

Time Complexity

1) For ($i=1; i < n; i = i * 2$) {
 $\log(n)$. $Stm^n + 3$

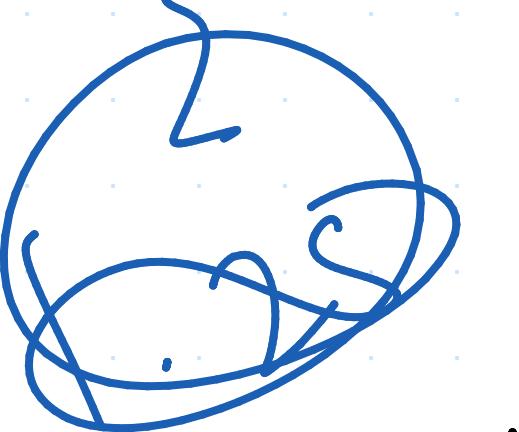
2) for ($i=n;$ ~~$i \geq n$~~ ; $i = i / 2$) {
 Stm^3

~~$i \neq 0 * 2$~~
 $i = 1 / 2$ $n = 10$ $i = 0 / 2$

for $i = n$ to $i = 1/2$ do i

$n = 10$

$\frac{2.5}{2.5}$



Start 3

i



5

5

2.5

1.25

$10/2 \rightarrow$

$10/2^2 \rightarrow$

$10/2^3 \rightarrow$

$10/2^4 \rightarrow$



$n = 20$

i

20

i

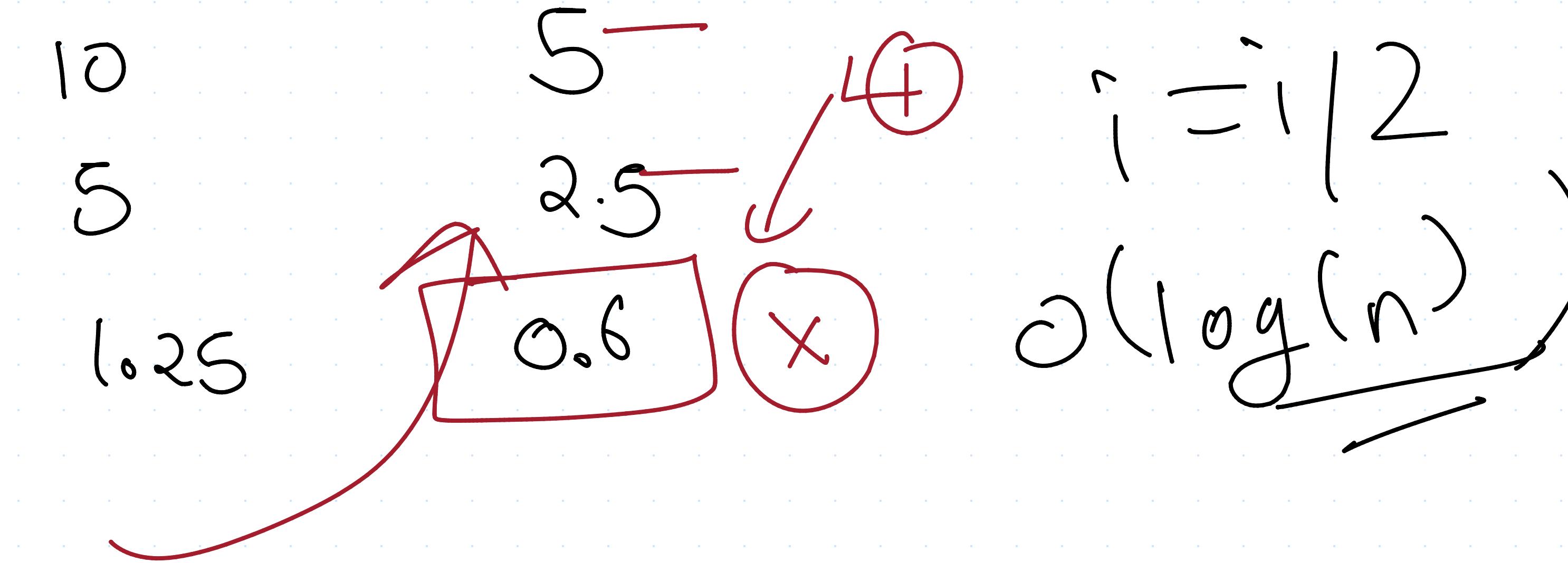
10

$n \rightarrow 20$

$i = i + 2$

$$\log(20)$$

$c_i = s$



$$n/2$$

$$n/2^2$$

$$n/2^3$$

$$\frac{n}{2^k} < 1$$

$$\frac{n}{2^k} = 1$$

$$n = 2^k$$

$$\frac{n}{2^k}$$

$$i = i_0 * 2$$

$$e_k \frac{n}{2^k} = \log(n) = \log(2)^k$$

$$\log(n) < \log(2)$$

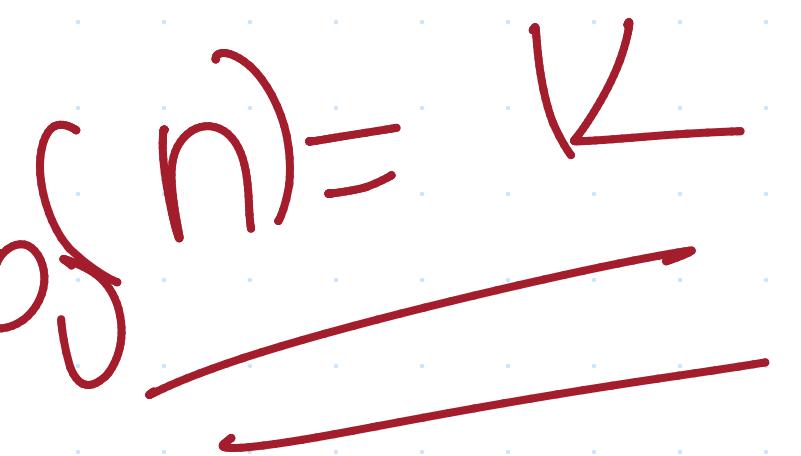
$$\leftarrow \log(n)$$

2
2²
2³
2⁴

ℓ^2

2^K

$$2^K = n$$

$$b(n) = K$$


$$n/3$$

$$n/3^2$$

$$n/3^3$$

$$n/3^K$$

$$n/3^K = 1$$

$$n = 3^K$$

$\log(n) \leftarrow \log(3^K)$

$$\log(n) = 2 \swarrow$$

$K = \log(n)$

~~$K = \log(n)$~~

for(i=0 | ~~i * i > n~~, ~~i++~~)

$$i^2 = 6 \quad (\sqrt{6})$$

$$i = \sqrt{2}$$

$$x^2 = 5$$

$$k = \sqrt{5}$$

j

i

o

l

O/P
- O -

22

o

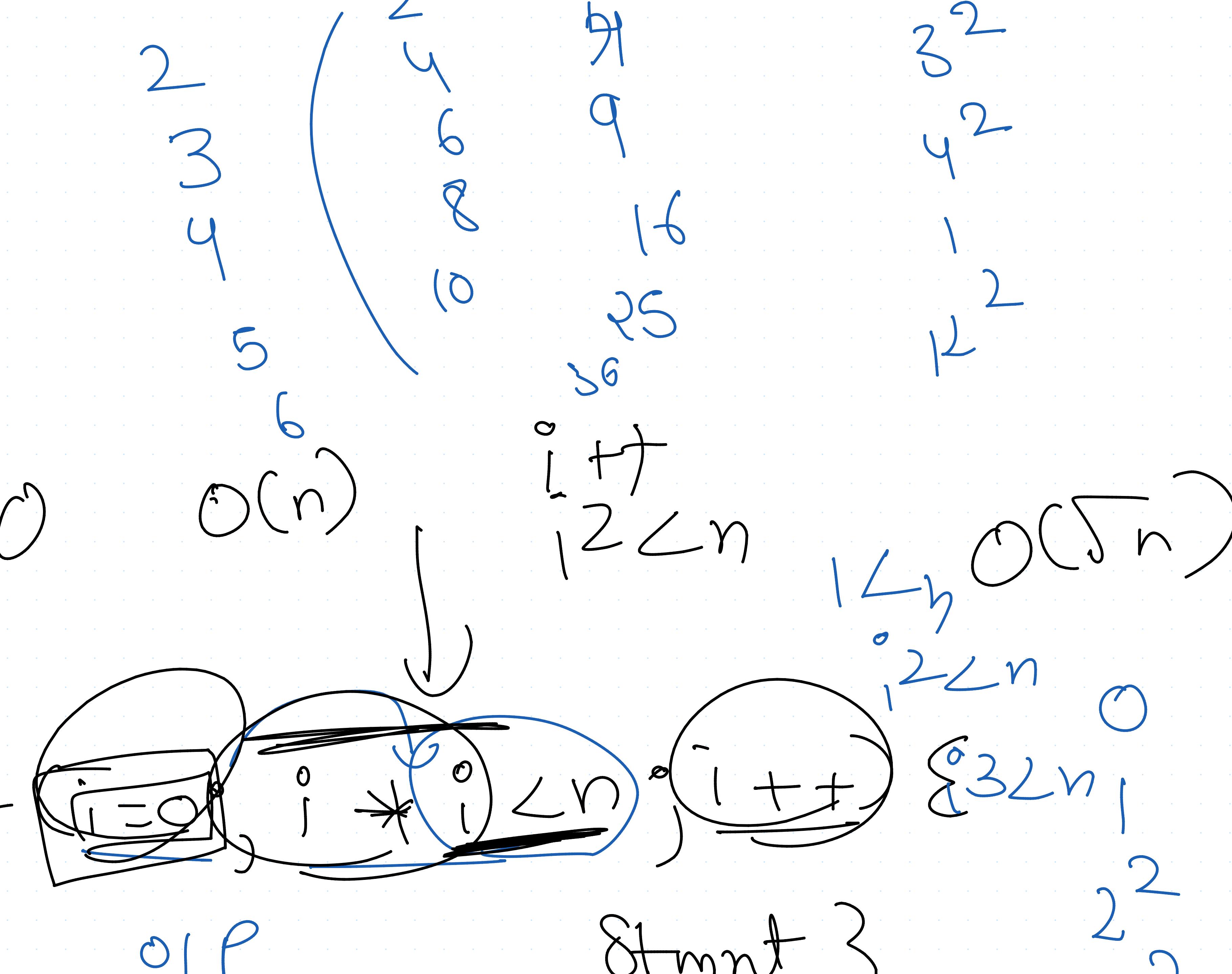
l

$$i^2 = n$$

$$i^2 = \sqrt{n}$$

$$i = \sqrt{n}$$

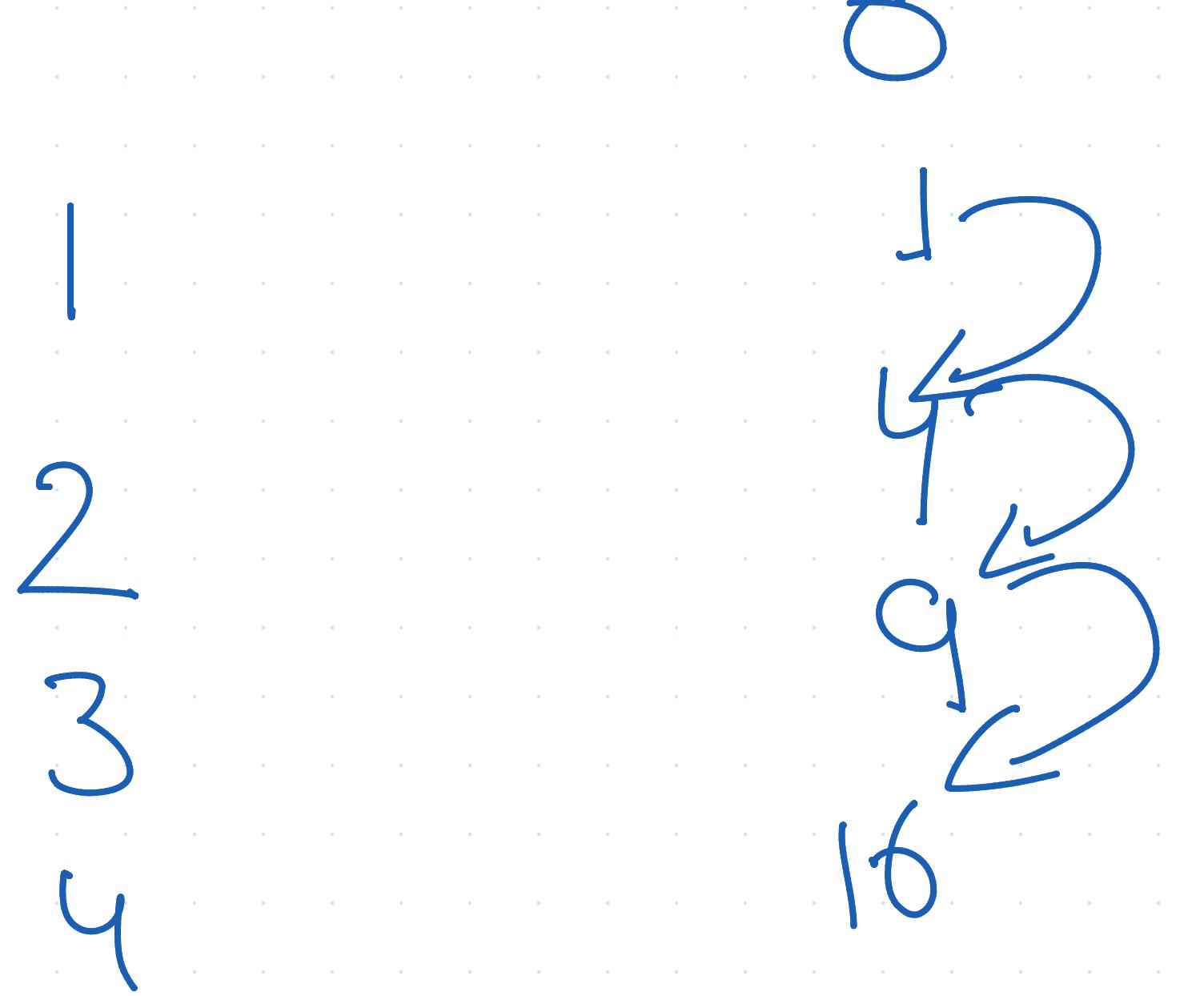
Start {



$f_{0,8}$
 i



$Statement\ 3$



$$K^2 = n \cdot 2^K$$

$$\sqrt{K^2} = \sqrt{n} \cdot K$$

$$\underline{K = \sqrt{n}}$$

$$\underline{\underline{O(\sqrt{n})}}$$

$$1 \\ 2 \\ 3 \\ 5 \\ 2 \\ 2 \\ 1 \\ 2 \\ 2 \\ 1 \\ 2$$

$$\# 2^K \rightarrow \log(n)$$

$$\# K^2 \rightarrow \sqrt{n}$$

1, 2, 3 - - - \swarrow
 \sqrt{n}

#

for ($i = 1$, $i < n$; $i++$) $\rightarrow n$
 n^2 n^3 n^4 $O(n)$

for ($j = 1$; $j < n$; $j++$) $\rightarrow n \rightarrow \frac{n}{2}$
 3 $O(n)$

$m \rightarrow$ loops

$O(n^m)$

A hand-drawn blue ink hash symbol (#) on a white background.

A hand-drawn diagram on a whiteboard. The drawing is enclosed in a large black rectangular border. Inside, there is a blue question mark on the left and a blue circle with a red vertical line through its center on the right.

$\log(\cdot)$

A red hand-drawn arrow points from the word 'SO' at the bottom right towards the right edge of the page.

A scatter plot illustrating a positive linear relationship. The x-axis and y-axis both range from 0 to 10, with major grid lines every 2 units. There are approximately 20 data points plotted as small blue dots. A thick red line represents the linear regression fit. Three specific points are highlighted with large red circles and labeled with the word "log" in red: one point is located below the regression line, one is on the line itself, and one is above the line. Arrows point from the labels "log" to each of these three points.

A photograph of a white sheet of paper with a light blue dotted grid pattern. Handwritten in red ink are the numbers '2' at the top left, '3' below it, and '4' at the bottom right. Handwritten in green ink are the letter 'J' and two plus signs ('+') positioned above and to the right of the number '3'. The handwriting is in a cursive or script style.

A scatter plot showing a positive linear trend. The x-axis has 10 blue dots and the y-axis has 10 blue dots. A red line of best fit passes through the data points, and a red arrow points upwards and to the right, indicating the direction of the trend.

α

卷之三

J X

1

10

A large, hand-drawn style red scribble mark.

The figure contains two sets of data points. The upper set, represented by a red line with circular markers, shows a clear upward trend from left to right. The lower set, represented by a blue line with circular markers, shows a slight downward trend from left to right.

2 2 2 2 7 9

2 3
2 4
2

$\nabla = \frac{1}{r} \partial_r$

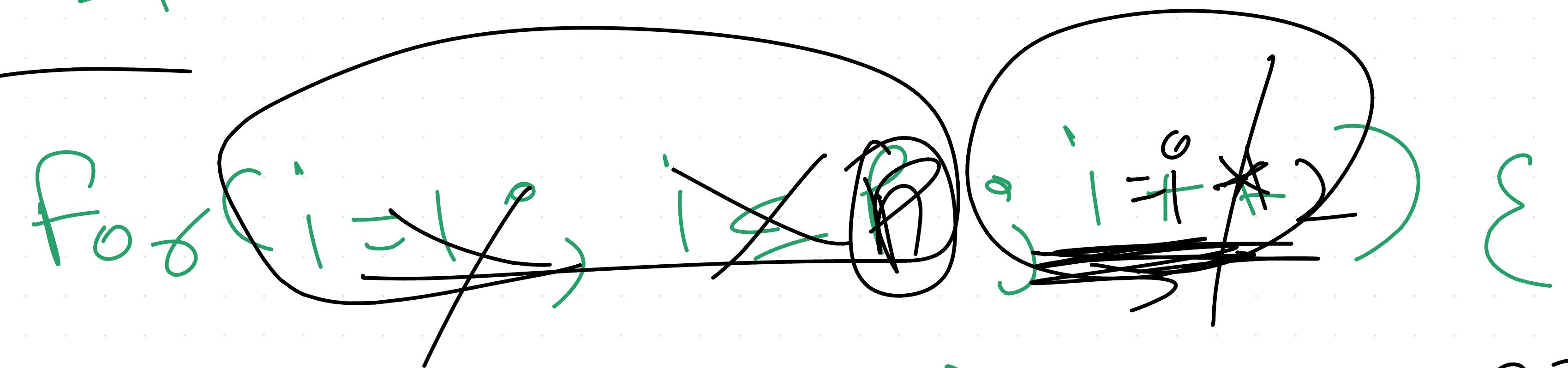
$\Omega(\log n)$

$K \leftarrow \text{OCP}$

$i \leftarrow K$

\dots

$P = 1$



1
2
3
4

Stm₃↑

$\leftarrow \triangleright P$
 OCP

$\log(P)$
 $\log(P)$

\leftarrow k

$K = P$

$O(n)$

i°
 $i * 2^2$
 $i / 2$

$O(\log(n))$

$\sqrt{5}$

i°
 $i++$
 $++i$

$O(n)$

~~for(i=1; i<n; i++)~~ $\rightarrow O(n)$
stmt3

$\text{for}(i=1; i \leq P; i++) \rightarrow O(P)$
stmt3

$\text{for}(i=1; i \leq x; i++) \rightarrow O(x)$
stmt3

for($i=1$; $i \leq n$; $i = i/2$)
 |
 | Stmt } $\rightarrow \log(n)$

for($i=1$; $i < p$; $i = i*2$) $\rightarrow \log(p)$

for($i=1$; $i \leq m$; $i = i*2$) $\rightarrow \log(m)$

A handwritten diagram illustrating the time complexity of a for loop. On the left, a blue 'for' loop structure is shown: `for(i=1; i<n; i++)`. A red arrow points from the condition `i < n` to a black oval containing the variable `n`, indicating that the loop runs until `i` reaches `n`. To the right of the oval, another red arrow points to the increment part `i++`, with a small red circle drawn around it. A large blue arrow points to the right, leading to the complexity notation `O(n)`. Below this, a red box contains the letter `n`, representing the input size.

The diagram illustrates four distinct paths originating from a single red dot at the top center of a grid. Each path leads to one of the four black numbers 1, 2, 3, or 4 arranged in a vertical column on the right side.

- Path 1:** A horizontal line extending to the right, ending at the number 1.
- Path 2:** A line that slopes upwards and to the right, ending at the number 2.
- Path 3:** A horizontal line extending to the right, ending at the number 3.
- Path 4:** A line that slopes downwards and to the right, ending at the number 4.

#

For(
 ²i = 1

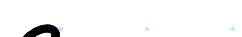
$$2^2$$
$$3^2$$
$$4^2 = n$$

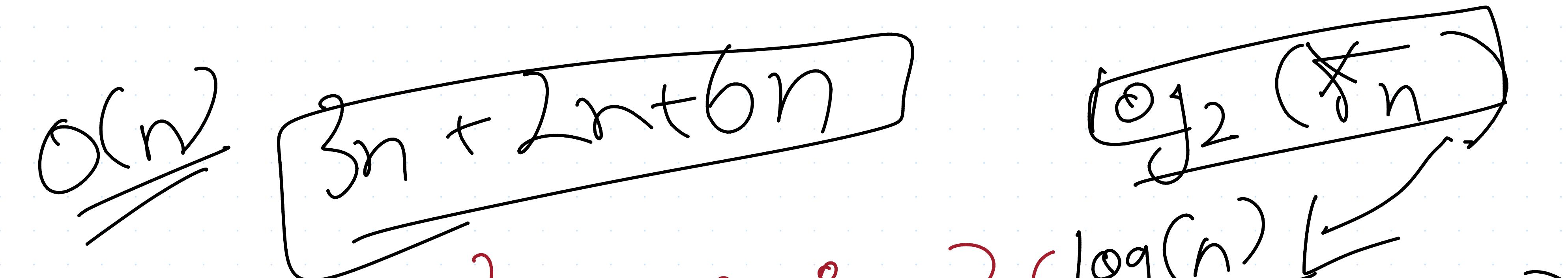
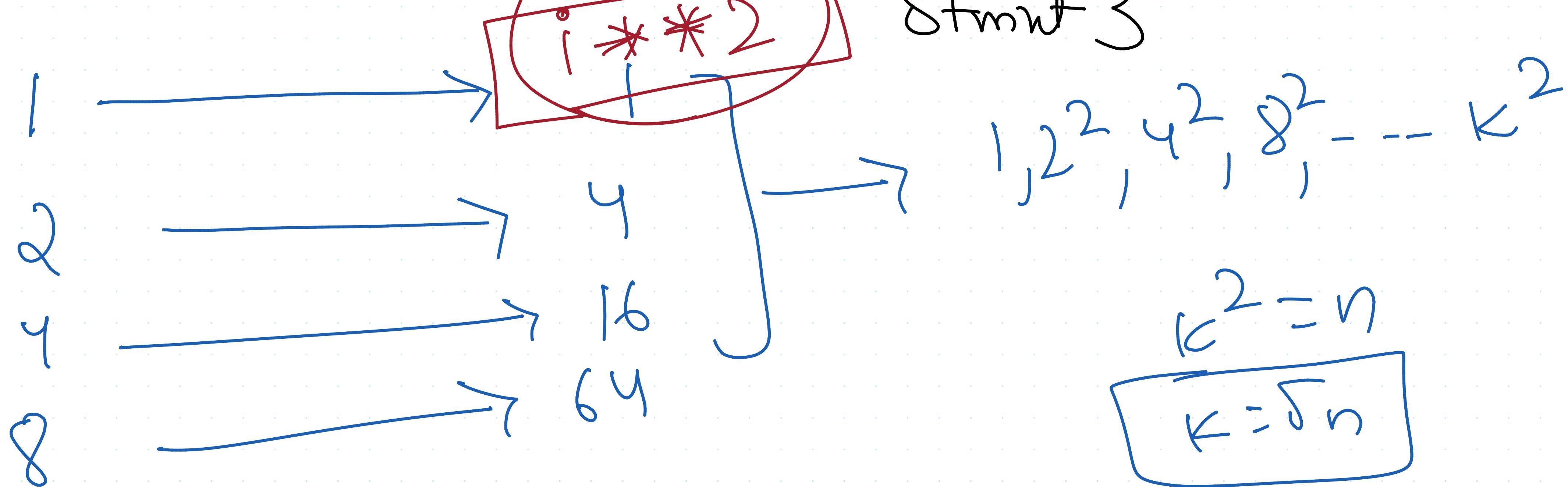
$$y_1^2 = K \cdot n$$

1 2
K

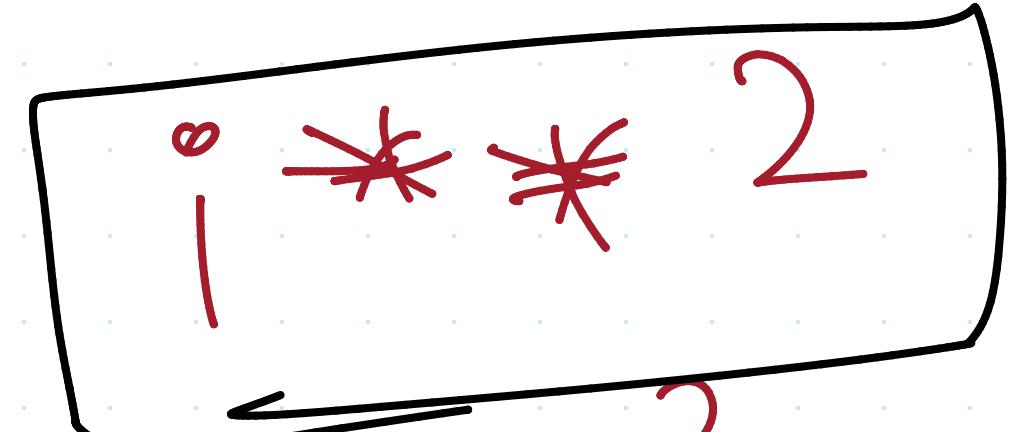
$$K^2 > n$$

A horizontal row of small blue dots representing data points, with two large blue arrows pointing upwards from the left and right ends.

$i = i * 2$  



For ($i=1$; $i^2 \leq n$; $i = i/23$) { $\log(n)$ }



$\log(x_n)$

$\log(n)$

Start

$6n^2 + 8n^3$

$\alpha(n) \sim n^3$

$\log(n)$

$\log(\log(n))$

$\log(\log(\log(n)))$

for ($i = 1$; $i^2 < n$; $i = i/2$) {

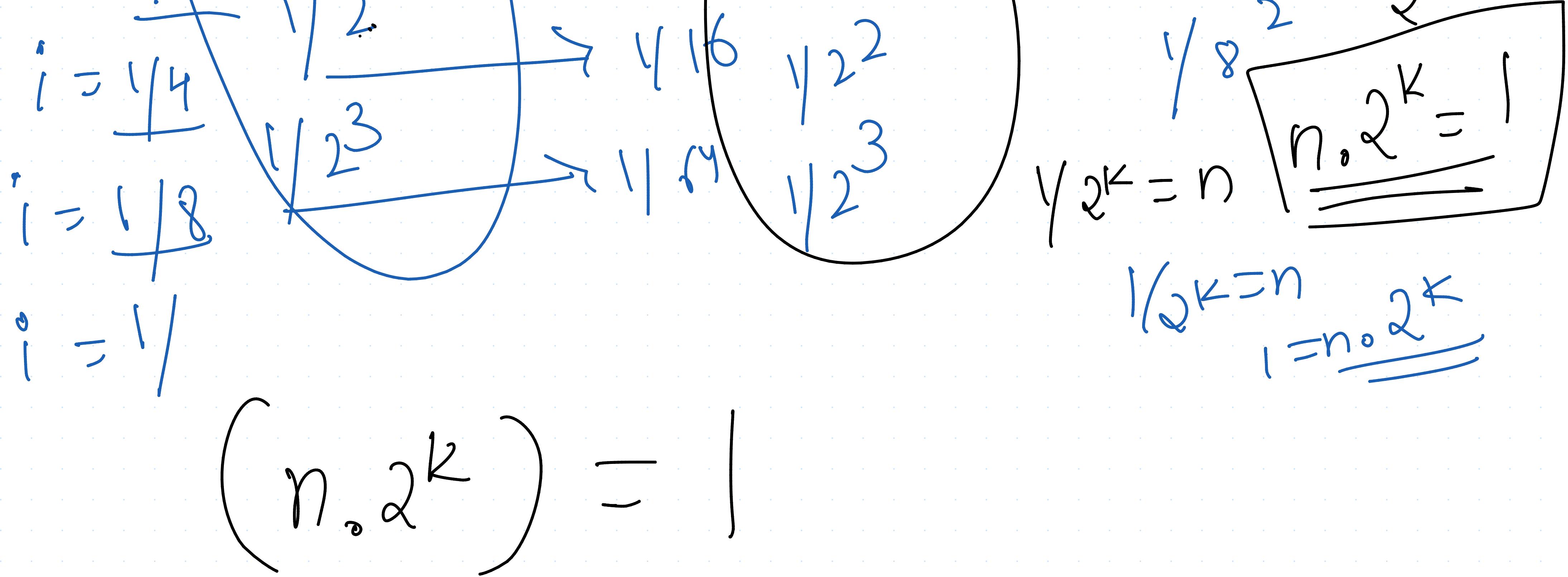
$i = 1$
 $i = 1/2$
 $i = 1/4$
 $i = 1/8$
 $i = 1/16$

if Statement 3

$i = 1/2$

$1/2^2$
 $1/2^4$
 $1/2^8$
 $1/2^{16}$
 $1/2^{32}$
 $1/2^{64}$
 $1/2^{128}$
 $1/2^{256} = n$

$1/4^2$
 $1/16^2$
 $1/256 = n$



$$\log(n_0 \cdot 2^K) = \log(1)$$

$$\log(n) + \log(2^K) = \log(1)$$

$$\log(n) = -\log(2)^K \quad K = \underline{\log(n)}$$
$$\log n = K \cdot \log(2)$$
$$\log(n) = -K \cdot \log(2)$$



$$\log(n)$$
$$\log(2)$$

2
2
2
2

$$i = 1$$

$$i \leq n$$

$$i = i * 2$$

$$\lceil -2^k = n$$

$$h = \log(n)$$

$$i = 1$$

$$i \leq n$$

$$i = i / 2$$

$$\log(n)$$

$$i = 1$$

$$i \leq n$$

$$i = i * 2$$

$$\log(n)$$

$$1/2 ID$$

A hand-drawn diagram on dot-grid paper. It features two circles with red 'X' marks through them. The left circle is enclosed in a black rectangular frame. Inside the left circle, there are black lines forming a triangle-like shape with labels i^0 , i^1 , and i^2 . A red line also passes through the circle. The right circle has a black line passing through it, with labels m , n , and 22 inside. Above the circles, there are blue lines and labels $i = l^\theta$, i , and \checkmark . To the right of the circles, there are more blue and black lines.

The diagram illustrates complex numbers and their operations on a grid background.

At the top left, there is a blue horizontal line representing the real axis. A blue arrow points from the origin along this line towards the right. Above the line, the letter a is written in blue. To the left of the line, the letter b is written in blue. A blue bracket groups the letters a and b . Above the bracket, the letter i is written in blue. Below the bracket, the expression $i = 0 + 1$ is written in blue. To the right of the bracket, there is a blue arrow pointing upwards.

On the right side of the diagram, there is a red wavy line representing the imaginary axis. A red arrow points from the origin along this line towards the right. Above the line, the letter n is written in red. To the left of the line, the letter m is written in red. A red bracket groups the letters m and n . Above the bracket, the letter i is written in red. Below the bracket, the expression $i = i/2$ is written in red. To the right of the bracket, there is a red arrow pointing upwards.

Below the blue line, a black rectangular box contains the expression $i = 0 + 1$.

$$\sqrt{2} - \sqrt{3} - \frac{1}{4} - \sqrt{s} = \sqrt{6} + \sqrt{4} + \sqrt{3} + \sqrt{2}$$