ANSWERS TO MATHEMATICS EXERCISES

A1

Q1 (a) 5 (b) 2 (c) 24 (d) 21 (e) 9

Q2 (a) $z = \frac{8}{y}$ (b) $z = \frac{6 + 2w}{3}$ (c) $z = 5p$ (d) $z = \frac{bc}{a}$

Q3 (a) (i) $m = V$ (ii) $V = \frac{m}{}$ (b) $r = \frac{C}{2}$ (c) $d^2 = \frac{4A}{}$ (d) $L = \frac{g T^2}{}$

A2

1 (a)(i) $a = \frac{(v - u)}{t}$ (ii) $t = \frac{(v - u)}{a}$ (b) (i) $t = \frac{2s}{(u + v)}$ (ii) $v = \frac{2s}{t} - u$

2. (a) $s = \frac{(v - at + v)}{2} t = \frac{(2v - at)}{2} t$ (b) $s = \frac{2vt - at^2}{2} = vt - \frac{1}{2} at^2$

A3

Q1 (a) 5 (b) 13 (c) 41 , Q2 (a) 12 (b) 4 (c) 40 , Q3 (a) 6 (b) 36 (c) 200

A4

Q1 (a) y = 2, z = 1 (b) y = 4 , z = 1 Q2 a) p = 5 q = 2 (b) q = 4 , p = 3

Q3 (a) E = 12 V , r = 4Ω (b) E = 2 V , r = 1Ω

B1

Q1 (a) 26, 36, 46 m (b) (i)(ii)(iii) 10 m (c) 10 m s^{-1}

Q2 (a) 0.9m , 0 (b) (i) 0.1 m s^{-1} (ii) 0.5 m s^{-1} (iii) 0.9 m s^{-1} , (c) The speed increases by 0.4 m s^{-1} every 2 seconds which means that the acceleration is constant, equal to 0.2 m s^{-2} .

Q3 (a) 16, 20, 24, 28, 32 m s^{-1} , (b)(i), (ii) (iii) 4 m s^{-1} (c) 4 m s^{-2}

B2

Q1 $6x^2$, (ii) $20x^4$, (iii) $3x^2 - 2$, (iv) $^4/_3\, x^3$

Q2 (i) 2 e^x (ii) 3 e^{3x} (iii) $-e^{-x}$ (iv) $-3e^{-x}$ (v) -2 e^{-2x}

Q3 (i) 5 + 6t , (ii) 2 - 12t , (iii) 3 - $15t^2$, (iv) $12t^2$ - 4t

B3

Q1 (a) 67.0 , 44.9 , 30.1 , 20.2 , 13.5 C (b)(i) 33.0 C , (ii) 14.8 C , (iii) 6.7 C (c) (i) 33 A , (ii) 6.7 A

Q2 (a) 8.9 V , 6.6 V , 4.9 V , 3.6 V , 2.7 V , (c) 1520 C

Radioactive Decay

Q1 (a) 3.35 x 10^{20} , 2.25 x 10^{20} , 1.51 x 10^{20} , 1.01 x 10^{20} , 0.68 x 10^{20} (c) 1.7 s

B4

Q1 (i) 2 cos 2t , (ii) 3 cos t , (iii) 0.5 cos 0.5t , (iv) cos 0.5t , (v) 15 cos 5t

Q2 (i) -3sin 3t , (ii) -2 sin t , (iii) -0.1 sin 0.1t , (iv) -12 sin 4t , (v) -2 sin 4t

C1

Q1 (a) (i) 2, (ii) 3 , (iii) -2 , (iv) 2 , (v) $^3/_2$, (b) (i) 0 , (ii) 5 , (iii) 6 , (iv) 3 , (v) -4

Q2 (a) (i) gradient = 4 ; y-intercept = 1 (ii) gradient = 2 , y - intercept = 3

C2

Q1 (a) 8.0×10^{-9} N , 8.9×10^{-10} N , 5.0×10^{-10} N , 3.2×10^{-10} N , 2.2×10^{-10} N

Q2 (a) (i) 2.0×10^{4} s^{-1} , (ii) 5.0×10^{3} s^{-1} (b) 2.23 m

Q3 (a) 1.6×10^{15} N , 1.8×10^{14} N , 1.0×10^{14} N , 6.4×10^{13} N , 4.4×10^{13} N

D1

Q1 (a) (i) 2.5 m , (ii) 13.9 m , (b) (i) 2.57 m , (ii) 4.29 m , (c) (i) 3.19 m , (ii) 3.53 m ,

Q3(a) 3.5 m, 6.9 m , (b) 63^{0} , 8.9 m , (c) 53^{0} , 3.0 m , (d) 9.5 m , 12.4 m ,

(e) 56^{0} , 14.4 m, (f) 19.5^{0} , 8.5 m , (g) 3.5 m, 2.0 m

D2

Q1 (a) (i) 0.63 , (ii) 0.59 , (b) (i) 1.26 , (ii) 0.95 , (c) 1.57 , 1.0

Q2 (a)(i) 7.0 V , (ii) 11.4 V , (iii) 8.5 V , (iv) -11.4 V , (v) 12.0 V

(b) (i) 1.67 ms , (ii) 2.05 ms (iii) 2.95 ms , (iv) 5.0 ms

D3

Q1 (a) (i) $\frac{}{6}$ (ii) $\frac{}{4}$ (iii) $\frac{}{2}$ (iv) $\frac{3}{4}$ (v)

(b) (i) 0.105 m (ii) 0.157 m (iii) 0.314 m (iv) 0.471 m (v) 0.628 m

Q2 (a) (i) 0.2 , (ii) 11.5^{0} (b) 0.4 , 22.9^{0} (c) (i) 1.0 , 57.3^{0} (d) (i) 4.0 , (ii) 229^{0}

Q3 (a) 0.86 m , (b) 0.28 m

E1

Q1 (a) (i) n = 10^{-9} (ii) = 10^{-6} (iii) m = 10^{-3} (iv) k = 10^{3} (v) M = 10^{6} (vi) G = 10^{9}

(b) (i) 3.00 x 10^{8} m/s , (ii) 3.1 x 10^{7} s , (iii) 5.90 x 10^{-7} m

Q2 (a)(i) 5.747 x 10^{3} , 1.483 x 10^{3} (b) (i) 2.8828 x 10^{4} (ii) 4.172 x 10^{3} (c)(i) 1.216 x 10^{20}

(ii) 1.34 x 10^{19} , (d) (i) 3.94 x 10^{6} , 3.04 x 10^{6} , (e) (i) 5.61 x 10^{-6} , (ii) 1.31 x 10^{-6}

Q3 (a)(i) 6.75 x 10^{6} (ii) 1.70 (b)(i) 2.03 x 10^{6} (ii) 1.34 , (c) (i) 3.65 x 10^{39} (ii) 1.25 ,

(d) (i) 1.57 x 10^{12} , (ii) 7.76 (e) (i) 7.44 x 10^{-12} , (ii) 1.61

E2

Q1 (a)(i) 39 (ii) 1.7 x 10^{12} (iii) 4.1 x 10^{42} (iv) 3.0 x 10^{-9} (v) 1.5 x 10^{-2}

(b) (i) 1.36 (ii) 15.3 (iii) 3.56 x 10^{3} (iv) 1.95 x 10^{-1} (v) 7.04 x 10^{-1}

Q2 (a) (i) 54.0 (ii) 2.14 x 10^{4} (iii) 4.53 x 10^{21} (iv) 146 (v) 2.92 x 10^{3}

(b) (i) 1.46 x 10^{-2} (ii) 2.59 x 10^{-5} (iii) 1.16 x 10^{-23} (iv) 5.09 x 10^{-3} iv) 2.14 x 10^{-4}

Q3 (a) (i) 4.82 x 10^{-7} (ii) 9.13 (iii) 0.123 (iv) 2.97 x 10^{5} (v) 1.10 x 10^{3}

(b) (i) 1.58 (ii) 0.16 (iii) 1.84 (iv) 0.737 (v) 1.10

E3

Q1 (a)(i) 1.65 (ii) 2.72 (iii) 4.48 (iv) 2.20 x 10^{4} (v) 2.69 x 10^{43}

(b) (i) 0.607 (ii) 0.368 (iii) 0.223 (iv) 0.135 (v) 8.21 x 10^{-2}

Q2 (a) (i) -4.61 (ii) -2.30 (iii) 0 (iv) 2.30 (v) 4.61

(b) (i) -3.51 (ii) -1.20 (iii) 1.10 (iv) 3.40 (v) 5.70

Q3 (a) (i) 0.105 (ii) 1 (iii) 9.49 (b) (i) - 0.916 (ii) 1.39 (iii) 3.69

Answers to F1

Q1 (i) 15.0 m , 26.0 m (ii) -34.2 N , 94.0 N

Q2 (a)(i) 8.66 N , 5.00 N (ii) 2.74 N , 7.52 N (b) (i) 16.0 N , 13.9 N (ii) 8.49 N, 6.0 N

Q3 (a)(ii) 17.5 km East, 35 km North

(b)(i) 113 m s^{-1} East , 41.0 m s^{-1} North (ii) 28.8 km East , 76 km North.

Answers to F2

Q1, Q2 (a) 11.7 N at 59^0 above the x-axis, (b) 14.0 N at 76^0 above the x-axis

Q3 (a) and (b) (i) 13.1 N at 23.4^0 to the 9.0 N force , (ii) 6.4 N at 41.7^0 to the 9.0 N force

Answers to F3

Q1 (b) (i) 6.0 i + 5.5 j (ii) -2.0 i + 0.5 j

Q2 (a) F_1 = 6.0 i , F_2 = 10.0 j , F_1 + F_2 = 6.0 i + 10.0 j , Resultant = 11.7 N

(b) F_1 = 6.0 i , F_2 = 5.0 i + 8.7 j , F_1 + F_2 = 11.0 i + 8.7 j , Resultant = 14.0 N

Q3 (a) (i) 5.41 N , (ii) 6.0 N (b) (i) 5.4 i - 1.0 j (ii) 5.5 N at 10.5^0 below the x-axis

(c) 0.6 i + 10.0 j (ii) 100 N at 87^0 above the x-axis