Order of Operations

Please Excuse My Dear Aunt Sally

P = parenthesis

E = exponents

M = multiplication

D = Division

A = addition

S = subtraction

Example: $5(8 + 2^2) \div 4 - 3^2$

$5(8+4) \div 4 - 3^2$

$5(12) \div 4 - 3^2$

$60 \div 4 - 9$

$15 - 9$ $\boxed{6}$

Example: $2x + (3x)^2 - 6x^2 \div 2x - x$

$2x + 9x^2 - \underbrace{6x^2 \div 2x} - x$

$2x + 9x^2 - 3x - x$

$\boxed{9x^2 - 2x}$

Scientific Notation:

Scientific notation involves writing a number in the form of

$a \times 10^n$, where $1 \leq a \leq 10$.

Example: 700

Why is 700 written as $\mathbf{7 \times 10^2}$ in Scientific Notation ?

→ $700 = 7 \times 100$

→ and $100 = 10^2$ *(see powers of 10)*

→ so $700 = \mathbf{7 \times 10^2}$

Both **700** and $\mathbf{7 \times 10^2}$ have the same value, just shown in different ways.

Example: 4,900,000,000

$1{,}000{,}000{,}000 = 10^9$,

so $4{,}900{,}000{,}000 = \mathbf{4.9 \times 10^9}$ in Scientific Notation

More examples:

Number in decimal	Number in scientific notation	
1,230,000	1.23×10^6	1.23 E 6
0.0098723	9.823×10^{-3}	9.823 E -3
12,300,000,000	1.23×10^{10}	1.23 E 10
0.000009123	9.123×10^{-6}	9.123 E -6

In calculator shows up like this

Problems on order of operations and scientific notation (unit 2.4)

1. The expression $\dfrac{2-(12\div 2)}{-(-2)^2}$ is equal to

6

$\dfrac{-4}{-4} = 1$

(A) $-\dfrac{5}{4}$

(B) -1

(C) -0.5

(D) 1

(E) $\dfrac{5}{4}$

2. The expression $5-2^2+3(\underbrace{1+2}_{3})^2$ is equal to:

$5-4+3(3)^2$

$5-4+3(9)$

$5-4+27$

28

(A) 10

(B) 28

(C) 30

(D) 36

(E) 145

3. The expression $\dfrac{-4}{2}-(-2)^3+1$ is equal to:

$-2-(-8)+1$

$-2+8+1$

7

(A) -9

(B) -7

(C) -5

(D) 7

(E) 11

4. The expression $3^2+\dfrac{2^3+1}{(1-2)^3}$ is equal to:

$9+\dfrac{8+1}{(-1)^3}$

$9+\dfrac{9}{-1}$

$9-9=0$

(A) -18

(B) -9

(C) 0

(D) 9

(E) 18

5. The expression $\dfrac{8+(6-3)^2}{2^2-3^2-12}$ is **closest** to:

$\dfrac{8+3^2}{4-9-12}$

$\dfrac{8+9}{-17} = \dfrac{17}{-17} = -1$

(A) -2

(B) -1

(C) 0

(D) 1

(E) 2

6. The expression $\dfrac{(3x)^3-x^3}{x^3}$ is equal to:

$\dfrac{27x^3-x^3}{x^3}$

$\dfrac{26x^3}{x^3} = 26$

(A) 0

(B) 2

(C) 8

(D) 26

(E) 27

7. The expression $-x^2-(-2x)^2-x+(-3)^3$ is equivalent to:

$-x^2-(4x^2)-x-27$

$-x^2-4x^2-x-27$

$-5x^2-x-27$

(A) $3x^2-x+9$

(B) $3x^2-x-27$

(C) $7x^2-x+-27$

(D) $-6x^2-27$

(E) $-5x^2-x-27$

8. <u>Extra Credit:</u> The expression $\dfrac{(x^2)^2+2x^2-6x\div 2x}{x\cdot x\cdot x-x\cdot x+x+x+x-3}$ is equivalent to:

$\dfrac{x^4+2x^2-3}{x^3-x^2+3x-3}$

$\dfrac{(x^2+3)(x^2-1)}{x^2(x-1)+3(x-1)}$

$\dfrac{(x^2+3)(x+1)(x-1)}{(x^2+3)(x-1)}$

(A) $x+1$

(B) x^2+3

(C) $x-1$

(D) x^2-3

(E) None of the above.

9. When expressed in scientific notation 150,000 is:

1.5 x 10^5

(A) 1.5×10^{-5}

(B) 1.5×10^{5}

(C) 0.15×10^{-5}

(D) 15×10^{4}

(E) 0.15×10^{6}

10. When expressed in scientific notation 0.000506 is:

5.06x10^-4

(A) 506×10^{-3}

(B) 506×10^{3}

(C) 5.06×10^{4}

(D) 5.06×10^{-4}

(E) 50.6×10^{-5}

11. What is the product of 1,350,000 and 2,300,000?

calc

3.105E12

(A) 3.105×10^{12}

(B) 3.105×10^{-12}

(C) 3.65×10^{5}

(D) 3.65×10^{-5}

(E) 27/46

12. When expressed in decimal, 6.2×10^{9} is

Big!

6.200000000

(A) 0.0000000062

(B) 0.00000000062

(C) 6,200,000,000

(D) 6.2000000000

(E) 6,200,000

0.00000003.2

13. When expressed in decimal, 3.2×10^{-8} is

(A) 32,000,000

(B) 0.0000000032

(C) 32.000000

(D) .000000032

(E) 328

14. What is the product of 5,330,000 and 0.22×10^{-10}?

calc: 1.1726E-4

(A) 11.726

(B) 1,172,600

(C) 1.1726×10^{-4}

(D) 1.1726×10^{-5}

(E) 1.1726×10^{-6}

15. Simplify $(1.2 \times 10^{-3}) \div (3.2 \times 10^{2})$

careful!

calc:

3.75E-6

(A) 0.0375

(B) 0.375

(C) 3.75×10^{-4}

(D) 3.75×10^{-5}

(E) 3.75×10^{-6}

16. The quantity $(9.1 \times 10^{10})^{5}$ is equivalent to:

calc!

6.24E54

(A) 6.24

(B) 62,403

(C) 6.24×10^{46}

(D) 6.24×10^{50}

(E) 6.24×10^{54}