

CHAPTER 2

Algebraic Manipulations

1. Using the special algebraic rules, calculate the following.

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| (a) 295×305 | (b) $49^2 + 98 + 1$ |
| (c) $299^2 - 298^2$ | (d) $72.9^2 + 27.1 \times 72.9$ |
| (e) $39 \times 23 - 23 \times 29$ | (f) 398^2 |
| (g) $98 \times 0.46 + 98 \times 0.78 - 49 \times 0.48$ | (i) $(\sqrt{8} - \sqrt{2})^2$ |
| (h) $1\,985^2 - 1\,990 \times 1\,980$ | (k) $\frac{123 \times 16 - 16 \times 113}{232^2 - 168^2}$ |
| (j) $\frac{5.4^2 - 5.3^2}{5.3 \times 4 + 4 \times 5.4}$ | (m) $55^2 - 550 + 25$ |
| (l) $1\,230\,003^2 - 1\,230\,002^2$ | |

2. (a) Given that $7.85^2 - 4.15^2 = 12k$, find the value of k .
 (b) Given that $x^2 + y^2 = 13$ and $xy = -3$, calculate the values of $(x + y)^2$ and $(x - y)^2$.
 (c) If $u - v = 8$ and $u^2 - v^2 = 28$, find the value of $(u + v)$.
 (d) If $(x - y)^2 = 11$ and $2xy = 3$, calculate the value of $x^2 + y^2$.
 (e) Given that $11x = 8.25 \times 2.75 + 8.25^2$, find the value of x .
 (f) Given that $x + y = 7$ and $(x - y) = -3$, find the value of
 (i) $x^2 - 2xy + y^2$,
 (ii) $2x^2 + 4xy + 2y^2$,
 (iii) $3x^2 - 3y^2$.

3. Express the following as fractions with a single denominator.

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| (a) $2\frac{1}{5}a - \frac{3}{4}(a + 1)$ | (b) $\frac{x + 3y}{2} - \frac{x - 7y}{4} + \frac{1}{3}$ |
| (c) $\frac{x + 3}{2} - \frac{11 - x}{5} - \frac{3x - 1}{20}$ | (d) $\frac{x + 2}{3} + \frac{3(x - 2)}{4} - \frac{2(2x + 1)}{5}$ |
| (e) $\frac{2y}{x} - \frac{3}{xy} + \frac{4x}{y}$ | (f) $\frac{2}{a} - \frac{3}{2a^2}$ |
| (g) $\frac{1}{x} + \frac{1}{12x} - \frac{4}{3x}$ | (h) $\frac{a + 3x}{2a} + \frac{a - x}{6a} - \frac{2x + a}{3a}$ |
| (i) $\left(\frac{5}{3xy}\right)^{-2} \div \frac{12xy}{15} + \frac{3xy}{4}$ | (j) $\frac{b - c}{bc} + \frac{c - a}{ac} + \frac{a - b}{ab}$ |
| (k) $\frac{a - b}{ab} + \frac{b - c}{bc} - \frac{c - a}{ac}$ | (l) $\frac{5}{x - 2} + \frac{4}{x + 2}$ |
| (m) $\frac{x}{x + 1} - \frac{y}{y + 1}$ | (n) $\frac{4}{x - 2} - \frac{7}{4 - 2x} + \frac{5}{3(x + 2)}$ |

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|------------------------------------|
| (o) $\frac{4c}{10c - 5}$ |
| (q) $\frac{a + 1}{2a - 8}$ |
| (s) $\frac{3}{p + 3r}$ |
| (u) $\frac{5}{2(e - f)}$ |
| (w) $\left(\frac{x}{x - 2}\right)$ |
| (x) $\frac{1}{x + 1} +$ |
| (y) $\frac{3}{x + 1} +$ |
| (z) $\frac{7}{x^2 + 3x}$ |

4. Expand and simplify.

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|-----------------------------|
| (a) $3(2x - 5)$ |
| (c) $(3p + 2)$ |
| (e) $6a + [5a]$ |
| (g) $(5m^2 - n)$ |
| (i) $(1 + u +$ |
| (k) $(x^2 + 3x)$ |
| (m) $\frac{-5}{x^2}(3x^4 -$ |
| (o) $9x - [(2x$ |
| (q) $-8x[(2x$ |
| (s) $(2x + 1)($ |
| (u) $3(2x + 1)$ |
| (w) $5[x - 3(x$ |

5. Expand and simplify.

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|---------------------|
| (a) $(x^3 + x^5)^2$ |
| (c) $(2p^5q + 1)$ |
| (e) $(a + 4)^2 -$ |
| (f) $(a + b +$ |
| (g) $(3a + 1)($ |
| (i) $4a(a + 4)$ |
| (k) $(2y - 3)^2$ |