1. Algebra

Exercise 1.1

1 A. Question

Choose the correct answer for the following:

The coefficient of x^4 in $-5x^7 + \frac{3}{7}x^4 - 3x^3 + 7x^2 - 1$ is

A. – 5

B. – 3

C. $\frac{3}{7}$

D. 7

Answer

The coefficient of a variable is a multiplicative factor or factors.

In the above question coefficient of x^4 is its factor i.e. $\frac{3}{7}$.

1 B. Question

Choose the correct answer for the following:

The coefficient of xy^2 in $7x^2 - 14x^2y + 14xy^2 - 5$ is

A. 7

B. 14

C. – 14

D. – 5

Answer

The coefficient of a variable is a multiplicative factor or factors.

In the above question coefficient of xy^2 is its factor i.e. + 14.

1 C. Question

Choose the correct answer for the following:

The power of the term $x^3 y^2 z^2$ is ____

A. 3

B. 2

C. 12

D. 7

Answer

The monomials in the polynomial are called the terms. The highest power of the terms is the degree of the polynomial.

It is a polynomial in variables x,y and z

The power of x^3 is 3, power of y^2 is 2 and the power of z^2 is 2

So the power of $x^3\ y^2\ z^2$ is 3 + 2 + 2 = 7

1 D. Question

Choose the correct answer for the following:

The degree of the polynomial $x^2 - 5x^4 + \frac{3}{4}x^7 - 73x + 5$ is ____

A. 7

B. $\frac{3}{4}$

C. 4

D. -73

Answer

The monomials in the polynomial are called the terms. The highest power of the terms is the degree of the polynomial.

$x^2 - 5x^4 + \frac{3}{4}\ x^7 - 73x + 5$ is a polynomial in variable x. Here we have 5 monomials x^2, $-5x^4$, $+\frac{3}{4}$, x^7, $-73x$, and + 5 which are called the terms of the polynomial.

The highest power is 7 so the degree of the polynomial is 7

1 E. Question

Choose the correct answer for the following:

The degree of the polynomial $x^2 - 5x^2y^3 + 30x^3\ y^4 - 576xy$ is

A. –576

B. 4

C. 5

D. 7

Answer

$x^2 - 5x^2y^3 + 30x^3 y^4 - 576xy$ is a polynomial in variable x and y.

Term 1: x^2 variable x, power of x is 2. Hence the power of the term is **2**.

Term 2: $-5x^2y^3$ the variables are x and y; the power of x is 2 and the power of y is 3.

Hence the power of the term $-5x^2y^3$ is 2 + 3 = **5** [Sum of the exponents of variables x and y].

Term 3: $30x^3y^4$ the variables are x and y; the power of x is 3 and the power of y is 4. Hence the power of the term $30x^3y^4$ is 3 + 4 = **7** [Sum of the exponents of variables x and y].

Term 4: – 576xy the variables are x and y; the power of x is 1 and the power of y is 1. Hence the power of the term -576xy is 1 + 1 = **2** [Sum of the exponents of variables x and y].

So the highest power is 7,hence the degree of the polynomial is 7.

1 F. Question

Choose the correct answer for the following:

$x^2 + y^2 - 2z^2 + 5x - 7$ is a

A. monomial

B. binomial

C. trinomial

D. polynomial

Answer

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

Expression that contains two terms is called a **binomial.**

Expression that contains three terms is called a **trinomial.**

Expression that contains one or more terms with non-zero coefficient is called a **polynomial.**

1 G. Question

Choose the correct answer for the following:

The constant term of $0.4x^7 - 75y^2 - 0.75$ is

A. 0.4

B. 0.75

C. – 0.75

D. – 75

Answer

.

2. Question

Identify the terms and their coefficients for the following expressions:

i. 3abc - 5ca

ii. $1 + x + y^2$

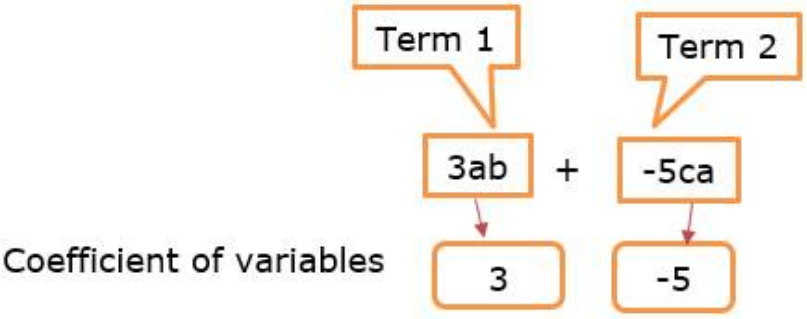
iii. $3x^2 y^2 - 3xyz + z^3$

iv. $-7 + 2pq - \frac{5}{7}qr + rp$

v. $\frac{x}{2} - \frac{y}{2} - 0.3xy$

Answer

i. 3abc - 5ca

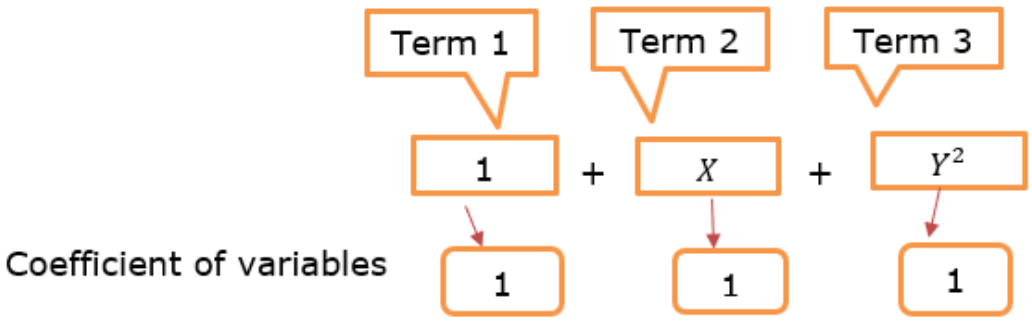


The terms are 3ab and -5ca

Coefficient of 3ab = 3

Coefficient of -5ca = -5

ii. $1 + x + y^2$



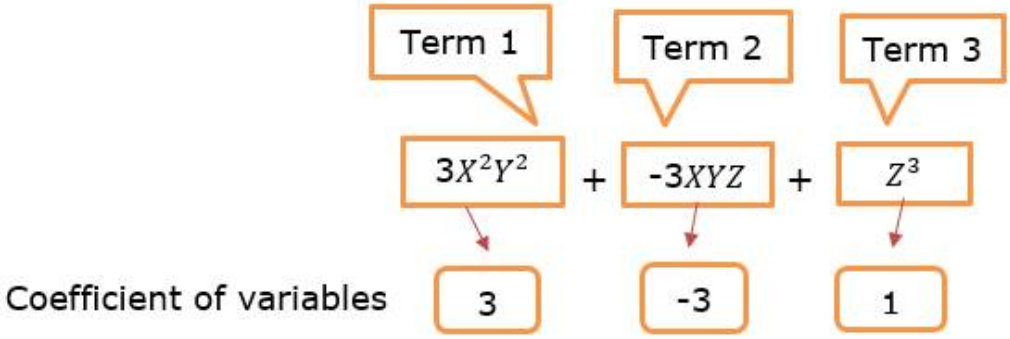
There are 3 terms 1,x and y^2

Coefficient of 1 = 1

Coefficient of x = 1

Coefficient of y^2 = 1

iii. $3x^2 y^2 - 3xyz + z^3$



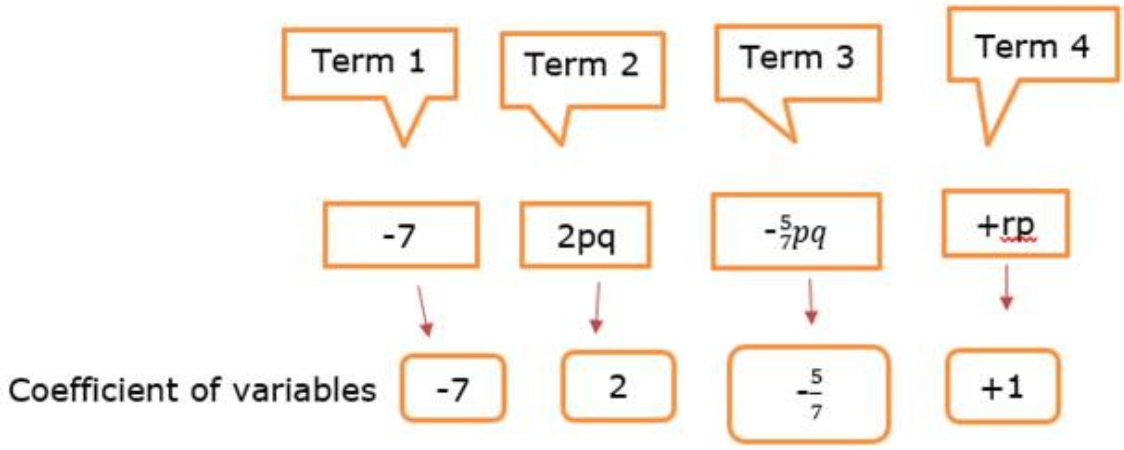
There are 3 terms $3x^2 y^2$, - 3xyz, and + z^3

Coefficient of $3x^2 y^2$ = 3

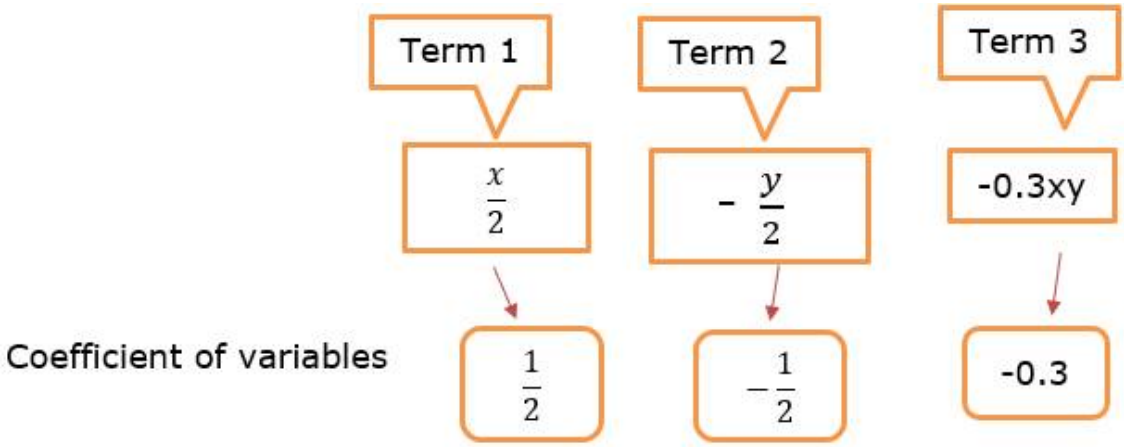
Coefficient of- 3xyz = -3

Coefficient of + z^3 = 1

iv. $-7 + 2pq - \frac{5}{7} qr + rp$



v. $\frac{x}{2} - \frac{y}{2} - 0.3xy$



Thus, we can conclude

Sl. No.	Terms	Coeffficients of variables
i)	$3\,abc$ $-5\,ca$	3 -5
ii)	$1, x, y^2$	constant term, 1, 1
iii)	$3x^2y^2$ $-3xyz$ y^2	3 -3 1
iv)	-7 $2\,pq$ $\frac{-5}{7}qr$ rp	constant term 2 $\frac{-5}{7}$ 1
v)	$\frac{x}{2}$ $\frac{-y}{2}$ $-0.3\,xy$	$\frac{1}{2}$ $\frac{-1}{2}$ -0.3

3. Question

Classify the following polynomials as monomials, binomials and trinomials:

$3x^2$, $3x + 2$, $x^2 - 4x + 2$, $x^5 - 7$, $x^2 + 3xy + y^2$,

$s^2 + 3st - 2t^2$, $xy + yz + zx$, $a^2b + b^2c$, $2l + 2m$

Answer

$3x^2$

Expression that contains only one term is called a monomial.

The above question has only one term i.e. $3x^2$, so it is **monomial.**

$3x + 2$

Expression that contains two terms is called a binomial.

The above question has two terms i.e. 3x and + 2 , so it is **binomial.**

$x^2 - 4x + 2$

Expression that contains three terms is called a trinomial.

The above question has 3 terms i.e. x^2 , -4x and + 2, so it is **trinomial.**

$x^5 - 7$

Expression that contains two terms is called a binomial.

The above question has two terms i.e. x^5 and -7, so it is a **binomial.**

$x^2 + 3xy + y^2$

Expression that contains three terms is called a trinomial.

The above question has 3 terms i.e. x^2 , + 3xy and y^2, so it is **trinomial.**

$s^2 + 3st - 2t^2$

Expression that contains three terms is called a trinomial.

The above question has 3 terms i.e. s^2 , + 3st and $-t^2$, so it is **trinomial.**

xy + yz + zx

Expression that contains three terms is called a trinomial.

The above question has 3 terms i.e. xy, + yz and + zx, so it is **trinomial.**

$a^2b + b^2c$

Expression that contains two terms is called a binomial.

The above question has 2 terms i.e. a^2b and + b^2c , so it is a **binomial.**

2l + 2m

Expression that contains two terms is called a binomial.

The above question has 2 terms i.e. 2l and + 2m, so it is a **binomial.**

4. Question

Add the following algebraic expressions:

i. $2x^2 + 3x + 5$ and $3x^2 - 4x - 7$

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

iii. $2t^2 + t - 4$ and $1 - 3t - 5t^2$

iv. xy - yz, yz - xz and zx - xy

v. $a^2 + b^2$, $b^2 + c^2$, $c^2 + a^2$ and 2ab + 2bc + 2ca

Answer

i. $2x^2 + 3x + 5$ and $3x^2 - 4x - 7$

Column method of addition

$$\begin{array}{r} 2x^2 + 3x + 5 \\ (+)\ 3x^2 - 4x - 7 \\ \hline 5x^2 - x - 2 \end{array}$$

$5x^2 - x - 2$

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

Column method of addition

$$\begin{array}{r} x^2 - 2x - 3 \\ (+)\ x^2 + 3x + 1 \\ \hline 2x^2 + x - 2 \end{array}$$

$2x^2 + x - 2$

iii. $2t^2 + t - 4$ and $1 - 3t - 5t^2$

Row method of addition

$(2t^2 + t - 4) + (1 - 3t - 5t^2)$

Now combine the like terms

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

$= -3t^2 - 2t - 3$

iv. xy - yz, yz - xz and zx - xy

(xy-yz) + (yz-xz) + (zx-xy)

Now combine the like terms

= (xy-xy) + (-yz + yz) + (-xz + zx)

= 0 + 0 + 0

= 0

V. $a^2 + b^2$, $b^2 + c^2$, $c^2 + a^2$ and 2ab + 2bc + 2ca

$$
\begin{array}{r}
a^2 + b^2 \\
b^2 + c^2 \\
c^2 + a^2 \\
(+)\ 2ab + 2bc + 2ca \\
\hline
2a^2 + 2b^2 + 2c^2 + 2ab + 2bc + 2ca \\
\hline
\end{array}
$$

Observe we have written the term- b^2 of the second polynomial below the corresponding term b^2 of the first polynomial. Since the term a^2 in the second polynomial and the term 2ab + 2bc + 2ca in the fourth polynomial do not exist, so their respective places have been left blank to facilitate the process of addition.

5. Question

Subtract

(i) Subtract 2 a – b from 3a - b

(ii) Subtract -3x + 8y from -7x - 10y

(iii) Subtract 2ab + 5bc - 3ca from 7ab - 2bc + 10ca

(iv) Subtract $x^5 - 2x^2 - 3x$ from $x^3 + 3x^2 + 1$

(v) Subtract $3x^2y - 2xy + 2xy^2 + 5x - 7y - 10$ from $15 - 2x + 5y - 11\ xy + 2xy^2 + 8x^2y$

Answer

i. Subtract 2 a – b from 3a – b

$$
\begin{array}{r}
3a - b \\
-\ (2a - b) \\
\hline
\\
\hline
\end{array}
\quad \Rightarrow \quad
\begin{array}{r}
3a - b \\
-2a + b \\
\hline
a + 0 \\
\hline
\end{array}
$$

Answer = a

ii. Subtract -3x + 8y from -7x - 10y

$$
\begin{array}{r}
-7x - 10y \\
-\ (-3x + 8y) \\
\hline
\\
\hline
\end{array}
\quad \Rightarrow \quad
\begin{array}{r}
-7x - 10y \\
+3x - 8y \\
\hline
-\ 4x - 18y \\
\hline
\end{array}
$$

Answer = -4x-18y

iii. Subtract 2ab + 5bc - 3ca from 7ab - 2bc + 10ca

Solution:

$7ab - 2bc + 10ca$

$2ab + 5bc - 3ca$ [change the sign]

$- \quad - \quad +$

$5ab - 7bc + 13ca$

iv. Subtract $x^5 - 2x^2 - 3x$ from $x^3 - 3x^2 + 1$

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

$x^5 + 0x^3 - 2x^2 - 3x + 0$ [change the sign]

$- \quad - \quad + \quad + \quad -$

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

Answer = $-x^5 + x^3 - x^2 + 3x + 1$

v. Subtract $3x^2y - 2xy + 2xy^2 + 5x - 7y - 10$ from $15 - 2x + 5y - 11xy + 2xy^2 + 8x^2y$

Row method of subtraction

$= (15 - 2x + 5y - 11xy + 2xy^2 + 8x^2y) - (3x^2y - 2xy + 2xy^2 + 5x - 7y - 10)$

$= 15 - 2x + 5y - 11xy + 2xy^2 + 8x^2y - 3x^2y + 2xy - 2xy^2 - 5x + 7y + 10$

Now combining the like terms

$= (2xy^2 - 2xy^2) + (8x^2y - 3x^2y) + (-11xy + 2xy) + (-2x - 5x) + (5y + 7y) + (15 + 10)$

$= 5x^2y + (-9xy) + (-7x) + 12y + 25$

$= 5x^2y - 9xy - 7x + 12y + 25$

Answer = $5x^2y - 9xy - 7x + 12y + 25$

6. Question

Find out the degree of the polynomials and the leading coefficients of the polynomials given below:

(i) $x^2 - 2x^3 + 5x^7 - \frac{8}{7}x^3 - 70x - 8$

(ii) $13x^3 - x^{13} - 113$

(iii) $-77 + 7x^2 - x^7$

(iv) $-181 + 0.8y - 8y^2 + 115y^3 + y^8$

(v) $x^7 - 2x^3y^5 + 3xy^4 - 10xy + 10$

Answer

(i) The monomials in the polynomial are called the terms. The highest power of the terms is the degree of the polynomial.

$x^2 - 2x^3 + 5x^7 - \frac{8}{7}x^3 - 70x - 8$ is a polynomial in x. Here we have 6 monomials x^2, $-2x^3$, $+5x^7$, $-\frac{8}{7}x^3$, $-70x$ and -8 which are called the terms of the polynomial.

The highest power is 7 so the **degree of the polynomial is 7**.

(ii) $13x^3 - x^{13} - 113$ is a polynomial in x. Here we have 3 monomials and the highest power is 13 so the **degree of the polynomial is 13.**

(iii) $-77 + 7x^2 - x^7$ is a polynomial in x. Here we have 3 monomials and the highest power is 7 so the **degree of the polynomial is 7**.

(iv) $-181 + 0.8y - 8y^2 + 115y^3 + y^8$ is a polynomial in x. Here we have 5 monomials and the highest power is 8 so the **degree of the polynomial is 8**.

(v) $x^7 - 2x^3y^5 + 3xy^4 - 10xy + 10$ is a polynomial in x and y, Here we have 5 monomials.

Term 1: x^7 variable x, power of x is 7. Hence the power of the term is **7**.

Term 2: $-2x^3y^5$ the variables are x and y; the power of x is 3 and the power of y is 5.

Hence the power of the term $-2x^3y^5$ is 3 + 5 = **8** [Sum of the exponents of variables x and y].

Term 3: $3xy^4$ the variables are x and y; the power of x is 1 and the power of y is 4.

Hence the power of the term $3xy^4$ is 1 + 4 = **5** [Sum of the exponents of variables x and y].

Term 4: $-10xy$ the variables are x and y; the power of x is 1 and the power of y is 1.

Hence the power of the term -10xy is 1 + 1 = **2** [Sum of the exponents of variables x and y].

Term 5: 10 the constant term and it can be written as $10x^0y^0$. The power of the variables x^0y^0 is zero. Hence the power of the term 10 is **0**.

So the highest power is 8, hence the **degree of the polynomial is 8.**

Exercise 1.2

1. Question

Find the product of the following pairs of monomials:

i. 3, 7x

ii. – 7x, 3y

iii. – 3a, 5ab

iv. $5a^2$, – 4a

v. $\frac{3}{7}x^5, \frac{14}{9}x^2$

vi. Xy^2, x^2y

vii. x^3y^5, xy^2

viii. abc, abc

ix. xyz. x^2yz

x. $a^2b^2c^3$, abc^2

Answer

i. 3, 7x

= 3×7x

= 21x

ii. – 7x, 3y

= -7 ×3×x ×y

= -21xy

iii. – 3a, 5ab

= -3 ×5 ×a ×a ×b

= $-15\times\ a^{(1+1)}\times b$

= $-15\times\ a^2\ \times b$

= $-15\ a^2b$

iv. $5a^2$, – 4a

= $(5\times -4)\times(a^2\times a)$

= $-20\times(a^{2+1})$

= $-20a^3$

v. $\frac{3}{7}x^5, \frac{14}{9}x^2$

= $\frac{3}{7}\times\frac{14}{9}\times(x^5\times x^2)$

= $\frac{2}{3}\times(x^{5+2})$

= $\frac{2}{3}\times(x^7)$

$= \frac{2}{3} x^7$

vi. Xy^2, x^2y

$= x^{1+2} \times y^{2+1}$

$= x^3 y^3$

vii. x^3y^5, xy^2

$= x^{(3+1)} \times y^{(5+2)}$

$= x^4 y^7$

viii. abc, abc

$= a \times b \times c \times a \times b \times c$

$= (a \times a) \times (b \times b) \times (c \times c)$

$= a^{(1+1)} \times b^{(1+1)} \times c^{(1+1)}$

$= a^2 b^2 c^2$

ix. xyz. X^2yz

$= (x \times x^2) \times (y \times y) \times (z \times z)$

$= x^3 y^2 z^2$

x. $a^2b^2c^3, abc^2$

$= (a^2 \times a) \times (b^2 \times b) \times (c^3 \times c)$

$= a^3 \times b^3 \times c^3$

2. Question

Complete the following table of products:

First monomial → Second Monomial ↓	$2x$	$-3y$	$4x^2$	$-5xy$	$7x^2y$	$-6x^2y^2$
$2x$	$4x^2$	....	....			
$-3y$						
$4x^2$						
$-5xy$				$25x^2y^2$		
$7x^2y$						
$-6x^2y^2$		$18x^2y^3$				

Answer

First monomial → Second Monomial ↓	2x A1	-3y A2	$4x^2$ A3	-5xy A4	$7x^2y$ A5	$-6x^2y^2$ A6
2x B1	$4x^2$	B1A2	....	B1A4		
-3y B2	B2A1					B2A6
$4x^2$ B3			B3A3		B3A5	
-5xy B4	B4A1			$25x^2y^2$		
$7x^2y$ B5			B5A3		B5A5	
$-6x^2y^2$ B6	B6A1	$18x^2y^3$				B6A6

For finding B1A2

2X x -3y

= -6xy

B1A4

2X x -5xy

= -10 $x^{(1+1)}$ y

= -10 x^2 y

B2A1

-3Y x 2x

= -6xy

B2A6

-3Y x $-6x^2y^2$

= 18 x $(y^{(1+2)})$ x x^2

= 18 y^3 x^2

B3A3

$4x^2$ x $4x^2$

= $16x^{(2+2)}$

= $16x^4$

B3A5

$4x^2$ x $7x^2y$

= (4x7) x (x^{2+2}) x y

= 28 x^4y

B4A1

-5xy X 2x

= (-5x2) x (x X x) x y

= -10 $x^{(1+1)}$y

= -10 x^2 y

So the final table will be

First → monomial Second Monomial ↓	2x A1	-3y A2	$4x^2$ A3	-5xy A4	$7x^2y$ A5	$-6x^2y^2$ A6
2x B1	$4x^2$	-6xy	$8X^3$	$-10x^2$ y	14y x^3	$12y^2$ x^3
-3y B2	-6xy	9 y^2	-12 x^2y	$15xy^2$	$-21y^2$ x^2	18 y^3 x^2
$4x^2$ B3	8 x^3	-12 x^2y	16 x^4	$-20x^3y$	28 x^4y	$-24x^4y^2$
-5xy B4	$-10x^2$ y	$15xy^2$	$-20x^3y$	$25x^2y^2$	$-35x^3y^2$	$30x^3y^2$
$7x^2y$ B5	$14x^3y$	$-21x^2y^2$	$28x^4y$	$-35x^3y^2$	$49x^4y^2$	$-42x^4y^3$
$-6x^2y^2$ B6	$-12x^3y^2$	$18x^2y^3$	$-24x^4y^2$	$30x^3y^3$	$-42x^4y^3$	$36x^4y^4$

3. Question

Find out the product :

(i) 2a, $3a^2$, $5a^4$

(ii) 2x, 4y, 9z

(iii) ab, bc, ca

(iv) m, 4m, $3m^2$, - $6m^3$

(v) xyz, y^2z, yx^2

(vi) lm^2, mn^2, ln^2

(vii) -2p, -3q, $-5p^2$

Answer

i. 2a, $3a^2$, $5a^4$

= $(2\times 3\times 5)\times(a\times a^2\times a^4)$

= $(30)\times(a^{1+2+4})$

= 30 a^7

ii. 2x, 4y, 9z

= $(2\times 4\times 9)\times(x\times y\times z)$

= 72xyz

iii. ab, bc, ca

= ab × bc × ca

= axaxbxbxcxc

= a^2 b^2 c^2

iv. m, 4m, $3m^2$, - $6m^3$

= mx4mx3 m^2x- 6m

= $(4 \times 3 \times (-6)) \times (m \times m \times m^2 \times m^3)$

= -72×($m^{1+1+2+3}$)

= -72 m^7

v. xyz, y^2z, yx^2

= $(x \times x^2) \times (y \times y2 \times y) \times (z \times z)$

= $(x^{1+2}) \times (y^{1+2+1}) \times (z^2)$

= $(x^3) \times (y^4) \times (z^2)$

= $x^3y^4z^2$

vi. lm^2, mn^2, ln^2

= $(l \times l) \times (m2 \times m) \times (n2 \times n2)$

= $l^2 \times m^3 \times n^2$

= l^2 m^3 n^2

vii. -2p, -3q, $-5p^2$

= $(-2 \times -3 \times -5) \times (p \times q \times p^2)$

= $(-30) \times (p^{1+2} \times q)$

= -30 p^3q

4. Question

Find the product :

(i) $(a^3) \times (2a^5) \times (4a^{15})$

(ii) (5 – 2x) (4 + x)

(iii) (x + 3y) (3x – y)

(iv) (3x + 2) (4x – 3)

(v) $\left(\frac{2}{3}ab\right)\left(\frac{-15}{8}a^2b^2\right)$

Answer

(i) $(2\times 4)(a^3 \times a^5 \times a^{15})$

$\Rightarrow 8\, a^{3+5+15}$

$\Rightarrow 8\, a^{23}$ ($\because a^{n+m} = a^n \times a^m$)

ii. $5 \times (4 + x) - 2x \times (4 + x)$

$\Rightarrow (5\times 4 + 5x) - (2x \times 4 + 2x \times x)$

$\Rightarrow (20 + 5x) - (8x + 2x^{1+1})$ ($\because a^{n+m} = a^n \times a^m$)

$\Rightarrow (20 + 5x) - (8x + 2x^2)$

$\Rightarrow 20 + 5x - 8x - 2x^2$

$\Rightarrow -2x^2 - 3x + 20$

iii. $x \times (3x - y) + 3y \times (3x - y)$

$\Rightarrow (x \times 3x + x \times (-y)) + (3y \times 3x + 3y \times (-y))$

$\Rightarrow (3x^{1+1} - xy) + ((3\times 3)xy - 3y^{1+1})$ ($\because a^{n+m} = a^n \times a^m$)

$\Rightarrow (3x^2 - xy) + (9xy - 3y^2)$

$\Rightarrow 3x^2 - xy + 9xy - 3y^2$

$\Rightarrow 3x^2 + 8xy - 3y^2$

iv. $3x \times (4x-3) + 2 \times (4x-3)$

$\Rightarrow (3x \times 4x + 3x \times (-3)) + (2\times 4x + 2 \times (-3))$

$\Rightarrow ((3\times 4)x^{1+1} - 9x) + (8x - 6)$ ($\because a^{n+m} = a^n \times a^m$)

$\Rightarrow 12x^2 - 9x + 8x - 6$

$\Rightarrow 12x^2 - x - 6$

v. $(\frac{2}{3} \times \frac{-15}{8})x(\ abX\ a^2\ b^2)$

$= \frac{-5}{4}\, x(a^{1+2}\, b^{(1+2)})$

$= \frac{-5}{4}\, a^3\, b^3$

5 A. Question

Find the product of the following :

$(a + b)\ (2a^2 - 5ab + 3b^2)$

Answer

$a \times (2a^2 - 5ab + 3b^2) + b \times (2a^2 - 5ab + 3b^2)$

$\Rightarrow$ **(** $a \times 2a^2 - a \times 5ab + a \times 3b^2) + (b \times 2a^2 - b \times 5ab + b \times 3b^2)$

$\Rightarrow$ **(** $2a^{2+1} - 5a^{1+1}b + 3ab^2) + (2a^2b - 5ab^2 + 3b^{2+1})$

$(\because a^{n+m} = a^n \times a^m)$

$\Rightarrow$ **(** $2a^3 - 5a^2b + 3ab^2) + (2a^2b - 5ab^2 + 3b^3)$

$\Rightarrow 2a^3 - 5a^2b + 2a^2b + 3ab^2 - 5ab^2 + 3b^3$

$\Rightarrow 2a^3 + (-5 + 2)a^2b + (3-5)ab^2 + 3b^3$

$\Rightarrow 2a^3 - 3a^2b - 2ab^2 + 3b^3$

5 B. Question

Find the product of the following :

$(2x + 3y)\ (x^2 - xy + y^2)$

Answer

$2x \times (x^2 - xy + y^2) + 3y \times (x^2 - xy + y^2)$

$\Rightarrow (2x \times x^2 - 2x \times xy + 2x \times y^2) + (3y \times x^2 - 3y \times xy + 3y \times y^2)$

$\Rightarrow (2x^{2+1} - 2x^{1+1}y + 2xy^2) + (3yx^2 - 3xy^{1+1} + 3y^{2+1})$

$(\because a^{n+m} = a^n \times a^m)$

$\Rightarrow (2x^{2+1} - 2x^{1+1}y + 2xy^2) + (3yx^2 - 3xy^{1+1} + 3y^{2+1})$

$\Rightarrow (2x^3 - 2x^2y + 2xy^2) + (3yx^2 - 3xy^2 + 3y^3)$

$\Rightarrow 2x^3 - 2x^2y + 3x^2y + 2xy^2 - 3xy^2 + 3y^3$

$\Rightarrow 2x^3 (-2 + 3)x^2y + (2-3)xy^2 + 3y^3$

$\Rightarrow 2x^3 + x^2y - xy^2 + 3y^3$

5 C. Question

Find the product of the following :

$(x + y + z)\ (x + y - z)$

Answer

$x(x + y-z) + y(x + y-z) + z(x + y-z)$

$\Rightarrow (x \times x + xy - xz) + (yx + y \times y - yz) + (zx + zy - z \times z)$

$\Rightarrow (x^{1+1} + xy - xz) + (yx + y^{1+1} - yz) + (zx + zy - z^{1+1})$

$(\because a^{n+m} = a^n \times a^m)$

$\Rightarrow x^2 + xy - xz + xy + y^2 - yz + xz + yz - z^2$

$\Rightarrow x^2 + y^2 - z^2 + xy + xy - xz + xz - yz + yz$

$\Rightarrow x^2 + y^2 - z^2 + (1 + 1)\, xy + (1-1)xz + (1-1)yz$

$\Rightarrow x^2 + y^2 - z^2 + 2xy$

5 D. Question

Find the product of the following :

$(a + b)\,(a^2 + 2ab + b^2)$

Answer

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

$\Rightarrow (a \times a^2 + a \times 2ab + a \times b^2) + (b \times a^2 + b \times 2ab + b \times b^2)$

$\Rightarrow (a^{2+1} + 2a^{1+1}b + ab^2) + (ba^2 + 2ab^{1+1} + b^{2+1})$

$(\because a^{n+m} = a^n \times a^m)$

$\Rightarrow (a^3 + 2a^2b + ab^2) + (ba^2 + 2ab^2 + b^3)$

$\Rightarrow a^3 + 2a^2b + a^2b + ab^2 + 2ab^2 + b^3$

$\Rightarrow a^3 + (2 + 1)a^2b + (1 + 2)ab^2 + b^3$

$\Rightarrow a^3 + 3a^2b + 3ab^2 + b^3$

5 E. Question

Find the product of the following :

$(m - n)\,(m^2 + mn + n^2)$

Answer

$m(m^2 + mn + n^2) - n(m^2 + mn + n^2)$

$\Rightarrow (m \times m^2 + m \times mn + mn^2) - (nm^2 + n \times mn + n \times n^2)$

$\Rightarrow (m^{2+1} + m^{1+1}n + mn^2) - (nm^2 + mn^{1+1} + n^{2+1})$

$(\because a^{n+m} = a^n \times a^m)$

$\Rightarrow (m^3 + m^2n + mn^2) - (nm^2 + mn^2 + n^3)$

$\Rightarrow m^3 + m^2n + mn^2 - nm^2 - mn^2 - n^3$

$\Rightarrow m^3 + m^2n - m^2n + mn^2 - mn^2 - n^3$

$\Rightarrow m^3 + (1-1)m^2n + (1-1)mn^2 - n^3$

$= m^3 - n^3$

6 A. Question

Add 2x(x – y – z) and 2y(z – y – x)

Answer

2xXx – 2xy – 2xz and z-y-x

$2x^2 - 2xy - 2xz$
$(+)\ 2yz - 2y^2 - 2yx$
$2x^2 - 2xy - 2xz + 2yz - 2y^2 - 2xy$

6 B. Question

Subtract 3a(a-2b + 3c) from 4a(5a + 2b - 3c)

Answer

(3a X a) + (3ax -2b) + (3ax3c) from (4ax5a) + (4ax2b) + (4ax(-3c))

= $3a^2$ – 6ab + 9ac from $20a^2$ + 8ab -12ac

$20a^2 + 8ab - 12ac$
$3a^2 - 6ab + 9ac$
\- + -
$17a^2 + 14ab - 21ac$

Exercise 1.3

1 A. Question

Choose the correct answer for the following:

$(a + b)^2 = (a + b) \times$ _____

A. ab

B. – 2ab

C. (a + b)

D. (a – b)

Answer

Squaring a term means multiplying it with itself.

$(a + b)^2 = (a + b) \times (a + b)$

1 B. Question

Choose the correct answer for the following:

$(a - b)^2 = (a - b) \times$ _____

A. (a + b)

B. – 2ab

C. ab

D. (a – b)

Answer

Squaring a term means multiplying it with itself.

$(a - b)^2 = (a - b) \times (a - b)$

1 C. Question

Choose the correct answer for the following:

$(a^2 - b^2) = (a - b) \times$ _____

A. (a – b)

B. (a + b)

C. $a^2 + 2ab + b^2$

D. $a^2 - 2ab + b^2$

Answer

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

$\Rightarrow (a - b) \times (a + b) = a^2 - b^2$

So, $(a^2 - b^2) = (a - b) \times (a + b)$

1 D. Question

Choose the correct answer for the following:

9.6^2 = _____

A. 9216

B. 93.6

C. 9.216

D. 92.16

Answer

Given $9.6^2 = (10 - 0.4)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a \times b$

$\Rightarrow 9.6^2 = 10^2 + 0.4^2 - 2(10) \times (0.4)$

$\Rightarrow 9.6^2 = 100 + 0.16 - 8$

$\Rightarrow 9.6^2 = 92.16$

1 E. Question

Choose the correct answer for the following:

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

A. 4ab

B. 2ab

C. $a^2 + 2ab + b^2$

D. $2(a^2 + b^2)$

Answer

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

and $(a+ b)^2 = a^2 + b^2 + 2a\times b$

$\Rightarrow (a+ b)^2 - (a- b)^2 = (a^2 + b^2 + 2a\times b) - (a^2 + b^2 - 2a\times b)$

$\Rightarrow (a+ b)^2 - (a- b)^2 = 4ab$

1 F. Question

Choose the correct answer for the following:

$m^2 + (c + d)\, m + cd =$ _____

A. $(m + c)^2$

B. $(m + c)\,(m + d)$

C. $(m + d)^2$

D. $(m + c)\,(m - d)$

Answer

Given $m^2 + (c + d)\, m + cd = m^2 + cm + dm + cd$

$\Rightarrow m^2 + (c + d)\, m + cd = m(m + c) + d(m + c)$

$\Rightarrow m^2 + (c + d)\, m + cd = (m + d)(m + c)$

2 A. Question

Using a suitable identity, find each of the following products:

$(x + 3)\,(x + 3)$

Answer

Given $(x + 3)(x + 3) = (x + 3)^2$

We know that

$(a+ b)^2 = a^2 + b^2 + 2a\times b$

$\Rightarrow (x + 3)(x + 3) = (x^2 + 3^2 + 2x\times 3)$

$\Rightarrow (x + 3)(x + 3) = x^2 + 9 + 6x$

2 B. Question

Using a suitable identity, find each of the following products:

$(2m + 3)(2m + 3)$

Answer

Given $(2m + 3)(2m + 3) = (2m + 3)^2$

We know that

$(a+ b)^2 = a^2 + b^2 + 2a\times b$

$\Rightarrow (2m + 3)(2m + 3) = ((2m)^2 + 3^2 + 2\times 2m\times 3)$

$\Rightarrow (2m + 3)(2m + 3)= 4m^2 + 9 + 12m$

2 C. Question

Using a suitable identity, find each of the following products:

$(2x - 5)(2x - 5)$

Answer

Given $(2x - 5)(2x - 5) = (2x - 5)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

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

$\Rightarrow (2x - 5)(2x - 5) = 4x^2 + 25 - 20x$

2 D. Question

Using a suitable identity, find each of the following products:

$$\left(a-\frac{1}{a}\right)\left(a-\frac{1}{a}\right)$$

Answer

Given $\left(a-\frac{1}{a}\right)\left(a-\frac{1}{a}\right)=(a-\frac{1}{a})^2$

We know that

$(a-b)^2 = a^2 + b^2 - 2a\times b$

$$\Rightarrow \left(a-\frac{1}{a}\right)\left(a-\frac{1}{a}\right) = \left(a^2 + \left(\frac{1}{a}\right)^2 - 2\times a\times\frac{1}{a}\right)$$

$$\Rightarrow \left(a-\frac{1}{a}\right)\left(a-\frac{1}{a}\right) = a^2 + \frac{1}{a^2} - 2$$

2 E. Question

Using a suitable identity, find each of the following products:

(3x + 2) (3x – 2)

Answer

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (3x + 2)(3x - 2) = (3x)^2 - (2^2)$

$\Rightarrow (3x + 2)(3x - 2) = (9x^2 - 4)$

2 F. Question

Using a suitable identity, find each of the following products:

(5a – 3b) (5a – 3b)

Answer

Given $(5a - 3b)(5a - 3b) = (5a - 3b)^2$

We know that

$(a-b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (5a - 3b)(5a - 3b) = ((5a)^2 + (3b)^2 - 2\times5a\times3b)$

$\Rightarrow (5a - 3b)(5a - 3b) = 25a^2 + 9b^2 - 30ab$

2 G. Question

Using a suitable identity, find each of the following products:

(2l – 3m) (2l + 3m)

Answer

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (2l - 3m)(2l + 3m) = (2l)^2 - (3m)^2$

$\Rightarrow (2l - 3m)(2l + 3m) = 4l^2 - 9m^2$

2 H. Question

Using a suitable identity, find each of the following products:

$$\left(\frac{3}{4}-x\right)\left(\frac{3}{4}+x\right)$$

Answer

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$$\therefore \left(\frac{3}{4} - x\right)\left(\frac{3}{4} + x\right) = \left(\frac{3}{4}\right)^2 - x^2$$

$$\Rightarrow \left(\frac{3}{4} - x\right)\left(\frac{3}{4} + x\right) = \frac{9}{16} - x^2$$

2 I. Question

Using a suitable identity, find each of the following products:

$$\left(\frac{1}{x}+\frac{1}{y}\right)\left(\frac{1}{x}-\frac{1}{y}\right)$$

Answer

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$$\therefore \left(\frac{1}{x} + \frac{1}{y}\right)\left(\frac{1}{x} - \frac{1}{y}\right) = \left(\frac{1}{x}\right)^2 - \left(\frac{1}{y}\right)^2$$

$$\Rightarrow \left(\frac{1}{x} + \frac{1}{y}\right)\left(\frac{1}{x} - \frac{1}{y}\right) = \frac{1}{x^2} - \frac{1}{y^2}$$

2 J. Question

Using a suitable identity, find each of the following products:

(100 + 3) (100 – 3)

Answer

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (100 + 3)\ (100 - 3) = (100)^2 - (3)^2$

$\Rightarrow (100 + 3)\ (100 - 3) = 10000 - 9 = 9991$

3 A. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

(x + 4)(x + 7)

Answer

Given $(x + 4)(x + 7)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(x + 4)(x + 7) = x^2 + (4 + 7)x + 4\times 7$

$\Rightarrow (x + 4)(x + 7) = x^2 + 11x + 28$

3 B. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

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

Answer

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

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(5x + 3)(5x + 4)= (5x)^2 + (3 + 4)5x + 3\times4$

$\Rightarrow (5x + 3)(5x + 4)= 25x^2 + 35x + 12$

3 C. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

$(7x + 3y)\ (7x - 3y)$

Answer

Given $(7x + 3y)\ (7x - 3y)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(7x + 3y)\ (7x - 3y)= (7x)^2 + (3y - 3y)7x + 3y\times3y$

$\Rightarrow (7x + 3y)\ (7x - 3y) = 49x^2 - 9y^2$

3 D. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

$(8x - 5)\ (8x - 2)$

Answer

Given $(8x - 5)\ (8x - 2)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(8x - 5)\ (8x - 2) = (8x)^2 + (- 5 - 2)8x + (- 5)\times(- 2)$

$\Rightarrow (8x - 5)\ (8x - 2) = 64x^2 - 56x + 10$

3 E. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

$(2m + 3n)\ (2m + 4n)$

Answer

Given $(2m + 3n)\ (2m + 4n)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(2m + 3n)\ (2m + 4n) = (2m)^2 + (3n + 4n)(2m) + 3n \times 4n$

$\Rightarrow (2m + 3n)\ (2m + 4n) = 4m^2 + 14mn + 12n^2$

3 F. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

$(xy - 3)\ (xy - 2)$

Answer

Given $(xy - 3)\ (xy - 2)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(xy - 3)\ (xy - 2) = (xy)^2 + (-3 - 2)xy + (-3) \times (-2)$

$\Rightarrow (xy - 3)\ (xy - 2) = x^2y^2 - 5xy + 6$

3 G. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

$$\left(a + \frac{1}{x}\right)\left(a + \frac{1}{y}\right)$$

Answer

Given $(a + \frac{1}{x})(a + \frac{1}{y})$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$$(a + \frac{1}{x})(a + \frac{1}{y}) = a^2 + (\frac{1}{x} + \frac{1}{y})a + \frac{1}{x} \times \frac{1}{y}$$

$$\Rightarrow \left(a + \frac{1}{x}\right)\left(a + \frac{1}{y}\right) = a^2 + \left(\frac{x + y}{xy}\right)a + \frac{1}{xy}$$

3 H. Question

Using the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$, find out the following products:

$(2 + x)\ (2 - y)$

Answer

Given $(2 + x)\ (2 - y)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

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

$\Rightarrow (2 + x)\ (2 - y) = 4 + 2(x - y) - xy$

4 A. Question

Find out the following squares by using the identities:

$(p - q)^2$

Answer

Given $(p - q)^2$

We know that

$(a - b)^2 = a^2 + b^2 - 2a \times b$

$\Rightarrow (p - q)^2 = ((p)^2 + (q)^2 - 2 \times p \times q)$

$\Rightarrow (p - q)^2 = p^2 + q^2 - 2pq$

4 B. Question

Find out the following squares by using the identities:

$(a - 5)^2$

Answer

Given $(a - 5)^2$

We know that

$(a - b)^2 = a^2 + b^2 - 2a \times b$

$\Rightarrow (a - 5)^2 = ((a)^2 + (5)^2 - 2 \times a \times 5)$

$\Rightarrow (a - 5)^2 = a^2 + 25 - 10a$

4 C. Question

Find out the following squares by using the identities:

$(3x + 5)^2$

Answer

Given $(3x + 5)^2$

We know that

$(a + b)^2 = a^2 + b^2 + 2a \times b$

$\Rightarrow (3x + 5)^2 = ((3x)^2 + (5)^2 + 2\times3x\times5)$

$\Rightarrow (3x + 5)^2 = 9x^2 + 25 + 30x$

4 D. Question

Find out the following squares by using the identities:

$(5x - 4)^2$

Answer

Given $(5x - 4)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (5x - 4)^2 = ((5x)^2 + (4)^2 - 2\times5x\times4)$

$\Rightarrow (5x - 4)^2 = 25x^2 + 16 - 40x$

4 E. Question

Find out the following squares by using the identities:

$(7x + 3y)^2$

Answer

Given $(7x + 3y)^2$

We know that

$(a+ b)^2 = a^2 + b^2 + 2a\times b$

$\Rightarrow (7x + 3y)^2 = ((7x)^2 + (3y)^2 + 2\times7x\times3y)$

$\Rightarrow (7x + 3y)^2 = 49x^2 + 9y^2 + 42xy$

4 F. Question

Find out the following squares by using the identities:

$(10m - 9n)^2$

Answer

Given $(10m - 9n)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (10m - 9n)^2 = ((10m)^2 + (9n)^2 - 2\times10m\times9n)$

$\Rightarrow (10m - 9n)^2 = 100m^2 + 81n^2 - 180mn$

4 G. Question

Find out the following squares by using the identities:

$(0.4a - 0.5b)^2$

Answer

Given $(0.4a - 0.5b)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (0.4a - 0.5b)^2 = ((0.4a)^2 + (0.5b)^2 - 2\times0.4a\times0.5b)$

$\Rightarrow (0.4a - 0.5b)^2 = 0.16a^2 + 0.25b^2 - 0.4ab$

4 H. Question

Find out the following squares by using the identities:

$$\left(x-\frac{1}{x}\right)^2$$

Answer

Given $(x-\frac{1}{x})^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$$\Rightarrow (x-\frac{1}{x})^2 = ((x)^2 + (\frac{1}{x})^2 - 2\times x\times\frac{1}{x})$$

$$\Rightarrow (x-\frac{1}{x})^2 = x^2 + \frac{1}{x^2} - 2$$

4 I. Question

Find out the following squares by using the identities:

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

Answer

Given $(\frac{x}{2}-\frac{y}{3})^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$$\Rightarrow \left(\frac{x}{2}-\frac{y}{3}\right)^2 = \left(\frac{x}{2}\right)^2 + \left(\frac{y}{3}\right)^2 - 2\times\frac{x}{2}\times\frac{y}{3}$$

$$\Rightarrow \left(\frac{x}{2}-\frac{y}{3}\right)^2 = \frac{x^2}{4} + \frac{y^2}{9} - \frac{xy}{3}$$

4 J. Question

Find out the following squares by using the identities:

$0.54 \times 0.54 - 0.46 \times 0.46$

Answer

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (0.54 \times 0.54 - 0.46 \times 0.46) = (0.54)^2 - (0.46)^2$

$\Rightarrow 0.54 \times 0.54 - 0.46 \times 0.46 = (0.54 - 0.46)\ (0.56 + 0.46)$

$\Rightarrow 0.54 \times 0.54 - 0.46 \times 0.46 = 0.08 \times 1.02$

$\Rightarrow 0.54 \times 0.54 - 0.46 \times 0.46 = 0.0816$

5 A. Question

Evaluate the following by using the identities:

103^2

Answer

$\because 103^2 = (100 + 3)^2$

We know that

$(a+ b)^2 = a^2 + b^2 + 2a \times b$

$\Rightarrow (100 + 3)^2 = ((100)^2 + (3)^2 + 2 \times 100 \times 3)$

$\Rightarrow (100 + 3)^2 = 10000 + 9 + 600$

$\Rightarrow 103^2 = 10609$

5 B. Question

Evaluate the following by using the identities:

48^2

Answer

$\because 48^2 = (50 - 2)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a \times b$

$\Rightarrow (50 - 2)^2 = ((50)^2 + (2)^2 - 2\times50\times2)$

$\Rightarrow (50 - 2)^2 = 2500 + 4 - 200$

$\Rightarrow 48^2 = 2304$

5 C. Question

Evaluate the following by using the identities:

54^2

Answer

$\because 54^2 = (50 + 4)^2$

We know that

$(a+ b)^2 = a^2 + b^2 + 2a\times b$

$\Rightarrow (50 + 4)^2 = ((50)^2 + (4)^2 + 2\times50\times4)$

$\Rightarrow (50 + 4)^2 = 2500 + 16 + 400$

$\Rightarrow 54^2 = 2916$

5 D. Question

Evaluate the following by using the identities:

92^2

Answer

$\because 92^2 = (100 - 8)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (100 - 8)^2= ((100)^2 + (8)^2 - 2\times100\times8)$

$\Rightarrow (100 - 8)^2 = 10000 + 64 - 1600$

$\Rightarrow 92^2 = 8464$

5 E. Question

Evaluate the following by using the identities:

998^2

Answer

$\because 998^2 = (1000 - 2)^2$

We know that

$(a- b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (1000 - 2)^2 = ((1000)^2 + (2)^2 - 2\times1000\times2)$

$\Rightarrow (1000 - 2)^2 = 1000000 + 4 - 4000$

$\Rightarrow 998^2 = 996004$

5 F. Question

Evaluate the following by using the identities:

53 × 47

Answer

$\because$ 53 × 47 = (50 + 3) (50 – 3)

We know that

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (50 + 3) (50 - 3) = (50)^2 - (3)^2$

$\Rightarrow (50 + 3) (50 - 3) = 2500 - 9 = 2491$

5 G. Question

Evaluate the following by using the identities:

96 × 104

Answer

$\because$ 96 × 104= (100 – 4) (100 + 4)

We know that

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (100 - 4) (100 + 4) = (100)^2 - (4)^2$

$\Rightarrow (100 - 4) (100 + 4)= 10000 - 16 = 9984$

5 H. Question

Evaluate the following by using the identities:

28 × 32

Answer: 896

Answer

$\because$ 28 × 32= (30 – 2) (30 + 2)

We know that

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (30 - 2)(30 + 2) = (30)^2 - (2)^2$

$\Rightarrow (30 - 2)(30 + 2) = 900 - 4 = 896$

5 I. Question

Evaluate the following by using the identities:

81×79

Answer

$\because 81 \times 79 = (80 + 1)(80 - 1)$

We know that

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore (80 + 1)(80 - 1) = (80)^2 - (1)^2$

$\Rightarrow (80 + 1)(80 - 1) = 6400 - 1 = 6399$

5 J. Question

Evaluate the following by using the identities:

2.8^2

Answer

$\because 2.8^2 = (3 - 0.2)^2$

We know that

$(a - b)^2 = a^2 + b^2 - 2a \times b$

$\Rightarrow (3 - 0.2)^2 = ((3)^2 + (0.2)^2 - 2 \times 3 \times 0.2)$

$\Rightarrow (3 - 0.2)^2 = 9 + 0.04 - 1.2$

$\Rightarrow 2.8^2 = 7.84$

5 K. Question

Evaluate the following by using the identities:

$12.1^2 - 7.9^2$

Answer

We know that

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\therefore 12.1^2 - 7.9^2 = (12.1 + 7.9)(12.1 - 7.9)$

$\Rightarrow 12.1^2 - 7.9^2 = 20 \times 4.2 = 84$

5 L. Question

Evaluate the following by using the identities:

9.7×9.8

Answer

Given $9.7 \times 9.8 = (9 + 0.7)(9 + 0.8)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(9 + 0.7)(9 + 0.8) = (9)^2 + (0.7 + 0.8)9 + (0.7)\times(0.8)$

$\Rightarrow 9.7 \times 9.8 = 81 + 13.5 + 0.56$

$\Rightarrow 9.7 \times 9.8 = 95.06$

6 A. Question

Show that

$(3x + 7)^2 - 84x = (3x - 7)^2$

Answer

Solving L.H.S. first,

$(3x + 7)^2 - 84x$

We know that

$(a+ b)^2 = a^2 + b^2 + 2a\times b$

$\Rightarrow (3x + 7)^2 - 84x = ((3x)^2 + (7)^2 + 2\times3x\times7) - 84x$

$\Rightarrow (3x + 7)^2 - 84x = 9x^2 + 49 + 42x - 84x$

$\Rightarrow (3x + 7)^2 - 84x = 9x^2 + 49 - 42x$

$\Rightarrow (3x + 7)^2 - 84x = ((3x)^2 + (7)^2 - 2\times3x\times7)$

Using $(a- b)^2 = a^2 + b^2 - 2a\times b$

$\Rightarrow (3x + 7)^2 - 84x = (3x - 7)^2$

$\because$ L.H.S. = R.H.S.

Hence, proved.

6 B. Question

Show that

$(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Answer

To Prove: $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$**Proof:**Solving L.H.S. first,

$(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$

We know that

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\Rightarrow (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = (a^2 - b^2) + (b^2 - c^2) + (c^2 - a^2)$

$\Rightarrow (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

$\because$ L.H.S. = R.H.S.

Hence, proved.

7. Question

If $a + b = 5$ and $a - b = 4$, find $a^2 + b^2$ and ab.

Answer

Given: $a + b = 5$ and $a + b = 5$

Using $(a- b)^2 = a^2 + b^2 - 2a\times b$ and $(a+ b)^2 = a^2 + b^2 + 2a\times b$

$$a^2 + b^2 = \frac{1}{2}[(a + b)^2 + (a - b)^2]$$

$$\Rightarrow a^2 + b^2 = \frac{1}{2}[(5)^2 + (4)^2]$$

$$\Rightarrow a^2 + b^2 = \frac{1}{2}(25 + 16)$$

$$\Rightarrow a^2 + b^2 = \frac{41}{2}$$

Similarly, $ab = \frac{1}{4}[(a + b)^2 - (a - b)^2]$

$$\Rightarrow ab = \frac{1}{4}[(5)^2 - (4)^2]$$

$$\Rightarrow ab = \frac{1}{4}(25 - 16)$$

$$\Rightarrow ab = \frac{9}{4}$$

8. Question

i. If the values of $a + b$ and ab are 12 and 32 respectively, find the values of $a^2 + b^2$ and $(a - b)^2$.

ii. If the values of $(a - b)$ and ab are 6 and 40 respectively, find the values of $a^2 + b^2$ and $(a + b)^2$.

Answer

(i) Given (a + b) = 12 and ab = 32

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

$\Rightarrow a^2 + b^2 = (12)^2 - 2(32)$

$\Rightarrow a^2 + b^2 = 144 - 64$

$\Rightarrow a^2 + b^2 = 80$

$(a- b)^2 = (a+ b)^2 - 4ab$

$\Rightarrow (a- b)^2 = (12)^2 - 4(32)$

$\Rightarrow (a- b)^2 = 144 - 128$

$\Rightarrow (a- b)^2 = 16$

(ii) Given (a – b) = 6 and ab = 40

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

$\Rightarrow a^2 + b^2 = (6)^2 + 2(40)$

$\Rightarrow a^2 + b^2 = 36 + 80$

$\Rightarrow a^2 + b^2 = 116$

$(a+ b)^2 = (a- b)^2 + 4ab$

$\Rightarrow (a+ b)^2 = (6)^2 + 4(40)$

$\Rightarrow (a+ b)^2 = 36 + 160$

$\Rightarrow (a+ b)^2 = 196$

9. Question

If $(x + a) (x + b) = x^2 - 5x - 300$, find the values of $a^2 + b^2$.

Answer

Given: $(x + a) (x + b) = x^2 - 5x - 300$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$\Rightarrow x^2 + (a + b)x + ab = x^2 - 5x - 300$

$\Rightarrow (a + b) = - 5$ and $ab = - 300$

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

$\Rightarrow a^2 + b^2 = (- 5)^2 - 2(- 300)$

$\Rightarrow a^2 + b^2 = 25 + 600$

$\Rightarrow a^2 + b^2 = 625$

10. Question

Deduce the Algebraic identity for (x + a) (x + b) (x + c) by using the product formula.
[Hint: (x + a) (x + b)(x + c) = (x + a) [(x + b)(x + c)]]

Answer

Given (x + a)(x + b)(x + c) = (x + a)[(x + b)(x + c)]

$\Rightarrow$ (x + a)(x + b)(x + c) = (x + a)[x (x + c) + b(x + c)]

$\Rightarrow$ (x + a)(x + b)(x + c) = (x + a)[x^2 + cx + bx + bc]

$\Rightarrow$ (x + a)(x + b)(x + c) = (x + a)[x^2 + x(c + b) + bc]

$\Rightarrow$ (x + a)(x + b)(x + c) = x[x^2 + x(c + b) + bc] + a[x^2 + x(c + b) + bc]

$\Rightarrow$ (x + a)(x + b)(x + c) = x^3 + x^2(c + b) + xbc + ax^2 + xa(c + b) + abc

$\Rightarrow$ (x + a)(x + b)(x + c) = x^3 + x^2(a + b + c) + x(ab + bc + ca) + abc

Exercise 1.4

1 A. Question

Choose the correct answer for the following:

The factors of 3a + 21ab are _____

A. ab, (3 + 21)

B. 3,(a + 7b)

C. 3a, (1 + 7b)

D. 3ab, (a + b)

Answer

Given 3a + 21ab can be written as 3× a× (1 + 7b)

1 B. Question

Choose the correct answer for the following:

The factors of x^2 – x – 12 are _____

A. (x + 4), (x – 3)

B. (x – 4), (x – 3)

C. (x + 2), (x – 6)

D. (x + 3), (x – 4)

Answer

Given x^2 – x – 12

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 - x - 12 = x^2 + (-4 + 3)x + (-4)\times 3$

On comparing with (I),

$a = -4$ and $b = 3$

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

The factors of $x^2 - x - 12$ are $(x - 4)$ and $(x + 3)$

1 C. Question

Choose the correct answer for the following:

The factors of $6x^2 - x - 15$ are$(2x + 3)$ and _____

A. $(3x - 5)$

B. $(3x + 5)$

C. $(5x - 3)$

D. $(2x - 3)$

Answer

Given $6x^2 - x - 15$

$\Rightarrow 6x^2 - x - 15 = 6x^2 - (10 - 9)x - 15$

$\Rightarrow 6x^2 - x - 15 = 6x^2 - 10x + 9x - 15$

$\Rightarrow 6x^2 - x - 15 = 2x(3x - 5) + 3(3x - 5)$

$\Rightarrow 6x^2 - x - 15 = (3x - 5)(2x + 3)$

The factors of $6x^2 - x - 15$ are$(2x + 3)$ and $(3x - 5)$

1 D. Question

Choose the correct answer for the following:

The factors of $169l^2 - 441m^2$ are _____

A. $(13l - 21\ m), (13l - 21m)$

B. $(13l + 21\ m), (13l + 21m)$

C. $(13l - 21\ m), (13l + 21m)$

D. $13(l + 21\ m), 13(l - 21m)$

Answer

Given $169l^2 - 441m^2$

$\because (a^2 - b^2) = (a - b) \times (a + b)$

$\Rightarrow 169l^2 - 441m^2 = (13l)^2 - (21m)^2$

$\Rightarrow 169l^2 - 441m^2 = (13l - 21m)(13l + 21m)$

The factors of $169l^2 - 441m^2$ are $(13l - 21m)$ and $(13l + 21m)$.

1 E. Question

Choose the correct answer for the following:

The product of $(x - 1)(2x - 3)$ is ___

A. $2x^2 - 5x - 3$

B. $2x^2 - 5x + 3$

C. $2x^2 + 5x - 3$

D. $2x^2 + 5x + 3$

Answer

Given $(x - 1)(2x - 3)$

$\Rightarrow (x - 1)(2x - 3) = x(2x - 3) + (-1)(2x - 3)$

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

$\Rightarrow (x - 1)(2x - 3) = 2x^2 - 5x + 3$

2 A. Question

Factorize the following expressions :

$3x - 45$

Answer

Given $3x - 45 = (3x - 3 \times 15)$

Taking 3 common,

$\Rightarrow 3x - 45 = 3(x - 15)$

2 B. Question

Factorize the following expressions :

$7x - 14y$

Answer

Given $7x - 14y = (7x - 7 \times 2)$

Taking 7 common,

$\Rightarrow 7x - 14y = 7(x - 2)$

2 C. Question

Factorize the following expressions :

$5a^2 + 35a$

Answer

Given $5a^2 + 35a = (5a^2 + 5a \times 7)$

Taking 5a common,

$\Rightarrow 5a^2 + 35a = 5a(a + 7)$

2 D. Question

Factorize the following expressions :

$-12y + 20y^3$

Answer

Given $-12y + 20y^3 = (4y \times (-3) + 4y \times 5y^2)$

Taking 4y common,

$\Rightarrow -12y + 20y^3 = 4y(-3 + 5y^2)$

2 E. Question

Factorize the following expressions :

$15a^2b + 35ab$

Answer

Given $15a^2b + 35ab = (5ab \times 3a + 5ab \times 7)$

Taking 5ab common,

$\Rightarrow 15a^2b + 35ab = 5ab(3a + 7)$

2 F. Question

Factorize the following expressions :

$pq - prq$

Answer

Given $(pq - prq) = (pq \times 1 - pq \times r)$

Taking pq common,

$(pq - prq) = pq(1 - r)$

2 G. Question

Factorize the following expressions :

$18m^3 - 45mn^2$

Answer

Given $18m^3 - 45mn^2 = (9m \times 2m^2 - 9m \times 5n^2)$

Taking 9m common,

$18m^3 - 45mn^2 = 9m \times (2m^2 - 5n^2)$

2 H. Question

Factorize the following expressions :

$17\,l^2 + 85m^2$

Answer

Given $17\,l^2 + 85m^2 = (17 \times l^2 + 17 \times 5m^2)$

Taking 17 common,

$17\,l^2 + 85m^2 = 17 \times (l^2 + 5m^2)$

2 I. Question

Factorize the following expressions :

$6x^3y - 12x^2y + 15x^4$

Answer

Given $6x^3y - 12x^2y + 15x^4 = (3x^2 \times 2xy - 3x^2 \times 4y + 3x^2 \times 5x^2)$

Taking $3x^2$ common,

$6x^3y - 12x^2y + 15x^4 = 3x^2\,(2xy - 4y + 5x^2)$

2 J. Question

Factorize the following expressions :

$2a^5b^3 - 14a^2b^2 + 4a^3b$

Answer

Given $2a^5b^3 - 14a^2b^2 + 4a^3b = (2a^2b \times a^3b^2 - 2a^2b \times 7b + 2a^2b \times 2a)$

Taking $2a^2b$ common,

$2a^5b^3 - 14a^2b^2 + 4a^3b = 2a^2b\,(a^3b^2 - 7b + 2a)$

3 A. Question

Factorize:

$2ab + 2b + 3a$

Answer

Given $2ab + 2b + 3a = (a \times 2b + 2b + 3a)$

Taking 2b common from 1^{st} and 2^{nd} term,

$2ab + 2b + 3a = 2b\,(a + 1) + 3a$

3 B. Question

Factorize:

$6xy - 4y + 6 - 9x$

Answer

Given $6xy - 4y + 6 - 9x = (2y \times 3x - 2y \times 2 + 3 \times 2 - 3 \times 3x)$

Taking 2y common from 1^{st} and 2^{nd} term and – 3 from 3^{rd} and 4^{th},

$6xy - 4y + 6 - 9x = 2y(3x - 2) + (-3)(3x - 2)$

$\Rightarrow 6xy - 4y + 6 - 9x = (3x - 2)\,(2y - 3)$

3 C. Question

Factorize:

$2x + 3xy + 2y + 3y^2$

Answer

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

Taking x common from 1^{st} and 2^{nd} term and y from 3^{rd} and 4^{th},

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

$\Rightarrow 2x + 3xy + 2y + 3y^2 = (x + y)\,(2 + 3y)$

3 D. Question

Factorize:

$15b^2 - 3bx2 - 5b + x^2$

Answer

Given $15b^2 - 3bx2 - 5b + x^2 = (3b \times 5b - 3b \times x^2 + (-1) \times 5b + x^2)$

Taking 3b common from 1^{st} and 2^{nd} term and (– 1) from 3^{rd} and 4^{th},

$15b^2 - 3bx2 - 5b + x^2 = 3b(5b - x^2) + (-1)(5b - x^2)$

$\Rightarrow 15b^2 - 3bx2 - 5b + x^2 = (5b - x^2)\,(3b - 1)$

3 E. Question

Factorize:

$a^2x^2 + axy + abx + by$

Answer

Given $a^2x^2 + axy + abx + by = (ax \times ax + ax \times y + b \times ax + b \times y)$

Taking ax common from 1^{st} and 2^{nd} term and b from 3^{rd} and 4^{th},

$a^2x^2 + axy + abx + by = ax (ax + y) + b (ax + y)$

$\Rightarrow a^2x^2 + axy + abx + by = (ax + y) (ax + b)$

3 F. Question

Factorize:

$a^2x + abx + ac + aby + b^2y + bc$

Answer

Given $a^2x + abx + ac + aby + b^2y + bc = (ax \times a + ax \times b + by \times a + by \times b + c \times a + c \times b)$

Taking ax common from 1^{st} and 2^{nd} term and by from 3^{rd} and 4^{th} and c from 5^{th} and 6^{th},

$a^2x + abx + ac + aby + b^2y + bc = ax (a + b) + by (a + b) + c (a + b)$

$\Rightarrow a^2x + abx + ac + aby + b^2y + bc = (ax + by + c) (a + b)$

3 G. Question

Factorize:

$ax^3 - bx^2 + ax - b$

Answer

Given $ax^3 - bx^2 + ax - b = (x^2 \times ax - x^2 \times b + ax - b)$

Taking x^2 common from 1^{st} and 2^{nd} term and 1 from 3^{rd} and 4^{th},

$ax^3 - bx^2 + ax - b = (x^2 \times ax - x^2 \times b + ax - b)$

$\Rightarrow ax^3 - bx^2 + ax - b = x^2 (ax - b) + (ax - b)$

$\Rightarrow ax^3 - bx^2 + ax - b = (x^2 + 1)(ax - b)$

3 H. Question

Factorize:

$mx - my - nx + ny$

Answer

Given $mx - my - nx + ny =(m \times x - m \times y + (- n) \times x + n \times y)$

Taking m common from 1^{st} and 2^{nd} term and (– n) from 3^{rd} and 4^{th},

$\Rightarrow mx - my - nx + ny = m\,(x - y) + (-n)(x - y)$

$\Rightarrow mx - my - nx + ny = (m - n)(x - y)$

3 I. Question

Factorize:

$2m^3 + 3m - 2m^2 - 3$

Answer

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

Taking m common from 1^{st} and 2^{nd} term and (-1) from 3^{rd} and 4^{th},

$\Rightarrow 2m^3 + 3m - 2m^2 - 3 = m\,(2m^2 + 3) + (-1)(2m^2 + 3)$

$\Rightarrow 2m^3 + 3m - 2m^2 - 3 = (2m^2 + 3)(m - 1)$

3 J. Question

Factorize:

$a^2 + 11b + 11ab + a$

Answer

Given $a^2 + 11b + 11ab + a = (a \times a + a \times 1 + (11b) \times 1 + (11b) \times a)$

Taking a common from 1^{st} and 2^{nd} term and $(11b)$ from 3^{rd} and 4^{th},

$\Rightarrow a^2 + 11b + 11ab + a = a\,(a + 1) + (11b)(1 + a)$

$\Rightarrow a^2 + 11b + 11ab + a = (a + 1)(a + 11b)$

4 A. Question

Factorize :

$a^2 + 14a + 49$

Answer

Given $a^2 + 14a + 49 = a^2 + 2 \times 7 \times a + (7)^2$

Comparing with $(a + b)^2 = a^2 + b^2 + 2a \times b$

$a = a$ and $b = 7$

So, $a^2 + 14a + 49 = (a + 7)(a + 7)$

4 B. Question

Factorize :

$x^2 - 12x + 36$

Answer

Given $x^2 - 12x + 36 = x^2 - 2\times 6\times x + (6)^2$

Comparing with $(a - b)^2 = a^2 + b^2 - 2a\times b$

$a = x$ and $b = 6$

So, $x^2 - 12x + 36 = (x - 6)(x - 6)$

4 C. Question

Factorize :

$4p^2 - 25q^2$

Answer

Given $4p^2 - 25q^2 = (2p)^2 - (5q)^2$

Comparing with $a^2 - b^2 = (a + b)(a - b)$

$a = 2p$ and $b = 5q$

So, $4p^2 - 25q^2 = (2p + 5q)(2p - 5q)$

4 D. Question

Factorize :

$25x^2 - 20xy + 4y^2$

Answer

Given $25x^2 - 20xy + 4y^2 = (5x)^2 - 2\times 5x \times 2y\ x + (2y)^2$

Comparing with $(a - b)^2 = a^2 + b^2 - 2a\times b$

$a = 5x$ and $b = 2y$

So, $25x^2 - 20xy + 4y^2 = (5x - 2y)(5x - 2y)$

4 E. Question

Factorize :

$169m^2 - 625n^2$

Answer

Given $169m^2 - 625n^2 = (13m)^2 - (25n)^2$

Comparing with $a^2 - b^2 = (a + b)(a - b)$

$a = 13m$ and $b = 25n$

So, $169m^2 - 625n^2 = (13m + 25n)(13m - 25m)$

4 F. Question

Factorize :

$$x^2 + \frac{2}{3}x + \frac{1}{9}$$

Answer

Given $x^2 + \frac{2}{3}x + \frac{1}{9} = x^2 + 2 \times \frac{1}{3} \times x + (\frac{1}{3})^2$

Comparing with $(a+ b)^2 = a^2 + b^2 + 2a \times b$

a =x and $b = \frac{1}{3}$

So, $x^2 + \frac{2}{3}x + \frac{1}{9} = \left(x + \frac{1}{3}\right)(x + \frac{1}{3})$

4 G. Question

Factorize :

$121a^2 + 154ab + 49b^2$

Answer

Given $121a^2 + 154ab + 49b^2 = (11a)^2 + 2 \times (11a) \times (7b) + (7b)^2$

Comparing with $(a+ b)^2 = a^2 + b^2 + 2a \times b$

a = 11a and b = 7b

So, $121a^2 + 154ab + 49b^2 = (11a + 7b)(11a + 7b)$

4 H. Question

Factorize :

$3x^3 - 75x$

Answer

Given $3x^3 - 75x = 3x \times x^2 - 3x \times (5)^2$

Taking 3x common,

$3x^3 - 75x = 3x (x^2 - (5)^2)$

Comparing with $a^2 - b^2 = (a + b) (a - b)$

a = x and b = 5

So, $3x^3 - 75x = 3x(x + 5)(x - 5)$

4 I. Question

Factorize :

$36 - 49x^2$

Answer

Given $36 - 49x^2 = (6)^2 - (7x)^2$

Comparing with $a^2 - b^2 = (a + b)(a - b)$

$a = 6$ and $b = 7x$

So, $36 - 49x^2 = (6 + 7x)(6 - 7x)$

4 J. Question

Factorize :

$1 - 6x + 9x^2$

Answer

Given $1 - 6x + 9x^2 = (1)^2 - 2\times 1 \times 3x + (3x)^2$

Comparing with $(a - b)^2 = a^2 + b^2 - 2a\times b$

$a = 1$ and $b = 3x$

So, $1 - 6x + 9x^2 = (1 - 3x)(1 - 3x)$

5 A. Question

Factorize :

$x^2 + 7x + 12$

Answer

Given $x^2 + 7x + 12$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 + 7x + 12 = x^2 + (4 + 3)x + (4)\times 3$

On comparing with (I),

$a = 4$ and $b = 3$

So, $x^2 + 7x + 12 = (x + 4)(x + 3)$

5 B. Question

Factorize :

$p^2 - 6p + 8$

Answer

Given $p^2 - 6p + 8$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow p^2 - 6p + 8 = p^2 + (-4 - 2)p + (-4)\times(-2)$

On comparing with (I),

$a = -4$ and $b = -2$

So, $p^2 - 6p + 8 = (p - 4)(p - 2)$

5 C. Question

Factorize :

$m^2 - 4m - 21$

Answer

Given $m^2 - 4m - 21$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow m^2 - 4m - 21 = m^2 + (-7 + 3)m + (-7)\times(3)$

On comparing with (I),

$a = -7$ and $b = 3$

So, $m^2 - 4m - 21 = (m - 7)(m + 3)$

5 D. Question

Factorize :

$x^2 - 14x + 45$

Answer

Given $x^2 - 14x + 45$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 - 14x + 45 = x^2 + (-9 - 5)x + (-9)\times(-5)$

On comparing with (I),

$a = -9$ and $b = -5$

So, $x^2 - 14x + 45 = (x - 9)(x - 5)$

5 E. Question

Factorize :

$x^2 - 24x + 108$

Answer

Given $x^2 - 24x + 108$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 - 24x + 108 = x^2 + (- 18 - 6)x + (- 18) \times (- 6)$

On comparing with (I),

$a = - 18$ and $b = - 6$

So, $x^2 - 24x + 108 = (x - 18)(x - 6)$

5 F. Question

Factorize :

$a^2 + 13a + 12$

Answer

Given $a^2 + 13a + 12$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow a^2 + 13a + 12 = a^2 + (12 + 1)a + (12) \times (1)$

On comparing with (I),

$a = 12$ and $b = 1$

So, $a^2 + 13a + 12 = (a + 12)(a + 1)$

5 G. Question

Factorize :

$x^2 - 5x + 6$

Answer

Given $x^2 - 5x + 6$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 - 5x + 6 = x^2 + (- 2 - 3)x + (- 2) \times (- 3)$

On comparing with (I),

$a = - 2$ and $b = - 3$

So, $x^2 - 5x + 6 = (x - 2)(x - 3)$

5 H. Question

Factorize :

$x^2 - 14xy + 24y^2$

Answer

Given $x^2 - 14xy + 24y^2$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 - 14xy + 24y^2 = x^2 + (- 12y - 2y)x + (- 12y)\times(- 2y)$

On comparing with (I),

$a = - 12$ and $b = - 2$

So, $x^2 - 14xy + 24y^2 = (x - 12y)(x - 2y)$

5 I. Question

Factorize :

$m^2 - 21m - 72$

Answer

Given $m^2 - 21m - 72$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow m^2 - 21m - 72 = m^2 + (- 24 + 3)m + (- 24)\times(3)$

On comparing with (I),

$a = - 24$ and $b = 3$

So, $m^2 - 21m - 72 = (m - 24)(m + 3)$

5 J. Question

Factorize :

$x^2 - 28x + 132$

Answer

Given $x^2 - 28x + 132$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ … (I)

$\Rightarrow x^2 - 28x + 132= x^2 + (- 22 - 6)x + (- 22)\times(- 6)$

On comparing with (I),

$a = - 22$ and $b = - 6$

So, $x^2 - 28x + 132 = (x - 22)(x - 6)$

Exercise 1.5

1 A. Question

Simplify:

$16x^4 \div 32x$

Answer

$$= \frac{16x^4}{32x}$$

$$= \frac{2 \times 2 \times 2 \times 2 \times x \times x \times x \times x}{2 \times 2 \times 2 \times 2 \times 2 \times x}$$

$$= \frac{x \times x \times x}{2}$$

$$= \frac{x^3}{2}$$

1 B. Question

Simplify:

$-42y^3 \div 7y^2$

Answer

$$= \frac{-42y^3}{7y^2}$$

$$= -\frac{2 \times 3 \times 7 \times y \times y \times y}{7 \times y \times y}$$

$$= -\frac{2 \times 3 \times y}{1}$$

$= -6y$

1 C. Question

Simplify:

$30a^3b^3c^3 \div 45abc$

Answer

$$= \frac{30a^3b^3c^3}{45abc}$$

$$= \frac{2 \times 3 \times 5 \times a \times a \times a \times b \times b \times b \times c \times c \times c}{3 \times 3 \times 5 \times a \times b \times c}$$

$$= \frac{2 \times a \times a \times b \times b \times c \times c}{3}$$

$$= \frac{2}{3}a^2b^2c^2$$

1 D. Question

Simplify:

$(7m^2 - 6m) \div m$

Answer

$$= \frac{7m^2 - 6m}{m}$$

$$= \frac{7m^2}{m} - \frac{6m}{m}$$

$$= \frac{7 \times m \times m}{m} - \frac{6 \times m}{m}$$

$$= \frac{7 \times m}{1} - \frac{6}{1}$$

$= 7m - 6$

1 E. Question

Simplify:

$25x^3y^2 \div 15x^2y$

Answer

$$= \frac{25x^3y^2}{15x^2y}$$

$$= \frac{5 \times 5 \times x \times x \times x \times y \times y}{3 \times 5 \times x \times x \times y}$$

$$= \frac{5 \times x \times y}{3}$$

$$= \frac{5}{3}xy$$

1 F. Question

Simplify:

$(-72l^4 m^5 n^8) \div (-8l^2 m^2 n^3)$

Answer

$$= \frac{-72l^4m^5n^8}{-8l^2m^2n^3}$$

$$= \frac{-2 \times 2 \times 2 \times 3 \times 3 \times l \times l \times l \times l \times m \times m \times m \times m \times m \times n \times n \times n \times n \times n \times n \times n \times n}{-2 \times 2 \times 2 \times l \times l \times m \times m \times n \times n \times n}$$

$$= \frac{3 \times 3 \times l \times l \times m \times m \times m \times n \times n \times n \times n \times n}{1}$$

$= 9l^2m^3n^5$

2 A. Question

Work out the following divisions:

$5y^3 - 4y^2 + 3y \div y$

Answer

$$= \frac{5y^3 - 4y^2 + 3y}{y}$$

$$= \frac{5y^3}{y} - \frac{4y^2}{y} + \frac{3y}{y}$$

$$= \frac{5 \times y \times y \times y}{y} - \frac{4 \times y \times y}{y} + \frac{3 \times y}{y}$$

$$= \frac{5 \times y \times y}{1} - \frac{4 \times y}{1} + \frac{3}{1}$$

$= 5y^2 - 4y + 3$

2 B. Question

Work out the following divisions:

$(9x^5 - 15x^4 - 21\,x^2) \div (3x^2)$

Answer

$$= \frac{9x^5 - 15x^4 - 21\,x^2}{3x^2}$$

$$= \frac{9x^5}{3x^2} - \frac{15x^4}{3x^2} - \frac{21\,x^2}{3x^2}$$

$$= \frac{3 \times 3 \times x \times x \times x \times x \times x \times x}{3 \times x \times x} - \frac{3 \times 5 \times x \times x \times x \times x \times x}{3 \times x \times x} - \frac{3 \times 7 \times x \times x}{3 \times x \times x}$$

$$= \frac{3 \times x \times x \times x \times x}{1} - \frac{5 \times x \times x \times x}{1} - \frac{7}{1}$$

$= 3x^3 - 5x^2 - 7$

2 C. Question

Work out the following divisions:

(5x3 – 4x2 +3x) ÷ (2x)

Answer

$$= \frac{5x^3 - 4x^2 + 3x}{2x}$$

$$= \frac{5x^3}{2x} - \frac{4x^2}{2x} + \frac{3x}{2x}$$

$$= \frac{5 \times x \times x \times x}{2 \times x} - \frac{2 \times 2 \times x \times x}{2 \times x} + \frac{3 \times x}{2 \times x}$$

$$= \frac{5 \times x \times x}{2} - \frac{2 \times x}{1} + \frac{3}{2}$$

$$= \frac{5}{2}x^2 - 2x + \frac{3}{2}$$

2 D. Question

Work out the following divisions:

$4x^2y - 28xy + 4xy^2 \div (4xy)$

Answer

$$= \frac{4x^2y - 28xy + 4xy^2}{4xy}$$

$$= \frac{4x^2y}{4xy} - \frac{28xy}{4xy} + \frac{4xy^2}{4xy}$$

$$= \frac{2 \times 2 \times x \times x \times y}{2 \times 2 \times x \times y} - \frac{2 \times 2 \times 7 \times x \times y}{2 \times 2 \times x \times y} + \frac{2 \times 2 \times x \times y \times y}{2 \times 2 \times x \times y}$$

$$= \frac{x}{1} - \frac{7}{1} + \frac{y}{1}$$

$= x - 7 + y$

2 E. Question

Work out the following divisions:

$(8x^4yz - 4xy^3z + 3x^2yz^4) \div (xyz)$

Answer

$$= \frac{8x^4yz - 4xy^3z + 3x^2yz^4}{xyz}$$

$$= \frac{8x^4yz}{xyz} - \frac{4xy^3z}{xyz} + \frac{3x^2yz^4}{xyz}$$

$$= \frac{2 \times 2 \times 2 \times x \times x \times x \times x \times y \times z}{x \times y \times z} - \frac{2 \times 2 \times x \times y \times y \times y \times z}{x \times y \times z} + \frac{3 \times x \times x \times y \times z \times z \times z \times z}{x \times y \times z}$$

$$= \frac{2 \times 2 \times 2 \times x \times x \times x}{1} - \frac{2 \times 2 \times y \times y}{1} + \frac{3 \times x \times z \times z \times z}{1}$$

$= 8x^3 - 4y^2 + 3xz^3$

3 A. Question

Simplify the following expressions:

$(x^2 + 7x + 10) \div (x + 2)$

Answer

Factorize the numerator,

$x^2 + 7x + 10 = x^2 + 5x + 2x + 10$

$= x(x + 5) + 2(x + 5)$

$= (x + 2)(x + 5)$

Now,

$$\frac{x^2 + 7x + 10}{x + 2}$$

$$= \frac{(x + 2)(x + 5)}{x + 2}$$

$= x + 5$

3 B. Question

Simplify the following expressions:

$(a^2 + 24a + 144) \div (a + 12)$

Answer

Factorize the numerator,

$a^2 + 24a + 144 = a^2 + 12a + 12a + 144$

$= a(a + 12) + 12(a + 12)$

$= (a + 12)(a + 12)$

Now,

$$\frac{a^2 + 24a + 144}{a + 12}$$

$$= \frac{(a + 12)(a + 12)}{a + 12}$$

$= a + 12$

3 C. Question

Simplify the following expressions:

$(m^2 + 5m - 14) \div (m + 7)$

Answer

Factorize the numerator,

$m^2 + 5m - 14 = m^2 + 7m - 2m - 14$

$= m(m + 7) - 2(m + 7)$

$= (m - 2)(m + 7)$

Now,

$$\frac{m^2 + 5m - 14}{m + 7}$$

$$= \frac{(m - 2)(m + 7)}{m + 7}$$

$= m - 2$

3 D. Question

Simplify the following expressions:

$(25m^2 - 4n^2) \div (5m + 2n)$

Answer

Factorize the numerator,

$25m^2 - 4n^2 = (5m)^2 - (2n)^2$

$= (5m + 2n)(5m - 2n)$ [$\because a^2 - b^2 = (a + b)(a - b)$]

Now,

$$\frac{25m^2 - 4n^2}{5m + 2n}$$

$$= \frac{(5m + 2n)(5m - 2n)}{5m + 2n}$$

$= 5m - 2n$

3 E. Question

Simplify the following expressions:

$(4a^2 - 4ab - 15b^2) \div (2a - 5b)$

Answer

Factorize the numerator,

$4a^2 - 4ab - 15b^2 = 4a^2 + 6ab - 10ab - 15b^2$

= 2a(2a + 3b) – 5b(2a + 3b)

= (2a + 3b)(2a – 5b)

Now,

$$\frac{4a^2 - 4ab - 15b^2}{5m + 2n}$$

$$= \frac{(2a + 3b)(2a - 5b)}{(2a - 5b)}$$

= (2a + 3b)

3 F. Question

Simplify the following expressions:

$(a^4 - b^4) \div (a - b)$

Answer

Factorize the numerator,

$a^4 - b^4 = (a^2)^2 - (b^2)^2$

$= (a^2 + b^2)(a^2 - b^2)$ [$\because a^2 - b^2 = (a + b)(a - b)$]

$= (a^2 + b^2)(a + b)(a - b)$ [$\because a^2 - b^2 = (a + b)(a - b)$]

Now,

$$\frac{a^4 - b^4}{a - b}$$

$$= \frac{(a^2 + b^2)(a + b)(a - b)}{a - b}$$

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

Exercise 1.6

1 A. Question

Solve the following equations:

3x + 5 = 23

Answer

Subtracting 5 from both sides,

$\Rightarrow 3x + 5 - 5 = 23 - 5$

$\Rightarrow 3x = 18$

Dividing both sides by 3,

$$\Rightarrow \frac{3x}{3} = \frac{18}{3}$$

$\Rightarrow x = 6$

1 B. Question

Solve the following equations:

17 = 10 - y

Answer

Subtracting 10 from both sides,

$\Rightarrow 17 - 10 = 10 - y - 10$

$\Rightarrow 7 = -y$

Dividing both sides by -1,

$$\Rightarrow \frac{-y}{-1} = \frac{7}{-1}$$

$\Rightarrow y = -7$

1 C. Question

Solve the following equations:

2y - 7 = 1

Answer

Adding 7 to both sides,

$\Rightarrow 2y - 7 + 7 = 1 + 7$

$\Rightarrow 2y = 8$

Dividing both sides by 2,

$$\Rightarrow \frac{2y}{2} = \frac{8}{2}$$

$\Rightarrow y = 4$

1 D. Question

Solve the following equations:

6x = 72

Answer

Dividing both sides by 6,

$$\Rightarrow \frac{6x}{6} = \frac{72}{6}$$

⇒ x = 12

1 E. Question

Solve the following equations:

$$\frac{y}{11} = -7$$

Answer

Multiplying both sides by 11,

$$\Rightarrow \frac{y}{11} \times 11 = -7 \times 11$$

⇒ y = -77

1 F. Question

Solve the following equations:

3(3x - 7) = 5(2x - 3)

Answer

9x – 21 = 10x – 15

⇒ 10x – 15 – 9x + 21 = 0

⇒ x + 6 = 0

⇒ x = -6

1 G. Question

Solve the following equations:

4(2x - 3) + 5(3x - 4) = 14

Answer

⇒ 8x – 12 + 15x – 20 = 14

⇒ 8x + 15x = 14 + 12 + 20

⇒ 23x = 46

Dividing both sides by 23,

$$\Rightarrow \frac{23x}{23} = \frac{46}{23}$$

⇒ x = 2

1 H. Question

Solve the following equations:

$$\frac{7}{x-5}=\frac{5}{x-7}$$

Answer

⇒ 7(x – 7) = 5(x – 5)

⇒ 7x – 49 = 5x – 25

⇒ 7x – 5x = 49 – 25

⇒ 2x = 24

Dividing both sides by 2,

$$\Rightarrow \frac{2x}{2}=\frac{24}{2}$$

⇒ x = 12

1 I. Question

Solve the following equations:

$$\frac{2x+3}{3x+7}=\frac{3}{5}$$

Answer

⇒ 5(2x + 3) = 3(3x + 7)

⇒ 10x + 15 = 9x + 21

⇒ 10x – 9x = 21 – 15

⇒ x = 6

1 J. Question

Solve the following equations:

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

Answer

$$\Rightarrow \frac{4m+3m}{12}=\frac{1}{2}$$

$$\Rightarrow \frac{7m}{12}=\frac{1}{2}$$

⇒ 7m × 2 = 12

⇒ 14m = 12

Dividing both sides by 2,

$$\Rightarrow \frac{14m}{14} = \frac{12}{14}$$

$$\Rightarrow m = \frac{6}{7}$$

2 A. Question

Frame and solve the equations for the following statements:

Half of a certain number added to its one third gives 15. Find the number.

Answer

Let the number be x

Then according to question,

$$\frac{1}{2}x + \frac{1}{3}x = 15$$

$$\Rightarrow \frac{x}{2} + \frac{x}{3} = 15$$

$$\Rightarrow \frac{3x + 2x}{6} = 15$$

$$\Rightarrow \frac{5x}{6} = 15$$

$$\Rightarrow x = \frac{15 \times 6}{5}$$

$\Rightarrow x = 18$

Hence, the number is 18.

2 B. Question

Frame and solve the equations for the following statements:

Sum of three consecutive numbers is 90. Find the numbers.

Answer

Let the numbers be x, x+1 and x+2

Then according to the question,

$x + (x + 1) + (x + 2) = 90$

$\Rightarrow x + x + 1 + x + 2 = 90$

$\Rightarrow 3x + 3 = 90$

$\Rightarrow 3x = 90 - 3$

$\Rightarrow 3x = 87$

$\Rightarrow x = \frac{87}{3}$

$\Rightarrow x = 29$

$\Rightarrow x + 1 = 29 + 1 = 30$

$\Rightarrow x + 2 = 29 + 2 = 31$

Hence, the numbers are 29, 30 and 31.

2 C. Question

Frame and solve the equations for the following statements:

The breadth of a rectangle is 8 cm less than its length. If the perimeter is 60 cm, find its length and breadth.

Answer

Let breadth of rectangle = x

Then length of rectangle = x + 8

Perimeter = 60 cm

We know that,

Perimeter of rectangle = 2 (length of rectangle + breadth of rectangle)

$\Rightarrow 60 = 2(x + (x + 8))$

$\Rightarrow 60 = 2(x + x + 8)$

$\Rightarrow 60 = 2(2x + 8)$

$\Rightarrow 60 = 4x + 16$

$\Rightarrow 4x = 60 - 16$

$\Rightarrow 4x = 44$

$\Rightarrow x = 11$

$\Rightarrow x + 8 = 11 + 8 = 19$

Hence, breadth of rectangle = 11 cm

length of rectangle = 19 cm

2 D. Question

Frame and solve the equations for the following statements:

Sum of two numbers is 60. The bigger number is 4 times the smaller one. Find the numbers.

Answer

Let the smaller number be x

Then bigger number = 4x

Then according to the question,

x + 4x = 60

⇒ 5x = 60

$$\Rightarrow x = \frac{60}{5}$$

⇒ x = 12

⇒ 4x = 4 × 12 = 48

Hence, the numbers are 12 and 48.

2 E. Question

Frame and solve the equations for the following statements:

The sum of the two numbers is 21 and their difference is 3. Find the numbers. (Hint: Let the bigger number be x and smaller number be x – 3)

Answer

Let the bigger number be x

Then the smaller number = x – 3 [∵ the difference is 3]

Then according to the question,

x + (x – 3) = 21

⇒ 2x – 3 = 21

⇒ 2x = 21 + 3

$$\Rightarrow x = \frac{24}{2}$$

⇒ x = 12

⇒ x – 3 = 12 – 3 = 9

Hence, the numbers are 12 and 9.

2 F. Question

Frame and solve the equations for the following statements:

Two numbers are in the ratio 5 : 3. If they differ by 18, what are the numbers?

Answer

Let the numbers be 5x and 3x

Then according to the question,

5x – 3x = 18

$\Rightarrow 2x = 18$

$\Rightarrow x = \frac{18}{2}$

$\Rightarrow x = 9$

$\Rightarrow 5x = 5 \times 9 = 45$

$\Rightarrow 3x = 3 \times 9 = 27$

Hence, the numbers are 45 and 27.

2 G. Question

Frame and solve the equations for the following statements:

A number decreased by 5% of it is 3800. What is the number?

Answer

Let the number be x

Then according to the question,

$$x - \frac{5}{100}x = 3800$$

$$\Rightarrow x - \frac{1}{20}x = 3800$$

$$\Rightarrow \frac{20x - x}{20} = 3800$$

$$\Rightarrow \frac{19x}{20} = 3800$$

$$\Rightarrow x = \frac{3800 \times 20}{19}$$

$\Rightarrow x = 4000$

Hence, the number is 4000.

2 H. Question

Frame and solve the equations for the following statements:

The denominator of a fraction is 2 more than its numerator. If one is added to both the numerator and their denominator the fraction becomes $\frac{2}{3}$. Find the fraction.

Answer

Let the numerator be x

Then the denominator = x + 2

Then according to the question,

$$\frac{x+1}{(x+2)+1}=\frac{2}{3}$$

$$\Rightarrow \frac{x+1}{x+3}=\frac{2}{3}$$

⇒ 3(x + 1) = 2(x + 3)

⇒ 3x + 3 = 2x + 6

⇒ 3x – 2x = 6 – 3

⇒ x = 3 (Numerator)

⇒ x + 2 = 3 + 2 = 5 (Denominator)

Hence, the fraction is $\frac{3}{5}$.

2 I. Question

Frame and solve the equations for the following statements:

Mary is 3 times older than Nandhini. After 10 years the sum of their ages will be 80. Find their present ages.

Answer

At present,

Let age of Nandini = x

Then age of Mary = 3x

After 10 years,

Age of Nandini = x + 10

Age of Mary = 3x + 10

Then according to the question,

[x + 10] + [3x + 10] = 80

⇒ x + 10 + 3x + 10 = 80

⇒ 4x + 20 = 80

⇒ 4x = 80 – 20

⇒ 4x = 60

⇒ x = 15

⇒ 3x = 3 × 15 = 45

Hence, Present age of Nandini = 15 years

Present age of Mary = 45 years

2 J. Question

Frame and solve the equations for the following statements:

Murali gives half of his savings to his wife, two third of the remainder to his son and the remaining ` 50,000 to his daughter. Find the shares of his wife and son.

Answer

Let the savings of Murali be x

$$\text{He gave savings to his wife } = \frac{1}{2}x$$

$$\text{Savings left } = x - \frac{1}{2}x$$

$$\Rightarrow \text{Savings left } = x - \frac{1}{2}x$$

$$\Rightarrow \text{Savings left } = \frac{1}{2}x$$

$$\text{He gave savings to his son } = \frac{2}{3}\left(\frac{1}{2}x\right) = \frac{1}{3}x$$

$$\text{Savings left } = \frac{1}{2}x - \frac{2}{3}\left(\frac{1}{2}x\right)$$

$$\Rightarrow \text{Savings left } = \frac{1}{2}x - \frac{1}{3}x$$

$$\Rightarrow \text{Savings left } = \frac{3x - 2x}{6}$$

$$\Rightarrow \text{Savings left } = \frac{x}{6}$$

$$\text{He gave savings to his daughter } = \frac{1}{6}x$$

According to the question,

$$\frac{1}{6}x = 50000$$

$$\Rightarrow x = 50000 \times 6$$

$$\Rightarrow x = 300000$$

$$\Rightarrow \frac{1}{2}x = \frac{1}{2} \times 300000 = 150000$$

$$\Rightarrow \frac{1}{3}x = \frac{1}{3} \times 300000 = 100000$$

Hence, Share of his wife = Rs 1,50,000

Share of his son = Rs 1,00,000