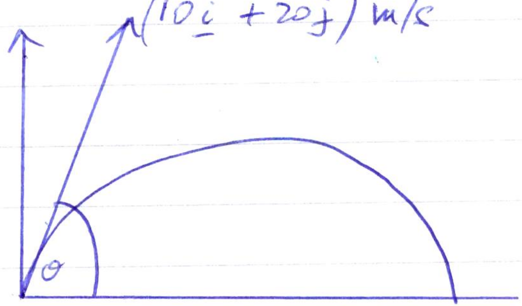
(10) ($\rightarrow$)

S	U	V	A	T
X	10	V_x	0	3

($\downarrow$)

S	U	V	A	T
Y	20	V_y	-9.8	2



So $(\rightarrow)$: $S = ut + \frac{1}{2}at^2 \Rightarrow x = 10(3) + 0 = 30$

$(\uparrow)$: $S = ut + \frac{1}{2}at^2 \Rightarrow y = 20(3) - \frac{1}{2}(10)(9) = 15$

So $\underline{S} = (30\underline{i} + 15\underline{j})$ m

For Velocity vector $v = u + at$. So

$(\rightarrow)$: $V_x = 10 + 0(3) = 10$

$(\uparrow)$: $V_y = 20 - 10(3) = -10$

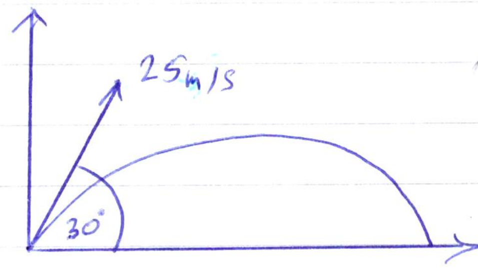
So $\underline{V} = (10\underline{i} - 10\underline{j})$ m/s

(11) $(\rightarrow)$

S	U	V	A	T
x	25cos30	V_x	0	$2\frac{1}{2}$

$(\uparrow)$

S	u	V	A	T
y	25 Sin30	V_y	-9.8	$2\frac{1}{2}$



$(\rightarrow)$: $v = u + at \Rightarrow V_x = 25\cos 30 + 0 = 21.65$

$(\uparrow)$: $V = u + at \Rightarrow V_y = 25\sin 30 - (9.8)(2\frac{1}{2}) = -12$

So horizontal velocity is 21.65 m/s
& vertical velocity is 12 m/s downward

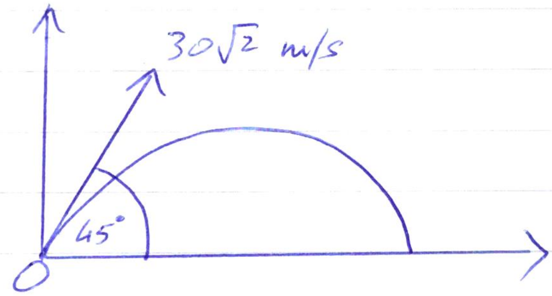
Speed after $t = 2\frac{1}{2}$ sec : $V = \sqrt{(21.65)^2 + (12)^2}$
$= 24.75$ m/s

Direction: $\theta = \tan^{-1} \frac{-12}{21.65} = -29°$.

or 29° below horizontal.

(12)

	S	U	V	A	T
$(\rightarrow)$	x	$30\sqrt{2}\cos 45$	V_x	0	2
$(\uparrow)$	y	$30\sqrt{2}\sin 45$	V_y	-9.8	2



So : $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow x = (30\sqrt{2}\cos 45)(2) + 0$
$= 60$

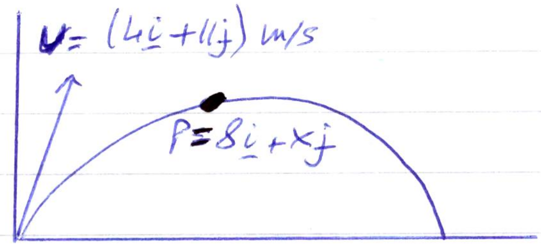
$(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow y = (30\sqrt{2}\sin 45)(2) - \frac{1}{2}(9.8)(4)$
$= 40.4$

So horizontal displacement is 60 m & vertical displacement is 40.4 m

$\therefore$ Distance From O $= \sqrt{60^2 + 40.4^2} = 72.33\,m$

(13)

	S	U	V	A	T
$(\rightarrow)$	8	4	V_x	0	t
$(\uparrow)$	x	11	V_y	-10	t

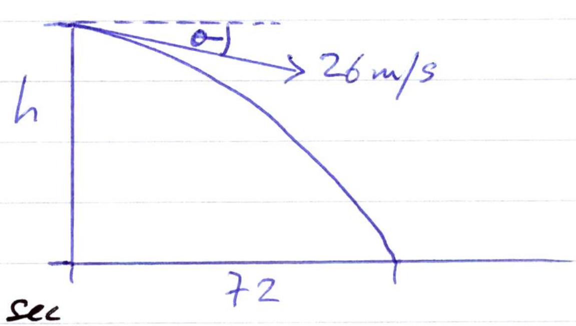


So : $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow 8 = 4t$
$\Rightarrow t = 2$ sec

$(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow x = 11(2) - \frac{1}{2}(10)(4) = 2\,m$

(14)

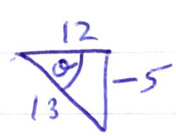
	S	U	V	A	T
$(\rightarrow)$	72	$26\cos\theta$		0	t
$(\uparrow)$	h	$26\sin\theta$		-10	t



So : $(\rightarrow)$ $s = ut + \frac{1}{2}at^2$
i.e $72 = [26(\cos\theta)]t + 0 \Rightarrow t = 3$ sec

$\cos\theta \rightarrow \frac{12}{13}$

$\tan\theta = \frac{5}{12}$



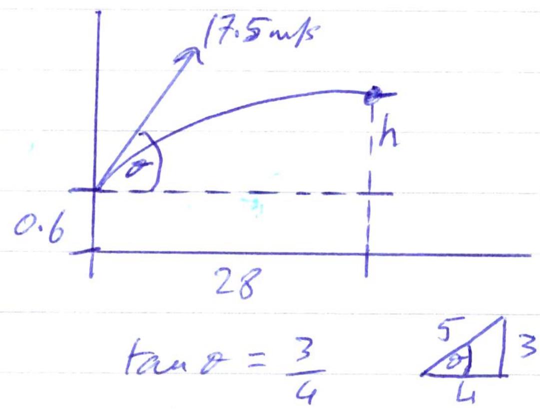
$(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow h = (26\sin\theta)t - \frac{10}{2}(t^2)$,

with $t = 3$. So $h = 26\left(\frac{-5}{13}\right)(3) - \frac{10}{2}(9)$

$= -75\,m$ i.e. 75m downward

(15)

	S	U	V	A	T
$(\rightarrow)$	28	$17.5\cos\theta$		0	t
$(\uparrow)$	h	$17.5\sin\theta$		-9.8	t



$\tan\theta = \frac{3}{4}$

So $(\rightarrow)$: $s = ut + \frac{1}{2}at^2$

$\therefore 28 = \left[17.5\left(\frac{4}{5}\right)\right]t + 0$

$\Rightarrow t = 2$ sec

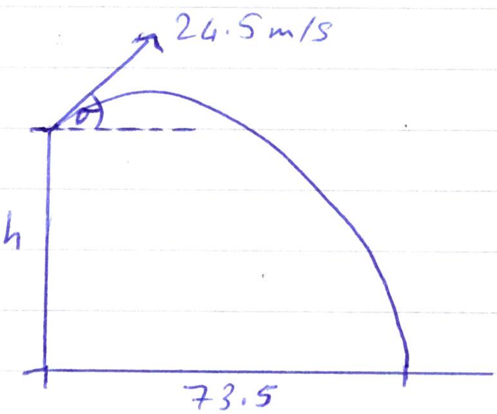
And $(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow h = \left[17.5\left(\frac{3}{5}\right)\right](2) - \frac{1}{2}(9.8)2^2$

$= 21 - 19.6 = 1.4\,m$

Ball is already 0.6 m above ground level so height of ball above ground level is $1.4 + 0.6 = 2m$.

(16)

	S	U	V	A	T
$(\rightarrow)$	73.5	$24.5\cos\theta$		0	t
$(\uparrow)$	h	$24.5\sin\theta$		-9.8	t



So $(\rightarrow)$: $s = ut + \frac{1}{2}at^2$

$\Rightarrow 73.5 = 24.5\left(\frac{3}{5}\right)t + 0$

$\Rightarrow t = 5$ sec

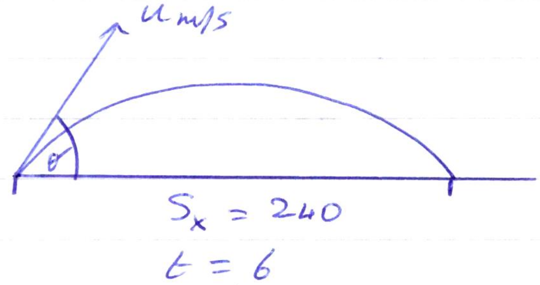
$\tan\theta = \frac{4}{3}$

$(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow h = 24.5\left(\frac{4}{5}\right)(5) - \frac{9.8}{2}(5)^2 = -24.5\,m$

i.e. ball lands 24.5 m below throwing point $\Rightarrow$ tower height is 24.5m

(17)

	S	U	V	A	T
$(\rightarrow)$	240	$u\cos\theta$	?	0	6
$(\uparrow)$	0	$u\sin\theta$	?	-10	6



So $(\rightarrow)$: $S = ut + \frac{1}{2}at^2$

$\therefore\ 240 = (u\cos\theta)(6) + 0$

$\Rightarrow\ u\cos\theta = 40$ (a)

$(\uparrow)$: $S = ut + \frac{1}{2}at^2 \Rightarrow 0 = (u\sin\theta)(6) - \frac{1}{2}(10)6^2$

$\Rightarrow\ u \quad \theta = 30$ (b)

use (a) & (b): $u^2\cos^2\theta + u^2\sin^2\theta = 40^2 + 30^2$

So $u^2(\cos^2\theta + \sin^2\theta) = 1600 + 900 = 2500$

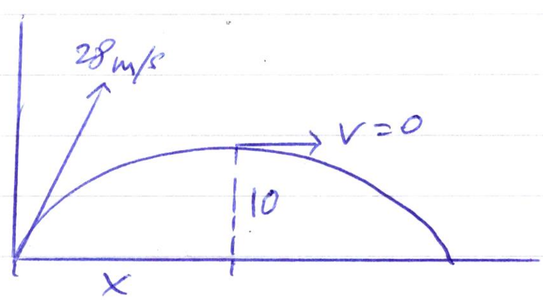
$\therefore\ u = 50$ m/s

(since $\cos^2\theta + \sin^2\theta = 1$)

and $\tan\theta = \dfrac{u\sin\theta}{u\cos\theta} = \dfrac{30}{40} \Rightarrow \theta = 36.87°$ for direction

(18)

	S	U	V	A	T
$(\rightarrow)$	x	$28\cos\theta$	0	0	t
$(\uparrow)$	10	$28\sin\theta$	0	-9.8	t



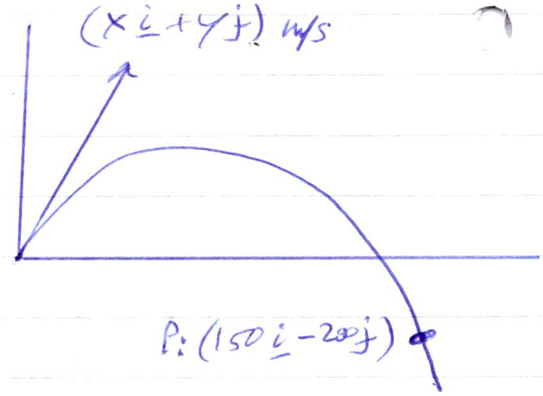
Note: At max ht $v = 0$.

So $(\uparrow)$: $v^2 = u^2 + 2as \Rightarrow 0 = (28\sin\theta)^2 - 2(9.8)(10)$

$\Rightarrow\ \sin\theta = \sqrt{\dfrac{196}{28^2}} = \frac{1}{2}$, $\therefore\ \theta = 30°$

(19)

	S	U	V	A	T
(→)	150	x		0	10
(↑)	-200	y		-9.8	10



So (→) : $s = ut + \frac{1}{2}at^2$

$\therefore\ 150 = (x)(10) \Rightarrow x = 15$

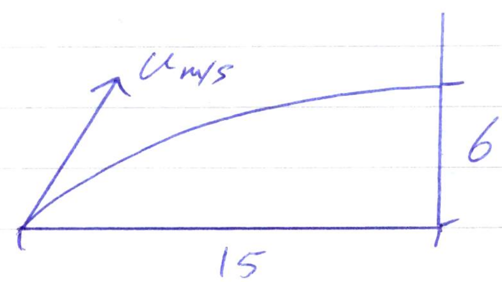
(↑) : $s = ut + \frac{1}{2}at^2 \Rightarrow -200 = (y)(10) - \frac{1}{2}(9.8)(100)$

$\therefore\ y = 29$

$\therefore\ \underline{u} = (15\underline{i} + 29\underline{j})$ m/s

(20)

	S	U	V	A	T
(→)	15	x		0	3
(↑)	6	y		-10	3



So (→) : $s = ut + \frac{1}{2}at^2 \Rightarrow 15 = 3x \Rightarrow x = 5$m

(↑) : $s = ut + \frac{1}{2}at^2 \Rightarrow 6 = 3y - \frac{1}{2}(10)(9)$

$\therefore\ y = 17$ m

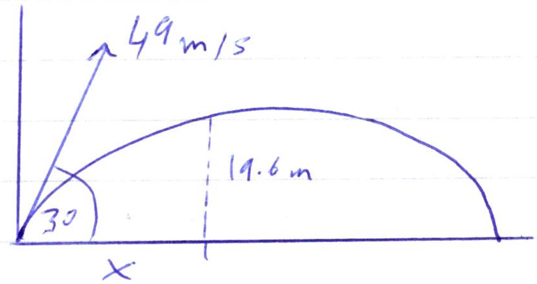
(21) Exactly same type of problem as (20), obtaining $x = 11$m

& $y = 11$m. Then $u = \sqrt{11^2 + 11^2} = 15.56$ms

& direction: $\theta = \tan^{-1}\frac{11}{11} = 45°$.

(22)

	S	U	V	A	T
(→)	x	49cos30	0	0	t
(↑)	19.6	49sin30	—	−9.8	t



So (→): $s = ut + \frac{1}{2}at^2 \Rightarrow x = (49\cos 30)t + 0$

(↑): $s = ut + \frac{1}{2}at^2 \Rightarrow 19.6 = (49\sin 30)t - \frac{1}{2}(9.8)t^2$

$\Rightarrow 4.9t^2 - 24.5t + 19.6 = 0$

$\therefore t = 1, 4$ seconds

⇒ time for particle to remain at least at a height of 19.6 m is $t = 4 - 1 = 3$ seconds

(Note: 19.6 m is Not max height)

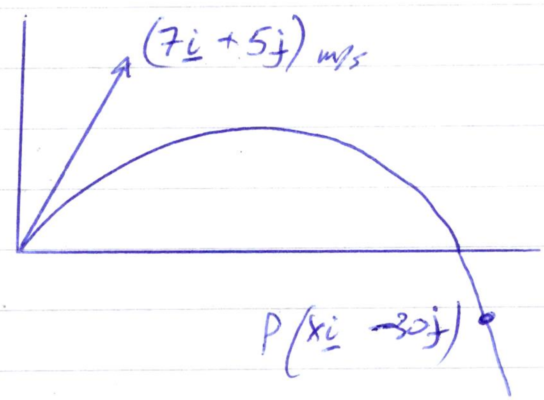
(23) Same as (22). Quadratic is $t^2 - 8t + 12 = 0$

$\Rightarrow t = 2, 6$ seconds

$\therefore$ time for particle to be at least 60 m high is $t = 6 - 2 = 4$ sec

(24)

	S	U	V	A	T
(→)	x	7	0	0	t
(↑)	−30	5		−10	t

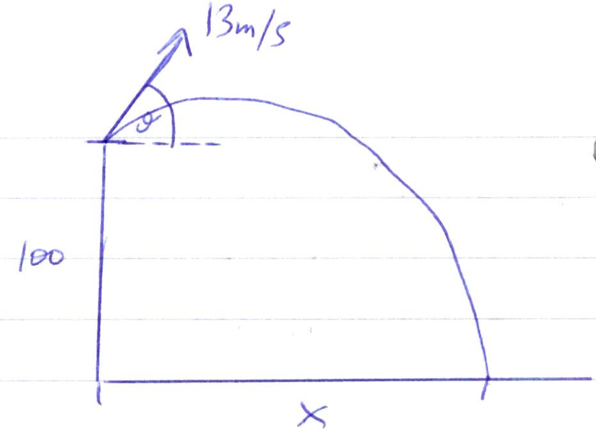


So (↑): $s = ut + \frac{1}{2}at^2$

$\Rightarrow -30 = 5t - \frac{1}{2}(10)t^2$

$\Rightarrow t^2 - t - 6 = 0, \therefore (t-3)(t+2) = 0 \Rightarrow t = 3$ seconds

Now (→): $s = ut + \frac{1}{2}at^2 \Rightarrow x = 7(3) = 21$ m



$\tan\theta = \frac{5}{12}$

(25)

	S	U	V	A	T
$(\rightarrow)$	x	$13\cos\theta$	0	0	t
$(\uparrow)$	-100	$13\sin\theta$	/	-10	t

<u>Note</u>: $S = -100$ for $(\uparrow)$ because stone has <u>fallen</u> by 100m

$\therefore (\uparrow)$: $\quad s = ut + \frac{1}{2}at^2$

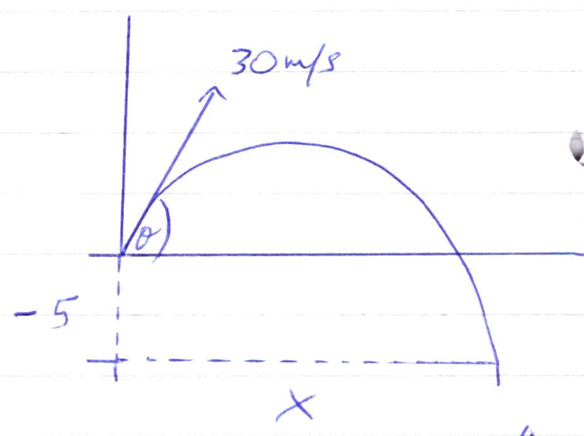
$\Rightarrow \quad -100 = \left[13.\left(\frac{5}{13}\right)\right]t - \frac{1}{2}(10)t^2$

$\Rightarrow \quad t^2 - t - 20 = 0 \Rightarrow (t-5)(t+4) = 0$

$\therefore \quad t = 5$ sec

For $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow \quad x = \left[13\left(\frac{12}{13}\right)\right](5) = 60$m.

(26)



$\tan\theta = \frac{4}{3}$

	S	U	V	A	T
$(\rightarrow)$	x	$30\cos\theta$	0	0	t
$(\uparrow)$	-5	$30\sin\theta$	/	-10	t

So $(\uparrow)$: $S = ut + \frac{1}{2}at^2$

$\Rightarrow -5 = 30\left(\frac{4}{5}\right)t - \frac{1}{2}(10)t^2$

$\Rightarrow \quad 5t^2 - 24t - 5 = 0$

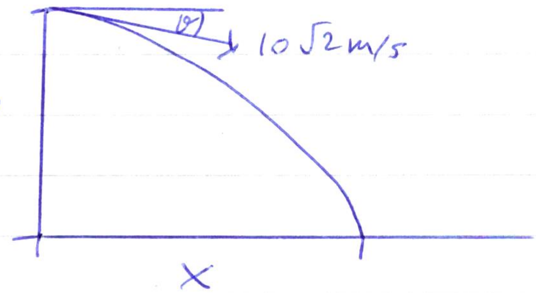
$\Rightarrow (5t+1)(t-5) = 0$

$\therefore t = 5$ seconds

From $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow \quad x = 30\left(\frac{3}{5}\right)(5) = 90$m.

(27)

	S	U	V	A	T
$(\rightarrow)$	x	$10\sqrt{2}\cos\theta$	0	0	t
$(\uparrow)$	-40	$10\sqrt{2}\sin\theta$		-10	t



$\theta = 45°$

So $(\uparrow)$: $s = ut + \frac{1}{2}at^2$

$\therefore\ -40 = (10\sqrt{2}\sin 45)t - \frac{1}{2}(10)t^2$

$\therefore\ 5t^2 + (10\sqrt{2}\sin 45)t - 40 = 0$

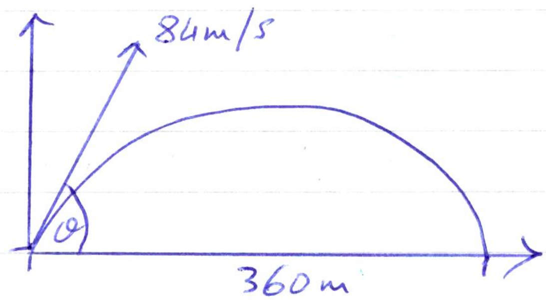
$\Rightarrow\ t^2 + 2t - 8 = 0$

$\therefore\ (t+4)(t-2) = 0 \Rightarrow t = 2$ sec.

$(\rightarrow)$: $S = ut + \frac{1}{2}at^2 \Rightarrow x = (10\sqrt{2}\cos 45).(2) = 20$ m

(28)

	S	U	V	A	T
$(\rightarrow)$	360	$84\cos\theta$	0	0	t
$(\uparrow)$	0	$84\sin\theta$		-9.8	t



So $(\rightarrow)$: $S = ut + \frac{1}{2}at^2$

$\therefore\ 360 = (84\cos\theta)t + 0$

$\Rightarrow\ t = \dfrac{360}{84\cos\theta}$ (1)

$(\uparrow)$: $S = ut + \frac{1}{2}at^2 \Rightarrow 0 = (84\sin\theta)t - \frac{1}{2}(9.8)t^2$

By (1): $0 = (84\sin\theta)\left(\dfrac{360}{84\cos\theta}\right) - 4.9\left(\dfrac{360}{84\cos\theta}\right)^2$

So $0 = (\sin\theta\cdot\cos\theta)(360) - (4.9)\left(\dfrac{360}{84}\right)^2$

$\Rightarrow\ \dfrac{360}{4.9}\sin\theta.\cos\theta = \left(\dfrac{360}{84}\right)^2 \Rightarrow \frac{1}{2}\sin 2\theta = \left(\dfrac{360}{84}\right)^2\left(\dfrac{4.9}{360}\right)$

So $\frac{1}{2}\sin 2\theta = \frac{1}{4} \Rightarrow \sin 2\theta = \frac{1}{2}$

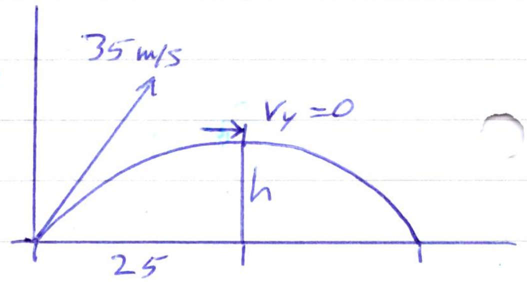
$\therefore 2\theta = 30 \pm 360n$ & $2\theta = 150 \pm 360n$, $n = 1, 2, \ldots$

$\therefore \theta = 15°$ or $75°$

(29) Same as (28)

(30)

	S	U	V	A	T
(→)	25	$35\cos\theta$		0	t
(↑)	h	$35\sin\theta$	0	-9.8	t



So (→): $S = ut + \frac{1}{2}at^2 \Rightarrow 25 = (35\cos\theta)t + 0$

$$\therefore t = \frac{25}{35} \cdot \frac{1}{\cos\theta} \quad (1)$$

(↑): $v = u + at \Rightarrow 0 = (35\sin\theta) - 9.8t$

$$\Rightarrow t = \frac{35}{9.8} \cdot \frac{1}{\sin\theta} \quad (2)$$

Then (1) = (2): $\frac{25}{35} \cdot \frac{1}{\cos\theta} = \frac{35}{9.8} \cdot \sin\theta$

So $\frac{(25)(9.8)}{35^2} = \sin\theta\cos\theta = \frac{1}{2}\sin 2\theta$

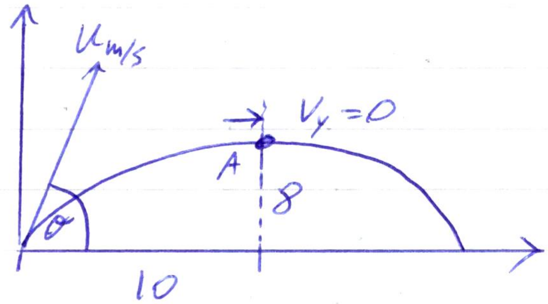
$\therefore \sin 2\theta = 0.4$

$\Rightarrow 2\theta = 23.58°, 156.42°$

$\therefore \theta = 11.79°, 78.21°$

31

	S	U	V	A	T
(→)	10	$u\cos\theta$		0	t
(↑)	8	$u\sin\theta$	0	−9.8	t



So (→): $s = ut + \frac{1}{2}at^2 \Rightarrow 10 = (u \cdot \cos\theta)t$

$$\therefore t = \frac{10}{u \cdot \cos\theta} \qquad (1)$$

(↑): $v = u + at \Rightarrow 0 = (u \cdot \sin\theta) - 9.8t$

$$\therefore t = \frac{u \cdot \sin\theta}{9.8} \qquad (2)$$

(1) = (2):

$$\frac{10}{u \cdot \cos\theta} = \frac{u \cdot \sin\theta}{9.8}$$

$$\Rightarrow \frac{98}{\cos\theta \cdot \sin\theta} = u^2 \qquad (3)$$

But Also (↑): $v^2 = u^2 + 2as \Rightarrow 0 = (u\sin\theta)^2 - 2(9.8)(8)$

$$\Rightarrow \frac{156.8}{\sin^2\theta} = u^2 \qquad (4)$$

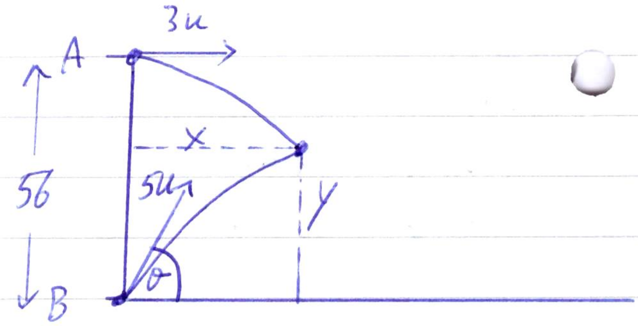
So (3) = (4): $\frac{156.8}{\sin^2\theta} = \frac{98}{\cos\theta \cdot \sin\theta}$

$\therefore \frac{156.8}{98} = \tan\theta \Rightarrow \theta = 58°$ above horizontal

By (4): $\frac{156.8}{(\sin 58)^2} = u^2 \Rightarrow u = 14.77$ m/s.

32

		S	U	V	A	T
A:	(→)	X	3u	0	0	2
	(↑)	56−y	0		−9.8	2
B:	(→)	x	5u cos	0	0	2
	(↑)	y	5u sin		−9.8	2



For B : (↑): $s = ut + \frac{1}{2}at^2 \Rightarrow y = (5u\sin\theta)(2) - \frac{1}{2}(9.8)(4)$

$\therefore \frac{y}{2} + 9.8 = 5u\sin\theta$ ①

(→): $s = ut + \frac{1}{2}at^2 \Rightarrow x = (5u\cos\theta)(2)$

$= 10u\cos\theta$ ②

For A : (↑): $56 - y = 0 - \frac{1}{2}(9.8)(4) \Rightarrow y = 36.4\,m$ ③

(→): $x = (3u)(2) + 0 = 6u$ ④

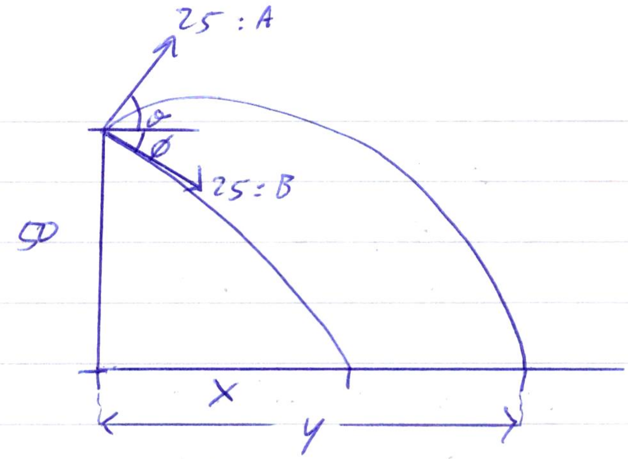
② into ④: $6u = 10u(\cos\theta) \Rightarrow \theta = 53.13^\circ$

using y & θ in ①: $\frac{36.4}{2} + 9.8 = 5u \cdot \sin 53.13$

$\therefore u = 7\,m/s$

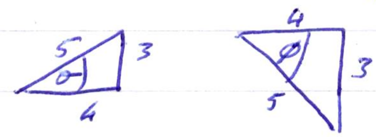
using u & θ in ②: $x = 10(7)\cos 53.13 = 42\,m.$

(33)



	S	U	V	A	T
A					
$(\rightarrow)$	Y	$25\cos\theta$	0	0	t
$(\uparrow)$	-50	$25\sin\theta$		-10	t
B					
$(\rightarrow)$	X	$25\cos\theta$	0	0	t
$(\uparrow)$	-50	$25\sin\theta$		-10	t

$\tan\theta = \frac{3}{4}$; $\tan\phi = \frac{3}{4}$



For A : $(\uparrow)$: $s = ut + \frac{1}{2}at^2$

$$\Rightarrow -50 = 25\left(\tfrac{3}{5}\right)t - \tfrac{1}{2}\cdot 10t^2$$

$$\Rightarrow t^2 - 3t - 10 = 0 \Rightarrow (t-5)(t+2) = 0 \Rightarrow \underline{t=5}$$

$\therefore$ A takes 5 secs to land

For B : $(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow -50 = (25\sin\phi)t - \frac{1}{2}\cdot 10\cdot t^2$

$\sin\phi = -\frac{3}{5}$ (Not $\frac{3}{5}$). $\therefore t^2 + 3t - 10 = 0$

leading to : $(t+5)(t-2) = 0 \Rightarrow \underline{t=2}$; B takes 2 secs to land

$\therefore$ time interval between B & A is 3 secs

For Y & X : A $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow Y = (25\cos\theta).t + 0$

$$= 25\left(\tfrac{4}{5}\right).5 = 100\text{m}$$

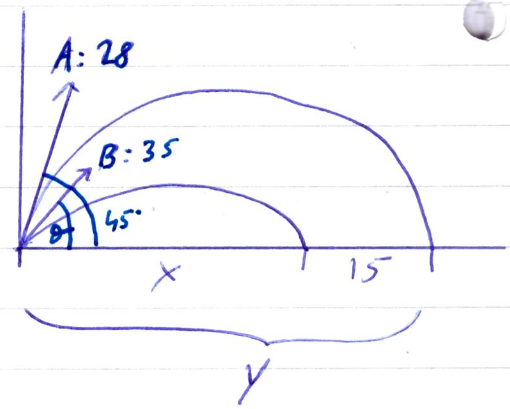
B $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow X = (25\cos\phi).t + 0$

$$= 25\left(\tfrac{4}{5}\right).2 = 40\text{ m}$$

So distance between Landings = 60 m.

(34)

		S	U	V	A	T
A:	$(\rightarrow)$	y	$28\cos\theta$	0	0	t
	$(\uparrow)$	0	$28\sin\theta$		-9.8	t
B:	$(\rightarrow)$	x	$35\cos\theta$	0	0	t
	$(\uparrow)$	0	$35\sin\theta$		-9.8	t



So A: $(\rightarrow)$: $y = x + 15 = (28\cos 45)t + 0$ (1)

$(\uparrow)$: $0 = (28\sin 45)t - \frac{1}{2}(9.8)t^2$ (2)

(all by $s = ut + \frac{1}{2}at^2$).

For B: $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow x = (35\cos\theta)t + 0$ (3)

$(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow 0 = (35\sin\theta)t - \frac{1}{2}(9.8)t^2$ (4)

By (2) : $4.9t^2 - \frac{28}{\sqrt{2}}t = 0 \Rightarrow t\left(4.9t - \frac{28}{\sqrt{2}}\right)$

So $t = 0$ or $4.9t = \frac{28}{\sqrt{2}} \Rightarrow t = 4.04$ sec (5)

(5) into (1): $x + 15 = (28\cos 45)(4.04) \Rightarrow x = 80 - 15$
$= 65$ m

Now use (3) : $65 = (35\cos\theta)t \Rightarrow t = \dfrac{65}{35\cos\theta}$

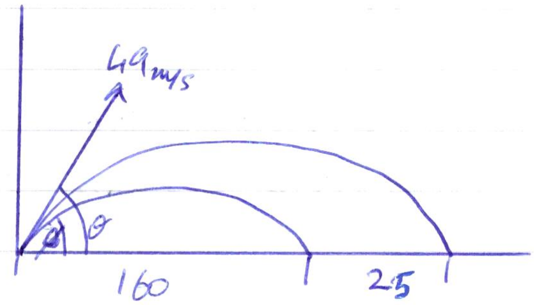
Now use (4) : $0 = \dfrac{(35\sin\theta)}{35\cos\theta} \cdot 65 - 4.9\left(\dfrac{65}{35\cos\theta}\right)^2$ (6)

(6) simplifies to $\sin\theta\cos\theta = \dfrac{(4.9)(65)}{35^2}$, i.e. $\frac{1}{2}\sin 2\theta = 0.26$

So $\theta = 15.66^\circ$ & 74.33°

(35)

	S	U	V	A	T
(→)	185	$49\cos\theta$	0	0	t
(↑)	0	$49\sin\theta$		-9.8	t
(→)	160	$49\cos\phi$	0	0	t
(↑)	0	$49\sin\phi$		-9.8	t



So (→) : $s = ut + \frac{1}{2}at^2 \Rightarrow 185 = (49\cos\theta)t + 0$ ①

and $160 = (49\cos\phi)t + 0$ ②

(↑) : $s = ut + \frac{1}{2}at^2 \Rightarrow 0 = (49\sin\theta)t - \frac{1}{2}9.8t^2$ ③

and $0 = (49\sin\phi)t - \frac{1}{2}\cdot 9.8t^2$ ④

By ①: $t = \dfrac{185}{49\cos\theta}$

Into ③: $0 = \dfrac{(49\sin\theta).185}{49\cos\theta} - 4.9\left(\dfrac{185}{49\cos\theta}\right)^2$

$\Rightarrow 0 = 185\dfrac{\sin\theta}{\cos\theta} - \dfrac{4.9}{49^2}\dfrac{185^2}{\cos^2\theta}$

$\Rightarrow 185\sin\theta\cos\theta = \dfrac{4.9}{49^2}\cdot 185^2$

$\Rightarrow \frac{1}{2}\sin 2\theta = \dfrac{(4.9)(185)}{49^2} = 0.377$

So $2\theta = 49.03$ & 130.96

so $\theta = 24.52$ & $65.48°$

By the same process, using ② into ④ we get

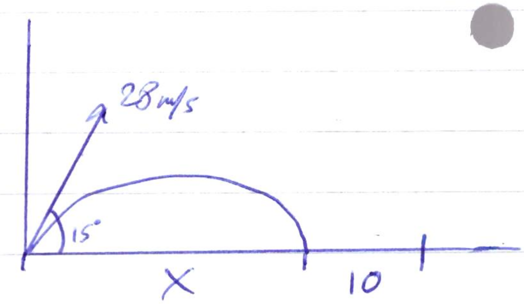
$\frac{1}{2}\sin 2\phi = 0.327$

leading to $\phi = 20.387°, 69.61°$

So we can have $20.39° \rightarrow 24.52°$ or $65.48° \rightarrow 69.61°$

(36)

	S	U	V	A	T
$(\rightarrow)$	x	$28\cos 15$	?	0	t
$(\uparrow)$	0	$28\sin 15$	?	-9.8	t



So $(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow x = (28\cos 15)\,t + 0$ (1)

$(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow 0 = (28\sin 15)t - \frac{1}{2}(9.8)t^2$ (2)

By (2): $t\,(4.9t - 28\sin 15) = 0 \Rightarrow t = 1.479$ sec (3)

(3) into (1) gives $x = (28\cos 15)(1.479) = 40$ m

So boundary is $40 + 10 = 50$ m away.

Now we have

	S	U	V	A	T
$(\rightarrow)$	50	$u\cos 15$		0	t
$(\uparrow)$	0	$u\sin 15$		-9.8	t

So $(\uparrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow 0 = (u\sin 15)t - \frac{1}{2}(9.8)t^2$ (4)

$(\rightarrow)$: $s = ut + \frac{1}{2}at^2 \Rightarrow 50 = (u\cos 15)t$ (5)

By (5): $t = \dfrac{50}{u\cdot\cos 15}$. This into (4) gives

$$0 = (u\sin 15)\left(\frac{50}{u\cos 15}\right) - 4.9\left(\frac{50}{u\cos 15}\right)^2$$

$$\Rightarrow u^2\cdot\cos 15.\sin 15 = (4.9)(50)$$

$$u^2\cdot\tfrac{1}{2}\sin 30 = (4.9)(50)$$

$$\Rightarrow u^2 = 980, \therefore u = 31.3 \text{ m/s}$$