Chapter – 12
Algebraic Expressions

Exercise 12.1

1. Get the algebraic expressions in the following cases using variables, constants and arithmetic operations.
(i) Subtraction of z from y.
(ii) One-half of the sum of numbers x and y.
(iii) The number z multiplied by itself.
(iv) One-fourth of the product of numbers p and q.
(v) Numbers x and y both squared and added.
(vi) Number 5 added to three times the product of numbers m and n.
(vii) Product of number y and z subtracted from 10.
(viii) Sum of numbers a and b subtracted from their product.

Answer:

(i) $y - z$

(ii) sum of numbers x and $y = x + y$

One half of the sum of numbers x and y =

(iii) $z \times z = z^2$

(iv) Products of two numbers p and $q = p \times q = pq$

So one - fourth of the above quantity is

(v) Square of no x : x^{22}

Square of no y : y^2

Addition of squares of x and $y = x^2 + y^2$

(vi) Product of m and $n = m \times n = mn$

Three times of product of m and $n = 3 \times mn = 3mn$

Five added to three times of product of m and n = 5 + 3mn

(vii) Product of number y and z = xy

Product of number y and z substracted from 10 = 10 – xy

(viii) Sum of numbers a and b = a + b

Products of numbers = ab

Subtraction of sum from product = ab – (a + b) or ab – a - b

2.

(A) Identify the terms and their factors in the following expressions. Show the terms and factors by tree diagrams.

(a) $x - 3$

(b) $1 + x + x^2$

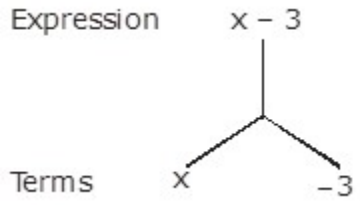
(c) $y - y^3$

(d) $5xy^2 + 7x^2y$

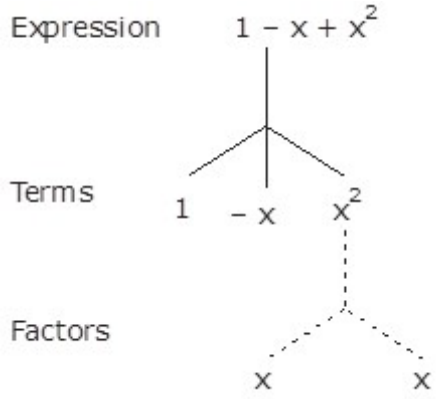
(e) $-ab + 2b^2 - 3a^2$

Answer:

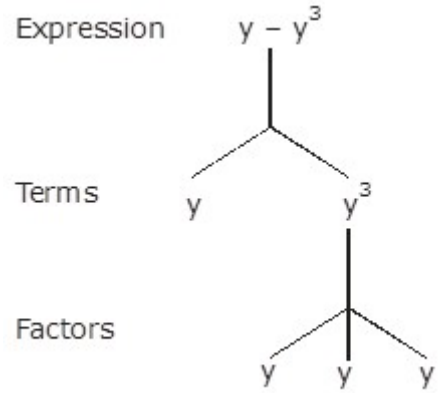
(a)



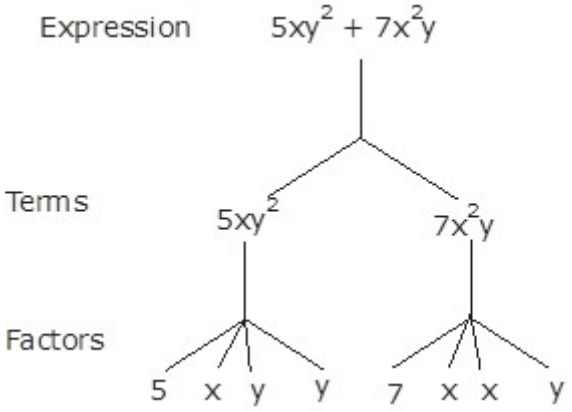
(b)



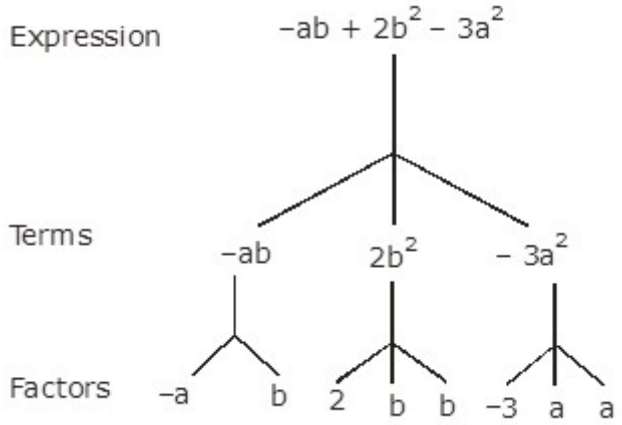
(c)



(d)



(e)



(B) Identify terms and factors in the expression given below:

(i) -4x + 5

(ii) -4x + 5y

(iii) $5y + 3y^2$

(iv) $xy + 2x^2y^2$

(v) $pq + q$

(vi) $1.2ab - 2.4ab + 3.6a$

(vii) $\frac{3}{4}x + \frac{1}{4}$

(viii) $0.1p^2 + 0.2q^2$

Answer:

S.No	Expression	Terms	Factors
a	-4x + 5	-4x 5	-4, x 5
b	-4x + 5y	-4x 5y	-4, x 5, y
c	$5y + 3y^2$	5y $3y^2$	5, y 3, y, y
d	$xy + 2x^2y^2$	xy $2x^2y^2$	x, y 2, x, x, y, y
e	pq + q	pq q	p, q q
f	1.2ab – 2.4ab + 3.6a	1.2ab -2.4ab 3.6a	1.2 , a, b -2.4, b 3.6, a
g	$\frac{3}{4}x + \frac{1}{4}$	$\frac{3}{4}x$ $\frac{1}{4}$	$\frac{3}{4}$, x $\frac{1}{4}$
h	$0.1p^2 + 0.2q^2$	$0.1\ p^2$	0.1 , p, p

		$0.2q^2$	0.2 , q, q

3. Identify the numerical coefficients of terms (other than constants) in the following expression:

(i) $5 - 3t^2$

(ii) $1 + t + t^2 + t^3$

(iii) $x + 2xy + 3y$

(iv) $100m + 100n$

(v) $-p^2q^2 + 7pq$

(vi) $1.2a + 0.8b$

(vii) $3.14\ r^2$

(viii) $2(l + b)$

(ix) $0.1y + 0.01y^2$

Answer:

S.No	Expression	Terms [Containing variables]	Coefficients
i	$5 - 3t^2$	$-3t^2$	-3
ii	$1 + t + t^2 + t^3$	t t^2 t^3	1 1 1
iii	$x + 2xy + 3y$	x $2xy$ $3y$	1 2 3
iv	$100m + 100n$	$100m$ $100n$	100 100
v	$-p^2q^2 + 7pq$	$-p^2q^2$	-1

		7pq	7
vi	1.2a + 0.8b	1.2a 0.8b	1.2 0.8
vii	$3.14\ r^2$	$3.14\ r^2$	3.14
viii	2(l + b)	2l 2b	2 2
ix	$0.1y + 0.01y^2$	0.1y $0.01y^2$	0.1 0.01

4.

(A) Identify terms which contain x and give the coefficient of x.

(i) $y^2x + y$

(ii) $13y^2 - 8yx$

(iii) $x + y + 2$

(iv) $5 + z + zx$

(v) $1 + x + xy$

(vi) $12xy^2 + 25$

(vii) $7x + xy^2$

Answer:

S.No	Expression	Terms [Containing x]	Coefficient of x
i	$y^2x + y$	y^2x	y^2
ii	$13y^2 - 8yx$	-8yx	-8y

iii	$x + y + 2$	x	1
iv	$5 + z + zx$	zx	Z
v	$1 + x + xy$	xy	Y
vi	$12xy^2 + 25$	$12xy^2$	$12y^2$
vii	$7x + xy^2$	7x	7

(B) Identify terms which contain x^2 and give the coefficient of y^2.

(i) $8 - xy^2$

(ii) $5y^2 + 7x$

(iii) $2x^2y - 15xy^2 + 7y^2$

Answer:

S.No	Expression	Terms [Containing y^2]	Coefficient of y^2
i.	$8 - xy^2$	$-xy^2$	-x
ii.	$5y^2 + 7x$	$5y^2$	5
iii.	$2x^2y - 15xy^2 + 7y^2$	$-15xy^2 + 7y^2$	-15x 7

5. Classify into monomials, binomials and trinomials.

(i) $4y - 7z$

(ii) y^2

(iii) $x + y - xy$

(iv) 100

(v) $ab - a - b$

(vi) $5 - 3t$

(vii) $4p^2q - 4pq^2$

(viii) $7mn$

(ix) $z^2 - 3z + 8$

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

(xi) $z^2 + z$

(xii) $1 + x + x^2$

Answer:

(i) $4y - 7z$

As the expression contains two terms expression is Binomial.

(ii) y^2

As the expression contains one term expression is Monomial

(iii) $x + y - xy$

As the expression contains three terms expression is Trinomial

(iv) 100 is a constant polynomial.

As the expression contains one term expression is Monomial

(v) $ab - a - b$

As the expression contains three terms expression is Trinomial

(vi) $5 - 3t$

As the expression contains two terms expression is Binomial

(vii) $4p^2q - 4pq^2$

As the expression contains two terms expression is Binomial

(viii) $7mn$

As the expression contains one term expression is Monomial

(ix) $z^2 - 3z + 8$

As the expression contains three terms expression is Trinomial.

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

As the expression contains two terms expression is Binomial

(xi) $z^2 + z$

As the expression contains two terms expression is Binomial

(xii) $1 + x + x^2$

As the expression contains three terms expression is Trinomial

6. State whether a given pair of terms is of like or unlike terms.

(i) 1, 100

(ii) $-7x, \frac{5x}{2}$

(iii) -29x, -29y

(iv) 14xy, 42xy

(v) $4m^2p, 4mp^2$

(vi) $12xz, 12x^2z^2$

Answer:

(i) 1, 100

As it contains only single term it is simply a like term

(ii) -7x,

As both term have same algebraic factor as x, the terms are like.

(iii) -29x, -29y

As both term don't have same algebraic factor (As -29x has x and -29 has y), the terms are unlike.

(iv) 14xy, 42yx

As both term have same algebraic factors as x and y, the terms are like.

(v) $4m^2p, 4mp^2$

As term $4m^2p$ has factors m, m and p but term $4mp^2$ has factors m, p and p. so both terms are unlike

(vi) $12xz, 12x^2y^2$

As term $12xz$ has factors x and z but term $12x^2y^2$ has factors x, x, y and y. so both terms are unlike.

7. Identify like terms in the following:

(a)$-xy^2, -4yx^2, 8x^2, 2xy^2, 7y, -11x62\ , -100x, -11yx, 20x2y,$

$-6x^2, y, 2xy, 3x$

(b)$10pq, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p,$

$78qp, 13p^2q, qp^2, 701\ p^2$

Answer:

(a)

Expression	Variable Factors
$-xy^2$	x, y, y
$-4yx^2$	y, x, x
$8x^2$	x, x
$2xy^2$	x, y, y
7y	y
$-11\ x^2$	x, x
-100x	x
-11yx	y, x

$20x^2y$	x, x, y
$-6x^2$	x, x
y	y
2xy	x, y
3x	x

So, From the above table we conclude that sets of like terms are

1. $-xy^2, 2xy^2$: As both have common variable factors as x, y and y

2. $-4yx^2, 20x^2y$: As both have common variable factors as x, x and y

3. $8x^2, -11x^2, -6x^2$: As both have common variable factors as x and x

4. -11yx, 2xy : As both have common variable factors as x and y

5. -100x, 3x : As both have common variable factor as x

6. 7y, y : As both have common variable factor as y

(b)

Expression	Variable Factors
100pq	p, q
7p	p
8q	q
$-p^2q^2$	p, p, q, q
-7qp	q, p

-100q	q
-23	Constant
$12q^2p^2$	q, q, p, p
$-5p^2$	p, p
41	Constant
2405p	p
78qp	q, p
$13p^2q$	p, p, q
qp^2	q, p, p
$701p^2$	p, p

So, From the above table we conclude that sets of like terms are

1. 10pq, –7qp, 78qp : As both have common variable factors as p and q

2. 7p, 2405p: As both have common variable factor as p

3. 8q, – 100q : As both have common variable factor as q

4. $-p^2q^2, 12q^2p^2$: As both have common variable factors as p, q, q and q

5. –23, 41 : As both terms are constant and don't have any variable factor .

6. $-5p^2, 701p^2$:As both have common variable factors as p and p.

7. $13p^2q, pq^2$: As both have common variable factors as p, p and q.

Exercise 12.2

1. Simplify combining like terms:

(i) $21b - 32 + 7b + 20b$

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z$

(iii) $P - (p - q) - q - (q - p)$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

(v) $5xy^2 - 5x^2 + 3xy^2 - 3x^2 + x^2 - y^2 + 8xy^2 - 3y^2$

(vi) $(3y^2 + 5y - 4) - (-8y - y^2 - 4)$

Answer:

Like terms are terms with the same variables and exponents.

(i) $21b + 7b - 20b - 32$

$= (21b + 7b - 20b) - 32$

$= (28b - 20b) - 32$

$= 8b - 32$

(ii) $7z^3 + 13z^2 - z^2 - 15z - 5z$

$= 7z^3 + (13z^2 - z^2) - (15z - 5z)$

$= 7z^3 + 12z^2 - 20z$

(iii) $p - (p - q) - q - (q - p)$

$= p - p + p + q - q - q$

$= p - q$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

$= 3a - 2b - ab - a + b - ab + 3ab + b - a$

$= (3a - a - a) + (-2b + b + b) + (-ab - ab + 3ab) = (3a - 2a) + 9-2b + 2b) + (-2ab + 3ab) = a + 0 + ab$

= a + ab

(v) $5x^2y + 3x^2y + 8xy^2 - 5x^2 + x^2 - 3y^2 - y^2 - 3y^2$

$= (5x^2y + 3x^2y) + 8xy^2 + (-5x^2 + x^2) + (-3y^2 - y^2 - 3y^2)$

$= 8x^2y + 8xy^2 - 4x^2 + (-4y^2 - 3y^2)$

$= 8x^2y + 8xy^2 - 4x^2 - 7y^2$

(vi) $(3y^2 + 5y - 4) - (8y - y^2 - 4)$

$= 3y^2 + 5y - 4 - 8y + y^2 + 4$

$= (3y^2 + y^2) + (5y - 8y) - 4 + 4$

$= 4y^2 - 3y$

2. Add:

(i) 3mn, -5mn, 8mn -4mn

(ii) t – 8tz, 3tz – z, z – t

(iii) -7mn + 5, 12mn + 2, 9mn – 8, -2mn – 3

(iv) a + b – 3, b - a + 3, a – b + 3

(v) 14x + 10y – 12xy – 13, 18 – 7x – 10y + 8xy, 4xy

(vi) 5m – 7n, 3n – 4m + 2, 2m – 3mn – 5

(vii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

(viii) $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$

(ix) ab – 4a, 4b – ab, 4a – 4b

(x) $x^2 - y^2 - 1, y^2 - 1 - x^2, 1 - x^2 - y^2$

Answer:

(i) 3mn + (-5mn) + 8mn + (-4mn)

= 3mn – 5mn + 8mn – 4mn

= 11 mn – 9mn

= 2mn

(ii) $t - 8tz, 3tz - z, z - t$

$= t - 8tz + 3tz - z + z - t$

$= t - t - z + z - 8tz + 3tz$

$= -5tz$

(iii) $-7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3$

$= (-7mn + 5) + (12mn + 2) + (9mn - 8) + (-2mn - 3)$

$= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3$

$= -9mn + 21mn + 7 - 11$

$= 12mn - 4$

(iv) $a + b - 3, b - a + 3, a - b + 3$

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

$= a - a + a + b + b - b - 3 + 3 + 3$

$= a + b + 3$

(v) $14x + 10y - 12xy - 13 + (18 - 7x - 10y + 8xy) + 4xy$

$= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8xy + 4xy$

$= 14x - 7x + 10y - 10y - 12xy + 8xy + 4xy - 13 + 18$

$= 7x + 5$

(vi) $(5m - 7n) + (3n - 4m + 2) + (2m - 3mn - 5)$

$= 5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$

$= 3m - 4n - 3mn - 3$

(vii) $4x^2y - 3xy^2 - 5xy^2 + 5x^2y$

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

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

$= 9x^2y - 8xy^2$

(viii) $(3p^2q^2 - 4pq + 5) + (-10p^2q^2) + (15 + 9pq + 7p^2q^2)$

$= 3p^2q^2 - 4pq + 5 - 10p^2q^2 + 15 + 9pq + 7p^2q^2$

$= 3p^2q^2 - 10p^2q^2 + 7p^2q^2 - 4pq + 9pq + 5 + 15$

$= 5pq + 20$

(ix) $(ab - 4a) + (4b - ab) + (4a - 4b)$

$= ab - 4a + 4b - ab + 4a - 4b$

$= ab - ab - 4a + 4a + 4b - 4b$

$= 0$

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

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

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

$= -x^2 - y^2 - 1$

3. Subtract:

(i) $-5y^2$ from y^2

(ii) $6xy$ form $-12xy$

(iii) $(a - b)$ from $(a + b)$

(iv) $A(b - 5)$ from $b(5 - a)$

(v) $-m^2 + 5mn$ from $4m^2 - 3mn + 8$

(vi) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

(vii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

Answer:

(i) $y^2 - (-5y^2)$

$= y^2 + 5y^2$

$= 6y^2$

(ii) $6xy$ from $-12xy$

$-12xy - 6xy = -18xy$

(iii) (a – b) from (a + b)

(a – b) – (a – b)

= a + b – a + b

= a – a + b + b

= 2b

(iv) a(b – 5) from b(5 – a)

b(5 – a) – a(b – 5)

= 5b – ab – ab + 5a

=5a + 5b – ab – ab

= 5a + 5b - 2ab

(v) $-m^2 + 5mn$ from $4m^2 - 3mn + 8$

$4m^2 - 3mn + 8 - (-m^2 + 5mn)$

$= 4m^2 - 3mn + 8 + m^2 - 5mn$

$= 5m^2 - 8mn + 8$

(vi) $-x^2 + 10x - 5$ form $5x - 10x^2$

$5x - 10x^2(-x^2 + 10x - 5)$

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

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

$= -9x^2 - 5x + 5$

(vii) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

$3ab - 2a^2 - 2b^2 - (5a^2 - 7ab + 5b^2)$

$= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5b^2$

$= 2a^2 - 5a^2 + 3ab + 7ab - 2b^2 - 5b^2$

$= 7a^2 + 10b - 7b^2$

(viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

$5p^2 + 3q^2 - pq - (4pq - 5q^2 - 3p^2)$

$= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2$

$= 5p^2 + 3p^2 + 3q^2 + 5q^2 - pq - 4pq$

$= 8p^2 + 8q^2 - 5pq$

4.

(A) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

Answer:

To Find: Expression which is to be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$

We need to subtract $x^2 + xy + y^2$ from $2x^2 + 3xy$ to obtain the required fraction.

Therefore, the expression $= 2x^2 + 3xy - x^2 + xy + y^2$

Required Expression $= 2^2 + 3xy - x^2 - xy - y^2$

Required Expression $= x^2 + 2xy - y^2$

Hence, $x^2 + 2xy - y^2$ is to be added to , $x^2 + 2xy + y^2$to obtain $2x^2 + 3xy$.

(B) What should be subtracted from 2a+8b+10 to get -3a+7b+16?

Answer:

Let "k" should be subtracted

2a + 8b + 10 – k = -3a + 7b + 16

Then,

k = 2a + 8b + 10 - (-3a + 7b + 16)

k = 2a + 8b + 10 + 3a – 7b – 16

k = 5a + b – 6

5. What should be taken away form $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

Answer:

Let k should be taken away from $3x^2 - 4y^2 + 5xy + 20$

$3x^2 - 4y^2 + 5xy + 20 - k = -x^2 - y^2 + 6xy + 20$

$k = 3x^2 - 4y^2 + 5xy + 20 - (-x^2 - y^2 + 6xy + 20)$

$k = 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$

$k = 4x^2 - 3y^2 - xy$

Hence value of k is $4x^2 - 3y^2 - xy$

6.

(A) From the sum of 3x - y + 11 and -y – 11, subtract 3x - y - 11.

Answer:

The algebraic equation for above problem will be as

[(3x – y + 11)+ (-y – 11)] - (3x – y – 11)]

= 3x – y + 11 - y – 11 – 3x + y + 11

= 3x – 3x – y – y + y +11 – 11 + 11

= -y + 11

Hence the value is 11 – y.

(B) From the sum of 4 + 3x and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 5$.

Answer:

The equation for the problem is

$[(4 + 3x) + (5 = 4x + 2x^2) - [(3x^2 - 5x) +) - x^2 + 5)]$

$= [4 + 3x + 5 - 4x + 2x^2] - [3x^2 + 5x + x^2 - 5]$

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

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

$= 4x + 4$

Exercise 12.3

1. If m = 2, find the value of :

(i) m – 2

(ii) 3m – 5

(iii) 9 – 5m

(iv) $3m^2 - 2m - 7$

(v) $\frac{5m}{2} - 4$

Answer:

(i) m – 2

Put m = 2

= 2 – 2

= 0

(ii) 3m – 5

Put m = 2

=3(2) – 5

=6 – 5

= 1

(iii) 9 – 5m

Put m = 2

= 9 – 5(2)

= 9 – 10

= -1

(iv) $3m^2 - 2m - 7$

Put m = 2

= $3(2)^2$ – 2(2) – 7

=3(4) - 4 – 7

=12 – 11

=1

(v) $\frac{5m}{2} - 4$

Put m = 2

= 5 – 4

= 1

2. If p = -2 find the value of:

(i) $4p + 7$

(ii) $-3p^2 + 4p + 7$

(iii) $-2p^3 - 3p^2 + 4p + 7$

Answer:

(i) $4p + 7$

Put p = -2

=4(-2) + 7

= -8 + 7

= -1

(ii) $-3p^2 + 4p + 7$

Put p = -2

$= -3(-2)^2 + 4(-2) + 7$

$= -3(4) - 8 + 7$

$= -12 - 8 + 7$

= -20 + 7

= -13

(iii) $-2p^3 - 3p^2 + 4p + 7$

Put p = -2

$= -2(-2)^3 - 3(-2)^2 + 4(-2) + 7$

= -2(-8) -3(4) – 8 + 7

= 16 – 12 – 8 + 7

= 4 – 1

= 3

3. Find the values of the following expressions when x=-1:

(i) 2x – 7

(ii) -x + 2

Answer:

(i) 2x – 7

Put x = -1

= 2(-1) – 7

= -2 – 7

= -9

(ii) -x + 2

Put x = -1

= -(-1) + 2

= 1 + 2

= 3

(iii) x^2 + 2x + 1

Put x = -1

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

$= 1 - 2 + 1$

$= 2 - 2$

$= 0$

(iv) $2x^2 - x - 2$

Put x = -1

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

$= 2(1) + 1 - 3$

$= 2 + 1 - 3$

$= 3 - 3$

$= 0$

4. If a = 2, b = - 2, find the value of :

(i) $a^2 - b^2$

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

(iii) $a^2 - b^2$

Answer:

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

Put a = 2 and b = -2

$= 2^2 - (-2)^2$

$= 4 + 4$

$= 8$

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

Put a = 2 and b = -2

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

$= 4 - 4 + 4$

= 4

(iii) $a^2 - b^2$

we know that,

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

Put a = 2 and b = -2

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

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

$a^2 - b^2 = 0 \ . \ 4 = 0$

$a^2 - b^2 = 0$

5. When a = 0, b = -1 find the value of the given expressions:

(i) $2a + 2b$

(ii) $2a^2 + b^2 + 1$

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

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

Answer:

(i) $2a + 2b$

Put a = 0 and b = -1

= 2(0) + 2(-1)

= 0 – 2

= -2

(ii) $2a^2 + b^2 + 1$

Put a = 0 and b = -1

= 2(0)2 + (-1)2 + 1

= 2(0) + 1 + 1

= 0 + 1 + 1

= 2

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

Put a = 0 and b = -1

= 2(0)2(-1) + 2(0)(-1)2 + 0(-1)

=2(0)(-1) + 2(0)(1) + 0

= 0 + 0 + 0

= 0

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

Put a = 0 and b = -1

=(0)2 + 0(-1) + 2

= 0 + 0 + 2

= 2

6. Simplify the expressions and find the value if x is equal to 2

(i) x + 7 + 4(x - 5)

(ii) 3(x + 2) + 5x - 7

(iii) 6x + 5(x - 2)

(iv) 4(2x - 1) + 3x +11

Answer:

(i) x + 7 + 4(x - 5)

Opening the brackets we get,

= x + 7 + 4x – 20

= x + 4x + 7 – 20

= 5x – 13

Put x = 2

= 5(2) – 13

= 10 – 13

= -3

(ii)3(x+2) + 5x – 7

Opening the brackets we get,

= 3x + 6 + 5x – 7

= 3x + 5x + 6 – 7

= 8x – 1

Put x = 2

= 8^2 – 1

= 16 – 1

= 15

(iii) 6x + 5(x – 2)

Opening the brackets we get,

= 6x + 5x – 10

= 11x – 10

Put x = 2

= 11^2 – 10

= 22 – 10

= 12

(iv) 4(2x – 1) + 3x + 11

Opening the brackets we get,

= 8x – 4 + 3x + 11

= 8x + 3x – 4 + 11

= 11x + 7

Put x = 2

$= 11^2 + 7$

$= 22 + 7$

$= 29$

7. Simplify these expressions and find their values, if x=3,a=-1,b=-2

(i) 3x – 5 – x + 9

(ii) 2 – 8x + 4x + 4

(iii) 3a + 5 – 8a + 1

(iv) 10 – 3b- 4 – 5b

(v) 2a – 2b – 4 – 5 + a

Answer:

(i) 3x – 5 – x + 9

= 3x – x – 5 + 9

= 2x – 5 + 9

= 2x + 4

Put x = 3

= 2(3) + 4

= 6 + 4

= 10 Ans.

(ii) 2 – 8x + 4x + 4

= -8x + 4x + 2 + 4

= -4x + 2 + 4

= -4x + 6

Put x = 3

= -4(3) + 6

= -12 + 6

= -6 Ans.

(iii) 3a + 5 – 8a + 1

On rearranging the terms,

= 3a - 8a + 5 + 1

= -5a + 5 + 1

= -5a + 6

Put a = -1

= -5(-1) + 6

= 5 + 6

= 11 Ans.

(iv) 10 – 3b – 4 – 5b

= 10 – 4 – 3b – 5b

= 6 – 3b – 5b

= 6 – 8b

Put b = -2

= 6 – 8(-2)

= 6 + 16

= 22 Ans.

(v) 2a – 2b – 4 – 5 + a

On rearranging the terms,

= 2a + a – 2b – 4 – 5

= 3a – 2b – 4 – 5

= 3a – 2b – 9

Put a = -1 & b = -2

= 3(-1) - 2(-2) – 9

= -3 + 4 – 9

= -8 Ans.

8. If z = 10, find the value of $z^3 - 3(z - 10)$

Answer:

$z^3 - 3(z - 10)$

As z = 10

z^3– 3(z – 10)

= (10)3 – 3(10 – 10)

= 1000 – 3(0)

= 1000 – 0

= 1000

9. If p = -10, find the value of $p^2 - 2p - 100$

Answer:

As p = -10

p^2 – 2p – 100

= $(-10^2$ – 2(-10) – 100

= (-10)(-10) + 20 – 100

= 100 + 20 – 100

= 20

10. What should be the value of a if the value of $2x^2 + x - a$ equals to 5, when x = 0?

Answer:

As x = 0

And

$2x^2 + x - a = 5$

$2(0)^2 + 0 - a = 5$

$2(0) - a = 5$

$0 - a = 5$

$-a = 5$

$a = -5$

11. Simplify the expression and find its value when a=5 and b = -3, then $2(a^2 + ab) + 3 - ab$

Answer:

To Simplify: $2(a^2 + ab) + 3 - ab$

$2(a^2 + ab) + 3 - ab$

Opening the brackets we get,

$= 2a^2 + 2ab + 3 - ab$

Taking like terms on one side we get,

$= 2a^2 + 2ab - ab + 3$

$= 2a^2 + ab + 3$

Put a = 5 and b = -3

$= 2(5)^2 + 5(-3) + 3$

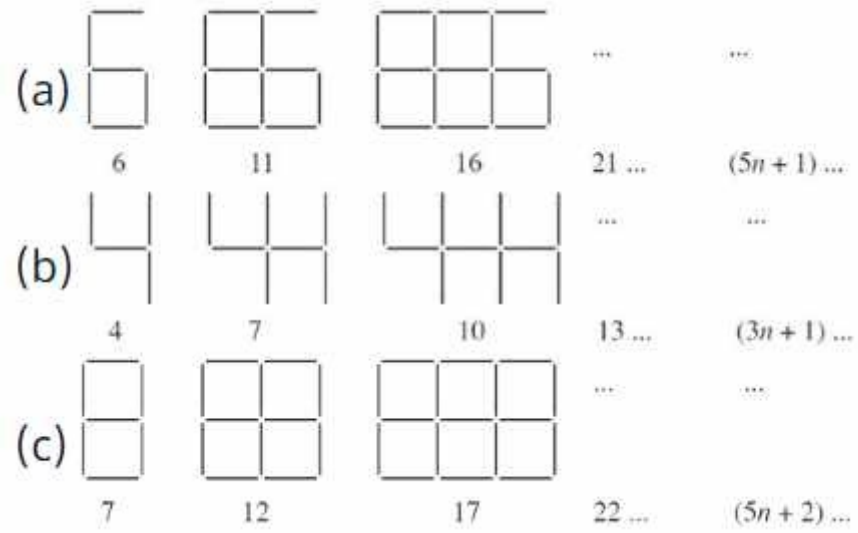
$= 2(25) - 15 + 3$

$= 50 - 12$

$= 38$

Exercise 12.4

1. Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.



If the number of digits formed is taken to be n, the number of segments required to form n digits is given by the algebraic expression appearing on the right of each pattern.

How many segments are required to form 5, 10, 100 digits of the kind 

Answer:

a) For digit

Expression : 5n + 1

Where n = no of digits

For 5 digits

No of segments required = 5(5) + 1 = 25 + 1 = 26

For 10 digits

No of segments required = 5(10) + 1 = 50 + 1 = 51

For 100 digits

No of segments required = 5(100) + 1 = 500 + 1 = 501

(b) For digit

Expression : 3n + 1

Where n = no of digits

For 5 digits

No of segments required = 3(5) + 1 = 15 + 1 = 16

For 10 digits

No of segments required = 3(10) + 1 = 30 + 1 = 31

For 100 digits

No of segments required = 3(100) + 1 = 300 + 1 = 301

(c) For digit

Expression : 5n + 2

Where n = no of digits

For 5 digits

No of segments required = 5(5) + 2 = 25 + 2 = 27

For 10 digits

No of segments required = 5(10) + 2 = 50 + 2 = 52

For 100 digits

No of segments required = 5(100) + 2 = 500 + 2 = 502

2. Use the given algebraic expression to complete the table of number patterns.

S.No	Expression	Terms									
		1st	2nd	3rd	4th	5th	…	10th	…	100th	…
(i)	2n – 1	1	3	5	7	9	-	19	-	-	
(ii)	3n+2	5	8	11	14	-	-	-	-	-	
(iii)	4n+1	5	9	13	17	-	-	-	-	-	
(iv)	7n+20	27	34	41	48	-	-	-	-	-	
(v)	$n^2 + 1$	2	5	10	17	-	-	-	-	10001	

Answer:

(i) Expression = 2n – 1

100th term (i.e. n = 100)

= 2(100) – 1

= 200 – 1

= 199

(ii) Expression = 3n + 2

5th term (i.e. n = 5)

= 3(5) + 2

= 15 + 2

= 17

10th terms (i.e. n =10)

=3(10) + 2

=30 + 2

= 32

100th term (i.e. n = 100)

=3(100) + 2

= 300 + 2

= 302

(iii)Expression = 4n + 1

5th term (i.e. n = 5)

= 4(5) + 1

= 20 + 1

= 21

10th terms (i.e. n =10)

= 4(10) + 1

= 40 + 1

= 41

100th term (i.e. n = 100)

= 4(100) + 1

= 400 + 1

= 401

(iv) Expression = 7n + 20

5th term (i.e. n = 5)

= 7(5) + 20

= 35 + 20

= 55

10th terms (i.e. n =10)

=7(10) + 20

=70 + 20

= 90

100th term (i.e. n = 100)

=7(100) + 20

= 700 + 20

= 720

(v) Expression = $n^2 + 1$

5th term (i.e. n = 5)

= $(5)^2 + 1$

= 25 + 1

= 26

10th terms (i.e. n =10)

= $(10)^2 + 1$

=100 + 1

= 101

So the Table is

S.No	Expression	Terms									
		1st	2nd	3rd	4th	5th	…	10th	…	100th	…
(i)	2n – 1	1	3	5	7	9	-	19	-	199	
(ii)	3n+2	5	8	11	14	17	-	32	-	302	
(iii)	4n+1	5	9	13	17	21	-	41	-	401	
(iv)	7n+20	27	34	41	48	55	-	90	-	720	
(v)	$n^2 + 1$	2	5	10	17	26	-	101	-	10001	