

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) $\frac{x^2 - 4x}{x^2 - 16}$ (b) $\frac{6x - 3}{10x - 5}$ (c) $\frac{xy + 2x - y^2 - 2y}{x^2 + 2x - xy - 2y}$
 (d) $\frac{x^2 + x - 6}{x^2 - 4x + 4}$ (e) $\frac{3x^2 - 8x - 3}{3x^3 + x^2}$ (f) $\frac{4x^2 - 4}{3x^2 - 9x - 12}$

Q7. Simplify:

129

- (a) $\frac{x+5}{x^2-4x-5} \cdot \frac{x^2-5x}{x^2+10x+25}$ (b) $\frac{2x+1}{2x^2-3x-9} \div \frac{10x-5}{2x^2-12x-18}$
 (c) $\frac{a^2-36}{a^2-4a-12} \cdot \frac{2a-12}{3a+18}$

Q8. Simplify:

130

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

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) $6p^2 - 17pq + 12pq^2$ | (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) $\frac{x^2 - 3x - 10}{2x^2 - 8x - 10}$ | (b) $\frac{18p^2 - 3p - 3}{9p^2 + 6p + 1}$ | (c) $\frac{2a^2 - 5ab + 2b^2}{2ab - b^2 + 4a - 2b}$ |
| (d) $\frac{m^4 - 16}{m^3 + 4m + 2m^2 + 8}$ | (e) $\frac{(x+3)^2 - y^2}{x^2 + 3x - xy}$ | (f) $\frac{2x^3 - 8x}{2x^3 - 8x^2 + 8x}$ |

Q4. Simplify these:

- | | |
|--|--|
| (a) $\frac{x^2 - 2x - 3}{x^2 - 1} \div \frac{x^2 - 6x + 9}{x^2 + x - 2}$ | (b) $\frac{x^4 - 9x^2}{4x^2 - 16x + 12} \cdot \frac{x^2 - 2x + 1}{3x^3 + 9x^2}$ |
| (c) $\frac{a^2 - b^2 + a + b}{a - a^3} \cdot \frac{1 - a^2}{a - b + 1}$ | (d) $\frac{(x-1)^2 - (x+1)^2}{x-1} \div \frac{x^3 - 4x^2 + 4x}{x^3 - 4x - x^2 + 4}$ |
| (e) $\frac{4x^2 - y^2}{2x^2 + 3xy - 2y^2} \cdot \frac{x^2 + 2xy}{xy - 2x^2}$ | (f) $\frac{x^2 - y^2 - 2x - 2y}{x^2 - 2xy - 3y^2} \cdot \frac{xy - 3y^2}{y - x + 2}$ |

Q5. Simplify:

- | | |
|--|--|
| (a) $\frac{x^2}{4x^2 + 7x + 3} + \frac{3x}{4x + 3}$ | (b) $\frac{3x}{2x^2 + 13x + 20} - \frac{2x}{x^2 + 6x + 8}$ |
| (c) $\frac{6x^2 + 5x - 6}{6x^2 + 13x + 6} + \frac{3x^2 - 4x - 4}{3x^2 - 8x + 4}$ | (d) $\frac{2x^2 - x^3 - x}{x^3 - x} - \frac{x^3 - x}{x - x^3}$ |
| (e) $\frac{2}{x^2 - x} + \frac{3}{x - x^2}$ | (f) $\frac{1}{x^2 - 4} - \frac{1}{x^2 + 3x + 2}$ |

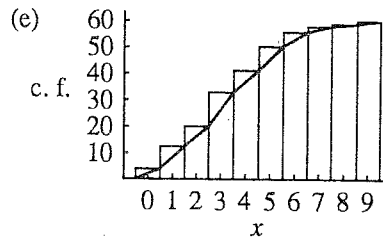
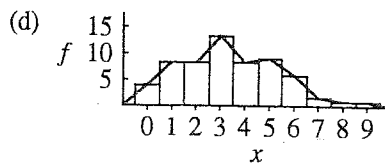
Level 2 — Statistics

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

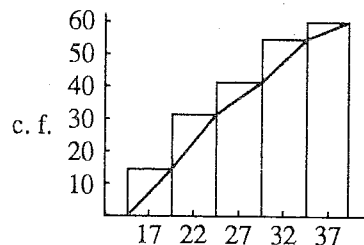
(c) 19



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 | |

(e)



(b) Mean = 25.25 cm

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

(d) 45%

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 \times 8 cm; MNOP: 8 cm \times 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) $\frac{x}{x+4}$ (b) $\frac{3}{5}$ (c) $\frac{y+2}{x+2}$ (d) $\frac{x+3}{x-2}$ (e) $\frac{x-3}{x^2}$ (f) $\frac{4(x-1)}{3(x-4)}$
- Q7. (a) $\frac{x}{(x+1)(x+5)}$ (b) $\frac{x+3}{5(2x+3)}$ (c) $\frac{2(a-b)}{3(a+2)}$
- Q8. (a) $\frac{2}{(2x-1)(2x+1)}$ (b) $\frac{x-4}{x-2}$ (c) $\frac{3x(x+5)}{(x+3)(x-2)}$

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) $\frac{x+2}{2(x+1)}$ (b) $\frac{3(2p-1)}{3p+1}$ (c) $\frac{a-2b}{b+2}$ (d) $m-2$ (e) $\frac{x+3+y}{x}$ (f) $\frac{x+2}{x-2}$
- Q4. (a) $\frac{x+2}{x-3}$ (b) $\frac{x-1}{12}$ (c) $\frac{a+b}{a}$ (d) $\frac{-4(x+2)}{x-2}$ (e) $\frac{2x+y}{y-2x}$ (f) $-y$
- Q5. (a) $\frac{x}{x+1}$ (b) $\frac{-x}{(2x+5)(x+2)}$ (c) $\frac{2(9x^2+4)}{(3x-2)(3x+2)}$ (d) $\frac{2}{x+1}$
 (e) $\frac{-1}{x(x-1)}$ (f) $\frac{3}{(x+2)(x-2)(x+1)}$

Level 1 — Geometry

- Q1. (a) $x = 102^\circ$ (\angle 's on straight line supplementary) (b) $\angle BCE = 63^\circ$ (corresponding \angle 's)
 $a = 117^\circ$ (supplementary to $\angle BCE$)
 (c) $y = 81^\circ$ (vertically opp. \angle 's) (d) $\angle EBC = 115^\circ$ (vert. opp.)
 $m = 115^\circ$ (corr. \angle to $\angle EBC$)
 (e) $n = 240^\circ$ (revolution) (f) $\angle BCH = 68^\circ$ (coint. to $\angle FBC$)
 $x = 68^\circ$ (vert. opp. to $\angle BCH$)
- Q2. (a) $\angle CAB = 85^\circ$ (vert. opp. to $\angle CAB$) (b) $\angle CAB = 60^\circ$ (supp. to $\angle DAC$)
 $x = 37^\circ$ (\angle sum of Δ) $x = 180 - 2 \times 60^\circ$ (\angle sum of Δ)
 $x = 60^\circ$
 (c) $\angle ACB = 47^\circ$ (alt. to $\angle DAC$) (d) $\angle CAB = 52^\circ$ (supp. to $\angle DAB$)
 $\angle CAB = 47^\circ$ (base \angle of isos. Δ) $\angle CBA = 64^\circ$ (vert. opp. to $\angle FBE$)
 $x = 86^\circ$ (\angle sum of Δ) $x = 64^\circ$ (\angle sum of Δ)
- (e) $\angle DCB = \angle DBC = 40^\circ$ (base \angle 's of isos. ΔDBC) (f) $\angle OBC = 25^\circ$ (\angle sum of Δ)
 $\angle ACB = 53^\circ$ (base \angle of isos. ΔABC) $\angle OCB = 25^\circ$ (base \angle of isos. ΔDBC)
 $x = 13^\circ$ $x = 130^\circ$ (\angle sum of Δ)
- Q3. (a) $\angle ADC = 75^\circ$ (vert. opp. to $\angle EDF$) (b) $DE = EC$ (diagonals of rectangle equal and
 $x = 75^\circ$ (opp. \angle 's of parallelogram bisect each other)
 equal) $\angle EDC = \angle ECD = 32^\circ$ (base \angle 's of isosceles
 ΔDEC)
 $\therefore x = 116^\circ$ (\angle sum of Δ)