

ANSWERS



Practice on Number
and Numeration

1. -2

$$2. \quad 2x^2 + 13x - 7 = 0$$

3. Daughter's age = 10 years

Father's age = 43 years

4. 1.5 or $1\frac{1}{2}$

$$5. \ 2.8 \times 10^{-3}$$

$$6. \ 5.62 \times 10^{-3}$$

7. (a) $1\frac{29}{30}$ (b) 3.5

9. (a) $x = 1.18$ or $x = -4.68$

$$(b) \quad x = \frac{1}{2}; y = -1$$

10. (a) 12% to the nearest whole number.

(b) 21 correct to the nearest Naira.

11. (a) $x = -10$ (b) 6×10^{-7}

12. (a) $x = 2; y = \frac{1}{2}$ (b) $x = \frac{3}{4}$ or 0.75

13. (a) $x = 817$ (b) $x = \frac{7}{4}$ or $1\frac{3}{4}$
 or 1.75

14. 56

15. 110011_2

16. (a) ₦142.50 (b) ₦22.50 (c) 18.75%

17. $2\frac{1}{8}$ or $\frac{17}{8}$

18. (a) -15 (b) -72 (c) 60 (d) -48

19. (a) 6 300 000 (b) 450 000

(c) 9 650 000 (d) 55 000

(e) 480 000

20. (a) $\frac{2}{10}; \frac{3}{15}$ (b) $\frac{6}{10}; \frac{9}{15}$

(c) $\frac{6}{8}; \frac{9}{12}$ (d) $\frac{10}{14}; \frac{15}{21}$

21. (a) $9\frac{25}{42}$ (b) $2\frac{1}{5}$ (c) 5 (d) $11\frac{27}{35}$

22. (a) 9 (b) 5 (c) -48 (d) -8

23. 73.4 peanuts

24. (a) 0.6 (b) 4.286

(c) 3.333 (d) 4.2

25. (a) $x = 48$ (b) $x = 5$

(c) $x = -\frac{16}{21}$ (d) $x = 16$

26. -54

27. (a) 8 (b) 2 (c) 17 (d) 10.5

28. (a) $3\frac{1}{7}$ (b) $7\frac{1}{4}$ (c) $12\frac{5}{6}$

(d) $5\frac{1}{5}$ (e) $18\frac{1}{4}$

29. (a) 4 and 8 (b) 3, 4, 9

(c) 3, 4, 5, 6 (d) 2, 3, 6

30. (a) 1, 2, 5, 10, 25, 50

(b) 1, 2, 4, 5, 10, 20

(c) 1, 2, 3, 4, 6, 9, 10, 15, 30, 45, 90

(d) 1, 2, 4, 5, 8, 10, 20, 40, 80

(e) 1, 2, 4, 11, 22, 44

31. $\frac{11}{20}$

32. (a) 4 700 (b) 0.47 (c) 4 355 000

(d) 0.00007004 (e) 0.057

33. (a) 0.25 (b) 0.4 (c) 0.75

(d) 0.9 (e) 0.67 (f) 0.625

34. (a) 15.3 (b) 0.0192 (c) 1.41

(d) 0.6525 (e) 35.72 (f) 0.702

(g) 1.215 (h) 0.0837

35. (a) Nine hundred and seventy-two thousand one hundred and fourteen.

(b) Five million eight hundred and fifty-six thousand seven hundred and fifteen.

(c) Seven hundred and seventy-seven thousand six hundred and forty-four

(d) Five hundred and forty thousand and seven

(e) Forty-seven thousand one hundred and fifty-four

(f) Eight hundred and eighty thousand one hundred and forty-seven.

36. (a) 24.708 (b) 4.22712

(c) 0.006138 (d) 32.608825

37. (a) 15.9 (b) 210.5 (c) 201

(d) 81.1 (e) 1.1 (f) 11100

38. (a) r^{18} (b) 10^{-12} (c) x^{11}

(d) c^5 (e) y^{-9} (f) n^{10}

39. (a) 1 cm (b) 760 cm (c) 5 cm

(d) 170 cm (e) 85 cm (f) 4.1 cm

40. (a) $\frac{25}{4}$ (b) $\frac{11}{3}$ (c) $\frac{29}{6}$

(d) $\frac{37}{5}$ (e) $\frac{19}{3}$ (f) $\frac{48}{5}$

41. (a) $14\sqrt{3-51}$ (b) $\sqrt{6}$ (c) $2\sqrt{3}$

(d) 71 (e) 61 (f) $\frac{2\sqrt{6}}{15}$

42. (a) $\frac{1}{17}$ (b) $\frac{1}{11}$ (c) $\frac{-1}{2}$

(d) $\frac{3}{2}$ (e) $\frac{-1}{4}$

43. (a) $2 \times 3 \times 7$

(b) $2 \times 2 \times 2 \times 2$

(c) $2 \times 2 \times 2 \times 3 \times 3$

(d) $2 \times 7 \times 7$

(e) 2×17

44. (a) 1, 3 (b) 2, 3, 4, 6, 12 (c) 1

(d) 1 (e) 1, 7

45. (a) 1 (b) 1 (c) 15

(d) 20 (e) 8

55. 1011001_2

56. 110011_2

57. 876_{10}

58. 5.875

59. 117_{10}

60. $n = 2$

61. (a) $x = -14$ (b) $y = 6$

 (c) $y = 17$ (d) $y = 8$

62. $P = 1$; $Q = -7$

63. 8

64. (a) 69 (b) 301 (c) 45

 (d) 109 (e) 49

65. 329

66. 46 527

67. (a) $(13, 1, 20, 8, 5, 13, 1, 20, 9, 3, 19)$,
 $(9, 19), (6, 21, 14)$.

 (b) $(1, 12, 7, 5, 2, 1, 81), (9, 19), (22, 5,$
 $18, 25), (19, 9, 13, 16, 12, 5)$

 (c) $(13, 1, 20, 8, 5, 13, 1, 20, 9, 3, 19)$,
 $(9, 14, 22, 15, 12, 22, 5, 19),$
 $(16, 18, 15, 2, 12, 5, 13), -(19, 15,$
 $12, 22, 9, 14, 7)$

 (d) $(7, 15, 15, 4), (1, 6, 20, 5, 18, 14, 15,$
 $15, 14), (5, 22, 5, 18, 25, 15, 14, 5)$

68. $\frac{56}{121}$

69. (a) $\frac{23}{300}$ (b) $\frac{13}{30}$ (c) $\frac{3}{20}$

 (d) $\frac{4}{25}$ (e) $\frac{91}{200}$

70. (a) $8:7$ (b) $3:2$ (c) $3:1$

 (d) $20:7$ (e) $4:9$ (f) $5:6$

Practice on Algebraic Processes

$$1. \ x = \frac{-8}{3}; \ y = \frac{-10}{3}$$

$$2. \ x = \frac{7}{6}; \ y = \frac{-1}{2}$$

$$3. \ x = \frac{-12}{13}; \ y = \frac{-9}{13}$$

$$4. \ x = 2; \ y = 0$$

$$5. \ x = 3; \ y = -1$$

$$6. \ x = \frac{-7}{17}; \ y = \frac{21}{17}$$

$$7. \ x = 3; \ y = 2$$

$$8. \ m = \frac{11}{2}; \ n = \frac{1}{2}$$

$$9. \ x = \frac{11}{4}; \ y = \frac{-1}{4}$$

$$10. \ x = 6$$

$$11. \ a = \frac{-8}{7}$$

$$12. \ x = \frac{1}{2}$$

$$13. \ y = 2$$

$$14. \ x = 16$$

$$15. \ r = 4$$

$$16. \ x = \frac{3}{4}$$

$$17. \ x = \frac{1}{4}$$

$$18. \ (a - c)(x - y)$$

$$19. \ 2(2a + 3b)(2a - 3b)$$

$$20. \ (x - 3)(x + p)$$

$$21. \ 3(x + 5)(x - 5)$$

$$22. 3xy(z - 7xy + 5z^2)$$

$$23. 2ab(a + 5b) - 5bz^2$$

$$24. 2(a - 1)$$

$$25. 6 - x$$

$$26. 7x - 2y$$

$$27. 9x + 4y$$

$$28. y^2 - 6x^2 + xy$$

$$29. 6x^2 - 13xy + 6y^2$$

$$30. a^2 - 2ab + b^2$$

$$31. xy + 15x - 6y - 90$$

$$32. 6x^2 + 17xy + 12y^2$$

$$33. 9 + q + r$$

$$34. \frac{32x - 25y - 6}{15}$$

$$35. 8 + 6b - 9b^2$$

$$36. x^2 + b^2$$

$$37. 5a + b$$

$$38. 12a - 7b$$

$$39. 14y + 13z$$

$$40. 13r$$

$$41. 4x^2$$

$$42. 25$$

$$43. 16.7\%$$

$$44. 38.4\%$$

$$45. \frac{42}{71}$$

$$46. 4.6$$

$$47. h = \frac{mr}{n}$$

$$48. S = T - \frac{K^2}{V^2}$$

$$49. x = \frac{(p-q)}{a(p+q)}$$

$$50. t = \frac{\rho Q}{(R-L)}$$

$$51. r = \sqrt{\frac{v}{\pi h}}$$

$$52. x = \frac{y-b}{a}$$

$$53. a = \frac{(r-p)^2}{2s}$$

$$54. x = \frac{7}{13}$$

$$55. \frac{11}{20m}$$

56. 10

$$57. x = \frac{-7}{4}$$

$$58. r = 40$$

$$59. x + 3 \text{ ft}$$

$$60. 5$$

$$61. -18$$

$$62. \text{(a) } 13 \quad \text{(b) } -7 \quad \text{(c) } 15 \\ \text{(d) } 11\frac{1}{4} \text{ or } 11.25$$

$$63. x^2 - 5x - 14 = 0$$

$$64. x = \frac{-1}{2} \text{ or } 2$$

$$65. 16$$

$$66. (x+3)(2x-5)$$

$$67. x = 7$$

$$68. x = \frac{1}{2} \text{ or } 1\frac{2}{3}$$

$$69. x = -6 \text{ or } 4$$

$$70. \frac{1}{35}$$

$$71. 1.5$$

$$72. (x - 12)(x + 16)$$

$$73. (2^e - 1)(e - 1)$$

$$74. y = 0 \text{ or } y = \frac{3}{7}$$

$$75. m = 16$$

$$76. a = -3 \text{ or } \frac{9}{2}$$

$$77. y = 5 \text{ or } -20$$

$$78. (3a - 2)(a - 3)$$

$$79. a - 5 = 0 \text{ or } a + 2 = 0$$

$$80. \frac{2y - 5x}{4}$$

$$81. 2^{n-2} - 2n$$

$$82. 12x^2 + 11x + 2 = 0$$

$$83. x = \frac{2}{3}$$

$$84. 7$$

$$85. (y - x)(2y + 3x)$$

$$86. 2x^2 - 3x - 2 = 0$$

$$87. \frac{3-x}{1-x^2}$$

$$88. 81$$

$$89. m = 3$$

$$90. x = -10$$

$$91. 6 \times 10^{-7}$$

$$92. x = 2; y = \frac{1}{2}$$

$$93. (2s + t)(s - 2t)$$

$$94. x = 3 \text{ or } -1$$

$$95. \frac{1}{12r}$$

$$96. (x - 3)(2x - 15)$$

$$97. x = 2; y = 6$$

$$98. 1.5 \times 10^2$$

$$99. \frac{m - 13n}{(m + 2n)(m - 3n)}$$

$$100. 7$$

Practice Exercise on Geometry and Mensuration

1. Equilateral

2. 5 cm

3. 44 cm

4. 6

5. $a = 54^\circ; b = 126^\circ$

6. 50°

7. 5 cm

8. 3 sides

9. 2

10. 540°

11. 8

12. 8 cm

13. 10 cm

14. 38 cm

15. 6 cm

16. 12 cm^2

17. 9 sides

$$18. \frac{|AB|}{|AC|} = \frac{|XY|}{|XZ|} = \frac{|AB|}{|BC|} = \frac{|XY|}{|YZ|}$$

19. 72°

20. 47.1 cm^2

21. 8 cm

22. 31 cm^2

23. 92°

24. 80 cm

25. 83.6 cm^2

26. $1\,437 \text{ cm}^3$

27. $n = 7$

28. $1\,350 \text{ cm}^2$

29. 140°

30. 20 cm

31. 660 cm^2

32. 8 cm

33. 77 cm^2

34. 150°

35. Isosceles triangle

36. 23°

37. 72 m

38. Triangular prisms

39. 114°

40. Triangle

41. 8 cm

42. Complementary angles

43. 67° , isosceles triangle

44. 19 cm

45. 4 cm

46. 84 cm^2

47. $2\pi rh$

48. 60°

49. 0

50. 10.5 m

Practice Exercise on Statistics

1. 70%
2. 56%
3. 70%
4. 30%
5. Abubakar
6. Regina
7. Mathematics
8. 81
9. 8
10. 34
11. 47
12. Amala
13. 20 customers
14. Pounded yam
15. $\frac{1}{4}$
16. 1
17. 2
18. 4
19. 3
20. 7 500
21. 18 000

22. 40 leaves

23. Most prefer it; so the ratio of the number sold in the three categories will continue.

24. 90 leaves

25. Because the sale is least here and this will continue to be like this or even drop.

26. N107.50

27. Yes, from 361 students in 2000 to 506 students in 2005.

28. 145

29. 10 classes in 2000; 10 classes in 2001.

30. 2002

31. 2006

32. About 540

33.

Score	8	10	13	16	99	
Tally						
Frequency	2	1	1	2	2	9

34. 15 students

35. 87

36. 41

37. 70

38. Fourth

39. Ninth equal

40. Twelfth (although he has the tenth best mark, there are 11 students in front of him).

41. 10 students

42. 14 students

43. 1 student

44. 64

45.

No. of experiments	0	1	2	3	4	5	6	7	
Tally									
Frequency	3	3	9	7	5	2	2	2	33

46. 2 experiments

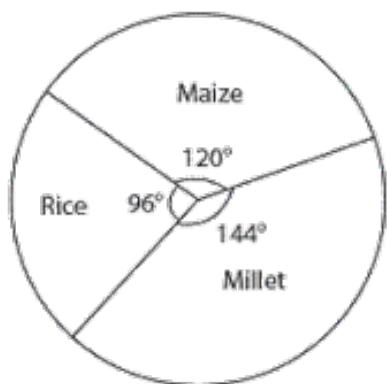
47. 5 students

48.

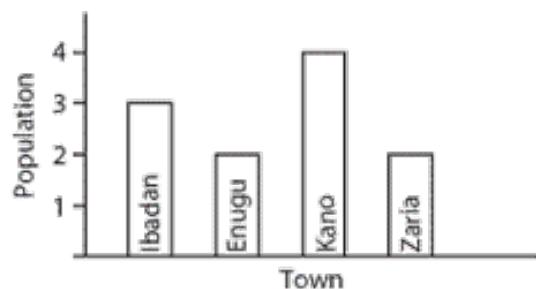
Marks	John	Tina	Rose
Mangoes	00000	000	0000000

49.

Crop	Tons	Degrees
Maize	20	$\frac{20}{60} \times 360 = 120^\circ$
Rice	16	$\frac{16}{60} \times 360 = 96^\circ$
Millet	24	$\frac{24}{60} \times 360 = 144^\circ$



50.



Chapter 1

Exercise 1

1. 157987_{10}
2. 3007_{10}
3. 8412_{10}
4. 5246_{10}
5. 3348_{10}
6. 1250_{10}
7. 3611_{10}
8. 7508_{10}
9. 2929_{10}
10. 2059_{10}
11. 57199_{10}
12. 2020_{10}
13. $n = 6$
14. $x = 2$
15. $r = 4$
16. 116_{10}

17. 101831_{10}

18. 1060_{10}

19. 218_{10}

20. 379_{10}

21. 1422_8

22. 1254_6

23. 721_9

24. $45D_{15}$

25. 15502_8

26. 2791_{14}

27. 741_{11}

28. 1565_7

29. 40534_7

30. 12865_9

Exercise 2

1. $116\frac{3}{10}^{3/5}$

2. $1174\frac{17}{36}_{10}$ or 1174.47

3. $101831\frac{51}{144}_{10}$ or 101831.35_{10}

4. $6388\frac{7}{18}_{10}$ or 6388.39_{10}

5. $218\frac{14}{25}_{10}$ or 218.56_{10}

6. $501\frac{59}{64}_{10}$ or 501.92_{10}

7. $379\frac{9}{64}_{10}$ or 379.14_{10}

$$8. 23991 \frac{153}{169_{10}} \text{ or } 23991.91_{10}$$

$$9. 999 \frac{1637}{3375_{10}} \text{ or } 999.49_{10}$$

$$10. 905 \frac{2111}{2744_{10}} \text{ or } 905.77_{10}$$

$$11. 20 \frac{1373}{2048_{10}} \text{ or } 20.67_{10}$$

$$12. 5446 \frac{811}{1024_{10}} \text{ or } 5446.79_{10}$$

$$13. 690 \frac{13}{81_{10}} \text{ or } 690.16_{10}$$

$$14. 29898 \frac{93}{128_{10}} \text{ or } 29898.73_{10}$$

$$15. 2504 \frac{20}{49_{10}} \text{ or } 2504.41_{10}$$

$$16. 13667 \frac{31}{36_{10}} \text{ or } 13667.86_{10}$$

$$17. 152 \frac{112}{121_{10}} \text{ or } 152.93_{10}$$

$$18. 2423 \frac{9}{37_{10}} \text{ or } 2423.28_{10}$$

$$19. 367760 \frac{50}{169_{10}} \text{ or } 367760.30_{10}$$

$$20. 121 \frac{56011}{65536_{10}} \text{ or } 121.86_{10}$$

Exercise 3

$$1. 5511_6$$

$$2. 251_7$$

$$3. 505_6$$

$$4. 3201122_4$$

5. ICF_{16}
6. 1415_6
7. 5135_9
8. 16426_7
9. 4330_{12}
10. $32FOOA_{16}$
11. 10101230_4
12. $2C44_{14}$
13. $EA16_{16}$ is larger than 4781_9 (Reason
 59911_{10} is bigger than 3556_{10})
14. $ABC4_{13}$ is bigger than $4E4E_{16}$ (Reason
 23989_{10} is bigger than 20046_{10})
15. (a) 20004_5 (b) 36030_9

Exercise 4

1. (a) 1311_7 (b) 533_7
(c) 13540_7 (d) 10321_7
2. (a) 524_9 (b) 120_9
(c) 4323_9 (d) 2723_9
3. (a) $11A9_{12}$ (b) 1265_{12}
4. (a) 673_{16} (b) $5FC2_{16}$
(c) $AB3F_{16}$ (d) $4B2B_{16}$
5. (a) 1016_{11} (b) 1010_{11}
(c) 1119_{11} (d) $1AO_{11}$
6. (a) 40_5 (b) $IF6_{16}$

7. (a) 999_{11} (b) $8A1_{11}$

(c) $19A_{11}$ (d) 2_{11}

8. $1031_5 = \text{nnnn}_5$

9. $x = 7$

10. 242_6

11. $n = 7$

12. $y = 8$

13. $x = \frac{Z + 2y + 2}{4}$

14. $x = 6; y = 4$

15. $x = 6$

16. 2654_8

17. $x = 6$

18. 9

19. 9

20. 5_8

21. 24_5

22. 645_7

23. 217774_8

24. $x = 4$

25. 11001_2

26. 7177_8 kendos

27. (a) 33333_6 (b) 26624_6

(c) 45344_6 (d) 1354054_6

28. 114

29. 645_7

30. $237D98_{16}$

Exercise 5

1. 1 and 0
2. $15 + 1 = 10$
3. Computer programming is on binary number system.
4. 10111211
5. $13 + 1 = 10$
6. 10110_2
7. 
8. D and E
9. 14 digits
10. 0, 1, 2, 3, 4, 5, 6, 7 and 8
11. (a) Mathematics, Yoruba and Government
(b) Mathematics and Government
12. 
13. (1100)(101)(1111)(1110)(1)(10010)
(100)(10011)(1101)(1)(10010)(0100)
14. 10011
10100
1
10010
15. (a) (i) UGLY DOG
(ii) NELSON MANDELA
(b) (i) DENARY (ii) CHIKE OBI

Graduated Exercises

1. $N = 8$
2. 430_5
3. 6542_8 Kendos.
4. 321_7
5. 101010110_2
6. $x = 1101_2$
7. $1B4D16$
8. $23990 \cdot 37_{10}$ or $23990 \frac{63}{169}_{10}$
9. (i) 5532_6 (ii) 1915_{16}
10. Since 41751_{10} is bigger than 1844_{10}
therefore, $A317_{16}$ is larger than 2468_9
11. $60B1_{16}$
12. 13265_{12}
13. 101_2
14. 121012_3
15. 102022_3
16. $y = 34_{10}$
17. Base 12 and 1
18. 876_{10}
19. 11251_7
20. $nnn_8 = 536_8 = 536_8$
21. $Q = 5$
22. $x = 18$
23. $P = 3$ and $Q = 4$ therefore
 $2pQ_7 = 234_7$

24. 101,

25. 235_g

$$26. X = 64_{10}$$

$$27. \quad 74.63_{10} \text{ or } 74\frac{51}{81}_{10}$$

28. 23₈

29. (a) B89₁₆ (b) 11306₇

30. (a) $x = 3_5$ (b) $y = 7$

Chapter 2

Exercise 1

1. -4

2. 4

3. 5

4. 2

5. 13

6. -13

7. 6

8.0

9. -

10. 7

11. (a) 2 (b) 2 (c) 0

12. (a) -2 (b) 4 (c) -

(a) -4 (b) 8

(d) 4 (e) 37

(a) 3 (b) -1

15. (a) -40 (b) -224 (c) 36

(d) 114 (e) -72

16. (a) -4 (b) -3

17. negative

18. negative

19. 8

20. -9

21. 14

22. 4

23. -8

24. 3

25. -2.4

26. -0.375

27. 3

28. -2.083

29. -32

30. -24

Exercise 2

1. $25 \equiv 1 \pmod{3}$

2. $25 \equiv 1 \pmod{4}$

3. $25 \equiv 0 \pmod{5}$

4. $25 \equiv 1 \pmod{6}$

5. $25 \equiv 4 \pmod{7}$

6. $153 \equiv 3 \pmod{10}$

7. $153 \equiv 10 \pmod{11}$

8. $153 \equiv 1 \pmod{4}$

9. (i) 1 (ii) 1 (iii) 3

10. (i) 3 (ii) 2 (iii) 1

11. (i) 1 (ii) 0 (iii) 1
 12. (i) 1 (ii) 2 (iii) 5
 13. (i) 0 (ii) 0 (iii) 2
 14. (i) 2 (ii) 1 (iii) 2
 15. 18
 16. 16
 17. 32
 18. $24 \equiv 3 \pmod{7}$
 19. $53 \equiv 1 \pmod{26}$
 20. $19 \equiv 4 \pmod{5}$

Exercise 3

1. (a) 1 (b) 3 (c) 3 (d) 3
 (e) 3 (f) 3 (g) 4 (h) 4
 (i) 2 (j) 3 (k) 3 (l) 2
 2. (a) 4 (b) 5 (c) 0
 (d) 5 (e) 0 (f) 6
 3. (a) 1 (b) 4 (c) 0
 (d) 0 (e) 6 (f) 5

4. Second number

+	0	1	2	3	4	5	6
0	0	1	2	3	4	5	6
1	1	2	3	4	5	6	0
2	2	3	4	5	6	0	1
3	3	4	5	6	0	1	2
4	4	5	6	0	1	2	3
5	5	6	0	1	2	3	4
6	6	0	1	2	3	4	5

Addition Table ($\pmod{7}$)

5. (a) 2 (b) 2 (c) 4
 (d) 5 (e) 1 (f) 3
 6. (a) 5 (b) 6 (c) 2
 (d) 0 (e) 5 (f) 2

7. Second number

-	0	1	2	3	4
0	0	4	3	2	1
1	1	0	4	3	2
2	2	1	0	4	3
3	3	2	1	0	4
4	4	3	2	1	0

Subtraction Table (mod 5)

8. (a) 1 (b) 4
 9. (a) 1 (b) 2
 10. (a) 2 (b) 4
 11. 2
 12. 4
 13. 2
 14. 2
 15. 3

Exercise 4

1. (a) 2 (b) 0 (c) 3
 (d) 4 (e) 4 (f) 4
 2. (a) 3 (b) 5 (c) 4
 (d) 0 (e) 3 (f) 0

\times	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	1	2	3	4	5
2	0	2	4	0	2	4
3	0	3	0	3	0	3
4	0	4	2	0	4	2
5	0	5	4	3	2	1

Multiplication Table (mod 6)

4. (a) 2 (b) 0 (c) 4 (d) 3
 (e) 5 (f) 3 (g) 7 (h) 0
 (i) No solution (j) 6 (k) 1 (l) 2
5. (a) 3 (b) 6 (c) 2 (d) 4
 (e) 2 (f) 2 (g) 0 (h) 3
6. (a) 3 (b) No solution
 (c) 4 (d) No solution
 (e) 0 (f) 2 or 5
 (g) 5 (h) No solution.
7. (a) 3 (b) 1
 (c) 3 (d) No solution
 (e) No solution (f) 1 or 3
8. (a) 1 (b) 1 (c) 0 (d) 5
 (e) 5 (f) 4
9. (a) 7 (b) 3 (c) 2
 (d) 8 (e) 8 (f) 2 or 5 or 8
10. 8
11. 20
12. (a) 2
13. (a) 3 (b) 1 (c) 5
14. (a) 0 (b) 1 (c) 2
15. (a) $0 \pmod{5}$ (b) $1 \pmod{5}$
 (c) $2 \pmod{5}$

Exercise 5

1. W
2. N
3. 3
4. 0
5. 3
6. 3
7. 0
8. 1
9. 4
10. 4
11. 3
12. 4

Graduated Exercises

1. -18
2. -0.082
3. 5.714
4. -4.8
5. 13.5
6. 2
7. 2
8. 0
9. 1
10. 1
11. 1
12. 0
13. 11
14. 16

15. 19

16. 3

17. $27 \equiv 9 \pmod{6}$

18. $47 \equiv 5 \pmod{3}$

19. $86 \equiv 6 \pmod{10}$

20. 1

21. (a) 5 (b) 0 (c) 1

22. 3

23. 0

24. 3

25. 4

26. 0

27. (a) 2 (b) 8

28. (a) 0 (b) 2

29. (a) 2 (b) 1 (c) 2

30. (a) 1 (b) 2 (c) 5 (d) 5

31. (a) 9 (b) 4 (c) 4 (d) 8 (e) 5

32. (a) 4 (b) 7 (c) 3

33. (a) March (b) January

(c) May (d) February

(e) January (f) January

34. (a) 0 (b) 1 (c) 0 (d) 3

35. (a) $47 = 6 \times 7 + 5$

$$35 = 6 \times 5 + 5 \text{ (Remainder 5)}$$

(b) The remainder is the same in both cases

(c) (i) $47 = 4 \times 11 + 3$

$$35 = 4 \times 8 + 3 \text{ (Remainder 3)}$$

(ii) $47 = 3 \times 15 + 2$

$$35 = 3 \times 11 + 2 \text{ (Remainder 2)}$$

Chapter 3

Exercise 1

1. 4.689×10^3
2. 5.05×10^2
3. 8.16×10^2
4. 4.6×10^4
5. 1.684321×10^6
6. 4.9689×10^4
7. 8.96407×10^5
8. 5.92325×10^2
9. 1.689×10^3
10. 4.05×10^2
11. 7.5×10^{-2}
12. 8.6×10^{-4}
13. 6.9×10^{-5}
14. 7.856×10^{-4}
15. 1.0×10^{-3}
16. 4780
17. 0.00168
18. 968000
19. 0.0000169
20. 36900000
21. 0.00000005505
22. 0.00689
23. 569500
24. 419000000000000
25. 689500
26. 1.889999131×10^5

27. 8.68811×10^{-2}
28. 2.186×10^{-1}
29. $\text{N}30730000000$
30. $3.875 \times 10^{10} \text{ cm}^2$

Exercise 2

1. 3^6
2. $8k^7$
3. q^7
4. $4x^2y^3$
5. $125p^3q$
6. $18x^5$
7. $10u^5$
8. $3p^2q^6$
9. 10^9
10. $a^3b^4c^5$
11. t
12. p^8
13. $\frac{4}{x^2}$
14. w^5
15. $\frac{1}{5k^2}$
16. $144y^3$
17. $3a^2$
18. $\frac{1}{3}$
19. 242
20. $\frac{1}{4}$
21. $5a$

$$22. (\sqrt{p})^3$$

$$23. 8$$

$$24. p^8$$

$$25. 243u^7p^5q^5$$

$$26. 2$$

$$27. \frac{1}{72}$$

$$28. 3$$

$$29. 0.000001$$

$$30. 32768$$

$$31. \frac{1}{2}$$

$$32. 1$$

$$33. \frac{3}{2^{\frac{3}{2}}}$$

$$34. 3$$

$$35. \frac{5}{12}$$

Exercise 3

$$1. -2$$

$$2. 2$$

$$3. -2$$

$$4. -4$$

$$5. 1$$

$$6. 0$$

$$7. 5$$

$$8. -10$$

$$9. \frac{7}{4}$$

$$10. 3$$

$$11. 6$$

12. 9

13. $\frac{1}{5}$

14. 2

15. $2\frac{1}{2}$

16. $\frac{-1}{2}$

17. 4

18. 0

19. 1 and 2

20. 1

Graduated Exercises

1. 4.6817×10^2

2. 5.98056×10^5

3. 1×10^{-4}

4. 8.67597×10^3

5. 5.689×10^3

6. 8.98×10^{-4}

7. 4760

8. 0.000169

9. 7860000

10. 0.000986

11. 969000000

12. 1

13. $8x^3y^4$

14. $20p^4$

15. 1

16. 2

17. 45

18. $\left(\frac{8}{X}\right)^{\frac{2}{3}}$

19. 3
20. $5x^2$

21. $3^{4/n(n+2)}$
22. $3^{\frac{17}{6}}$

23. $\frac{9}{4}$

24. $\frac{3}{2}$

25. 4

26. -1 and 2

27. -1

28. -2

29. -1

30. $\frac{3}{2}$

31. 0

32. -1

33. -3

34. 5

35. -3

36. 2

37. 3

38. 3

39. -1

40. -1

Chapter 4

Exercise 1

1. $\log_4 16 = 2$
2. $\log_x 8 = 3$

$$3. \log_a = \frac{1}{2}$$

$$4. \log_2 \left(\frac{1}{8} \right) = -3$$

$$5. \log_3 \left(\frac{1}{9} \right) = -2$$

$$6. \log_{0.1} 0.01 = 2$$

$$7. \log_6 36 = 2$$

$$8. \log_{11} 121 = 2$$

$$9. \log_2 \left(\frac{1}{256} \right) = -8$$

$$10. \log_{0.2} (0.04) = 2$$

$$11. 5^3 = 125$$

$$12. 10^3 = 1000$$

$$13. 2^x = y + 4$$

$$14. 3^k = y - 1$$

$$15. 5^{-2} = \frac{1}{25}$$

$$16. -4$$

$$17. 7$$

$$18. 3$$

$$19. -4$$

$$20. -2$$

$$21. 2$$

$$22. 625$$

$$23. 4$$

$$24. 6$$

$$25. 0$$

Exercise 2

$$1. 27$$

$$2. x^2 = 8(1+y)^x$$

3. 1
4. $\frac{-3}{2}$
5. $2(a+1)$
6. 3
7. $\log_{10} 500$
8. 2

Exercise 4

1. 7.567×10^2
2. 48×10^0
3. 1.686×10^1
4. 1.738×10^1
5. 6.840052×10^4
6. 3.9946×10^2
7. 8.92×10^0
8. 2.8789
9. 0.3945
10. 1.2269
11. 4.8351
12. 2.6015
13. 0.9504
14. 1.8958
15. 10^{3338}
16. $10^{0.0828}$
17. $10^{0.9202}$
18. $10^{0.6167}$
19. $10^{0.8757}$
20. $10^{0.6991}$

Exercise 5

1. 21 130
2. 409.4
3. 16.26
4. 1.288
5. 12.96
6. 2.477
7. 5 291 000
8. 27 690
9. 204.7
10. 23.35
11. 16.65
12. 6640
13. 16.47
14. 2584
15. 48.97
16. 205.3
17. 27800
18. 185 800 000
19. 2.939
20. 1.402
21. 1243
22. 14.02
23. 41 990
24. 110.0
25. 1.307

Exercise 6

1. 109.74
2. 2 356.38

3. 3 649.05

4. 50.096

5. 1 186.74

6. 25.81

7. 184.71

8. 26.45

9. 39.71

10. 16.22

11. 8 819.86

12. 0.00169

13. 0.01485

14. 24.57

15. 17.05

Exercise 7

1. $15\ 480 \text{ cm}^3$

2. 622.64 cm^2

3. 51.48 litres

4. 18.82 m

5. ₦1 732 346.73

Graduated Exercises

1. $\log_a N = x$

2. $\log_2 8 = 3$

3. $\log_k 1 = 0$

4. $\log_{p^2} 7 = 3$

5. $\log_{25} 5 = \frac{1}{2}$

6. $y^k = N$

$$7. 2^5 = 32$$

$$8. 10^{-3} = 0.001$$

$$9. 5^3 = 125$$

$$10. 2^3 = x$$

$$11. 3^0 = x$$

$$12. x^{-\frac{1}{2}} = 9$$

$$13. x^{-2} = 9$$

$$14. x^2 = 9$$

$$15. (x + 1)^{\frac{1}{3}} = 27$$

$$16. (x - 1)^{\frac{1}{2}} = 4$$

$$17. 5.196$$

$$18. 21.35$$

$$19. 7.189$$

$$20. 18\ 281\ 329.54$$

$$21. 94.0 \text{ cm}^2 \text{ (2 s.f.)}$$

$$22. 60 \text{ cm} \text{ (2 s.f.)}$$

$$23. 3\ 540 \text{ cm}^3 \text{ (2 s.f.)}$$

$$24. 56.4 \text{ cm}^2 \text{ (3 s.f.)}$$

$$25. 15.5 \text{ cm} \text{ (3 s.f.)}$$

Chapter 5

Exercise 1

1. \notin

2. \notin

3. \in

4. \notin

5. \in
6. \notin
7. \in
8. \notin
9. \notin
10. \notin
11. $1, 2, 3, \dots, 9$
12. $2, 5, 10, 25$
13. $25, 50$
14. $1, 4, 9, 16, 25, 36, 49, 64, 81$
15. no element
16. $1, 8$
17. 8
18. $27, 64$
19. $1, 2, 3, \dots, 9$
20. $-2, 2$
21. 1
22. $2, 3, 5$
23. $1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60$
24. $12, 24, 36, 48, \dots$
25. square and rhombus

Exercise 2

1. 11
2. 3
3. 1
4. 3
5. 3

6. 4

7. 25

8. 4

9. 7

10. 7

11. 6

12. 12

13. 2

14. 31

15. 1

16. 5

17. 21

18. 33

19. 23

20. 9

Exercise 3

1. Empty set

2. Infinite set

3. Finite set

4. Infinite set

5. Finite set

6. Finite set

7. Empty set

8. Empty set

9. Finite set

10. Infinite set

11. Finite set

12. Empty set

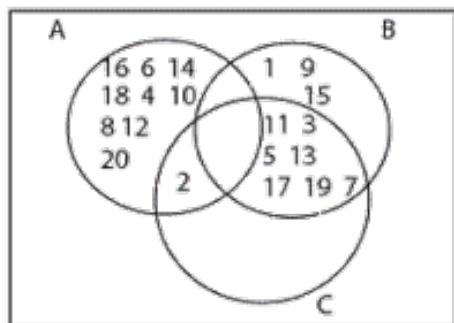
13. Finite set
14. Empty set
15. Empty set

Exercise 4

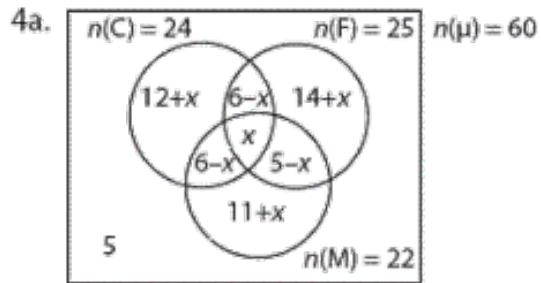
1. (a) {2, 3, 5} (b) {2} (c) {2, 3, 5}
2. {0, 2, 3, 6, 7, 8, 9, 10}
3. 12
4. \emptyset
5. (a) {3, 5, 6, 7, 9} (b) {4, 8}
6. {1}
7. {1, 2, 3, 4}
8. {-4, -3, 0}
9. {1, 4, 9}
10. {4, 8, 16}

Exercise 5

1a.

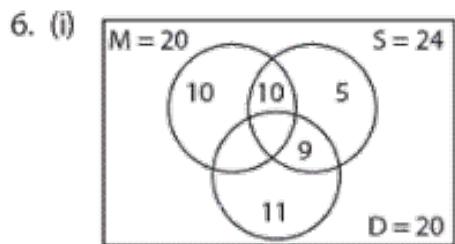


- b. (a) \emptyset (b) {2}
(c) {1, 2, 3, 5, 7, 9, 11, 13, 15, 17, 19}
2. (a) {2, 3, 5, 6, 7, 9} (b) 4 and 8
3. (a) 156 candidates
(b) 111 candidates
(c) 38 candidates
(d) 45 candidates

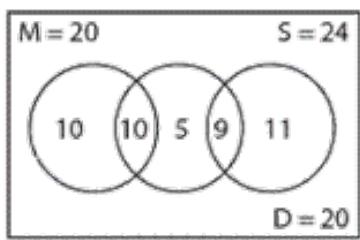


- b. (i) 1 candidate
(ii) 13 candidates
(iii) 15 candidates
(iv) 12 candidates

5. 22



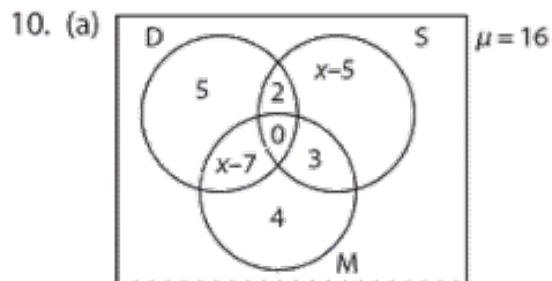
OR



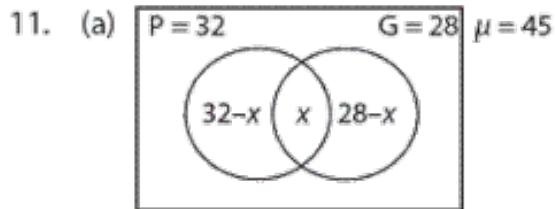
7. 9 students

8. 19 women

9. 26

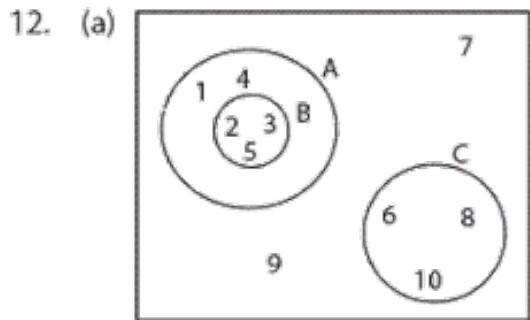


(b) 7



(b) 27

(c) 33

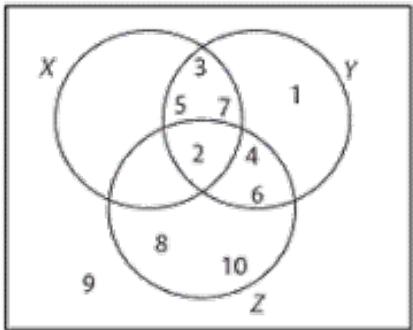


(b) \emptyset

(c) {1, 4}

13. (a) (i) $X = \{2, 3, 5, 7\}$
(ii) $Y = \{1, 2, 3, 4, 5, 6, 7\}$
(iii) $Z = \{2, 4, 6, 8, 10\}$

(b) (i)



(ii) 1

14. (a) {6, 12, 15}

- (b) {2, 6, 12, 15}

15. (a) 5

- (b) 15

Graduated Exercises

1. 8

2. (a) Infinite (b) Empty (c) Finite

(d) Finite (e) Finite

3. (a) 0 (b) 26 (c) 12

(d) 20 (e) 9

4. (a) 7 (b) 8 (c) 0

(d) 10 (e) 4

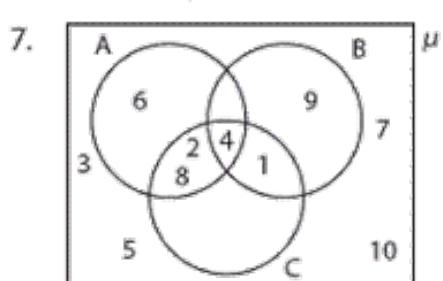
5. (a) 35 (b) {a, d, e, i, o, t, u, y} (c) i

(d) consonants = {b, c, d, f, g, h,
j, k, l, m, n, p, q, r, s, t, v, w, x, y}

(e) $\mu = \{a, b, c, d, \dots, z\}$

6. (a) 12 (b) {6, 8} (c) {5}

(d) {5, 6, 8, 12} (e) {5, 6, 8}



8. (a) $n(A) = 2$, $n(B) = 2$, $n(C) = 5$

(b) (i) {2, 3, 4, 5, 6, 8, 9, 10} (b) (ii) {}

(b) (iii) {1, 2, 3, 4, 5, 6, 7, 8, 10}

(b) (iv) {2} (b) (v) {1, 7}

9. (a) False (b) True (c) True

(d) False (e) False

10. (a) $A = \{8, 27\}$, $B = \{4, 9, 16, 25\}$,

$C = \{2, 3, 5, 6, 10, 15, 30\}$

(b) $n(A) = 2$, $n(B) = 4$, $n(C) = 7$

(c) {}

11. (a) {2, 4, 6, 8, 10, 12, 14, 16, 18, 20}

(b) {9, 10, 11, 12, 13, 14, 15, 16, 17,
18, 19, 20}

(c) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

(d) {7, 8, 9, 10, 11, 12, 13, 14, 15, 16,
17, 18, 19, 20}

12. (a) False (b) False (c) True
13. (a) (i) Infinite (ii) Finite (b) {1}
(c) 1
14. (a) (i) {4, 8, 12, 16, 20, 24, 28} (ii) {6, 12, 18, 24}
(iii) {1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14,
15, 17, 18, 21, 22, 23, 25, 26, 27}
(b) (i) 29 (ii) 7 (iii) 4 (iv) 22
(c) (i) {4, 6, 8, 12, 16, 20, 24, 28} (ii) {12, 24}
(iii) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14,
15, 16, 17, 18, 19, 20, 21, 22, 23, 25,
26, 27, 28, 29}
15. {17}
16. (a) {s, p, m, e} (b) {a, p, k, c}
(c) {}
17. {3, 6, 9}
18. 110 students
19. (a) 160 students (b) 330 students

- 20 (a)
-
- $\mu = 22$
- (b) 1 student (c) 3 students

Chapter 6

Exercise 1

1. -3
2. $\frac{1}{2}$
3. 1

4. $\frac{1}{6}$

5. $-\frac{1}{2}$

6. $4\frac{2}{5}$

7. $1\frac{1}{3}$

8. -1

9. -2

10. 8

11. 20

12. 2

13. 1

14. 3

15. 0

16. 4

17. 7

18. 3

19. 5

20. 3

21. $\frac{1}{2}$

22. $\frac{3}{5}$

23. $1\frac{3}{7}$

24. -11

25. 16

26. $1\frac{1}{3}$

27. $-1\frac{5}{16}$

28. $-2\frac{4}{5}$

29. $-2\frac{4}{5}$

$$30. -1\frac{11}{31}$$

$$31. \frac{55}{62}$$

$$32. \frac{-9}{16}$$

$$33. \frac{31}{38}$$

$$34. 7$$

$$35. \frac{2}{9}$$

Exercise 2

$$1. \frac{bx}{\sqrt{b^2-y^2}}$$

$$2. \frac{fv}{2v-f}$$

$$3. \left[\frac{A}{\pi r} \right]^2 + r^2$$

$$4. \frac{A-\pi l^2}{2\pi l}$$

$$5. \frac{3}{4}$$

$$6. \frac{h}{g^2} + 3$$

$$7. \frac{hm}{x-mz}$$

$$8. \frac{bx}{\sqrt{a^2-x^2} s^2}$$

$$9. \frac{2(s-ut)}{t^2}$$

$$10. \frac{\sqrt{(aw)^2-v^2}}{w}$$

$$11. \frac{R-aR}{a+1}$$

$$12. \frac{4h}{5} + \frac{v}{\pi h^2}$$

$$13. \frac{100(t-1)}{t}$$

$$14. -\left[\frac{K}{V}\right]^2$$

$$15. \frac{m - rq^2}{q}$$

$$16. \frac{y^2 + b}{a}$$

$$17. \frac{K^2 r}{m^2} + p$$

$$18. \frac{a-x}{t-x}$$

$$19. \frac{bc - gp}{gd - 1}$$

$$20. R - \frac{15P^3}{Q}$$

Exercise 3

1. $\frac{9}{77}$

2. 104

3. 15

4. 66.7

5. 26.8

6. 7.9

7. (a) $\sqrt{\frac{6v - \pi h^2}{3\pi h}}$ (b) 13.0

8. (a) $\frac{b}{a} \sqrt{(ar)^2 - x^2}$ (b) 5

9. (a) $-\frac{1}{a}$ (b) 5

10. (a) $\frac{100t}{1-t^2}$ (b) $66\frac{2}{3}$

Exercise 4

1. 55 sec

2. $6\frac{3}{8}$ 3. $\frac{3}{2}\sqrt{y}$

4. 50

5. 8.45

6. 4 096

7. 4

8. 250

9. 1

10. 34

Exercise 5

1. 4

2. $+\frac{4}{5}$

3. 16

4. 45 men

5. 5

6. 9

7. $y = \frac{48}{x^2}$ 8. $x = 1\frac{4(y-z)}{yz}$ 9. $1\frac{7}{9}$ 10. (i) $R = \frac{0.72}{d^2}$ (ii) $d = 0.2$

11. 4

12. $\frac{1}{9}$

13. $\frac{1}{9}$

14. 80

15. 27 Nm^{-2}

Exercise 6

1. $r = \frac{0.288 p^3}{q^2}$

2. $13\frac{1}{2}$

3. 4

4. (a) $R = \frac{6l}{625r}$ (b) $r = 0.16 \text{ cm}$

5. (a) $t = \frac{5v}{2p}$ (b) 62.5 minutes

(c) 5 pumps

6. 35.08

7. 4

8. (a) $E = \frac{8R}{D^2}$ (b) 196

9. (a) $P = \frac{5R}{2\sqrt{Q}}$ (b) $Q = \frac{9}{16}$

Exercise 7

1. 24

2. (a) $y = a + \frac{b}{x^2}$ (b) $y = 3\frac{1}{2}$

3. (a) \$14 265.00 (b) 14 pupils

4. 61.56

5. (a) $A = -27 + 2P$ (b) 39

6. (a) $y = -7 + \frac{12}{3\sqrt{x}}$ (b) -4

7. -128.3(1 d.p)

8. Le 91.67

9. (a) $L = 315 - \frac{M}{5}$ (b) $L = 185$

Graduated Exercises

1. (i) 5 (ii) $2\frac{1}{2}$ (iii) 35

2. (i) 5 (ii) -6 (iii) 1

3. (i) $\frac{5}{6}$ (ii) 8 (iii) $\frac{6}{13}$

4. $f = \frac{ce-d}{c}$

5. $K = \sqrt{y^2 t^2 - x^2}$

6. $T = \frac{s^2 - 4k\pi r^2}{4\pi r^2 Q}$

7. $r = \frac{LR - 2aE}{L}$

8. $f = \frac{t^2 g}{gv - t^2}$

9. $r = \frac{tp^2}{d^3}$

10. $y = P + Qx^2$

11. $P = \frac{a(y-1)}{y+1}$

12. (i) $m = \frac{\sqrt{8^2 - k^2 n^2}}{K}$ (ii) 609.917

13. 11.49

14. 6.375

15. $x = \frac{3}{2} \sqrt{y}$

16. 24

17. $d = \sqrt{\frac{42W}{5L}}$

18. 45

19. 50

20. $\frac{6}{35}$

21. $c = \frac{2d - 5 - abd}{ad}$

22. $y = \frac{10}{31}x^2 + \frac{52}{31\sqrt{x}}$

23. (a) $y = a + \frac{b}{x^2}$ (b) $3\frac{1}{2}$

24. $M = \frac{3n}{2p^2}$

25. (a) $A = \frac{21 - 21y - 7Bx}{5x}$ (b) 35

Chapter 7

Exercise 1

1. $(a - 9)(a - 2)$

2. $(b + 4)(b + 2)$

3. $(c - 5)(c - 2)$

4. $(d + 3)(d + 2)$

5. $(e - 7)(e - 2)$

6. $(f - 4)(f - 5)$

7. $(g + 9)(g + 5)$

8. $(h + 1)(h + 38)$

9. $(k + 3)(k + 5)$

10. $(l - 15)(l - 10)$

11. $(m + 5)(m + 7)$

12. $(n + 6)(n + 4)$

13. $(p + 8)(p + 2)$

14. $(q + 6)(q + 1)$

15. $(r - 1)(r - 1)$
16. $(a + 4)(a - 2)$
17. $(b - 6)(b + 5)$
18. $(c + 5)(c - 2)$
19. $(d - 4)(d + 1)$
20. $(e - 5)(e - 4)$
21. $(f + 5)(f - 4)$
22. $(g - 5)(g - 5)$
23. $(h - 11)(h - 1)$
24. $(k + 8)(k - 4)$
25. $(l - 6)(l - 7)$
26. $(m + 10)(m - 4)$
27. $(1 + 2n)(1 - n)$
28. $(2 - p)(6 + p)$
29. $(5 - q)(6 + q)$
30. $(r - 3)(r - 3)$

Exercise 2

1. $(a + 1)(a - 1)$
2. $(2b + 1)(2b - 1)$
3. $2\{(c + 4)(c - 4)\}$
4. $(10 + 2r)(10 - 2r)$
5. $(5p + 9q)(5p - 9q)$
6. $(u + 7v)(u - 7v)$
7. $(2m + 3n)(2m - 3n)$
8. $2\{(1 + 3p)(1 - 3p)\}$
9. $8\{(2d + e)(2d - e)\}$
10. $(u + 5v)(u - 5v)$

Exercise 3

1. $-4, -2$
2. $-6, -1$
3. $-3, -5$
4. $-3, -1$
5. $-5, -2$
6. $-7, -2$
7. -6 twice
8. $-4, -3$
9. $-8, -3$
10. $-\frac{2}{3}$
11. $-\frac{2}{3}, -\frac{1}{3}$
12. $\frac{2}{3}, \frac{3}{2}$
13. $-1, -\frac{1}{4}$
14. $-11, -2$
15. $-\frac{1}{2}, -\frac{1}{14}$
16. $-4, +2$
17. $5, -3$
18. $5, -2$
19. $-8, 3$
20. $-6, 1$
21. $4, -2$
22. $3, -1$
23. $7, -2$
24. $8, -4$
25. $6, -4$

$$26. 2, 1$$

$$27. 10, 4$$

$$28. 6, 3$$

$$29. 9, 1$$

$$30. 5, 8$$

$$31. 1, \frac{1}{2}$$

$$32. \frac{3}{2}, \frac{5}{2}$$

$$33. \frac{1}{2}, \frac{1}{4}$$

$$34. \frac{1}{4}, \frac{3}{4}$$

$$35. -3, 4$$

$$36. \frac{5}{6}, 3$$

$$37. \frac{2}{3}, \frac{1}{2}$$

$$38. \frac{3}{4}, \frac{4}{5}$$

$$39. \frac{5}{6}, -\frac{1}{6}$$

$$40. -4, 1$$

$$41. -\frac{1}{6}$$

$$42. -\frac{1}{3}, \frac{3}{4}$$

$$43. -2, \frac{1}{2}$$

$$44. \frac{4}{5}, \frac{3}{5}$$

$$45. \frac{1}{2}, -\frac{1}{3}$$

Exercise 4

$$1. \pm \frac{1}{20}$$

$$2. \pm \frac{5}{2}$$

$$3. \pm 14$$

$$4. \pm \frac{1}{2}$$

$$5. \pm \frac{3}{5}$$

$$6. \pm \frac{1}{6}$$

$$7. \pm \frac{1}{6}$$

$$8. \pm 2$$

$$9. \pm \frac{2}{5}$$

$$10. \pm \frac{5}{2}$$

Exercise 5

$$1. 20x^2 + 11x - 3 = 0$$

$$2. 28x^2 + 27x - 10 = 0$$

$$3. 24x^2 - 13x - 2 = 0$$

$$4. 5x^2 - 11x + 2 = 0$$

$$5. 9x^2 - 1 = 0$$

$$6. 49x^2 - 49x + 10 = 0$$

$$7. 4x^2 - x = 0$$

$$8. 72x^2 - 102x + 35 = 0$$

$$9. 24x^2 - 22x + 3 = 0$$

$$10. 30x^2 - 7x - 2 = 0$$

$$11. 8; 20$$

$$12. \frac{5}{3}, \frac{1}{18}$$

$$13. \frac{-1}{4}; \frac{-3}{8}$$

$$14. \frac{-48}{5}; \frac{-42}{5}$$

$$15. \frac{-3}{8}; \frac{-7}{8}$$

$$16. \frac{3}{4}; \frac{-3}{2}$$

$$17. 4; -3$$

$$18. \frac{5}{12}; \frac{2}{3}$$

$$19. 6; \frac{3}{8}$$

$$20. \frac{3}{7}; \frac{-1}{7}$$

Graduated Exercises

$$1. (a + 5)(a + 4)$$

$$2. (b - 5)(b - 1)$$

$$3. (c - 1)(c - 12)$$

$$4. (d - 5)(d - 7)$$

$$5. (e - 2)(e + 8)$$

$$6. (2g - 1)(g - 5)$$

$$7. (h + 3)(2h - 8)$$

$$8. (k - 6)(k - 4)$$

$$9. (2m - 3)(3m + 2)$$

$$10. (3 - m)(2 + 3m)$$

$$11. (2a + 3)(2a - 3)$$

$$12. 4[(3b + 2c)(3b - 2c)]$$

$$13. 2[(2d + 1)(2d - 1)]$$

$$14. 5(f+9)(f-9)$$

$$15. (1 + 2m)(1 - 2m)$$

$$16. (4 + 5t)(4 - 5t)$$

$$17. (2 + 3u)(2 - 3u)$$

$$18. 2(3 + 4y)(3 - 4y)$$

$$19. 4(2x + 3)(2x - 3)$$

$$20. 6(d + 1)(d - 1)$$

$$21. a = 7 \text{ or } 4$$

$$22. b = -3 \text{ or } -\frac{3}{4}$$

$$23. c = 5 \text{ or } -\frac{1}{8}$$

$$24. d = 5 \text{ or } 1\frac{1}{2}$$

$$25. e = \frac{4}{5} \text{ or } -\frac{3}{4}$$

$$26. v = 5 \text{ or } 4$$

$$27. m = 0 \text{ or } 24$$

$$28. n = 0 \text{ or } -40$$

$$29. p = -2 \text{ or } 3\frac{3}{4}$$

$$30. q = -1 \text{ or } 1\frac{1}{2}$$

$$31. 12x^2 - 7x + 1 = 0$$

$$32. 27x^2 - 21x + 2 = 0$$

$$33. 10x^2 + 49x - 5 = 0$$

$$34. 30x^2 + 11x + 1 = 0$$

$$35. 8x^2 + 3x = 0$$

$$36. x^2 + x - 6 = 0$$

$$37. 20x^2 - 13x + 2 = 0$$

$$38. 18x^2 - 19x + 5 = 0$$

$$39. x^2 - 19x + 90 = 0$$

$$40. 24x^2 - 2x - 15 = 0$$

$$41. x = -3 \text{ or } -1$$

$$42. x = 3 \text{ or } 2.5$$

$$43. x = \frac{1}{5} \text{ or } 5$$

$$44. x = -1 \text{ or } 2\frac{1}{3}$$

$$45. x = 9 \text{ or } -4$$

Chapter 8

Exercise 1

1.

Expression	A statement?	True or false?
A	Y	T
B	Y	T
C	Y	F
D	Y	Impossible to say
E	N	Not applicable
F	N	Not applicable
G	N	F
H	N	Impossible to say

2.

Expression	A statement			True or False
	Closed?	Open?	Neither?	
A	✓			False
B	✓			True
C		✓		Impossible to say
D		✓		Impossible to say
E			✓	Not applicable
F	✓			False
G	✓			True
H		✓		Impossible to say
I	✓			False

3.

4. (a) She is an ugly lady
(b) Franklin is my enemy
(c) y is an even number
(d) The bag is not black
(e) It is not hot in Maiduguri
(f) Yassir is younger than John
(g) The river is not flowing
(h) The figure is not a triangle
(i) The school is open
(j) She does not study chemistry

5. (a) Correct

(b) Correct

(c) Correct

(d) Correct

(e) Correct

Exercise 2

1. (a) **P:** Number 3 is prime

Q: It is odd

P is true

Q is true

Conjunction is false

(b) **P:** All integers are positive

Q: All integers are negative

P is false

Q is false

Conjunction is false

(c) **P:** A point occupies a position

Q: A point's location can be determined

P is true

Q is true

Conjunction is true

- (d) **P:** 42 is divisible by 5

Q: 42 is divisible by 6

R: 42 is divisible by 7

P is false

Q is true

R is true

Conjunction is false

2. (a) **P:** A line is straight

Q: A line extends indefinitely in both directions

Conjunction is true

- (b) **P:** 0 is less than every positive integer

Q: 0 is less than every negative integer

Conjunction is false

- (c) **P:** All living things have two legs

Q: All living things have two eyes

Conjunction is true

- (d) **P:** $x = 2$ is a root of the equation

$$3x^2 - x - 10 = 0$$

Q: $x = 3$ is a root of the equation

$$3x^2 - x - 10 = 0$$

Conjunction is false

3. (a) **P:** The number is a multiple of 9

Q: The number is a multiple of 3

The compound statement is true

- (b) **P:** You are born in some country

Q: You are a citizen of that country

The compound statement is true

4. (a) If you are not a citizen of Nigerian
then you are not born in Nigeria
 - (b) If a triangle is not isosceles then it
is not equilateral
 - (c) If x is not odd then x is not a prime
number
 - (d) If two lines intersect in the same plane
then two lines are not parallel
 - (e) If you know how to reason deductively
you can comprehend geometry.
5. (a) (i) Contra positive
(ii) Converse
 - (b) (i) Contra positive
(ii) Converse

Graduated Exercises

1. Logic is the study of the way people
reason.
2. A simple statement is the declaration
of facts in speech, writing an abstract
of an account that is true or false but
not both; while a compound state-
ment is obtained by a combination of
one or more statements using some
connecting words like "and", "or" etc.
 - (a) Not a statement
 - (b) Not a statement
 - (c) A statement
 - (d) A statement
 - (e) Not a statement
 - (f) A statement
 - (g) A statement

3. (a) False

(b) True

(c) False

(d) True

(e) False

4. (a) False

(b) False

(c) True

(d) True

(e) False

5. (i) Conjunction (ii) Disjunction

(iii) Implication (iv) Bi-implication

6. Compound statements are formed by combining one or more simple statements using connecting words like "and", "or" etc.

(a) If Bunu is a youth corper then she has a degree.

(b) If she is smiling then she is happy.

(c) If $-\delta < x < 10$ then $100 < x^2 < \delta$

7. (a) If a line is a tangent to the circle then it is perpendicular to the radius.

(b) If it rains sufficiently then the harvest will be good.

(c) If the three sides of a triangle are equal then it is an equilateral triangle.

8. (a) If a triangle is not an isosceles triangle then its two sides are not equal.
- (b) If two circles are not concentric circles then they will not have the same centre.

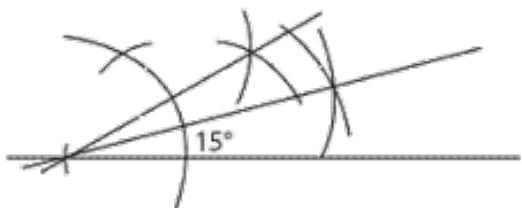
9.

P	Q	$P \vee Q$	$\sim(P \vee Q)$	$\sim P$	$(P \vee Q) \wedge P$	$\sim(P \vee Q) \Leftrightarrow \sim P$
T	T	T	F	F	T	T
T	F	T	F	F	T	T
F	T	T	F	T	F	T
F	F	F	T	T	F	T

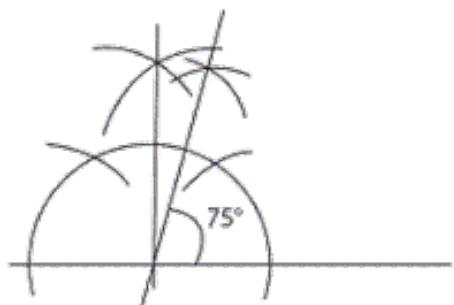
Chapter 9

Exercise 1

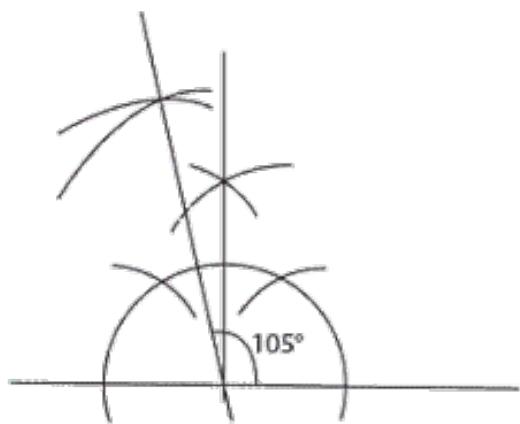
1. (a) 15°



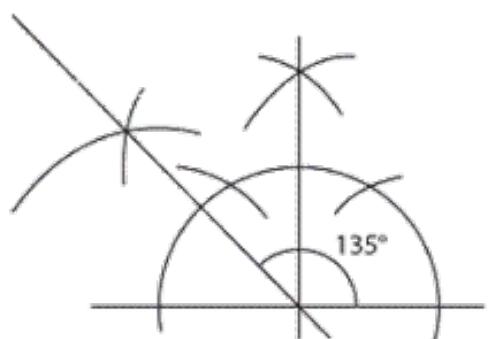
- (b) 75°



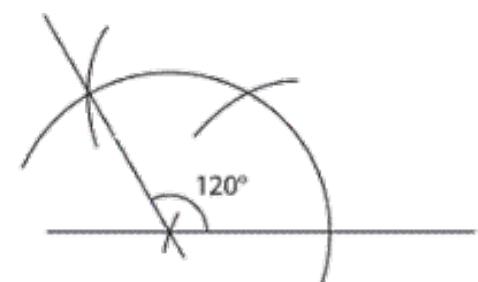
(c) 105°



(d) 135°



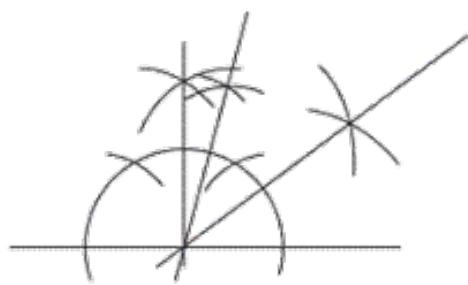
(e) 120°



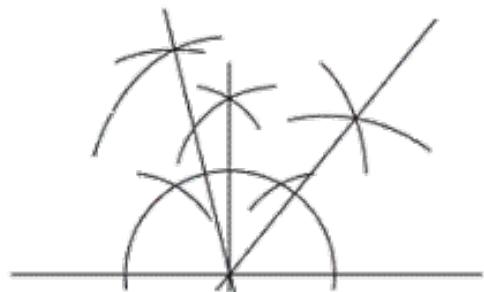
2. (a)



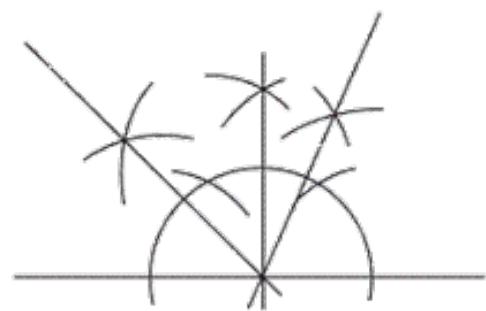
(b)



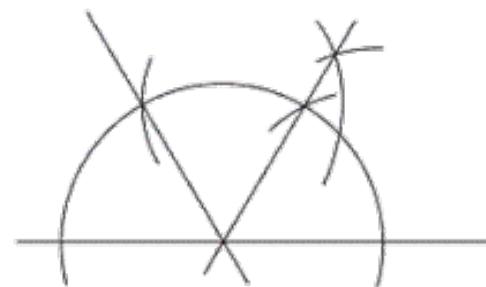
(c)



(d)



(e)



3. C

4. 75°

5. (a) 30° (b) 105°

6. Perpendicular bisector of a straight line

$$7. |AC| = 14 \text{ cm}, \angle BAC = 35^\circ$$

8.

$$9. |AC| = 7.5 \text{ cm}$$

$$10. |SU| = 1.9 \text{ cm}$$

$$11. |YP| = 2.5 \text{ cm}$$

12. /DE/ = 4 cm

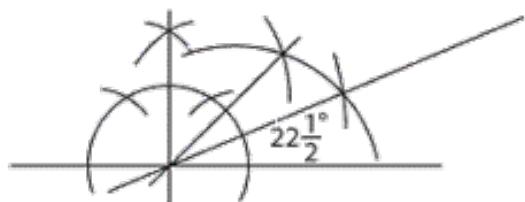
$$13. /CE/ = 2.5 \text{ cm}$$

$$14. |OP| = 4 \text{ cm}$$

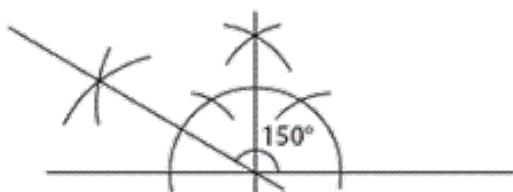
$$15. \overline{AE} = 4 \text{ cm}$$

Exercise 2

1. (a)



(b)



$$3. \overline{AP} = 1.1 \text{ cm} \quad \overline{QB} = 2.8 \text{ cm}$$

$$4. \overline{PA} = 2.5 \text{ cm}$$

$$5. \overline{QO} = 4.3 \text{ cm}$$

6. $\overline{RS} = 8.2 \text{ cm}$ $\angle QRS = 98^\circ$

7. $\overline{CP} = 6.5 \text{ cm}$

8. Radius = 6.1 cm

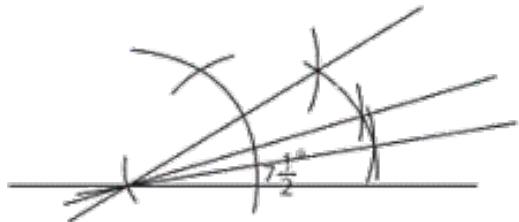
10. (b) 11.3 cm

11. (b) $\angle BAD = 131^\circ$

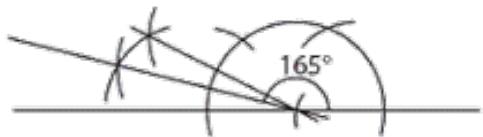
12. (b) 5.8 cm

Graduated Exercise

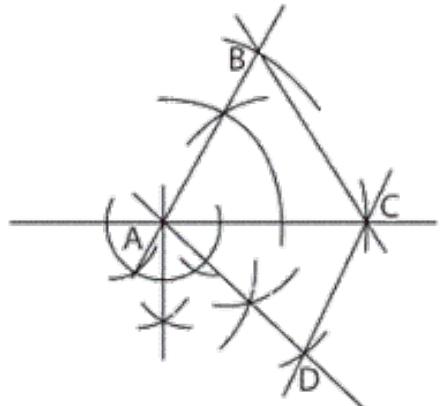
1. a.



b.



2.



3. II

4. I

5. $/AB/ = 11.3 \text{ cm}$
6. $\overline{XY} = 14 \text{ cm}; \angle YXZ = 31^\circ$
7. $\overline{LM} = 8.6 \text{ cm}$
8. $\overline{TR} = 7.5 \text{ cm}$
9. $\overline{ON} = 5.8 \text{ cm}$
10. $\overline{OC} = 4.8 \text{ cm}$
11. $\overline{BM} = 6.5 \text{ cm}$
12. (i) $/PS/ = 5.9 \text{ cm}$
(ii) 5.9 cm
(iii) trapezium
13. Area = 40 cm^2
14. $/AP/ = 5.2 \text{ cm}$
15. radius = 1.6 cm

Chapter 10

Exercise 1

1. $x = 100^\circ, y = 40^\circ$
2. 52°
3. $a = 65^\circ \quad b = 48^\circ \quad c = 67^\circ \quad d = 48^\circ$
4. (a) 64° (b) 116°
5. 75°
6. 70°
- 7.
- 8.
9. 22.5°
- 10.
11. 73°
- 12.

13. $36^\circ, 72^\circ, 72^\circ$

14. 130°

15. $52^\circ, 53^\circ$

16. $35^\circ, 55^\circ, 90^\circ$

17.

18. $85^\circ, 54^\circ$

19. $87^\circ, 30^\circ$

20. $95^\circ, 65^\circ$

Exercise 2

1. $a = 130^\circ, b = 50^\circ, c = 130^\circ, e = 50^\circ,$
 $f = 130^\circ, g = h = 130^\circ$

2. $n = 145^\circ, p = 145^\circ, q = 35^\circ$

3. 30°

4. 165°

5. $n = 68^\circ, p = 68^\circ, q = 112^\circ$

6. 15

7. 40°

8. 128°

9. 7

10. 16

11. 80

12. (a) 108° (b) 54°

13. 266°

14. 55°

15. 140°

16. 34°

17. 50°

18. (a) congruent(SAS)
(b) congruent (SSS)
(c) congruent (RHS)
(d) congruent (SSS)
19. (a) ΔZDX (AAS) (b) ΔNMZ (SAS)
- 20.
- 21.
- 22.
23. 101°
24. $p = 7, q = 8$
(b) $m = 2, n = 4$

Graduated Exercise

1. $x = 58^\circ, y = 122^\circ, z = 30^\circ$
2. 18°
- 3.
4. 145°
5. 55°
6. 25°
7. $x = y + z$
- 8.
9. 63°
10. 4 cm
11. 75°
12. 140°
13. 120°
14. 4 cm
15. 120 cm

Chapter 11

Exercise 1

1.

S.No	Angle	Sine	Cosine	Tangent
1	15°	0.2588	0.9659	0.2679
2	23°	0.3907	0.9205	0.4245
3	37°	0.6018	0.7986	0.7536
4	43°	0.6820	0.7314	0.9325
5	48°	0.7431	0.6691	1.1106
6	56°	0.8290	0.5592	1.4826
7	57.14°	0.8400	0.5426	1.5481
8	57.64°	0.8447	0.5352	1.5782
9	68.75°	0.9320	0.3624	2.5715
10	75.63°	0.9687	0.2482	3.9032

2.

S. No		(a) \sin^{-1}	(b) \cos^{-1}
1	0.1456	8°	82°
2	0.4361	26°	64°
3	0.4891	29°	61°
4	0.5789	35°	55°
5	0.4976	30°	60°
6	0.7694	50°	40°
7	0.9416	70°	20°
8	0.8496	58°	32°
9	0.6946	44°	46°
10	0.0468	3°	87°

3. (a) 4.81 cm (b) 9.66 cm
(c) 7.51 cm (d) 15.89 cm
(e) 15.26 cm

4. (a) 25° (b) 56° (c) 21°
(d) 36° (e) 46°
5. (a) 23° (b) 15° (c) 18°
(d) 42° (e) 75° (f) 30°
(g) 15° (h) 16° (i) 11°
(j) 20°
6. 86.04 m
7. 60°
8. 86.6 m
9. (a) 27° (b) 8.0 m
10. $\sin B = 0.6544$ $\cos B = 0.7562$
 $\tan B = 0.8654$

Exercise 2

1. (a) 8.54 cm (b) 3 cm (c) 7.91 cm
(d) 2.8 cm (e) 12 cm
2. $\sqrt{9 + 16a^2}$
3. 13 cm
4. 4°
5. 14.21 cm
6. $\frac{x}{\sqrt{2}}$ or $\frac{x\sqrt{2}}{2}$
7. 17 cm
8. (a) 5 m (b) 60 m^2
9. 5 cm
10. $2\frac{2}{5}$
11. $\frac{144}{169}$

$$12. \frac{\sqrt{55}}{8}$$

$$13. \frac{2}{\sqrt{13}} \text{ or } \frac{2\sqrt{13}}{13}$$

$$14. 18 \frac{5}{12}$$

$$15. \frac{\sqrt{3}-1}{2}$$

Exercise 3

1. (i) $a = \frac{\sqrt{3}}{2}$ $b = (\sqrt{3} \times \sqrt{3}) \text{ cm or } 3 \text{ cm}$

(ii) $C = 3 \text{ cm}$ $d = 3\sqrt{2} \text{ cm}$

(iii) $e = \frac{\sqrt{5}}{2} \text{ cm}$ $f = \sqrt{15} \text{ cm}$

(iv) $g = \frac{10}{\sqrt{3}}$ $h = \frac{5}{\sqrt{3}} \text{ cm}$

(v) $K = \frac{3\sqrt{2}}{2}$ $I = \frac{\sqrt{5}}{\sqrt{2}} \text{ cm}$

2. $\frac{120}{\sqrt{3}} \text{ m}$

3. 27 m

4. 1 cm

5. $5\sqrt{3} \text{ m}$

6. $\frac{4}{\sqrt{3}} \text{ m}$

7. $\frac{12}{\sqrt{3}}$

Exercise 4

1. (a) 67° (b) 35° (c) 58°

2. (a) 74° (b) 20° (c) 60°

Graduated Exercises

1. (a) 50° (b) 15° (c) 16°
(d) 25° (e) 5°
2. $2\frac{5}{6}$
3. (a) $\sin 43^\circ = 0.6820$
 $\cos 43^\circ = 0.7314$
 $\tan 43^\circ = 0.9325$
(b) $\sin 53.4^\circ = 0.8028$
 $\cos 53.4^\circ = 0.5962$
 $\tan 53.4^\circ = 1.3465$
(c) $\sin 64.13^\circ = 0.8998$
 $\cos 64.13^\circ = 0.4363$
 $\tan 64.13^\circ = 2.0622$
4. (a) 69° (b) 72.5° (c) 50.99°
5. $10\sqrt{3}$ m
6. $15\sqrt{2}$ m
7. 36°
8. 12.17 cm
9. 66°
10. 24.33 cm^2

Chapter 12

Exercise 1

1. (a) 2nd (b) 2nd (c) 1st (d) 3rd
(e) 4th (f) 3rd (g) 2nd (h) 3rd
(i) 3rd (j) 1st (k) 2nd (l) 3rd
(m) 2nd (n) 2nd (o) 1st
2. (a) $+300^\circ$ (b) $+224^\circ$ (c) $+346^\circ$
(d) $+217^\circ$ (e) $+237^\circ$ (f) $+321^\circ$
(g) $+219^\circ$ (h) $+50^\circ$

3. (a) -321° (b) -150° (c) -247°
 (d) -224° (e) -169° (f) -204°
 (g) -203° (h) -171°

Exercise 2

1. (a) 0 (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{\sqrt{3}}{2}$
 (d) 0 (e) $-\frac{\sqrt{3}}{2}$
2. (a) $\frac{\sqrt{3}}{2}$ (b) 0 (c) $-\frac{\sqrt{3}}{2}$
 (d) $-\frac{\sqrt{3}}{2}$ (e) 0
3. (a) 0 (b) $\sqrt{3}$ (c) $-\sqrt{3}$
 (d) $-\sqrt{3}$ (e) 0
4. (a) 0.5736 (b) 0.9336 (c) 0.7071
 (d) 0.1908 (e) -0.9962 (f) -0.8988
 (g) -0.4226 (h) -0.1736
5. (a) 0.7660 (b) 0.3420 (c) -0.7660
 (d) -0.9848 (e) 0.2588
6. (a) 0.4663 (b) 1.4281 (c) -1.5399
 (d) -0.2309 (e) 1.1430

Exercise 3

1. C
2. D
3. B
4. (a)

x	0°	30°	60°	90°	120°	150°	180°	210°	240°
y	2	2.2	1.9	1	-0.1	-1.2	2.0	-2.2	-1.9

(b)

- (c) (i) $x = 117^\circ \pm 1^\circ$
(ii) $x = 9^\circ$ or $x = 42^\circ (\pm 1^\circ)$
(d) $y = -1.8 \pm 0.1$

5. (a)

x	0°	30°	60°	90°	120°	150°	180°
y	0	2.6	2.6	0	-2.6	-2.6	0

(b)

- (c) (i) 0° 90° 180° $\pm 1^\circ$
(ii) Minimum value of $y = -2.7$
 (± 0.1)
Maximum value of $y = 2.7$
 (± 0.1)

Graduated Exercises

1. (a)

x	0°	30°	60°	90°	120°	150°	180°
y	4	2	-2	-4	-2	2	4

(b)

- (c) $x = 42^\circ$ or $x = 141^\circ (\pm 2^\circ)$

2. (a)

x	0°	30°	60°	90°	120°	150°	180°	210°
y	9	10.3	8.8	5	-0.2	-5.3	-9	-10.3

(b)

- (c) (i) $x = 118^\circ \pm 2^\circ$
(ii) $x = 99^\circ \pm 1^\circ$
(d) $y = 10.3$

3. (a)

x	0°	60°	120°	180°	240°	300°	360°
y	2.0	3.6	1.6	-2.0	-3.6	-1.6	2.0

(b)

(c) either $x = 120^\circ$ or $x = 354^\circ (\pm 2^\circ)$

(d) $156^\circ < x < 318^\circ (\pm 2^\circ)$

4. (a)

x	0°	30°	60°	90°	120°	150°	180°
y	2.0	3.3	0.8	-2	-4.2	-5.3	-5.0
x	210°	240°	270°	300°	330°	360°	
y	-3.3	-0.8	2	4.2		2.0	

(b) (i) $x = 64^\circ$ or $x = 249^\circ (\pm 2^\circ)$

(ii) $x = 39^\circ$ or $279^\circ (\pm 2^\circ)$

5. (a)

x	0°	30°	60°	90°	120°	150°	180°
y	2.0	2.7	2.7	2.0	0.7	-0.7	-2.0
x	210°	240°	270°	300°	330°	360°	
y	-2.7	-2.7	-2.0	-0.7	0.7	2.0	

(b)

(c) Either $x = 0^\circ$ or $x = 90^\circ$ or $x = 360^\circ$

Chapter 13

Exercise 1

1. (a) 3 cm (b) 61 cm (c) 35 cm
2. (a) 8.38 cm (b) 13.49 cm
 (c) 26.19 cm
3. 25.93 cm
4. 12.83 cm
5. (a) major arc (b) 33.17 cm
6. (a) 22 cm (b) 7.8 cm (c) 11 cm
7. (a) 14.97 cm (b) 9.78 cm
 (c) 11.13 cm
8. 126 cm
9. 115 m
10. 19.09 cm
11. (a) 103° (b) 147° (c) 146°
12. (a) 77° (b) 156° (c) 95°
13. 106.36° (2 d.p.)
14. 131.73° (2 d.p.)
15. 194.73° (2 d.p.)
16. (a) 18 cm (b) 30 cm (c) 85 cm
17. (a) 5.15 cm (b) 8.97 cm
 (c) 12.38 cm
18. (a) 3.42 cm (b) 7.52 cm
 (c) 17.32 cm
19. (a) 4.33 cm (b) 9.02 cm
 (c) 15.21 cm
20. 28.10 cm

Exercise 2

1. (a) 3 cm^2 (b) 52 cm^2 (c) 216 cm^2
2. (a) 190.97 cm^2 (b) 104.76 cm^2
(c) 33.83 cm^2
3. 148.06 cm^2
4. ~~77~~ 245.54
5. 29.86 cm^2
6. (a) 257.36 cm^2 (b) 230.07 cm
(c) 5.50 m
7. (a) 221.45 cm (b) 160.36 cm
(c) 107.82 cm
8. 21.18 cm
9. 101.70 cm
10. 100 cm
11. (a) 25° (b) 61° (c) 70°
12. (a) 175° (b) 237° (c) 218°
13. 140°
14. 35°
15. 135°
16. (a) 12 cm^2 (b) 25 cm^2 (c) 45.4 cm^2
17. (a) 6 cm^2 (b) 18 cm^2 (c) 27.5 cm^2
18. 27.5 cm^2
19. 33.75 cm
- 20.
21. (a) 0.3 cm^2 (b) 37.39 cm^2
(c) 0.92 cm^2
22. 24.36 cm^2
23. 110.36 cm^2
24. 125.53 cm^2

25. (a) 33.71 cm (b) 14.84 cm
(c) 15.21 cm

Exercise 3

S.No	Height	Base	Volume
(a)	12 cm	Rectangular base 5 cm by 7 cm	140 cm ³
(b)	8 cm	Square base of 3 cm	24 cm ³
(c)	2.67 cm	Triangular base 13 × 12 × 5	80 cm ³

2. (a) 437.60 cm² (b) 465.62 cm²
3. 7 cm
4. (a) 345.67 cm³ (b) 339.43 cm³
5. (a) 478.43 cm³ (b) 403.97 cm²
6. (a) 72.90 cm³ (b) 126.99 cm²
7. (a) 95.00 cm² (b) 48.41 cm³
8. (a) 3.87 cm (b) 16 cm²
9. (a) 304.12 cm² (b) 325.86 cm²
10. (a) 363.62 m³ (b) 0.03 kg/m³
 (c) 240 m² (d) ₦3 600.00

Exercise 4

1. (a) 4 284.76 cm³ (b) 1 790.65 cm²
2. (a) 1 206.67 cm³ (b) 713.413 cm
3. (a) 6 198.17 cm³ (b) 2 183.26 cm²
4. (a) 6 7659.43 cm³ (b) 67.66 litres
5. (a) 1 46.67 cm³ (b) 164.41 cm²
6. (a) 30 999.99 cm³ (b) 5 724.88 cm²

7. (a) 500 m^3 (b) 322 m^2
8. (a) 840 cm^3 (b) 660 cm^3
9. 186.67 cm^3
10. 241.67 cm^3

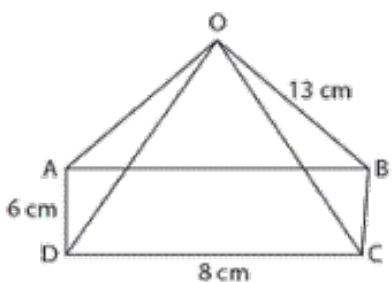
Exercise 5

1. Volume = 353 cm^3 T.S.A = 292 cm^2
2. Volume = 330 cm^3 T.S.A = 272 cm^2
3. Volume = 560 cm^3 T.S.A = 455 cm^2
4. Volume = 133 cm^3 T.S.A. = 182 cm^2
5. Volume = 182 cm^3
T.S.A. = 194.86 cm^2
6. (a) $1\,709.71 \text{ cm}^2$ (b) $5\,430.86 \text{ cm}^3$
7. (a) 212.86 cm^3 (b) 270.87 cm^2
8. (a) 831.43 cm^3 (b) 519.14 cm^2
9. (a) $1\,655.05 \text{ cm}^3$ (b) 992.21 cm^2
10. (a) 965.71 cm^3 (b) 695.32 cm^2

Graduated Exercises

1. (a) 360 cm^2 (b) 400 cm^3 (c) 67°
2. (a) 135.27 cm^2 (b) 37.14 cm
3. (a) (i) 19.72 cm (ii) 50°
(iii) 600 cm^3
(b) $1\,500 \text{ g}$

4. (a)



- (b) (i) 12 cm (ii) 192 cm^3
 (iii) 49.48 cm^3 (iv) 76°

5. 19.25 cm^2

6. 21.33 cm

7. 15 m^3

8. (a) (i) 95° (ii) 85°
 (b) (i) 20.78 cm (ii) 11.47 cm

9. (a) 459.63 cm^2 (b) $1\,017.05 \text{ cm}^2$
 (c) 906.73 cm^2

10. (a) 58 m^3 (b) 107.31 m^2

Chapter 14

Exercise 1

1. (a) 10%, 10%, 20%, 20%, 30%, 30%,
 30%, 30%, 40%, 40%, 40%, 40%,
 40%, 50%, 50%, 50%, 50%, 50%,
 50%, 50%, 60%, 60%, 60%, 60%,
 60%, 70%, 70%, 70%, 80%, 80%.

(b) 80%, 80%, 70%, 70%, 70%, 60%,
 60%, 60%, 60%, 60%, 50%, 50%,
 50%, 50%, 50%, 50%, 50%, 40%,
 40%, 40%, 40%, 40%, 30%, 30%,
 30%, 30%, 20%, 20%, 10%, 10%.

(c) 50%

2. (a) 1.03m, 1.07m, 1.09m, 1.11m,
 1.13m, 1.13m, 1.17m, 1.23m,
 1.24m, 1.3m, 1.3m, 1.31m, 1.35m,
 1.36m, 1.41m.

(b) 1.41m, 1.36m, 1.35m, 1.31m, 1.3m,
 1.3m, 1.24m, 1.23m, 1.17m, 1.13m,
 1.13m, 1.11m, 1.09m, 1.07m,
 1.03m.

3. (a) 39, 39, 40, 40, 40, 40, 40, 40, 41, 41,
41, 41, 42, 42, 42, 42, 42, 42, 42, 42,
43, 43, 43, 43, 43, 44, 44, 44, 45, 45.

(b) 45, 45, 44, 44, 44, 43, 43, 43, 43,
42, 42, 42, 42, 42, 42, 42, 41, 41,
41, 41, 40, 40, 40, 40, 40, 39, 39.

(c) 42

4. (a) 11, 11, 11, 11, 11, 11, 12, 12, 12, 12,
12, 12, 13, 13, 13, 13, 13, 13, 13, 13,
13, 14, 14, 14, 14, 14, 14, 14, 15, 15,
15, 15, 15, 16, 16, 16.

(b) 16, 16, 16, 15, 15, 15, 15, 15, 14, 14,
14, 14, 14, 14, 14, 13, 13, 13, 13, 13,
13, 13, 13, 13, 12, 12, 12, 12, 12, 12,
11, 11, 11, 11, 11, 11.

5. (a) A, A, A, A, A, B, B, B, B, B, C, D, D, D,
D, D, D, D, D, E, E, E, E, F, F, F, F.

(b) F, F, F, F, E, E, E, E, D, D, D, D, D,
D, D, D, C, B, B, B, B, B, A, A, A, A.

(c) D

(d) C

Exercise 2

1.

Class interval	Tally	Frequency (f)
1–10		4
11–20		7
21–30		9
31–40		11

Class interval	Tally	Frequency (<i>f</i>)
41 – 50		12
51 – 60		6
61 – 70		3
71 – 80		5
81 – 90		4
91 – 100		5

2.

Class interval	Tally	Frequency (<i>f</i>)
21 – 25		7
26 – 30		10
31 – 35		9
36 – 40		11
41 – 45		6
46 – 50		8

3.

Class interval	Tally	Frequency (<i>f</i>)
40 – 49		9
50 – 59		2
60 – 69		9
70 – 79		22
80 – 89		20
90 – 99		10

(continued)

4.

Class interval	Tally	Frequency (f)
21 – 30		2
31 – 40		3
41 – 50		6
51 – 60		10
61 – 70		9
71 – 80		10
81 – 90		4
91 – 100		4

5.

Class interval	Tally	Frequency (f)
1 – 5		4
6 – 10		6
11 – 15		11
16 – 20		8
21 – 25		1

Exercise 3

1. (a)

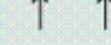
Fruit	Tally	Frequency
A		2
B		15
M		10

Fruit	Tally	Frequency
O		6
P		11

(b) Key  = 2 fruits

Fruit	Pictogram
A	
B	
M	
O	
P	

2. Key  = 2 mango trees

House	Pictogram
A	
B	
C	
D	
E	

3. (a) 52 aircrafts (b) 2008 and 2009

(c) 2006

4. Key  = 2 bottles of soft drinks

Student	Pictogram
A	  
B	   
C	 
D	
E	

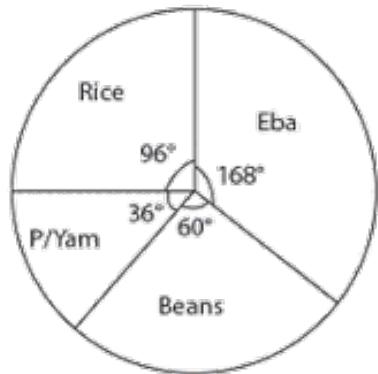
5. Key  = 2 students

Activity	Pictogram
Travelling	    
Watching TV	       
Studying	   
Farming	
Playing	    

Exercise 4

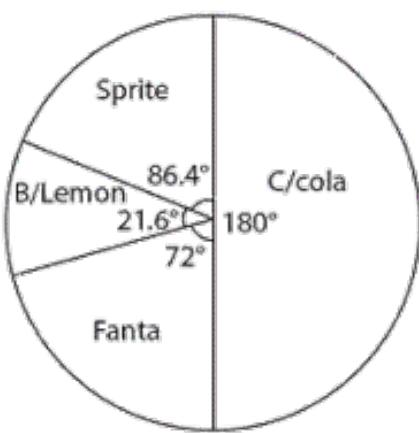
1.

Item	Freq. (f)	Relative value	Sectorial angle
Rice	8	$\frac{8}{30}$	$\frac{8}{30} \times \frac{360^\circ}{1} = 96^\circ$
Eba	14	$\frac{14}{30}$	$\frac{14}{30} \times \frac{360^\circ}{1} = 168^\circ$
Beans	5	$\frac{5}{30}$	$\frac{5}{30} \times \frac{360^\circ}{1} = 60^\circ$
P/yam	3	$\frac{3}{30}$	$\frac{3}{30} \times \frac{360^\circ}{1} = 36^\circ$
Total	= 30		= 360°



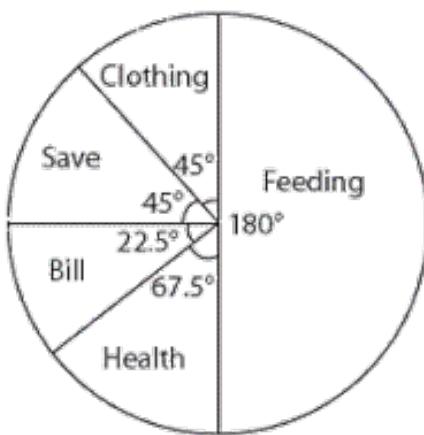
2.

Item	Freq. (f)	Relative value	Sectorial angle
Fanta	10	$\frac{10}{50}$	$\frac{10}{50} \times \frac{360^\circ}{1} = 72^\circ$
Sprite	12	$\frac{12}{50}$	$\frac{12}{50} \times \frac{360^\circ}{1} = 86.4^\circ$
Coca cola	25	$\frac{25}{50}$	$\frac{25}{50} \times \frac{360^\circ}{1} = 180^\circ$
B/Lemon	3	$\frac{3}{50}$	$\frac{3}{50} \times \frac{360^\circ}{1} = 21.6^\circ$
Total	= 50		= 360°



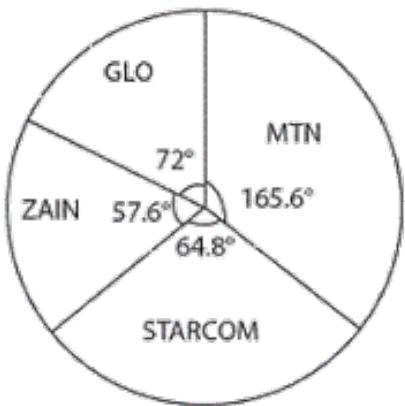
3.

Item	Freq. (f)	Relative value	Sectorial angle
Health	3	$\frac{3}{16}$	$\frac{3}{16} \times \frac{360^\circ}{1} = 67.5^\circ$
Clothing	2	$\frac{2}{16}$	$\frac{2}{16} \times \frac{360^\circ}{1} = 45^\circ$
Bill	1	$\frac{1}{16}$	$\frac{1}{16} \times \frac{360^\circ}{1} = 22.5^\circ$
Feeding	8	$\frac{8}{16}$	$\frac{8}{16} \times \frac{360^\circ}{1} = 180^\circ$
Save	2	$\frac{2}{16}$	$\frac{2}{16} \times \frac{360^\circ}{1} = 45^\circ$
Total	= 16		= 360°



4.

Item	Tally	Freq. (f)	Relative value	Sectorial angle
MTN		23	$\frac{23}{50}$	$\frac{23}{50} \times \frac{360^\circ}{1} = 165.6^\circ$
GLO		10	$\frac{10}{50}$	$\frac{10}{50} \times \frac{360^\circ}{1} = 72^\circ$
ZAIN		8	$\frac{8}{50}$	$\frac{8}{50} \times \frac{360^\circ}{1} = 57.6^\circ$
STARCOM		9	$\frac{9}{50}$	$\frac{9}{50} \times \frac{360^\circ}{1} = 64.8^\circ$
TOTAL	= 50			= 360°



5. (a) ₦5,555,773.82
 (b) ₦31,112,333.39
 (c) 3 : 5

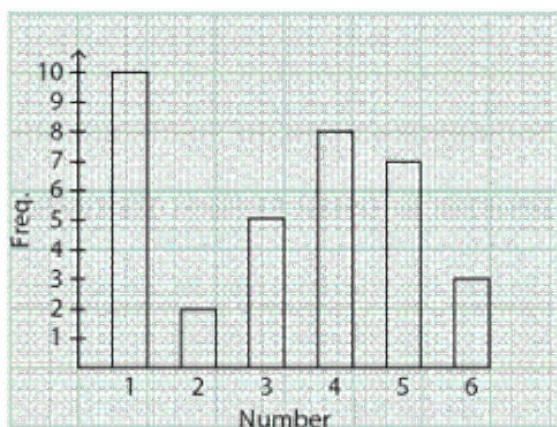
Exercise 5

1. (i)

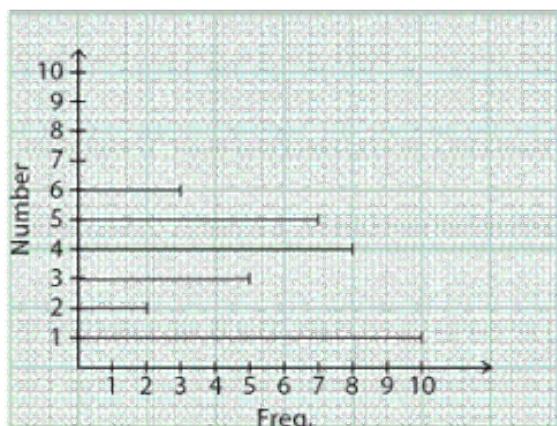
Number	Tally	Freq. (f)
1		10
2		2

Number	Tally	Freq. (f)
3		5
4		8
5		7
6		3

(ii)



(a) A vertical bar chart

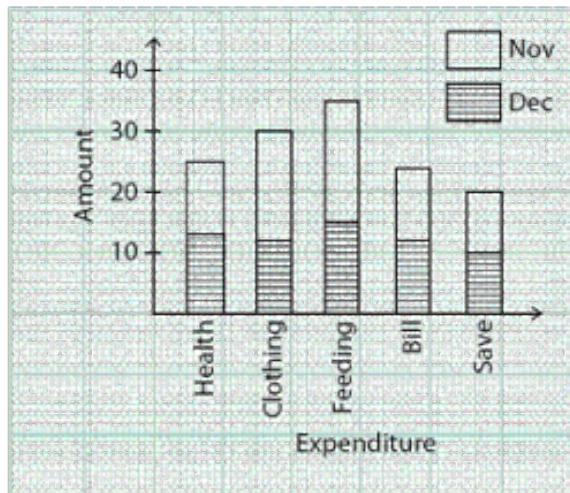


(b) A horizontal widthless bar chart

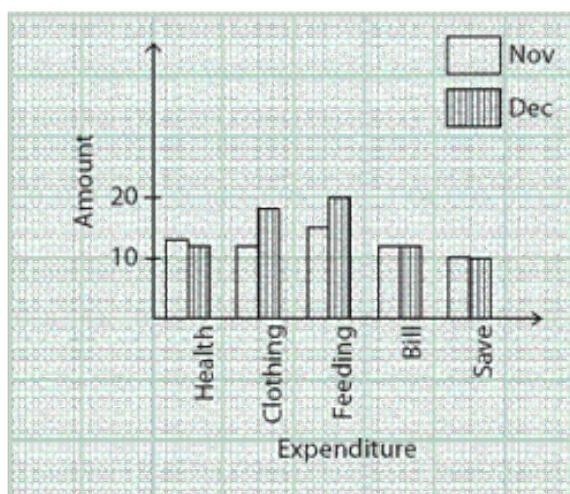
2.

Item	Nov. (N thousand)	Dec. (N thousand)	Total
Health	13	12	25
Clothing	12	18	30

Item	Nov. (N thousand)	Dec. (N thousand)	Total
Feeding	15	20	35
Bill	12	12	24
Save	10	10	20



(a) A component bar chart



(b) A multiple bar chart

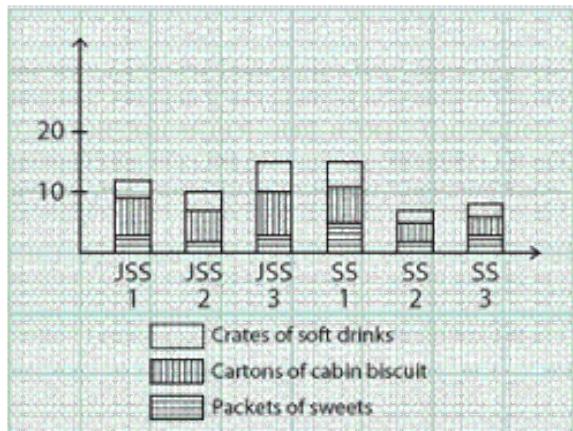
3. (a) A bar chart on cities visited by students
 (b) 140 students
 (c) 1370 students

(d) $\frac{40}{137}$

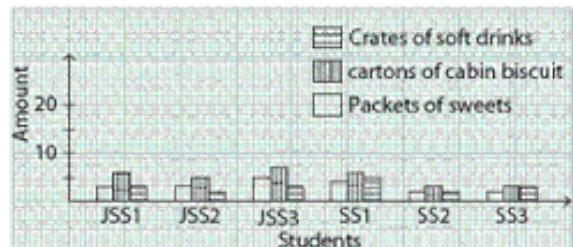
(e) 31 : 19

4.

Item	JSS1	JSS2	JSS3	SS1	SS2	SS3	Total
Crates of s/d	3	3	5	4	2	2	19
Cartons of cabin biscuit	6	5	7	6	3	3	30
packets of sweets	3	2	3	5	2	3	18
Total	12	10	15	15	7	8	



(a) A component bar chart



(b) A multiple bar chart

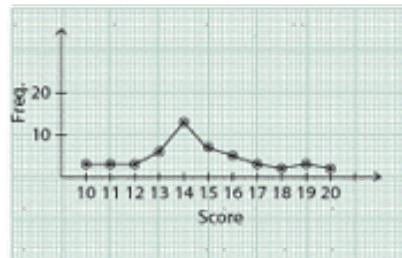
5. (a) 1290 student

(b) 340 males

(c) 8 : 17

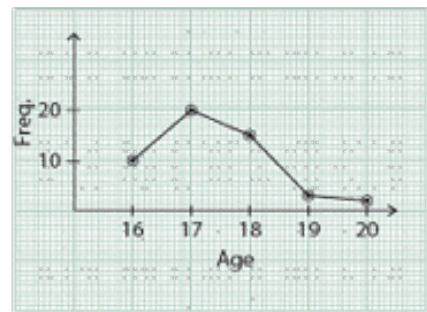
Exercise 6

1.



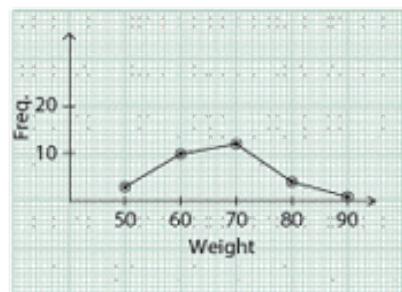
A line graph

2.



A line graph

3.



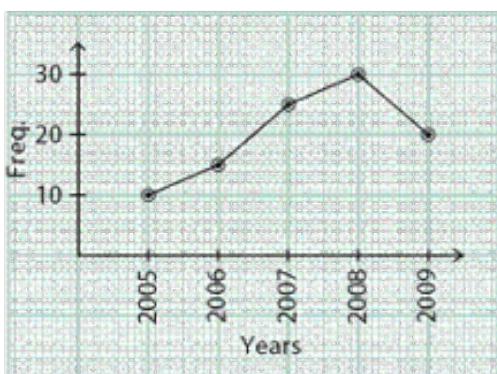
A line graph

4.



A line graph

5.

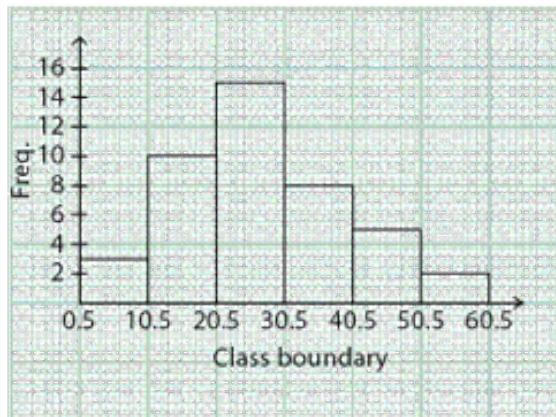


A line graph

Exercise 7

1.

Class interval	Freq. (<i>f</i>)	Class boundary
1 – 10	3	0.5 – 10.5
11 – 20	10	10.5 – 20.5
21 – 30	15	20.5 – 30.5
31 – 40	8	30.5 – 40.5
41 – 50	5	40.5 – 50.5
51 – 60	2	50.5 – 60.5

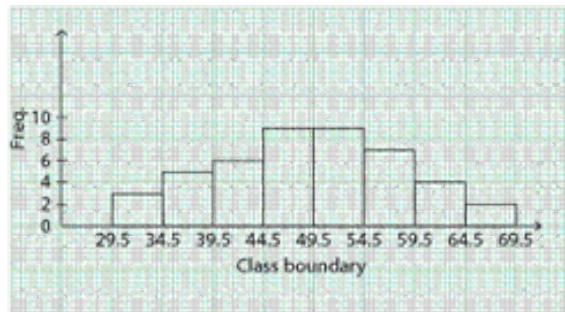


2. (a)

Class int.	Tally	Freq. (<i>f</i>)	Class boundary
30 – 34		3	29.5 – 34.5
35 – 39		5	34.5 – 39.5

Class int.	Tally	Freq. (<i>f</i>)	Class boundary
40–44		6	39.5–44.5
45–49		9	44.5–49.5
50–54		9	49.5–54.5
55–59		7	54.5–59.5
60–64		4	59.5–64.5
65–69		2	64.5–69.5

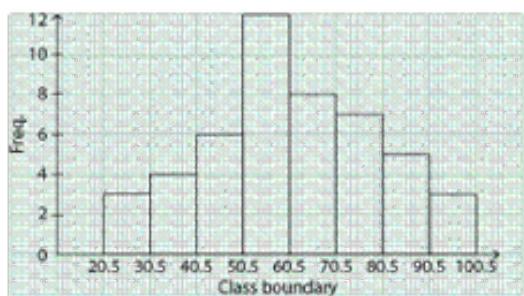
(b)



3. (a)

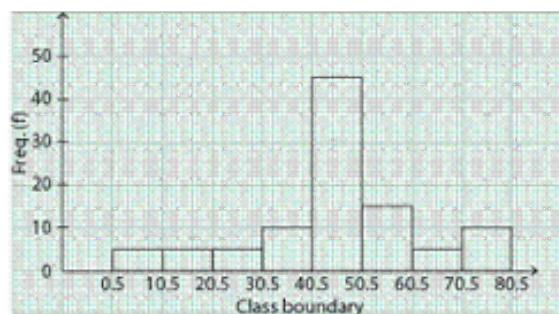
Class int.	Tally	Freq. (<i>f</i>)	Class boundary
20–30		3	20.5–30.5
31–40		4	30.5–40.5
41–50		6	40.5–50.5
51–60		12	50.5–60.5
61–70		8	60.5–70.5
71–80		9	70.5–80.5
81–90		5	80.5–90.5
91–100		3	90.5–100.5

(b)



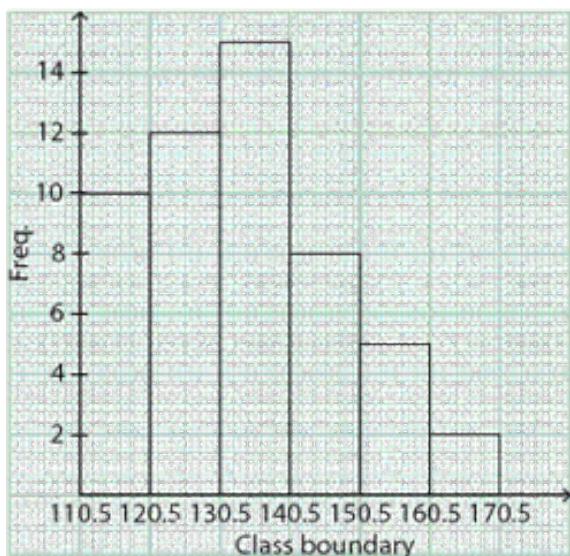
4.

Score range	Freq. (f)	Class boundary
1–10	5	0.5–10.5
11–20	5	10.5–20.5
21–30	5	20.5–30.5
31–40	10	30.5–40.5
41–50	45	40.5–50.5
51–60	15	50.5–60.5
61–70	5	60.5–70.5
71–80	10	70.5–80.5



5.

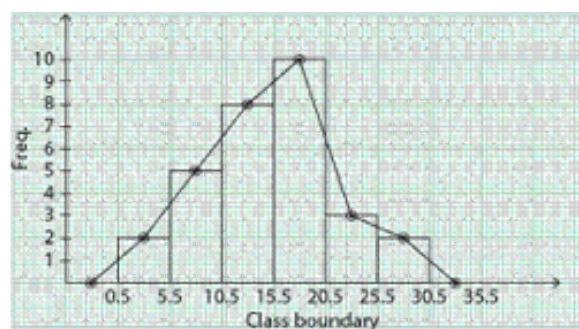
Height ranges (cm)	Freq. (f)	Class boundary
111–120	10	110.5–120.5
121–130	12	120.5–130.5
131–140	15	130.5–140.5
141–150	8	140.5–150.5
151–160	5	150.5–160.5
161–170	2	160.5–170.5



Exercise 8

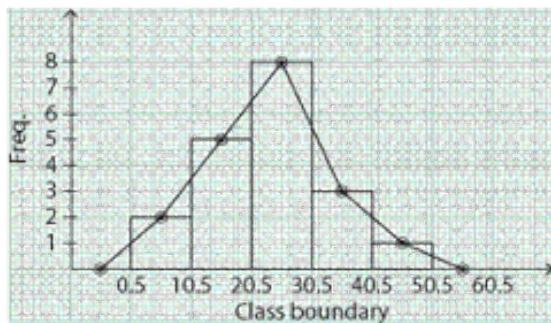
1.

Class int.	Freq. (f)	Mid point	Class boundary
1–5	2	3	0.5–5.5
6–10	5	8	5.5–10.5
11–15	8	13	10.5–15.5
16–20	10	18	15.5–20.5
21–25	3	23	20.5–25.5
26–30	2	28	25.5–30.5



2.

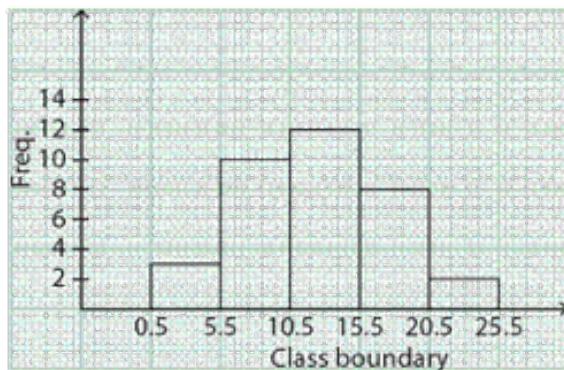
Class int.	Freq. (f)	Mid point	Class boundary
1–10	2	5.5	0.5–10.5
11–20	5	15.5	10.5–20.5
21–30	8	25.5	20.5–30.5
31–40	3	35.5	30.5–40.5
41–50	1	45.5	40.5–50.5



A frequency polygon

3.

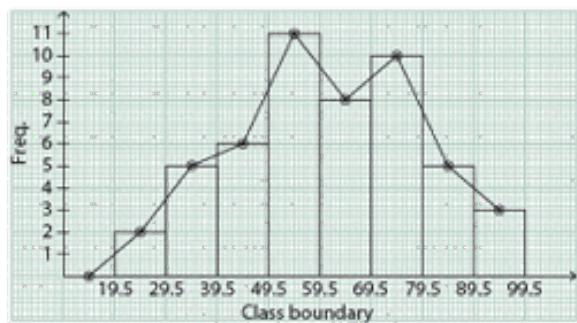
Class int.	Freq. (f)	Mid point	Class boundary
1–5	3	3	0.5–5.5
6–10	10	8	5.5–10.5
11–15	12	13	10.5–15.5
16–20	8	18	15.5–20.5
21–25	2	23	20.5–25.5



A frequency polygon

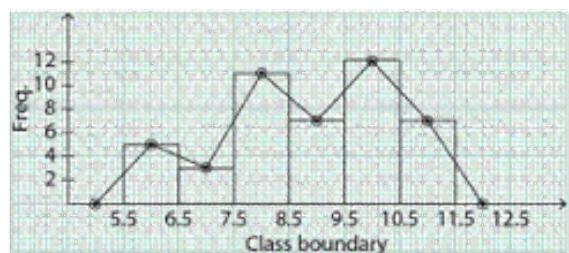
4.

Class int.	Tally	Freq. (f)	Mid point	Class boundary
20–29		2	24.5	19.5–29.5
30–39		5	34.5	29.5–39.5
40–49		6	44.5	39.5–49.5
50–59		11	54.5	49.5–59.5
60–69		8	64.5	59.5–69.5
70–79		10	74.5	69.5–79.5
80–89		5	84.5	79.5–89.5
90–99		3	94.5	89.5–99.5



5.

Shoe sizes	Tally	Freq. (f)	Class boundary
6		5	5.5–6.5
7		3	6.5–7.5
8		11	7.5–8.5
9		7	8.5–9.5
10		12	9.5–10.5
11		7	10.5–11.5

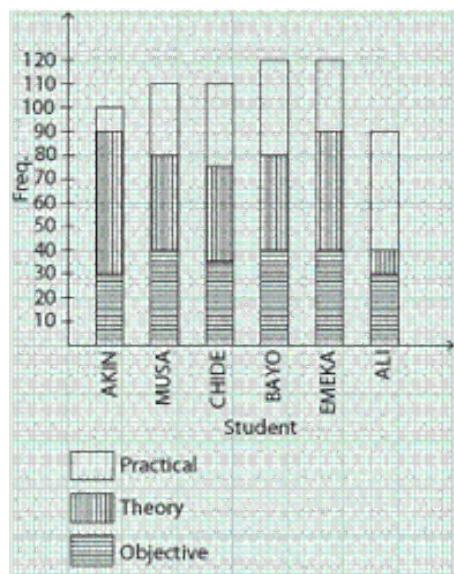


A frequency polygon

Graduated Exercises

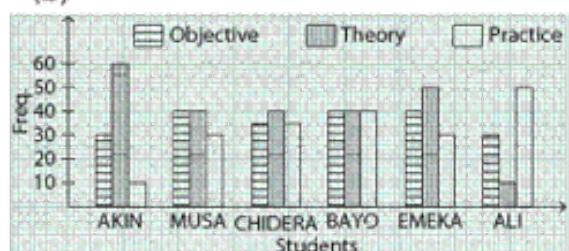
1. (a)

Student	Akin	Musa	Chidera	Bayo	Emeka	All
Objective	30	40	35	40	40	30
Theory	60	40	40	40	50	10
Practical	10	30	35	40	30	50
Total	100	110	110	120	120	90



A compound bar chart

(b)



2.

Subject	Freq. (f)	Relative value	Sectorial angle
Eng	10	$\frac{10}{36}$	$\frac{10}{36} \times \frac{360^\circ}{1} = 100^\circ$
Maths	7	$\frac{7}{36}$	$\frac{7}{36} \times \frac{360^\circ}{1} = 70^\circ$
Biology	3	$\frac{3}{36}$	$\frac{3}{36} \times \frac{360^\circ}{1} = 30^\circ$
Statistics	4	$\frac{4}{36}$	$\frac{4}{36} \times \frac{360^\circ}{1} = 40^\circ$
Igbo	3	$\frac{3}{36}$	$\frac{3}{36} \times \frac{360^\circ}{1} = 30^\circ$
Others	9	$\frac{9}{36}$	$\frac{9}{36} \times \frac{360^\circ}{1} = 90^\circ$
Total	= 36		= 360°



A pie chart

3.

Class int.	Tally	Freq. (f)
21 – 30		2
31 – 40		4
41 – 50		7
51 – 60		12
61 – 70		9

Class int.	Tally	Freq. (<i>f</i>)
71 – 80		8
81 – 90		5
91 – 100		3

4. (a)

Colour	Tally	Freq. (<i>f</i>)
Red		8
Blue		15
Yellow		10
White		12

(b)

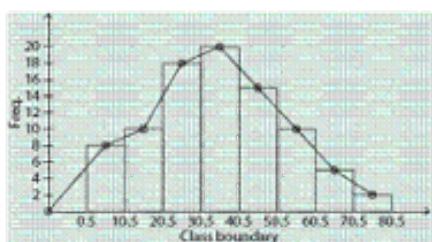
Colour	Pictogram
Red	♂♂♂♂
Blue	○○○○○○○○
Yellow	○○○○○
White	○○○○○

Key ♂ = Two students

5. (a)

Class int.	Freq. (<i>f</i>)	Class boundary
1 – 10	8	0.5 – 10.5
11 – 20	10	10.5 – 20.5
21 – 30	18	20.5 – 30.5
31 – 40	20	30.5 – 40.5
41 – 50	15	40.5 – 50.5
51 – 60	10	50.5 – 60.5
61 – 70	5	60.5 – 70.5
71 – 80	2	70.5 – 80.5

(b)



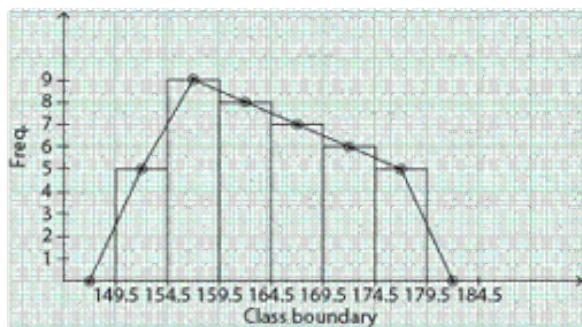
A histogram and a frequency polygon

(c) $\frac{17}{88}$

6. (a)

Height (cm)	Freq. (f)	Class boundary
150 - 154	5	149.5 - 154.5
155 - 159	9	154.5 - 159.5
160 - 164	8	159.5 - 164.5
165 - 169	7	164.5 - 169.5
170 - 174	6	169.5 - 174.5
175 - 179	5	174.5 - 179.5

(b)



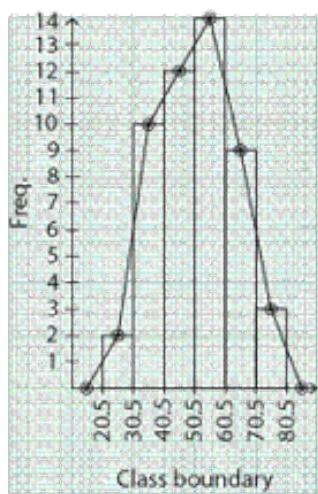
A histogram and a frequency polygon

(c) $\frac{11}{20}$

7. (a)

Class int.	Tally	Freq. (f)	Class boundary
21 – 30		2	20.5 – 30.5
31 – 40		10	30.5 – 40.5
41 – 50		12	40.5 – 50.5
51 – 60		14	50.5 – 60.5
61 – 70		9	60.5 – 70.5
71 – 80		3	70.5 – 80.5

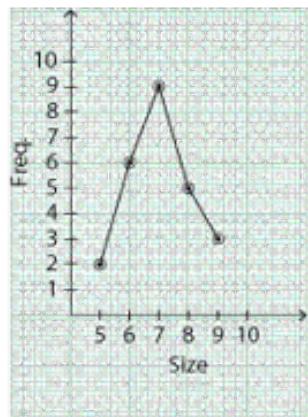
(b) and (c)



A histogram and a frequency polygon

(d) $\frac{9}{50}$

8. (a)



A line graph

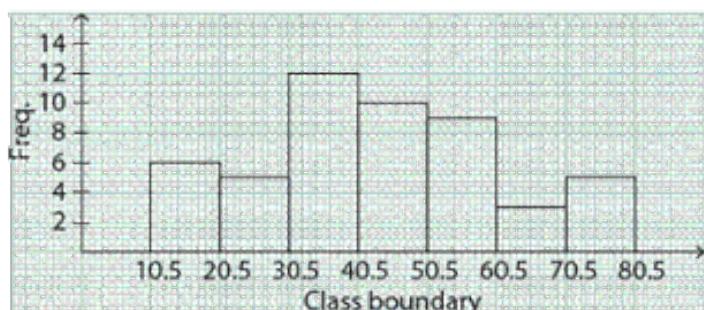
(b) 1:5

9. 1.28 million

10. (a)

Class Int.	Tally	Freq. (f)	Class boundary
11 – 20		6	10.5–20.5
21 – 30		5	20.5–30.5
31 – 40		12	30.5–40.5
41 – 50		10	40.5–50.5
51 – 60		9	50.5–60.5
61 – 70		3	60.5–70.5
71 – 80		5	70.5–80.5

(b)



A histogram

(c) 16%