5.4: Scientific Notation

5.4.1

Note Title 10/8/2018

Scientific Notation: We write numbers so they have exactly one nonzero digit to the left of the decimal point, and are multiplied by a power of 10.

Example: Write 3254 in scientific notation.

$$3254 = \boxed{3.254 \times 10^3}$$

3254.

3 slots

new location

old location of decimal

Scientific notation is usually used for very large and very small numbers.

Ex: Write 0.0001536 in scientific notation.

0.0001536

old location

4 slots

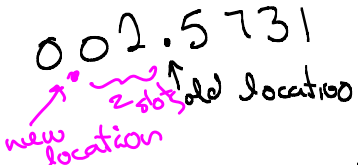
new location

$$0.0001536 = \boxed{1.536 \times 10^{-4}}$$

5.4.2

Ex: Write the number without scientific notation.

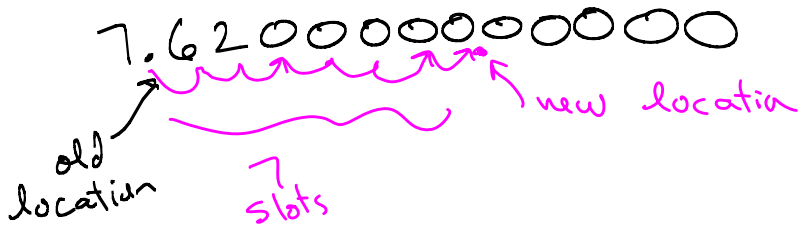
2.5731×10^{-2}



$2.5731 \times 10^{-2} = \boxed{0.025731}$

Ex: Write the number without scientific notation.

7.62×10^{7}



$7.62 \times 10^{7} = 76200000 =$ $\boxed{76,200,000}$

$=$ $\boxed{76\ 200\ 000.}$

5.5: Addition and subtraction of Polynomials

A polynomial (in x) is a sum of terms of the form ax^n, where x is a real number and the exponent n is a nonnegative integer.

Examples of polynomials: $3x^4 + 5x^2 - 7x$

$2x^{13} + 5$

$\frac{1}{4}x^3 + \frac{1}{3}x^2 - \frac{2}{5}x$

Not polynomials:

$\frac{1}{x^2} + \frac{5}{x^3}$, $\sqrt{x} + \sqrt[3]{x}$

$x^{-2} + 5x^{-3}$ negative exponents

$x^{\frac{1}{2}} + x^{\frac{1}{3}}$ fractional exponents

For each term ax^n, a is the coefficient, and n is the degree of the term.

The term with the largest exponent is the leading term.

The leading coefficient is the coefficient of the leading term.

The degree of the polynomial is the largest exponent.

5.5.2

Ex: $7x^4 - 2x^5 + 13x^2 - 6$

Leading term: $-2x^5$

Leading coefficient: -2

Degree: 5

Sometimes we rearrange polynomials in descending order:

$$-2x^5 + 7x^4 + 13x^2 - 6$$

If a polynomial has two or more variables, the degree is the largest total exponent in a term:

Ex: $2x^3y - 4x^3y^2 + 6x^4y^3 - 2xy + 3x^2 + 4y^4$

- $2x^3y$: total exponent 4
- $-4x^3y^2$: total exponent 5
- $6x^4y^3$: total exp 7
- $-2xy$: total exp 2
- $3x^2$: total exp 2
- $4y^4$: total exp 4

Find the degree. Degree 7

Special names for certain polynomials.

Polynomial with 3 terms: trinomial

Polynomial with 2 terms: binomial

Polynomial with 1 term: monomial

Example: $5x - x^3$ is a

3rd degree binomial. ←

Note:
Leading term: $-x^3$
Leading coefficient: -1
Descending order: $-x^3 + 5x$

Ex: $2x^4 + 6x^2 - 8$ is a

4th degree trinomial.

Ex: $17x^8$ is an 8th degree monomial
(monomial of degree 8)

Adding and subtracting: Combine like terms.

Ex: Simplify

$$(3x^2 - 7x + 5) + (-4x^2 + 8x + 1)$$
$$= 3x^2 - 7x + 5 - 4x^2 + 8x + 1$$
$$= \boxed{-x^2 + x + 6}$$

Ex: Simplify.

$$2x^3 - 5x^2 - 3x + 6 - (-x^2 + 5x - 8)$$
$$= 2x^3 - 5x^2 - 3x + 6 - 1(-x^2 + 5x - 8)$$
$$= 2x^3 - 5x^2 - 3x + 6 + x^2 - 5x + 8$$
$$= \boxed{2x^3 - 4x^2 - 8x + 14}$$

5.6: Multiplication of Polynomials and Special Products

Simplify.

Ex: $3x^4(-7x^8)$

$= \boxed{-21x^{12}}$

Ex: $3x^3(2x^2 - 8x + 7)$

$= 3x^3(2x^2) + 3x^3(-8x) + 3x^3(7)$

$= \boxed{6x^5 - 24x^4 + 21x^3}$

Ex: $-5x^2y^3(-xy^4 + 8xy^2)$

$= -5x^2y^3(-xy^4) - 5x^2y^3(8xy^2)$

$= \boxed{5x^3y^7 - 40x^3y^5}$

Multiplying 2 polynomials that have 2 or more terms

5.6.2

Distributive Property: $c(a+b) = ca + cb$

$(a+b)(c) = ac + bc$

Ex: $(3x+5)(x-8)$

$= 3x(x-8) + 5(x-8)$

$= 3x(x-8) + 5(x-8)$

$= 3x^2 - 24x + 5x - 40$

$= \boxed{3x^2 - 19x - 40}$

Ex: $(2x-1)(6x-5)$

$= 2x(6x-5) - 1(6x-5)$

$= 12x^2 - 10x - 6x + 5$

$= \boxed{12x^2 - 16x + 5}$

5.6.3

Ex: $(-2x+8)(x^2+7x-4)$

$= -2x(x^2+7x-4) + 8(x^2+7x-4)$

$= -2x^3 - 14x^2 + 8x + 8x^2 + 56x - 32$

$= \boxed{-2x^3 - 6x^2 + 64x - 32}$