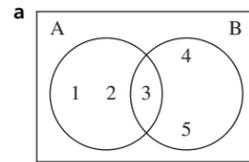


# Answers

## Chapter 0. Exercise 1

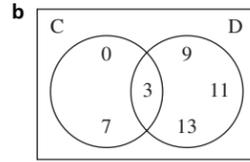
1 a  $\{x: x \leq 2, x \in \mathbb{R}\}$  b  $\{x: x \geq -2, x \in \mathbb{R}\}$  c  $\{x: x > 1, x \in \mathbb{R}\}$  d  $\{x: -1 \leq x \leq 3, x \in \mathbb{R}\}$

2 Venn diagrams



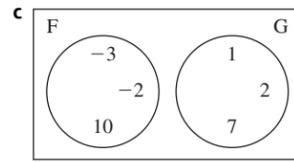
$$A \cap B = \{3\},$$

$$A \cup B = \{1, 2, 3, 4, 5\}$$



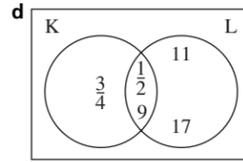
$$C \cap D = \{3\},$$

$$C \cup D = \{0, 3, 7, 9, 11, 13\}$$



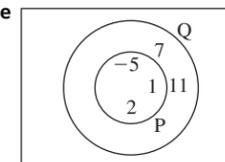
$$F \cap G = \emptyset,$$

$$F \cup G = \{-3, -2, 1, 2, 7, 10\}$$



$$K \cap L = \left\{ \frac{1}{2}, 9 \right\},$$

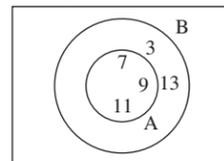
$$K \cup L = \left\{ \frac{1}{2}, \frac{3}{4}, 9, 11, 17 \right\}$$



$$P \cap Q = \{-5, 1, 2\},$$

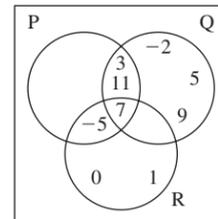
$$P \cup Q = \{-5, 1, 2, 7, 11\}$$

3 Venn diagram



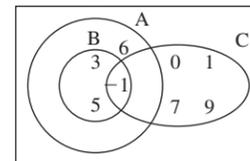
$$A = \{7, 9, 11\}$$

4 Venn diagram



$$P \cup Q = \{-5, -2, 3, 5, 7, 9, 11\}, P \cap Q \cap R = \{7\}$$

5 Venn diagram

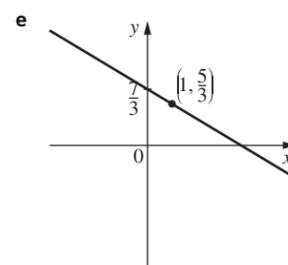
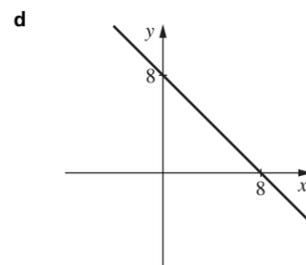
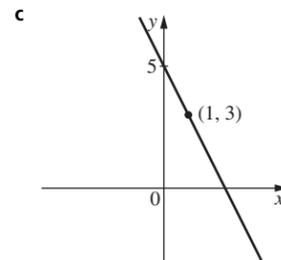
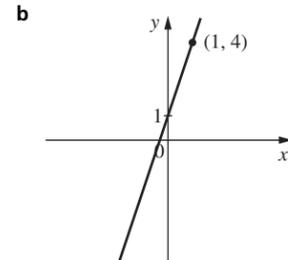
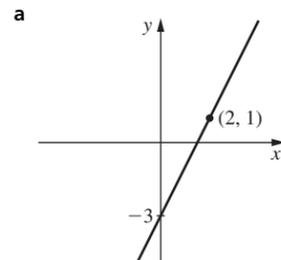


$$B \cup C = \{-1, 0, 1, 3, 5, 7, 9\}, A \cap B \cap C = \{9\}$$

## Chapter 0. Exercise 2

1 a  $m = 2$  b  $m = \frac{5}{4}$  c  $m = \frac{9}{4}$  d  $m = -\frac{7}{3}$  e  $m = -2$  f  $m = 0$

2 Graphs



3 a  $y = \frac{7}{3}x + \frac{5}{3}$  b  $y = \frac{3}{5}x + \frac{13}{5}$  c  $y = 3x + 11$  d  $y = -2x + 6$  e  $y = -\frac{3}{4}x + \frac{15}{4}$  f  $y = -2$

4 a  $3y - x - 10 = 0$  b  $2y + 7x + 7 = 0$  c  $4y - 5x + 3 = 0$  5 a  $45^\circ$  b  $71.6^\circ$  c  $117^\circ$  d  $53.1^\circ$

6  $y = \sqrt{3}x - 3\sqrt{3} + 1$  7  $y = 3x - 2$  8  $y = -\frac{1}{4}x + \frac{13}{4}$  9  $y = 2x + 1$  10 a  $(4, 4)$  b  $\left(1, \frac{9}{2}\right)$  c  $\left(-3, -\frac{9}{2}\right)$  d  $(4, 2)$  e  $\left(-2, \frac{9}{2}\right)$

11 a  $\sqrt{52}$  b  $\sqrt{41}$  c  $\sqrt{61}$  d 6 e  $\sqrt{205}$  12 a  $M(-2, 3)$  b  $AB = 6\sqrt{5}$  c  $y = 2x + 7$  d  $y = -\frac{1}{2}x + 2$  e  $153^\circ$

## Chapter 0. Exercise 3

- 1 a  $50^\circ$  b  $x = 13.9$  2 a  $x = 120^\circ, y = 60^\circ$  b  $x = 45^\circ, y = 5.66$  3 a  $x = 14.3$  b  $x = 31.0^\circ$   
 4 a  $x = 50^\circ, y = 90^\circ, z = 40^\circ$  b  $x = 55^\circ, y = 70^\circ, z = 35^\circ$  5 a  $x = 8.60$  b  $x = 68.9^\circ$   
 7 a  $x = 12.5$  b  $x = 5.37$  c  $x = 49.1^\circ$  8  $d = 5\text{cm}$  9 AB is longer by 1.29cm

## Chapter 0. Exercise 4

- 1 a  $2\sqrt{5}$  b  $4\sqrt{2}$  c  $3\sqrt{7}$  d  $2\sqrt{11}$  e  $10\sqrt{3}$  2 a  $5\sqrt{5}$  b  $7\sqrt{2}$  c  $4\sqrt{2}$  d  $27\sqrt{3}$  e  $6\sqrt{2}$   
 3 a  $3\sqrt{2}$  b  $4\sqrt{6}$  c  $10\sqrt{2}$  d 30 e  $15\sqrt{15}$  4 a  $4 + 4\sqrt{2}$  b  $6 + 3\sqrt{3}$  c  $12 - 4\sqrt{2}$  d  $7\sqrt{3} - 28$  e  $3\sqrt{2} + 2$   
 4 f  $6 + 3\sqrt{2} + 2\sqrt{5} + \sqrt{10}$  g  $19 - 18\sqrt{3}$  h  $7 + 4\sqrt{3}$  i  $32 - 10\sqrt{7}$  5  $x = \sqrt{18 + 6\sqrt{2} + 4\sqrt{3}}$   
 6 a  $\frac{2\sqrt{3}}{3}$  b  $\frac{3\sqrt{5}}{5}$  c  $2\sqrt{2}$  d  $\frac{7\sqrt{18}}{18}$  e  $\frac{\sqrt{15}}{3}$  f  $\frac{5\sqrt{3}}{3}$  g  $\sqrt{3} + 1$  h  $2\sqrt{5} - 2$  i  $\frac{36 + 12\sqrt{2}}{7}$   
 6 j  $2\sqrt{3} + 2\sqrt{2}$  k  $-2 - \sqrt{5} + 2\sqrt{3} + \sqrt{15}$  l  $6 - 3\sqrt{3} - 2\sqrt{5} + \sqrt{15}$   
 7 a  $a^{10}$  b  $k^3$  c  $p^8$  d  $z^{\frac{11}{2}}$  e  $x^4$  f  $8k^2$  g  $8k^7$  h  $x^{12}$  i  $243p^{10}$  j  $196k^{-12}$  k  $x^5y^{10}$  l  $p^{-8}q^{-12}$  m  $k^{\frac{2}{3}}$  n  $12x^2$   
 8 a  $x^{-1} - 4$  b  $x^4 - x^{-2}$  c  $\frac{1}{2}x^5 + \frac{1}{2}x$  d  $3x^{\frac{3}{2}} + 4x^{-\frac{1}{2}}$  e  $8x^{\frac{5}{3}} - 3x^{\frac{2}{3}}$  f  $x + 6 + 9x^{-1}$  g  $\frac{1}{3} + \frac{1}{3}x^{-1} - 2x^{-2}$   
 8 h  $\frac{9}{4}x^{-1} - 3 + x$  i  $25x^{-2} - 40x^{-1} + 16$  j  $x + 1 - 3x^{-1} - 3x^{-2}$  k  $x^{\frac{3}{2}} + 4x^{\frac{1}{2}} + 4x^{-\frac{1}{2}}$

## Chapter 0. Exercise 5

- 1  $8x - 10$  2  $11y + 17$  3  $2a + 7$  4  $x^2 + x - 2$  5  $-3x^2 - 16x$  6  $6y^2 + 21y - 72$  7  $5y + 19z - 45$  8  $28a^2 + 88a$   
 9  $xy + 4x + 2y + 8$  10  $ab - 7a - 6b + 42$  11  $6ef - 2e + 15f - 5$  12  $30st - 85s + 72t - 204$  13  $x^2 + 13x + 40$   
 14  $y^2 + y - 56$  15  $y^2 - 49$  16  $a^2 - 8a + 16$  17  $2x^2 + 3x - 5$  18  $15b^2 + b - 6$  19  $-15t^2 + 17t + 4$  20  $-4s^2 + 16s - 7$   
 21  $-9y^2 + 4$  22  $4x^2 - 36x + 81$  23  $7t^2 + 6t + 1$  24  $x^2 + 4y^2 - 25$  25  $10x^2 + 25x - 15$  26  $-3a^2 + 2a + 8$  27  $-r^2 - 8r$   
 28  $x^2 - y^2 - 2x - 6y - 8$  29  $2x^2 + 2x^2y + xy^2 - 4xy - 5x$  30  $-a^2 - ab - ac + 3a + 3b + 3c$  31  $6x^2 - 35y^2 - 11xy - 8x + 59y - 14$   
 32  $2a^2 - 2a^2b + 4ab^2 + 24a - 20b - 18ab + 70$  33  $6x^2 - 24y^2 + 18z^2 + 18xy - 24xz - 66yz$

## Chapter 0. Exercise 6

- 1  $3(x - 5)$  2  $x(5x - 2)$  3  $3(a + 5b)$  4  $2xy(y + 6x)$  5  $5y(2x + 3 - x^2)$  6  $(a + 2d)(c + 2b)$  7  $(2c + d)(a - 3b)$   
 8  $(4y - z)(x - 2y)$  9  $(4y - 3h)(3e + 2f)$  10  $(7s + x)(s - 5t)$  11  $(x + 1)(x + 2)$  12  $(x + 3)(x + 2)$  13  $(x + 7)(x - 2)$   
 14  $(x - 11)(x + 2)$  15  $(x - 7)(x - 5)$  16  $(x + 3)(x + 2)$  17  $(x + 6)(x + 2)$  18  $(x - 8)(x + 1)$  19  $(x + 4)(x - 3)$   
 20  $(x - 6)(x - 3)$  21  $2(x + 3)(x + 2)$  22  $3(x - 4)(x + 3)$  23  $(2x + 1)(x + 2)$  24  $(2x + 5)(x + 4)$  25  $(3x - 1)(x + 2)$   
 26  $(5x - 4)(x + 2)$  27  $(3x - 5)(x + 5)$  28  $(2x + 1)(2x + 3)$  29  $(3x + 1)(2x + 5)$  30  $(4x + 1)(x - 8)$  31  $(4x + 3)(3x - 4)$   
 32  $(7x - 5)(4x - 3)$

## Chapter 0. Exercise 7

- 1  $\frac{1}{4}$  2  $\frac{5}{3}$  3  $\frac{x^2}{y}$  4  $\frac{a-6}{2a-3}$  5  $\frac{x-6}{x+5}$  6  $\frac{x-3}{x-1}$  7  $\frac{12}{p+3q}$  8  $\frac{6x^3}{y^2}$  9  $10st^4$  10  $4x$  11  $\frac{r}{3}$  12  $\frac{1}{2(2x+1)}$  13  $\frac{5}{3x-1}$   
 14  $\frac{7a^6}{18}$  15  $\frac{a^4}{c^2}$  16  $\frac{x+2}{9}$  17  $\frac{2g-3f}{fg}$  18  $\frac{z^2+1}{z}$  19  $\frac{18x-5}{12}$  20  $\frac{2\sin B + 3\sin A}{\sin A \sin B}$  21  $\frac{196y+1}{28y}$  22  $\frac{z(a^2+b^2)}{a^2b^2}$   
 23  $\frac{2y}{y^2-1}$  24  $\frac{9x+30}{(x+4)(x+3)}$  25  $\frac{3-2a}{a^2-4}$  26  $\frac{-2(1+3z)}{(2z+1)^2}$  27  $\frac{6(2+x)}{(2x+1)^2}$  28  $\frac{29y-78}{12(y+3)(3y-2)}$  29  $\frac{2x^2-21x+13}{(x-1)(x+5)(x-2)}$   
 30  $\frac{5-3y+3x}{y^2-x^2}$  31  $\frac{13t-30}{(t+1)(t-5)}$  32  $\frac{-1}{x+1}$  33  $\frac{2x(x+4)}{(x+3)(x-2)}$  34  $\frac{3}{x(x+5)}$  35  $\frac{-2x}{x^2-9}$  36  $\frac{6x^2+7x-1}{(3x+2)(x+3)}$   
 37  $\frac{2x(1+x+2y)}{(x+3y)(x+2y)}$  38  $\frac{2(x-3)(x+2)^2}{9(x+1)(x-2)}$

## Chapter 0. Exercise 8

- 1  $x = 24$  2  $x = \frac{5}{4}$  3  $x = -\frac{2}{3}$  4  $x = \frac{12}{5}$  5  $x = 210$  6  $x = 28$  7  $x = -1$  8  $x = 2$  9  $x = \frac{16}{11}$  10  $a = \frac{9}{7}$  11  $b = -\frac{13}{4}$   
 12  $t = -32$  13  $p = -\frac{17}{11}$  14  $x = \frac{1}{7}$  15  $y = -\frac{23}{6}$  16  $a = \frac{5}{4}$  17  $x = -\frac{3}{53}$  18  $x = \frac{43}{26}$  19  $x = -\frac{125}{24}$  20  $x = -10$   
 21  $x = -25$  22  $x = \frac{29}{2}$  23  $x = -\frac{27}{16}$  24  $x = -\frac{61}{58}$

## Chapter 0. Exercise 9

- 1  $z = \frac{2y-x}{3}$  2  $c = \frac{2a-y}{b}$  3  $y = x + 5z$  4  $a = \frac{3c^2}{b-2c}$  5  $x = \frac{a-3b}{a+2b-3}$  6  $y = \frac{4xz}{x+z}$  7  $f = \frac{hk-g}{3}$  8  $z = \frac{5+2a-b}{a+b}$   
 9  $b = \frac{135a^2+93a+2}{2(a-1)}$  10  $a = \frac{3b-92}{138+3b}$  11  $x = \frac{a^2}{b-1}$  12  $m = n + p$  13  $y = \frac{5(1-3z)}{2(z-6)}$  14  $z = \frac{12y+5}{2y+15}$   
 15  $a = \frac{x(3c-b)}{4c^2x^2-x^2+b-2c}$  16  $t = \pm\sqrt{\frac{p-3}{q}}$  17  $b = \pm\sqrt{\frac{a(1+2a)}{3}}$  18  $t = \pm\sqrt{\frac{s(5s-1)}{9s^3}}$  19  $b = \pm\sqrt{\frac{3a-a+2}{6}}$   
 20  $b = \pm\sqrt{\frac{7-3a^2-14a}{21-45a}}$

## Chapter 0. Exercise 10

- 1  $x = 2, y = 1$  2  $x = 2, y = 5$  3  $x = 1, y = -1$  4  $x = -2, y = -1$  5  $x = 1, y = 2$  6  $x = 4, y = 3$  7  $x = -1, y = -3$   
 8  $x = 2, y = 3$  9  $x = \frac{1}{2}, y = \frac{1}{2}$  10  $x = -\frac{121}{17}, y = -\frac{4}{17}$  11  $x = 1, y = 4$  12  $x = 2, y = 5$  13  $x = 1, y = -3$  14  $x = -2, y = -3$   
 15  $x = \frac{3}{2}, y = -\frac{1}{2}$  16  $x = 1, y = 7$  17  $x = 1, y = -2$  18  $x = -1, y = -3$  19  $x = -1, y = -4$  20  $x = \frac{13}{5}, y = 2$