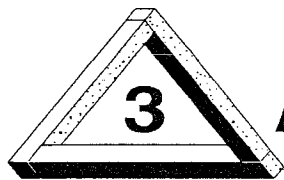


Question 3 Evaluate the following using a non-programable hand calculator and giving answers correct to 2 decimal places:

(a) $\frac{56.8 \times 32.45}{87 \div 9.07}$

(b) $\sqrt{\frac{98.43 + 210.5}{109 - 31.55}}$

(c) $\sqrt[5]{\frac{(8.5)^2 + \sqrt{56.78}}{78.32 \div 544.2}}$



Algebra: substitution, simplification

Question 1 If $x = 5$, $y = -6$, and $z = 8$, evaluate the following expressions:

(a) $\frac{x}{y}$

(b) $x + y + z$

(c) $x - y - z$

(d) $\frac{x + y + z}{xyz}$

(e) $5x - 4y + 2z$

(f) $\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$

Question 2 If $k = 4$, $m = \frac{1}{2}$, and $n = \frac{3}{5}$, evaluate the following expressions:

(a) $m^2 + n^2$

(b) $\frac{1}{k} + m - n$

(c) $km + mn + nk$

Question 3 Simplify the following expressions:

(a) $6a - 9b - 12a + 7b$

(b) $9 - 4mn + 15 - 7mn$

(c) $15mn + 23np - 4mn + 8np$

(d) $13a^2 + 2a + 8a^2 - 15a$

(e) $2x^2 + 7x + 5 - 3x^2 - 12x - 17$

(f) $5a - 6b + 8a^2 - 11b - 15a^2$

(g) $25x^2 + 14xy^2 - 15 + 13xy^2 - 20 - 2x^2y$



Question 4 Simplify the following expressions:

a) $6x \times 12y$

(b) $5a \times (-4ab)$

(c) $10mn \times 4np$

d) $8xy \times x \times 3y$

(e) $-3n \times 5n \times 7$

(f) $11ab \times (-7a) \times b$

Question 5 Simplify the following expressions:

a) $24ab \div 4b$

(b) $72ab \div (-6ab)$

(c) $-22x^2 \div 2x$

d) $31mn \div 31n$

(e) $\frac{-6a}{42}$

(f) $\frac{35xy}{-14y}$

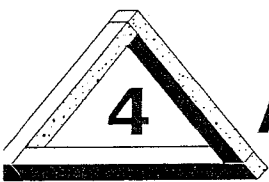
g) $\frac{14x \times 5y}{-10 \times 7x}$

(h) $\frac{4x^2 \times 3x}{-12xy}$

(i) $12mn \times 7n \div 4n$

j) $-15a^2b \div 3ab \times (-2b)$

k) $45m^2 \div 15m \div 3m$



4 Algebraic fractions

Question 1 Simplify the following:

a) $\frac{8x}{11} - \frac{5x}{6}$

(b) $\frac{x}{3} + \frac{2x}{5}$

(c) $\frac{7m}{5} - \frac{3m}{4}$

d) $\frac{13y}{9} + \frac{11y}{12}$

(e) $\frac{x}{7} + \frac{x}{2}$

(f) $\frac{3m}{7} - \frac{2m}{5}$

g) $\frac{2n}{13} + \frac{3n}{5}$

(h) $\frac{3y}{12} - \frac{y}{15}$

(i) $\frac{8r}{9} - \frac{5r}{21}$

Question 2 Simplify the following:

(a) $\frac{5q}{12} \times \frac{3q}{10}$

(b) $\frac{11x}{6} \div \frac{22}{21}$

(c) $\frac{7m}{15} \times \frac{9}{14}$

(d) $\frac{3m}{5} \times \frac{2m}{6}$

(e) $\frac{5y}{4} \div \frac{11}{2y}$

(f) $\frac{x}{6} \div \frac{5x}{12}$

(g) $\frac{3a}{4} \div \frac{2}{a}$

(h) $\frac{5m}{32} \times \frac{8m}{15}$

(i) $\frac{5n}{7} \times \frac{7n}{5}$

(j) $\frac{5abc}{6} \times \frac{18b}{10a}$

(k) $\frac{5x^2}{12} \times \frac{6x}{y}$

(l) $\frac{3x}{7} \times \frac{9x}{2}$

Question 3 Simplify the following:

(a) $\frac{mn}{a} \times \frac{np}{b}$

(b) $\frac{ab}{2x} \times \frac{a}{4b}$

(c) $\frac{xy}{a} \div \frac{a^2}{2y}$

(d) $\frac{3ab^2}{4c} \div \frac{2b}{a}$

(e) $\frac{5n}{7} \times \frac{7n}{5} \times \frac{n}{3}$

(f) $\frac{5abc}{6} \times \frac{18b}{a} \div \frac{c^2}{b}$

(g) $\frac{5x^2}{mn} \times \frac{6x}{y} \times \frac{n}{10}$

(h) $\frac{3h}{2} \div \frac{ab}{h^2} \div \frac{6}{b}$

(i) $\frac{3x}{7} \div \frac{9x}{2} \div \frac{12}{x}$

Question 4 Simplify the following:

(a) $\frac{x}{a} + \frac{y}{a}$

(b) $\frac{x}{a} + \frac{y}{b}$

(c) $\frac{x}{y} - \frac{y}{x}$

(d) $\frac{x}{c} + \frac{x}{c}$

(e) $\frac{ab}{c} + \frac{ba}{c}$

(f) $\frac{m}{ab} + \frac{n}{ab}$

(g) $\frac{m}{abc} + \frac{3m}{abc}$

(h) $\frac{x}{ab} + \frac{y}{bc}$

(i) $\frac{2}{xy} - \frac{3}{xy}$



Algebraic expressions with grouping symbols

Expand the following by removing the grouping symbols, and simplify where possible:

(a) $3m(2+m)$

(b) $-4n(n+5)$

(c) $-2(2+7x)+4x$

(d) $8(3x+5)+7(2x-4)$

(e) $3(7m+3)+4(3m-5)$

(f) $m(m-n)+n(m-n)$

(g) $5a-3b+2c-(2a+b+3c)$

(h) $25+5(a-3)+7a$

(i) $15m+11n-6(3m-n)$

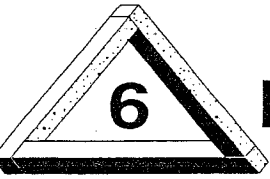
(j) $a(a+b)+b(a+b)$

(k) $x(3x+y)+x(x-y)$

(l) $a(b+c)+d(b+c)$

(m) $5x(2x-3y)-x(4y-x)$

(n) $x(y+z)+y(z+x)+z(x+y)$



Binomial products

Expand the following by removing the grouping symbols, and simplify where possible:

(a) $(a+b)(c+d)$

(b) $(a-3b)(2c+5d)$

(c) $(a+4)(a+3)$

(d) $(x-5)(x-8)$

(e) $(m+6)(m-3)$

(f) $(a+3)(a-12)$

(g) $(x+15)(x-5)$

(h) $(2x-7)(x+7)$

(i) $(x-7)(11+x)$

(j) $(b+2)(3b-5)$

(k) $(p-8)(8-2p)$

(l) $(4m+3)(3m-5)$

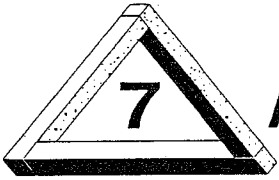
(m) $(4p+11)(2p-7)$

(n) $(6y+5)(7-3y)$

(o) $(2x+5)(2x-15)$

(p) $(11+5a)(5a-11)$

(q) $(3m-5)(5-3m)$



Algebraic squares, difference of two squares

Question 1 Expand the following perfect squares:

(a) $(a+b)^2$

(b) $(m-n)^2$

(c) $(a+3)^2$

(d) $(x-5)^2$

(e) $(m+6)^2$

(f) $(a-12)^2$

(g) $(3-y)^2$

(h) $(2x+3)^2$

(i) $(3m+4)^2$

(j) $(5x-7)^2$

(k) $(3b-5)^2$

(l) $(8-5p)^2$

(m) $(2x+y)^2$

(n) $(4m+3n)^2$

(o) $(4m+2n)^2$

(p) $(3a-9b)^2$

(q) $(y-2x)^2$

(r) $(11x+12y)^2$

(s) $(4a+b)^2$

(t) $(2p-5q)^2$

(u) $(x^2+y^2)^2$

Question 2 Express the following as a difference of two squares:

(a) $(m-n)(m+n)$

(b) $(a-3)(a+3)$

(c) $(a+11)(a-11)$

(d) $(x-5)(x+5)$

(e) $(m+6)(m-6)$

(f) $(3+y)(3-y)$

(g) $(x+15)(x-15)$

(h) $(2x-7)(2x+7)$

(i) $(4m+3)(4m-3)$

(j) $(11-x)(11+x)$

(k) $(8+2p)(8-2p)$

(l) $(3x-7)(3x+7)$

(m) $(2m + n)(2m - n)$

(n) $(4a - b)(4a + b)$

(o) $(4p + 11)(4p - 11)$

(p) $(3m - 5n)(3m + 5n)$

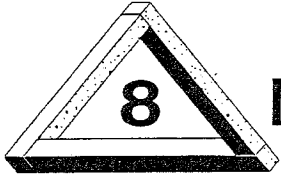
(q) $(3m - 11y)(3m + 11y)$

(r) $(11t + 5a)(11t - 5a)$

(s) $(x^2 + y^2)(x^2 - y^2)$

(t) $(x^3 + y^3)(x^3 - y^3)$

(u) $(2x^2 + 3y^2)(2x^2 - 3y^2)$



Metric system

Question 1 Complete the following conversions:

(a) 85 L = _____ mL

(b) 8 km = _____ cm

(c) 450 g = _____ kg

(d) 86 mm = _____ m

(e) 8750 kg = _____ t

(f) 75 cm = _____ km

(g) 1247.9 cm = _____ m

(h) 8.6 g = _____ cg

(i) 28 s = _____ μ s

(j) 880 s = _____ h

(k) 25 g = _____ dg

(l) 35 dm = _____ m

Question 2

- (a) A disinfectant concentrate is mixed according to the following instructions:

150 mL of disinfectant
concentrate to 40 L of water

This will clean a surface of 100 m^2 .

How much water is needed for 120 mL of concentrate, and what area will this clean?

- (b) A swimming pool of capacity 480 kL is to be filled by a pump at the rate of 4 L/sec.

How long will it take to fill the pool?

- (c) A household used 10 804 kW of electricity over a 3-month period.

Find the average daily rate of consumption.

If the cost of electricity is 10.25 c/kW, what was the annual electricity bill in dollars and cents?



ANSWERS

I Approximation and estimation

- 1 (a) 5 (b) 2 (c) 2
 (d) 6 (e) 3 (f) 5
 (g) 3 (h) 5 (i) 5
 (j) 4 (k) 2 (l) 1
- 2 (a) 3000 (b) 1.7 (c) 26
 (d) 3600 (e) 0.0086 (f) 18 000
 (g) 53.7 (h) 13.03 (i) 1.4×10^6
 (j) 7.55 (k) 0.0078 (l) 4.4×10^{-6}
- 3 (a) 21.5 (b) 0.01 (c) 0.7
 (d) 3.4 (e) 3.41 (f) 3.4051
 (g) 8.99 (h) 9.0 (i) 9.00
- 4 (a) 2452 (b) 2451.864 (c) 2450
 (d) 2451.86 (e) 2500 (f) 2451.9
 (g) 2450 (h) 2000
- 5 (a) 3 (b) $5\frac{1}{2}$ (c) 100
 (d) 500 (e) 3 (f) 250
- 6 (a) 2.98×10^5 (b) 3.0×10^5 (c) 1.23×10^7
- 7 (a) 4370 (b) 0.004 37 (c) 41270 000
 (d) 0.000 2143 (e) 37 (f) 0.000 000 037
 (g) 11721.8 (h) 0.043 657 (i) 0.000 000 37

II Using the hand calculator

- 1 (a) 729.000 (b) 0.071 (c) 40.000
 (d) 0.008 (e) 3.728 (f) 568.346
 (g) 1886.654 (h) 2.744 (i) 12.400
- 2 (a) 53.7 (b) 7.81 (c) 2.74
 (d) 104 (e) 120 (f) 1.29
 (g) 2.80 (h) 49.4 (i) 252
- 3 (a) 192.15 (b) 2.00 (c) 3.54

III Algebra: substitution, simplification

- (a) $-\frac{5}{6}$ (b) 7 (c) 3
 (d) $\frac{7}{240}$ (e) 65 (f) $\frac{1}{60}$
- (a) $\frac{61}{100}$ (b) $\frac{3}{20}$ (c) $4\frac{7}{10}$
- (a) $-6a - 2b$ (b) $24 - 11mn$
 (c) $11mn + 31np$ (d) $21a^2 - 13a$
 (e) $-x^2 - 5x - 12$ (f) $5a - 17b - 7a^2$
 (g) $25x^2 + 27xy^2 - 35 - 2x^2y$

- 4 (a) $72xy$ (b) $-20a^2b$ (c) $40mn^2p$
 (d) $24x^2y^2$ (e) $-105n^2$ (f) $-77a^2b^2$
- 5 (a) $6a$ (b) -12 (c) $-11x$
 (d) m (e) $-\frac{a}{7}$ (f) $-\frac{5x}{2}$
 (g) $-y$ (h) $-\frac{x^2}{y}$ (i) $21mn$
 (j) $\frac{2}{3}r$ (k) $10ab$ (l) 1

4 Algebraic fractions

- 1 (a) $-\frac{7x}{66}$ (b) $\frac{11x}{15}$ (c) $\frac{13m}{20}$
 (d) $\frac{43y}{18}$ (e) $\frac{9x}{14}$ (f) $\frac{m}{35}$
 (g) $\frac{49n}{65}$ (h) $\frac{11y}{60}$ (i) $\frac{41r}{63}$
- 2 (a) $\frac{q}{8}$ (b) $\frac{7x}{4}$ (c) $\frac{3m}{10}$
 (d) $\frac{m^2}{5}$ (e) $\frac{5}{22}$ (f) $\frac{2}{5}$
 (g) $\frac{3a^2}{8}$ (h) $\frac{m^2}{12}$ (i) n^2
 (j) $\frac{3b^2c}{2}$ (k) $\frac{5x^3}{y}$ (l) $\frac{27x^2}{14}$
- 3 (a) $\frac{mn^2p}{ab}$ (b) $\frac{a^2}{8x}$ (c) $\frac{2xy^2}{a^3}$
 (d) $\frac{3a^2b}{8c}$ (e) $\frac{n^3}{3}$ (f) $\frac{15b^3}{c}$
 (g) $\frac{3x^3}{my}$ (h) $\frac{h^3}{4a}$ (i) $\frac{x}{126}$
- 4 (a) $\frac{x+y}{a}$ (b) $\frac{bx+ay}{ab}$ (c) $\frac{x^2-y^2}{xy}$
 (d) $\frac{2x}{c}$ (e) $\frac{2ab}{c}$ (f) $\frac{m+n}{ab}$
 (g) $\frac{4m}{abc}$ (h) $\frac{cx+ay}{abc}$ (i) $-\frac{1}{xy}$

5 Algebraic expressions with grouping symbols

- (a) $6m + 3m^2$ (b) $-4n^2 - 20n$
 (c) $-4 - 10x$ (d) $38x + 12$
 (e) $33m - 11$ (f) $m^2 - n^2$
 (g) $3a - 4b - c$ (h) $10 + 12a$
 (i) $-3m + 17n$ (j) $a^2 + 2ab + b^2$
 (k) $4x^2$ (l) $ab + ac + db + dc$
 (m) $10x^2 - 15xy - 4xy + x^2$ (n) $2xy + 2xz + 2yz$

Binomial products

- $ac + ad + bc + bd$ (b) $2ac + 5ad - 6bc - 15bd$
 $a^2 + 7a + 12$ (d) $x^2 - 13x + 40$
 $m^2 - 3m - 18$ (f) $a^2 - 9a - 36$
 $x^2 + 10x - 75$ (h) $2x^2 + 7x - 49$
 $x^2 + 4x - 77$ (j) $3b^2 + b - 10$
 $-2p^2 + 24p - 64$ (l) $12m^2 - 11m - 15$
 $8p^2 - 6p - 77$ (n) $-18y^2 + 27y + 35$
 $4x^2 - 20x - 75$ (p) $25a^2 - 121$
 $-9m^2 + 30m - 25$

Algebraic squares, difference of two squares

- (a) $a^2 + 2ab + b^2$ (b) $m^2 - 2mn + n^2$
 (c) $a^2 + 6a + 9$ (d) $x^2 - 10x + 25$
 (e) $m^2 + 12m + 36$ (f) $a^2 - 24a + 144$
 (g) $9 - 6y + y^2$ (h) $4x^2 + 12x + 9$
 (i) $9m^2 + 24m + 16$ (j) $25x^2 - 70x + 49$
 (k) $9b^2 - 30b + 25$ (l) $64 - 80p + 25p^2$
 (m) $4x^2 + 4xy + y^2$ (n) $16m^2 + 24mn + 9n^2$
 (o) $16m^2 + 16mn + 4n^2$ (p) $9a^2 - 54ab + 81b^2$
 (q) $y^2 - 4xy + 4x^2$ (r) $121x^2 + 264xy + 144y^2$
 (s) $16a^2 + 8ab + b^2$ (t) $4p^2 - 20pq + 25q^2$
 (u) $x^4 + 2x^2y^2 + y^4$

- (a) $m^2 - n^2$ (b) $a^2 - 9$ (c) $a^2 - 121$
 (d) $x^2 - 25$ (e) $m^2 - 36$ (f) $9 - y^2$
 (g) $x^2 - 225$ (h) $4x^2 - 49$ (i) $16m^2 - 9$
 (j) $121 - x^2$ (k) $64 - 4p^2$ (l) $9x^2 - 49$
 (m) $4m^2 - n^2$ (n) $16a^2 - b^2$ (o) $16p^2 - 121$
 (p) $9m^2 - 25n^2$ (q) $9m^2 - 121y^2$ (r) $121t^2 - 25a^2$
 (s) $x^4 - y^4$ (t) $x^6 - y^6$ (u) $4x^4 - 9y^4$

Metric system

- (a) 85 000 mL (b) 800 000 cm
 (c) 0.45 kg (d) 0.086 m
 (e) 8.75 t (f) 0.000 75 km
 (g) 12.479 m (h) 860 cg
 (i) $\frac{4}{5}$ h or 0.8 h (j) 28 000 000 μ s
 (k) $\frac{11}{45}$ h or 0.24 h (l) 1 000 000 g
 (m) 2.5 dg (n) 3.5 m

9 Equations

- 1 (a) $m = 7$ (b) $a = -26$ (c) $x = 4$
 (d) $y = -2$ (e) $p = -3\frac{1}{2}$ (f) $b = -13$
 2 (a) $y = 5\frac{4}{7}$ (b) $x = 1\frac{3}{5}$ (c) $a = -4\frac{3}{4}$
 (d) $y = -\frac{3}{5}$ (e) $m = 9\frac{2}{5}$ (f) $r = -3$
 3 (a) $a = 3$ (b) $x = -1\frac{1}{5}$ (c) $m = 4\frac{1}{2}$
 (d) $r = -4$ (e) $x = -2\frac{1}{2}$ (f) $y = 2$
 4 (a) $x = 3\frac{1}{3}$ (b) $p = -2\frac{3}{4}$ (c) $m = 1\frac{5}{8}$
 (d) $x = 3\frac{3}{5}$ (e) $q = 30$ (f) $n = 15\frac{3}{4}$
 5 (a) $p = 32$ (b) $n = 3$ (c) $d = -5\frac{4}{5}$
 (d) $q = 14\frac{1}{2}$ (e) $x = 11$ or $x = -1$
 (f) $x = 22$
 6 (a) $S = 90$ (b) $v = 15.52$ (c) $V = 401.92$
 (d) $C = 35$ (e) $V = 2662.95$ (f) $S = 1440$
 (g) $x = -1$ or $-\frac{2}{3}$ (h) $R = 1.5$

10 Perimeter and area

Answers may vary slightly, depending on the value of π used.

- 1 (a) 82.27 m (b) 45.71 cm
 (c) 92.28 mm (d) 132 cm
 2 (a) 499.91 m (b) 6.28 m
 3 (a) 132.32 m² (b) 187 m² (c) 215.5 cm²
 (d) 42.9 cm² (e) 346.86 cm² (f) 141.66 cm²

11 Volume and surface area

- 1 (a) $V = 660 \text{ cm}^3$ (b) $V = 849.3 \text{ m}^3$
 $SA = 577.02 \text{ cm}^2$ $SA = 614.12 \text{ m}^2$
 (c) $V = 54\,900 \text{ m}^3$ (d) $V = 225 \text{ m}^3$
 $SA = 10\,230 \text{ m}^2$ $SA = 270 \text{ m}^2$
 (e) $V = 9120 \text{ m}^3$ (f) $V = 3911.3 \text{ cm}^3$
 $SA = 2821.27 \text{ m}^2$ $SA = 1608.5 \text{ cm}^2$
 (g) $V = 4014.6 \text{ m}^3$ (h) $V = 14\,883 \text{ m}^3$
 $SA = 2035.5 \text{ m}^2$ $SA = 2886.69 \text{ m}^2$

12 Solving problems with equations

- 1 157
 2 24 girls
 3 14 cm
 4 9 cm by 23 cm
 5 2 km

- 2 (a) 32 L; 80 m²
 (b) 33 hours 20 minutes
 (c) 118.73 kW per day; \$4444.85