

Answers

Answers to practice exercises

Chapter 1

Exercise 1 (page 2)

1. 19 kg
2. 16 m
3. 479 mm
4. -66
5. £565
6. -225
7. -2136
8. -36 121
9. £10 7701
10. -4
11. 1487
12. 5914
13. 189 g
14. -70872
15. \$15 333
16. 89.25 cm
17. $d = 64$ mm, $A = 136$ mm, $B = 10$ mm

Exercise 2 (page 5)

1. (a) 468 (b) 868
2. (a) £1827 (b) £4158
3. (a) 8613 kg (b) 584 kg
4. (a) 351 mm (b) 924 mm
5. (a) 10304 (b) -4433
6. (a) 48 m (b) 89 m
7. (a) 259 (b) 56
8. (a) 1648 (b) 1060
9. (a) 8067 (b) 3347
10. 18 kg

Exercise 3 (page 6)

1. (a) 4 (b) 24
2. (a) 12 (b) 360
3. (a) 10 (b) 350
4. (a) 90 (b) 2700
5. (a) 2 (b) 210
6. (a) 3 (b) 180
7. (a) 5 (b) 210
8. (a) 15 (b) 6300
9. (a) 14 (b) 420 420
10. (a) 14 (b) 53 900

Exercise 4 (page 8)

1. 59
2. 14
3. 88
4. 5
5. -33
6. 22
7. 68
8. 5
9. 2
10. 5
11. -1

Chapter 2

Exercise 5 (page 11)

1. $2\frac{1}{7}$
2. $7\frac{2}{5}$
3. $\frac{22}{7}$
4. $\frac{71}{8}$
5. $\frac{4}{11}$
6. $\frac{3}{7}, \frac{4}{2}, \frac{1}{2}, \frac{2}{5}, \frac{5}{8}$
7. $\frac{8}{25}$
8. $\frac{11}{15}$
9. $\frac{9}{30}$
10. $\frac{9}{10}$
11. $\frac{3}{16}$
12. $\frac{3}{16}$
13. $\frac{43}{75}$
14. $\frac{1}{15}$
15. $\frac{4}{27}$
16. $8\frac{51}{52}$
17. $1\frac{9}{40}$
18. $1\frac{16}{21}$
19. $\frac{17}{60}$
20. $\frac{17}{20}$

Exercise 6 (page 13)

1. $\frac{8}{35}$
2. $2\frac{2}{9}$
3. $\frac{6}{11}$
4. $\frac{5}{12}$
5. $\frac{3}{28}$
6. $\frac{3}{5}$
7. 11
8. $\frac{1}{13}$
9. $1\frac{1}{2}$
10. $\frac{8}{15}$
11. $2\frac{2}{5}$
12. $\frac{5}{12}$
13. $3\frac{3}{4}$
14. $\frac{12}{23}$
15. 4
16. $\frac{3}{4}$
17. $\frac{1}{9}$
18. 13
19. 15
20. 400 litres
21. (a) £60, P£36, Q£16
22. 2880 litres

Exercise 7 (page 14)

1. $2\frac{1}{18}$
2. $-\frac{1}{9}$
3. $1\frac{1}{6}$
4. $4\frac{3}{4}$
5. $\frac{13}{20}$
6. $\frac{7}{15}$
7. $4\frac{19}{20}$
8. 2
9. $7\frac{1}{3}$
10. $\frac{1}{15}$
11. 4
12. $2\frac{17}{20}$

Chapter 16

Exercise 62 (page 118)

1. (a) 0.1653 (b) 0.4584 (c) 22030
2. (a) 5.0988 (b) 0.064037 (c) 40.446
3. (a) 4.55848 (b) 2.40444 (c) 8.05124
4. (a) 48.04106 (b) 4.07482 (c) -0.08286
5. 2.739 6. 120.7 m

Exercise 63 (page 120)

1. 2.0601 2. (a) 7.389 (b) 0.7408
3. $1 - 2x^2 - \frac{8}{3}x^3 - 2x^4$
4. $2x^{1/2} + 2x^{5/2} + x^{9/2} + \frac{1}{3}x^{13/2}$
 $+ \frac{1}{12}x^{17/2} + \frac{1}{60}x^{21/2}$

Exercise 64 (page 122)

1. 3.95, 2.05 2. 1.65, -1.30
3. (a) 28 cm^3 (b) 116 min 4. (a) 70°C (b) 5 minutes

Exercise 65 (page 124)

1. (a) 0.55547 (b) 0.91374 (c) 8.8941
2. (a) 2.2293 (b) -0.33154 (c) 0.13087
3. -0.4904 4. -0.5822 5. 2.197 6. 816.2
7. 0.8274 8. 11.02 9. 1.522 10. 1.485
11. 1.962 12. 3 13. 4
14. 147.9 15. 4.901 16. 3.095
17. $t = e^{b+a \ln D} = e^b e^{a \ln D} = e^b e^{\ln D^a}$ i.e. $t = e^b D^a$
18. 500 19. $W = PV \ln \left(\frac{U_2}{U_1} \right)$

Exercise 66 (page 127)

1. (a) 150°C (b) 100.5°C 2. 99.21 kPa
3. (a) 29.32 volts (b) $71.31 \times 10^{-6} \text{ s}$
4. (a) 1.993 m (b) 2.293 m 5. (a) 50°C (b) 55.45 s
6. 30.37 N 7. (a) 3.04 A (b) 1.46 s
8. 2.45 mol/cm^3 9. (a) 7.07 A (b) 0.966 s
10. £2424

Chapter 17

Exercise 67 (page 134)

1. (a) Horizontal axis: 1 cm = 4 V (or 1 cm = 5 V),
 vertical axis: 1 cm = 10 Ω
 (b) Horizontal axis: 1 cm = 5 m, vertical axis:
 1 cm = 0.1 V
 (c) Horizontal axis: 1 cm = 10 N, vertical axis:
 1 cm = 0.2 mm
2. (a) -1 (b) -8 (c) -1.5 (d) 5 3. 14.5
4. (a) -1.1 (b) -1.4
5. The 1010 rev/min reading should be 1070 rev/min;
 (a) 1000 rev/min (b) 167 V

Exercise 68 (page 140)

1. Missing values: -0.75, 0.25, 0.75, 2.25, 2.75;
 Gradient = $\frac{1}{2}$
2. (a) 4, -2 (b) -1, 0 (c) -3, -4 (d) 0, 4
3. (a) $2, \frac{1}{2}$ (b) $3, -\frac{2}{2}$ (c) $\frac{1}{24}, \frac{1}{2}$
4. (a) 5, -3 (b) -2, 4 (c) 3, 0 (d) 0, 7
5. (a) $2, -\frac{1}{2}$ (b) $-\frac{2}{3}, -1\frac{2}{3}$ (c) $\frac{1}{18}, 2$ (d) $10, -4\frac{2}{3}$
6. (a) $\frac{3}{5}$ (b) -4 (c) $-1\frac{5}{6}$
7. (a) and (c), (b) and (e)
8. (2, 1) 9. (1.5, 6) 10. (1, 2)
11. (a) 89 cm (b) 11 N (c) 2.4 (d) $1 = 2.4 W + 48$
12. $P = 0.15 W + 3.5$ 13. $a = -20, b = 412$

Exercise 69 (page 144)

1. (a) 40°C (b) 128 Ω
2. (a) 850 rev/min (b) 77.5 V
3. (a) 0.25 (b) 12 (c) $F = 0.25L + 12$
 (d) 89.5 N (e) 592 N (f) 212 N
4. -0.003, 8.73
5. (a) 22.5 m/s (b) 6.43 s (c) $v = 0.7t + 15.5$
6. $m = 26.9L - 0.63$
7. (a) 1.31 t (b) 22.89% (c) $F = -0.09 W + 2.21$
8. (a) $96 \times 10^9 \text{ Pa}$ (b) 0.00022 (c) $28.8 \times 10^6 \text{ Pa}$

4. $t = 122^\circ 7'$ and $237^\circ 53'$
 5. $\alpha = 218^\circ 41'$ and $321^\circ 19'$
 6. $\theta = 39^\circ 44'$ and $219^\circ 44'$

Exercise 88 (page 202)

1. 5 2. 180° 3. 30 4. 120°
 5. $1, 120^\circ$ 6. $2, 144^\circ$ 7. $3, 90^\circ$ 8. $5, 720^\circ$
 9. $\frac{7}{2}, 960^\circ$ 10. $6, 360^\circ$ 11. $4, 180^\circ$ 12. 5 ms
 13. 40 Hz 14. $100 \mu\text{s}$ or 0.1 ms
 15. 625 Hz 16. leading 17. leading

Exercise 89 (page 203)

1. (a) 40 (b) 25 Hz (c) 0.04 s or 40 ms (c) 25 Hz
 (d) 0.29 rad (or 16.62°) leading $40 \sin 50\pi t$
 2. (a) 75 cm (b) 6.37 Hz (c) 0.157 s
 (d) 0.54 rad (or 30.94°) lagging $75 \sin 40t$
 3. (a) 300 V (b) 100 Hz (c) 0.01 s or 10 ms
 (d) 0.412 rad (or 23.61°) lagging $300 \sin 200\pi t$
 4. (a) $v = 120 \sin 100\pi t$ volts
 (b) $v = 120 \sin(100\pi t + 0.43)$ volts
 5. $i = 20 \sin\left(80\pi t - \frac{\pi}{6}\right)$ A or
 $i = 20 \sin(80\pi t - 0.524)$ A
 6. $3.14 \sin(100\pi t + 0.488)$ m
 7. (a) 5 A, 50 Hz, 20 ms, 24.75° lagging
 (b) -2.093 A (c) 4.363 A (d) 6.375 ms (e) 3.423 ms

Chapter 23**Exercise 90 (page 207)**

1. $C = 83^\circ$, $a = 14.1 \text{ mm}$, $c = 28.9 \text{ mm}$,
 area = 189 mm^2
 2. $A = 52^\circ 2'$, $c = 7.568 \text{ cm}$, $a = 7.152 \text{ cm}$,
 area = 25.65 cm^2
 3. $D = 19^\circ 48'$, $E = 134^\circ 12'$, $e = 36.0 \text{ cm}$,
 area = 134 cm^2
 4. $E = 49^\circ 0'$, $F = 26^\circ 38'$, $f = 15.08 \text{ mm}$,
 area = 185.6 mm^2
 5. $J = 44^\circ 29'$, $L = 99^\circ 31'$, $l = 5.420 \text{ cm}$,
 area = 6.132 cm^2 , or, $J = 135^\circ 31'$, $L = 8^\circ 29'$,
 $l = 0.811 \text{ cm}$, area = 0.917 cm^2
 6. $K = 47^\circ 8'$, $J = 97^\circ 52'$, $j = 62.2 \text{ mm}$,
 area = 820.2 mm^2 or $K = 132^\circ 52'$, $J = 12^\circ 8'$,
 $j = 13.19 \text{ mm}$, area = 174.0 mm^2

Exercise 91 (page 209)

1. $p = 13.2 \text{ cm}$, $Q = 47.35^\circ$, $R = 78.65^\circ$,
 area = 77.7 cm^2
 2. $p = 6.127 \text{ m}$, $Q = 30.83^\circ$, $R = 44.17^\circ$,
 area = 6.938 m^2
 3. $X = 83.33^\circ$, $Y = 52.62^\circ$, $Z = 44.05^\circ$,
 area = 27.8 cm^2
 4. $Z = 29.77^\circ$, $Y = 53.50^\circ$, $Z = 96.73^\circ$,
 area = 355 mm^2

Exercise 92 (page 210)

1. 193 km 2. (a) 122.6 m (b) 94.80° , 40.66° , 44.54°
 3. (a) 11.4 m (b) 17.55° 4. 163.4 m
 5. $BF = 3.9 \text{ m}$, $EB = 4.0 \text{ m}$ 6. 6.35 m, 5.37 m
 7. 32.48 A, 14.31°

Exercise 93 (page 211)

1. $3(122^\circ, 59.58^\circ, 40.20^\circ)$ 2. (a) 15.23 m (b) 38.07°
 3. 40.25 cm, 126.35° 4. 19.8 cm 5. 36.2 m
 6. $x = 9.3 \text{ mm}$, $y = 142 \text{ mm}$ 7. 130° 8. 13.66 mm

Chapter 24**Exercise 94 (page 215)**

1. $(5.83, 59.04^\circ)$ or $(5.83, 1.03 \text{ rad})$
 2. $(6.61, 20.82^\circ)$ or $(6.61, 0.36 \text{ rad})$
 3. $(4.47, 116.57^\circ)$ or $(4.47, 2.03 \text{ rad})$
 4. $(6.55, 145.58^\circ)$ or $(6.55, 2.54 \text{ rad})$
 5. $(7.62, 203.20^\circ)$ or $(7.62, 3.55 \text{ rad})$
 6. $(4.33, 236.31^\circ)$ or $(4.33, 4.12 \text{ rad})$
 7. $(5.83, 329.04^\circ)$ or $(5.83, 5.74 \text{ rad})$
 8. $(15.68, 307.75^\circ)$ or $(15.68, 5.37 \text{ rad})$

Exercise 95 (page 217)

1. (1.294, 4.830) 2. (1.917, 3.960)
 3. $(-5.362, 4.500)$ 4. $(-2.884, 2.154)$
 5. $(-9.353, -5.400)$ 6. $(-2.615, -3.207)$
 7. (0.750, -1.299) 8. (4.252, -4.233)
 9. (a) $40 \angle 18^\circ$, $40 \angle 90^\circ$, $40 \angle 162^\circ$, $40 \angle 234^\circ$, $40 \angle 306^\circ$
 (b) (38.04, 12.36), (0, 40), $(-38.04, 12.36)$,
 $(-23.51, -32.36)$, (23.51, -32.36)
 10. 47.0 mm

Chapter 25

Exercise 96 (page 221)

1. $p = 105^\circ$, $q = 35^\circ$ 2. $r = 142^\circ$, $s = 95^\circ$
3. $t = 146^\circ$

Exercise 97 (page 225)

1. (i) rhombus (a) 14 cm^2 (b) 16 cm (ii) parallelogram
(a) 180 mm^2 (b) 80 mm (iii) rectangle (a) 3600 mm^2
(b) 300 mm (iv) trapezium (a) 190 cm^2 (b) 62.91 cm
2. 35.7 cm^2 3. (a) 80 m (b) 170 m 4. 27.2 cm^2
5. 18 cm 6. 1200 mm
7. (a) 29 cm^2 (b) 650 mm^2 8. 560 m^2
9. 3.4 cm 10. 6750 mm^2 11. 43.30 cm^2
12. 32

Exercise 98 (page 226)

1. 482 m^2
2. (a) 50.27 cm^2 (b) 706.9 mm^2 (c) 3183 mm^2
3. 2513 mm^2 4. (a) 20.19 mm (b) 63.41 mm
5. (a) 53.01 cm^2 (b) 129.9 mm^2 6. 5772 mm^2
7. 1.89 m^2

Exercise 99 (page 228)

1. 1932 mm^2 2. 1624 mm^2 3. (a) 0.918 ha (b) 456 m

Exercise 100 (page 229)

1. 80 ha 2. 80 m^2 3. 3.14 ha

Chapter 26

Exercise 101 (page 231)

1. 45.24 cm 2. 259.5 mm 3. 2.629 cm 4. 47.68 cm
5. 38.73 cm 6. 12730 km 7. 97.13 mm

Exercise 102 (page 232)

1. (a) $\frac{\pi}{6}$ (b) $\frac{5\pi}{12}$ (c) $\frac{5\pi}{4}$
2. (a) 0.838 (b) 1.481 (c) 4.054
3. (a) 210° (b) 80° (c) 105°
4. (a) $0^\circ 43'$ (b) $154^\circ 8'$ (c) $414^\circ 53'$

Exercise 103 (page 234)

1. 113 cm^2 2. 2376 mm^2 3. 1790 mm^2
4. 802 mm^2 5. 1709 mm^2 6. 1269 m^2
7. 1548 m^2 8. (a) 106.0 cm (b) 783.9 cm^2
9. 21.46 m^2 10. 17.80 cm , 74.07 cm^2
11. (a) 59.86 mm (b) 197.8 mm 12. 26.2 cm
13. 8.67 cm , 54.48 cm 14. 82.5° 15. 748
16. (a) 0.698 rad (b) 804.2 m^2 17. 10.47 m^2
18. (a) 396 mm^2 (b) 42.24% 19. 701.8 mm
20. 7.74 mm

Exercise 104 (page 237)

1. (a) 2 (b) $(3, -4)$ 2. Centre at $(3, -2)$, radius 4
3. Circle, centre $(0, 1)$, radius 5
4. Circle, centre $(0, 0)$, radius 6

Chapter 27

Exercise 105 (page 243)

1. 1 m^3 2. 5 cm^3 3. 8 cm^3
4. (a) 3840 mm^2 (b) 1792 mm^2
5. 972 litres 6. 15 cm^3 , 135 g 7. 500 litres
8. 4 m^3 9. (a) 35.3 cm^3 (b) 61.3 cm^2
10. (a) 2400 cm^3 (b) 2460 cm^2 11. 37.04 m
12. 1.63 cm 13. 8796 cm^3
14. 4.709 cm , 153.9 cm^2
15. 2.99 cm 16. 28060 cm^3 , 1.099 m^2
17. 8.22 m by 8.22 m 18. 62.5 min
19. 4 cm 20. 4.08 m^3

Exercise 106 (page 246)

1. 201.1 cm^3 , 159.0 cm^2 2. 7.68 cm^3 , 25.81 cm^2
3. 113.1 cm^3 , 113.1 cm^2 4. 5.131 cm 5. 3 cm
6. 2681 mm^3 7. (a) 268083 mm^3 or 268.083 cm^3
(b) 20106 mm^2 or 201.06 cm^2
8. 8.53 cm
9. (a) $512 \times 10^6\text{ km}^2$ (b) $1.09 \times 10^{12}\text{ km}^3$ 10. 664

Exercise 107 (page 251)

1. 5890 mm^2 or 58.90 cm^2
2. (a) 56.55 cm^3 (b) 84.82 cm^2 3. 13.57 kg
4. 29.32 cm^3 5. 393.4 m^2
6. (i) (a) 670 cm^3 (b) 523 cm^2 (ii) (a) 180 cm^3
(b) 154 cm^2 (iii) (a) 56.5 cm^3 (b) 84.8 cm^2
(iv) (a) 10.4 cm^3 (b) 32.0 cm^2 (v) (a) 96.0 cm^3

- Parabola, 156
 Parallel lines, 165
 Parallelogram, 219
 method, 267
 Peak value, 199
 Pentagon, 219
 Percentage component bar chart, 289
 error, 36
 relative frequency, 289
 Percentages, 33
 Percentile, 304
 Perfect square, 105
 Perimeter, 171
 Period, 199
 Periodic function, 200
 plotting, 238
 Periodic time, 200
 Phasor, 280
 Pictograms, 289
 Pie diagram, 289
 Planimeter, 257
 Plotting periodic functions, 238
 Polar co-ordinates, 214
 Pol/Rec function on calculator, 217
 Polygon, 210
 frequency, 293, 296
 Population, 289
 Power, 47
 series for e^x , 119
 Powers and roots, 47
 Practical problems
 quadratic equations, 108
 simple equations, 77
 simultaneous equations, 96
 straight line graphs, 141
 trigonometry, 209
 Precedence, 6, 71
 Prefixes, 53
 Presentation of grouped data, 292
 statistical data, 288
 Prism, 240, 242
 Probability, 306
 laws of, 307
 Production of sine and cosine waves, 198
 Proper fraction, 9
 Properties of circles, 230
 triangles, 171
 Proportion, 40
 Pyramid, 244
 volumes and surface area of frustum of, 252
 Pythagoras' theorem, 181
 Quadrant, 230
 Quadratic equations, 102
 by completing the square, 105
 factorization, 102
 formula, 106
 graphically, 156
 practical problems, 108
 Quadratic formula, 106
 graphs, 156
 Quadrilaterals, 219
 properties of, 219
 Quartiles, 303
 Radians, 27, 165, 166, 232
 Radius, 230
 Range, 295
 Ranking, 299
 Rates of change, 323
 Ratio and proportion, 40
 Ratios, 40
 Reciprocal, 24
 Rectangle, 219
 Rectangular axes, 131
 co-ordinates, 131
 prism, 240
 Reduction of non-linear laws to linear form, 147
 Reflex angle, 165
 Relative frequency, 289
 Relative velocity, 276
 Resolution of vectors, 269
 Resultant
 of parallel forces, by drawing, 280
 of horizontal and vertical components, 283
 plotting, 278
 sine and cosine rules, 281
 Rhombus, 219
 Right angle, 165
 Right angled triangle, 171
 solution of, 188
 Sample, 289
 Scalar quantities, 266
 Scalene triangle, 171
 Scales, 131
 Sector, 222, 230
 area of, 233
 Segment, 230
 Semicircle, 230
 Semi-interquartile range, 304
 Set, 289
 Short division, 4
 Significant figures, 17, 18
 Similar shapes, 229, 256
 triangles, 176
 Simple equations, 73
 practical problems, 77
 Simpson's rule, 258
 Simultaneous equations, 90
 graphical solution, 155
 in three unknowns, 99
 in two unknowns, 90
 practical problems, 96
 Sine, 27, 183
 graph of, 195
 Sine rule, 205, 281
 wave, 198, 260
 mean value, 260
 Sinusoidal form $A \sin(\omega t \pm \alpha)$, 202
 SI units, 53
 Slope, 134
 Solution of linear and quadratic equations simultaneously, 110
 Solving right-angled triangles, 188
 simple equations, 73
 Space diagram, 276
 Sphere, 246
 Square, 23, 219
 numbers, 23
 root, 25, 48
 units, 219
 Standard deviation, 302
 discrete data, 302
 grouped data, 303
 Standard differentials, 321
 form, 56
 integrals, 326
 Statistical data, presentation of, 288
 terminology, 288
 Straight line, 165
 equation of, 135
 Straight line graphs, 132
 practical problems, 141
 Subject of formulae, 83
 Subtraction in algebra, 62
 Subtraction of fractions, 10
 numbers, 1, 18
 vectors, 274
 Successive differentiation, 322
 Supplementary angles, 165
 Surface areas of frusta of pyramids and cones, 252
 of solids, 247
 Symbols, 28
 Tally diagram, 293, 296
 Tangent, 27, 183, 230
 graph of, 195
 Terminating decimal, 17
 Theorem of Pythagoras, 181
 Transposition of formulae, 83
 Transversal, 165
 Trapezium, 220
 Trapezoidal rule, 257

- Triangle, 171, 219
- Triangles, area of, 205
 - congruent, 175
 - construction of, 179
 - properties of, 171
 - similar, 176
- Trigonometric functions, 27
- Trigonometric ratios, 183
 - evaluation of, 185
 - graphs of, 195
 - waveforms, 195
- Trigonometry, 181
 - practical situations, 209
- Turning points, 156
- Ungrouped data, 289
- Units, 53
- Upper class boundary, 293
- Use of calculator, 22
- Vector addition, 267
 - subtraction, 274
- Vectors, 266
 - addition of, 267
 - by calculation, 267
 - by horizontal and vertical components, 269
 - drawing, 266
 - subtraction of, 274
- Velocity, relative, 276
- Vertical axis intercept, 133
 - bar chart, 289
 - component, 269, 283
- Vertically opposite angles, 165
- Vertices of triangle, 172
- Volumes of common solids, 240
 - frusta of pyramids and cones, 252
 - irregular solids, 259
 - pyramids, 244
 - similar shapes, 256
- Waveform addition, 278
- y-axis intercept, 135
- Young's modulus of elasticity, 143

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Page 33 of 38