LEVEL 1 — FURTHER ALGEBRA AND FACTORISATION

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

Q1. Factorise the following expressions: 123

    (a) $6x + 24$ (b) $5 - 15x$ (c) $18x + 30y$

    (d) $4x + 6x^2$ (e) $9p - 15pq$ (f) $14xy - 8xy^2$

Q2. Factorise these: 123

    (a) $x^2 - 16$ (b) $4x^2 - y^2$ (c) $49 - 25m^2$

    (d) $9a^2 - 4b^2$ (e) $m^2n^2 - 36$ (f) $2x^2 - 2$

Q3. Factorise these trinomials: 124

    (a) $x^2 + 7x + 12$ (b) $x^2 - 3x - 10$ (c) $m^2 - 11m + 28$

    (d) $b^2 - 5b - 24$ (e) $3a^2 + 15a - 18$ (f) $2x^2 + 10x - 72$

Q4. Factorise the following four term expressions: 125

    (a) $ab - ac + b^2 - bc$ (b) $3xz + x + 6yz + 2y$

    (c) $12n + 6m - 2mn - m^2$ (d) $x^2 + xy - 3x - 3y$

    (e) $6ab + bc + 3b^2 + 2ac$ (f) $5xy - y^2 - 25x + 5y$

Q5. Factorise these: 126, 127

    (a) $2x^2 - 9x - 5$ (b) $3x^2 - 10x + 3$ (c) $5x^2 + 22x + 8$

    (d) $6x^2 + 5x - 6$ (e) $12x^2 - 19x + 4$ (f) $16x^2 + 16x - 5$

Q6. Simplify the following expressions: 128

    (a) $\dfrac{x^2 - 4x}{x^2 - 16}$ (b) $\dfrac{6x - 3}{10x - 5}$ (c) $\dfrac{xy + 2x - y^2 - 2y}{x^2 + 2x - xy - 2y}$

    (d) $\dfrac{x^2 + x - 6}{x^2 - 4x + 4}$ (e) $\dfrac{3x^2 - 8x - 3}{3x^3 + x^2}$ (f) $\dfrac{4x^2 - 4}{3x^2 - 9x - 12}$

Q7. Simplify: 129

    (a) $\dfrac{x + 5}{x^2 - 4x - 5} \cdot \dfrac{x^2 - 5x}{x^2 + 10x + 25}$ (b) $\dfrac{2x + 1}{2x^2 - 3x - 9} \div \dfrac{10x - 5}{2x^2 - 12x - 18}$

    (c) $\dfrac{a^2 - 36}{a^2 - 4a - 12} \cdot \dfrac{2a - 12}{3a + 18}$

Q8. Simplify: 130

    (a) $\dfrac{1}{2x - 1} - \dfrac{1}{2x + 1}$ (b) $\dfrac{x}{x + 2} - \dfrac{8}{x^2 - 4}$ (c) $\dfrac{6x}{x^2 + x - 6} + \dfrac{3x}{x - 2}$

LEVEL.2 — FURTHER ALGEBRA AND FACTORISATION

Q1. Factorise each of the following:

(a) $x^2 + yz - xy - xz$ (b) $32x^2 - 2$ (c) $12 + x - x^2$

(d) $a^2 - 2ab + b^2$ (e) $3x + 2 - 2x^2$ (f) $8x^2 - 52x + 80$

(g) $(3x + 1)^2 - 9$ (h) $4ab - 3bc + 2ac - 6b^2$ (i) $11x - 12x^2 + 15$

Q2. Factorise completely:

(a) $2m^2 + 5mn + 2n^2$ (b) $x^3 - x$ (c) $a^4 - b^4$

(d) $6p^2 - 17pq + 12\,pq^2$ (e) $10a^2b + 11ab - 6b$ (f) $4x^4 - 13x^2 - 12$

(g) $x^8 - y^8$ (h) $m^2 - n^2 - 4m - 4n$ (i) $(x + 2)^2 - (x - 1)^2$

Q3. Simplify the following:

(a) $\dfrac{x^2 - 3x - 10}{2x^2 - 8x - 10}$ (b) $\dfrac{18p^2 - 3p - 3}{9p^2 + 6p + 1}$ (c) $\dfrac{2a^2 - 5ab + 2b^2}{2ab - b^2 + 4a - 2b}$

(d) $\dfrac{m^4 - 16}{m^3 + 4m + 2m^2 + 8}$ (e) $\dfrac{(x + 3)^2 - y^2}{x^2 + 3x - xy}$ (f) $\dfrac{2x^3 - 8x}{2x^3 - 8x^2 + 8x}$

Q4. Simplify these:

(a) $\dfrac{x^2 - 2x - 3}{x^2 - 1} \div \dfrac{x^2 - 6x + 9}{x^2 + x - 2}$ (b) $\dfrac{x^4 - 9x^2}{4x^2 - 16x + 12} \cdot \dfrac{x^2 - 2x + 1}{3x^3 + 9x^2}$

(c) $\dfrac{a^2 - b^2 + a + b}{a - a^3} \cdot \dfrac{1 - a^2}{a - b + 1}$ (d) $\dfrac{(x - 1)^2 - (x + 1)^2}{x - 1} \div \dfrac{x^3 - 4x^2 + 4x}{x^3 - 4x - x^2 + 4}$

(e) $\dfrac{4x^2 - y^2}{2x^2 + 3xy - 2y^2} \cdot \dfrac{x^2 + 2xy}{xy - 2x^2}$ (f) $\dfrac{x^2 - y^2 - 2x - 2y}{x^2 - 2xy - 3y^2} \cdot \dfrac{xy - 3y^2}{y - x + 2}$

Q5. Simplify:

(a) $\dfrac{x^2}{4x^2 + 7x + 3} + \dfrac{3x}{4x + 3}$ (b) $\dfrac{3x}{2x^2 + 13x + 20} - \dfrac{2x}{x^2 + 6x + 8}$

(c) $\dfrac{6x^2 + 5x - 6}{6x^2 + 13x + 6} + \dfrac{3x^2 - 4x - 4}{3x^2 - 8x + 4}$ (d) $\dfrac{2x^2 - x^3 - x}{x^3 - x} - \dfrac{x^3 - x}{x - x^3}$

(e) $\dfrac{2}{x^2 - x} + \dfrac{3}{x - x^2}$ (f) $\dfrac{1}{x^2 - 4} - \dfrac{1}{x^2 + 3x + 2}$

Level 2 — Statistics

Q1. (a)

x	f	fx	c. f.
0	4	0	4
1	8	8	12
2	8	16	20
3	13	39	33
4	8	32	41
5	9	45	50
6	6	36	56
7	2	14	58
8	1	8	59
9	1	9	60
	60	207	

(b) Mean = 3.45
Mode = 3
Median = 3

(c) 19

(d)

(e)
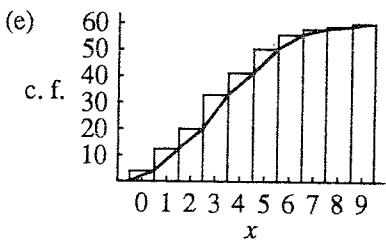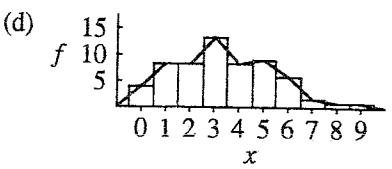
Q2. (a)

x	c. c.	f	$f \times$ c. c.	c.f
15 – 19	17	14	238	14
20 – 24	22	17	374	31
25 – 29	27	10	270	41
30 – 34	32	14	448	55
35 – 39	37	5	185	60
		60	1515	
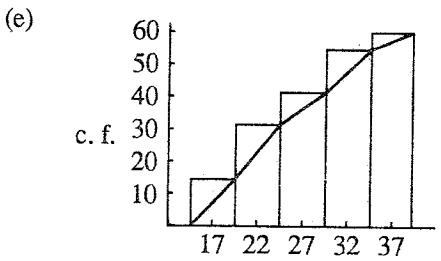
(b) Mean = 25.25 cm

(c) Modal class = 20 – 24 cm
Median class = 20 – 24 cm

(d) 45%

(e)

Q3. (a) 16 – 20
(b) 7, 8, 11, 16, 14, 9
(c) 16 – 20
(d) 16.77

Simultaneous equations

Q1. (a) $x = -6$, $y = 16$ (b) $x = 3$, $y = -1$ (c) $x = -1$, $y = 5$ (d) $x = -1$, $y = -5$

(e) $x = 1$, $y = 2\frac{1}{2}$ (f) $x = -2$, $y = -3$

Q2. (a) $x = 1$, $y = -2$ (b) $x = -3$, $y = 6$ (c) $x = 2$, $y = 3$ (d) $x = -4$, $y = 14$

(e) $x = 3$, $y = 5$ (f) $x = -3$, $y = \frac{1}{2}$

Q3. (a) 15 and 26   (b) 4.5 g   (c) $l = 14$ cm, $b = 9$ cm   (d) 8 years, 40 years
(e) ABCD: 16 cm × 8 cm; MNOP: 8 cm × 2 cm   (f) 7 cm

Q4. Each of the lines passes through the point $(-2, 5)$ $\therefore$ concurrent.

Level 1 — Further algebra and factorisation

Q1. (a) $6(x + 4)$ (b) $5(1 - 3x)$ (c) $6(3x + 5y)$
(d) $2x(2 + 3x)$ (e) $3p(3 - 5q)$ (f) $2xy(7 - 4y)$

Q2. (a) $(x - 4)(x + 4)$ (b) $(2x - y)(2x + y)$ (c) $(7 - 5m)(7 + 5m)$
(d) $(3a - 2b)(3a + 2b)$ (e) $(mn - 6)(mn + 6)$ (f) $2(x - 1)(x + 1)$

Q3. (a) $(x + 3)(x + 4)$ (b) $(x - 5)(x + 2)$ (c) $(m - 4)(m - 7)$
(d) $(b - 8)(b + 3)$ (e) $3(a + 6)(a - 1)$ (f) $2(x + 9)(x - 4)$

Q4. (a) $(a + b)(b - c)$ (b) $(x + 2y)(3z + 1)$ (c) $(6 - m)(2n + m)$
     (d) $(x - 3)(x + y)$ (e) $(2a + b)(3b + c)$ (f) $(5x - y)(y - 5)$

Q5. (a) $(2x + 1)(x - 5)$ (b) $(x - 3)(3x - 1)$ (c) $(5x + 2)(x + 4)$
     (d) $(2x + 3)(3x - 2)$ (e) $(3x - 4)(4x - 1)$ (f) $(4x - 1)(4x + 5)$

Q6. (a) $\dfrac{x}{x + 4}$ (b) $\dfrac{3}{5}$ (c) $\dfrac{y + 2}{x + 2}$ (d) $\dfrac{x + 3}{x - 2}$ (e) $\dfrac{x - 3}{x^2}$ (f) $\dfrac{4(x - 1)}{3(x - 4)}$

Q7. (a) $\dfrac{x}{(x + 1)(x + 5)}$ (b) $\dfrac{x + 3}{5(2x + 3)}$ (c) $\dfrac{2(a - b)}{3(a + 2)}$

Q8. (a) $\dfrac{2}{(2x - 1)(2x + 1)}$ (b) $\dfrac{x - 4}{x - 2}$ (c) $\dfrac{3x(x + 5)}{(x + 3)(x - 2)}$

Level 2 — Further algebra and factorisation

Q1. (a) $(x - y)(x - z)$ (b) $2(4x - 1)(4x + 1)$ (c) $(x + 3)(4 - x)$
     (d) $(a - b)(a - b)$ (e) $(2 - x)(2x + 1)$ (f) $4(2x - 5)(x - 4)$
     (g) $(3x + 4)(3x - 2)$ (h) $(2a - 3b)(2b + c)$ (i) $(5 - 3x)(4x + 3)$

Q2. (a) $(2m + n)(m + 2n)$ (b) $x(x - 1)(x + 1)$ (c) $(a - b)(a + b)(a^2 + b^2)$
     (d) $(2p - 3q)(3p - 4q)$ (e) $b(5a - 2)(2a + 3)$ (f) $(4x^2 + 3)(x^2 - 4)$
     (g) $(x - y)(x + y)(x^2 + y^2)(x^4 + y^4)$ (h) $(m - n)(m + n - 4)$ (i) $3(2x + 1)$

Q3. (a) $\dfrac{x + 2}{2(x + 1)}$ (b) $\dfrac{3(2p - 1)}{3p + 1}$ (c) $\dfrac{a - 2b}{b + 2}$ (d) $m - 2$ (e) $\dfrac{x + 3 + y}{x}$ (f) $\dfrac{x + 2}{x - 2}$

Q4. (a) $\dfrac{x + 2}{x - 3}$ (b) $\dfrac{x - 1}{12}$ (c) $\dfrac{a + b}{a}$ (d) $\dfrac{-4(x + 2)}{x - 2}$ (e) $\dfrac{2x + y}{y - 2x}$ (f) $-y$

Q5. (a) $\dfrac{x}{x + 1}$ (b) $\dfrac{-x}{(2x + 5)(x + 2)}$ (c) $\dfrac{2(9x^2 + 4)}{(3x - 2)(3x + 2)}$ (d) $\dfrac{2}{x + 1}$
     (e) $\dfrac{-1}{x(x - 1)}$ (f) $\dfrac{3}{(x + 2)(x - 2)(x + 1)}$

Level 1 — Geometry

Q1. (a) $x = 102°$ ($\angle$'s on straight line supplementary)   (b) $\angle BCE = 63°$ (corresponding $\angle$'s)
                                                 $a = 117°$ (supplementary to $\angle BCE$)

     (c) $y = 81°$ (vertically opp. $\angle$'s)   (d) $\angle EBC = 115°$ (vert. opp.)
                                                      $m = 115°$ (corr. $\angle$ to $\angle EBC$)

     (e) $n = 240°$ (revolution)   (f) $\angle BCH = 68°$ (coint. to $\angle FBC$)
                                                      $x = 68°$ (vert. opp. to $\angle BCH$)

Q2. (a) $\angle CAB = 85°$ (vert. opp. to $\angle CAB$)   (b) $\angle CAB = 60°$ (supp. to $\angle DAC$)
        $x = 37°$ ($\angle$ sum of Δ) $x = 180 - 2 \times 60°$ ($\angle$ sum of Δ)
                                                           $x = 60°$

     (c) $\angle ACB = 47°$ (alt. to $\angle DAC$)   (d) $\angle CAB = 52°$ (supp. to $\angle DAB$)
        $\angle CAB = 47°$ (base $\angle$ of isos. Δ) $\angle CBA = 64°$ (vert. opp. to $\angle FBE$)
           $x = 86°$ ($\angle$ sum of Δ) $x = 64°$ ($\angle$ sum of Δ)

     (e) $\angle DCB = \angle DBC = 40°$ (base $\angle$'s of isos. ΔDBC)   (f) $\angle OBC = 25°$ ($\angle$ sum of Δ)
        $\angle ACB = 53°$ (base $\angle$ of isos. ΔABC) $\angle OCB = 25°$ (base $\angle$ of isos. ΔDBC)
           $x = 13°$ $x = 130°$ ($\angle$ sum of Δ)

Q3. (a) $\angle ADC = 75°$ (vert. opp. to $\angle EDF$)   (b) $DE = EC$ (diagonals o rectangle equal and
       $x \quad = 75°$ (opp. $\angle$'s of parallelogram   bisect each other)
                  equal) $\angle EDC = \angle ECD = 32°$ (base $\angle$'s of isosceles
                                                              ΔDEC)
                                            $\therefore \quad x = 116°$ ($\angle$ sum of Δ)