Chapter – 2

Polynomials.

- Quantity

1- Variables	2- Constant
A Symbol which may assinged different numerical value.	A Symbol which has a fixed numerical value.
It is denoted by x, y, z etc.	It is denoted by a, b, c etc.

- Algebraic Expression — The Combination of variable and Constant connected with mathematical operation $(+, -, \times, \div)$.

Ex — $2x^2 + 5x + 3$.

$\frac{1}{x} + 2x^3 + xyz$.

$x^{-2} + \sqrt{x} + 5$

$\frac{10x}{2x}$.

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• Polynomial — An algebraic expression is said to be polynomials.

If —:

1- There are finite number of terms.

2- Power of variable involve in the expression in each term is non - negative integers.

Ex- $2x^2 + 3x + 4$ ✓

$5x^3 + \frac{1}{x} + 2$ ✗

$x^4 + \frac{1}{5}x + 2$ ✓

$\sqrt{x} + 2x + 4$ ✓

$x^2 + \sqrt{5x} + 4$ ✓

20 ✓

$x^{ny} - x^{n-1} + x^{n+1}$ ✗

Excercise - 2.1

1- Which of the following expression are polynomials in one variable and which are not? State reason for your answer?

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

= This number is polynomial because it has only one variable.

2- $y^2 + \sqrt{2}$

= This number is polynomial because In this number one variable is given.

3- $3\sqrt{7} + 7\sqrt{2}$

= This number is not polynomial because In this number root is given.

4- $y + \frac{2}{y}$

= This number is not polynomial because In this number, Number is given in fractional form.

5- $x^{10} + y^3 + 7^{50}$

= This number is polynomial because In this number three variables are given.

2- Write the coefficient of x^2 in each of the following.

1- $2 + x^2 + x$

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= The cofficents of x^2 is 1

2 - $2 - x^2 + x^3$

= The Coefficent of x^2 is -1.

3 - $\frac{\pi}{2} x^2 + x$

= The Coefficent of x^2 is $\frac{\pi}{2}$.

4 - $\sqrt{2x} - 1$

= The Coefficent of x^2 is 0.

· Types of polynomial —

1 - Monomial — A Number which has only one terms

ex - $4x^5$, 10

2 - Binomial — A polynomial consisting two terms is called Binomial

ex - $9x^3 - 2$, $4x^2 + 3x$.

3 - Trinomial — A polynomial Consisting three terms is called Trinomial.

· Degree of polynomial —:

· The highest power of variable involved is known as degree of polynomial.

Ex - $4x^4 + 3x^2 + 200x + 1$
Degree = $4x^4$

$2x + 4$
Degree = 1

10
Degree - 0.

· Type of polynomial according to degree -:

1 - Linear — A polynomial having its degree 1.

Ex - $2x + 4$, x, $45x$ etc.

2 - Quadratic - A polynomial having its degree 2 is called Quadratic.

Ex - $2x^2 + 3x + 1$, $x^2 + 2$, $4x^2$.

3 - Cubic — A polynomial having its degree 3 is called Cubic.

Ex - $4x^3 + 2x^2 + 5x + 1$, $5x^3 + x^2 + x$, $10x^3 + 2x^2$, x^3

4- Bi-quadratic = A polynomial having the degree 4 is called bi-quadratic.

Ex- $x^4+4x^3+2y^2+3x+1$
[illegible]
[illegible]

Note- General form of the n-degree polynomial is $a_nx^n+a_{n-1}x^{n-1}+\dots+a_1x+a_0$ where $a_n, a_{n-1}, \dots, a_1, a_0$ are the coefficient $a_n \neq 0$.

- Standard form of linear polynomial is $ax+b$.
- Standard form of quadratic polynomial is ax^2+bx+c.
- Standard form of cubic polynomial is ax^3+bx^2+cx+d.
- Standard form of bi-quadratic polynomial is $ax^4+bx^3+cx^2$ ...

3- Give one examples each of binomial of degree 35 and monomial of degree 100.

1- Example of Binomial =

Ex- $x^{35}+2x$

2- Example of Monomial =

Ex- x^{100}

4- Write the degree of each polynomial.

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

= 3 degree

2- $4-y^2$

= 2 degree

3- $5t-\sqrt{7}$

= 1 degree

4- 3

= 0 degree

5- Classify the polynomials =

1- x^2+x

= Quadratic polynomial

2- $x - x^3$

= Cubic polynomial

3- $y + y^2 + 4$

= Quadratic polynomial

4- $1 + r$

= Linear polynomial

5- $3t$

= Linear polynomial

6- r^2

= Quadratic polynomial

7- $7x^3$

= Cubic polynomial

- Zeros of polynomial -:

- Let $P(x)$ be any polynomial and $x = a$ be any real number
  If $P(a) = 0$
  then, $x = a$ is a zeros of polynomial

- Value of Variables for which the polynomial becomes zero called Zeros of polynomial.

Ex- $P(x) = x^2 - 5x + 6$
$P(2) = 4 - 10 + 6$
$P(2) = 0.$
= $x = 2$ is a zeros of polynomial

Note -: n- Degree polynomial has n zeros

Ex-2.2

1- find the value of polynomial -:

a- $x = 0$

= $5x - 4x^2 + 3$
= $5 \times 0 - 4 \times (0)^2 + 3$
= $0 - 0 + 3$

2- $x = -1$

$= 5x - 4x^2 + 3$
$= 5 \times -1 + 4 \times (-1)^2 + 3$
$= -5 + 4 + 3$
$= -6.$

3- $x = 2$

$= 5x - 4x^2 + 3$
$= 5 \times 2 - 4 \times (2)^2 + 3$
$= 10 - 16 + 3$
$= -3.$

2- Find $P(0)$, $P(1)$, $P(2)$ —

1- $P(y) = y^2 - y + 1$

$= P(0) = (0)^2 - 0 + 1$
$= 0 + 1$
$= +1.$

$= P(1) = (1)^2 - 1 + 1$
$= 1 - 2$
$= 1$

$= P(2) = (2)^2 - 2 + 1$
$= 4 - 2 + 1$
$= 3.$

2- $P(y) = 2 + y + 2y^2 - y^3$

$= P(0) = 2 + 0 + 2 \times (0)^2 - (0)^3$
$= 2 + 0 - 0$
$= 2.$

$= P(1) = 2 + 1 + 2 \times (1)^2 - (1)^3$
$= 3 + 2 - 1$
$= 4.$

$= P(2) = 2 + 2 + 2 \times (2)^2 - (2)^3$
$= 4 + 8 - 8$
$= 4.$

3- $P(x) = x^3$

$= P(0) = (0)^3$
$= 0.$

$= P(1) = (1)^3$
$= 1.$

$= P(2) = (2)^3$
$= 8.$

4- $P(x) = (x-1)(x+1)$

$= P(0) = (0-1)(0+1)$
$= -1 \times 1$
$= -1.$

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$= P(1) = (1-1)(1+1)$
$= 0 \times 2$
$= 0.$

$= P(2) = (2-1)(2+1)$
$= 1 \times 3$
$= 3.$

3- Verify the following are zeros =

1- $P(x) = 3x+1,\ x = \frac{-1}{3}$

$= P\left(\frac{-1}{3}\right) = 3x\frac{-1}{3} + 1$

$= \frac{-3}{3} + \frac{1}{1}$

$= \frac{-3+1}{3}$

$= \frac{-2}{3}$ is not a zeros of polynomial.

2- $P(x) = 5x - \pi,\ x = \frac{4}{5}$

$\Rightarrow P\left(\frac{4}{5}\right) = \cancel{5} \times \frac{4}{\cancel{5}} - \frac{22}{7}$

$= \frac{4}{1} - \frac{22}{7}$

$= \frac{28-22}{7}$

$= \frac{6}{7}$ is not a zeros of polynomial

$3 \Rightarrow P(x) = x^2 - 1,\ x = 1, -1$

$= P(1) = 1^2 - 1$
$= 1 - 1$
$= 0$ is a zeros of polynomial

$= P(-1) = (-1)^2 - 1$
$= 1 - 1$
$= 0$ is a zeros of polynomial.

4- $P(x) = (x+1)(x-2),\ x = -1, 2$

$= P(-1) = (-1+1)(-1-2)$
$= 0$, 0 is a zeros of polynomial.

$= P(2) = (2+1)(2-2)$
$= 3,\ 0.$ is a zeros of polynomial.

5- $P(x) = x^2,\ x = 0$
$P(0) = (0)^2$
$= 0$ is a zeros of polynomial.

6- $P(x) = lx + m,\ x = -\frac{m}{l}$

$= P\left(\frac{-M}{L}\right) = \cancel{L} \times \frac{-M}{\cancel{L}} + M$

$= 0$ is a zeros of polynomial

7- $P(x) = 3x^2 - 1,\ x = \frac{-1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$

$= P\left(\frac{-1}{\sqrt{3}}\right) = 3 \times \left(\frac{-1}{\sqrt{3}}\right)^2 - 1$

$= \cancel{3} \times + \frac{1}{\cancel{3}} - 1$

$= P\frac{-1}{\sqrt{3}} =$ 0 is a zeros of polynomial.

$= P(x) = 3x^2 - 1$

$= P\left(\frac{2}{\sqrt{3}}\right) = 3 \times \left(\frac{2}{\sqrt{3}}\right)^2 - 1$

$= \cancel{3} \times \frac{4}{\sqrt{3}} \quad 1$

= 3 is not a zeros of polynomial

8- $P(x) = 2x + 1,\ x = \frac{1}{2}$

$= P\left(\frac{1}{2}\right) = \cancel{2} \times \frac{1}{\cancel{2}} + 1$

= 2 is not a zeros of polynomial

4- Find zeros of polynomial —

1- $P(x) = x + 5$
$= x + 5 = 0$
$= x = -5.$

2- $P(x) = x - 5$
$= x - 5 = 0$
$= x = 5.$

3- $P(x) = 2x + 5$
$= 2x + 5 = 0$
$= x = \frac{-5}{2}$

4- $P(x) = 3x - 2 = 0$
$= x = \frac{2}{3}.$

5) $P(x) = 3x = 0$
$= x = -3.$
$= x = 0.$

6) $P(x) = ax,\ a \neq 0.$
$x = 0.$

7) $P(x) = cx + d,\ c \neq 0.$
$= cx + d = 0$
$= x = \frac{c}{-d}$

• Remainder Theorem —:

• Let $P(x)$ be any polynomial and a be any real number.

• If $P(x)$ is divided by $(x-a)$. It gives remainder $P(a)$.

Ex- Let $P(x) = x^3 + 2x^2 + 3x + 1$ be a polynomial If $P(x)$ is divided by $(x-4)$ find Remainder?

Solve —: When $P(x)$ is divided by $(x-4)$. It gives remainder $P(4)$.

where, $P(4) = 4^3 + 2 \times 4^2 + 3 \times 4 + 1$
$= 64 + 32 + 12 + 1$
$= 109$ Ans

• Factor Theorem —:
Let $P(x)$ be any ~~polynomial~~ of degree $n > 1$ and $x = a$ be any real number.

• If $P(a) = 0$ then, $x - a$ is a factor of $P(x)$.

Ex- $P(x) = x^2 + 2x + 1$
$P(-1) = 1 + -2 + 1$
$= 1 - 2 + 1$
$= 0$. Therefore $(x+1)$, is factor of $P(x)$.

• Check whether $2x-3$ is a factor of x^2+2x+1

$= P(x) = x^2+2x+1$

If $P(x)$ is divided by $2x-3$, it gives remainder $P\left(\frac{3}{2}\right)$

$=$ where, $P\left(\frac{3}{2}\right) = \left(\frac{3}{2}\right)^2 + 2\times\frac{3}{2}+1$

$= \frac{9}{4} + 3+1$

$= 2\frac{1}{4}+4$

$P\left(\frac{3}{2}\right) = 6\frac{1}{4}$

$\left(\frac{3}{2}\right) \neq 0.$

So, $(2x-3)$ is not a factor of $P(x)$

Ex - 2.3

1- find the remainder when x^3+3x^2+3x+1 —

(a) - $x+1$

$=$ When $P(x)$ is divided by $x+1$, it gives remainder $P(-1)$.

$= P(-1) = x^3+3x^2+3x+1$

$= P(-1) = (-1)^3 + 3\times(-1)^2 + 3\times -1+1$

$= -1+3+(-3)+1$

$= -1+3-1+1$

$= 0$

$\Rightarrow$ The remainder of $P(x)$ is 0

(b) $x-\frac{1}{2}$

$=$ When $P(x)$ is divided by $x-\frac{1}{2}$ it gives remainder $P\left(\frac{1}{2}\right)$

$= P\left(\frac{1}{2}\right) = x^3+3x^2+3x+1$

$= \left(\frac{1}{2}\right)^3 + 3\times\left(\frac{1}{2}\right)^2 + 3\times\frac{1}{2}+1$

$= \frac{1}{8}+\frac{3}{4}+\frac{3}{2}+\frac{1}{1}$

$= \frac{1+6+12+8}{8}$

$= \frac{27}{8}$

$=$ The remainder of $P(x) = \frac{27}{8}$

(c) x

$=$ When $P(x)$ is divided by x, it gives remainder $P(0)$.

$= P(0) = x^3+3x^2+3x+1$

$= (0)^3+3\times(0)^2+3\times0+1$

$= 0+0+0+1$

$P(0) = 1.$

= The remainder of $P(x) = 1$.

(d)- $x + \pi = \frac{22}{7}$

= When $P(x)$ is divided by $x+\pi$. It gives remainder $-\frac{22}{7}$

= $P(x) = x^3 + 3x^2 + 3x + 1$

= $P\left(-\frac{22}{7}\right) = \left(-\frac{22}{7}\right)^3 + 3\times\left(-\frac{22}{7}\right)^2 + 3\times\left(-\frac{22}{7}\right) + 1$

$= -\pi^3 + 3\pi + (-3\pi) + 1$

$= -\pi^3 + 3\pi^2 - 3\pi + 1$

(e)- $5 + 2x$

= When $P(x)$ is divided by $5+2x$. It gives remainder $= -\frac{5}{2}$

= $P(x) = x^3 + 3x^2 + 3x + 1$

$P\left(-\frac{5}{2}\right) = \left(-\frac{5}{2}\right)^3 + 3\times\left(-\frac{5}{2}\right)^2 + 3\times\left(-\frac{5}{2}\right) + 1$

$= -\frac{125}{8} + 3\times\frac{25}{4} + -\frac{15}{2} + 1$

$= -\frac{125}{8} + \frac{75}{4} - \frac{15}{2} + \frac{1}{1}$

= $\frac{-125 + 150 - 60 + 8}{8}$

= $P(x) = -\frac{27}{8}$

= The Remainder of $P(x) = -\frac{27}{8}$.

2- find the remainder ——

1- $x - a$

= When $P(x)$ is divided by $x-a$. It gives remainder (a).

= $P(x) = x^3 - ax^2 + 6x - a$

= $P(a) = (a)^3 - a(a)^2 + 6a - a$

$= \cancel{a^3} - \cancel{a^3} + 6a - a$

= $P(a) = 5a$.

= The Remainder of $P(x)$ is $5a$.

3- Check whether $7+3x$ is a factor of $3x^3+7x$

= $P(x) = 3x^3 + 7x$

= If $P(x)$ is divided by $7+3x$. It gives remainder $\left(-\frac{7}{3}\right)$

= $P(x) = 3x^3 + 7x$

= $P\left(-\frac{7}{3}\right) = 3\times\left(-\frac{7}{3}\right)^3 + 7\times -\frac{7}{3}$

$= \frac{3 \times 343}{27} + \frac{-49}{3}$

$= \frac{1029}{27} - \frac{49}{3}$

$= \frac{1029 - 441}{27}$

$= P\left(\frac{-7}{3}\right) = \frac{588}{27}$

$-\frac{7}{3} \neq 0.$

= So, $7 + 3x$ is not a factor of $P(x)$.

Excercise - 2.4

1- Determine which of the following polynomial $(x+1)$ a factor :-

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

= If $P(x)$ is divided by $x+1$, It gives remainder $P(-1)$.

where, $P(-1) = (-1)^3 + (-1)^2 + (-1) + 1$
$= -1 + 1 - 1 + 1$
$\therefore P(-1) = 0.$

= So, $(x+1)$ is a factor of $P(x)$

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

= If $P(x)$ is divided by $(x+1)$, It gives remainder $P(-1)$.

= where, $P(-1) = (-1)^4 + (-1)^3 + (-1)^2 + (-1) + 1$
$= 1 - 1 + 1 - 1 + 1$
$P(-1) = 1$

= So, $(x+1)$ is not a factor of $P(x)$.

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

= If $P(x)$ is divided by $(x+1)$, It gives remainder $P(-1)$.

= Where $P(-1) = (-1)^4 + 3(-1)^3 + 3(-1)^2 + (-1) + 1$

$= 1 + (-3) + 3 - 1 + 1$

$= 1 - 3 + 3 - 1 + 1$

$P(-1) = 1.$

= So, $(x+1)$ is not a factor of $P(x)$.

4- $x^3 - x^2 - (2+\sqrt{2})x + \sqrt{2}$

= If $P(x)$ is divided by $(x+1)$, It gives remainder $P(-1)$.

= Where, $P(-1) = (-1)^3 - (-1)^2 - (2+\sqrt{2})-1+\sqrt{2}$

$= -1 - 1 + 2\sqrt{2} + \sqrt{2}$

$= 2\sqrt{2}$

$P(-1) \neq 0$

= So, $(x+1)$ is not a factor of $P(x)$.

2- Use factor theorem to determine $g(x)$ is a factor of $P(x)$ —:

1- $P(x) = 2x^3 + x^2 - 2x - 1$, $g(x) = x+1$

= If $P(x)$ is divided by $(x+1)$, It gives remainder $P(-1)$.

= Where $P(-1) = 2(-1)^3 + (-1)^2 - 2(-1) - 1$

$= 2(-1) + 1 - (-2) - 1$

$= -2 + 2 - 1$

$P(-1) = 0.$

= So, $(x+1)$ is a factor of $P(x)$.

2- $P(x) = x^3 + 3x^2 + 3x + 1$, $g(x) = x+2$

= If $P(x)$ is divided by $(x+2)$, It gives remainder $P(-2)$.

= Where $P(-2) = (-2)^3 + 3(-2)^2 + 3(-2) + 1$

$= -8 + 12 - 6 + 1$

$P(-2) = 3.$

= So, $(x+2)$ is not a factor of $P(x)$.

3- $P(x) = x^3 - 4x^2 + x + 6$, $g(x) = x-3$

= If $P(x)$ is divided by $x-3$, It gives remainder $P(3)$.

= Where, $P(3) = (3)^3 - 4(3)^2 + 3 + 6$

$= 27 - 36 + 9$

$P(3) = 18$

= So, $(x-3)$ is not a factor of $P(x)$

3- find the value of k, if $(x-1)$ is a factor of $P(x)$.

1- $P(x) = x^2+x+k$

= Given,
$P(x) = x^2+x+K$

= So, that $(x-1)$ is a factor of $P(x)$.

According to factor theorem —:

= $P(1) = 0$
= $(1)^2+1+k=0$
= $1+1+k=0$
= $2+k=0$
= $k=-2$.

2- $P(x) = 2x^2+kx+\sqrt{2}$.

= Given,
$P(x) = 2x^2+kx+\sqrt{2}$

= So, that $(x-1)$ is a factor of $P(x)$.

⇒ According to factor theorem —:

= $P(1) = 0$
= $2(1)^2+k(1)+\sqrt{2}$.
= $2+k(1)+\sqrt{2}$.

= $k = -(2+\sqrt{2})$.

3- $P(x) = kx^2-\sqrt{2}x+1$

= Given,
$P(x) = kx^2-\sqrt{2}x+1$.

= So, that $(x-1)$ is a factor of $P(x)$.

= According to factor theorem —:

= $P(1) = 0$
= $K(1)^2-\sqrt{2}(1)+1$
= $K1-\sqrt{2}(2)$.
= $K = 1-\sqrt{2}$.

4- $P(x) = Kx^2-3x+k$

= Given,
$P(x) = Kx^2-3x+k$.

= So, that $(x-1)$ is a factor of $P(x)$.

⇒ According to factor Theorem —:

= $P(1) = 0$
= $K(1)^2-3(1)+k$
= $K1-3+k$
= $2K-3$
= $K = \frac{3}{2}$.

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4- factorise —

1- $12x^2 - 7x + 1$

$= 12x^2 - 4x - 3x + 1$
$4x(3x-1) - 1(3x-1)$
$(3x-1)(4x-1)$

2- $2x^2 + 7x + 3$
$2x^2 + x + 6x + 3$
$x(2x+1) + 3(2x+1)$
$(2x+1)(x+3)$

3- $6x^2 + 5x - 6$
$6x^2 + 9x - 4x - 6$
$3x(2x+3) 2(2x+3)$
$(2x+3)(3x-2)$
$(2x+3)(3x-2)$

4- $3x^2 - x - 4$
$3x^2 - 4x + 3x - 4$
$x(3x-4) + 1(3x-4)$
$(3x-4)(x+1)$

- Addition —

Same Sign ⇒ Use given sign

Ex — 1- $(-4) + (-2) = -6$.
2- $3 + 8 = 11$.

- Different Sign = Use Sign of bigger number.

Ex — $(-4) + 2 = -2$.
$4 - 2 = 2$

- Multiplication

- Same Sign = Use (+) Sign

Ex — 1- $(-4) \times (-2) = 8$
2- $3 \times 4 = 12$

- Different Sign = Use (−) Sign

Ex — 1- $(-2) \times 3 = -6$.
2- $3 \times (-4) = -12$.

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5- Factorise

A- $x^3 - 2x^2 - x + 2$

$\Rightarrow x^2(x-2) - 1(x-2)$
$= (x-2)(x^2-1)$
$= (x-2)(x+1)(x-1)$.

b- x^3-3x^2-9x-5

$= P(x) = x^3-3x^2-9x-5$

$=$ Put $x = (-1)$

$= P(-1) = (-1)^3 - 3\times(-1)^2 - 9\times(-1) - 5$

$= -1 - 3 + 9 - 5$

$= 0 = (x+1)$ is a factor of $P(x)$.

$= x^3-3x^2-9x-5 \div x+1 = x^2-4x-5$

$= x^3-3x^2-9x-5 = (x+1)(x^2-4x-5)$

$= (x+1)(x^2-5x+x-5)$

$= (x+1)[x(x-5)+1(x-5)]$

$= x^3-3x^2-9x-5 = (x+1)^2(x-5)$.

c- $x^3+13x^2+32x+20$

$= P(x) = x^3+13x^2+32x+20$

Put $x = (-1)$

$= (-1)^3 + 13\times(-1)^2 + 32\times(-1) + 20$

$= -1 + 13 + (-32) + 20$

$= -1 + 13 - 32 + 20$

$= 0 = (x+1)$ is a factor of $P(x)$

$= x^3+13x^2+32x+20 \div x+1 = x^2+12x+20$

$= x^3+13x+32x+20 = (x+1)(x^2+12x+20)$

$= (x+1)(x^2+10x+2x+20)$

$= (x+1)[x(x+10)+2(x+10)]$

$= (x+1)(x+10)(x+2)$.

d- $2y^3+y^2-2y-1$

$= 2y^3-2y+y^2-1$

$= 2y(y^2-1)+1(y^2+1)$

$= (2y+1)(y^2-1)(y^2+1)$.

- Formulas

1- $(a+b)^2 = a^2+b^2+2ab$

2- $(a-b)^2 = a^2+b^2-2ab$

3- $a^2-b^2 = (a+b)(a-b)$

4- $(a+b)^3 = a^3+b^3+3ab(a+b)$

5- $(a-b)^3 = a^3-b^3-3ab(a-b)$

6- $a^3+b^3 = (a+b)(a^2+b^2-ab)$

7- $a^3-b^3 = (a-b)(a^2+b^2+ab)$

8- $(a+b+c)^2 = a^2+b^2+c^2+2ab+2bc+2ca$.

9- $a^3+b^3+c^3 = (a+b+c)(a^2+b^2+c^2-ab-bc-ca) + 3abc$.

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Exercise-25

1- Use suitable identities to find products

1- $(x+4)(x+10)$

$= x^2+(4+10)x+4\times10$

$= x^2+14x+40.$

2- $(x+8)(x-10)$

$= x^2+(8-10)x+8\times(-10)$

$= x^2+2x+(-80)$

$= x^2+2x-80.$

3- $(3x+4)(3x-5)$

$= (3x)^2+(4-5)(3x)+4\times(-5)$

$= 9x^2-3x-20.$

4- $\left(y^2+\frac{3}{2}\right)\left(y^2-\frac{3}{2}\right)$

$= (y)^2+\left(\frac{3}{2}\right)^2$

$= y^4+\frac{9}{4}$

5- $(3-2x)(3+2x)$

$= (3)^2-(2x)^2$

$= 9-4x^2.$

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2- Evaluate the following —

1- 103×107

$= (100+3)(100+7)$

$= (100)^2+(3+7)\times100+3\times7$

$= 10000+1000+21$

$= 11021$

2- 95×96

$= (100-5)(100-4)$

$= (100)^2+(-5-4)100+(-5)(-4)$

$= 10000-900+20$

$= 9120.$

3- 104×96

$= (100+4)(100-4)$

$= (100)^2-(4)^2$

$= 10000-16$

$= 9984.$

3- Factorise —

1- $9x^2+6xy+y^2$

$= (3x)^2+2\times3x\times y+(y)^2$

$= (3x+y)^2.$

2- $4y^2 - 4y + 1$

$= (2y)^2 - 2 \times 2y \times 1 + (1)^2$

$= (2y-1)^2.$

3- $x^2 - \dfrac{y^2}{100}$

$= (x)^2 - \left(\dfrac{y}{10}\right)^2$

$= \left(x + \dfrac{y}{10}\right)\left(x - \dfrac{y}{10}\right).$