

# LEVEL 1 — ALGEBRA

| Note: Only turn back to page number if you have difficulty   | Page   |
|--|--------|
| Q1. (a) A car travels $y$ km/h for $x$ hours. How far does it travel?<br>(b) Two angles of a triangle are $x^\circ$ and $y^\circ$ . What is the size of the third angle?<br>(c) Three people have \$ $x$ , \$ $y$ and \$ $z$ respectively. What is their average wealth? | 1      |
| Q2. If $p = 6$ , $q = 2$ , $r = 4$ and $s = 3$ , find:<br>(a) $ps + qr$ (b) $pqrs$ (c) $\sqrt{2p+r}$<br>(d) $2(p+q) - r^2$ (e) $5r + 2q - 3s$ (f) $\frac{1}{2}pq + \frac{1}{3}rs$  | 2      |
| Q3. Simplify:<br>(a) $5x + 3x^2 - 2x + 6x^2$ (b) $p^2 + 2p - 5 - 6p + 3p^2$<br>(c) $6xy - 5x + 4y - 3xy$ (d) $x^2 + 3y + 3xy - x^2 + 5xy$  | 3      |
| Q4. Simplify:<br>(a) $5a \times b \times 3c$ (b) $6p \times 4q \times \frac{1}{2}p$ (c) $3xy \times -5x$<br>(d) $16mn \div 2n$ (e) $4x^2y \div 2x$ (f) $24abc \div 2ac$  | 4      |
| Q5. Simplify:<br>(a) $\frac{m}{2} + \frac{m}{4}$ (b) $\frac{x}{3} - \frac{x}{4}$ (c) $\frac{2a}{5} + \frac{a}{2}$<br>(d) $\frac{a}{x} + \frac{b}{x}$ (e) $\frac{3x}{2} - \frac{2y}{3}$ (f) $\frac{m}{3} - \frac{2m}{7}$  | 5      |
| Q6. Simplify:<br>(a) $\frac{x}{2} \times \frac{x}{4}$ (b) $\frac{5}{a} \times \frac{b}{10}$ (c) $\frac{4}{m} \times \frac{3}{2n}$<br>(d) $\frac{a}{3} \div \frac{a}{4}$ (e) $\frac{2x}{3} \div \frac{x}{6}$ (f) $\frac{4}{m} \div \frac{3n}{m}$                          | 6, 7   |
| Q7. Expand the following:<br>(a) $5(x + 2)$ (b) $3(2a - 1)$ (c) $2y(y + 3)$<br>(d) $4(3 - x)$ (e) $-2(m + n)$ (f) $b(2 - 3b)$  | 8, 9   |
| Q8. Expand these binomial products:<br>(a) $(x + 2)(x + 1)$ (b) $(x - 1)(x - 3)$ (c) $(m + 3)(m - 4)$<br>(d) $(a + 3)(b - 2)$ (e) $(m - 9)(n + 2)$ (f) $(b - 2)(a + 2)$  | 10, 11 |

## LEVEL 2 — ALGEBRA

Note: Only turn back to page number if you have difficulty

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|   |   |                                  |
|---|---|----------------------------------|
| Q1. Write the simplest algebraic expressions for each of the following: | 1   |                                  |
| (a) The perimeter of a square with side $x$ cm.                         |   |                                  |
| (b) The perimeter of a rectangle with sides $x + 3$ and $x + 4$ .       |   |                                  |
| (c) The area of a square with side $x - 1$ .                            |   |                                  |
| (d) The area of a rectangle with sides $x + 6$ and $x - 3$ .            |   |                                  |
| Q2. If $x = 3$ , $y = -4$ and $z = 6$ , find:                           | 2   |                                  |
| (a) $z^2 - (x^2 + y^2)$   | (b) $(x + y)^2 + (y + z)^2$                                 | (c) $2xy(x - y + z)$             |
| (d) $\frac{xy}{z}$  | (e) $\frac{x}{2} + \frac{yz}{3}$                            | (f) $\sqrt[3]{\frac{xy^2}{z}}$   |
| Q3. Simplify:   | 3, 4  |                                  |
| (a) $-2xy + 5y \times 3x + 6x - y$                                      | (b) $-3mn \div 2m + 4n - m$                                 |                                  |
| (c) $2a + 15a^2b \div 3ab - 2ab$  | (d) $8x^2 \times (-3xy^2) \div (-6xy)$                      |                                  |
| Q4. Simplify:   | 5 - 7   |                                  |
| (a) $\frac{4y}{3x} + \frac{3y}{4x} - \frac{y}{x}$                       | (b) $\frac{4n}{5m} + \frac{3n}{2m} - \frac{2n}{m}$          |                                  |
| (c) $\left(\frac{3}{8y} + \frac{5}{6x}\right) \div \frac{5}{12xy}$      | (d) $\frac{2a}{5b} \times \frac{3a}{5b} \div \frac{5a}{4b}$ |                                  |
| Q5. Expand and simplify:  | 8, 9  |                                  |
| (a) $3x(2x + 5) + 4x$   | (b) $-x(2 - x) + x$   | (c) $\frac{1}{2}(4x - 3) - 5x$   |
| (d) $-\frac{3}{4}(3x + 2) - 2$  | (e) $2x\left(\frac{2x + 1}{3}\right)$                       | (f) $-(6x - 5) - (2x - 3)$       |
| Q6. Expand and simplify:  | 10, 11  |                                  |
| (a) $(2x + 3)(x - 4)$   | (b) $(3x - 2)(2x + 3)$                                      | (c) $(4x - 5)(2x - 3)$           |
| (d) $(4 - x)(3x + 2)$   | (e) $2(2x + 1)(x - 2)$                                      | (f) $\frac{1}{2}(2x + 6)(x - 4)$ |
| Q7. Expand and simplify:  | 12, 13  |                                  |
| (a) $(x + 4)^2$   | (b) $(x - 1)(x + 1)$  | (c) $(m + n)(n - m)$             |
| (d) $(4x + 3)(4x - 3)$  | (e) $(2x - 1)^2$  | (f) $(3x + 2)^2$                 |
| (g) $(x^2 + 4)^2$   | (h) $5x(6x + 1)^2$  | (i) $\frac{1}{2}x(2x - 4)^2$     |

### LEVEL 3 — ALGEBRA

- Q1. (a) If  $x$  apples cost a total of  $\$y$ , what is the cost of  $z$  apples?  
(b) The price of bricks increases from  $\$x/\text{tonne}$  to  $\$y/\text{tonne}$ . Before the price rise, the cost of bricks for an average house was  $\$H$ . What is the new cost of bricks for an average house?  
(c)  $\$A$  is divided in the ratio  $x : y$ . What is the difference, in dollars, between the two amounts if  $x > y$ ?

Q2. If  $x = \frac{1}{2}$ ,  $y = \frac{2}{3}$  and  $z = \frac{3}{4}$ , evaluate:

(a)  $\frac{x}{y} + z$                       (b)  $\sqrt{\frac{xy}{z}}$                       (c)  $\frac{x^2}{z} \cdot \frac{2}{y}$

- Q3. Simplify:                      (a)  $x + \frac{1}{x}$                       (b)  $\frac{5x}{7} - x$   
(c)  $\frac{4}{x^2} + \frac{2}{x}$                       (d)  $\left(\frac{1}{x} + \frac{1}{y}\right) \div (x + y)$

Q4. Expand and simplify:

- (a)  $x(x + y) + y(x - y)$                       (b)  $x(x + 1)(x + 2)$   
(c)  $(2x - 3)^2 - (x - 3)^2$                       (d)  $\frac{1}{2}(x + 3) + \frac{1}{3}(x + 2)$   
(e)  $(2x - 3y)(2x + 3y)$                       (f)  $-(2x - 1)^2$

Q5. Simplify:

- (a)  $(3x + 2)(3x - 2) + (x - 1)^2 - (x + 1)^2$   
(b)  $(5x - 3)^2 - (x + 3)^2 + (2x - 1)(2x + 1)$   
(c)  $5x^2 - 4x(3x - 2) - (4x - 1)^2 + (2x + 1)^2$   
(d)  $(x + 1)^2 - (x + 2)^2 + (x - 3)^2 + (x + 4)^2 - x^2$

- Q6. Simplify:                      (a)  $\frac{(x - 3)^2}{(x + 3)^2} - \frac{(x + 2)^2}{(x + 3)^2}$   
(b)  $\frac{3(x - 1)}{x + 1} + \frac{2(x + 1)}{x - 1}$

## Level 1 — Algebra

- Q1. (a)  $xy \text{ km}$  (b)  $(180 - x - y)^\circ$  (c)  $\frac{\$(x + y + z)}{3}$
- Q2. (a) 26 (b) 144 (c) 4 (d) 0 (e) 15 (f) 10
- Q3. (a)  $3x + 9x^2$  (b)  $4p^2 - 4p - 5$  (c)  $3xy - 5x + 4y$  (d)  $3y + 8xy$
- Q4. (a)  $15abc$  (b)  $12p^2q$  (c)  $-15x^2y$  (d)  $8m$  (e)  $2xy$  (f)  $12b$
- Q5. (a)  $\frac{3m}{4}$  (b)  $\frac{x}{12}$  (c)  $\frac{9a}{10}$  (d)  $\frac{a+b}{x}$  (e)  $\frac{9x-4y}{6}$  (f)  $\frac{m}{21}$
- Q6. (a)  $\frac{x^2}{8}$  (b)  $\frac{b}{2a}$  (c)  $\frac{6}{mn}$  (d)  $1\frac{1}{3}$  (e) 4 (f)  $\frac{4}{3n}$
- Q7. (a)  $5x + 10$  (b)  $6a - 3$  (c)  $2y^2 + 6y$  (d)  $12 - 4x$  (e)  $-2m - 2n$  (f)  $2b - 3b^2$
- Q8. (a)  $x^2 + 3x + 2$  (b)  $x^2 - 4x + 3$  (c)  $m^2 - m - 12$   
 (d)  $ab - 2a + 3b - 6$  (e)  $mn + 2m - 9n - 18$  (f)  $ab + 2b - 2a - 4$

## Level 2 — Algebra

- Q1. (a)  $4x \text{ cm}$  (b)  $(4x + 14) \text{ units}$  (c)  $(x^2 - 2x + 1) \text{ units}^2$  (d)  $(x^2 + 3x - 18) \text{ units}^2$
- Q2. (a) 11 (b) 5 (c) -312 (d) -2 (e)  $-6\frac{1}{2}$  (f) 2
- Q3. (a)  $13xy + 6x - y$  (b)  $\frac{5n}{2} - m$  (c)  $7a - 2ab$  (d)  $4x^2y$
- Q4. (a)  $\frac{13y}{12x}$  (b)  $\frac{3n}{10m}$  (c)  $\frac{9x+20y}{10}$  (d)  $\frac{24a}{125b}$
- Q5. (a)  $6x^2 + 19x$  (b)  $x^2 - x$  (c)  $-3x - \frac{3}{2}$  (d)  $-\frac{9x}{4} - \frac{7}{2}$  (e)  $\frac{4x^2}{3} + \frac{2x}{3}$  (f)  $8 - 8x$
- Q6. (a)  $2x^2 - 5x - 12$  (b)  $6x^2 + 5x - 6$  (c)  $8x^2 - 22x + 15$   
 (d)  $-3x^2 + 10x + 8$  (e)  $4x^2 - 6x - 4$  (f)  $x^2 + 7x + 12$
- Q7. (a)  $x^2 + 8x + 16$  (b)  $x^2 - 1$  (c)  $n^2 - m^2$   
 (d)  $16x^2 - 9$  (e)  $4x^2 - 4x + 1$  (f)  $9x^2 + 12x + 4$   
 (g)  $x^4 + 8x^2 + 16$  (h)  $180x^3 + 60x^2 + 5x$  (i)  $2x^3 - 8x^2 + 8x$

## Level 3 — Algebra

- Q1. (a)  $\$(\frac{zy}{x})$  (b)  $\$(\frac{Hy}{x})$  (c)  $\frac{A(x-y)}{x+y}$
- Q2. (a)  $1\frac{1}{2}$  (b)  $\frac{2}{3}$  (c) 1
- Q3. (a)  $\frac{x^2+1}{x}$  (b)  $-\frac{2x}{7}$  (c)  $\frac{4+2x}{x^2}$  (d)  $\frac{1}{xy}$
- Q4. (a)  $x^2 + 2xy - y^2$  (b)  $x^3 + 3x^2 + 2x$  (c)  $3x^2 - 6x$  (d)  $\frac{5x+13}{6}$   
 (e)  $4x^2 - 9y^2$  (f)  $-4x^2 + 4x - 1$
- Q5. (a)  $9x^2 - 4x - 4$  (b)  $28x^2 - 36x - 1$  (c)  $-19x^2 + 20x$  (d)  $x^2 + 22$
- Q6. (a)  $\frac{5-10x}{(x+3)^2}$  (b)  $\frac{5x^2-2x+5}{x^2-1}$