Algebraic Expression

1. Write the following using literals, numbers and signs of basic operations.
(a) x increased by 12
(b) y decreased by 7
(c) The difference of a and b. when a > b
(d) 5 times x added to 7 times y
(e) Sum of x and the quotient of y by 5
(f) x taken away from 4
(g) 2 less than the quotient of x by y
(h) x multiplied by itself
(i) Twice x increased by y
(j) Thrice x added to y squared
(k) x cubed less than y cubed

2. Write the following in the exponential form:
(a) b × b × b × ...15 times
(b) y × y × y × ...20 times
(c) 14 × a × a × a × a × b × b × b
(d) 6 × x × x × y × y
(e) 3 × z × z × z × y × y × x

3. Write down the following in the product form:
(a) x^2y^4 (b) $6y^5$ (c) $9xy^2z$ (d) $10a^3b^3c^3$

4. If a = 2 and b = 3. find the value of
(a) a + b (b) a^2 + ab (c) ab - a^2
(d) 2a - 3b (e) $5a^2$ - 2ab (f) a^3 - b^3

5. If x = 1, y = 2 and z = 5, find the value of
(a) 3x - 2y + 4z (b) $x^2 + y^2 + z^2$
(c) $2x^2 - 3y^2 + z^2$ (d) xy + yz - zx
(e) $2x^2y - 5yz + xy^2$ (f) $x^3 - y^3 - z^3$

6. If p = -2, q = -1 and r = 3, find the value of
(a) $p^2 + q^2 - r^2$ (b) $2p^2 - q^2 + 3r$
(c) p - q - r (d) $p^3 + q^3 + r^3 + 3pqr$
(e) $p^4 + q^4 - r^4$ (f) $3p^2q + 5pq^2 + 2pqr$

7. Write the coefficient of
(a) x in 13x (b) y in -5y (c) y^2 in $8xy^2z$
(d) z in -7xz (e) p in -2pqr (f) a in 6ab
(g) x^3 in x^3 (h) x^2 in $-x^2$

8. Write die numerical coefficient of
(a) ab (b) -6bc (c) 7xyz (d) $-2x^3y^2z$

9. Write the constant term of
(a) $3x^2 + 5x + 8$ (b) $2x^2 - 9$
(c) $4y^2 - 5y + \frac{3}{5}$ (d) $z^3 - 2z^2 + z - \frac{8}{3}$

10. Identify the monomials, binomials and trinomials in the following:
(a) -2xyz (b) $5 + 7x^3y^3z^3$ (c) $-5x^3$
(d) a + b - 2c (e) xy + yz - zx (f) x^5
(g) 2x + 1 (h) -14
(i) $ax^3 + bx^3 + cx + d$

11. Write all the terms of the algebraic expressions:
(a) $4x^5 - 6y^4 + 7x^2y - 9$ (b) $9x^3 - 5z^4 + 7x^3y - xyz$

12. Identify the like terms in the following:
(a) a^2, b^2, $-2a^2$, c^2 , 4a
(b) 3x, 4xy, -yz, -zy, $\frac{1}{2}$zy
(c) $-2xy^2$, x^2y, $5y^2x$, x^2z
(d) abc, ab^2c, acb^2, c^2ab, b^2ac, a^2bc, cab^2

Add:

13. (a) 3x, 7x (b) 7y, -9y
(c) 2xy 5xy, -xy (d) 3x, 2y
(e) $2x^2$, $3x^2$, $7x^2$ (f) $6a^3$, $-4a^3$, $10a^3$, $-8a^3$
(g) 7xyz, -5xyz, 9xyz, - 8xyz
(h) x^2 -a^2, - $5x^2 + 2a^2$, - $4x^2 + 4a^2$

14. (a) x - 3y - 2z, 5x + 7y - z and -7x - 2y + 4z
(b) m^2 - 4m + 5, $-2m^2$ + 6m - 6 and $-m^2$ - 2m - 7
(c) $2x^2$ - 3xy + y^2, $-7x^2$ - 5xy - $2y^2$ and $4x^2$ + xy - $6y^2$
(d) 4xy - 5yz - 7zx, -5xy + 2yz + zx and -2xy - 3yz + 3zx

15. (a) 3a - 2b + 5c, 2a + 5b - 7c, - a - b + c
(b) 8a - 6ab + 5b, 6a - ab - 8b, - 4a + 2ab + 3b
(c) $2x^3 - 3x^2 + 7x - 8$, $- 5x^3 + 2x^2 - 4x + 1$, $3 - 6x + 5x^2 - x^3$
(d) $2x^2 - 8xy + 7y^2$ - $8xy^2$, $2xy^2 + 6xy - y^2 + 3x^2$, $4y^2 - xy - x^2 + xy^2$
(e) $x^3 + y^3 - Z^3 + 3xyz$, $- x^3 + y^3 + z^3 - 6xyz$, $x^3 - y^3 - z$
(f) $2 + x - x^2 + 6x^3$, $- 6 - 2x + 4x^2 - 3x^3$, $2 + x^2$, $3 - x^3 + 4x - 2x$

Subtract:

14. (a) 5x from 2x (b) -xy from 6xy
(c) 3a from 5b (d) -7x from 9y
(e) $10x^2$ from $-7x^2$ (f) $a^2 - b^2$ from $b^2 - a^2$

15. (a) 5a + 7b - 2c from 3a - 7b + 4c
(b) a - 2b - 3c from -2a + 5b - 4c
(c) $5x^2 - 3xy + y^2$ from $7x^2 - 2xy - 4y^2$
(d) $6x^3 - 7x^2 + 5x - 3$ from $4 - 5x + 6x^2 - 8x^3$
(e) $x^3 + 2x^2y + 6xy^2 - y^3$ from $y^3 - 3xy^2$
(f) $-11x^2y^2 + 7xy - 6$ from $9x^2y^2 - 6xy + 9$
(g) -2a + b + 6d from 5a - 2b - 3c

Simplify:

15. (a) $2p^3 - 3p^2 + 4p^5 - 6p^3 + 2p^2 - 8p - 2 + 6p + 8$
(b) $2x^2 - xy + 6x - 4y + 5xy - 4x + 6x + 3y$
(c) $x^4 - 6x^3 + 2x - 7 + 7x^3 - x + 5x^2 + 2 - x^4$

16. (a) a - (b - 2a) (b) 4x - (3y - x + 2z)

17. (a) $(a^2 + b^2 + 2ab) - (a^2 + b^2 - 2ab)$
(b) -3(a + b) + 4(2a - 3b) - (2a - b)
(c) $-4x^2 + \{(2x^2 - 3) - (4 - 3x^2)\}$
(d) $-2(x^2 - y^2 + xy) - 3(x^2 + y^2 - xy)$
(e) a - [2b - {3a - (2b - 3c)}]
(f) - x + [5y - {x - (5y - 2x)}]
(g) 86 - [15x - 7(6x - 9) - 2{10x - 5(2 - 3x)}]
(h) 12x - [$3x^2 + 5x^2$ - {$7x^2$ - (4 - 3x - x^3) + $6x^3$} - 3x]
(i) 5a - [a^2 - {2a(1 - a + $4a^2$)- 3a(a^2 - $5a^3$)}] - 8a
(j) 3 - [x - {2y -(5x + y - 3) + $2x^2$} -(x^2 - 3y)]
(k) xy - [yz - zx - {yx -(3y - xz)-(xy - zy)}]
(l) 2a - 3b - [3a - 2b - {a - c - (a - 2b)}]
(m) -a - [a + {a + b - 2a - (a - 2b)} - b]

Simple Equations

1. Write each of the following statements as an equation:
(a) 5 times a number equals 40.
(b) A number Increased by 8 equals 15.
(c) 25 exceeds a number by 7.
(d) 5 subtracted from thrice a number is 16.

2. Write a statement for each of the equations, given below:
(a) x - 7 = 14 (b) 2y = 18 (c) 11 + 3x = 17
(d) 2x - 3 = 13 (e) 12y - 30 = 6 (f) $\frac{2z}{3} = 8$

3. Verify by substitution that
(a) the root of 3x - 5 = 7 is x = 4
(b) the root of 3 + 2x = 9 is x = 3

4. Solve each of the following equations by the trial-and-error method:
(a) y + 9 = 13 (b) x - 7 = 10 (c) 4x = 28
(d) 3y = 36 (e) 11 + x = 19 (f) $\frac{x}{3} = 4$
(g) 2x - 3 = 9 (h) $\frac{1}{2}x + 7 = 11$ (i) 2y + 4 = 3y

Solve each, of the following equations and. verify the answer in each case:

5. (a) x – 1 = 0 (b) x + 1 = 0 (c) x – 1 = 5
(d) x + 6 = 2 (e) y – 4 = –7 (f) y – 4 = 4
(g) y + 4 = 4 (h) y + 4 = –4 (i) x + 5 = 12

6. (a) 3l = 42 (b) $\frac{b}{2} = 6$ (c) $\frac{p}{7} = 4$
(d) 4x = 25 (e) 8y = 36 (f) $\frac{z}{3} = \frac{5}{4}$
(g) $\frac{a}{5} = \frac{7}{15}$ (h) 20t = –10

7. (a) 3n – 2 = 46 (b) 5m + 7 = 17 (c) $\frac{20p}{3} = 40$
(d) $\frac{3p}{10} = 6$ (e) 10p + 10 = 100

8. (a) 10p = 100 (b) $\frac{p}{4} = 5$ (c) $\frac{-p}{3} = 5$
(d) $\frac{3p}{4} = 6$ (e) 3s = –9 (f) 3s + 12 = 0
(g) 3s = 0 (h) 2q = 6 (i) 2q – 6 = 0
(j) 2q + 6 = 0 (k) 2q + 6 = 12

9. (a) $2y + \frac{5}{2} = \frac{37}{2}$ (b) 5t + 28 = 10
(c) $\frac{a}{5} + 3 = 2$ (d) $\frac{q}{4} + 7 = 5$
(e) $\frac{5}{2}x = 10$ (f) $\frac{5}{2}x = \frac{52}{4}$
(g) $7m + \frac{19}{2} = 13$ (h) 6z + 10 = –2
(i) $\frac{3l}{2} = \frac{2}{3}$ (j) $\frac{2b}{3} - 5 = 3$

10. (a) 2(x + 4) = 12 (b) 3(n – 5) = 21
(c) 3(n – 5) = – 21 (d) – 4(2 + x) = 8
(e) 4(2 – x) = 8

11. (a) 4 = 5(p – 2) (b) – 4 = 5(p – 2)
(c) 16 = 4 + 3(t + 2) (d) 4 + 5(p – 1) = 34
(e) 0 = 16 + 4(m – 6)

Exponents and Powers

1. Find the value of:
(a) 2^6 (b) 9^3 (c) 11^2 (d) 5^4

2. Express the following in exponential form:
(a) 6 × 6 × 6 × 6 (b) t × t
(c) b × b × b × b (d) 5 × 5 × 7 × 7 × 7
(e) 2 × 2 × a × a
(f) a × a × a × c × c × c × c × d

3. Express each of the following numbers using exponential notation:
(a) 512 (b) 343 (c) 729 (d) 3125

4. Identify the greater number, wherever possible, in each of the following?
(a) 4^3 या 3^4 (b) 5^3 या 3^5 (c) 2^8 या 8^2 (d) 2^3 या 2^2

5. Express each of the following as product of powers of their prime factors:
(a) 648 (b) 405 (c) 540 (d) 3600

Simplify:

6. (a) 2×10^3 (b) 72×2^2 (c) $2^3 \times 5$ (d) 3×4^4
(e) 0×10^2 (f) $5^2 \times 3^3$ (g) $2^4 \times 3^2$ (h) $3^2 \times 10^4$

7. (a) $(-4)^3$ (b) $(-3) \times (-2)^3$ (c) $(-3)^2 \times (-5)^2$

Using laws of exponents, simplify and write the answer in exponential form:

9. (a) $2^5 \times 2^3$ (b) $p^3 \times p^2$ (c) $4^3 \times 4^2$
(d) $a^3 \times a^2 \times a^7$ (e) $5^3 \times 5^7 \times 5^{12}$ (f) $(-4)^{10} \times (-4)^{20}$

10. (a) $2^9 \div 2^3$ (b) $10^8 \div 10^4$ (c) $20^{15} \div 20^{13}$
(d) $9^{11} \div 9^7$ (e) $7^{13} \div 7^{10}$ (f) $11^6 \div 11^2$

11. (a) $(6^2)^4$ (b) $(2^2)^{100}$ (c) $(7^{50})^2$ (d) $(5^3)^7$

12. (a) $4^3 \times 2^3$ (b) $2^5 \times b^5$ (c) $a^2 \times t^2$
(d) $5^6 \times (-2)^6$ (e) $(-2)^4 \times (-3)^4$ (f) $a^m \times b^m$

13. (a) $4^5 \div 3^5$ (b) $2^5 \div b^5$ (c) $(-2)^5 \div b^3$ (d) $5^6 \div (-2)^6$

14. (a) 8^0 (b) $(-3)^0$ (c) $4^0 + 5^0$ (d) 6^0 × 7^0

15. (a) $(4)^{-1}$ (b) $(-6)^{-1}$ (c) $\left(\frac{1}{3}\right)^{-1}$ (d) $\left(\frac{-2}{3}\right)^{-1}$

16. (a) $3^2 \times 3^4 \times 3^8$ (b) $6^{15} \div 6^{10}$ (c) $a^3 \times a^2$
(d) $7^x \times 7^2$ (e) $(5^2)^3 \div 5^3$ (f) $2^5 \times 5^5$
(g) $a^4 \times b^4$ (h) $(3^4)^3$ (i) $8^t \div 8^2$

17. Express each of the following as a product of prime factors only in exponential form:
(a) 108 × 192 (b) 270 (c) 729 × 64 (d) 768

18. Write the following numbers in the expanded forms:
279404, 3006194, 2806196, 120719, 20068

19. Find the number from each of the following expanded forms:
(a) $8 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$
(b) $4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$
(c) $3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0$
(d) $9 \times 10^5 + 2 \times 10^2 + 3 \times 10^1$

20. Express the following numbers in standard form:
(a) 5,00,00,000 (b) 70,00,000 (c) 3,18,65,00,000
(d) 3,90,878 (e) 39087.8 (f) 3908.78

21. Expregs each of the following numbers in standard form:
(a) Diameter of Earth = 12756000 m.
(b) Distance between Earth and Moon = 384000000 m.
(c) Population of India in March 2001 = 1027000000.
(d) Number of stars in a galaxy = 100000000000.
(e) The present age of universe = 12000000000 years.