions

Vocabulary alert!!

NUMERICAL EXPRESSION – a mathematical phrase that contains numbers and operation symbols

ORDER OF OPERATIONS – the procedure to follow when simplifying a numerical expression

NOTES (the order of operations)

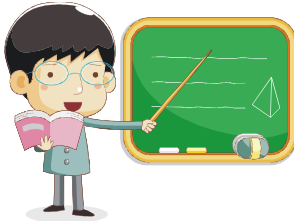
1. Complete all operations within a **GROUP** first! Grouping symbols include a) parenthesis, b) brackets, c) braces, d) division bars

() [] { } —

*****IMPORTANT** – within the group, you must follow steps 2, 3, and 4.

2. Evaluate any **EXPONENTS** (which mean repeated multiplication)
3. From left to right, do any **MULTIPLICATION OR DIVISION**.
4. From left to right, do any remaining **ADDITION OR SUBTRACTION**.

Simplifying Expressions



“Do one thing at a time! Trying more than that leads to confusion and more chance for errors. While you’re working, remember FLOCK OF SEAGULLS!”

EXAMPLES

1a) $5 + 10 \times 4$

\checkmark

$5 + 40$

\checkmark

45

1b) $36 - 10 \div 2$

2a) $30 - 10 \div 2 + 6$

\checkmark

$30 - 5 + 6$

\checkmark

$25 + 6$

\checkmark

31

2b) $19 + 16 \div 2 \times 8$

3a) $5 \times (4 + 3 \times 2)$

\checkmark

$5 \times (4 + 6)$

\checkmark

5×10

\checkmark

50

3b) $15 + [7 \times 2 - 2]$

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4a)

$$3 \times 24 \div 4 - 10 + 7^2$$

$$3 \times 24 \div 4 - 10 + 49$$

$$72 \div 4 - 10 + 49$$

$$18 - 10 + 49$$

$$8 + 49$$

$$\boxed{57}$$

4b)

$$4 \times 3^2 - 30 \div 3$$

5a)

$$\frac{10 - 3 \times 3 + 11}{4}$$

$$\frac{10 - 9 + 11}{4}$$

$$\frac{1 + 11}{4}$$

$$\frac{12}{4}$$

$$\boxed{3}$$

5b)

$$\frac{31 - 12 \div 3}{12 + 3 \times 10 \div 2}$$

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MORE COMPLEX EXAMPLES

6a) $[5 - (5 \times 3 - 12)]^2 + 10$

∨
 $[5 - (15 - 12)]^2 + 10$

∨
 $[5 - 3]^2 + 10$

∨
 $2^2 + 10$

|
 $4 + 10$

∨

14

6b) $5^2 - [(4 + 2^3) \times 2] + 9$

7) $3^3 - (4^2 \div 2 \times 8) \div 4$

8) $57 - [(10 - 2^3) \times 3]^2$

Simplifying Expressions

Vocabulary alert!!

VARIABLE EXPRESSION – a mathematical phrase that contains variables, numbers, and operation symbols

EVALUATE – to replace variables with numbers and then simplify the expression

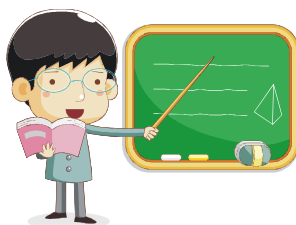
NOTES

To evaluate variable expressions:

1. Turn the variable expression into a numerical expression by **SUBSTITUTING** the known values into that expression.
2. Follow the order of operations to simplify the numerical expression.

Operation Table

Addition	Subtraction	Multiplication	Division
$A + B$	$A - B$	$A \times B$	$A \div B$
		$A \cdot B$	A / B
		$A * B$	$\frac{A}{B}$
		AB	$\frac{A}{B}$
		$A(B)$	
		$(A)(B)$	



“TAKE OUT the variable, and PUT IN the number! Keep the original operators in tact...especially the multiplication!”

Simplifying Expressions

EXAMPLES

9) Evaluate the expression using: $x = 4, y = 3, z = 6$

A) $10y - 6x + 4z$

B) $5y - 3x \div z$

$$10 \cdot 3 - 6 \cdot 4 + 4 \cdot 6$$

$$30 - 6 \cdot 4 + 4 \cdot 6$$

$$30 - 24 + 4 \cdot 6$$

$$30 - 24 + 24$$

$$6 + 24$$

$$\boxed{30}$$

C) xy^3

D) $(2x - z)^y$

10) Evaluate the expression using: $a = 5, b = 8, c = 2$

A) $(20 - 3a)(b + c)$

B) $5(3c + b) - ab$

$$(20 - 3 \cdot 5)(8 + 2)$$

$$(20 - 15)(8 + 2)$$

$$5 \cdot (8 + 2)$$

$$5 \cdot 10$$

$$\boxed{50}$$

C) $b^c - 4a / 10$

D) $[a - (ac - b)]^3$