University of British Columbia, Vancouver
Department of Computer Science

CPSC 304 Project Cover Page

Milestone #: __2__

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Group Number: __84__

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

ER Diagram:
Changes

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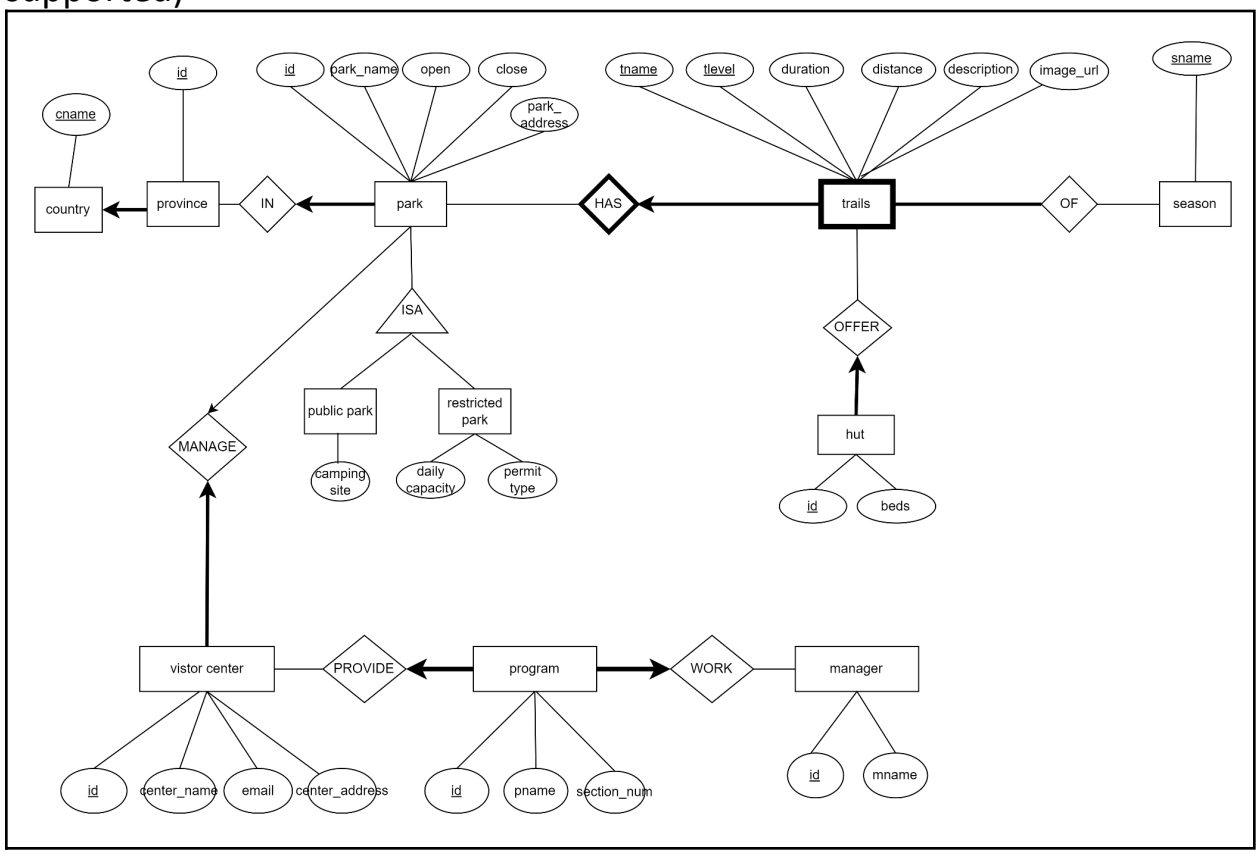
2. The ER diagram

// tname, tlevel of trails are the keys of a weak entity. (dotted line are not supported)



changes:

1. Assign id as a key of the **province** attribute
2. Add the **country** entity to have 7 relationships
3. Add attribute:
    a. Image url in trail entity
    b. Park address in park entity
    c. Section number in program

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3 & 4. Table list

1) Country(cname: string)
PK: cname
CK: N/A
FK: N/A
FD: N/A

2) Province(id: number, cname: string) (cname cannot be NULL)
PK: id
CK: N/A
FK: cname
FD:
id -> cname

3) Park(id: number, province_id: number, park_name: string, park_address: string, open_hour: string, close_hour: string) (province_id cannot be NULL)
PK: id
CK: park_address,
FK: province_id
FDs:
id -> park_name, open_hour, close_hour, park_address, province_id
park_address -> id, province_id, name, open_hour, close_hour

4) Public_park (id: number, camping_site: number)
PK: id
CK: N/A
FK: id
FD:
id -> camping_site

5) Restricted_park (id: number, daily_capacity: number, permit_type: string)
PK: id,
CK: N/A
FK: id,
FD:
id -> daily_capacity, permit_type

6) Trail(name: string, tlevel: string, duration: string, distance: number, description: string, park_id: number, image_url: string)
PK: name, park_id, tlevel
CK: N/A
FK: park_id

FDs:
FD1: name, park_id, tlevel -> duration, distance, description, image_url
FD2: tlevel, distance -> duration

7) Season(name: string)
PK: name
CK: N/A
FK: N/A
FD: N/A

8) Trail_season(park_id: number, trail_name: string, season_name: string)
PK: park_id, trail_name, season_name
CK: N/A
FK: park_id, trail_name, season_name
FD: N/A – All attributes are part of the primary key.

9) Hut(id: number, beds: number, trail_name: string, park_id: number) (trail_name, park_id cannot be NULL)

PK: id
CK: N/A
FK: trail_name, park_id
FD:
id -> beds, trail_name, park_id

10) Visitor_center(id: number, park_id: number, center_name: string, email: string, center_address: string) (park_id is Unique, park_id cannot be null)
PK: id
CK: center_address
FK: park_id
FDs:
id -> name, email, center_address, park_id
center_address -> id, contact_number, email, park_id

11) Program(pname: string, section_num: number, visitor_center_id: number, manager_id: number) (visitor_center_id, manager_id cannot be NULL)
PK: id
CK: N/A
FK: visitor_center_id, manager_id
FDs:
FD1: id -> name, section_num, visitor_center_id, manager_id
FD2: visitor_center_id, pname, section_num -> manager_id

FD3: visitor_center_id, pname, section_num -> id

12) Manager(id:number, mname: string)
PK: id
CK: N/A
FK: N/A
FD:
id -> mname

5. Normalization

1) Country(cname: string)
Normalization: Already in BCNF

2) Province(id: number, **country_name**: string, name: string) (country_name cannot be NULL)
Normalization: Already in BCNF

3) Park(id, name: string, open_hour: string, close_hour: string, province_id, park_address) (province_id cannot be NULL)
Normalization: Already in BCNF

4) Public_park(id: number, camping_site: number)
Normalization: Already in BCNF

5) Restricted_park(id: number, daily_capacity: number, permit_type: string)
Normalization: Already in BCNF

6) Trail(name: string, tlevel: string, park_id: number, duration: string, distance: number, trail_description: string, image_url: string)
Normalization:
FDs:
FD1: name, park_id, tlevel -> duration, distance, description, image_url
FD2: tlevel, distance -> duration

Trail(tname: string, level: string, park_id: number, duration: string, distance: number, trail_description: string, image_url: string)

Trail table is not in BCNF because (level, distance) in FD2 are not a super key; it's also not in 3NF due to (duration) in FD2 not being a part of a (minimal) key. Thus, decompose Trail.
Decompose Trail into:

Trail_info(tname: string, tlevel: string, park_id: number, distance: number,
trail_description: string, image_url: string)
PK: tname, park_id, tlevel
CK: N/A
FK: park_id, distance, tlevel

Trail_level(tlevel: string, distance: number, duration: string)
PK: tlevel, distance
CK: N/A
FK: N/A

7) Season(name: string)
Normalization: Already in BCNF

8) Trail_season(park_id: number, trail_name: string, season_name: string)
Normalization: Already in BCNF

9) Hut(id: number, beds: number, trail_name: string, park_id: number) (trail_name, park_id cannot be NULL)
Normalization: Already in BCNF

10) Visitor_center(id: number, center_name: string, email: string, vc_address: string, park_id: number) (park_id is Unique, park_id cannot be null)
Normalization: Already in BCNF

11) Program(id: number, pname: string, section_num: number, visitor_center_id: number, manager_id: number) (visitor_center_id, manager_id cannot be NULL)
Normalization:

FDs:
FD1: id -> name, section_num, visitor_center_id, manager_id
FD2: visitor_center_id, pname, section_num -> manager_id
FD3: visitor_center_id, pname, section_num -> id

Program(id: number, pname: string, section_num: number, visitor_center_id: number, manager_id: number)

Program table is not in BCNF or 3NF since the X (visitor_center_id, name, section_num) in FD2 and FD3 are not a superkey and the b of FD2, manager_id is not a part of a (minimal) key. Thus, decompose it into BCNF.

Program_info(id: number, visitor_center_id: number, pname: string, section_num: number) (visitor_center_id, pname, section_num cannot be NULL)
PK: id
CK: N/A
FK: visitor_center_id, pname, section_num

Program_manager(visitor_center_id: number, pname: string, section_num: number, manager_id: number) (manager_id cannot be NULL)
PK: visitor_center_id, pname, section_num
CK: N/A
FK: visitor_center_id, manager_id

12) Manager(id:number, name: string)
Normalization: Already in BCNF

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CONSTRAINTS:

- **SQL DDL statements for #6 and #7 are Oracle-compatible.**
  - Oracle does not support “ON UPDATE CASCADE”. Therefore, we have only included “ON DELETE CASCADE” where needed.

6. SQL DDL statements

```
// Constraints:
// commands below are only for Oracle

 CREATE TABLE Country (
  cname CHAR(100) PRIMARY KEY
 );

 CREATE TABLE Province (
  id INT PRIMARY KEY,
  cname CHAR(100) NOT NULL,
  FOREIGN KEY(cname) references Country(cname) ON DELETE CASCADE
 );

 CREATE TABLE Park (
  id INT PRIMARY KEY,
  province_id INT NOT NULL,
  park_name CHAR(100),
  park_address CHAR(200),
  open_hour CHAR(100),
  close_hour CHAR(100),
  FOREIGN KEY(province_id) references province(id) ON DELETE CASCADE
 );

 CREATE TABLE Public_park (
  id INT PRIMARY KEY,
  camping_site NUMBER(1) DEFAULT 0,
  FOREIGN KEY(id) references park(id) ON DELETE CASCADE
 );

 CREATE TABLE Restricted_park (
  id INT PRIMARY KEY,
  daily_capacity INT,
  permit_type CHAR(10),
```

```
 FOREIGN KEY(id) references park(id) ON DELETE CASCADE
);

CREATE TABLE Season(
 sname CHAR(100) PRIMARY KEY
);

CREATE TABLE Visitor_center (
 id INT PRIMARY KEY,
 park_id INT NOT NULL UNIQUE,
 center_name CHAR(200),
 email CHAR(100),
 center_address CHAR(200),
 FOREIGN KEY(park_id) references park(id) ON DELETE CASCADE
);

CREATE TABLE Trail_level (
 distance FLOAT,
 tlevel CHAR(100),
 duration CHAR(100),
 PRIMARY KEY(distance, tlevel)
);


CREATE TABLE Trail_info (
 tname CHAR(200),
 park_id INT,
 tlevel CHAR(100),
 distance FLOAT NOT NULL,
 trail_description CHAR(200),
 image_url CHAR(100),
 PRIMARY KEY(tname, park_id, tlevel),
 FOREIGN KEY(park_id) references park(id) ON DELETE CASCADE,
 FOREIGN KEY(distance, tlevel) references trail_level(distance,
tlevel) ON DELETE CASCADE
);

CREATE TABLE Hut(
 id INT PRIMARY KEY,
 tname CHAR(200) NOT NULL,
 park_id INT NOT NULL,
```

```
 tlevel CHAR(100) NOT NULL,
 beds INT,
 FOREIGN KEY(tname, park_id, tlevel) references trail_info(tname,
park_id, tlevel) ON DELETE CASCADE,
 FOREIGN KEY(park_id) references park(id) ON DELETE CASCADE
);


CREATE TABLE Trail_season(
 tname CHAR(200),
 sname CHAR(100),
 park_id INT,
 tlevel CHAR(100),
 PRIMARY KEY(tname, park_id, tlevel, sname),
 FOREIGN KEY(tname, park_id, tlevel) references Trail_info(tname,
park_id, tlevel) ON DELETE CASCADE,
 FOREIGN KEY(sname) references season(sname) ON DELETE CASCADE
);

CREATE TABLE Manager (
 id INT PRIMARY KEY,
 mname CHAR(100)
);

//“Program_manager” and “Program_info” are created by the
decomposition of the “Program” table to preserve BCNF. The
decomposition process causes “Program_manager” to be a weak entity,
and visitor_center_id is both a part of the PK and a FK for this
table.
CREATE TABLE Program_manager (
 visitor_center_id INT,
 pname CHAR(200),
 section_num INT,
 manager_id INT NOT NULL,
 PRIMARY KEY(visitor_center_id, pname, section_num),
 FOREIGN KEY(visitor_center_id) references Visitor_center(id),
 FOREIGN KEY(manager_id) references manager(id) ON DELETE CASCADE
);

CREATE TABLE Program_info (
 id INT PRIMARY KEY,
```

```
 visitor_center_id INT NOT NULL,
 pname CHAR(200) NOT NULL,
 section_num INT NOT NULL,
FOREIGN KEY(visitor_center_id) references visitor_center(id) ON
DELETE CASCADE,
 FOREIGN KEY(visitor_center_id, pname, section_num) references
program_manager(visitor_center_id, pname, section_num) ON DELETE
CASCADE
);
```

7. INSERT statements

```
INSERT ALL
INTO Country(cname) VALUES ('CANADA')
INTO Country(cname) VALUES ('MEXICO')
INTO Country(cname) VALUES ('KOREA')
INTO Country(cname) VALUES ('US')
INTO Country(cname) VALUES ('FRANCE')
SELECT * FROM dual;

INSERT ALL
INTO Province(id, cname) VALUES(11, 'CANADA')
INTO Province(id, cname) VALUES(21, 'US')
INTO Province(id, cname) VALUES(12, 'CANADA')
INTO Province(id, cname) VALUES(13, 'CANADA')
INTO Province(id, cname) VALUES(14, 'CANADA')
SELECT * FROM dual;

INSERT ALL
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(101, 11, 'Strathcona Provincial Park', '857 Malkin
Ave, Vancouver, BC V6A 2K5', '09', '17')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(102, 11, 'Cypress Provincial Park', 'West
Vancouver, BC V0N 1G0', '09', '17')
```

```
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(103, 11, 'Simson Provincial Park', 'Halfmoon Bay,
BC V0N 1Y0', '08', '16')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(201, 21, 'Death Valley National Park', 'CA 190
from Death Valley Junction, CA', '00', '00')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(202, 21, 'Channel Islands National Park',
'Ventura, CA 93001, United States', '08', '17')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(104, 11, 'Beaver Creek Provincial Park', '8801
BC-22A, Trail, BC V1R 4W6', '00', '00')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(105, 11, 'Cedar Point Provincial Park', 'Cariboo
F, BC V0L 1N0', '08', '16')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(106, 11, 'Ferry Island Provincial Park', 'Fraser
Valley, BC V0X 1X0', '00', '00')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(203, 21, 'Caspar Headlands State Natural Reserve',
'14260 Headlands Dr, Mendocino, CA 95460, United States', '10', '1')
INTO Park(id, province_id, park_name, park_address, open_hour,
close_hour) VALUES(107, 11, 'Gibson River Provincial Park', 'S Gibson
Lake Rd, Severn, ON L0K 1S0', '02', '03')
SELECT * FROM dual;

INSERT ALL
INTO Public_park(id, camping_site) VALUES(101, 1)
INTO Public_park(id, camping_site) VALUES(102, 1)
INTO Public_park(id, camping_site) VALUES(103, 1)
INTO Public_park(id, camping_site) VALUES(201, 0)
INTO Public_park(id, camping_site) VALUE(202, 0)
INTO Public_park(id) VALUES(203)
SELECT * FROM dual;


INSERT ALL
INTO Restricted_park(id, daily_capacity, permit_type) VALUES(104, 80,
'A')
INTO Restricted_park(id, daily_capacity, permit_type) VALUES(105,
120, 'A')
INTO Restricted_park(id, daily_capacity, permit_type) VALUES(106, 60,
```

```
'B')
INTO Restricted_park(id, daily_capacity, permit_type) VALUES(203, 80,
'B')
INTO Restricted_park(id, daily_capacity, permit_type) VALUES(107,
100, 'A')
SELECT * FROM dual;
)

INSERT ALL
INTO season(sname) VALUES('SPRING')
INTO season(sname) VALUES('SUMMER')
INTO season(sname) VALUES('FALL')
INTO season(sname) VALUES('WINTER')
INTO season(sname) VALUES('ALL')
SELECT * FROM dual;

INSERT ALL
INTO visitor_center(id, park_id, center_name, email, center_address)
VALUES(1001, 101, 'Strathcona Wilderness Institute',
'strathconawilderness@gmail.com', 'Courtenay, British Columbia
V9N 5N5')
INTO visitor_center(id, park_id, center_name, email, center_address)
VALUES(1002, 102, 'Cypress Provincial Park visitor
center','contact@cypressmountain.com', 'West Vancouver, BC V0N 1G0')
INTO visitor_center(id, park_id, center_name, email, center_address)
VALUES(1004, 104, 'Beaver Creek Institute', 'beavercreekp@gmail.com',
'8801 BC-22A, Trail, BC V1R 4W6 CANADA')
INTO visitor_center(id, park_id, center_name, email, center_address)
VALUES(2001, 201, 'Death Valley National Park Visitor
Center','deathvalleyvs@gmail.com', 'P.O. Box 579 Death Valley CA
92328 US')
INTO visitor_center(id, park_id, center_name, email, center_address)
VALUES(2003, 203, 'Caspar Headlands State Natural Reserve Visitor
Center','casparheadlandsmanage@gmail.com', '14261 Headlands Dr
Mendocino, CA 95460 US')
SELECT * FROM dual;

INSERT ALL
INTO Trail_level(distance, tlevel, duration)
VALUES(5.6, 'A', 'UNDER HALF')
INTO Trail_level(distance, tlevel, duration)
VALUES(6.0, 'C', 'HALF')
```

```
INTO Trail_level(distance, tlevel, duration)
VALUES(4.8, 'A', 'UNDER HALF')
INTO Trail_level(distance, tlevel, duration)
VALUES(2.9, 'A', 'UNDER HALF')
INTO Trail_level(distance, tlevel, duration)
VALUES(5.1, 'B', 'HALF')
SELECT * FROM dual;

INSERT ALL
INTO Trail_info(tname, park_id, tlevel, distance, trail_description)
VALUES ('Dog Mountain Trail', 101, 'A', 5.6, 'Discover this 5.6-km
out-and-back trail near North Vancouver, British Columbia. Generally
considered a moderately challenging route')
INTO Trail_info(tname, park_id, tlevel, distance, trail_description)
VALUES ('Stawamus Chief Trail', 101, 'C', 6.0, 'Experience this
6.0-km loop trail near Squamish, British Columbia. Generally
considered a challenging route, it takes an average of 3 h 20 min to
complete.')
INTO Trail_info(tname, park_id, tlevel, distance, trail_description)
VALUES ('Wapta Falls Trail', 102, 'A', 4.8, 'Try this 4.8-km
out-and-back trail near Field, British Columbia. Generally considered
an easy route, it takes an average of 1 h 17 min to complete.')
INTO Trail_info(tname, park_id, tlevel, distance, trail_description)
VALUES ('Lighthouse Loop', 201, 'A', 2.9, 'Generally considered an
easy route, it takes an average of 44 min to complete.')
INTO Trail_info(tname, park_id, tlevel, distance, trail_description)
VALUES ('Emerald Lake Loop', 103, 'B', 5.1, 'Generally considered an
easy route, it takes an average of 1 h 20 min to complete.')
SELECT * FROM dual;

INSERT ALL
INTO Hut(id, tname, park_id, tlevel, beds) VALUES (1, 'Dog Mountain
Trail', 101, 'A', 2)
INTO Hut(id, tname, park_id, tlevel, beds) VALUES (2, 'Stawamus Chief
Trail', 101, 'C', 2)
INTO Hut(id, tname, park_id, tlevel, beds) VALUES (3, 'Wapta Falls
Trail', 102, 'A', 1)
INTO Hut(id, tname, park_id, tlevel, beds) VALUES (4, 'Lighthouse
Loop', 201, 'A', 2)
INTO Hut(id, tname, park_id, tlevel, beds) VALUES (5, 'Emerald Lake
Loop', 103, 'B', 5)
SELECT * FROM dual;
```

```
INSERT ALL
INTO Trail_season(tname, sname, park_id, tlevel)
VALUES ('Dog Mountain Trail', 'ALL', 101, 'A')
INTO Trail_season(tname, sname, park_id, tlevel)
VALUES ('Stawamus Chief Trail', 'SUMMER', 101, 'C')
INTO Trail_season(tname, sname, park_id, tlevel)
VALUES ('Wapta Falls Trail', 'FALL', 102, 'A')
INTO Trail_season(tname, sname, park_id, tlevel)
VALUES ('Lighthouse Loop', 'SPRING', 201, 'A')
INTO Trail_season(tname, sname, park_id, tlevel)
VALUES ('Emerald Lake Loop', 'SUMMER', 103, 'B')
SELECT * FROM dual;

INSERT ALL
INTO Manager(id, mname) VALUES(1, 'Jenny')
INTO Manager(id, mname) VALUES(2, 'Olivia')
INTO Manager(id, mname) VALUES(3, 'Emma')
INTO Manager(id, mname) VALUES(4, 'Jean')
INTO Manager(id, mname) VALUES(5, 'Jhon')
SELECT * FROM dual;

INSERT ALL
INTO Program_info(id, visitor_center_id, pname, section_num)
VALUES (1, 1001, 'Places of Wonder and Discovery', 101)
INTO Program_info(id, visitor_center_id, pname, section_num)
VALUES (2, 1002, 'Kicking Horse', 102)
INTO Program_info(id, visitor_center_id, pname, section_num)
VALUES (3, 1004, 'Coastal Carnivores', 103)
INTO Program_info(id, visitor_center_id, pname, section_num)
VALUES (4, 2001, 'Habitat Conservation', 104)
INTO Program_info(id, visitor_center_id, pname, section_num)
VALUES (5, 2003, 'Junior Ranger Angler', 105)
SELECT * FROM dual;

INSERT ALL
INTO Program_manager(visitor_center_id, pname, section_num,
manager_id)
VALUES (1001, 'Places of Wonder and Discovery', 101, 1)
INTO Program_manager(visitor_center_id, pname, section_num,
manager_id)
VALUES (1002, 'Kicking Horse', 102, 2)
```

```
INTO Program_manager(visitor_center_id, pname, section_num,
manager_id)
VALUES (1004, 'Coastal Carnivores', 103, 3)
INTO Program_manager(visitor_center_id, pname, section_num,
manager_id)
VALUES (2001, 'Habitat Conservation', 104, 4)
INTO Program_manager(visitor_center_id, pname, section_num,
manager_id)
VALUES (2003, 'Junior Ranger Angler', 105, 5)
SELECT * FROM dual;
```