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* I'm using UTLXPLP.SQL for pretty printing.

Section 1

5.

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		807G	399175	17M
HASH JOIN		807G	399175	17M
TABLE ACCESS FULL	C	936K	158M	1651
HASH JOIN		861M	284G	22578
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	B	968K	163M	1651

6.

4 and 5 produces same plan.

8.

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		906M	448G	49494
HASH JOIN		906M	448G	49494
TABLE ACCESS FULL	C	936K	158M	1651
HASH JOIN		968K	326M	19917
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	B	968K	163M	1651

9.

7 and 8 produces same plan.

11.

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		715G	353653	14M
HASH JOIN		715G	353653	14M
TABLE ACCESS FULL	APRIME	984K	166M	1651
HASH JOIN		726M	239G	21018
TABLE ACCESS FULL	CPRIME	714K	120M	1649
TABLE ACCESS FULL	BPRIME	1M	171M	1652

12.

same plan.

14.

Operation	Name	Rows	Bytes	Cost
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SELECT STATEMENT		726M	359G	48224
HASH JOIN		726M	359G	48224
TABLE ACCESS FULL	CPRIME	714K	120M	1649
HASH JOIN		1M	343M	20352
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	BPRIME	1M	171M	1652

15.

same plan.

16.

myCon x

APRIME x

0.109 seconds

Worksheet

Query Builder

```

delete from plan_table;
explain plan for select * from A, B, C where A.ht = B.ht and B.ht = C.ot;
/*explain plan for select * from A, B, C where C.ot = B.ht and B.ht = A.ht;*/

select | Operation                                | Name                                | Rows | Bytes | Cost
union all
select '-----
union all
select rpad(' | ' || substr(lpad(' ', 1*(level-1)) || operation ||
          decode(options, null, ' ', ' ' || options), 1, 34), 35, ' ') || ' | ' |
rpad(substr(object_name || ' ', 1, 20), 20, ' ') || ' | ' |
lpad(decode(cardinality, null, ' ',
            decode(sign(cardinality-1000), -1, cardinality || ' ',
            decode(sign(cardinality-1000000), -1, trunc(cardinality/1000) || 'K',
            decode(sign(cardinality-1000000000), -1, trunc(cardinality/1000000) || 'M',
            trunc(cardinality/1000000000) || 'G'))), 7, ' ') || ' | ' |
lpad(decode(bytes, null, ' ',
            decode(sign(bytes-1024), -1, bytes || ' ',

```

Script Output x

Query Result x

Task completed in 0.109 seconds

6 rows deleted.
plan FOR succeeded.
Plan Table

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		100M	49G	191078
HASH JOIN		100M	49G	191078
TABLE ACCESS FULL	C	936K	158M	1651
HASH JOIN		9M	3G	19943
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	B	968K	163M	1651

9 rows selected

myCon x

APRIME x

0.161 seconds

Worksheet

Query Builder

```

delete from plan_table;
/*explain plan for select * from A, B, C where A.ht = B.ht and B.ht = C.ot;*/
explain plan for select * from A, B, C where C.ot = B.ht and B.ht = A.ht;

select '| Operation                                | Name                                | Rows | Bytes| C
union all
select '-----
union all
select rpad(''|substr(lpad(' ',1*(level-1))||operation||
          decode(options,null,''|options),1,34),35,' '|'|||
       rpad(substr(object_name||' ',1,20),20,' '|)||'|
       lpad(decode(cardinality,null,' ',
          decode(sign(cardinality-1000),-1,cardinality)||' ',
          decode(sign(cardinality-1000000),-1,trunc(cardinality/1000))||'K',
          decode(sign(cardinality-1000000000),-1,trunc(cardinality/1000000))||'M',
          trunc(cardinality/1000000000)||'G'))),7,' '|)||'|
       lpad(decode(bytes,null,' ',
          decode(sign(bytes-1024),-1,bytes)||' ',

```

Script Output x

Query Result x

Task completed in 0.161 seconds

9 rows selected

6 rows deleted.

plan FOR succeeded.

Plan Table

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		100M	49G	191078
HASH JOIN		100M	49G	191078
TABLE ACCESS FULL	C	936K	158M	1651
HASH JOIN		9M	3G	19943
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	B	968K	163M	1651

9 rows selected

18.

myCon x

APRIME x

0.153 seconds

Worksheet

Query Builder

```

delete from plan_table;
explain plan for select * from A, BPRIME, CPrime where A.pk = BPRIME.ht and BPRIME.ht = CPrime.ot;

select ' | Operation                                | Name                                | Rows | Bytes| Cost |' as "Plan Tab"
union all
select '-----' from dual
union all
select rpad(' | '||substr(lpad(' ',1*(level-1))||operation||
      decode(options, null,' '||options), 1, 34), 35, ' ')||'|'
      rpad(substr(object_name||' ',1, 20), 20, ' ')||'|'
      lpad(decode(cardinality,null,' ',
        decode(sign(cardinality-1000), -1, cardinality)||' ',
        decode(sign(cardinality-1000000), -1, trunc(cardinality/1000)||'K',
        decode(sign(cardinality-1000000000), -1, trunc(cardinality/1000000)||'M',
        trunc(cardinality/1000000000)||'G'))), 7, ' ') || ' |' ||
      lpad(decode(bytes,null,' ',
        decode(sign(bytes-1024), -1, bytes)||' ',
        decode(sign(bytes-1048576), -1, trunc(bytes/1024)||'K',

```

Script Output x

Query Result x

Task completed in 0.153 seconds

9 rows selected

6 rows deleted.

plan FOR succeeded.

Plan Table

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		8M	4G	46006
HASH JOIN		8M	4G	46006
TABLE ACCESS FULL	CPRIME	714K	120M	1649
HASH JOIN		1M	343M	20352
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	BPRIME	1M	171M	1652

9 rows selected

19.

myCon x APRIME x

0.132 seconds

Worksheet Query Builder

```
delete from plan_table;
explain plan for select * from A, BPrime, CPrime where CPrime.ot = BPrime.ht and BPrime.ht = A.pk;

select ' | Operation | Name | Rows | Bytes | Cost | ' as "Plan Table"
union all
select '-----' from dual
union all
select rpad(' | '||substr(lpad(' ',1*(level-1))||operation||
        decode(options,null,' '||options),1,34),35,' ')||' | '||
        rpad(substr(object_name||' ',1,20),20,' ')||' | '||
        lpad(decode(cardinality,null,' ',
        decode(sign(cardinality-1000),-1,cardinality||' ',
        decode(sign(cardinality-1000000),-1,trunc(cardinality/1000)||'K',
        decode(sign(cardinality-1000000000),-1,trunc(cardinality/1000000)||'M',
        trunc(cardinality/1000000000)||'G'))),7,' ') || ' | '||
        lpad(decode(bytes,null,' ',
        decode(sign(bytes-1024),-1,bytes||' ',
        decode(sign(bytes-1048576),-1,trunc(bytes/1024)||'K',
```

Script Output x Query Result x

Task completed in 0.132 seconds

9 rows selected

6 rows deleted.
plan FOR succeeded.
Plan Table

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		8M	4G	46006
HASH JOIN		8M	4G	46006
TABLE ACCESS FULL	CPRIME	714K	120M	1649
HASH JOIN		1M	343M	20352
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	BPRIME	1M	171M	1652

9 rows selected

The order of the tables in from clause doesn't impact the final plan.

20.

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		1M	706M	50512
HASH JOIN		1M	706M	50512
TABLE ACCESS FULL	CDPRIME	1M	206M	1653
HASH JOIN		1M	342M	20343
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	BDPRIME	1M	171M	1652

21.

Operation	Name	Rows	Bytes	Cost
SELECT STATEMENT		1M	706M	50512
HASH JOIN		1M	706M	50512
TABLE ACCESS FULL	CDPRIME	1M	206M	1653
HASH JOIN		1M	342M	20343
TABLE ACCESS FULL	A	890K	150M	1651
TABLE ACCESS FULL	BDPRIME	1M	171M	1652

22.

20 and 21 have same plan.

The optimizer is impacted by the foreign keys constraint. As BDPrime and CDPrime both have foreign keys referencing A (pk), the query joins A with another table first. This hash join only takes 1M rows, which exactly query the rows in B (and find its referencing row in A in constant time). Otherwise, this join would take $|A| * |BDPrime|$ rows.