(~~2n+1~~) □ $l^2+m^2+n^2$ ニテアラハシ得ザル整数ニツイテ。

$l_0 = 2l_1+1$ ナラバ $l^2 = 4l_1(l_1+1)+1 = 8l_2+1$,

$ = 2l_1$ ナラバ $ = 4l_1(l_1+1)+4l_1+4 = 8l_2$ or $8l_2+4$.

従ッテ $l^2+m^2+n^2 \equiv 0, 1, 2, 3, 4, 5, 6 \pmod 8$

故ニ $8p+7$ or $\boxed{8p-1}$ ナル形ノ数ハ $l^2+m^2+n^2$ トシテアラハシ得ナイ。

次ニ ~~…~~ $4(8p-1)$ ヲ考ヘテ見レバ、モシコレガ $l^2+m^2+n^2$ デアラハシウルナラバ

~~l m n~~
~~偶 偶 偶~~
奇 奇

(i) $l=2l_1$　$m=2m_1$　$n=2n_1$

又ハ(ii) $l=2l_1$　$m=2m_1+1$　$n=2n_1+1$

(イヅレカノ形デナケレバナラヌ。)

(i)ノ場合ハ $l^2+m^2+n^2 = 4(l_1^2+m_1^2+n_1^2)$　∴2ノ場合ハ矛盾。

括弧中ノ数ハ $8p-1$ ナル形デアリ得ナイ。

(ii)ノ場合ハ $l^2+m^2+n^2 = (2l_1)^2+(2m_1+1)^2+(2n_1+1)^2$

$= 4(\ldots)+2$.

ハ偶デアルカラ
~~之ハ $8p-1$ ナル形ナル要ナシ。~~ ナル形ニハナリ得ナイ。

∴ $\boxed{4(8p-1)}$ ナル形ノ数モ又 $l^2+m^2+n^2$ デアラハシ得ナイ。

之以外ノ数ハ凡テ $l^2+m^2+n^2$ ナル形デアラハシウルヤ否ヤ

疑問デアル。

尚一般ニ $4^r(8p-1)$ ナル形ノ数ヲ考ヘテミルニ

$4(l_1^2+m_1^2+n_1^2)$ or $4\{l_1^2+m_1(m_1+1)+n_1(n_1+1)\}+2$.

アトノ方ハ矛盾。　~~or $l_1^2+m_1(m_1$~~ デアラハサレネバ

∴ $4^{r-1}(8p-1)$ ガ $l_1^2+m_1^2+n_1^2$

ナル。r ガ 4ノ場合ハ矛盾。

故ニ $\boxed{4^2(8p-1)}$ ハ $l^2+m^2+n^2$ デアラハシ得ナイ。

~~…~~ 一般ニ $4^n(8p-1)$ ハ $l_2^2+m_2^2+n_2^2$ ナル形ニアラハシ得ナイ。

(∵アラハシウルナラバ $4^{n-1}(8p-1) = l_1^2+m_1^2+n_1^2$ $n=0, 1$ ナノ場合アラハシ得ザル故、之ハ矛盾 アヤマリ)

トナル。 但シ $n=0, 1, 2, \ldots$　$p=1, 2, 3, \ldots$

次ニ　之 $4^n(8p-1)$ 以外ノ数ハ　全部 $l^2+m^2+n^2$ 中ニツツマレテ
居ルカドウカヲ考ヘテ見ル。　~~$4^n(8p-1)$~~
先ヅ任意 N ナル数ヲトリ、
$N \equiv 1 \pmod 8$　or $5 \pmod 8$
トスル。　~~N≡~~ ~~4(8~~

2

~~$\mp(8p-1)$~~

{ 奇 偶偶
{ 奇 奇 奇.

$$N = (2l_1+1)^2+(2m_1)^2+(2n_1)^2$$
$$= 4\,(l_1(l_1+1)+m_1^2+n_1^2)+1$$

又4 $l_1(l_1+1)+m_1^2+n_1^2$

l_1

1ツハ偶数.

$\therefore 4(l_1(l_1+1)+\cdots\cdots)+3.$

$\boxed{8p,\ 8p+4}$

$8p+1,\ 8p+5$

$8p+2,\ 8p+6$

$8p+3$

i) 偶 偶 偶; $4(l_1^2+m_1^2+n_1^2)$

ii) 奇 偶 偶; $4(\underline{l_1(l_1+1)+m_1^2+n_1^2})+1$

iii) 奇 奇 偶; $4(l_1(l_1+1)+m_1(m_1+1)+n_1^2)+2.$

iv) 奇 奇 奇; $4(l_1(l_1+1)+m_1(m_1+1)+n_1(n_1+1))+3$

$4(l_1(l_1+1)+m_1(m_1+1)$

括弧ノ中ノ数ガ任意ノ整数デアル、之ハ中々見出スガ困難デアル。

i)ノ場合ハ 整数ト同ジ結果デアル。

iv)ノ場合ハ、( )ノ中 全体偶数ナラバヨイ。任意ノ偶数デアラバ、之ヲ

カケテ2 $\dfrac{l_1(l_1+1)+m_1(m_1+1)+n_1(n_1+1)}{2} = \sum_{l=1}^{l_1} l + \sum_{m=1}^{m_1} m + \sum_{n=1}^{n_1} n$

$= \sum_{l=1}^{l_1} l + \sum_{m=1}^{m_1} m + \sum_{n=1}^{n_1} n$

l	$l(l+1)/2$		
0	0	0	0
1	1	1	1
2	3	3	3
3	6	6	6
4	10	10	10
5	15	15	15
6	21	21	21

n

$n \to m+1$

$a+1$ $\boxed{n}$.

$3\sum_{l=1}^{n} l + 2\sum_{l=n+1}^{n+m} l n + \sum_{l=n+m+1}^{n+m+l} n$

0 0 0
1 1 1
4 4 6
9 9 12
25 25 20
36 36 30
49 49 42 =

(23) 54

$\frac{23}{4}$

$\frac{102}{2}$

104 !!

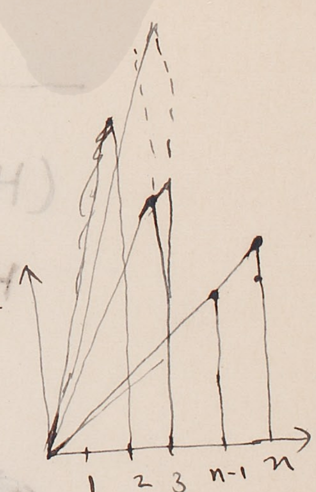
0, 1, 4, 9, 25, 36, 49

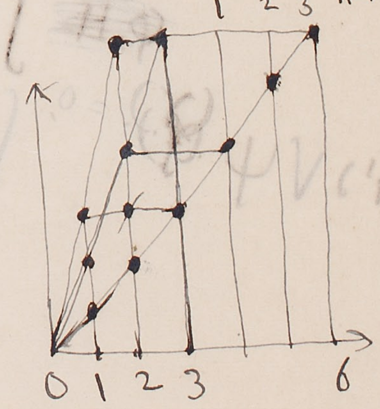
0, 6, 15, 21

0	0	0
1	1	1
1+2	1+2	1+2
1+2+3	1+2+3	1+2+3
1+2+3+4	1+2+3+4	1+2+3+4

a

$a+1$





$\dfrac{(a+1)a}{2} < N < \dfrac{(a+1)(a+1)}{2}$

$N - \dfrac{(a+1)a}{2} \leq a+1.$

0 1 2 3

$a^2+3a+2-a^2+a$

$2a+2.$

$a+1.$

0, 2, 4, 6,
0, 1, 4.
0, 1, 4.
0, 1, 2, 3, 4, 5, 6, 7

0, 2, 4, 6
0, 2, 4, 6
0, 1, 4,
0, 1, 2, 3, 4, 5, 6, 7.

3

$\varphi_f(x)\,\alpha_j(\sigma)\quad (f=1,2,\cdots N \quad j=1,2)$

$$\psi(f_1\cdots f_r)=\begin{array}{c|cccc|} & 1 & 2 & i & N \\ 1,j_1 & \varphi_1(x_1)\alpha_{j_1}(\sigma_1) & \varphi_1(x_2)\alpha_{j_1}(\sigma_2) & \varphi_1(x_i)\alpha_{j_1}(\sigma_i) & \varphi_1(x_N)\alpha_{j_1}(\sigma_N) \\ 2,j_2 & \varphi_2(x_1)\alpha_{j_2}(\sigma_1) & \varphi_2(x_2)\alpha_{j_2}(\sigma_2) & & \\ \vdots & & & & \\ f,j_f & - & - & \varphi_f(x_i)\alpha_{j_f}(\sigma_i) & \\ \vdots & & & & \\ N,j_N & - & - & - & \varphi_N(x_N)\alpha_{j_N}(\sigma_N) \end{array}$$

$\alpha_{1j}(\sigma_1)\alpha$

f_1

$j_{f_1}=j_{f_2}=\cdots=j_{f_r}=1$

$j_{r+1}=\cdots=j_N=2$

$m\frac{h}{2\pi}=\frac{1}{2}\frac{h}{2\pi}[-r+(N-r)]$, $\quad m=n-r$

$N=2n$

$\psi(r)=\sum_{f_1\cdots f_r}a_f(f_1\cdots f_r)\,\psi(f_1\cdots f_r)$

$\binom{N}{r}$ 通リ, Verteilung ニツキテ ヨモアツナ。

$$V=\sum_{i,f=1}^{N}V_f(x_i)+\sum_{i<k}\frac{e^2}{r_{ik}}+\sum_{f<g}V_{fg}$$

1 2 3	4 5
1 3 4	5 2

1 2 3 4 5

→ → → ← ←

→ → ← → ←

→ → ← ← ←

→ → → ← ←

→ ← ← → →

$(H_0+H_1)\psi=0$

$H_0\varphi_1=H_1\varphi_0$

$\int\varphi_0' H_1\varphi_2=0.$

$\int\widetilde{(\beta_1\varphi_1+\beta_2\varphi_2)}H_1(\alpha_1\varphi_1+\alpha_2\varphi_2)=0.$ $\quad 8!!$

$\tilde\psi(r')V\psi(r)=0,\quad \int\widetilde{(\alpha_1\varphi_1+\alpha_2\varphi_2)}H_1(\beta_1\varphi_1+\beta_2\varphi_2)=$ $\quad 2.$

$(\beta_1\varphi_1+\beta_2\varphi_2)\quad \widetilde{H_1(\alpha_1\varphi_1+\alpha_2\varphi_2)}$

$\alpha_1\varphi_1$

$\alpha_1^2+\alpha_2^2=|\beta_1|^2+|\beta_2|^2=1$ $\quad 2.$

$\tilde\alpha_1\beta_1+\tilde\alpha_2\beta_2=0.$ $\quad 2$

$\tilde\alpha_1\beta_1H_{11}+\tilde\alpha_2\beta_1H_{12}+\tilde\alpha_1\beta_2H_{21}$

$+\tilde\alpha_2\beta_2H_{22}=0.$

$[\mathbf{r}\,\mathbf{I}] \cdot [\mathbf{r}\ \mathrm{rot}\,\mathbf{H}] = \left(y \left(\frac{\partial H_y}{\partial x} - \frac{\partial H_x}{\partial y}\right) - z\left(\frac{\partial H_x}{\partial z} - \frac{\partial H_z}{\partial x}\right) \right)$

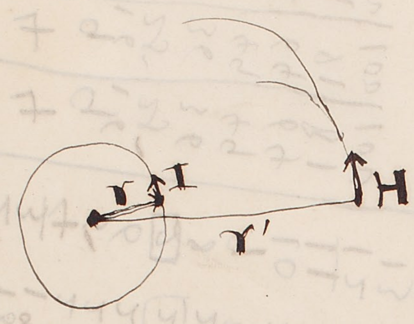
$\frac{4\pi}{c}$ $=$

$\int \mathbf{H}\,ds = \int \mathbf{I}\,df$

$\mathrm{rot}\,\mathbf{H} = \mathbf{I}.$

$\int \mathbf{I}\,df = \int \mathbf{H}\,ds$

$\mathbf{A} = \int \frac{\mathbf{I}(r')\,dv}{|\mathbf{r}-\mathbf{r}'|}$

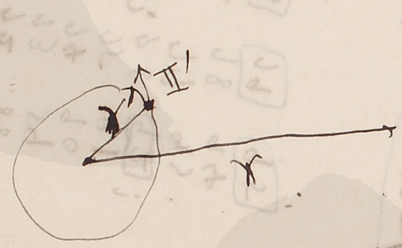


$2\pi R \sin\theta \cdot H_\varphi =$

$\mathbf{H} = \mathrm{rot}\,\mathbf{A} = \int \frac{[\mathbf{r}\,\mathbf{I}]\,dv}{|\mathbf{r}-\mathbf{r}'|^2}$

$\frac{I'_z(y-y') - I'_y(z-z')}{|\mathbf{r}-\mathbf{r}'|^3}$

$\frac{4\pi}{c},$



$\mathbf{H} = \int \frac{[\mathbf{r}-\mathbf{r}', \mathbf{I}']\,dv'}{|\mathbf{r}-\mathbf{r}'|^3}$

$[\mathbf{r}\,\mathbf{I}']$

$= \frac{[\mathbf{r}\,\mathbf{I}']\,dv'}{|\mathbf{r}-\mathbf{r}'|^3}$

$[\mathbf{r}'\,\mathbf{I}']$

$\mathbf{r}\ \mathbf{I}$

$\frac{[\mathbf{r}-\mathbf{r}' \cdot \mathbf{I}']}{|\mathbf{r}-\mathbf{r}'|^3} = \frac{[\mathbf{r} \cdot \mathbf{I}(0)]}{r^3}$

$\int \frac{[\mathbf{r}\,\mathbf{I}']\,dv}{(\mathbf{r}-\mathbf{r}')^3 r^3}$

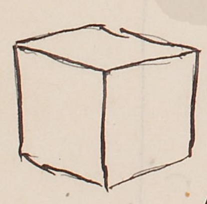
$\mathbf{H} = \int \frac{[\mathbf{r}\,\mathbf{I}']\,dv'}{|\mathbf{r}-\mathbf{r}'|^3}$

$(0, 4)$ $(1, 2, 3, 5, 6)$

$\{\mathbf{r}$

$\mathbf{r}$ $\mathbf{I}$

$\mathbf{H}(\mathbf{r}) = \int \frac{[\mathbf{r}, \mathbf{I}(\mathbf{r}-\mathbf{r}')]\,dv'}{r'^3}$



$W(\nu)\,d\nu$ N_r $\square\square\square\square\square\square\square\square\square\square$, $\boxed{E = \sum_n n_r h\nu_r}$

$\rho(\nu)\,d\nu$ n_r

$W(n_r) = \prod \frac{N_r + n_r - 1!}{n_r!\, N_r - 1!}$

$P(\nu)\,d\nu = \frac{\int W(\alpha)\,\rho(\nu,\alpha)\,d\nu\,d\alpha}{\int W(\alpha)\,\rho(\nu,\alpha)\,d\nu\,d\alpha}$

most probable state $\neq$. mean value for all state

value for

$W = \sum n_s \prod_r \frac{(N_r+n_r-1)!}{n_r!\,(N_r-1)!} \frac{(N_s+n_s-1)!}{n_s!\,(N_s-1)!}$

$E = \sum n_r h\nu_r = \sum n_r h\nu_r$

4

0	0	0	0	16	32	48	64	80	96!!
1	1	1	1×	17	33	49	65	81	97
4	4	4	2×	18	34	50	66	82	98
9	9	9	3	19	35	51	67	83	99
16	16	16	4	20	36	52	68	84	100
25	25	25	5	21	37	53	69	85	101
36	36	36	6	22	38	54	70	86	102
49	49	49	7	23	39	55	71	87	103
64	64	64	8	24	40	56	72	88	
81	81	81	9	25	41	57	73	89	
100	100	100	10	26	42	58	74	90	
			11	27	43	59	75	91	
			12	28?	44	60?	76	92?	
			13	29	45	61	77	93	
			14	30	46	62	78	94	
			15	31	47	63	79	95	

75
108 ~~92~~

49 49

49 2 !! 7!!

35 !!

15, 30, 43

8

95 64 31

49 46.

36.

$\frac{16}{102}$

$l^2 = 8l_1 + 1$ or ~~4l~~ or ~~8~~$4l_1 = 8l_1+4$. 0, 1, 4

4.

4.

$m^2 = \quad 8$

$n^2 =$

15

64

p, q, r

$p^2+q^2+r^2$

$p^2+q^2+r^2$

8(~~l_1+l_2~~ ~~+3~~)

8(,,) + 1

8(,,) + 2

8(,,) + 3

8(,,) + 4

+ 5

+ 6

$32p-4$

$\boxed{32p-4}$ $\boxed{4(8p-1)}$ ~~×8(~~ ~~)+7~~

$4k-1-l^2 = 4k-1- \quad 4(\ )-1$

$= 4(\ )-2.$

$l^2+m^2 \neq 4k-1$?

$n^2 = 4m$ or $8m+1$

I

$8p-1.$

$l^2 < 8p-1 < (l+1)^2,$

$8p-1-l^2 = 8\cancel{p}r - 2.$

$8p-1-l^2 = 4n^2+4n = 4n(n+1).$

$(2n+1)^2-1 = 4n^2+4n$

$\geq 8 pr.$

$8p-1-l^2 = (2n+1)^2 = \{8\{\ldots\} - 1\} - 1$

$8p-1-(2n)^2 = 8p-1-4n^2$

$= 4(\ ) - 1.$

n: even

n: odd ?

~~4k-1~~ 4k−1 !!

4k−2 !!

$8p-1$

$4(8p-1)$

$\left.\begin{array}{l}8p-1\\8p-2\\4k-2\end{array}\right\}$,

$8l_1+1$

8l	~~8(l+1)~~	~~8l+4~~
~~8m~~	8m+1	~~8m+4~~
8n	~~8n+1~~	~~8n+4~~

0, 1, 2, 3, 4

5, 6, ~~7~~

$4(8p-1) = l^2+m^2+n^2.$

$(2n+1)^2 = 4n(n+1)+1,$

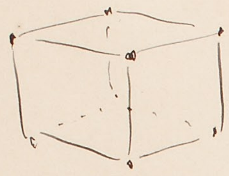
~~$(2n+1)^2$~~ $= 4n(n+1)+4n+4.$

~~$4(n+1)^2$~~

$4(\ ) = l^2+m^2 \times$

$(2l+1)^2+(2m+1)^2$

$= 4(\ )+2.$



$\nu_r = \frac{c}{\lambda} =$

$\lambda_x = \frac{L}{n_x}, \ldots$

$\sin 2\pi \cancel{\ldots} (p x)$

$p = (l, m, n)/L$

$\nu_r = c\sqrt{l^2+m^2+n^2}/L$

$E = \frac{hc}{L}\{\sqrt{l^2+m^2+n^2} \cdot n_{lmn}\}$

$N_{lmn}(\nu)\ \cancel{l^2+m^2+n^2} =$ ν^2

$\nu=1$

$N_0 = 1.$

$N_1 = 3.$

$N_{\sqrt{2}} = 3$

$N_{\sqrt{3}} = 1$

$N_2 = 3$

$N_{\sqrt{5}}$

l	m	n
0	0	1
0	1	0
1	0	0
0	1	1
1	1	0
1	0	1
0	0	2
0	2	0
2	0	0
0	1	2

	N	l	m	n
N_0	1	0	0	0
N_1	3	0	0	1
N_2	3	0	1	1
N_3	1	1	1	1
N_4	3	0	0	2
N_5	6	0	1	2
N_6	3	1	1	2
N_7	0			
N_8	3	0	2	2
N_9	6	0{1, 0	2, 0	2, 3
N_{10}	6	0	1	3
N_{11}	3	1	1	3
N_{12}	1	2	2	2
N_{13}	6	0	2	3
N_{14}	6	1	2	3
N_{15}	0			
N_{16}	1	0	0	4
N_{17}	9	{0, 2	1, 2	4, 3
N_{18}	6	{0, 1	3, 1	3, 4
N_{19}	3	1	3	3
N_{20}	6	{0	2	4
N_{21}	6	1	2	4
N_{22}	3	2	3	3

N_{23}	0	
N_{24}	3	2 2 4
N_{25}	6	0 3 4

(0,0) (0,1) 1, 3, 5, 7, 9, ...

0, 1

$8p-1$

$l^2 - l'^2$

$l^2+m^2+n^2 = 8(p+1)-1$

$l^2+m^2+n^2 \neq 8p-1$

$\neq 8$

$(l^2-l'^2)+(m^2-m'^2)+(n^2-n'^2) \neq 8p$

$\boxed{l^2+m^2+n^2 \neq 8p-1}$

N_{32}, N_{39}, N_{47} N_{31}

4 3

16 9

2 2 4

16

N_{39}

$l^2+m^2+n^2 \geq 8(p+1)-1,$

$l^2+m^2+n^2 - (l^2-l'^2)+(m^2-m'^2)+(n^2-n'^2) \neq 8p$ for any p

$l^2 - l'^2 =$

$p \leq \frac{l^2+m^2+n^2}{8} - 1.$

$l \leq m < n.$

$(2l+1)$

1, 2, 4, 8, 16, 32, ...

1, 2

1	2
0	2
1	8
4	18
9	50
25	.
36	.
49	.

0 1 1

1 1 4

4 4 4

$8n-1.$

2 2

1 6 $\boxed{7}$

$l^2-(l-1)^2 = \boxed{2l-1}$

$(l+1)^2-l^2 = 1 = 2l\ !!$ 4

次ニ ~~[illegible]~~ 一ツノ数Nヲ取ツテ見ル. l, m, n ノ組合ハイクツアルカヲ記スコトニ

p	~~[illegible]~~ $4p$ $4(l_i^2+m_i^2+n_i^2)$		$4p+1$ $4(l_i(l_i+1)+m_i^2+n_i^2)+1$		$4p+2$ $4(l_i(l_i+1)+m_i(m_i+1)+n_i^2)+2$		$4p+3$ $4(l_i(l_i+1)+m_i(m_i+1)+n_i(n_i+1))+3$	
0	0	1	1	3	2		3	
1	4	3	5	6				
2	8	3	9	3				
3	12	1	13					
4	16	3	17					
5	20	6	21					
6	24	3	25					
7	28	0	29					
8	32	3	33					

6