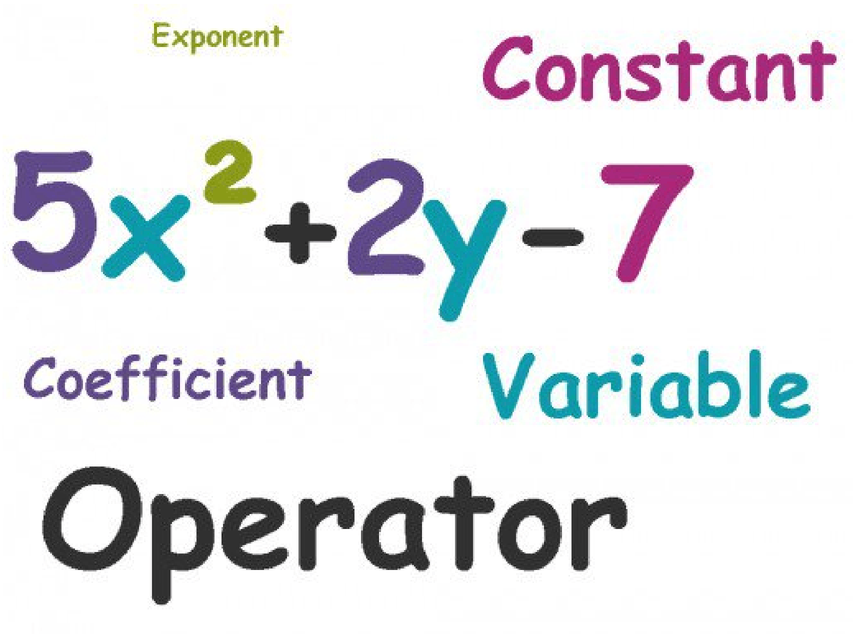
NCERT Class 9 Solutions: Polynomials (Chapter 2) Exercise 2.1

Q-1 Which of the following expressions are polynomials in one variable and which are not? State reasons for your answer

1. $4x^2 - 3x + 7$
2. $y^2 + \sqrt{2}$
3. $3\sqrt{t} + t\sqrt{2}$
4. $y + \frac{2}{y}$
5. $x^{10} + y^3 + t^{50}$

Solution:



A polynomial is an expression consisting of variables (or indeterminate) and coefficients, that involves only the operations of addition, subtraction, multiplication, **and non-negative integer exponents**. That is the exponent of the variable in a polynomial can only be zero or positive integer.

For example:

$1 + 2x + 2x^2$ is a polynomial but $\frac{1}{2x}$ or $\sqrt{x}$ are not.

Polynomials are defined as they are for a few distinct reasons: (1) because polynomials as functions have certain properties that other algebraic expressions don't have, and (2) because there are other terms for more generalized algebraic forms.

For example, polynomials are nice functions which don't go to infinity (no poles) . If we substitute a polynomial into another polynomial, we always get another polynomial. Also, all polynomials have a "degree" equal to the highest power of x in the polynomial, and a polynomial never has more roots (where value of polynomial becomes zero) than its degree.

1. $4x^2 - 3x + 7$

There is only one variable x with whole number power

So, this is a polynomial in one variable

1. $y^2 + \sqrt{2}$

There is only one variable y with whole number power

So, this is a polynomial in one variable

1. $3\sqrt{t} + t\sqrt{2}$

There is one variable t but in $3\sqrt{t}$ power of t is $\frac{1}{2}$ which not a whole number

So, $3\sqrt{t} + t\sqrt{2}$ is not a polynomial.

1. $y + \frac{2}{y}$

There is only one variable y but $\frac{2}{y} = 2y^{-1}$

So, the power is not a whole number

So, $y + \frac{2}{y}$ is not a polynomial

1. $x^{10} + y^3 + t^{50}$

There are three variables x, y and t

And there powers are whole number

So this polynomial in three variable

Q-2 Write the coefficients of x^2 in each of the following:

1. $2 + x^2 + x$
2. $2 - x^2 + x^3$
3. $\frac{\pi}{2}x^2 + x$
4. $\sqrt{2}x - 1$

Solution:

The numerical values (including + ve or – ve signs) of the terms in a polynomial are called the coefficients of the polynomial.

1. $2 + x^2 + x$

The coefficient of x^2 is 1

1. $2 - x^2 + x^3$

The coefficient of x^2 is -1

1. $\frac{\pi}{2}x^2 + x$

The coefficient of x^2 is $\frac{\pi}{2}$

1. $\sqrt{2}x - 1 = 0 \times x^2 + \sqrt{2}x - 1$

The coefficient of x^2 is 0

Q-3 Given one example each of a binomial of degree 35, and of a monomial of degree 100

Solution:

- Degree of a polynomial is the highest power of variable in the polynomial. Binomial has two terms in it. So a binomial of degree 35 can be written as $x^{35} + 1$

- Monomial has only one term in it. So monomial of degree 100 can be written as x^{100}

Q-4 Write the degree of each of the following polynomials:

1. $5x^3 + 4x^2 + 7x$
2. $4 - y^2$
3. $5t - \sqrt{7}$
4.

Polynomial	Degree	Number of Terms	Name
$10x^3 + 4x^2 + x - 4$	3 (from the x^3)	4	**Cubic Polynomial**
$t(t^3 + t) = t^4 + t^2$	4 (from the t^4)	2	**Quartic Binomial**
8	0 (no variables)	1	**Constant Monomial**
$\frac{(x+4)}{2} + \frac{xy}{\sqrt{3}} + 3$	2 (from the xy)	3	**Quadratic Trinomial**
$4x^3y^4 + 2x^2y + xy + x + y - 4$	7 (from the x^3y^4)	6	**Polynomial of Degree 7**
$x(x+4)^2(x-3)^5$	8 (add up the exponents: 1 + 2 + 5 = 8).	(Difficult to say unless multiply out)	**(Difficult to say unless multiply out)**

Solution:

1. $5x^3 + 4x^2 + 7x$

This is a polynomial in variable x and the highest power of variable x is 3

Therefore, the degree of this polynomial is 3.

1. $4 - y^2$

This is a polynomial in variable y and the highest power of variable y is 2

Therefore, the degree of this polynomial is 2.

1. $5t - \sqrt{7}$

This is a polynomial in variable t and the highest power of variable t is 1

Therefore, the degree of this polynomial is 1.

1.

This is a constant polynomial

Degree of a constant polynomial is always 0.

Q-5 Classify the following as linear, quadratic and cubic polynomials:

1. $x^2 + x$
2. $x - x^3$
3. $y + y^2 + 4$
4. $1 + x$
5. $3t$
6. r^2
7. $7x^3$

Solution:

1. The highest degree of $x^2 + x$ is 2

So it is a quadratic polynomial.

1. The highest degree of $x - x^3$ is 3

So, it is cubic polynomial.

1. The highest degree of $y + y^2 + 4$ is 2

So it is a quadratic polynomial.

1. The highest degree of $1 + x$ is 1

So it is a linear polynomial.

1. The highest degree of $3t$ is 1

So it is a linear polynomial.

1. The highest degree of r^2 is 2

So it is a quadratic polynomial.

1. The highest degree of $7x^3$ is 3

So, it is cubic polynomial.