1a) $s = 50$
$u = 0$
$v = 20$
a
t

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

$(20)^2 = (0)^2 + 2a(50)$

$400 = 100a$

$a = 4\ ms^{-2}$

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

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

$50 = 10t$

$t = 5s$

b) $s = 200$
u
$v = 30$
$a = 2$
t

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

$(30)^2 = u^2 + 2(2)(200)$

$900 = u^2 + 800$

$100 = u^2$

$u = \pm 10\ ms^{-1}$

$v = u + at$

$30 = 10 + 2t$ or $30 = -10 + 2t$

$20 = 2t$ $40 = 2t$

$t = 10s$ $t = 20\ s$

c) $s = 85$
$u = ?$
$v = 20$
a
$t = 5$

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

$85 = \frac{u+20}{2} \cdot 5$

$17 = \frac{u+20}{2}$

$34 = u + 20$

$u = 14\ ms^{-1}$

$v = u + at$

$20 = 14 + 5a$

$6 = 5a$ $a = \frac{6}{5}\ ms^{-2}$

d) $s = 100$

u

v

$a = 2$

$t = 4$

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

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

$100 = 4u + 16$

$84 = 4u$

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

$v = u + at$

$v = 21 + 2(4)$

$= 21 + 8$

$= 29\ ms^{-1}$

e) s

u

$v = 10$

$a = 1.5$

$t = 3$

$v = u + at$

$10 = u + 1.5(3)$

$10 = u + 4.5$

$u = 5.5\ ms^{-1}$

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

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

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

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

2) s

$u = 20$

v

$a = -9.8$

$t = 5$

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

$= 20(5) + \frac{1}{2}(-9.8)(5)^2$

$= -22.5\,m$

$\therefore$ h is 22.5m above the ground

b) $v = u + at$

$= 20 + (-9.8)(5)$

$= \underline{-29\ ms^{-1}}$

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

3) s

$u = 20$

$v = 70$

a

$t = 10$

a) $v = u + at$

$70 = 20 + a(10)$

$50 = 10a$

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

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

$= \frac{20+70}{2} \cdot 10$

$= \underline{450\ m}$

4) $s = -120$

$u = 0$

v

$a = -9.8$

$t =$

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

$-120 = 0(t) + \frac{1}{2}(-9.8)t^2$

$-120 = -4.9t^2$

$t^2 = -120/-4.9$

$t = \cancel{2.4}$ 4.95 s (3sf)

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

$v^2 = 0 + 2(-9.8)(-120)$

$v^2 = 2352$

$v = \underline{48\ ms^{-1}}$ (2sf)

5) $s = 120$, $u = u$, $v = 2u$, a, $t = 8$

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

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

$30 = 3u$

$u = 10\ ms^{-1}$ $\quad v = 20 ms^{-1}$

b) $v = u + at$

$20 = 10 + 8a$

$10 = 8a$

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

6) s, $u = 5$, $v = 20$, a, $t = 8$

a) $v = u + at$

$20 = 5 + 8a$

$15 = 8a$

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

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

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

$= 100\ m$

c) $s = 50$, $u = 5$, v, $a = 15/8$, t

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

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

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

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

$160 = 16t + 3t^2$

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

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

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

$= 5.1\ s$ $\quad$ 2 s.f

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

$u = 10$

v

a

$t = 6$

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

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

$100 = 60 + 18a$

$40 = 18a$

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

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

$u = 10$

$v =$

$a = 20/9$

$t =$

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

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

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

c) $\overrightarrow{BC}$ $s = 60$

$u = 50/3$

v

$a = 20/9$

$t = ?$

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

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

$6 = \frac{5}{3}t + \frac{1}{9}t^2$

$54 = 15t + t^2$

$t^2 = +$

$t^2 + 15t - 54 = 0$

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

$= 3\ s$

8

To The Top

$s = ?$

$u = 18$

$v = 0$

$a = -9.8$

t

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

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

$s = 17\ m$ (2sf)

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

b) Whole Journey

$s = -2$

$u = 18$

$v =$

$a = -9.8$

$t =$

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

$v^2 = (18)^2 + 2(-9.8)(-2)$

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

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

c) $v = u + at$

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

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

9)

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

$\overrightarrow{PQ}$

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

$50 = 2u + \frac{1}{2}a(2)^2$

$50 = 2u + 2a$

$25 = u + a$

$(25 - a) = u$

$\overrightarrow{PR}$

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

$150 = 5u + \frac{1}{2}a(5)^2$

$150 = 5u + \frac{25}{2}a$

$30 = u + \frac{5}{2}a$

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

$5 = \frac{3}{2}a$

$a = \frac{10}{3}\ ms^{-2}$

b/ $\overrightarrow{PQ}$

$s = 50$

u

v

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

$t = 2$

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

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

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

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

To the top

10 $s = ?$

$u = 10$

$v = 0$

$a = -9.8$

t

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

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

$0 = 100 - 19.6s$

$s = 5.1$ m (2sf)

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

b) to 3m above ground:

$s = 1.5$

$u = 10$

$v =$

$a = -9.8$

$t = ?$

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

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

$1.5 = 10t - 4.9t^2$

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

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

$t = 1.9$ $\quad$ $t = 0.16$

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