CHAPTER

Algebraic Expressions and Identities 93



Algebraic Expressions and Identities

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## Addition and Subtraction of Algebraic Expressions

In earlier classes, we have already become familiar with what algebraic expressions (or simply expressions) are. Examples of expressions are:

*x* + 3, 2*y* – 5, 3*x*2, 4*xy* + 7 etc.

In the earlier classes, we have also learnt how to add and subtract algebraic expressions. For example, to add 7*x*2 – 4*x* + 5 and 9*x* – 10, we do

7*x*2 – 4*x* + 5

+ 9*x* – 10 7*x*2 + 5*x* – 5

Observe how we do the addition. We write each expression to be added in a separate

row. While doing so we write like terms one below the other, and add them, as shown. Thus 5 + (–10) = 5 –10 = –5. Similarly, – 4*x* + 9*x* = (– 4 + 9)*x* = 5*x*. Let us take some more examples.

**Example 1:** Add: 7*xy* + 5*yz* – 3*zx*, 4*yz* + 9*zx* – 4*y* , –3*xz* + 5*x* – 2*xy*.

**Solution:** Writing the three expressions in separate rows, with like terms one below the other, we have

7*xy* + 5*yz* –3*zx*

+ 4*yz* + 9*zx* – 4*y*

+ –2*xy* – 3*zx* + 5*x* (Note *xz* is same as *zx*) 5*xy* + 9*yz* + 3*zx* + 5*x* – 4*y*

Thus, the sum of the expressions is 5*xy* + 9*yz* + 3*zx* + 5*x* – 4*y*. Note how the terms, – 4*y* in the second expression and 5*x* in the third expression, are carried over as they are, since they have no like terms in the other expressions.

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**Example 2:** Subtract 5*x*2 – 4*y*2 + 6*y* – 3 from 7*x*2 – 4*xy* + 8*y*2 + 5*x* – 3*y*.

### Solution:

7*x*2 – 4*xy* + 8*y*2 + 5*x* – 3*y*

|  |  |  |  |
| --- | --- | --- | --- |
|  | 5*x*2 | – 4*y*2 | + 6*y* – 3 |
| (–) |  | (+) | (–) (+) |

2*x*2 – 4*xy* + 12*y*2 + 5*x* – 9*y* + 3

Note that subtraction of a number is the same as addition of its additive inverse. Thus subtracting –3 is the same as adding +3. Similarly, subtracting 6*y* is the same as adding – 6*y*; subtracting – 4*y*2 is the same as adding 4*y*2 and so on. The signs in the third row written below each term in the second row help us in knowing which operation has to be performed.

# EXERCISE 8.1

1. Add the following.



(i) *ab* – *bc*, *bc* – *ca*, *ca* – *ab* (ii) *a* – *b* + *ab*, *b* – *c* + *bc*, *c* – *a* + *ac*

(iii) 2*p*2*q*2 – 3*pq* + 4, 5 + 7*pq* – 3*p*2*q*2 (iv) *l*2 + *m*2, *m*2 + *n*2, *n*2 + *l*2,

2*lm* + 2*mn* + 2*nl*

1. (a) Subtract 4*a* – 7*ab* + 3*b* + 12 from 12*a* – 9*ab* + 5*b* – 3
   1. Subtract 3*xy* + 5*yz* – 7*zx* from 5*xy* – 2*yz* – 2*zx* + 10*xyz*
   2. Subtract 4*p*2*q* – 3*pq* + 5*pq*2 – 8*p* + 7*q* – 10 from 18 – 3*p* – 11*q* + 5*pq* – 2*pq*2 + 5*p*2*q*

## Multiplication of Algebraic Expressions:

**Introduction**

1. Look at the following patterns of dots.



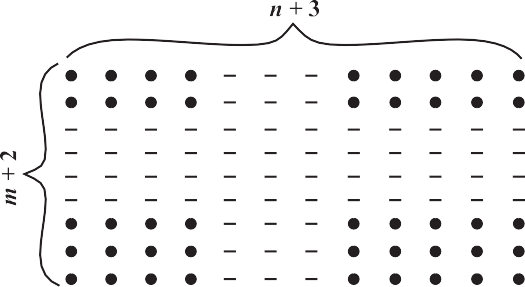
**Pattern of dots**

**Total number of dots**

4 × 9

5 × 7

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*m* × *n*

To find the number of

dots we have to multiply the expression for the number of rows by the expression for the number of columns.

(*m* + 2) × (*n* + 3)

1. Can you now think of similar other situations in which two algebraic expressions have to be multiplied?

Ameena gets up. She says, “We can think of area of a rectangle.” The area of a rectangle is *l* × *b*, where *l*

Here the number of rows is increased by

2, i.e., *m* + 2 and number of columns increased by 3, i.e., *n* + 3.

is the length, and *b* is breadth. If the length of the  rectangle is increased by 5 units, i.e., (*l* + 5) and

To find the area of a rectangle, we have to multiply algebraic expressions like *l* × *b* or

(*l* + 5) × (*b* – 3).



breadth is decreased by 3 units , i.e., (*b* – 3) units, the area of the new rectangle will be (*l* + 5) × (*b* – 3).

1. Can you think about volume? (The volume of a rectangular box is given by the product of its length, breadth and height).
2. Sarita points out that when we buy things, we have to carry out multiplication. For example, if

price of bananas per dozen = ₹ *p*

and for the school picnic bananas needed = *z* dozens,

then we have to pay = ₹ *p* × *z*

Suppose, the price per dozen was less by ₹ 2 and the bananas needed were less by 4 dozens.

Then, price of bananas per dozen = ₹ (*p* – 2)

and bananas needed = (*z* – 4) dozens, Therefore, we would have to pay = ₹ (*p* – 2) × (*z* – 4)

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 In all the above examples, we had to carry out multiplication of two or more quantities. If the quantities are given by algebraic expressions, we need to find their product. This means that we should know how to obtain this product. Let us do this systematically. To begin with we shall look at the multiplication of two monomials.

**TRY THESE**

Can you think of two more such situations, where we may need to multiply algebraic expressions?

[**Hint:**  Think of speed and time;

* Think of interest to be paid, the principal and the rate of simple interest; etc.]

## Multiplying a Monomial by a Monomial

Expression that contains only one term is called a **monomial**.

### Multiplying two monomials

We begin with

Notice that all the three products of monomials, 3*xy*, 15*xy*, –15*xy*, are also monomials.

4 × *x* = *x* + *x* + *x* + *x* = 4*x* as seen earlier.

Similarly, 4 × (3*x*) = 3*x* + 3*x* + 3*x* + 3*x* = 12*x* Now, observe the following products.

* + - 1. *x* × 3*y* = *x* × 3 × *y* = 3 × *x* × *y* = 3*xy*
      2. 5*x* × 3*y* = 5 × *x* × 3 × *y* = 5 × 3 × *x* × *y* = 15*xy*
      3. 5*x* × (–3*y*) = 5 × *x* × (–3) × *y*

= 5 × (–3) × *x* × *y* = –15*xy*

Some more useful examples follow.

Note that 5 × 4 = 20

i.e., coefficient of product = coefficient of first monomial × coefficient of second monomial;

and *x* × *x*2 = *x*3

i.e., algebraic factor of product

= algebraic factor of first monomial

× algebraic factor of second monomial.

* + - 1. 5*x* × 4*x*2 = (5 × 4) × (*x* × *x*2)

= 20 × *x*3 = 20*x*3

* + - 1. 5*x* × (– 4*xyz*) = (5 × – 4) × (*x* × *xyz*)

= –20 × (*x* × *x* × *yz*) = –20*x*2*yz*

Observe how we collect the powers of different variables in the algebraic parts of the two monomials. While doing so, we use the rules of exponents and powers.

### Multiplying three or more monomials

Observe the following examples.

* + - 1. 2*x* × 5*y* × 7*z* = (2*x* × 5*y*) × 7*z* = 10*xy* × 7*z* = 70*xyz*
      2. 4*xy* × 5*x*2*y*2 × 6*x*3*y*3 = (4*xy* × 5*x*2*y*2) × 6*x*3*y*3 = 20*x*3*y*3 × 6*x*3*y*3 = 120*x*3*y*3 × *x*3*y*3

= 120 (*x*3 × *x*3) × (*y*3 × *y*3) = 120*x*6 × *y*6 = 120*x*6*y*6

It is clear that we first multiply the first two monomials and then multiply the resulting monomial by the third monomial. This method can be extended to the product of any number of monomials.

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**TRY THESE**

Find 4*x* × 5*y* × 7*z*

First find 4*x* × 5*y* and multiply it by 7*z*; or first find 5*y* × 7*z* and multiply it by 4*x*.

Is the result the same? What do you observe?

Does the order in which you carry out the multiplication matter?

We can find the product in other way also. 4*xy* × 5*x*2*y*2 × 6*x*3 *y*3

= (4 × 5 × 6) × (*x* × *x*2 × *x*3) × (*y* × *y*2 × *y*3)

= 120 *x*6*y*6

**Example 3:** Complete the table for area of a rectangle with given length and breadth.

|  |  |  |
| --- | --- | --- |
| **Solution: length** | **breadth** | **area** |
| 3*x* | 5*y* | 3*x* × 5*y* = 15*xy* |
| 9*y* | 4*y*2 | .............. |
| 4*ab* | 5*bc* | .............. |
| 2*l*2*m* | 3*lm*2 | .............. |

**Example 4:** Find the volume of each rectangular box with given length, breadth and height.

(i)

(ii)

(iii)

**length**

2*ax m*2*n* 2*q*

**breadth**

3*by n*2*p* 4*q*2

**height**

5*cz p*2*m* 8*q*3

**Solution:** Volume = length × breadth × height Hence, for (i) volume = (2*ax*) × (3*by*) × (5*cz*)

= 2 × 3 × 5 × (*ax*) × (*by*) × (c*z*) = 30*abcxyz* for (ii) volume = *m*2*n* × *n*2*p* × *p*2*m*

= (*m*2 × *m*) × (*n* × *n*2) × (*p* × *p*2) = *m*3*n*3*p*3

for (iii) volume = 2*q* × 4*q*2 × 8*q*3

= 2 × 4 × 8 × *q* × *q*2 × *q*3 = 64*q*6

# EXERCISE 8.2

1. Find the product of the following pairs of monomials.

(i) 4, 7*p* (ii) – 4*p*, 7*p* (iii) – 4*p*, 7*pq* (iv) 4*p*3, – 3*p*

1. 4*p*, 0
2. Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(*p*, *q*); (10*m*, 5*n*); (20*x*2, 5*y*2); (4*x*, 3*x*2); (3*mn*, 4*np*)

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1. Complete the table of products.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| First monomial   Second monomial  | 2*x* | –5*y* | 3*x*2 | – 4*xy* | 7*x*2*y* | –9*x*2*y*2 |
| 2*x* | 4*x*2 | . . . | . . . | . . . | . . . | . . . |
| –5*y* | . . . | . . . | –15*x*2*y* | . . . | . . . | . . . |
| 3*x*2 | . . . | . . . | . . . | . . . | . . . | . . . |
| – 4*xy* | . . . | . . . | . . . | . . . | . . . | . . . |
| 7*x*2*y* | . . . | . . . | . . . | . . . | . . . | . . . |
| –9*x*2*y*2 | . . . | . . . | . . . | . . . | . . . | . . . |

1. Obtain the volume of rectangular boxes with the following length, breadth and height respectively.

(i) 5*a*, 3*a*2, 7*a*4 (ii) 2*p*, 4*q*, 8*r* (iii) *xy*, 2*x*2*y*, 2*xy*2 (iv) *a*, 2*b*, 3*c*

1. Obtain the product of

(i) *xy*, *yz*, *zx* (ii) *a*, – *a*2, *a*3 (iii) 2, 4*y*, 8*y*2, 16*y*3

* 1. *a*, 2*b*, 3*c*, 6*abc* (v) *m*, – *mn*, *mnp*
  2. **Multiplying a Monomial by a Polynomial** Expression that contains two terms is called a **binomial**. An expression containing three terms is a **trinomial** and so on. In general, an expression containing, one or more terms with

non-zero coefficient (with variables having non negative integers as exponents) is called

a **polynomial**.

### Multiplying a monomial by a binomial

Let us multiply the monomial 3*x* by the binomial 5*y* + 2, i.e., find 3*x* × (5*y* + 2) = ?

Recall that 3*x* and (5*y* + 2) represent numbers. Therefore, using the distributive law, 3*x* × (5*y* + 2) = (3*x* × 5*y*) + (3*x* × 2) = 15*xy* + 6*x*

We commonly use distributive law in our calculations. For example:

7 × 106 = 7 × (100 + 6)

= 7 × 100 + 7 × 6

= 700 + 42 = 742

7 × 38 = 7 × (40 – 2)

= 7 × 40 – 7 × 2

= 280 – 14 = 266

(Here, we used distributive law)

(Here, we used distributive law)



Similarly, (–3*x*) × (–5*y* + 2) = (–3*x*) × (–5*y*) + (–3*x*) × (2) = 15*xy* – 6*x* and 5*xy* × (*y*2 + 3) = (5*xy* × *y*2) + (5*xy* × 3) = 5*xy*3 + 15*xy*.

What about a binomial × monomial? For example, (5*y* + 2) × 3*x* = ?

We may use commutative law as : 7 × 3 = 3 × 7; or in general *a* × *b* = *b* × *a*

Similarly, (5*y* + 2) × 3*x* = 3*x* × (5*y* + 2) = 15*xy* + 6*x* as before.

Find the product (i) 2*x* (3*x* + 5*xy*) (ii) *a*2 (2*ab* – 5*c*)

**TRY THESE**

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### Multiplying a monomial by a trinomial

Consider 3*p* × (4*p*2 + 5*p* + 7). As in the earlier case, we use distributive law; 3*p* × (4*p*2 + 5*p* + 7) = (3*p* × 4*p*2) + (3*p* × 5*p*) + (3*p* × 7)

= 12*p*3 + 15*p*2 + 21*p*

**TRY THESE**

Find the product: (4*p*2 + 5*p* + 7) × 3*p*

Multiply each term of the trinomial by the monomial and add products.

Observe, by using the distributive law, we are able to carry out the multiplication term by term.

**Example 5:** Simplify the expressions and evaluate them as directed:

(i) *x* (*x* – 3) + 2 for *x* = 1, (ii) 3*y* (2*y* – 7) – 3 (*y* – 4) – 63 for *y* = –2

### Solution:

* + - 1. *x* (*x* – 3) + 2 = *x*2 – 3*x* + 2

For *x* = 1, *x*2 – 3*x* + 2 = (1)2 – 3 (1) + 2

= 1 – 3 + 2 = 3 – 3 = 0

* + - 1. 3*y* (2*y* – 7) – 3 (*y* – 4) – 63 = 6*y*2 – 21*y* – 3*y* + 12 – 63

= 6*y*2 – 24*y* – 51

For *y* = –2, 6*y*2 – 24*y* – 51 = 6 (–2)2 – 24(–2) – 51

= 6 × 4 + 24 × 2 – 51

= 24 + 48 – 51 = 72 – 51 = 21

**Example 6:** Add

(i) 5*m* (3 – *m*) and 6*m*2 – 13*m* (ii) 4*y* (3*y*2 + 5*y* – 7) and 2 (*y*3 – 4*y*2 + 5)

### Solution:

1. First expression = 5*m* (3 – *m*) = (5*m* × 3) – (5*m* × *m*) = 15*m* – 5*m*2

Now adding the second expression to it,15*m* – 5*m*2 + 6*m*2 – 13*m = m*2 + 2*m*

1. The first expression = 4*y* (3*y*2 + 5*y* – 7) = (4*y* × 3*y*2) + (4*y* × 5*y*) + (4*y* × (–7))

= 12*y*3 + 20*y*2 – 28*y*

The second expression = 2 (*y*3 – 4*y*2 + 5) = 2*y*3 + 2 × (– 4*y*2) + 2 × 5

= 2*y*3 – 8*y*2 + 10

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Adding the two expressions, | 12*y*3 | + | 20*y*2 – 28*y* |  |
|  | + 2*y*3 | – | 8*y*2 | + 10 |
|  | 14*y*3 | + | 12*y*2 – 28*y* | + 10 |

**Example 7:** Subtract 3*pq* (*p* – *q*) from 2*pq* (*p* + *q*).

**Solution:** We have 3*pq* (*p* – *q*) = 3*p*2*q* – 3*pq*2 and

2*pq* (*p* + *q*) = 2*p*2*q* + 2*pq*2

Subtracting, 2*p*2*q* + 2*pq*2 3*p*2*q* – 3*pq*2

– + – *p*2*q* + 5*pq*2

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# EXERCISE 8.3



1. Carry out the multiplication of the expressions in each of the following pairs.

(i) 4*p*, *q* + *r* (ii) *ab*, *a* – *b* (iii) *a* + *b*, 7*a*2*b*2 (iv) *a*2 – 9, 4*a*

* 1. *pq* + *qr* + *rp*, 0

1. Complete the table.

|  |  |  |
| --- | --- | --- |
|  | **First expression** | **Second expression** |
| (i) | *a* | *b* + *c* + *d* |
| (ii) | *x* **+** *y* – 5 | 5*xy* |
| (iii) | *p* | 6*p*2 – 7*p* + 5 |
| (iv) | 4*p*2*q*2 | *p*2 – *q*2 |
| (v) | *a* + *b* + *c* | *abc* |

1. Find the product.

**Product**

. . .

. . .

. . .

. . .

. . .

(i) (*a*2) × (2*a*22) × (4*a*26) (ii)

 2   9

*xy*



2 2 

  10

3  6 3 

*pq*



 3 

2

 10 *x y* 

3 4

1.  3

  5

*p q*

1. *x* × *x* × *x* × *x*

1

1. (a) Simplify 3*x* (4*x* – 5) + 3 and find its values for (i) *x* = 3 (ii) *x* = 2 .
   1. Simplify *a* (*a*2 + *a* + 1) + 5 and find its value for (i) *a* = 0, (ii) *a* = 1
2. *a* = – 1.
3. (a) Add: *p* ( *p* – *q*), *q* ( *q* – *r*) and *r* ( *r* – *p*)
   1. Add: 2*x* (*z* – *x* – *y*) and 2*y* (*z* – *y* – *x*)
   2. Subtract: 3*l* (*l* – 4 *m* + 5 *n*) from 4*l* ( 10 *n* – 3 *m* + 2 *l* )
   3. Subtract: 3*a* (*a* + *b* + *c* ) – 2 *b* (*a* – *b* + *c*) from 4*c* ( – *a* + *b* + *c* )

## Multiplying a Polynomial by a Polynomial

### Multiplying a binomial by a binomial

Let us multiply one binomial (2*a* + 3*b*) by another binomial, say (3*a* + 4*b*). We do this step-by-step, as we did in earlier cases, following the distributive law of multiplication,

(3*a* + 4*b*) × (2*a* + 3*b*) = 3*a* × (2*a* + 3*b*) + 4*b* × (2*a* + 3*b*)

= (3*a* × 2*a*) + (3*a* × 3*b*) + (4*b* × 2*a*) + (4*b* × 3*b*)

Observe, every term in one binomial multiplies every term in the other binomial.

= 6*a*2 + 9*ab* + 8*ba* + 12*b*2

= 6*a*2 + 17*ab* + 12*b*2 (Since *ba* = *ab*)

When we carry out term by term multiplication, we expect 2 × 2 = 4 terms to be present. But two of these are like terms, which are combined, and hence we get 3 terms. **In multiplication of polynomials with polynomials, we should always look for like terms, if any, and combine them**.

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**Example 8:** Multiply

(i) (*x* – 4) and (2*x* + 3) (ii) (*x* – *y*) and (3*x* + 5*y*)

### Solution:

1. (*x* – 4) × (2*x* + 3) = *x* × (2*x* + 3) – 4 × (2*x* + 3)

= (*x* × 2*x*) + (*x* × 3) – (4 × 2*x*) – (4 × 3) = 2*x*2 + 3*x* – 8*x* – 12

= 2*x*2 – 5*x* – 12 (Adding like terms)

1. (*x* – *y*) × (3*x* + 5*y*) = *x* × (3*x* + 5*y*) – *y* × (3*x* + 5*y*)

= (*x* × 3*x*) + (*x* × 5*y*) – (*y* × 3*x*) – ( *y* × 5*y*)

= 3*x*2 + 5*xy* – 3*yx* – 5*y*2 = 3*x*2 + 2*xy* – 5*y*2 (Adding like terms)

**Example 9:** Multiply

(i) (*a* + 7) and (*b* – 5) (ii) (*a*2 + 2*b*2) and (5*a* – 3*b*)

### Solution:

1. (*a* + 7) × (*b* – 5) = *a* × (*b* – 5) + 7 × (*b* – 5)

= *ab* – 5*a* + 7*b* – 35

Note that there are no like terms involved in this multiplication.

1. (*a*2 + 2b2) × (5*a* – 3*b*) = *a*2 (5*a* – 3*b*) + 2*b*2 × (5*a* – 3*b*)

= 5*a*3 – 3*a*2*b* + 10*ab*2 – 6*b*3

### Multiplying a binomial by a trinomial

In this multiplication, we shall have to multiply each of the three terms in the trinomial by each of the two terms in the binomial. We shall get in all 3 × 2 = 6 terms, which may reduce to 5 or less, if the term by term multiplication results in like terms. Consider

,

( *a*\_,7) binomial

× (*a*2  3*a*  5) trinomial

= *a* × (*a*2 + 3*a* + 5) + 7 × (*a*2 + 3*a* + 5)

[using the distributive law]

= *a*3 + 3*a*2 + 5*a* + 7*a*2 + 21*a* + 35

= *a*3 + (3*a*2 + 7*a*2) + (5*a* + 21*a*) + 35

= *a*3 + 10*a*2 + 26*a* + 35 (Why are there only 4

terms in the final result?)

**Example 10:** Simplify (*a* + *b*) (2*a* – 3*b* + *c*) – (2*a* – 3*b*) *c.*

**Solution:** We have

(*a* + *b*) (2*a* – 3*b* + *c*) = *a* (2*a* – 3*b* + *c*) + *b* (2*a* – 3*b* + *c*)

= 2*a*2 – 3*ab* + *ac* + 2*ab* – 3*b*2 + *bc*

= 2*a*2 – *ab* – 3*b*2 + *bc* + *ac* (Note, –3*ab* and 2*ab*

are like terms)

and (2*a* – 3*b*) *c* = 2*ac* – 3*bc* Therefore,

(*a* + *b*) (2*a* – 3*b* + *c*) – (2*a* – 3*b*) *c* = 2*a*2 – *ab* – 3*b*2 + *bc* + *ac* – (2*ac* – 3*bc*)

= 2*a*2 – *ab* – 3*b*2 + *bc* + *ac* – 2*ac* + 3*bc*

= 2*a*2 – *ab* – 3*b*2 + (*bc* + 3*bc*) + (*ac* – 2*ac*)

= 2*a*2 – 3*b*2 – *ab* + 4*bc* – *ac*

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# EXERCISE 8.4



1. Multiply the binomials.

(i) (2*x* + 5) and (4*x* – 3) (ii) (*y* – 8) and (3*y* – 4)

(iii) (2.5*l* – 0.5*m*) and (2.5*l* + 0.5*m*) (iv) (*a* + 3*b*) and (*x* + 5)

(v) (2*pq* + 3*q*2) and (3*pq* – 2*q*2) (vi)



1. Find the product.

(i) (5 – 2*x*) (3 + *x*) (ii) (*x* + 7*y*) (7*x* – *y*)

* 1. (*a*2 + *b*) (*a* + *b*2) (iv) (*p*2 – *q*2) (2*p* + *q*)

1. Simplify.

(i) (*x*2 – 5) (*x* + 5) + 25 (ii) (*a*2 + 5) (*b*3 + 3) + 5

* 1. (*t* + *s*2) (*t*2 – *s*)
  2. (*a* + *b*) (*c* – *d*) + (*a* – *b*) (*c* + *d*) + 2 (*ac* + *bd*)
  3. (*x* + *y*)(2*x* + *y*) + (*x* + 2*y*)(*x* – *y*) (vi) (*x* + *y*)(*x*2 – *xy* + *y*2)

1. (1.5*x* – 4*y*)(1.5*x* + 4*y* + 3) – 4.5*x* + 12*y*
2. (*a* + *b* + *c*)(*a* + *b* – *c*)

# WHAT HAVE WE DISCUSSED?

1. Expressions are formed from **variables** and **constants**.
2. Terms are added to form **expressions**. Terms themselves are formed as product of **factors**.
3. Expressions that contain exactly one, two and three terms are called **monomials**, **binomials** and **trinomials** respectively. In general, any expression containing one or more terms with non-zero coefficients (and with variables having non- negative integers as exponents) is called a **polynomial**.
4. **Like** terms are formed from the same variables and the powers of these variables are the same, too. Coefficients of like terms need not be the same.
5. While adding (or subtracting) polynomials, first look for like terms and add (or subtract) them; then handle the unlike terms.
6. There are number of situations in which we need to multiply algebraic expressions: for example, in finding area of a rectangle, the sides of which are given as expressions.
7. A monomial multiplied by a monomial always gives a monomial.
8. While multiplying a polynomial by a monomial, we multiply every term in the polynomial by the monomial.
9. In carrying out the multiplication of a polynomial by a binomial (or trinomial), we multiply term by term, i.e., every term of the polynomial is multiplied by every term in the binomial (or trinomial). Note that in such multiplication, we may get terms in the product which are like and have to be combined.