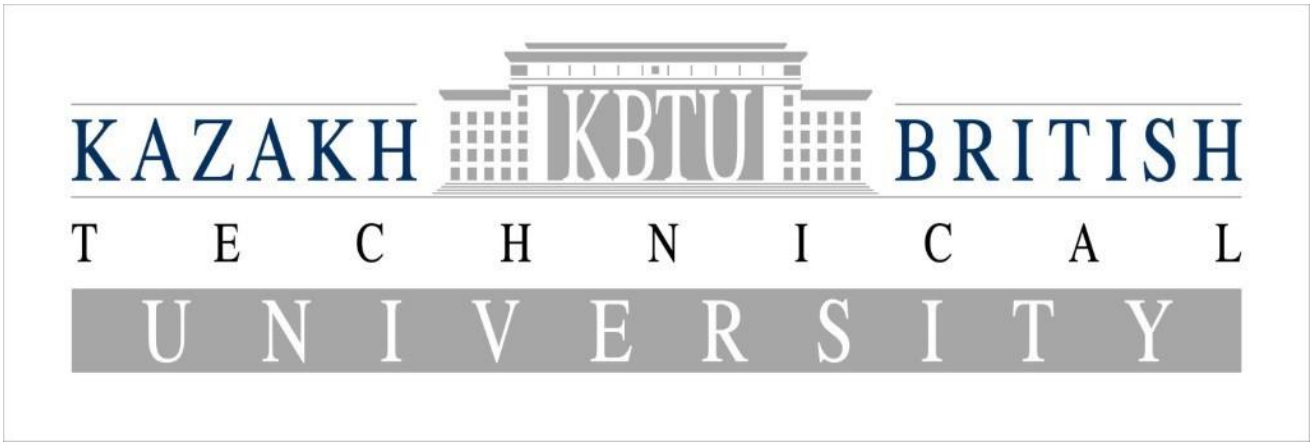

JSC "Kazakh British Technical University"
School of Mathematic and Cybernetics

Analysis of Data Bases

Laboratory Work #2

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To perform the following tasks, you need to supplement the EMPLOYEES table with new data: add a department_id column with data type integer. For each department that is present on employees, assign the following numeric values:

AD – ‘10’;
MK – ‘20’;
SH – ‘50’;
IT – ‘60’;
SA – ‘80’;
AC – ‘110’.

```sql
ALTER TABLE EMPLOYEES
ADD department_id integer;
/*Add a new Column without any variables with inteder type*/
UPDATE EMPLOYEES
set department_id = 110
WHERE job_id like 'AC%';
/*Fill in the column 'department_id' doing it each time for every given condition */
```

	job_id	department_id
1	AC_MGR	110
2	AC_ACCOUNT	110
3	AD_PRES	10
4	AD_VP	10
5	AD_VP	10
6	AD_ASST	10
7	MK_MAN	20
8	MK_REP	20
9	SH_MAN	50
10	SH_CLERK	50
11	SH_CLERK	50
12	SH_CLERK	50
13	SH_CLERK	50
14	IT_PROG	60
15	IT_PROG	60
16	IT_PROG	60
17	SA_MAN	80
18	SA_REP	80
19	SA_REP	80
20	SA_REP	80

Exercises:

1. Write a query to display all the information about employees whose salaries are higher than the average salary of programmers

```sql
select * from employees where salary > (select avg(salary) from employees group by JOB_ID having JOB_ID like 'IT%');
/*A query to display all the information about employees whose salaries are higher than the average salary of programmers*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	205	Shelley	Higgins	SHIGGINS	515.123.8080	1994-06-07	AC_MGR	12000	36000	110
2	206	William	Gietz	WGIETZ	515.123.8181	1994-06-07	AC_ACCOUNT	8300	24900	110
3	100	Assanali	Moldash	SKING	515.123.4567	2001-08-18	AD_PRES	24000	72000	10
4	101	Neena	Kochhar	NKOCHAR	515.123.4568	1989-09-21	AD_VP	17000	51000	10
5	102	Lex	De Haan	LDEHAAN	515.123.4569	1993-03-13	AD_VP	17000	51000	10
6	201	Michael	Hartstein	MHARTSTE	515.123.5555	1996-02-17	MK_MAN	13000	39000	20
7	103	Alexander	Hunold	AHUNOLD	515.123.4567	1990-01-03	IT_PROG	9000	27000	60
8	149	Eleni	Zlotkey	EZLOTKEY	011.44.1344.429018	2000-01-29	SA_MAN	10500	31500	80
9	174	Ellen	Abel	EABEL	011.44.1644.429267	1996-05-11	SA_REP	11000	33000	80
10	176	Jonathon	Taylor	JTAYLOR	011.44.1644.429265	1998-03-24	SA_REP	8600	25800	80
11	178	Kimberely	Grant	KGRANT	011.44.1644.429263	1999-05-24	SA_REP	7000	21000	80

2. Write a query to display the list of employees with the longest name

```
24 ✔ select * from employees where length(FIRST_NAME) = (select max(length(first_name)) from employees);
25   /*Query to display the list of employees with the longest name*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	103	Alexander	Hunold	AHUNOLD	515.123.4567	1990-01-03	IT_PROG	9000	27000	60
2	178	Kimberely	Grant	KGRANT	011.44.1644.429263	1999-05-24	SA_REP	7000	21000	80

3. Write a query to display the id, first name, last name and salary of the employee with the maximum salary

```
27 ✔ select employee_id,first_name,last_name, salary from EMPLOYEES where SALARY = (select max(salary) from employees);
28   /*Query to display the id, first name, last name and salary of the employee with the
29   maximum salary*/
```

	employee_id	first_name	last_name	salary
1	100	Assanali	Moldash	24000

4. Write a query to display the information of department managed by Jennifer.

```
31 ✔ select  * from departments where manager_id = (select EMPLOYEE_ID from employees where FIRST_NAME like 'Jennifer');
32   /*Query to display the information of department managed by Jennifer.*/
```

	department_id	department_name	manager_id	location_id
1	10	Administration	200	1700

5. Write a query to display the average salary for the most numerous department.

```
169 ✔ select avg(salary) average_salary from employees
170   group by EMPLOYEES.department_id
171   having count(EMPLOYEES.department_id) =
172   (select max(number_clients) from
173   (select count(department_id) number_clients from employees group by  EMPLOYEES.department_id)a);
```

	average_salary
1	3500

6. Write a query to display in which departments the minimum salary is greater than the minimum salary in the 50th department.

```
176 ✔ select department_name,department_id from departments
177   where department_id in
178   (select EMPLOYEES.department_id from EMPLOYEES
179   group by EMPLOYEES.department_id having min(salary) > (select min(salary)
180   from EMPLOYEES where EMPLOYEES.department_id = 50));
181   /*Query to display in which departments the minimum salary is greater than the minimum salary in the 50th department*/
```

	department_name	department_id
1	Administration	10
2	Marketing	20
3	IT	60
4	Sales	80
5	Accounting	110

7. Write a query to display the maximum average salary by department

```
183  select max(average_salary) maximum_average_salary
184  from (select AVG(salary) average_salary from EMPLOYEES group by EMPLOYEES.department_id)a;
185  /*Query to display the maximum average salary by department*/
```

	maximum_average_salary
1	15600

8. Write a query to display the department names for each employee using JOIN

```
187  select e.first_name,e.last_name,d.department_name
188  from EMPLOYEES e join departments d
189  on e.department_id = d.department_id;
190  /*Query to display the department names for each employee using JOIN*/
```

	first_name	last_name	department_name
1	Jennifer	Whalen	Administration
2	Lex	De Haan	Administration
3	Neena	Kochhar	Administration
4	Assanali	Moldash	Administration
5	Pat	Fay	Marketing
6	Michael	Hartstein	Marketing
7	Peter	Vargas	Shipping
8	Randall	Matos	Shipping
9	Curtis	Davies	Shipping
10	Trenna	Rajs	Shipping
11	Kevin	Mourgos	Shipping
12	Diana	Lorentz	IT
13	Bruce	Ernst	IT
14	Alexander	Hunold	IT
15	Kimberely	Grant	Sales
16	Jonathon	Taylor	Sales
17	Ellen	Abel	Sales
18	Eleni	Zlotkey	Sales
19	William	Gietz	Accounting
20	Shelley	Higgins	Accounting

9. Write a query to display all departments in which there is no employee.

```
46  select * from departments where department_id not in (select department_id from EMPLOYEES);
47  /*Query to display all departments in which there is no employee.*/
```

	department_id	department_name	manager_id	location_id
1	90	Executive	100	1700
2	190	Contracting	<null>	1700

10. Write a query to display the JOB_Grade for each employee.

```
49  select j.gra, e.first_name,e.salary
50  from job_grades j join employees e
51  on e.salary BETWEEN  j.lowest_sal AND j.highest_sal;
52  /*. Write a query to display the JOB_Grade for each employee.*/
```

	gra	first_name	salary
1	A	Randall	2600
2	A	Peter	2500
3	B	Jennifer	4400
4	B	Kevin	5800
5	B	Trenna	3500
6	B	Curtis	3100
7	B	Diana	4200
8	C	William	8300
9	C	Pat	6000
10	C	Alexander	9000
11	C	Bruce	6000
12	C	Jonathon	8600
13	C	Kimberely	7000
14	D	Shelley	12000
15	D	Michael	13000
16	D	Eleni	10500
17	D	Ellen	11000
18	E	Assanali	24000
19	E	Neena	17000
20	E	Lex	17000

11. Write a query to display the department name and number of employees in each of the department.

```
56  select departments.department_name, count(EMPLOYEES.EMPLOYEE_ID) as employees_number
57  from departments Left Outer Join  employees
58  on departments.department_id = EMPLOYEES.department_id
59  group by  departments.department_name,department_name
60  order by employees_number;
61  /*Query to display the department name and number of employees in each of the
62  department.*/
```

	department_name	employees_number
1	Contracting	0
2	Executive	0
3	Marketing	2
4	Accounting	2
5	IT	3
6	Sales	4
7	Administration	4
8	Shipping	5

12. Write a query to display the last name, first name, job title, department name of employee, and hire date for all the jobs which started on or after 1st of January, 1995 and ending with on or before 11th of February, 2021.

```
64  select e.last_name, e.first_name, e.job_id,d.department_name,d.department_id,e.HIRE_DAT
65  from employees e join departments d
66  on d.department_id = e.department_id
67  where e.hire_dat >='1995-01-01' and e.hire_dat <='2021-02-11';
68  /*Write a query to display the last name, first name, job title, department name of employee,
69    and hire date for all the jobs which started on or after 1st of January,
70    1995 and ending with on or before 11th of Febraury, 2021.*/
```

	last_name	first_name	job_id	department_name	department_id	hire_dat
1	Moldash	Assanali	AD_PRES	Administration	10	2001-08-18
2	Fay	Pat	MK_REP	Marketing	20	1997-08-17
3	Hartstein	Michael	MK_MAN	Marketing	20	1996-02-17
4	Vargas	Peter	SH_CLERK	Shipping	50	1998-07-09
5	Matos	Randall	SH_CLERK	Shipping	50	1998-03-15
6	Davies	Curtis	SH_CLERK	Shipping	50	1997-01-29
7	Rajs	Trenna	SH_CLERK	Shipping	50	1995-10-17
8	Mourgos	Kevin	SH_MAN	Shipping	50	1999-11-16
9	Lorentz	Diana	IT_PROG	IT	60	1999-02-07
10	Grant	Kimberely	SA_REP	Sales	80	1999-05-24
11	Taylor	Jonathon	SA_REP	Sales	80	1998-03-24
12	Abel	Ellen	SA_REP	Sales	80	1996-05-11
13	Zlotkey	Eleni	SA_MAN	Sales	80	2000-01-29

Create a table LOCATIONS and Fill the information

```
108  create Table LOCATIONS(
109      loc_id integer,
110      loc_name varchar(20),
111      country_id varchar(20)
112  );
113  insert into LOCATIONS values(1700,'Karagandy','KAZ');
114  insert into LOCATIONS values(1800,'Moscow','RUS');
115  insert  into LOCATIONS values(1500,'Toronto','CND');
116  insert into LOCATIONS values(1400,'Tokyo','JPN');
117  insert into LOCATIONS values(2500,'Almaty','KAZ');
118  select  * from LOCATIONS;
```

	loc_id	loc_name	country_id
1	1700	Karagandy	KAZ
2	1800	Moscow	RUS
3	1500	Toronto	CND
4	1400	Tokyo	JPN
5	2500	Almaty	KAZ

13. Write a query to display the name of the cities for each employee

```
select e.first_name,l.loc_name
from employees e join departments d
on e.department_id = d.department_id
left join  locations l
on d.location_id = l.loc_id;
/*Query to display the name of the cities for each employee*/
```

	first_name	loc_name
1	Shelley	Karagandy
2	William	Karagandy
3	Assanali	Karagandy
4	Neena	Karagandy
5	Lex	Karagandy
6	Jennifer	Karagandy
7	Michael	Moscow
8	Pat	Moscow
9	Kevin	Toronto
10	Trenna	Toronto
11	Curtis	Toronto
12	Randall	Toronto
13	Peter	Toronto
14	Alexander	Tokyo
15	Bruce	Tokyo
16	Diana	Tokyo
17	Eleni	Almaty
18	Ellen	Almaty
19	Jonathon	Almaty
20	Kimberely	Almaty

14. Write a query to display the name of the cities for each employee and show their monthly and annual mandatory pension contributions (10% of the salary).

```
select e.first_name,l.loc_name,e.SALARY/10 as month_contributions, e.SALARY/10 *12 as year_contributions
from employees e join departments d
on e.department_id = d.department_id
left join  locations l
on d.location_id = l.loc_id;
/*Query to display the name of the cities for each employee and show their
  monthly and annual mandatory pension contributions (10% of the salary)*/
```

	first_name	loc_name	month_contributions	year_contributions
1	Shelley	Karagandy	1200	14400
2	William	Karagandy	830	9960
3	Assanali	Karagandy	2400	28800
4	Neena	Karagandy	1700	20400
5	Lex	Karagandy	1700	20400
6	Jennifer	Karagandy	440	5280
7	Michael	Moscow	1300	15600
8	Pat	Moscow	600	7200
9	Kevin	Toronto	580	6960
10	Trenna	Toronto	350	4200
11	Curtis	Toronto	310	3720
12	Randall	Toronto	260	3120
13	Peter	Toronto	250	3000
14	Alexander	Tokyo	900	10800
15	Bruce	Tokyo	600	7200
16	Diana	Tokyo	420	5040
17	Eleni	Almaty	1050	12600
18	Ellen	Almaty	1100	13200
19	Jonathon	Almaty	860	10320
20	Kimberely	Almaty	700	8400

15. Write a query to display the average salary for each city

```
87  select l.loc_name,avg(e.SALARY) as average_salary
88  from employees e join departments d
89  on e.department_id = d.department_id
90  left join  locations l
91  on d.location_id = l.loc_id
92  group by l.loc_name;
93  /*Query to display the average salary for each city*/
```

	loc_name	average_salary
1	Moscow	9500
2	Karagandy	13783.333333333333
3	Tokyo	6400
4	Almaty	9275
5	Toronto	3500

16. Write a query to display all the information about the manager with the highest salary.

```
192  select * from employees where salary =
193  (select max(SALARY) from employees where employees.employee_id in
194  (select manager_id from departments where manager_id is not NULL));
195  /*Query to display all the information about the manager with the highest salary.*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	100	Assanali	Moldash	SKING	515.123.4567	2001-08-18	AD_PRES	24000	72000	10

17. If the 142nd and 144th employees work in the same department, then write a query to display only their colleagues, without a manager.

```
205  select department_id from employees where EMPLOYEE_ID in(142,144);
206  /*Obtain department id of the employees 142 and 144 to see are they the same or not*/
207  select * from employees where EMPLOYEES.department_id = 50
208  AND employees.employee_id not in ((select manager_id from departments where department_id = 50),142,144);
209  /*Since we found that 142 and 144 employees work together we also found the manager
210    of that department and displayed the info about only the collegues in the same department*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	141	Trenna	Rajs	TRAJS	650.121.8009	1995-10-17	SH_CLERK	3500	10500	50
2	143	Randall	Matos	RMATOS	650.121.2874	1998-03-15	SH_CLERK	2600	7800	50

18. Write a query to display data about the employee who has the third maximum salary.

```
108  select * from employees where salary = (select Max(salary) from employees where
109  salary < (select Max(salary) from (select * from employees where salary < (select Max(salary) top_salary from EMPLOYEES))a));
110  /*Query to display data about the employee who has the third maximum salary.*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	201	Michael	Hartstein	MHARTSTE	515.123.5555	1996-02-17	MK_MAN	13000	39000	20

19. Write a query to display all the information about the employees whose department location is <select any city from the table LOCATIONS at your direction>

```
115  select * from employees where employees.department_id in
116  (select department_id from departments where location_id = (select loc_id from locations where loc_name like 'Karagandy'));
117  /*Query to display all the information about the employees whose department location is Karaganda */
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	205	Shelley	Higgins	SHIGGINS	515.123.8080	1994-06-07	AC_MGR	12000	36000	110
2	206	William	Gietz	WGIETZ	515.123.8181	1994-06-07	AC_ACCOUNT	8300	24900	110
3	100	Assanali	Moldash	SKING	515.123.4567	2001-08-18	AD_PRES	24000	72000	10
4	101	Neena	Kochhar	NKOCHAR	515.123.4568	1989-09-21	AD_VP	17000	51000	10
5	102	Lex	De Haan	LDEHAAN	515.123.4569	1993-03-13	AD_VP	17000	51000	10
6	200	Jennifer	Whalen	JWHALEN	515.123.4444	1987-09-17	AD_ASST	4400	13200	10

20. Write a query to display all employees who are not managers.

```
112  select * from employees where employees.employee_id NOT IN (select manager_id from departments where manager_id is not NULL);
113  /*Query to display all employees who are not managers*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary	department_id
1	206	William	Gietz	WGIETZ	515.123.8181	1994-06-07	AC_ACCOUNT	8300	24900	110
2	101	Neena	Kochhar	NKOCHAR	515.123.4568	1989-09-21	AD_VP	17000	51000	10
3	102	Lex	De Haan	LDEHAAN	515.123.4569	1993-03-13	AD_VP	17000	51000	10
4	202	Pat	Fay	PFAY	603.123.6666	1997-08-17	MK_REP	6000	18000	20
5	141	Trenna	Rajs	TRAJS	650.121.8009	1995-10-17	SH_CLERK	3500	10500	50
6	142	Curtis	Davies	CDAVIES	650.121.2994	1997-01-29	SH_CLERK	3100	9300	50
7	143	Randall	Matos	RMATOS	650.121.2874	1998-03-15	SH_CLERK	2600	7800	50
8	144	Peter	Vargas	PVARGAS	650.121.2004	1998-07-09	SH_CLERK	2500	7500	50
9	104	Bruce	Ernst	BERNST	515.123.4568	1991-05-21	IT_PROG	6000	18000	60
10	107	Diana	Lorentz	DLORENTZ	515.123.4567	1999-02-07	IT_PROG	4200	12600	60
11	174	Ellen	Abel	EABEL	011.44.1644.429267	1996-05-11	SA_REP	11000	33000	80
12	176	Jonathon	Taylor	JTAYLOR	011.44.1644.429265	1998-03-24	SA_REP	8600	25800	80
13	178	Kimberely	Grant	KGRANT	011.44.1644.429263	1999-05-24	SA_REP	7000	21000	80

21. Write a query to display the city of the employee whose ID <select ID>

```
119  select e.first_name,l.loc_name
120  from employees e join departments d
121  on e.department_id = d.department_id
122  left join  locations l
123  on d.location_id = l.loc_id
124  where e.employee_id = 124;
125  /*Query to display the city of the employee whose ID = 124*/
```

	first_name	loc_name
1	Kevin	Toronto

22. Write a query to display the number of subordinates for each manager

```
select d.manager_id,count(EMPLOYEE_ID)
from employees e right join departments d
on e.department_id = d.department_id
where (manager_id is not NULL AND e.EMPLOYEE_ID != d.manager_id) OR manager_id = 100
group by manager_id;
/*Query to display the number of subordinates for each manager*/
```

	manager_id	count
1	124	4
2	149	3
3	200	3
4	103	2
5	205	1
6	201	1
7	100	0

23. Write a query to display all the information about a manager who is also a subordinate.

```
select *
from employees e right join departments d
on e.employee_id = d.manager_id
where (e.department_id is not NULL AND d.department_id is not NULL)
  AND (e.department_id != d.department_id);
/*Query to display all the information about a manager who is also a subordinate.*/
```

	employee_id	first_name	last_name	email	phone_number	hire_dat	job_id	salary	dream_salary
1	100	Assanali	Moldash	SKING	515.123.4567	2001-08-18	AD_PRES	24000	72000

e.department_id	d.department_id	department_name	manager_id	location_id
10	90	Executive	100	1700

Countries Table creation and insertion of variables:

```
create table countries(
    country_id varchar(5),
    country_name varchar(20),
    region_id integer
);

insert into countries values('KAZ','Kazakhstan','9');
insert into countries values('RUS','Russia',2);
insert into countries values('CND','Canada',3);
insert into countries values('JPN','Japan',1);
```

	country_id	country_name	region_id
1	KAZ	Kazakhstan	9
2	RUS	Russia	2
3	CND	Canada	3
4	JPN	Japan	1

24. Write a query to display the full names of employees (last name + first name), separated by only one space, into a common column, with ID and name of the country presently where (s)he is working

```sql
select concat(e.last_name,' ',e.first_name) full_name, c.region_id,c.country_name
from employees e join departments d
on e.department_id = d.department_id
join  locations l
on d.location_id = l.loc_id
join countries c
on l.country_id = c.country_id;
/*Query to display the full names of employees (last name + first name), separated by only one
space, into a common column, with ID and name of the country presently where (s)he is working*/
```

	full_name	region_id	country_name
1	Grant Kimberely	9	Kazakhstan
2	Taylor Jonathon	9	Kazakhstan
3	Abel Ellen	9	Kazakhstan
4	Zlotkey Eleni	9	Kazakhstan
5	Whalen Jennifer	9	Kazakhstan
6	De Haan Lex	9	Kazakhstan
7	Kochhar Neena	9	Kazakhstan
8	Moldash Assanali	9	Kazakhstan
9	Gietz William	9	Kazakhstan
10	Higgins Shelley	9	Kazakhstan
11	Fay Pat	2	Russia
12	Hartstein Michael	2	Russia
13	Vargas Peter	3	Canada
14	Matos Randall	3	Canada
15	Davies Curtis	3	Canada
16	Rajs Trenna	3	Canada
17	Mourgos Kevin	3	Canada
18	Lorentz Diana	1	Japan
19	Ernst Bruce	1	Japan
20	Hunold Alexander	1	Japan

25. Write a query to display the country name, city, and number of those departments where at least 2 employees are working

```sql
select c.country_name as country,l.loc_name as city,count(department_id) as department_number
from countries c join locations l
on c.country_id = l.country_id
join departments d
on d.location_id = l.loc_id
where department_id in
(select department_id from employees
group by department_id
having count(department_id) > 1)
group by country_name,loc_name;
/*Query to display the country name, city, and number of those departments where at least 2 employees are working*/
```

	country	city	department_number
1	Kazakhstan	Karagandy	2
2	Kazakhstan	Almaty	1
3	Japan	Tokyo	1
4	Canada	Toronto	1
5	Russia	Moscow	1

26. Write a query to display the name (first name and last name) for those employees who gets more salary than the employee whose id is 124.

```sql
select first_name, last_name from EMPLOYEES
where salary > (select salary from EMPLOYEES where EMPLOYEE_ID = 124);
/*Query to display the name ( first name and last name ) for those employees who gets more salary than the employee whose id is 124.*/
```

	first_name	last_name
1	Shelley	Higgins
2	William	Gietz
3	Assanali	Moldash
4	Neena	Kochhar
5	Lex	De Haan
6	Michael	Hartstein
7	Pat	Fay
8	Alexander	Hunold
9	Bruce	Ernst
10	Eleni	Zlotkey
11	Ellen	Abel
12	Jonathon	Taylor
13	Kimberely	Grant