Algebraic Expressions: Exercise 12.1

Q.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 numbers y and z subtracted from 10.
(viii) Sum of numbers a and b subtracted from their product.
Sol:
(i) Given: Subtraction of z from y.
Algebraic expressions: $y - z$

(ii) Given: One-half of the sum of numbers x and y.
Algebraic expressions: $½(x + y) = (x + y)/2$

(iii) Given: The number z multiplied by itself.
Algebraic expressions: $z \times z = z^2$

(iv) Given: One-fourth of the product of numbers p and q.
Algebraic expressions: $¼ (p \times q) = (p \times q)/4$

(v) Given: Numbers x and y both squared and added.
Algebraic expressions: $x^2 + y^2$

(vi) Given: Number 5 added to three times the product of numbers m and n.
Algebraic expressions: $3mn + 5$

(vii) Given: Product of numbers y and z subtracted from 10.
Algebraic expressions: $10 - (y \times z) = 10 - yz$

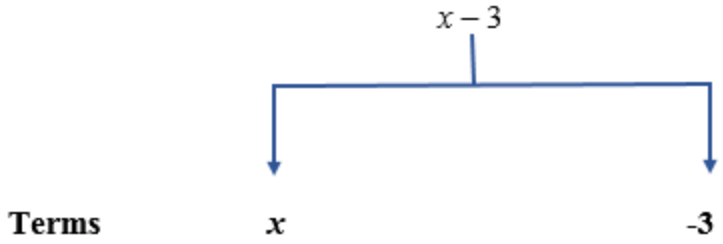
(viii) Given: Sum of numbers a and b subtracted from their product.
Algebraic expressions: $(a \times b) - (a + b) = ab - (a + b)$

Q.2 (i) 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) $-ab + 2b^2 - 3a^2$**
(ii) Identify 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) $1.2\,ab - 2.4\,b + 3.6\,a$**
(g) $\frac{3}{4}x + \frac{1}{4}$ **(h) $0.1\,p^2 + 0.2\,q^2$**

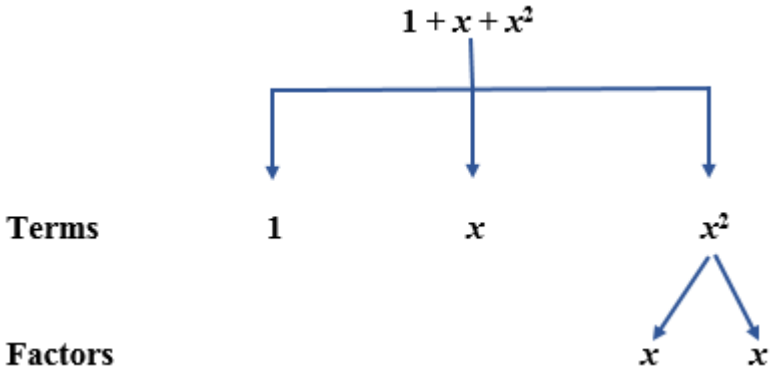
Sol:

(i)

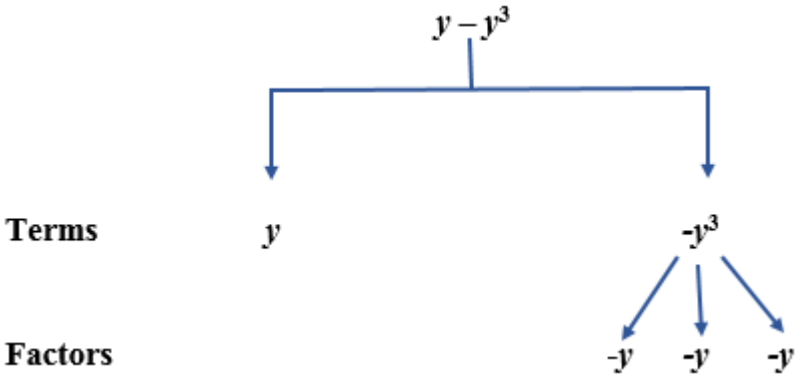
(a) Given expression: $x - 3$



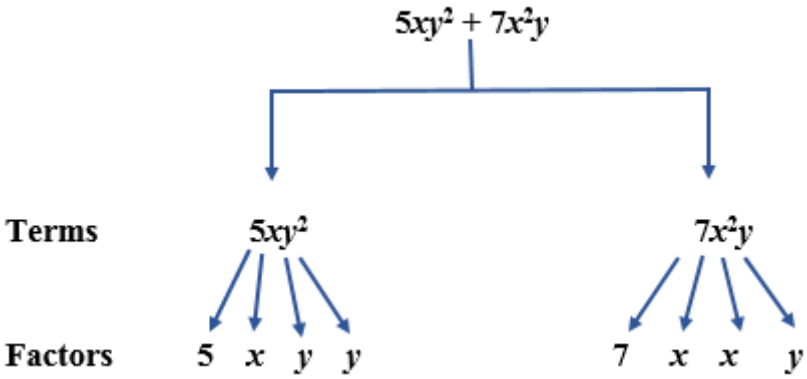
(b) Given Expression: $1 + x + x^2$



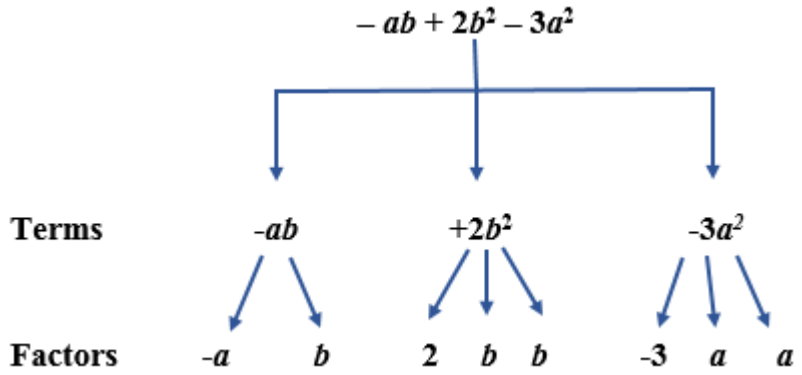
(c) Given Expression: $y - y^3$



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



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



(ii)
(a) Given Expression: $-4x + 5$
Terms: $-4x, +5$
Factors: $-4x$: $-4, x$ and $+5$: 5

(b) Given expression: $-4x + 5y$
Terms: $-4x, +5y$
Factors: $-4x$: $-4, x$ and $+5y$: $5, y$

(c) Given expression: $5y + 3y^2$
Terms: $5y, +3y^2$
Factors: $5y$: $5, y$ and $+3y^2$: $+3, y, y$

(d) Given expression: $xy + 2x^2y^2$
Terms: $xy, +2x^2y^2$
Factors: xy: x, y and $+2x^2y^2$: $2, x, x, y, y$

(e) Given expression: $pq + q$
Terms: $pq, +q$
Factors: pq : p, q and $+q$: q

(f) Given expression: $1.2\,ab - 2.4\,b + 3.6\,a$
Terms: $1.2\,ab, -2.4\,b, +3.6\,a$
Factors: $1.2\,ab$: $1.2, a, b$ and $-2.4\,b$: $-2.4, b$

(g) Given expression: $\frac{3}{4}x + \frac{1}{4}$
Terms: $\frac{3}{4}x, \frac{1}{4}$
Factors: $\frac{3}{4}x$: $\frac{3}{4}, x$ and $\frac{1}{4}$: $\frac{1}{4}$

(h) Given expression: $0.1\,p^2 + 0.2\,q^2$
Terms: $0.1\,p^2, +0.2\,q^2$
Factors: $0.1\,p^2$: $0.1, p, p$ and $+0.2, q, q$

Q.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)** $1.2\,a + 0.8\,b$
(vii) $3.14\,r^2$ **(viii)** $2\,(l + b)$ **(ix)** $0.1\,y + 0.01\,y^2$

Sol:
(i) Given expression: $5 - 3t^2$
Terms other than constant: $-3t^2$
Coefficients of terms: $-3t^2$: -3
(ii) Given expression: $1 + t + t^2 + t^3$
Terms other than constant: t, t^2, t^3
Coefficients of terms: t: 1, t^2:1 and t^3: 1

(iii) Given expression: $x + 2xy + 3y$
Terms other than constant: $x, 2xy, 3y$
Coefficients of terms: x: 1, $2xy$: 2 and $3y$: 3

(iv) Given expression: $100m + 1000n$
Terms other than constant: $100m, 1000n$
Coefficients of terms: $100m$: 100 and $1000n$:1000

(v) Given expression: $-p^2q^2 + 7pq$
Terms other than constant: $-p^2q^2, 7pq$
Coefficients of terms: $-p^2q^2$: -1 and $7pq$: 7

(vi) Given expression: $1.2a + 0.8b$
Terms other than constant: $1.2a, 0.8b$
Coefficients of terms: $1.2a$: 1.2 and $0.8b$: 0.8

(vii) Given expression: $3.14r^2$
Terms other than constant: $3.14r^2$
Coefficients of terms: $3.14r^2$: 3.14

(viii) Given expression: $2(l + b) = 2l + 2b$
Terms other than constant: $2l, 2b$
Coefficients of terms: $2l$: 2, $2b$: 2

(ix) Given expression: $0.1y + 0.01y^2$
Terms other than constant: $0.1y, 0.01y^2$
Coefficients of terms: $0.1y$: 0.1 and $0.01y^2$: 0.01

Q.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) $2x^2y - 15xy^2 + 7y^2$**
Sol:
(a)
(i) Given expression: $y^2x + y$
Terms contain x: y^2x
Coefficient of x: y^2

(ii) Given expression: $13y^2 - 8yx$
Terms contain x: $-8yx$
Coefficient of x: $-8y$

(iii) Given expression: $x + y + 2$

Terms contain x: x
Coefficient of x: 1

(iv) Given expression: $5 + z + zx$
Terms contain x: zx
Coefficient of x: z

(v) Given expression: $1 + x + xy$
Terms contain x: x, xy
Coefficient of x: x: 1 and xy: y

(vi) Given expression: $1 + x + xy$
Terms contain x: x, xy
Coefficient of x: x: 1 and xy: y

(vii) Given expression: $7x + xy^2$
Terms contain x: $7x, xy^2$
Coefficient of x: $7x$: 7 and xy^2: y^2

(b)
(i) Given expression: $8 - xy^2$
Terms contain y^2: $- xy^2$
Coefficient of y^2: $-x$

(ii) Given expression: $5y^2 + 7x$
Terms contain y^2: $5y^2$
Coefficient of y^2: 5

(iii) Given expression: $2x^2y - 15xy^2 + 7y^2$
Terms contain y^2: $- 15xy^2, 7y^2$
Coefficient of y^2: $- 15xy^2$: $- 15x^2$ and $7y2$: 7

Q.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) $1+x+x^2$**

Sol: Classification of monomials, binomials and trinomials terms:
(i) Given expression: $4y - 7z$
Number of terms: 2
Given expression is Binomial.

(ii) Given expression: y^2
Number of terms: 1
Given expression is Monomial.

(iii) Given expression: $x + y - xy$
Number of terms: 3
Given expression is Trinomial.

(iv) Given expression: 100
Number of terms: 1
Given expression is Monomial.

(v) Given expression: $ab - a - b$
Number of terms: 3

Given expression is Trinomial.

(vi) Given expression: $5 - 3t$
Number of terms: 2
Given expression is Binomial.

(vii) Given expression: $4p^2q - 4pq^2$
Number of terms: 2
Given expression is Binomial.

(viii) Given expression: $7mn$
Number of terms: 1
Given expression is Monomial.

(ix) Given expression: $z^2 - 3z + 8$
Number of terms: 3
Given expression is Trinomial.

(x) Given expression: $a^2 + b^2$
Number of terms: 2
Given expression is Binomial.

(xi) Given expression: $z^2 + z$
Number of terms: 2
Given expression is Binomial.

(xii) Given expression: $1 + x + x^2$
Number of terms: 3
Given expression is Trinomial.

Q.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)** $12xz, 12x^2z^2$

Sol:

(i) Given expression: 1, 100
Since, given expression have the same algebraic factors, so they are like terms.

(ii) Given expression: $-7x, \frac{5}{2}x$
Since, given expression have the same algebraic factors, so they are like terms.

(iii) Given expression: $-29x, -29y$
Since, given expression have different algebraic factors, so they are unlike terms.

(iv) Given expression: $14xy, 42yx$
Since, given expression have the same algebraic factors, so they are like terms.

(v) Given expression: $4m^2p, 4mp^2$
Since, given expression have different algebraic factors, so they are unlike terms.

(vi) Given expression: $12xz, 12x^2z^2$
Since, given expression have different algebraic factors, so they are unlike terms.

Q.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) $10pq, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$
Sol:
(a) Given expressions: $-xy^2, -4yx^2, 8x^2, 2xy^2, 7y, -11x^2, -100x, -11yx, 20x^2y, -6x^2, y, 2xy, 3x$
Since, if expressions have the same algebraic factors, then they are like terms.
Like terms:

(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) Given expressions: $10pq, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$
Since, if expressions have the same algebraic factors, then they are like terms.
Like terms:

(i) $10pq, -7qp, 78qp$

(ii) $7p, 2405p$

(iii) $8q, -100q$

(iv) $-p^2q^2, 12q^2p^2$

(v) $-23, 41$

(vi) $-5p^2, 701p^2$

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