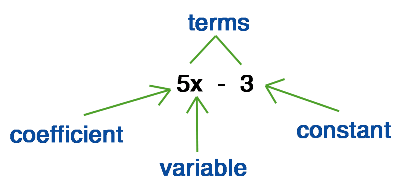
**Algebraic Expressions**

#### Algebraic Expression

Generally, Algebraic expressions are the symbol or a combination of symbols used in algebra containing one or more numbers, variables, and arithmetic operations. 2xyz, 2x +yz, 2x + y, etc. are the examples of Algebraic Expressions.

source : [www.shmoop.com](http://www.shmoop.com)  
Fig :Algebraic Expressions

**Evaluation of Algebraic Expressions**

When we replace the variable of a term or expression with numbers, the value of the terms or expression is obtained. It is called the evaluation of a term or expression. For examples,

If x = 3, y = 4 and z = 2, then

2xyz = 2 × 3 × 4 × 2 = 48

**Law of Indices**

While performing the operations of multiplication and division of algebraic expression it needs to work out indices of the same bases under the certain rules. These are called the law of indices.

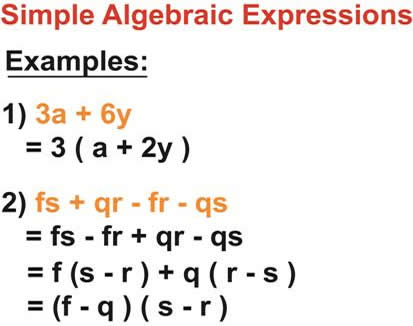
1. **Product law of indices**  
   In product law of indices, when the same base is multiplied we should add their indices. When am and an are two terms then aa + n. For examples,  
   2 × 2 = 21 + 1 = 22  
   2×2 = 24+2 = 26
2. **Quotient law of indices**  
   In quotient law of indices, when the base is divided by another same base, power should be subtracted. Like, am ÷ an = am-n. For examples,  
   32÷3 = 323

=3×33

1. = 3 = 32-1
2. **Power law of indices**  
   In power law of indices, when a base with some power has another power, the powers are multiplied. For examples,  
   (22)2 = 22 × 22= 22+2= 24
3. **Law of Zero indices**  
   In this law of indices, the value of a base with power 0 is always1. If a0 is any term with a base a and power 0, then a0 = 1. For example,  
   20 = 1, 50 = 1

**Addition and Subtraction of algebraic expression**

To add and subtract the algebraic expression, there should be the like and unlike terms. Unlike terms are those which do not have the same base and like terms are those which have the same base. While adding and subtracting algebraic term, we should add or subtract the coefficients of

Source :www.algebra4children.com  
Fig :Factorisation of Simple Algebraic Expression

like terms. For example,

1. 2x + 3x = 5x
2. 7x - 5x = 2x

**Multiplication of algebraic expressions**

When the coefficients of the terms of the terms are multiplied and the power of the same bases are added then it is called Multiplication of algebraic expressions. For example,

1. 2x2×3x = 6x3
2. 3a2×3a2 = 9a4

**Multiplication of polynomials by monomials**

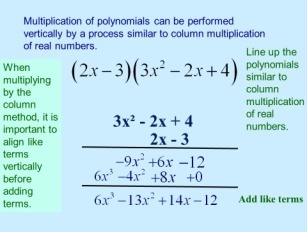
In this case, in each term of polynomials is separately multiplied by the monomial. For example

Multiply, (b+c) by x.

Here, x× (b+c) = bx +cx

**Multiplication of polynomials**

In this case, each term of polynomials is separately multiplied by each term of another polynomial. Then, the product is simplified. For examples,

source :slideplayer.com  
Fig :Polynomials mono means one bi means two

(a+b) by (x+y)

Here, (x+y)(a+b)

or, x(a+b) = y(a+b)

or, ax+bx+ay+by

**Some special products formulae**

1. The product of (a+b) and (a+b) (square of binomials).  
   Let's multiply (a+b) by (a+b)  
   (a+b)×(a+b) = a(a+b) + b(a+b)  
   (a+b)2 = a2 + 2ab + b2  
   = a2 + 2ab + b2  
   Thus, (a+b)2 = a2 +2ab +b2, then  
   a2 + b2 = (a+b)2 - 2ab
2. The product of (a-b) and (a-b)  
   Let's multiply (a-b) by (a-b)  
   (a-b)×(a-b) = a(a-b) - b(a-b)  
   (a-b)2 = a2 - ab - ab + b2  
   = a2 - 2ab + b2  
   THus, (a-b)2 = a2 - 2ab + b2  
   Here, if (a-b)2 = a2 - 2ab + b2, then,  
   a2 + b2 = (a-b)2 + 2ab
3. The product of (a+b), (a+b) and (a+b) (cube of binomials)  
   Lets, find the products of (a+b)3  
   (a+b)3 = (a+b) (a+b) (a+b)  
   (a+b) (a+b)2  
   (a+b)(a2+2ab+b2)  
   a(a2+2ab+b2) + b(a2+2ab+b2)  
   a3 + 2a2b +ab2 + a2b + 2ab2 +b3  
   a3 +3a2b + 3ab2 + b3  
   ∴(a+b)3 = (a3 +3a2b + 3ab2 + b3)
4. The product of (a-b), (a-b) and (a-b)  
   Lets, find the products of (a-b)3  
   (a-b)3 = (a-b) (a-b) (a-b)  
   (a-b) (a-b)2  
   (a-b)(a2-2ab+b2)  
   a(a2-2ab+b2) - b(a2-2ab+b2)  
   a3- 3a2b +ab2 + a2b + 2ab2- b3  
   a3- 3a2b + 3ab2- b3  
   ∴(a-b)3 = (a3-3a2b + 3ab2- b3)  
   We can express these formulaes in other following forms  
   we have (a3 +3a2b + 3ab2 + b3) =(a+b)3  
   a3 + b3 + 3ab (a+b) =(a+b)3  
   a3 + b3 =(a+b)3 - 3ab (a+b)  
   ∴ a3 + b3 =(a+b)3- 3ab (a+b)  
   Also,(a3-3a2b + 3ab2- b3) = (a-b)3a3 - b3 - 3ab(a-b) = (a-b)3  
   a3 - b3 - 3ab(a-b) = (a-b)3 + 3ab(a-b)  
   ∴ a3- b3 =(a-b)3+ 3ab (a-b)
5. The product of (a+b) and (a+b)  
   Let's multiply (a-b) by (a-b)  
   (a+b)(a-b) = a(a-b) + b(a-b) = a2 - ab + ab - b2 = a2 - b2  
   Thus, (a+b) (a-b) = a2 -b2

**Division of algebraic expressions**

While dividing a monomial by another monomial, divide the coefficient of dividend by the coefficient of of divisor. Then substract the power of the base of divisor from the power of the same base of dividend. For examples,

18x4y3 by 6x2y2

or, 18x4y3÷ 6x2y2 = 18*x*4*y*36*x*2*y*2

or, 3x4-2y3-2 = 3x2y

**Division of polynomials by monomials**

In this case each term of a polynomial is separately dividend by the monomial. For example,

(12x4 - 15x3)÷ 3x2

= 24*x*43*x*2

- 15*x*33*x*2

= 4x4-2 - 5x3-2

= 4x2 - 5x

**Division of polynomials by polynomials**

In this case, at first we should arrange the terms of divisor and dividend in descending or ascending order of power of common bases. Then we should atart the division dividing the term of dividend with the highest power.

Things to remember

* (a+b)2 = a2 + 2ab + b2
* a2 + b2 = (a+b)2 - 2ab
* (a-b)2 = a2 - 2ab + b2
* a2 + b2 = (a-b)2 + 2ab
* (a+b)3 = (a3 +3a2b + 3ab2 + b3)
* a3 - b3 = (a-b)3 + 3ab (a-b)
* (a+b) (a-b) = a2 -b2

### Questions and Answers

#### Click on the questions below to reveal the answers

**[Factorise the number 1296 and express in exponential forms.](file:///D:\\Project%20materail\\test.html" \l "collapse31629)**

|  |  |
| --- | --- |
| Divisor | Dividend |
| 2 | 1296 |
| 2 | 648 |
| 2 | 324 |
| 2 | 162 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
|  | 3 |

∴

1296 = 2×2×2×2×3×3×3×3

 = 24×34

 =(2×3)4

 = 64 ans.

#### [Find the value of (1681](file:///D:\Project%20materail\test.html#collapse31631)

#### [)14](file:///D:\Project%20materail\test.html#collapse31631)

Solution:

(1681

)14

 = (2434

)14

 = (23

)4×14

 = (23

)1

 = 23

**[Multiply (2x](file:///D:\\Project%20materail\\test.html" \l "collapse31637)[2](file:///D:\\Project%20materail\\test.html" \l "collapse31637)[+ 3x - 5) by (4x - 7).](file:///D:\\Project%20materail\\test.html" \l "collapse31637)**

Solution:

 = (4x - 7) (2x2 + 3x - 5)

 = 4x(2x2 + 3x - 5) - 7 (2x2 + 3x - 5)

 = 8x3 + 12x2 - 20x - 14x2 - 21x + 35

 = 8x3 - 2x2 - 41x + 35

**[If (a+b) = 2, find the value of a](file:///D:\\Project%20materail\\test.html" \l "collapse31639)[3](file:///D:\\Project%20materail\\test.html" \l "collapse31639) [+ b](file:///D:\\Project%20materail\\test.html" \l "collapse31639)[3](file:///D:\\Project%20materail\\test.html" \l "collapse31639) [+ 6ab.](file:///D:\\Project%20materail\\test.html" \l "collapse31639)**

Solution:

Here, (a+b) = 2

∴

(a+b)3 = 23

or, a3 + 3a2b + 3ab2 + b3 = 8

or, a3 + b3 + 3ab2 = 8

or, a3 + b3 + 6ab = 8

So, the required value of a3 + b3 + 6ab is 8.

Quiz

**If x = 5, y = 4 and z = 2, then evaluate the xy(-z)3.**

-120  
-140  
-180  
-160

**If x = 2 and y = 3 what will be the value of yx.**

9   
12  
8  
6

**What should be added to 7x to get 12 x?**

3x  
6x  
5x  
4x

**What should be subtracted from 5pq to get 10pq?**

15pq  
-15pq  
5pq  
-5pq

**What will be the final products of (a - b)3.**

a3 - 3a2b + 3ab2 + b3  
a3 + 3a2b + 3ab2 + b3  
a3 - 3a2b + 3ab2 - b3  
a3 - 3a2b - 3ab2 - b3

**If (a + b) = 2, what will be the valuee of a3 + b3 + 6ab**

20  
12  
16  
8

**What will be the quotients of 6x2 ÷ 3x.**

6x  
2x  
5x  
4x

**If p -(frac{1}{p}) = 8 find the value of p2 + (frac{1}{p^2}).**

66  
68  
69  
67

**Find the squares of the (y - 3).**

y2 + 9  
y2- 6y + 9   
(y + 3) (y - 3)  
(y - 3)2

**Find the area of a square when l = 4.6 cm.**

21.16 cm2  
23.12 cm2  
18.32cm2  
16.36 cm2