

Student Text *UNIT 22 Algebraic Concepts*

Answers

22.1 Simplifying Expressions

1. (a) $6a$ (b) $3a + 12$ (c) $11a + 6b$ (d) $4x + 11y$
 (e) $13x - y$ (f) $2a + 10b$ (g) $3a + b + 6$ (h) $6p - 7q$
 (i) $-7x + 3y$ (j) $2x - p$ (k) $15x - 9z$ (l) $-14x + 5z$
 (m) $8a + 4q - 6x$ (n) $-p - q + x + z$ (o) $3x - 2y + 10$ (p) $21x - 32q$
 (q) $2y$ (r) $2x$ (s) $-19x + 11y$ (t) $23x - 18y - 4$
 (u) $-7x - 10y$ (v) $-4p + 4q$

2. (a) $6x^2 + 8x$ (b) $x^2 + 13x + 10$ (c) $2x^2 + 10x$
 (d) $5x^2 + 2x + 10$ (e) $-x^2 + 7x$ (f) $3x^2 - 2y^2$
 (g) $2x^2 + y^2 - x - y$ (h) $5x^2 - 3x - 10$ (i) $3x^2 - 3y^2 - x - y$
 (j) $5x^2 + 2y - 4$ (k) $5ab + cd$ (l) $2xy + 5xz$
 (m) $11ab - 3ad$ (n) $9pq - 3qr$

3. (a) $3x + 15$ (b) $24 + 4x$ (c) $7x + 14$ (d) $2x + 12$
 (e) $5x + 10$ (f) $8x + 12$ (g) $15x + 10$ (h) $40x + 24$
 (i) $7x - 42$ (j) $40 - 8x$ (k) $8x - 28$ (l) $35x - 21$
 (m) $18x - 30$ (n) $4x - 8y$ (o) $5x + 10y + 15z$ (p) $5x + x^2$
 (q) $2a - a^2$ (r) $4b - 12$ (s) $2x^2 - 12x$ (t) $8x^2 + 12x$
 (u) $21x - 6x^2$ (v) $8x^2 - 40x$

4. (a) $7a + 26$ (b) $7x + 23$ (c) $8x + 22$ (d) $2x^2 + 7x$
 (e) $x^2 + 9x + 4$ (f) $12a + 17b$

5. (a) $5(x - y)$ or $5x - 5y$ (b) $7x$ (c) $\frac{x - 2}{8}$
 (d) $\frac{5}{4}x$ (e) $-2 - \frac{11}{2}y$ (f) $\frac{13}{8}y - \frac{3}{4}$

6. $\frac{5x - 2}{6}$

22.2 Simple Equations

1. (a) $x = 4$ (b) $x = 10$ (c) $x = 3$ (d) $x = 12$ (e) $x = 14$
 (f) $x = -2$ (g) $x = 9$ (h) $x = 4$ (i) $x = 18$ (j) $x = 8$
 (k) $x = 34$ (l) $x = 7$ (m) $x = 10$ (n) $x = 24$ (o) $x = 50$
 (p) $x = 12$ (q) $x = 21$ (r) $x = 66$ (s) $x = 8$ (t) $x = 6$
 (u) $x = 26$ (v) $x = 36$ (w) $x = 15$ (x) $x = 4$

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2. (a) $x = -4$ (b) $x = -5$ (c) $x = 3$ (d) $x = -6$ (e) $x = -4$
 (f) $x = -14$ (g) $x = -6$ (h) $x = -8$ (i) $x = -12$ (j) $x = -16$
 (k) $x = -3$ (l) $x = -20$ (m) $x = 8$ (n) $x = 8$ (o) $x = 6$
 (p) $x = -5$ (q) $x = -10$ (r) $x = -26$
3. (a) $x + 110^\circ = 180^\circ$; $x = 70^\circ$ (b) $x + 92^\circ = 180^\circ$; $x = 88^\circ$
 (c) $x + 110^\circ = 180^\circ$; $x = 149^\circ$ (d) $42^\circ + x + 40^\circ = 180^\circ$; $x = 98^\circ$
4. $x - 2 = 16$; $x = 18$
5. $12 \times x = 54$; $x = \$4.50$
6. $x + 3 = 41$; $x = \$38$
7. 52 is double Melanie's number, so the number is half of 52. It is 26.
 Alternatively, $x \times 2 = 52$, so $x = 26$.
8. 24 is double Lennox's number, so his number is half of 24. It is 12.
 Alternatively, $x \times 2 = 24$, so $x = 12$.
9. George is 11 years old. Carla is $11 - 2 = 9$ years old.
 Grace is twice as old as Carla, so Grace is $9 \times 2 = 18$ years old.

22.3 Solving Equations

1. (a) $x = 14$ (b) $x = 9$ (c) $x = 14$ (d) $x = 8$ (e) $x = 4$
 (f) $x = 1\frac{1}{3}$ (g) $x = -4$ (h) $x = -1$ (i) $x = \frac{-5}{3}$ (j) $x = 7$
 (k) $x = 6$ (l) $x = -2$ (m) $x = 10$ (n) $x = 1$ (o) $x = \frac{3}{5}$
 (p) $x = -2\frac{1}{2}$ (q) $x = \frac{1}{5}$ (r) $x = \frac{-3}{4}$ (s) $x = -3$ (t) $x = 0$
 (u) $x = \frac{-2}{5}$ (v) $x = 36$ (w) $x = 15$ (x) $x = 5$
2. (a) $x = -3$ (b) $x = -6$ (c) $x = \frac{13}{4}$ (d) $x = 14$
 (e) $x = 4$ (f) $x = 10$ (g) $x = 1$ (h) $x = -3$ (i) $x = 13$
 (j) $x = 3$ (k) $x = 4$ (l) $x = \frac{2}{3}$ (m) $x = 3$ (n) $x = 2$
 (o) $x = \frac{5}{3}$ (p) $x = 4$ (q) $x = 2$ (r) $x = \frac{1}{2}$ (s) $x = 8$
 (t) $x = 12$ (u) $x = 32$ (v) $x = 14$ (w) $x = 39$ (x) $x = 12$

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3. (a) $(3x + 40) + 80 + x = 360$; $x = 60^\circ$
 (b) $(x + 10) + (x + 30) + (2x + 30) + x = 360$; $x = 58^\circ$
 (c) $(x + 10) + (x + 30) + (x - 10) = 360$; $x = 110^\circ$
 (d) $(140 - x) + (120 - x) + (180 - x) = 360^\circ$; $x = 26\frac{2}{3}^\circ$
4. $x + x + (x + 1) + (x + 1) = 10$; $x = 2$ m
5. $2x + 10 = 42$; $x = 16$
6. $6x - 8 = 34$; $x = 7$
7. (a) $\$(12 + x)$ (b) $\$(2 + x)$ (c) $(12 + x) = 3(2 + x)$ (d) $x = 3$ (e) $\$3$
8. (a) $(x + 6) \times 2 = 18$; $x = 3$ (b) $(x \div 2) + 10 = 16$; $x = 12$
 (c) $[(x \div 2) + 2] \times 2 = 9$; $x = 5$ (d) $[(x - 7) \div 2] \times 10 = 115$; $x = 30$
9. $x + (x + 1) + (x + 2) + (x + 3) = 114$; $x = 27$
10. 6
11. (a) $y = 2x + 1$ (b) $x = 4$
12. (a) 7 (b) 4
13. $x = 2$
14. (a) $x = 4\frac{1}{2}$ (b) $y = 4$
15. (a) $(3x + 1)$ cm (b) (i) $3x + 1 = 22$ (ii) 7 cm, 5 cm and 10 cm
16. (a) $2x$ cents (b) $(x + 20)$ cents (c) 60 cents
17. $x = 4$

22.4 Algebraic Manipulation

1. (a) $-a - b$ (b) $\frac{b - d}{a - c}$ (c) $\frac{-1}{a - b}$ (d) $4a + 6$
 (e) $\frac{c - b}{3}$ (f) $\frac{a - c}{b - d}$ (g) $\frac{a - 2}{3}$ (h) a
 (i) $\frac{p + q}{q - p}$ (j) $3a + 2b$ (k) $\frac{-5 - a}{3}$ (l) $\frac{ab}{4 - a}$
2. (a) $\frac{P}{1 - P}$ (b) $\frac{b}{P - a}$ (c) $\frac{Qa + b}{Q - 1}$ (d) $\frac{q^2y + y}{q^2 - 1}$
 (e) $\frac{-2 - 3a}{a - 1}$ (f) $\frac{4c - b}{3}$ (g) $\frac{p^2}{1 - p^2}$ (h) $\frac{-2}{w^2 - 1}$ or $\frac{2}{1 - w^2}$
 (i) $\frac{w^2 + 2}{1 - w^2}$ (j) $\pm \sqrt{\frac{2}{p - 1}}$ (k) $\pm \sqrt{\frac{3p - 2}{p - 1}}$ (l) $\pm \sqrt{\frac{gy + y}{1 - g}}$

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22.5 Algebraic Fractions

1. (a) $\frac{9x}{20}$ (b) $\frac{11x}{28}$ (c) $\frac{8x}{15}$ (d) $\frac{41y}{21}$ (e) $\frac{23y}{20}$
 (f) $\frac{13y}{7}$ (g) $\frac{19x}{70}$ (h) $\frac{x}{6}$ (i) $\frac{9x}{8}$ (j) $\frac{27x}{24}$
 (k) $\frac{5a+4b}{20}$ (l) $\frac{8x+3y}{24}$ (m) $\frac{5a-3b}{15}$ (n) $\frac{10a+12b}{15}$ (o) $\frac{32a-27b}{36}$
2. (a) $\frac{4y+2x}{xy}$ (b) $\frac{6y-x}{xy}$ (c) $\frac{y+3x}{xy}$ (d) $\frac{5}{a}$ (e) $\frac{8b+3a}{2ab}$
 (f) $\frac{10b-3a}{6ab}$ (g) $\frac{25b+12a}{15ab}$ (h) $\frac{23}{15a}$ (i) $\frac{17}{28a}$ (j) $\frac{21b-16a}{24ab}$
 (k) $\frac{1}{12a}$ (l) $\frac{11}{8a}$
3. (a) $\frac{2x+1}{x(x+1)}$ (b) $\frac{3x+4}{x(x+2)}$ (c) $\frac{7x+3}{x(x+1)}$ (d) $\frac{4x+10}{x(x+2)}$ (e) $\frac{4x+2}{x(x-2)}$
 (f) $\frac{14x-12}{3x(x+3)}$ (g) $\frac{-6}{x(x+1)}$ (h) $\frac{6x-10}{x(x-5)}$ (i) $\frac{27x+42}{5x(x+6)}$ (j) $\frac{17x-49}{2x(x-7)}$
 (k) $\frac{23x-50}{3x(x-10)}$ (l) $\frac{7x-8}{3x(x-8)}$
4. (a) $\frac{2x+3}{(x+1)(x+2)}$ (b) $\frac{2x}{(x-1)(x+1)}$ (c) $\frac{7}{(x+2)}$
 (d) $\frac{6x-28}{(x-2)(x-6)}$ (e) $\frac{-x-2}{(x+3)(x+4)}$ (f) $\frac{x+35}{(x+7)(x-7)}$
 (g) $\frac{8x+28}{(x-4)(8+x)}$ (h) $\frac{-2x+30}{(x-4)(x+7)}$ (i) $\frac{8x+27}{(x+6)(x-1)}$
 (j) $\frac{5x-2}{(2x+6)(3x-8)}$ (k) $\frac{-6x}{(2x+5)(5-4x)}$ (l) $\frac{17x-7}{(2x-1)(3x-1)}$
 (m) $\frac{37x+13}{(2x+3)(5x-1)}$ (n) $\frac{18x+4}{(3x-7)(2x+3)}$

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$$5. \quad (a) \frac{3x^2}{(x+1)(x-2)} \quad (b) \frac{15x}{(x-7)(2x+1)} \quad (c) \frac{5x^2-3x}{(x-1)(3x-1)}$$

$$(d) \frac{x^2+3x+12}{(x+3)(x-1)} \quad (e) \frac{8x^2+11x}{(x-3)(x+4)} \quad (f) \frac{5x}{(2-x)(4x-3)}$$

$$(g) \frac{5x^2-13x}{(5-x)(x+1)} \quad (h) \frac{-4x^2-14x}{(4+x)(x+6)} \quad (i) \frac{x^2-4x-18}{(x+6)(x-1)}$$

$$6. \quad \frac{15-pq}{3q}$$

$$7. \quad \frac{5a-9}{a(a-3)}$$

$$8. \quad (a) m-2 \quad (b) \frac{y-6}{y(y-2)}$$

$$9. \quad \frac{5-x}{(x-1)(x+1)} \quad \text{or} \quad \frac{5-x}{x^2-1}$$