1a)
$$s = 50 \qquad v^2 = u^2 + 2as$$
$$u = 0 \qquad (20)^2 = (0)^2 + 2a(50)$$
$$v = 20 \qquad 400 = 100a$$
$$a \qquad\qquad a = 4\,ms^{-2}$$
$$t$$

$$s = \frac{u+v}{2} \cdot t$$

$$50 = \frac{0+20}{2} \cdot t$$
$$50 = 10t$$
$$t = 5s$$

b)
$$s = 200 \qquad v^2 = u^2 + 2as$$
$$u \qquad\qquad (30)^2 = u^2 + 2(2)(200)$$
$$v = 30 \qquad 900 = u^2 + 800$$
$$a = 2 \qquad 100 = u^2$$
$$t \qquad\qquad u = \pm 10\,ms^{-1}$$

$$v = u + at$$
$$30 = 10 + 2t \qquad\qquad or \qquad\qquad 30 = -10 + 2t$$
$$20 = 2t \qquad\qquad\qquad\qquad\qquad 40 = 2t$$
$$t = 10s \qquad\qquad\qquad\qquad\qquad t = 20\,s$$

c)
$$s = 85 \qquad\qquad s = \frac{u+v}{2}t$$
$$u = ? \qquad\qquad 85 = \frac{u+20}{2} \cdot 5$$
$$v = 20$$
$$a. \qquad\qquad\qquad 17 = \frac{u+20}{2}$$
$$t = 5$$
$$\qquad\qquad\qquad 34 = u + 20$$
$$\qquad\qquad\qquad u = 14\,ms^{-1}$$

$$v = u + at$$
$$20 = 14 + 5a$$
$$6 = 5a \qquad\qquad\qquad a = \frac{6}{5}\,ms^{-2}$$

d) $s = 100$ $s = ut + \frac{1}{2}at^2$

u

v $100 = u(4) + \frac{1}{2}(2)(4)^2$

$a = 2$

$t = 4$ $100 = 4u + 16$

$$84 = 4u$$

$$u = 21 \, ms^{-1}$$

$$v = u + at$$
$$v = 21 + 2(4)$$
$$= 21 + 8$$
$$= 29 \, ms^{-1}$$

e) s $v = u + at$

u $10 = u + 1.5(3)$

$v = 10$ $10 = u + 4.5$

$a = 1.5$ $u = 5.5 \, ms^{-1}$

$t = 3$

$$s = ut + \frac{1}{2}at^2$$

$$s = 5.5(3) + \frac{1}{2}(1.5)(3)^2$$

$$s = 16.5 + \frac{1}{2} \cdot \frac{3}{2} \cdot 9$$

$$s = \frac{93}{4} \, m$$

2)

s
$u = 20$
v
$a = -9.8$
$t = 5$

$$s = ut + \tfrac{1}{2}at^2$$
$$= 20(5) + \tfrac{1}{2}(-9.8)(5)^2$$
$$= -22.5\,m$$

$\therefore h$ is $22.5\,m$ above the ground

b)

$$v = u + at$$
$$= 20 + (-9.8)(5)$$
$$= \underline{\underline{-29\,ms^{-1}}}$$

The ball hits the ground with a $\underline{speed}$ of $\underline{\underline{29\,ms^{-1}}}$

3)

s
$u = \dfrac{50}{9}$
$v = \dfrac{175}{9}$
a
$t = 10$

$\dfrac{20 \times 1000}{3600} = \dfrac{50}{9}$

$\dfrac{70 \times 1000}{3600} = \dfrac{175}{9}$

a)
$$v = u + at$$
$$\frac{175}{9} = \frac{50}{9} + a(10)$$
$$\frac{125}{9} = 10a$$
$$a = \underline{\underline{\frac{25}{18}\,ms^{-2}}}$$

b)
$$s = \frac{u+v}{2}\cdot t$$
$$= \frac{\frac{50}{9} + \frac{175}{9}}{2}\cdot 10$$
$$= \underline{\underline{125\,m}}$$

4)

$s = -120$
$u = 0$
v
$a = -9.8$
$t =$

a)
$$s = ut + \tfrac{1}{2}at^2$$
$$-120 = 0(t) + \tfrac{1}{2}(-9.8)t^2$$
$$-120 = -4.9\,t^2$$
$$t^2 = {}^{1200}\!/_{49}$$
$$t = \underline{\underline{4.9\,s}} \quad (2\,sf)$$

b)
$$v^2 = u^2 + 2as$$
$$v^2 = 0 + 2(-9.8)(-120)$$
$$v^2 = 2352$$
$$v = \underline{\underline{48}}\,ms^{-1} \quad \textbf{(2\,sf)}$$

5) $s = 120$

$u = u$

$v = 2u$

a

$t = 8$

a) $s = \frac{u+v}{2} t$

$120 = \frac{u + 2u}{2} \cdot 8$

$30 = 3u$

$u = \underline{10 \, ms^{-1}}$ $\qquad v = 20 \, ms^{-1}$

b) $v = u + at$

$20 = 10 + 8a$

$10 = 8a$

$a = \underline{\frac{5}{4} \, ms^{-2}}$

6) s

$u = 5$

$v = 20$

a

$t = 8$

a) $v = u + at$

$20 = 5 + 8a$

$15 = 8a$

$a = \underline{\frac{15}{8} \, ms^{-2}}$

b/ $s = \frac{u+v}{2} t.$

$= \frac{5 + 20}{2} \cdot 8$

$= \underline{100 \, m}$

c/ $s = 50$

$u = 5$

v

$a = 15/8$

t

$s = ut + \frac{1}{2} at^2$

$50 = 5t + \frac{1}{2} \left(\frac{15}{8}\right) t^2$

$50 = 5t + \frac{15}{16} t^2$

$10 = t + \frac{3}{16} t^2$

$160 = 16t + 3t^2$

$0 = 3t^2 + 16t - 160$

$a = 3 \qquad b = 16 \qquad c = -160$

$t = \frac{-16 \pm \sqrt{(16)^2 - 4(3)(-160)}}{2(3)}$

$= \underline{5.1 \, s} \qquad 2 \, sf$

7. $\vec{AC}$ $s = 100$

$u = 10$

v

a

$t = 6$

$$s = ut + \tfrac{1}{2}at^2$$

$$100 = 10(6) + \tfrac{1}{2}a(6)^2$$

$$100 = 60 + 18a$$

$$40 = 18a$$

$$a = \frac{20}{9} \; ms^{-2}$$

b) $\vec{AB}$ $s = 40$

$u = 10$

$v =$

$a = 20/9$

$t =$

$$v^2 = u^2 + 2as$$

$$v^2 = (10)^2 + 2\left(\frac{20}{9}\right)(40)$$

$$v = \frac{50}{3} \; ms^{-1}$$

c) $\vec{BC}$ $s = 60$ $s = ut + \tfrac{1}{2}at^2$

$u = 50/3$ $60 = \frac{50}{3}t + \tfrac{1}{2}\frac{20}{9}t^2$

v

$a = 20/9$ ~~t~~ $6 = \frac{5}{3}t + \tfrac{1}{9}t^2$

$t = ?$ $54 = 15t + t^2$

                ~~$t^2 = $~~

$t = \dfrac{-15 \pm \sqrt{(15)^2 - 4(1)(-54)}}{2(1)}$ $t^2 + 15t - 54 = 0$

$= \underline{3} \; s$

To The Top

8 $s = ?$ a) $v^2 = u^2 + 2as$

$u = 18$ $0 = 18^2 + 2(-9.8)s$

$v = 0$ $s = 17\ m \quad (2sf)$

$a = -9.8$

t total height $= 2 + 17 = \underline{\underline{19\ m}}$

b) Whole Journey

$s = -2$ $v^2 = u^2 + 2as$

$u = 18$ $v^2 = (18)^2 + 2(-89.8)(-2)$

$v =$ $v = \pm\underline{\underline{19\ ms^{-1}}} \quad (2sf)$

$a = -9.8$

$t =$ speed $= 19\ ms^{-1}$

c) $v = u + at$

$-19 = 18 + -9.8 \cdot t$

$t = \underline{\underline{3.8\ s}} \quad (2sf)$

9) $\vec{PQ}$ | $\vec{QR}$ | $\vec{PR}$

$\vec{PQ}$	$\vec{QR}$	$\vec{PR}$
$s = 50$	$s = 100$	$s = 150$
$u = u$	u	$u = u$
v	$v = v$	$v = v$
$a = a$	$a = a$	$a = a$
$t = 2$	$t = 3$	$t = 5$

$\vec{PQ}$

$$s = ut + \tfrac{1}{2}at^2$$
$$50 = 2u + \tfrac{1}{2}a(2)^2$$
$$50 = 2u + 2a$$
$$25 = u + a$$
$$(25 - a) = u$$

$\vec{PR}$

$$s = ut + \tfrac{1}{2}at^2$$
$$150 = 5u + \tfrac{1}{2}a(5)^2$$
$$150 = 5u + \frac{25}{2}a$$
$$30 = u + \tfrac{5}{2}a$$

$$30 = 25 - a + \tfrac{5}{2}a$$

$$5 = \tfrac{3}{2}a$$
$$a = \underline{\underline{\frac{10}{3}}} \, ms^{-2}$$

b) $\vec{PQ}$

$s = 50$

u

v

$a = \frac{10}{3}$

$t = 2$

$$s = vt - \tfrac{1}{2}at^2$$

$$50 = 2v - \tfrac{1}{2}\frac{10}{3}(2)^2$$

$$50 = 2v - \frac{20}{3}$$

$$v = \underline{\underline{\frac{85}{3}}} \, ms^{-1}$$

To the top

10 $s = ?$

$u = 10$ $v^2 = u^2 + 2as$

$v = 0$ $0 = (10)^2 + 2(-9.8)(s)$

$a = -9.8$ $0 = 100 - 19.6s$

t $s = 5.1 \text{ m}$ (2sf)

Greatest Height $= 1.5 + 5.1 = \underline{\underline{6.6 \text{ m}}}$

b/ to 3m above ground:

$s = 1.5$

$u = 10$ $s = ut + \frac{1}{2}at^2$

$v =$ $1.5 = 10t + \frac{1}{2}(-9.8)t^2$

$a = -9.8$ $1.5 = 10t - 4.9t^2$

$t = ?$ $4.9t^2 - 10t + 1.5 = 0$

$$t = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(4.9)(1.5)}}{2(4.9)}$$

$t = 1.9$ $t = 0.16$

"1.9" - "0.16" $= \underline{\underline{1.7 \text{ s}}}$ (2sf)