

# Lesson 1-7

Objective - To simplify expressions using the order of operations.

Simplify each expression below.

1)  $6 + 5(8 - 2)$

2)  $2 + 3 \cdot 5^2$

3)  $16 \div 2 \cdot 4$

4)  $10 - 3 + 2 \cdot 4$

## Order of Operations

- Parenthesis** 1)  $6 + 5(8 - 2)$   
 $6 + 5(6)$   
 $6 + 30 = 36$
- Exponents** 2)  $2 + 3 \cdot 5^2$   
 $2 + 3 \cdot 25$   
 $2 + 75 = 77$
- Multiply / Divide** 3)  $16 \div 2 \cdot 4$   
 $8 \cdot 4 = 32$
- Add / Subtract** 4)  $10 - 3 + 2 \cdot 4$   
 $10 - 3 + 8$   
 $7 + 8 = 15$

Simplify the following.

1)  $(4 + 3 \cdot 6)2 - 10$

$(4 + 18)2 - 10$

$(22)2 - 10$

$44 - 10 = 34$

2)  $24 - 2[18 \div (5 + 1)]$

$24 - 2[18 \div 6]$

$24 - 2[3]$

$24 - 6 = 18$

3)  $8 - 36 \div 4 + 5$

$8 - 9 + 5$

$-1 + 5 = 4$

4)  $\frac{8 + 5 \cdot 4}{10 - 6}$

$\frac{8 + 20}{4}$

$\frac{28}{4} = 7$

Evaluate the expression if  $a = 2$ ,  $b = 4$ , and  $c = 8$

1)  $c - ab$

$8 - 2 \cdot 4$

$8 - 8$

$0$

2)  $3a(c - b)$

$3 \cdot 2(8 - 4)$

$3 \cdot 2(4)$

$6(4) = 24$

3)  $b + 3a^2 \div 2$

$4 + 3(2)^2 \div 2$

$4 + 3(4) \div 2$

$4 + 12 \div 2$

$4 + 6 = 10$

4)  $\frac{2(b+c)}{a}$

$\frac{2(4+8)}{2}$

$\frac{2(12)}{2} = \frac{24}{2} = 12$

Fact: Scientific calculators and computers follow the order of operations. Four function calculators do not.

4 - Function  
Calculator

$3 + 4 \times 2 =$   
 $7 \times 2 = 14$

Scientific  
Calculator

$3 + 4 \times 2 =$   
 $3 + 8 = 11$

Computer

$3 + 4 * 2 =$   
 $3 + 8 = 11$

## Symbolic Differences in Calculators and Computers

Expression	Scientific Calculator	Computer
+	+	+
-	-	-
x	x	*
÷	÷	/
$4^2$	$4 \boxed{x^y} 2$	$4 \wedge 2$

# Lesson 1-7 (cont.)

Key Sequences

<u>Expression</u>	<u>Incorrect</u>	<u>Correct</u>
$3(8-2) =$	$3 \times 8 - 2 =$	$3 \times (8 - 2) =$
$\frac{12}{6-2} =$	$12 \div 6 - 2 =$	$12 \div (6 - 2) =$
$\left(\frac{6+8}{2}\right)^2 =$	$6 + 8 \div 2 \wedge 2 =$	$(6 + 8) \div 2 \wedge 2 =$
		$((6 + 8) \div 2) \wedge 2 =$

Factor the following using the distributive property.

1) $7x - 21$ $7(x - 3)$	4) $16 - 2b$ $2(8 - b)$
2) $9y - 54$ $9(y - 6)$	5) $15x - 10y + 20$ $5(3x - 2y + 4)$
3) $4a - az$ $a(4 - z)$	6) $12k - 18m - 36$ $6(2k - 3m - 6)$

Use the distributive property to combine like terms.

$7x + 5x$   
 $x(7 + 5)$   
 $x(12) = 12x$

Simplify.

1) $8y + 3y$ $y(8 + 3)$ $y(11) = 11y$	2) $11n^3 - 2n^3$ $n^3(11 - 2)$ $n^3(9) = 9n^3$
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Like Terms

Like terms - variable terms that differ only in their coefficients.

<u>Like Terms</u>		<u>Unlike Terms</u>	
$7x$	$3x$	$7x$	$3y$
$5y$	$y$	$5y$	$y^2$
$10xy$	$2yx$	$2a$	$3ab$
$\frac{2}{3}a^2b$	$6ba^2$	$5x^2y$	$7xy^2$
$4p^2$	$p^2$	$4p$	$p^2$

Simplify by combining like terms.

1) $7x + 4y + 2x + y$ $9x + 5y$	5) $4k + (2j) + 6k + j$ $10k + 3j$
2) $3m + 10n + 4m + 1$ $7m + 10n + 1$	6) $10 + 4x + 3y + 17x$ $21x + 3y + 10$
3) $7x + 3y$ $7x + 3y$	7) $3y^2 + y + 6y^2 + y$ $9y^2 + 2y$
4) $6x + (5x) + 2x + 3$ $13x + 3$	8) $\frac{3}{7}m^2 + 4t + \frac{2}{7}m^2 + t$ $\frac{5}{7}m^2 + 5t$

Simplify the expression using the Distributive Property and then combining like terms.

1) $3(a + 4) + 2a$ $3a + 12 + 2a$ $5a + 12$	3) $2a + 6(5 + a) + a$ $2a + 30 + 6a + a$ $9a + 30$
2) $5x + 4(x + 7)$ $5x + 4x + 28$ $9x + 28$	4) $3(b + 4) + 2(b + 5)$ $3b + 12 + 2b + 10$ $5b + 22$

# Lesson 1-7 (cont.)

Simplify each variable expression.

5)  $7(x + 4) + 2x$

$$7x + 28 + 2x$$

$$9x + 28$$

6)  $5x + 3(x + 1)$

$$5x + 3x + 3$$

$$8x + 3$$

7)  $a + 2(4 + a) + 1$

$$a + 8 + 2a + 1$$

$$3a + 9$$

8)  $3(b + 2) + 6b$

$$3b + 6 + 6b$$

$$9b + 6$$

9)  $2(3m + 1) + 4m$

$$6m + 2 + 4m$$

$$10m + 2$$

10)  $3(k + m) + 5(k + 2m)$

$$3k + 3m + 5k + 10m$$

$$8k + 13m$$

Translate each phrase into a mathematical expression.

1) six less than twice the quantity of x plus 4

$$2(x + 4) - 6$$

2) three times the sum of k and 4

$$3(k + 4)$$

3) twice the difference of m and 3

$$2(m - 3)$$

4) the quantity of 7 plus a number x divided by 2

$$(7 + x) \div 2$$

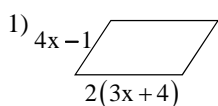
5) the difference of 6 and k divided by 9

$$(6 - k) \div 9$$

6) 4 minus the quantity of 12 plus y

$$4 - (12 + y)$$

Find the perimeter of the figures below in terms of x.

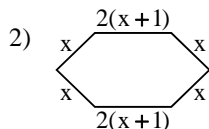


$$P = 2(4x - 1) + 2 \cdot 2(3x + 4)$$

$$P = 8x - 2 + 4(3x + 4)$$

$$P = 8x - 2 + 12x + 16$$

$$P = 20x + 14$$



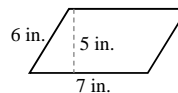
$$P = 4(x) + 2 \cdot 2(x + 1)$$

$$P = 4x + 4(x + 1)$$

$$P = 4x + 4x + 4$$

$$P = 8x + 4$$

Use formulas to find the perimeter and area of the figure below.



Perimeter

$$P = 2a + 2b$$

$$P = 2(6) + 2(7)$$

$$P = 12 + 14$$

$$P = 26 \text{ inches}$$

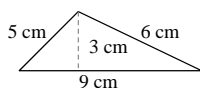
Area

$$A = b \cdot h$$

$$A = 7 \cdot 5$$

$$A = 35 \text{ in}^2$$

Use formulas to find the perimeter and area of the figure below.



Perimeter

$$P = a + b + c$$

$$P = 5 + 6 + 9$$

$$P = 20 \text{ cm}$$

Area

$$A = \frac{1}{2} b \cdot h$$

$$A = \frac{1}{2} (9 \cdot 3)$$

$$A = \frac{1}{2} (27)$$

$$A = 13.5 \text{ cm}^2$$