

6

Polynomial

◆ Let us remember :

In Standard 5, we have learnt to write mathematical statement into symbolic form.
e.g. 3 is added to 'a' is written as $a + 3$.

- '6 is subtracted from four times of y' is written as $4y - 6$. Now, like this write the following mathematical statement into symbolic form.

No.	Mathematical statement	Symbolic form
1.	7 is subtracted from a	
2.	4 is subtracted from 5 times of y	
3.	5 is added to third part of x	
4.	b is divided by 6 and then add 15	
5.	A number is subtracted from 13	

- $6x - 5$ is the symbolic form of mathematical statement. Its mathematical statement is written as '5 is subtracted from six times of x ' or '6 is multiplied by x and then 5 is subtracted from it.'
- $\frac{y}{2} + 3$, its mathematical statement is '3 is added on dividing y by 2' or '3 is added to half of y .'

Now, write the following symbolic form into mathematical statement :

No.	Symbolic form	Mathematical statement
1.	$5x + 6$	
2.	$7x - 8$	
3.	$2x + 3$	
4.	$\frac{x}{2} + 1$	
5.	$\frac{x}{3} + 2$	
6.	$\frac{a}{5} - 7$	

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◆ **Let us learn new :**

Monomial, Binomial and Trinomial :

- Polynomial $18abc$ has only one term. (It is understood that $(18abc + 0)$ is monomial but it is polynomial.)
- In polynomial $5x^2 - 12xy$ there are two terms : $5x^2$ and $12xy$.
- $12x^2 + 3xy - 4x^2yz$ is also a polynomial. There are three terms : $12x^2$, $3xy$ and $4x^2yz$.

Terms of polynomial is joined with + (plus) or - (minus) sign.



1. Write the number of terms in following polynomials :

- (1) $7x^3 + 8x^2 + 9xy + 4y^2$ (2) $2xy + 3x^2 - 25y^3$
 (3) a^2bc (4) $6a + 5b - 10ab - a^2 - b^2$

2. Write six polynomials having different terms :

(1)	(2)
(3)	(4)
(5)	(6)

3. Classify the polynomial written in Question 2 into monomial, binomial and trinomial :

Monomial	Binomial	Trinomial
.....
.....
.....



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◆ Let us remember :

- A polynomial contains one term is called monomial.
e.g., $2x$, $3a^2bc$, p^2q , $3q$
- A polynomial contains two terms is called binomial.
e.g., $x^2 + 2$, $a - 3$, $xy + 10$
- A polynomial contains three terms is called trinomial.
e.g., $a^2 + 2a + 3$, $2xy - 3 + y^2$, $a^2 + 2ab + b^2$



1. $8ab$, $a^2b + 3$, $-9x^2$,
 $-4x + y$, $-9xy + 5$,
 $6p^2 - 5$, $-7x^2y^2$,
 $6xy + 3x - 3$, $9abc$

Classify polynomials given in the box and write only monomial in your notebook.

2. Dear students, write three-three illustrations each of monomial, binomial and trinomial in the following Table :

Monomial	Binomial	Trinomial
(1)	(1)	(1)
(2)	(2)	(2)
(3)	(3)	(3)

Power of Terms :

We have learnt in Power and Exponent that $4 \times 4 = 4^2$, where 4^2 is the form of power. Where 4 is base and 2 is exponent, same way in x^4 , x is base and 4 is exponent. Here x is variable.

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See and understand :

No.	Term	Variable	Power of variable
1	$5x^2$	x	2
2	$-3y^5$	y	5
3	$8a$	a	1
4	$12b^4$	b	4
5	a^3	a	3
6	$7m^6$	m	6

Like (15) is also a monomial; it is constant term. In constant term exponent of variable is zero.

e.g. $15 = 15 \times x^0$

In 7th Standard we will learn that $x^0 = 1$.

$\therefore 15 \times 1 = 15$

Thus, exponent of variable in constant term is zero. Thus, 23, -5 and 18 etc. are constant term. Now, we will know the sum of exponent of variable as power of term. (or degree of term.)

See, understand and complete :

No.	Term	Variable	Exponent of variable	Power of term
1	$4x^3y^2$	x	3	$3 + 2 = 5$
		y	2	
2	$-5a^2b^3c^4$	a	2	$2 + 3 + 4 = 9$
		b	3	
		c	4	
3	$7x^2y^2z^2$			
4	$-2x^3y^4$			

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In the given term, sum of the exponent of variable is called power of term. e.g. in the term $4x^3y^2$, power of the variable x is 3 and power of variable y is 2. So, the power of the term $4x^3y^2$ is $3 + 2 = 5$.

Numerical co-efficient of Terms :

We know that, $2 + 2 + 2 = 2 \times 3$, $3 + 3 + 3 + 3 = 3 \times 4$, $5 + 5 = 5 \times 2$

Similarly, $a + a = a \times 2 = 2a$

$$b + b + b = b \times 3 = 3b$$

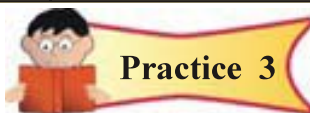
$$xy + xy + xy + xy = xy \times 4 = 4xy$$

$$a^2b^2 + a^2b^2 + a^2b^2 + a^2b^2 + a^2b^2 = a^2b^2 \times 5 = 5a^2b^2$$

Here, $2a$, $3b$, $4xy$ and $5a^2b^2$ are polynomials. In polynomial $2a$, 2 is multiplied with variable ' a '. So, it is called co-efficient of variable ' a '. In polynomial $3b$, 3 is multiplied with variable ' b ', it is called co-efficient of variable ' b '. In polynomial $4xy$, 4 is the co-efficient of variable ' xy ' and in $5a^2b^2$, 5 is the co-efficient of variable ' a^2b^2 '. Thus, in the term, the constant number which is multiplied with the term is called co-efficient of term.

See and understand :

No.	Term	Variable	Co-efficient of term
1.	$10x$	x	10
2.	$-3y$	y	-3
3.	a^2	a	1
4.	$6b^2$	b	6
5.	$-ab$	a and b	-1
6.	$7m^3n$	m and n	7



1. Make five terms by using different variables. Give variable of each term and co-efficient of terms.
2. Write variable of the term, power of the term, co-efficient of the term and exponent of the term : $4x^2$, $-y^3$, $3x^2y^3z^6$, $-15abc^2$

3. Think :

- (1) Which co-efficient is there in the term x^2 ?
- (2) How many power has the term $3abc$?
- (3) In $12x + 7$, power of the term 7 is what ?

Like Terms and Unlike Terms

Activity 1 :

$4x^2, -y^3, 8x^4, 7x^2, 2x^2,$
 $8y^2, -y^3, 3y^3, 2xy^2, 3xy^2,$
 $6x^7, 9x, 7y, x^7$

Make a pair of same variable and power of same variable.

Activity 2 :

$5x, -3x, 7x^2, 3y^2, 2x^2,$
 $5x^2, 8xy^3, 8yx^3, a^2b^2,$
 $-x^2, x^2, 7ab$

Make a pair of same variable and different power of variable.

Activity 3 :

$4x^2, -y^2, 5x, -3x,$
 $8x^4, y^3, 3ab, 4b^2,$
 $p^2, 3p^2$

Make a pair of different variable and same power of variable.

- The terms having same variable and exponent of the same variable is same, then the terms are called like terms.
 e.g. $4x^2$ and $7x^2$, $-y^3$ and $3y^3$, abc and $9abc$

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- The terms having equal variable or unequal variable but power of variable is not same, then the terms are called unlike terms. In short, the terms which are not like terms are called unlike terms.

e.g., $7x^2$ and $3y^2$, x^2 and x^3 , $4ab$ and $-7a^2b^2$



- Make a pair of like terms from the given terms :

$5x$, $7x^2$, $-3y^2$, $-5x^2$, $7ab$, $3a^2b^2$, xy , $3xy$, $6a^2b^2$, $-10y^2$, a^7 , $14x^7$

- Write unlike terms from question 1 in the given box :

To find the value of polynomial :

We know that $4x$ is a polynomial. If a value of variable is placed in it, then we get the value of polynomial. If variable $x = 3$ is taken, then,

$$\begin{aligned} 4x &= 4 \times x \\ &= 4 \times 3 \\ &= 12 \end{aligned}$$

Illustration 1 : Find the value of $5m^2$ by taking $m = 2$.

$$\begin{aligned} 5m^2 &= 5 \times m \times m & \text{or} & & 5m^2 &= 5(2)^2 \\ &= 5 \times 2 \times 2 & & & &= 5 \times 4 \\ &= 20 & & & &= 20 \end{aligned}$$

Illustration 2 : If $y = 1$, then find the value of $5y^2 - 1$.

$$\begin{aligned} 5y^2 - 1 &= 5 \times y \times y - 1 & \text{or} & & 5y^2 - 1 &= 5(1)^2 - 1 \\ &= 5 \times 1 \times 1 - 1 & & & &= 5 \times 1 - 1 \\ &= 5 - 1 & & & &= 5 - 1 \\ &= 4 & & & &= 4 \end{aligned}$$

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Illustration 3 : If $x = 2$ and $y = 3$, then find the value of $x^2 + xy + y^2$

$$\begin{aligned} x^2 + xy + y^2 &= x \times x + x \times y + y \times y \\ &= 2 \times 2 + 2 \times 3 + 3 \times 3 \\ &= 4 + 6 + 9 \\ &= 19 \end{aligned}$$

$$\begin{aligned} x^2 + xy + y^2 &= (2)^2 + (2)(3) + (3)^2 \\ &= 4 + 6 + 9 \\ &= 19 \end{aligned}$$



Practice 5

1. Find the value of the following polynomials by taking $x = 1$, $y = 3$ and $a = 2$:

- (1) $x + y$ (2) $x + y - a$ (3) $4x - y$ (4) $a^2 - x$ (5) x^2 (6) $3a + xy$
 (7) $y^2 - a^2$ (8) $x^2 - 6xy + x^2$ (9) $4x^2 + 2xy + 9y^2$ (10) $a^2 - 6ax + 9x^2$



Exercise

1. Write co-efficient and power of each term of the following polynomials :

- (1) $5x^3 + 2xy + 3$ (2) $12x^4 - 6xy^2 + 4$ (3) $8a^6 - 13$

2. Write the polynomial having constant term from the given polynomials :

- $2x^2 + 3xy$, $4x^2 + 2x - 3$, $x + 4$, $12x^2 + ab$, $6a^2 + 5ab + 7$, $-9x$,
 16 , $6x^2 - 6x + 5$, $12p^2 + 9p$

3. Make pairs of like terms from given polynomials :

- (1) $4x^2 - x + 5$ and $3x^2 - 2x + 7$
 (2) $7x + 3y - 8x^2$ and $7x^2 - 2x - y$
 (3) $a^2 + 2ab + b^2$ and $3b^2 - ab + 2$

4. If $m = 2$ and $n = 1$, then find the value of following polynomials :

- (1) $m + 3$ (2) $4m^2$ (3) $m^2 + 6$ (4) $3n^2$ (5) $5m - 6n$ (6) $mn - n$
 (7) $n^2 + 3mn$ (8) $2m - 3n^2$ (9) $3m^2 - 12mn + 4n^2$ (10) $3n - 2m^2 + 3$



Answers



Practice 1

1. (1) 4 (2) 3 (3) 1 (4) 5



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Practice 2

1. $8ab$, $-9x^2$, $-7x^2y^2$, $9abc$

Practice 3

2.

Term	Variable	Power of variable	Co-efficient of terms	Power of term
$4x^2$	x	2	4	2
$-y^2$	y	3	-1	3
$3x^2y^3z^6$	x, y, z	2, 3, 6	3	11
$-15abc^2$	a, b, c	1, 1, 2	-15	4

Practice 4

1. $7x^2$ and $-5x^2$, $-3y^2$ and $-10y^2$, $3a^2b^2$ and $6a^2b^2$, xy and $3xy$

Practice 5

(1) 4 (2) 2 (3) 1 (4) 3 (5) 1 (6) 9 (7) 5 (8) (-8) (9) 49 (10) 1

Exercise

4. (1) 5 (2) 16 (3) 10 (4) 3 (5) 4 (6) 1 (7) 7 (8) 1 (9) (-8) (10) (-2)



Extra knowledge :

- ◆ In daily life of common people, there is practical and important use of maths. On the basic elements of maths one can live his routine life. Vegetables vendors, hawkers they are nearly illiterate but they do perfect calculation.
- ◆ Main aim of maths teaching is that the students think perfectly and logically.
- ◆ In maths teaching, for practice, oral work and short calculation, mind development is important.

