Iterator Interface

\[
\text{get-next (opt) to produce input to opz}
\]

```
DISTINCT
```

```
Project B, C
```

```
Select A = 5
```

FROM R
Sequential scan $\sigma_C(R)$

if $t.c$ is true, put into output buffer

$\text{Cost} = \text{Pages}(R)$
Duplicate Removal (SR) "Distinct"

Cost = If $m-1$ blocks hold all unique values

Pages ($R$)

[Diagram showing a flowchart with nodes labeled 1, M-1, and a question "is new?" with a branch to "YES" and "NO discard"]
GROUP BY $\delta_{A,B, SUM(C), \, \text{avg}(D)}$

\text{new t} \quad \text{YES} \quad \text{init sum sum D}

A, B, C, D, count

\text{NO} \quad \text{update}

\text{cost} = \text{if results fit in } M-1 \text{ block}

\text{pages}(R)$
\text{R \ union \ all \ S}

\text{OUTPUT}

\text{\[\text{cost} = \text{Pages} (R) + \text{Pages} (S)\]}

\text{\(M = 1\)}
R UNION S

\[ \text{cost} = \begin{cases} 0 & \text{if } M-1 > \text{sufficient memory} \\ \text{PAGES}(R) + \text{PAGES}(S) & \text{otherwise} \end{cases} \]
2 EXCEPTS

\[ \text{cost} = \text{If} \, m-1 \, \text{block lines unique value of}_r, \]
then
\[ \text{pages}(r) + \text{pages}(s) \]

M-1 blocks

New register

New register

M blocks

\text{store unique memory}

\text{less delete from tuple}

\text{is tuple} \Rightarrow \text{new register}
Index Scan

```
SELECT A,B
FROM R
WHERE C = 10;
```

Index I1 on R(C)

Output A,B of tuple

Page of R found tuple

M=1

Cast

Root +

INTERNAL (1 for each)

+ LEAF NODES CONTAINING C=10

+ (PAGES CONTAINING TUPLES IF NOD)