Saint Ignatius' College

3/4 Unit Common Trial HSC Exam 2000.

Question 1

a) $|x - 3| \geq 5$

$x - 3 > 5$ or $x - 3 < -5$

$x > 8$ or $x < -2$

b) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right) = \pi - \cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

$= \pi - \frac{\pi}{4}$

$= \frac{3\pi}{4}$

c) $\frac{d}{dx} e^{-\ln x}$

$= -\frac{1}{x} e^{-\ln x}$

$= -\frac{1}{x} e^{\ln \frac{1}{x}}$ $\quad \left(e^{\ln \frac{1}{x}} = \frac{1}{x}\right)$

$= -\frac{1}{x} \cdot \frac{1}{x}$

$= -\frac{1}{x^2}$

Most students didn't get past this step to simplify answer ∴ second mark was not awarded to them.

d) $\int_{2}^{2\sqrt{3}} \frac{dx}{\sqrt{16 - x^2}} = \left[\sin^{-1}\frac{x}{4}\right]_{2}^{2\sqrt{3}}$

$= \left(\sin^{-1}\frac{\sqrt{3}}{2}\right) - \left(\sin^{-1} - \frac{1}{2}\right)$

$= \frac{\pi}{3} + \frac{\pi}{6}$

$= \frac{\pi}{2}$

e) $\left(x + \frac{1}{x}\right)^{13}$

$T_{r+1} = {}^{13}C_r \left(x^r\right)\left(x^{-1}\right)^{13-r}$

$= {}^{13}C_r \left(x^r\right)\left(x^{r-13}\right)$

$= {}^{13}C_r \, x^{2r-13}$

Since we are finding the coefficient of x^5, let

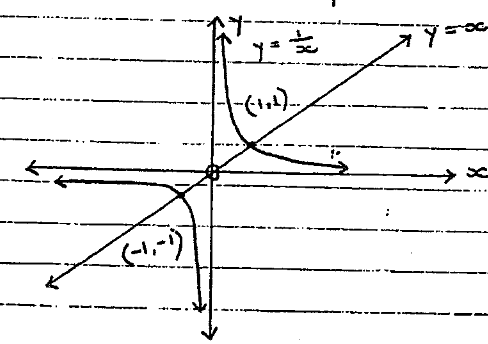
$2r - 13 = 5$

$2r = 18$

$r = 9$

∴ coefficient is ${}^{13}C_9 = 715$.

f) i)



ii) Easier to use graph to solve $\frac{1}{x} > x$ than t

solve algebraically.

∴ $\frac{1}{x} > x$ for $0 < x < 1$ and $x < -$

estion 2

$$\int_e^{e^2} \frac{\log_e x}{x}\,dx \text{ using the substitution } u = \log_e x$$

$\frac{u}{\cancel{x}} \cdot \cancel{x}\,du$

$= \left[\frac{u^2}{2}\right]_1^2$

$\frac{du}{dx} = \frac{1}{x}$

$dx = x\,du$

when $x = e^2$, $u = 2$

when $x = e$, $u = 1$

get to limits in ms of u.

$= 2 - \frac{1}{2}$

$= \frac{3}{2}$.

i) Prove that $\frac{1-\cos x}{\sin x} = \tan\frac{x}{2}$

$\boxed{\begin{aligned} &\frac{x}{2} = t \\ &x = \frac{1-t^2}{1+t^2} \\ &x = \frac{2t}{1+t^2} \end{aligned}}$

LHS $= \dfrac{1 - \frac{1-t^2}{1+t^2}}{\frac{2t}{1+t^2}}$

$= \frac{1+t^2-1+t^2}{\cancel{1+t^2}} \times \frac{\cancel{1+t^2}}{2t}$

$= \frac{2t^2}{2t}$

$= t$

$= \tan\frac{x}{2}$.

ii) Sketch $y = \frac{1-\cos x}{\sin x}$ for $-\pi < x < \pi$ $(x \neq 0)$

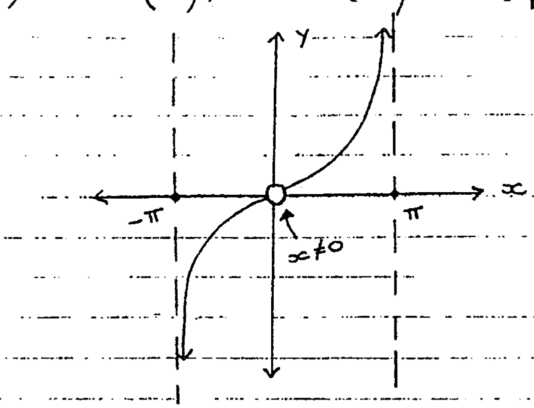
Using the result in (i), sketch $y = \tan\frac{x}{2}$ $(x \neq 0$

$y = \tan\frac{x}{2}$

Period $= \frac{\pi}{n}$

$= \frac{\pi}{1/2}$

$= 2\pi$



c) i) Solve $y = x^2+1$ and $y = x^3 - x$ simultaneously to find the point of intersection.

$x^2+1 = x^3 - x$

$x^3 - x^2 - x - 1 = 0$, Let $f(x) = x^3 - x^2 - x - 1$

$f(1) = -2$

$f(2) = 1$

Since $f(1)$ and $f(2)$ are opposite in sign, then the root of $x^3 - x^2 - x - 1 = 0$ lies between $x=1$ and $x=2$

$\therefore 1 < x < 2$.

ii) $f(x) = x^3 - x^2 - x - 1$

$f'(x) = 3x^2 - 2x$

$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$

let $x_1 = 1.8$

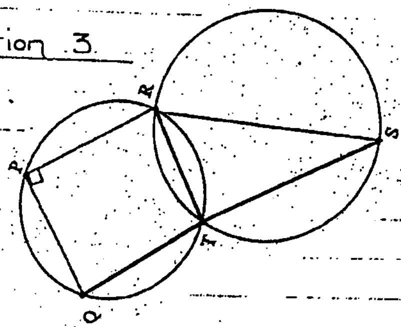
$x_2 = 1.8 - \frac{f(1.8)}{f'(1.8)}$

$= 1.8 - \frac{-0.208}{5.12}$

$= 1.840625$

Question 3

(a)



Construction

Join Q to T,
T to S,
T to R.

$\angle RTS = 90°$ (angle standing on a diameter)

$\angle QTR = 90°$ (opposite angles of a cyclic quadrilateral are supplementary)

$\angle QTS = \angle RTS + \angle QTR$ (adjacent angles)

$= 90° + 90°$

$= 180°$

$\therefore$ Q, T and S are collinear

(b) i) $y = 2\sin^{-1} 3x$

Domain: $-1 \leq 3x \leq 1$

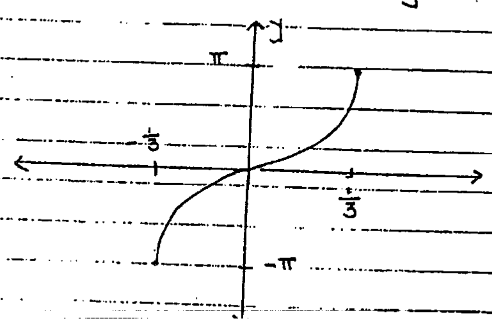
$-\frac{1}{3} \leq x \leq \frac{1}{3}$

Range: $-\frac{\pi}{2} \leq \sin^{-1} 3x \leq \frac{\pi}{2}$

$-\pi \leq 2\sin^{-1} 3x \leq \pi$

$-\pi \leq y \leq \pi$

ii)



(Many students had curve in the wrong quadrants or concavity of curve was incorrect).

iii) $V = \pi \int_a^b x^2 \, dy$

$= \pi \int_{-\pi}^{\pi} \frac{1}{9} \sin^2 \frac{y}{2} \, dy$

$= 2\pi \cdot \frac{1}{9} \int_0^{\pi} \sin^2 \frac{y}{2} \, dy$

$= \frac{\cancel{2}\pi}{9} \int_0^{\pi} \frac{1}{\cancel{2}} \left(1 - \cos y\right) dy$

$= \frac{\pi}{9} \left[y - \sin y \right]_0^{\pi}$

$= \frac{\pi}{9} \left[(\pi - \sin \pi) - (0 - 0) \right]$

$= \frac{\pi^2}{9}$

$y = 2\sin^{-1} 3x$

$\frac{y}{2} = \sin^{-1} 3x$

$3x = \sin \frac{y}{2}$

$x = \frac{1}{3} \sin \frac{y}{2}$

$x^2 = \frac{1}{9} \sin^2 \frac{y}{2}$

$\sin^2 \frac{y}{2} = \frac{1}{2}(1 - \cos$

This is from

$\sin^2 A = \frac{1}{2}(1 - \cos$

iv)

A A
B B ... 10 choices for 1st sock $({}^{10}C_1)$
C C ... 9 choices for 2nd sock $({}^{9}C_1)$
D D
E E $\therefore$ number of odd pairs $= 10 \times 9$
F F $= 90$
G G (Note: left sock and right sock
H H are indistinguishable).
I I
J J

Alternate method:

Total combinations $= {}^{10}C_2$

$= 190$

$\therefore$ subtract 10 pairs of matching socks

$190 - 10 = 180$

3U Trial SIC 2000

QUESTION 5

Solution	Comments
a) When $n = 1$, $5^n - 1 = 4$ which is divisible by 4. $\therefore$ statement true when $n = 1$	
Assume result true when $n = k$	
ie Assume $5^k - 1 = 4M$, $M \in I$	you do not assume $n = k$
Now prove that the result holds when $n = k+1$	
ie Prove that $5^{k+1} - 1 = 4N$, $N \in I$ ✓	you do not prove that $n = k+1$
Now $5^{k+1} - 1$	
$= 5 \cdot 5^k - 1$ ✓	$5 \cdot 5^k - 1 \neq 5(5^k - 1)$
$= (4+1)5^k - 1$	
$= 4 \cdot 5^k + 5^k - 1$ ✓ but $5^k - 1 = 4M$	or $5 \cdot 5^k - 1$
$= 4 \cdot 5^k + 4M$	$= 5(4M+1) - 1$
$= 4(5^k + 1)$ ✓ but $5^k + 1$ is an integer	$= 20M + 4 = 4(5M+1)$
$= 4N$, $N \in I$	[4] $= 4N$
$\therefore$ result holds when $n = k+1$	
$\therefore$ since the result is true for $n = 1$, it is also true for $n = 2$ and hence for $n = 3$ and so on for all $n \in I^+$.	
b) $\frac{dF}{dn} = -k(F - F_0)$ if $F = 275e^{-k(n-1)} + F_0$	
(i) LHS $= \frac{dF}{dn} = \frac{d(275e^{-k(n-1)} + F_0)}{dn}$	similar to showing that a point is on a line. It is best set up as an identity
$= -k \cdot 275e^{-k(n-1)}$	
RHS $= -k(F - F_0) = -k(275e^{-k(n-1)} + F_0 - F_0)$	Poorly done. You got away with very poor solutions because it was worth only 1 mark.
$= -k \cdot 275e^{-k(n-1)}$ ✓	
LHS = RHS	[1]
$\therefore F = 275e^{-k(n-1)} + F_0$ is a solution to $\frac{dF}{dn} = -k(F - F_0)$	

Solution	Comments
(ii) $F = 275e^{-k(n-1)} + F_0$ if $F = 350$ when $n = 1$	$350 = 275 + F_0$ not division not $F_0 =$
$350 = 275e^{-k(1-1)} + F_0$	
$F_0 = 75$ ✓	[1]
(iii) $F = 275e^{-k(n-1)} + 75$	
$\lim_{n \to \infty} (275e^{-k(n-1)} + 75) = 0 + 75 = 75$	
$\therefore$ the endurance limit is 75 ✓	[1]
(iv) if $F = 80$ when $n = 200$	this question was mostly well done
$80 = 275e^{-k(200-1)} + 75$	
$5 = 275e^{-199k}$	
$e^{-199k} = \frac{5}{275}$ ✓	
$-199k = \ln\left(\frac{5}{275}\right)$	
$k = -\ln\left(\frac{5}{275}\right) \div 199 = 0.02013735$ ✓ (7 s.f.)	[2]
(c) P(no children) $= .28$	be careful of the "not"s
P(children) $= .72$	
(i) P(CCC) $\doteq .72^3 = 0.373248$ ✓	[1] 37%
(ii) P(at least one has children)	if you add these up separately don't forget ${}^3C_1$
$= 1 - $ P(none has children)	
$= 1 - .28^3$ ✓	
$= .978048$ ✓	[2] 98%

Question 4 (12 marks)

	Comments
$\cos x = \frac{\sqrt{3}}{2}$ $x = \frac{\pi}{6}$ (acute) (2) gen sol^{n} $x = 2n\pi \pm \frac{\pi}{6}$	Most students did not know the general solution formula for $\cos^{-1} \alpha$.
$\frac{1}{(x+1)(x+2)} \equiv \frac{1}{x+1} - \frac{1}{x+2}$ RHS $= \frac{1}{x+1} - \frac{1}{x+2}$ $= \frac{x+2-(x+1)}{(x+1)(x+2)}$ (1) $= \frac{1}{(x+1)(x+2)}$ $=$ LHS	part (i) was generally done well
$\int_0^1 \frac{dx}{(x+1)(x+2)}$ $= \int_0^1 \left(\frac{1}{x+1} - \frac{1}{x+2}\right) dx$ (2) $= \left[\ln(x+1) - \ln(x+2)\right]_0^1$ $\left[\ln\left(\frac{x+1}{x+2}\right)\right]_0^1$ $\ln \frac{2}{3} - \ln \frac{1}{2}$ $\ln \frac{4}{3}$	most students were able to find the indefinite integral as a log function <u>BUT</u> many made errors in evaluating the definite integral.

Question 4 (continued)

	Comments
(c) (i) Chord of Contact: $x x_0 = 2(y + y_0)$ (1)	i) very few students could remember this formula.
(ii) $x x_0 = 2(y + y_0)$ — ① $x^2 = 4y$ $y = \frac{x^2}{4}$ — ② Solve simultaneously for x $x x_0 = 2\left(\frac{x^2}{4} + y_0\right)$ $x x_0 = \frac{x^2}{2} + 2y_0$ (2) $2x x_0 = x^2 + 4y_0$ $x^2 - 2x_0 x + 4y_0 = 0$ — (A)	(ii) Not knowing the formula made par[t] virtually impossibl[e]
(iii) Use the quadratic formula to solve (A) $x = \frac{2x_0 \pm \sqrt{4x_0^2 - 4(4y_0)}}{2}$ $= \frac{2x_0 \pm 2\sqrt{x_0^2 - 4y_0}}{2}$ $= x_0 \pm \sqrt{x_0^2 - 4y_0}$ Midpoint of PQ $=$ average of roots $x = \frac{x_0 + \sqrt{x_0^2 - 4y_0} + x_0 - \sqrt{x_0^2 - 4y_0}}{2}$ $x = x_0$ Sub into ① to find y.	(iii) Some students use[d] the sum of roots method. sum of roots $= -\frac{b}{a}$ $= 2x_0$ from Average of roots $= \frac{\text{sum of roots}}{2}$ $= x_0$ etc to find y_M.

(iv) $T(x_0, y_0)$ moves on
The line $y = x - 1$

$\therefore\ y_0 = x_0 - 1$ — (A)

$M\left(x_0, \tfrac{1}{2}x_0^2 - y_0\right)$ (2)

$\therefore\ x = x_0$ — ①

$y = \tfrac{1}{2}x_0^2 - y_0$ — ②

A): $y = \tfrac{1}{2}x_0^2 - (x_0 - 1)$

$= \tfrac{1}{2}x_0^2 - x_0 + 1$

$\therefore\ y = \tfrac{1}{2}x^2 - x + 1$

It is important under examination conditions to realise That parts (iii) and (iv) of This question could have been attempted independently of parts (i) and (ii)

→ learn to <u>SCROUNGE FOR MARKS</u>.

<u>Question 6</u> (12 marks)

$f(x) = e^{-x^2}$

$f(a) = e^{-a^2}$

$f(-a) = e^{-(-a)^2}$

$= e^{-a^2}$

$= f(a)$

$\therefore\ f(x)$ is even since $f(a) = f(-a)$

(i) generally well done <u>HOWEVER</u>

it is not good enough to show That $f(1) = f(-1)$ ... etc

ie for only one value of x

→ you must show $f(x) = f(-x)$ for any value of x e.g $x = a$.

(a) (ii) $f(x) = e^{-x^2}$

$f'(x) = -2x\,e^{-x^2}$

t.p. when $f'(x) = 0$ (1)

$-2xe^{-x^2} = 0$

$x = 0$

$y = 1$

x	-1	0	$+1$
$f'(x)$	$+$	0	$-$

Max at $(0,1)$

(ii) Many students could not differentiate e^{-x^2} → $-2e^{-x^2}$ (common ...

→ Should always classify The t.p's.

→ marks were not deducted since this was only worth 1 mark

(iii) $f''(x) = -2x \cdot -2xe^{-x^2} + -2 \cdot e^{-x^2}$

$= -2e^{-x^2}(1 - 2x^2)$

infl. pt may occur when $f''(x) = 0$

ie $-2e^{-x^2}(1 - 2x^2) = 0$ (2)

$x^2 = \tfrac{1}{2}$

$x = \pm\tfrac{1}{\sqrt{2}}$

infl. pts $\left(\tfrac{1}{\sqrt{2}}, \tfrac{1}{\sqrt{e}}\right)$ and $\left(-\tfrac{1}{\sqrt{2}}, \tfrac{1}{\sqrt{e}}\right)$

x	-2	$-\tfrac{1}{\sqrt{2}}$	0	$\tfrac{1}{\sqrt{2}}$	2
$f''(x)$	$+$	0	$-$	0	$+$

$\therefore$ change of concavity through I.P.'s.

(iii) When asked to find either t.p's or I. you should always find The y-co-ord

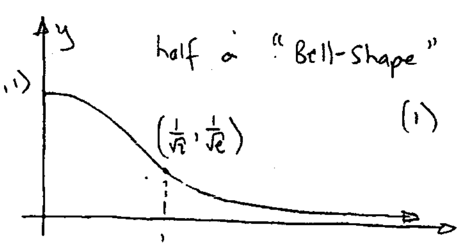
→ many students just found $x = 0$ part (ii)

$x = \pm\tfrac{1}{\sqrt{2}}$ part (iii)

→ it is good practice to test The concavity.

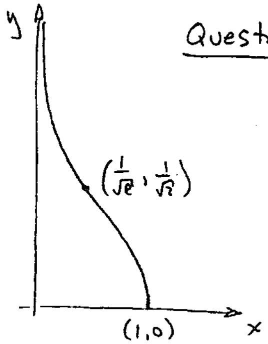
$f''(x) = 0$ <u>DOES NOT PROVE</u> change in concavity !!

(iv) half a "Bell-Shape" (1)



(iv) Students were not penalised for sketching The full bell shape nor for omitting The inflection point.

Question 6 (continued)



(1)

$y = e^{-x^2}$

$x = e^{-y^2}$

$\ln x = -y^2$

$y^2 = -\ln x$

$= \ln \frac{1}{x}$ (3)

$\therefore y = +\sqrt{\ln(\frac{1}{x})}$ take $+\sqrt{}$ since range is $y \geq 0$

$Df^{-1}: 0 < x \leq 1$

(i) $v^2 = 2(8x - x^2 - 7)$

$\frac{1}{2}v^2 = 8x - x^2 - 7$

$\frac{d}{dx}\left(\frac{1}{2}v^2\right) = 8 - 2x$

$\ddot{x} = -2(x - 4)$

HM Since it is in the form $\ddot{x} = -n^2 x$ where $n = \sqrt{2}$, and centre of oscillation is at $x = 4$ km from Control office.

(v) This was poorly done
→ most students had difficulty in finding the inverse shape
→ reflection in $y = x$
→ interchange $x \Leftrightarrow y$

(vi) students picked up marks here, even though they were unable to sketch the inverse they were able to perform the inverse algebraic operations.

(i) Many students forgot about the formula $\frac{d}{dx}(\frac{1}{2}v^2) = \ddot{x}$

$\therefore$ They struggled to prove the motion was S.H.M

→ ie. that acceleration is proportional to displacement.

(b) (ii) $v^2 = 2(8x - x^2 - 7)$

max. displacement when $v = 0$

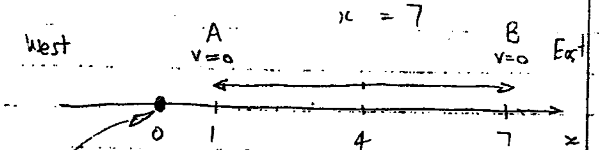
ie $2(8x - x^2 - 7) = 0$

$x^2 - 8x + 7 = 0$

$(x - 7)(x - 1) = 0$ (1)

$x = 1$

$x = 7$



∴ stations are 6 km apart

(iii) Control office is 1 km West of Station (A) (1)

(ii) generally well d[one] by those who attempted this part

(iii) Students thought [that] the control office would be at the centre of the moti[on]
→ question stated the distance was measur[ed] FROM THE CONTROL O[FFICE]
ie $(x = 0)$.

$$y = \frac{100}{x^2+100}$$

) when $y = \frac{1}{4}$, $\frac{1}{4} = \frac{100}{x^2+100}$

$x^2 + 100 = 400$

$x^2 = 300 \qquad x = \pm 10\sqrt{3}$

From diagram, $k > 0 \quad \therefore k = 10\sqrt{3}$ ✓

[1]

) $A = 2\int_0^{10\sqrt{3}} \frac{100}{x^2+100}\,dx - \frac{1}{4} \times 20\sqrt{3}$ ✓

$= 2 \times 100 \times \frac{1}{10}\left[\tan^{-1}\frac{x}{10}\right]_0^{10\sqrt{3}} - 5\sqrt{3}$ ✓

$= 20\left[\tan^{-1}\sqrt{3} - \tan^{-1} 0\right] - 5\sqrt{3}$

$= 20 \cdot \frac{\pi}{3} - 5\sqrt{3} \quad = 5\left(\frac{4\pi}{3} - \sqrt{3}\right)$

$= \frac{5(4\pi - 3\sqrt{3})}{3}$

$\frac{1}{4} \times 20\sqrt{3}$ is area of rectangle below shaded area from $(-k,0)$ to $(k,0)$

or $2\int_0^{10\sqrt{3}}\left(\frac{100}{x^2+100} - \frac{1}{4}\right)dx$

[2]

Area $= 2\int_0^k \frac{100}{100+x^2}\,dx - 2k \times \frac{100}{k^2+100}$

$= 20\left[\tan^{-1}\left(\frac{x}{10}\right)\right]_0^k - \frac{200k}{k^2+100}$

$= 20\tan^{-1}\left(\frac{k}{10}\right) - \frac{200k}{k^2+100}$ ✓

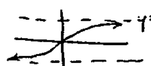
or $2\int_0^k\left(\frac{100}{100+x^2} - \frac{1}{4}\right)dx$

now as $k \to \infty$

$\tan^{-1}\left(\frac{k}{10}\right) \to \frac{\pi}{2}$ and $\frac{200k}{k^2+100} \to 0$ ✓

$\therefore$ limit of Area is $20 \times \frac{\pi}{2} = 10\pi$

$\therefore$ area never exceeds 10π m^2.



$\lim_{k\to\infty} \frac{200k}{k^2+100}$

$= \lim_{k\to\infty} \frac{\frac{200}{k}}{1 + \frac{100}{k^2}} = \frac{0}{1+0} = 0$

[2]

LHS $= (x+1)^n(x+1)^n$

$= \left[\binom{n}{0}x^n + \binom{n}{1}x^{n-1} + \binom{n}{2}x^{n-2} + \dots + \binom{n}{n-2}x^2 + \binom{n}{n-1}x + \binom{n}{n}\right]$

$\times \left[\binom{n}{0}x^n + \binom{n}{1}x^{n-1} + \binom{n}{2}x^{n-2} + \dots + \binom{n}{n-2}x^2 + \binom{n}{n-1}x + \binom{n}{n}\right]$

In this product the coefficient of x^{n+1} will be

$\binom{n}{0}\binom{n}{n-1} + \binom{n}{1}\binom{n}{n-2} + \binom{n}{2}\binom{n}{n-3} + \dots + \binom{n}{n-2}\binom{n}{1} + \binom{n}{n-1}\binom{n}{0}$ ✓

But $\binom{n}{n-k} = \binom{n}{k} \quad \therefore \binom{n}{n-1} = \binom{n}{1}, \binom{n}{n-2} = \binom{n}{2}, \dots \binom{n}{0} = \binom{n}{n}$ ✓

$\therefore$ coefficient can be written as

$\binom{n}{0}\binom{n}{1} + \binom{n}{1}\binom{n}{2} + \binom{n}{2}\binom{n}{3} + \dots + \binom{n}{n-2}\binom{n}{n-1} + \binom{n}{n-1}\binom{n}{n}$

LHS $= (x+1)^{2n}$

$= \binom{2n}{0}x^{2n} + \binom{2n}{1}x^{2n-1} + \dots + \binom{2n}{n-1}x^{n+1} + \dots + \binom{2n}{2n}$

Here the coefficient of x^{n+1} is $\binom{2n}{n-1}$

but $\binom{2n}{n-1} = \frac{(2n)!}{(n-1)!\,(2n-(n-1))!}$

$= \frac{(2n)!}{(n-1)!\,(n+1)!}$ ✓

$\therefore \binom{n}{0}\binom{n}{1} + \binom{n}{1}\binom{n}{2} + \dots + \binom{n}{n-1}\binom{n}{n} = \frac{(2n)!}{(n-1)!\,(n+1)!}$

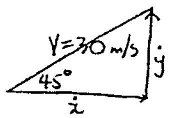
QED

[3]

learn how to set it up.

c)

	COMMENTS



<u>Initially</u>

$\dot{y} = V\sin\theta = 30\sin 45°$
$= 30 \times \frac{1}{\sqrt{2}} = 15\sqrt{2}$

$\dot{x} = V\cos\theta = 30\cos 45° = 15\sqrt{2}$

set initial $\dot{x}$ & $\dot{y}$ up before you start

i) $\ddot{x} = 0$

$\dot{x} = c_1$ but $\dot{x} = 15\sqrt{2}$ initially

$\therefore \dot{x} = 15\sqrt{2}$

Integrating wrt t

$x = 15\sqrt{2}\,t + c_2$ but $x = 0$ when $t = 0$ $\therefore c_2 = 0$

$\therefore x = 15\sqrt{2}\,t$

[1] must set up & find constants all the way through. **

$\ddot{y} = -10$

$\dot{y} = -10t + c_3$ but $\dot{y} = 15\sqrt{2}$ when $t = 0$ $\therefore c_3 = 15\sqrt{2}$

$\therefore \dot{y} = -10t + 15\sqrt{2}$

$y = -5t^2 + 15\sqrt{2}\,t + c_4$ but $y = 6$ when $t = 0$ $\therefore c_4 = 6$

$\therefore y = -5t^2 + 15\sqrt{2}\,t + 6$

[1]

Target is at (100, 4) $\therefore$ for the ball to <u>reach</u> target $y \geq 4$ when $x = 100$

"hit" is not the same as "reach".
(would hit only if $y = 4$ when $x = 100$)

when $x = 100$ $100 = 15\sqrt{2}\,t$

$t = \frac{100}{15\sqrt{2}} = \frac{100\sqrt{2}}{30} = \frac{10\sqrt{2}}{3}$ ✓

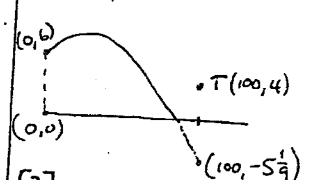
<u>OR</u> set $y = 0$, find t, find x ($= 95.65$)

when $t = \frac{10\sqrt{2}}{3}$ $y = -5\left(\frac{10\sqrt{2}}{3}\right)^2 + 15\sqrt{2}\left(\frac{100}{15\sqrt{2}}\right) + 6$

$= \frac{-5 \times 200}{9} + 100 + 6$

$= -5\frac{1}{9}$

$\therefore$ the ball will <u>not</u> reach the target. ✓



[2]