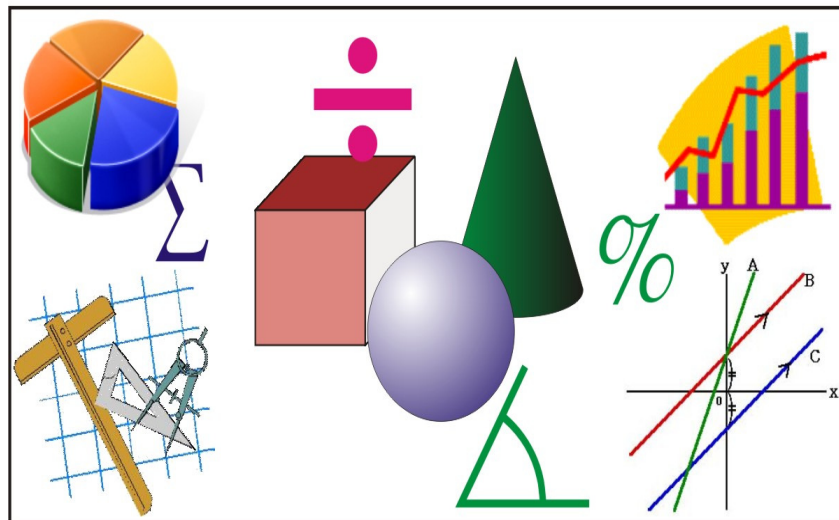


New!

**DISTRIBUTED LEARNING
RAVEN'S MATHEMATICS
GRADE 9**

**Designed from the WNCPCurriculum
for the Western Provinces and the Territories**

**STUDENT GUIDE AND
RESOURCE BOOK**



BASED ON THE WESTERN PROTOCOLS FOR 2008 AND BEYOND



Raven Research Associates, Inc.

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SAMPLE EXERCISE

2A.4 Order of Operations

▪ From previous work we saw that when there are several operations needed to simplify an expression, a special order of operations needs to be done. Following are 4 levels to be done in order, beginning with level 1.

▪ Remember **BEDMAS**

1. Level 1	B (brackets)	←	▪ If more than one set, innermost first
2. Level 2	E (exponents)		
3. Level 3	D (divide)	←	▪ Same level, do left to right
	M (multiply)	←	
4. Level 4	A (add)	←	▪ Same level order doesn't matter
	S (subtract)	←	

▪ If there are no brackets (parentheses), perform all multiplication and division in the order they appear, before any addition or subtraction.

e.g.

1. $2 + 4 \times 6 - 6$	<i>Solution:</i> $2 + 24 - 6 = 26 - 6 = 20$	▪ <i>Perform multiplication first</i>
2. $12 + 24 \div 2 + 2 \times 8$	<i>Solution:</i> $12 + 12 + 16 = 24 + 16 = 40$	▪ <i>Perform division and multiplication first in the order they appear</i>
3. $4 + \frac{1}{2} \times 8 - 20$	<i>Solution:</i> $4 + 4 - 20 = 8 - 20 = -12$	▪ <i>Perform multiplication first</i>
4. $12 \times 2 + 8.4 \div 2.1$	<i>Solution:</i> $24 + 4 = 28$	▪ <i>Perform multiplication and division first in the order they appear</i>

▪ If there are brackets (parentheses) perform all operations inside the brackets before any other operations.

e.g.

1. $4 \times (7.1 + 2) - 3$	<i>Solution:</i> $4 \times (9.1) - 3$ $= 36.4 - 3$ $= 33.4$	▪ <i>Perform operations in brackets first</i> ▪ <i>Perform multiplication</i> ▪ <i>Perform subtraction next</i>
2. $5.5 + (2 + 1.2) \div 2$	<i>Solution:</i> $5.5 + (3.2) \div 2$ $= 5.5 + 1.6$ $= 7.1$	▪ <i>Perform operations in brackets first</i> ▪ <i>Perform division next</i> ▪ <i>Perform addition next</i>
3. $5 - 3(5 - 3.5)(1.5)$	<i>Solution:</i> $5 - 3(1.5)(1.5)$ $= 5 - 4.5(1.5)$ $= 5 - 6.75$ $= -1.75$	▪ <i>Perform operations in brackets first</i> ▪ <i>Perform multiplication</i> ▪ <i>Perform multiplication</i> ▪ <i>Perform subtraction</i>

Further Examples:

- First simplify each of the following expressions without using a calculator: then use a calculator to verify your solution. Use a scientific calculator which can do order of operations, otherwise you will need to input the order yourself.

Example 1

$$2 + 3 \times 4$$

- since there are no brackets, perform the multiplication first

$$2 + \underline{3 \times 4} = 2 + 12$$

- now add $2 + 12 = 14$

Example 2

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

- perform operations inside of the brackets first

$$\underline{(2 + 3)} \times 4 = 5 \times 4$$

- now multiply $5 \times 4 = 20$

Example 3

$$32 \div 4 - (3 \times 2)$$

- perform operations inside of brackets first

$$32 \div 4 - \underline{(3 \times 2)} = 32 \div 4 - 6$$

- now perform division before adding or subtracting

$$\underline{32 \div 4} - 6 = 8 - 6$$

- now subtract $8 - 6 = 2$

Example 4

$$1.3 + 2(5 + 0.25) - 4$$

- perform operations inside of brackets first

$$1.3 + 2(5 + 0.25) - 4 = 1.3 + 2(5.25) - 4$$

- now perform multiplication before adding or subtracting

$$1.3 + 10.5 - 4$$

- now add and subtract 7.8

Find the error(s) in each of the following incorrect simplifications on the left and then do the questions correctly on the right.

Example 5

$$4 + 9 \times 3 \\ = 13 \times 3 = 39 \quad \mathbf{X}$$

Correct Solutions

$$4 + 9 \times 3 \\ = 4 + 27 \quad (\text{multiplication first}) \\ = 31$$

Example 6

$$7 \times 6 + 8 \div 2 \\ = 42 + 8 \div 2 \\ = 50 \div 2 = 25 \quad \mathbf{X}$$

$$7 \times 6 + 8 \div 2 \\ = 42 + 4 \quad (\text{multiplication and division first}) \\ = 46$$

Example 7

$$6 - 4(5 - 8) \\ = 2(-3) \\ = -6 \quad \mathbf{X}$$

$$6 - 4(5 - 8) \\ = 6 - 4(-3) \quad (\text{brackets first}) \\ = 6 + 12 \quad (\text{multiplication next}) \\ = 18$$

Exercises 2A.4

Evaluate each of the following expressions without a calculator; then use a calculator to verify your solution.

1. $3 - 4(5) + 2$

2. $9(5) + 44 \div 11$

3. $21 + 9 \div 3 - 5$

4. $5.2(2.4) + 8 - (3.5 \div 7)$

5. $7 - \frac{1}{3}(12) + 3$

6. $45(6 - 2) + 6 \div 3$

7. $(22 + 4) \div 13 - 4$

8. $0.5(12 - 0.2) + 4(1.5)$

9. $-36 \div 6(21-18) \times (-2)$

10. $3(8 - 3.5) - 2 \div 4$

Find the errors in each of the following incorrect simplifications, and then do the questions correctly.

11. $12 - 7 \times 3$
 $= 5 \times 3$
 $= 15$

12. $6 \times 6 + 12 \div 4$
 $= 36 + 12 \div 4$
 $= 48 \div 4$
 $= 12$

13. $8 - 2(7 - 10)$
 $= 6(-3)$
 $= -18$

14. $10 + (16 - 10) \times 3$
 $= 10 + 6 \times 3$
 $= 16 \times 3$
 $= 48$