Mathematics

(Chapter – 12) (Algebraic Expressions)

(Class – VII)

Exercise 12.1

Question 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 m and n.

(vii) Product of numbers y and z subtracted from 10.

(viii) Sum of numbers a and b subtracted from their product.

Answer 1:

(i) $y-z$

(ii) $\frac{x+y}{2}$

(iii) z^2

(iv) $\frac{pq}{4}$

(v) x^2+y^2

(vi) $3mn+5$

(vii) $10-yz$

(viii) $ab-(a+b)$

Question 2:

(i) Identify the terms and their factors in the following expressions, show the terms and factors by tree diagram:

(a) $x-3$ (b) $1+x+x^2$ (c) $y-y^3$

(d) $5xy^2+7x^2y$ (e) $-ab+2b^2-3a^2$

(ii) Identify the terms and factors in the expressions given below:

(a) $-4x+5$ (b) $-4x+5y$ (c) $5y+3y^2$

(d) $xy+2x^2y^2$ (e) $pq+q$ (f) $1.2ab-2.4b+3.6a$

(g) $\frac{3}{4}x+\frac{1}{4}$ (h) $0.1p^2+0.2q^2$

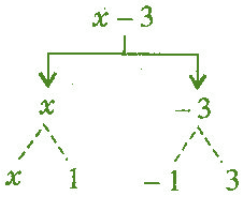
Answer 2:

(i) (a) $x-3$

Expression

Terms

Factors

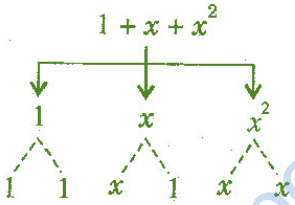


(b) $1+x+x^2$

Expression

Terms

Factors

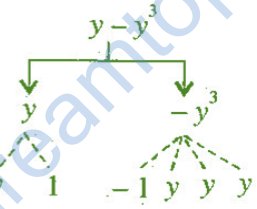


(c) $y-y^3$

Expression

Terms

Factors

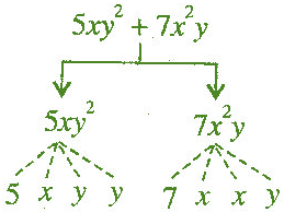


(d) $5xy^2+7x^2y$

Expression

Terms

Factors

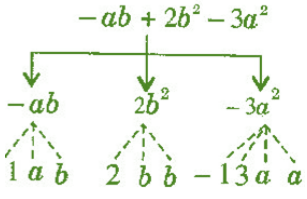


(e) $-ab+2b^2-3a^2$

Expression

Terms

Factors



(ii) (a) $-4x+5$

Terms: $-4x, 5$

Factors: $-4, x$; 5

(b) $-4x+5y$

Terms: $-4x, 5y$

Factors: $-4, x$; $5, y$

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

Terms: $5y, 3y^2$

Factors: $5, y$; $3, y, y$

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

Terms: $xy, 2x^2y^2$

Factors: x, y ; $2x, x, y, y$

(e) $pq+q$

Terms: pq, q

Factors: p, q ; q

(f) $1.2ab-2.4b+3.6a$

Terms: $1.2ab, -2.4b, 3.6a$

Factors: $1.2, a, b$; $-2.4, b$; $3.6, a$

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

Terms: $\frac{3}{4}x, \frac{1}{4}$

Factors: $\frac{3}{4}, x$; $\frac{1}{4}$

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

Terms: $0.1p^2, 0.2q^2$

Factors: $0.1, p, p$; $0.2, q, q$

Question 3:

Identify the numerical coefficients of terms (other than constants) in the following expressions:

(i) $5-3t^2$ (ii) $1+t+t^2+t^3$ (iii) $x+2xy+3y$

(iv) $100m+1000n$ (v) $-p^2q^2+7pq$ (vi) $1.2a+0.8b$

(vii) $3.14r^2$ (viii) $2(l+b)$ (ix) $0.1y+0.01y^2$

Answer 3:

S.No.	Expression	Terms	Numerical Coefficient
(i)	$5-3t^2$	$-3t^2$	-3
(ii)	$1+t+t^2+t^3$	t	1
		t^2	1
		t^3	1
(iii)	$x+2xy+3y$	x	1
		$2xy$	2
		$3y$	3
(iv)	$100m+1000n$	$100m$	100
		$1000n$	1000
(v)	$-p^2q^2+7pq$	$-p^2q^2$	-1
		$7pq$	7
(vi)	$1.2a+0.8b$	$1.2a$	1.2
		$0.8b$	0.8
(vii)	$3.14r^2$	$3.14r^2$	3.14
(viii)	$2(l+b)=2l+2b$	$2l$	2
		$2b$	2
(ix)	$0.1y+0.01y^2$	$0.1y$	0.1
		$0.01y^2$	0.01

Question 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) $7x+xy^2$

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

(i) $8-xy^2$ (ii) $5y^2+7x$ (iii) $2x^2y-15xy^2+7y^2$

Answer 4:

(a)

S.No.	Expression	Term with factor 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)	$1+x+xy$	x	1
		xy	y
(vi)	$12xy^2+25$	$12xy^2$	$12y^2$
(vii)	$7x+xy^2$	xy^2	y^2
		$7x$	7

(b)

S.No.	Expression	Term contains y^2	Coefficient of y^2
(i)	$8-xy^2$	$-xy^2$	$-x$
(ii)	$5y^2+7x$	$5y^2$	5
(iii)	$2x^2y-15xy^2+7y^2$	$-15xy^2$	$-15x$
		$7y^2$	7

Question 5:

Classify into monomials, binomials and trinomials:

(i)	$4y-7x$	(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 5:

S.No.	Expression	Type of Polynomial
(i)	$4y-7z$	Binomial
(ii)	y^2	Monomial
(iii)	$x+y-xy$	Trinomial
(iv)	100	Monomial
(v)	$ab-a-b$	Trinomial
(vi)	$5-3t$	Binomial
(vii)	$4p^2q-4pq^2$	Binomial
(viii)	$7mn$	Monomial
(ix)	z^2-3z+8	Trinomial
(x)	a^2+b^2	Binomial
(xi)	z^2+z	Binomial
(xii)	$1+x+x^2$	Trinomial

Question 6:

State whether a given pair of terms is of like or unlike terms:

(i)	$1,\ 100$	(ii)	$-7x, \frac{5}{2}x$	(iii)	$-29x, -29y$
(iv)	$14xy, 42yx$	(v)	$4m^2p, 4mp^2$	(vi)	$12xz, 12x^2z^2$

Answer 6:

S.No.	Pair of terms	Like / Unlike terms
(i)	1, 100	Like terms
(ii)	$-7x, \frac{5}{2}x$	Like terms
(iii)	$-29x, -29y$	Unlike terms
(iv)	$14xy, 42yx$	Like terms
(v)	$4m^2p, 4mp^2$	Unlike terms
(vi)	$12xz, 12x^2z^2$	Unlike terms

Question 7:

Identify like terms in the following:

(a) $-xy^2, -4yx^2, 8x^2, 2xy^2, 7y, -11x^2 - 100x, -11yx, 20x^2y, -6x^2, y, 2xy, 3x$

(b) $10pq, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$

Answer 7:

(a) Like terms are:

(i) $-xy^2, 2xy^2$ (ii) $-4yx^2, 20x^2y$ (iii) $8x^2, -11x^2, -6x^2$

(iv) $7y, y$ (v) $-100x, 3x$ (vi) $-11yx, 2xy$

(b) Like terms are:

(i) $10pq, -7pq, 78pq$ (ii) $7p, 2405p$ (iii) $8q, -100q$

(iv) $-p^2q^2, 12p^2q^2$ (v) $-12, 41$ (vi) $-5p^2, 701p^2$

(vii) $13p^2q, qp^2$

Exercise 12.2

Question 1:

Simplify combining like terms:

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

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

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

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

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

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

Answer 1:

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

$= 28b-20b-32 = 8b-32$

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

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

(iii) $p-(p-q)-q-(q-p)=p-p+q-q-q+p$

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

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

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

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

$= a-0-(-ab)$

$= a+ab$

(v)

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

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

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

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

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

$= 4y^2-3y-0 = 4y^2-3y$

Question 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 2:

(i) $3mn, -5mn, 8mn, -4mn = 3mn + (-5mn) + 8mn + (-4mn)$

$= (3 - 5 + 8 - 4)mn = 2mn$

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

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

$= (1 - 1)t + (-8 + 3)tz + (-1 + 1)z$

$= 0 - 5tz + 0 = -5tz$

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

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

$= (-7 + 12 + 9 - 2)mn + 7 - 11$

$= 12mn - 4$

(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)

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

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

$= 7x + 0y + 0xy + 5 = 7x + 5$

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

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

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

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

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

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

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

$= (3-10+7)p^2q^2+(-4+9)pq+20$

$= 0p^2q^2+5pq+20 = 5pq+20$

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

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

$= 0+0+0=0$

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

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

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

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

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

Question 3:

Subtract:

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

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

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

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

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

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

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

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

Answer 3:

(i) $y^2-\left(-5y^2\right) = y^2+5y^2$

$= 6y^2$

(ii) $-12xy-\left(6xy\right) = -12xy-6xy$

$= -18xy$

(iii) $\left(a+b\right)-\left(a-b\right) = a+b-a+b$

$= a-a+b+b$

$= 2b$

(iv) $b\left(5-a\right)-a\left(b-5\right)$

$= 5b-ab-ab+5a$

$= 5b-2ab+5a$

$= 5a+5b-2ab$

(v) $4m^2-3mn+8-\left(-m^2+5mn\right)$

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

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

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

(vi) $5x-10-\left(-x^2+10x-5\right)$

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

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

$= x^2-5x-5$

(vii) $3ab-2a^2-2b^2-\left(5a^2-7ab+5b^2\right)$

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

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

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

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

(viii) $5p^2+3q^2-pq-\left(4pq-5q^2-3p^2\right)$

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

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

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

Question 4:

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

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

Answer 4:

(a) Let p should be added.

Then according to question,

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

$\Rightarrow \quad p=2x^2+3xy-\left(x^2+xy+y^2\right)$

$\Rightarrow \quad p=2x^2+3xy-x^2-xy-y^2$

$\Rightarrow \quad p=2x^2-x^2-y^2+3xy-xy$

$\Rightarrow \quad p=x^2-y^2+2xy$

Hence, x^2-y^2+2xy should be added.

(b) Let q should be subtracted.

Then according to question,

$2a+8b+10-q=-3a+7b+16$

$\Rightarrow \quad -q=-3a+7b+16-\left(2a+8b+10\right)$

$\Rightarrow \quad -q=-3a+7b+16-2a-8b-10$

$\Rightarrow \quad -q=-3a-2a+7b-8b+16-10$

$\Rightarrow \quad -q=-5a-b+6$

$\Rightarrow \quad q=-\left(-5a-b+6\right)$

$\Rightarrow \quad q=5a+b-6$

Question 5:

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

Answer 5:

Let q should be subtracted.

Then according to question,

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

$\Rightarrow \quad q=3x^2-4y^2+5xy+20-\left(-x^2-y^2+6xy+20\right)$

$\Rightarrow \quad q=3x^2-4y^2+5xy+20+x^2+y^2-6xy-20$

$\Rightarrow \quad q=3x^2+x^2-4y^2+y^2+5xy-6xy+20-20$

$\Rightarrow \quad q=4x^2-3y^2-xy+0$

Hence, $4x^2-3y^2-xy$ should be subtracted.

Question 6:

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

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

Answer 6:

(a) According to question,

$$(3x - y + 11) + (-y - 11) - (3x - y - 11) = 3x - y + 11 - y - 11 - 3x + y + 11$$

$$= 3x - 3x - y - y + y + 11 - 11 + 11$$

$$= (3 - 3)x - (1 + 1 - 1)y + 11 + 11 - 11$$

$$= 0x - y + 11 = -y + 11$$

(b) According to question,

$$\left[(4 + 3x) + (5 - 4x + 2x^2)\right] - \left[(3x^2 - 5x) + (-x^2 + 2x + 5)\right]$$

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

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

$$= \left[2x^2 - x + 9\right] - \left[2x^2 - 3x + 5\right]$$

$$= 2x^2 - x + 9 - 2x^2 + 3x - 5$$

$$= 2x^2 - 2x^2 - x + 3x + 9 - 5$$

$$= 2x + 4$$

Exercise 12.3

Question 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 1:

(i) $m-2 = 2-2$ [Putting $m=2$]

$= 0$

(ii) $3m-5 = 3\times 2-5$ [Putting $m=2$]

$= 6 - 5 = 1$

(iii) $9-5m = 9 - 5 \text{ x } 2$ [Putting $m=2$]

$= 9 - 10 = -1$

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

$= 3(2)^2-2(2)-7$ [Putting $m=2$]

$= 3 \text{ x } 4 - 2 \text{ x } 2 - 7$

$= 12 - 4 - 7$

$= 12 - 11 = 1$

(v) $\frac{5m}{2}-4 = \frac{5\times 2}{2}-4$ [Putting $m=2$]

$= 5 - 4 = 1$

Question 2:

If $p = -2$, find the value of:

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

Answer 2:

(i) $4p+7 = 4(-2)+7$ [Putting $p=-2$]

$= -8+7 = -1$

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

$= -3(-2)^2+4(-2)+7$ [Putting $p=-2$]

$= -3\times 4-8+7$

$= -12-8+7$

$= -20+7 = -13$

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

$= -2(-2)^3-3(-2)^2+4(-2)+7$ [Putting $p=-2$]

$= -2\times(-8)-3\times4-8+7$

$= 16-12-8+7$

$= -20+23 = 3$

Question 3:

Find the value of the following expressions, when $x=-1$:

(i) $2x-7$ (ii) $-x+2$ (iii) x^2+2x+1

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

Answer 3:

(i) $2x-7 = 2(-1)-7$ [Putting $x=-1$]

$= -2-7 = -9$

(ii) $-x+2 = -(-1)+2$ [Putting $x=-1$]

$= 1 + 2 = 3$

(iii) $x^2+2x+1 = (-1)^2+2(-1)+1$ [Putting $x=-1$]

$= 1 - 2 + 1$

$= 2 - 2 = 0$

(iv) $2x^2-x-2 = 2(-1)^2-(-1)-2$ [Putting $x=-1$]

$= 2 \text{ x } 1 + 1 - 2$

$= 2 + 1 - 2$

$= 3 - 2 = 1$

Question 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 4:

(i) $a^2+b^2 = (2)^2+(-2)^2$ [Putting $a=2, b=-2$]

$= 4 + 4 = 8$

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

$= (2)^2+(2)(-2)+(-2)^2$ [Putting $a=2, b=-2$]

$= 4 - 4 + 4 = 4$

(iii) $a^2 - b^2 = (2)^2 - (-2)^2$ [Putting $a = 2, b = -2$]

$= 4 - 4 = 0$

Question 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 5:

(i) $2a + 2b = 2(0) + 2(-1)$ [Putting $a = 0, b = -1$]

$= 0 - 2 = -2$

(ii) $2a^2 + b^2 + 1 = 2(0)^2 + (-1)^2 + 1$ [Putting $a = 0, b = -1$]

$= 2 \times 0 + 1 + 1 = 0 + 2 = 2$

(iii) $2a^2b + 2ab^2 + ab = 2(0)^2(-1) + 2(0)(-1)^2 + (0)(-1)$ [Putting $a = 0, b = -1$]

$= 0 + 0 + 0 = 0$

(iv) $a^2 + ab + 2 = (0)^2 + (0)(-1) + 2$ [Putting $a = 0, b = -1$]

$= 0 + 0 + 2 = 2$

Question 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 6:

(i) $x + 7 + 4(x - 5) = x + 7 + 4x - 20 = x + 4x + 7 - 20$

$= 5x - 13 = 5 \times 2 - 13$ [Putting $x = 2$]

$= 10 - 13 = -3$

(ii) $3(x + 2) + 5x - 7 = 3x + 6 + 5x - 7 = 3x + 5x + 6 - 7$

$= 8x - 1 = 8 \times 2 - 1$ [Putting $x = -1$]

$= 16 - 1 = 15$

(iii) $6x + 5(x - 2) = 6x + 5x - 10 = 11x - 10$

$= 11 \times 2 - 10$ [Putting $x = -1$]

$= 22 - 10 = 12$

(iv) $4(2x-1)+3x+11 = 8x-4+3x+11 = 8x+3x-4+11$

$= 11x+7 = 11 \times 2 + 7$ [Putting $x=-1$]

$= 22 + 7 = 29$

Question 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 7:

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

$= 2\times3+4$ [Putting $x=3$]

$= 6 + 4 = 10$

(ii) $2-8x+4x+4 = -8x+4x+2+4 = -4x+6$

$= -4\times3+6$ [Putting $x=3$]

$= -12+6=-12$

(iii) $3a+5-8a+1 = 3a-8a+5+1 = -5a+6$

$= -5(-1)+6$ [Putting $a=-1$]

$= 5 + 6 = 11$

(iv) $10-3b-4-5b = -3b-5b+10-4 = -8b+6$

$= -8(-2)+6$ [Putting $b=-2$]

$= 16 + 6 = 22$

(v) $2a-2b-4-5+a = 2a+a-2b-4-5$

$= 3a-2b-9 = 3(-1)-2(-2)-9$ [Putting $a=-1$, $b=-2$]

$= -3+4-9 = -8$

Question 8:

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

(ii) If $p=-10$, find the value of $p^2-2p-100$.

Answer 8:

(i) $z^3-3(z-10) = (10)^3-3(10-10)$ [Putting $z=10$]

$= 1000 - 3 \times 0 = 1000 - 0$

$= 1000$

(ii) $p^2 - 2p - 100 = (-10)^2 - 2(-10) - 100$ [Putting $p = -10$]

$= 100 + 20 - 100 = 20$

Question 9:

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

Answer 9:

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

$\Rightarrow$ $2(0)^2 + 0 - a = 5$ [Putting $x = 0$]

$\Rightarrow$ $0 + 0 - a = 5$

$\Rightarrow$ $a = -5$

Hence, the value of a is -5.

Question 10:

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

Answer 10:

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

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

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

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

$\Rightarrow$ $2(5)^2 + (5)(-3) + 3$ [Putting $a = 5$, $b = -3$]

$\Rightarrow$ 2 x 25 – 15 + 3

$\Rightarrow$ 50 – 15 + 3

$\Rightarrow$ 38

Exercise 12.4

Question 1:

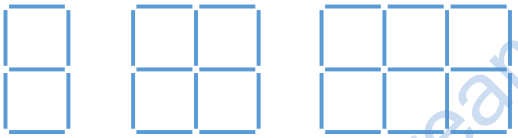
Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.

(a) 

6 11 16 21... $(5n+1)$...

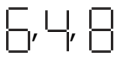
(b) 

4 7 10 13... $(3n+1)$...

(c) 

7 12 17 22... $(5n+2)$...

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 1:

S. No.	Symbol	Digit's number	Pattern's Formulae	No. of Segments
(i)		5	$5n+1$	26
		10		51
		100		501
(ii)		5	$3n+1$	16
		10		31
		100		301

(iii)		5	$5n+2$	27
		10		52
		100		502

(i) $5n+1$

Putting $n=5$, 5 x 5 + 1 = 25 + 1 = 26

Putting $n=10$, 5 x 10 + 1 = 50 + 1 = 51

Putting $n=100$, 5 x 100 + 1 = 500 + 1 = 501

(ii) $3n+1$

Putting $n=5$, 3 x 5 + 1 = 15 + 1 = 16

Putting $n=10$, 3 x 10 + 1 = 30 + 1 = 31

Putting $n=100$, 3 x 100 + 1 = 300 + 1 = 301

(iii) $5n+2$

Putting $n=5$, 5 x 5 + 2 = 25 + 2 = 27

Putting $n=10$, 5 x 10 + 2 = 50 + 2 = 52

Putting $n=100$, 5 x 100 + 2 = 500 + 2 = 502

Question 2:

Use the given algebraic expression to complete the table of number patterns:

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

Answer 2:

(i) $2n-1$

Putting $n=100$, 2 x 100 – 1 = 200 – 1 = 199

(ii) $3n+2$

Putting $n=5$, 3 x 5 + 2 = 15 + 2 = 17

	Putting	$n = 10,$	3 x 10 + 2 = 30 + 2 = 32
	Putting	$n = 100,$	3 x 100 + 2 = 300 + 2 = 302
(iii)	$4n+1$		
	Putting	$n = 5,$	4 x 5 + 1 = 20 + 1 = 21
	Putting	$n = 10,$	4 x 10 + 1 = 40 + 1 = 41
	Putting	$n = 100,$	4 x 100 + 1 = 400 + 1 = 401
(iv)	$7n+20$		
	Putting	$n = 5,$	7 x 5 + 20 = 25 + 20 = 55
	Putting	$n = 10,$	7 x 10 + 20 = 70 + 20 = 90
	Putting	$n = 100,$	7 x 100 + 20 = 700 + 20 = 720
(v)	n^2+1		
	Putting	$n = 5,$	5 x 5 + 1 = 25 + 1 = 26
	Putting	$n = 10,$	10 x 10 + 1 = 100 + 1 = 101
	Putting	$n = 100,$	100 x 100 + 1 = 10000 + 1 = 10001

Now complete table is,

S.No.	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
(i)	$2n-1$	1	3	5	7	9	---	19	---	**199**	---
(ii)	$3n+2$	2	5	8	11	**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	---