Number 5 relation n^2

$1^2 = 1 = 5\times0 + 1 \rightarrow \times0 \quad +1$

$2^2 = 4 = 5\times1 - 1 \rightarrow \times1 \quad -1$

$3^2 = 9 = 5\times2 - 1 \rightarrow \times2 \quad -1$

$4^2 = 16 = 5\times3 + 1 \rightarrow \times3 \quad +1$

$5^2 = 25 = 5\times5 + 0 \rightarrow \times5 \quad +0$

$6^2 = 36 = 5\times7 + 1 \rightarrow \times7 \quad +1$

$7^2 = 49 = 5\times10 - 1 \rightarrow \times10 \quad -1$

$8^2 = 64 = 5\times13 - 1 \rightarrow \times13 \quad -1$

$9^2 = 81 = 5\times16 + 1 \rightarrow \times16 \quad +1$

$10^2 = 100 = 5\times20 + 0 \rightarrow \times20 \quad +0$

$11^2 = 121 = 5\times24 + 1 \rightarrow \times24 \quad +1$

$12^2 = 144 = 5\times29 - 1 \rightarrow \times29 \quad -1$

$13^2 = 169 = 5\times34 - 1 \rightarrow \times34 \quad -1$

$14^2 = 196 = 5\times39 + 1 \rightarrow \times39 \quad +1$

$15^2 = 225 = 5\times45 + 0 \rightarrow \times45 \quad +0$

$16^2 = 256 = 5\times51 + 1 \rightarrow \times51 \quad +1$

$17^2 = 289 = 5\times58 - 1 \rightarrow \times58 \quad -1$

$18^2 = 324 = 5\times65 - 1 \rightarrow \times65 \quad -1$

$19^2 = 361 = 5\times72 + 1 \rightarrow \times72 \quad +1$

$20^2 = 400 = 5\times80 + 0 \rightarrow 80 \quad +0$

$O = \begin{cases} \frac{n}{5} \pm 1 & \text{will apply } +1 \\ \frac{n}{5} & \text{will apply } +0 \\ \frac{n}{5} \pm (2,3) & -1 \end{cases}$

$T(n)$ {
- ~~Answers =~~
- ~~if n mod 5 = 4~~
- if n mod 5 = 1 or 4 then +1
- if n mod 5 = 0 then +0
- if n mod 5 = (2 or 3) then −1

-3 → -1 -2 → -1 -1 → 0	2 1 0
0 → 0	0
1 → 0	0
2 → 1	1
3 → 1	2
4 → 1	3
5 → 2	5
6 → 2	7
7 → 3	10
8 → 3	13
9 → 3	16
10 → 4	20
11 → 4	24
12 → 5	29
13 → 5	34
14 → 5	39
15 → 6	45
16 → 6	51
17 → 7	58
18 → 7	65
19 → 7	72
20 → 8	80

~~$T(n) = 5\,a(n)$~~

$T(n) + 5\,a(n) = n^2$

$a(n) = \left\lfloor \frac{n^2+1}{5} \right\rfloor$

$$T(n) = \begin{cases} +1 & \text{if } n \equiv 1,4 \pmod 5 \\ 0 & \text{if } n \equiv 0 \pmod 5 \\ -1 & \text{if } n \equiv 2,3 \pmod 5 \end{cases}$$

$$b(n) = 2 \cdot \left\lfloor \frac{n}{5} \right\rfloor + \begin{cases} 0 & \text{if } n \bmod 5 < 2 \\ 1 & \text{if } n \bmod 5 \geq 2 \end{cases}$$

$a(n) = \left\lfloor \frac{n^2+1}{5} \right\rfloor$

$\frac{37}{5} = 7$

$\frac{400}{5} = 80$

$\left\lfloor \frac{n^2+1}{5} \right\rfloor$

$5 \left\lfloor \frac{n^2+1}{5} \right\rfloor$

2x0 +1

1 4 9 16 25 36 49 64 81 100

4 24 40

0 2 5 8 12 18 25 32 41 50

2 3 4 5 6 7 8 9 10

$2\left\lfloor \frac{n}{2} \right\rfloor$

$2\left\lfloor \frac{n}{2} \right\rfloor + 1$

upper → $\left\lfloor \frac{n^2}{2} \right\rfloor + 1$, lower → $\left\lceil \frac{n^2}{2} \right\rceil$

upper

if $n \bmod 2 = 1$ then → +1 even small / -1 odd big

if $n \bmod 2 = 0$ then +0

$n^2 =$ if $n \bmod 2 = 1$ then { Even $2\left\lfloor \frac{n^2}{2} \right\rfloor + 1$; odd $2\left\lceil \frac{n^2}{2} \right\rceil - 1$ }

if $n \bmod 2 = 0$ then $2\left\lfloor \frac{n^2}{2} \right\rfloor$ or $2\left\lceil \frac{n^2}{2} \right\rceil$ x2

1 2 5 8 13 18 25 32 41 50

0 4 8 12 24 40

a,

4 → up • $\left\lfloor \frac{n^2}{4} \right\rfloor$ $\left\lfloor \frac{n^2}{4} \right\rfloor$ $\left\lfloor \frac{n^2}{4} \right\rfloor$ $\left\lfloor \frac{n^2}{4} \right\rfloor$ -3

→ down • $\left\lfloor \frac{n^2}{4} \right\rfloor$ $\left\lfloor \frac{n^2}{4} \right\rfloor$ $\left\lfloor \frac{n^2}{4} \right\rfloor$ $+1$

5 → up $\left\lfloor \frac{n^2}{5} \right\rfloor$ $-4, -2$

→ down $\left\lfloor \frac{n^2}{5} \right\rfloor$ $+1, +4$

3 → up $\left\lfloor \frac{n^2}{3} \right\rfloor$ -2

→ down $\left\lfloor \frac{n^2}{3} \right\rfloor$ $+1$

2 → up $\left\lfloor \frac{n^2}{2} \right\rfloor$ -1

→ down $\left\lfloor \frac{n^2}{2} \right\rfloor$ $+1$

6 → up → $\left\lfloor \frac{n^2}{6} \right\rfloor$ $-3, -2, -5$

→ down $\left\lfloor \frac{n^2}{6} \right\rfloor$ $+1, +4, +3$

4 kelah'an

1 4 9 16 25 36 49 64 81 100

0 1 2 3 4 6 7 9 12 13 16 20 21 25

1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

up -> $\lfloor \frac{n^2}{4} \rfloor$ $\lfloor \frac{n^2}{4} \rfloor + n$

down -> $\lfloor \frac{n^2}{4} \rfloor$ $\lfloor \frac{n^2}{4} \rfloor$ $\lfloor \frac{n^2}{4} \rfloor$

up up -> $\lfloor \frac{n}{2} \rfloor + (n-1) \% 2$ $\lfloor \frac{(n+1)}{2} \rfloor + n \bmod 2$

5's

1 4 9 16 25 36 49 64 81 100

1.	1	2	4	5	8	10	13	17	20	25	29	
0	0	1	3		7	9	12	16		24	28	

up $\left\lceil \frac{n^2}{5} \right\rceil$

down $\left\lfloor \frac{n^2}{5} \right\rfloor$

6th

1 4 9 16 25 36 49 64 81 100 121 144

1	1	2	3	5	6	9	11	14	17	21	24
0	0	1	2	4		8	10	13	16	20	

up → $\left\lceil \frac{n^2}{6} \right\rceil$ $-5, -2, -3,$

down → $\left\lfloor \frac{n^2}{6} \right\rfloor$ $+1, +4, +3,$

3^5

up +1,
down -2,

1 4 9 16 25 36 49 64 81

1 4 9 16 25 36 49 64 100

1 4 9 16 25 36 49 64 81 100

1 1 3 5 7 9 12 16 17 21 22 27 33 34
0 2 3 6 9 12 17 22 27 34

1 2 2 2 3 4 4 5 6 6
1 2 1 3 3 3 5 5 5 7 7

up up → $\left\lfloor \frac{2n}{3} \right\rfloor$

down down

$\frac{n+2}{3}$

$\frac{n+2}{3} + 1$

$2\left\lfloor \frac{n}{3} \right\rfloor + 1$

up → $\left\lfloor \frac{n^2}{3} \right\rfloor$ $\left\lceil \frac{n^2}{3} \right\rceil$

down → $\left\lceil \frac{n^2}{3} \right\rceil$ $\left\lfloor \frac{n^2}{3} \right\rfloor$

1 2 3 6 9 12 17 22 27 34
0 1 5 8 16 21 33

2's

0 1 2 5 8 13 18 25 32 41 50 61 72 85
0 4 12 24 40 60 84

up up $\lceil \frac{n^2}{2} \rceil$

up up 1 3 3 5 5 7 7 9 9 11 11 13 13

up up ~~n~~ $\lfloor \frac{n}{2} \rfloor * 2 + 1$

low | down $\lfloor \frac{n^2}{2} \rfloor$

wallis formula

downdown → 0, 2, 2, 4, 4, 6, 6, 8, 8, 10, 10, 12, 12

down down $\lfloor \frac{n+1}{2} \rfloor * 2$

$\prod \lfloor \frac{n}{2} \rfloor * 2 + 1$

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$\prod \left[\lfloor \frac{n^3}{2} \rfloor * 2 \right]$

$\prod \left[\lfloor \frac{n}{2} \rfloor * 2 + 1 \right]$

$$\pi = 2 * \prod_{n=1}^{\infty} \frac{\left\lfloor \frac{n+1}{2} \right\rfloor * 2}{\left\lfloor \frac{n}{2} \right\rfloor * 2 + 1}$$

$$\Rightarrow \pi = 2 * \prod_{n=1}^{\infty} \frac{\left\lfloor \frac{n+1}{2} \right\rfloor * 2}{\left\lfloor \frac{n}{2} \right\rfloor * 2 + 1}$$

Wallis = mine

$$\pi = 2 \prod_{n=1}^{\infty} \frac{(2n)^2}{(2n-1)(2n+1)} = 2 \prod_{n=1}^{\infty} \frac{\left\lfloor \frac{n+1}{2} \right\rfloor * 2}{\left\lfloor \frac{n}{2} \right\rfloor * 2 + 1}$$

3's

1	2	3	6	9	12	17	22	27	34	41
0	1		5	8		16	21		33	40

up → $\left\lfloor \frac{n^2}{3} \right\rfloor$

up up → 1, 1, 3, 3, 3, 5, 5, 5, 7, 7

2 up up → $2 * \left\lfloor \frac{n}{3} \right\rfloor + 1$

down → $\left\lfloor \frac{n^2}{3} \right\rfloor$

down down → 1, 1, 2, 3, 4, 4, 5, 6, 6, 7, 8, 8, 9, 10, 10, 11

down down $\left\lfloor \frac{n+2}{3} \right\rfloor$ $\left\lfloor \frac{2*(n+1)}{3} \right\rfloor$

$$2 * \prod_{n=1}^{\infty} \frac{\left\lfloor \frac{2*(n+1)}{3} \right\rfloor}{2\left\lfloor \frac{n}{3} \right\rfloor + 1} = \pi$$

4's

$\frac{1}{0}$ 1 $\frac{3}{2}$ 4 $\frac{7}{6}$ 9 $\frac{13}{12}$ 16 $\frac{21}{20}$ 25

up → $\left\lceil \frac{n^2}{4} \right\rceil$

up up → 0, 2, 1, 3, 2, 4, 3, 5, 4, 6, 5, 7, 6, 8, 7, 9

up up → $2 * \left\lceil \frac{n-1}{2} \right\rceil - \left\lfloor \frac{n-1}{2} \right\rfloor$

down → $\left\lfloor \frac{n^2}{4} \right\rfloor$

down down → 1, 1, 2, 2, 3, 3, 4, 4, 5

dowm dowm → $\left\lceil \frac{n}{2} \right\rceil$

$$\prod_{n=1}^{\infty} \frac{\left\lceil \frac{n+1}{2} \right\rceil}{2 * \left\lceil \frac{n}{2} \right\rceil - \left\lfloor \frac{n}{2} \right\rfloor} = 1$$

if limit is even or odd

or for large value, it will tend to 1

S'n | 1 1 2 4 5 8 10 13 17 20 25 29
0 0 1 3 7 9 12 16 24 28

up $\lceil \frac{n^2}{5} \rceil$

up up → 0 1 2 1 3 2 3 4 3 5 4 5 6 5 7 6

1 1 -1 2 -1 1 1 -1 2 -1

up up formula $\lceil \frac{n}{5} \rceil + \lceil \frac{n-1}{5} \rceil - \lceil \frac{n-2}{5} \rceil + 2\lceil \frac{n-3}{5} \rceil - \lceil \frac{n-4}{5} \rceil$

$\lceil \frac{1}{5} \rceil + \lceil \frac{0}{5} \rceil - \lceil \frac{-1}{5} \rceil + 2\lceil \frac{-2}{5} \rceil - \lceil \frac{-3}{5} \rceil$

$1 + 0 - 0 + 0 - 0$

$\lceil \frac{2}{5} \rceil + \lceil \frac{1}{5} \rceil - \lceil \frac{0}{5} \rceil + 2\lceil \frac{-1}{5} \rceil - \lceil \frac{-2}{5} \rceil$

$1 + 1 - 0 + 0 - 0 = 2$

$\lceil \frac{7}{5} \rceil + \lceil \frac{6}{5} \rceil - \lceil \frac{5}{5} \rceil + 2\lceil \frac{4}{5} \rceil - \lceil \frac{3}{5} \rceil$

$2 + 2 - 1 + 2 - 1 = 4$

actual formula $\lceil \frac{n-1}{5} \rceil + \lceil \frac{n-2}{5} \rceil - \lceil \frac{n-3}{5} \rceil + 2\lceil \frac{n-4}{5} \rceil - \lceil \frac{n-5}{5} \rceil$

P dom 0 0 1 3 5 7 9 12 16 20 24

dom dom 0 1 2 2 2 2 3 4 4 4 4 5 6 6
6 6 7 8 8 8 8

dom dom $\Rightarrow \left\lceil \frac{n-1}{5} \right\rceil + \left\lceil \frac{n}{5} \right\rceil$

$$P \prod_{n=1}^{\sigma} \frac{\left\lceil \frac{n-1}{5} \right\rceil + \left\lceil \frac{n}{5} \right\rceil}{\left\lceil \frac{n}{5} \right\rceil + \left\lceil \frac{n-1}{5} \right\rceil - \left\lceil \frac{n-2}{5} \right\rceil + 2 * \left\lceil \frac{n-3}{5} \right\rceil - \left\lceil \frac{n-4}{5} \right\rceil}$$

μ (upper, lower)

$\mu = 5 \rightarrow (3,3)$ or $(5,5)$
$\mu = 6 \rightarrow (3,3)$ or $(6,6)$
$\mu = 7 \rightarrow (3,3)$ or $(7,7)$
$\mu = 9 \rightarrow (5,5)$ or $(9,9)$
$\mu = 10 \rightarrow (4,4)$ or $(10,10)$
$\mu = 11 \rightarrow (4,4)$ or $(11,11)$
$\mu = 13 \rightarrow (6,6)$ or $(13,13)$
$\mu = 14 \rightarrow (6,6)$ or $(14,14)$
$\mu = 15 \rightarrow (6,6)$ or $(15,15)$
$\mu = 17 \rightarrow (8,8)$ or $(17,17)$

$\mu = 8$ $(5,5)$
$\mu = 12$ $(7,7)$
$\mu = 16$ $(9,9)$

$$\frac{\mu + 2}{2}$$

for μ when its multiple of 4 or 4 its factor