DB1 Syntax Details

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"so basically i am monkey" - monke, monkeeee

Acknowledgements

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Most of the following is based on the Oracle Tutorial.

Reset Everything

Reset Everything

Run the following to get the commands to drop all tables and their constraints:

```
begin
  for i in (select index_name from user_indexes where index
    execute immediate 'drop index ' || i.index_name;
  end loop;

  for i in (select trigger_name from user_triggers) loop
    execute immediate 'drop trigger ' || i.trigger_name;
  end loop;

  for i in (select view_name from user_views) loop
    execute immediate 'drop view ' || i.view_name;
  end loop;

  for i in (select table_name from user_tables) loop
    execute immediate 'drop table ' || i.table_name || ' ca
  end loop;
```

SQL

Operators

Operator	Description
=	Equality
!=,<>	Inequality
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
IN	Equal to any value in a list of values
ANY/ SOME/ ALL	Compare a value to a list or subquery. It must be preceded by another operator such as =, >, <.j
NOT IN	Not equal to any value in a list of values
[NOT] BETWEEN n and m	Equivalent to [Not] >= n and <= y.
[NOT] EXISTS	Return true if subquery returns at least one row
IS [NOT]	NULL test

Joins

- An **inner join** matches stuff in both tables:

```
select a.id as id_a, a.color as color_a, b.id as id_b,
```

- A **left (outer) join** matches everything in the left tables plus what matches in the right table:

```
select a.id as id_a, a.color as color_a, b.id as id_b,
```

- This **left (outer)** join matches everything that is in the left table and not in the right table:

```
select a.id as id_a, a.color as color_a, b.id as id_b,
```

- A **right (outer) join** matches everything in the right join plus what matches in the left table:

```
select a.id as id_a, a.color as color_a, b.id as id_b,
```

- This **right (outer) join** matches everything that is in the right table and not in the left table:

```
select a.id as id_a, a.color as color_a, b.id as id_b,
```

Aliases

- You can alias long column names with `select mylongname as name from contacts` or just `select mylongname name from contacts`. The as keyword is optional. Full-text column names are supported by enclosing in “”. as can also format strings: `select first_name || ' ' || last_name as "Name" from employees;` yields Alice, Bob and System.
- You can also create a table alias (using `from employees e`), but you CAN'T USE the as keyword.

Limits and Pagination

- The Oracle equivalent of filter is `fetch n next rows only`: `select * from products order by list_price desc fetch next 5 rows only;`.
- You may also use the `fetch next n percent rows only`:

```
select * from inventories order by quantity desc fetch
```

- Filtering by for example a quantity, and you only want the first 10 "condition matches"? Use `fetch n next rows with ties`:

```
select * from inventories order by quantity desc fetch
```

- Need Pagination? Use offset:

```
select * from products order by standard_cost desc offs
```

Dates and Intervals

- Want to extract a year from a date? Use `extract`:

```
select * from orders where status = 'Shipped' and extra
```

- Want to get the current date? Use `current_date`:

```
select current_date from dual;
```

- The `to_char` function can convert dates (and timestamps) to chars:

```
select to_char(sysdate, 'YYYY-MM-DD') from dual;
```

- The `to_date` function can convert chars to dates:

```
select to_date('2021-01-12', 'YYYY-MM-DD') from dual;
```

- Alternatively, the date literal uses the `YYYY-MM-DD` format and does not require format specs:

```
select date '1969-04-20' from dual;
```

- You can get the current date with `sysdate`:

Expressions

- Only single quotes are supported.
- Comparisons are done with =, NOT ==.
- It also supports full expression evaluation:

```
select product_name as "Product Name", list_price - standar
```

- You can use () in where clauses to prioritize:

```
select * from orders where (
status = 'Canceled' or status = 'Pending' ) and custome
order by order_date;
```

- The in keyword is a useful tool for sub collections and subqueries:
  - `select * from orders where salesman_id in (54, 55, 56) order by order_id;`
  - `select * from orders where salesman_id not in (54, 55, 56) order by order_id;` (you can use not)
  - `select * from employees where employee_id in ( select distinct salesman_id from orders where`

Grouping and Ordering

- You can use functions like `upper` and dates when ordering.
- The `group by` keyword can be used to find unique data:

```
select status from orders group by status;
```

- By combining `group by` with `count` you can count the amount of unique data:

```
select status, count (*) from orders group by status;
```

- `group by` can also be used with the `where` keyword:

```
select name, count(*) as "Shipped Orders" from orders i
```

- `where` can NOT APPEAR AFTER `group by`; use the having keyword instead.
- The `having` keyword enables you to filter like with `where`, but after the `group by` keyword like so:

```
select status from orders where extract(year from order
```

Counting and Sums

- You can count the amount of rows with the `count()` function:

```
select count(*) from products
```

- The `sum` function can be used to calculate a total:

```
select sum(unit_price * quantity) from order_items;
```

- It can also be used to calculate a total per row (the group by `order_id` part is required; `group by order_value` does not work):

```
select order_id, sum(unit_price * quantity) as order_va
```

Inserting

- It is a good idea to always specify the columns when inserting:

```
insert into discounts(discount_name, amount, start_date
```

- You can also "insert from select" using `insert into`:

```
insert into sales(customer_id, product_id, order_date,
```

- It's even possible to "create a table from select" using `create table x as`, basically coping its schema (`where 1 = 0` skips copying the rows):

```
create table sales_2017 as select * from sales where 1
```

- Using insert all, it is possible to insert multiple rows at once (note the lack of commas between the into keywords. Here, the subquery is ignored/a placeholder.):

```
insert all into fruits (fruit_name, color) values ('App
```

- You can also use conditions based on the subquery (`insert first` is the equivalent of a switch case.):

Switches

- Using `case` it is possible to create if/else constructs:

```
select product_name, list_price, case category_id when
```

- `case` is also useful for conditional grouping:

```
select * from locations order by country_id, case count
```

- `case` also evaluates to an expression, so you can use it for conditional updates:

```
update products set list_price = case when list_price <
```

Helper Functions

- You can extract substrings with `substr`: `select substr('Alex', 1, 1) from dual;`
- Stuff like `select upper('uwu') from dual` can come in handy.
- Using `round` it is possible to round numbers (returns 5.23):

```
select round(5.234234234234, 2) from dual;
```

- You can use `replace` to replace strings:

```
update accounts set phone = replace(phone, '+1-', '');
```

- You can use the `floor`, `round` and `ceil` functions to get rounded values.

Auto-Generated Primary Keys

- `generated by default as identity` is quite useful for auto-incrementing columns such as PKs:

  ```
  create table persons ( person_id number generated by de
  ```

- `generated always as identity` is the same but does not allow setting it manually.

Modifying Columns

- You can use `desc mytable` to show the schema for a table.
- `alter table` can be used to add columns using add:

```
alter table persons add birthdate date not null;
```

- You can also add multiples at once (note that there is no column keyword):

```
alter table persons add ( phone varchar2(20), email var
```

- `modify` can change the column type (note that there is no column keyword):

```
alter table persons modify birthdate date null;
```

- `drop column` can be used to remove a column

```
alter table persons drop column birthdate;
```

- `rename column` can be used to rename a column:

```
alter table persons rename column first_name to forenam
```

Virtual Columns

- You can create virtual columns in regular tables without using views with `alter table x add ... as` (note the required `(` after the `as` keyword):

```
alter table parts add (capacity_description as ( case w
```

- The size of a `varchar2` is adjustable afterwards (note that this checks if any current `varchar2`s are larger than the new size and fails if they are.):

```
alter table persons modify first_name varchar2(255);
```

Modifying Tables

- You can drop a table with `drop table`:

  ```
  drop table people;
  ```

- Appending `purge` clears the recycle bin; appending `cascade constraints` drop all related constraints.

- You can clear a table using `truncate table`:

  ```
  truncate table customers_copy;
  ```

- The same limitations as with drop table concerning constraints apply, so appending cascade (WITHOUT constraints) drops all related ones.

- You can clear the recycle bin with:

  ```
  purge recyclebin;
  ```

Constraints

- It is possible to add constraints (any constraints, a primary key in this example) after creating a table with add constraint:

```
alter table purchase_orders add constraint purchase_ord
```

- You may remove a constraint with `drop constraint`:

```
alter table purchase_orders drop constraint purchase_or
```

- Instead of removing it, you can also use `disable constraint`:

```
alter table purchase_orders disable constraint purchase
```

- And re-enable it with `enable constraint`:

```
alter table purchase_orders enable constraint purchase_
```

- You can also add foreign key constraints:

```
alter table suppliers add constraint suppliers_supplier
```

- Using a check constraint, arbitrary expressions can be

Types

- You can create a number within a range: `number(1,0)`.
- The `number` type is used for all types of numbers by specifying precision and scale: `number(6)` (or `number(6,0)`) is a signed integer fitting 6 digits, `number(6,2)` is a float with two digits precision. The DB doesn't just cut of numbers, it rounds them.
- The float type can be emulated by the number type, i.e. `float(2)` is equal to `number(38,2)`. The argument is in bits instead of digits though.
- The `lengthdb` function can be used to get the length of field in bytes.
- The char type has a fixed length: name `char(10)` or name `char(10 bytes)`, meaning that a char always takes up the amount of bytes set. `nchar` is the same but UTF-8 or UTF-16 any doesn't take bytes.
- The `varchar2` type also takes an argument for the length in bytes, which in ASCII corresponds to the amount of characters. `nvarchar2` is the same but UTF-8 or UTF-16 and doesn't take bytes.

Views

- You can create a view with `create view x as select ...`:

  ```
  create view employees_years_of_service as select employ
  ```

- If used with `create or replace view`, upserts are possible.
- By appending `with read only`, you can prevent data modifications:

  ```
  create or replace view employees_years_of_service as se
  ```

- `drop view x` removes the view.
- Deletions and updates on views are usually fine, but inserts can often be not that useful due to fields being excluded from the view; see `instead of` triggers later on for a solution;
- Subqueries can be used in selects:

  ```
  select * from ( select * from products) where list_pric
  ```

- They can also be used in updates:

Indexes

- You can create an index with `create index`:

```
create index members_last_name on members(last_name);
```

- You can also create an index spanning multiple columns:

```
create index members_full_name on members(first_name, l
```

- You can drop an index with `drop index`:

```
drop index members_full_name;
```

PL/SQL

Block Structure

- Block structure:

```
declare
-- declarations
begin
-- your logic
exception
-- exception handling
end;
```

- The most simple example is as follows:

```
begin
   dbms_output.put_line('Hello World!');
end;
```

- Use `put_line` from the `dmbs_output` package to print to stdout.
- You can use the declare section for variables:

Variables

- PL/SQL extends SQL by adding a boolean type (which can have the values true, false and null).
- Variables need not be given a value at declaration if they are nullable:

```
declare
    total_sales number(15,2);
    credit_limit number(10,0);
    contact_name varchar2(255);
begin
    null;
end;
```

- You can use `default` as an alternative to the `:=` operator when assigning variables in the declaration section. DO NOT use = when assignment, even re-assignment also uses `:=`.
- If a variable is defined as not null, it can't take a string of length 0:

Fetching Data

- Use `select ... into` to fetch data into variables; `%TYPE` infers the type of a column:

```
declare
    customer_name customers.name%TYPE;
    customer_credit_limit customers.credit_limit%TYPE;
begin
    select
        name, credit_limit
    into
        customer_name, customer_credit_limit
    from customers where customer_id = 38;

    dbms_output.put_line(customer_name || ': ' || custo
end;
```

Branches and Expressions

- `if ... then ... end if` can be used for branching:

```
declare
    sales number := 20000;
begin
    if sales > 10000 then
        dbms_output.put_line('Lots of sales!');
    end if;
end;
```

- Inline expressions are also supported:

```
large_sales := sales > 10000
```

- Booleans need not be compared with `my_bool = true`, a simple `if my_bool then` is fine.
- `elseif ... then` is NOT valid syntax; `elsif ... then` is valid syntax.
- Statements may also be nested:

Switches

- You may use the case keyword for switch cases:

```
declare
    grade char(1);
    message varchar2(255);
begin
    grade := 'A';

    case grade
        when 'A' then
            message := 'Excellent';
        when 'B' then
            message := 'Great';
        when 'C' then
            message := 'Good';
        when 'D' then
            message := 'Fair';
        when 'F' then
            message := 'Poor';
```

Labels and Goto

- A `label`/`goto` equivalent is also available:

```
begin
    goto do_work;
    goto goodbye;

    <<do_work>>
    dbms_output.put_line('mawahaha');

    <<goodbye>>
    dbms_output.put_line('Goodbye!');
end;
```

Loops

- The equivalent of the `while` loop is the `loop`. `exit`/`continue` prevents an infinite loop:

```
declare
    i number := 0;
begin
    loop
        i := i + 1;

        dbms_output.put_line('Iterator: ' || i);

        if i >= 10 then
            exit;
        end if;
    end loop;

    dbms_output.put_line('Done!');
end;
```

Types and Objects

- You can also use %ROWTYPE to infer the type of a row and select an entire row at once:

```
declare
    customer customers%ROWTYPE;
begin
    select * into customer from customers where custome

    dbms_output.put_line(customer.name || '/' || custom
end;
```

- It is also possible to use OOP-style object/row creation thanks to %ROWTYPE:

```
declare
    person persons%ROWTYPE;

begin
    person.person_id := 1;
    person.first_name := 'John';
```

Exceptions

- You can create custom exceptions:

```
declare
    e_credit_too_high exception;
    pragma exception_init(e_credit_too_high, -20001);
begin
    if 10000 > 1000 then
        raise e_credit_too_high;
    end if;
end;
```

- If you want to raise a custom exception, use `raise_application_error`:

```
declare
    e_credit_too_high exception;
    pragma exception_init(e_credit_too_high, -20001);
begin
    raise_application_error(-20001, 'Credit is to high!
end;
```

Cursors

- Using cursors, you can procedurally process data:

```
declare
    cursor sales_cursor is select * from sales;
    sales_record sales_cursor%ROWTYPE;
begin
    update customers set credit_limit = 0;

    open sales_cursor;

    loop
        fetch sales_cursor into sales_record;
        exit when sales_cursor%NOTFOUND;

        update
            customers
        set
            credit_limit = extract(year from sysdate)
        where
```

Locks

- The DB can also lock fields for safe multiple access:

```
declare
    cursor customers_cursor is select * from customers
begin
    for customer_record in customers_cursor loop
        update customers set credit_limit = 0 where cus
    end loop;
end;
```

Procedures

- You can create procedures, which are comparable to functions:

```
create or replace procedure
    print_contact(customer_id_arg number)
is
    contact_record contacts%rowtype;
begin
    select * into contact_record from contacts where cu

    dbms_output.put_line(contact_record.first_name || '
end;
```

- These procedures can then be executed:

```
begin
    print_contact(50);
end;
```

- Or, without PL/SQL:

```
exec print_contact(50);
```

Functions

- Functions are similar, but require returning a value:

```
create or replace function
    get_total_sales_for_year(year_arg integer)
return number
is
    total_sales number := 0;
begin
    select sum(unit_price * quantity) into total_sales
    from order_items
    inner join orders using (order_id)
    where status = 'Shipped'
    group by extract(year from order_date)
    having extract(year from order_date) = year_arg;

    return total_sales;
end;
```

- You can call them from PL/SQL:

Packages

- Packages can be used to group function "interfaces" and variables:

```
create or replace package order_management
as
    shipped_status constant varchar(10) := 'Shipped';
    pending_status constant varchar(10) := 'Pending';
    cancelled_status constant varchar(10) := 'Canceled'

    function get_total_transactions return number;
end order_management;
```

- You can now access the variables in the package with `.`:

```
begin
    dbms_output.put_line(order_management.shipped_statu
end;
```

- In order to use functions in a package, you then have to create a package body, implementing it:

Triggers

- Triggers follow a similar structure as procedures:

```
declare
-- declarations
begin
-- your logic
exception
-- exception handling
end;
```

- Using triggers, you can for example create a manual log after operations with `after update or delete on ...`:

```
create or replace trigger customers_audit_trigger
    after update or delete
    on customers
    for each row
declare
    transaction_type varchar2(10);
begin
```

Maps

- Maps are also possible in PL/SQL using `table of`:

```
declare
    type country_capitals_type
        is table of varchar2(100)
        index by varchar2(50);

    country_capitals country_capitals_type;
begin
    country_capitals('China') := 'Beijing';
    country_capitals('EU') := 'Brussels';
    country_capitals('USA') := 'Washington';
end;
```

- You can use `mymap.first` and `mymap.next` to iterate:

```
declare
    type country_capitals_type
        is table of varchar2(100)
        index by varchar2(50);
```

Arrays

- Using `varray`, it is also possible to create arrays:

```
declare
    type names_type is varray(255) of varchar2(20) not

    names names_type := names_type('Albert', 'Jonathan'
begin
    dbms_output.put_line('Length before append: ' || na

    names.extend;

    names(names.last) := 'Alice';

    dbms_output.put_line('Length after append: ' || nam

    names.trim;

    dbms_output.put_line('Length after trim: ' || names
```