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Database Fundamentals

IS 4420-001

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Project Overview

- TASC Inc. is a nonprofit organization dedicated to drug testing
  - 40 years of experience
- Well known for analyzing drugs of abuse and being a leader in creating standards and procedures within the field
- Several million drug tests are conducted annually
- TASC is a licensed facility to provide outpatient behavioral health treatment and counseling

Counseling Services Include:

- Substance abuse treatment
- Domestic abuse treatment
- Anger management
- DUI Screening
- Clinical Laboratory services

The Aspects of the Business Involved in the Actual Drug Testing

Types of Testing

URINE	ORAL	HAIR
		

TASC performs tests for:

- Criminal Justice Agencies
- Schools
- Workplaces
- Personal/Private Testing

User Requirements

Employee - Know what type of test is being done so they can provide the correct test and collect the correct specimen.

Sample Collector - Check in samples they have picked up from clients' facilities so they can report the collection time, arrival time, and temperature of each sample.

Lab Supervisor - Access chain of custody data (collection, check-in, and analyzing) for each sample so they can know who to talk to if any issues arise.

Lead Scientist - Know how much reagent each lab has on hand to ensure all labs have enough reagent to process the day's samples.

Criminal Justice Services - Receive a summary of all of the previous day's test results sent to us each morning, sorted by court (misdemeanor or felony) and case manager, so we can assess the status of our cases.

Employers - Choose to send their employees for an oral drug test instead of urinalysis to detect any recent drug use without the chance of cheating or tampering with the sample.

Lab Technician - Know the last date of calibration on an analyzer so they know if it needs calibration at the beginning of their shift.

Business Rules

Examples of our business rules are:

Supervises

- An employee can have only one supervisor but a supervisor can oversee one, none or many employees.

Produces

- An analyzer produces one, none, or many results but a result comes from one and only one analyzer.

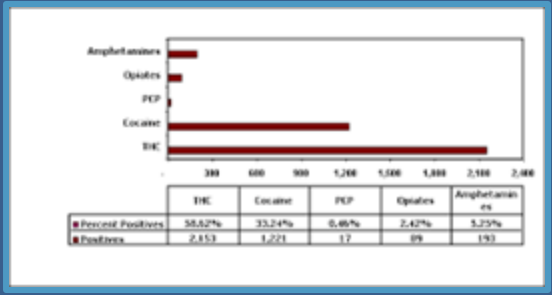
Converts To

- A test converts to one or none results and a result has one and only one test.

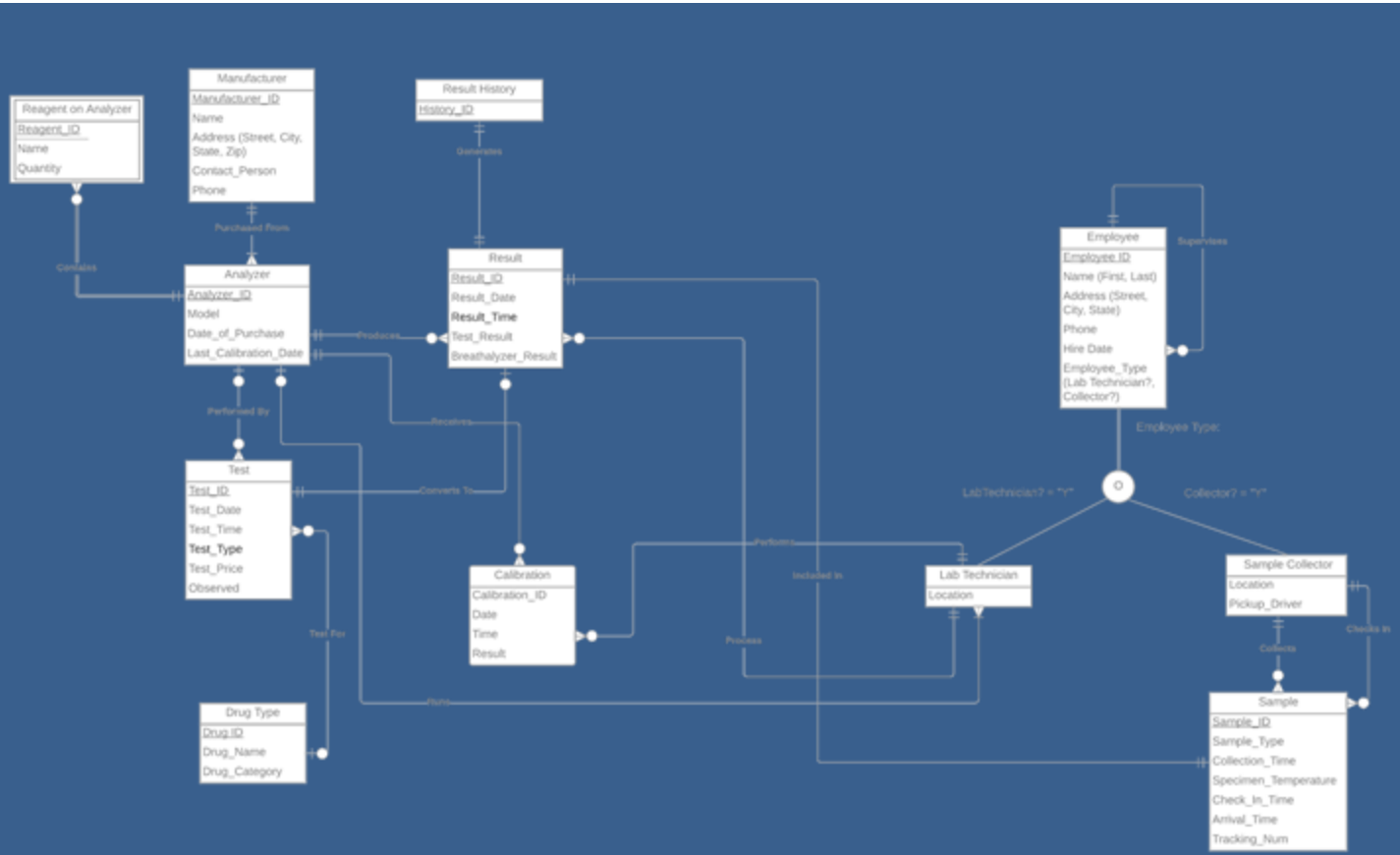
Data Outputs / Business Questions

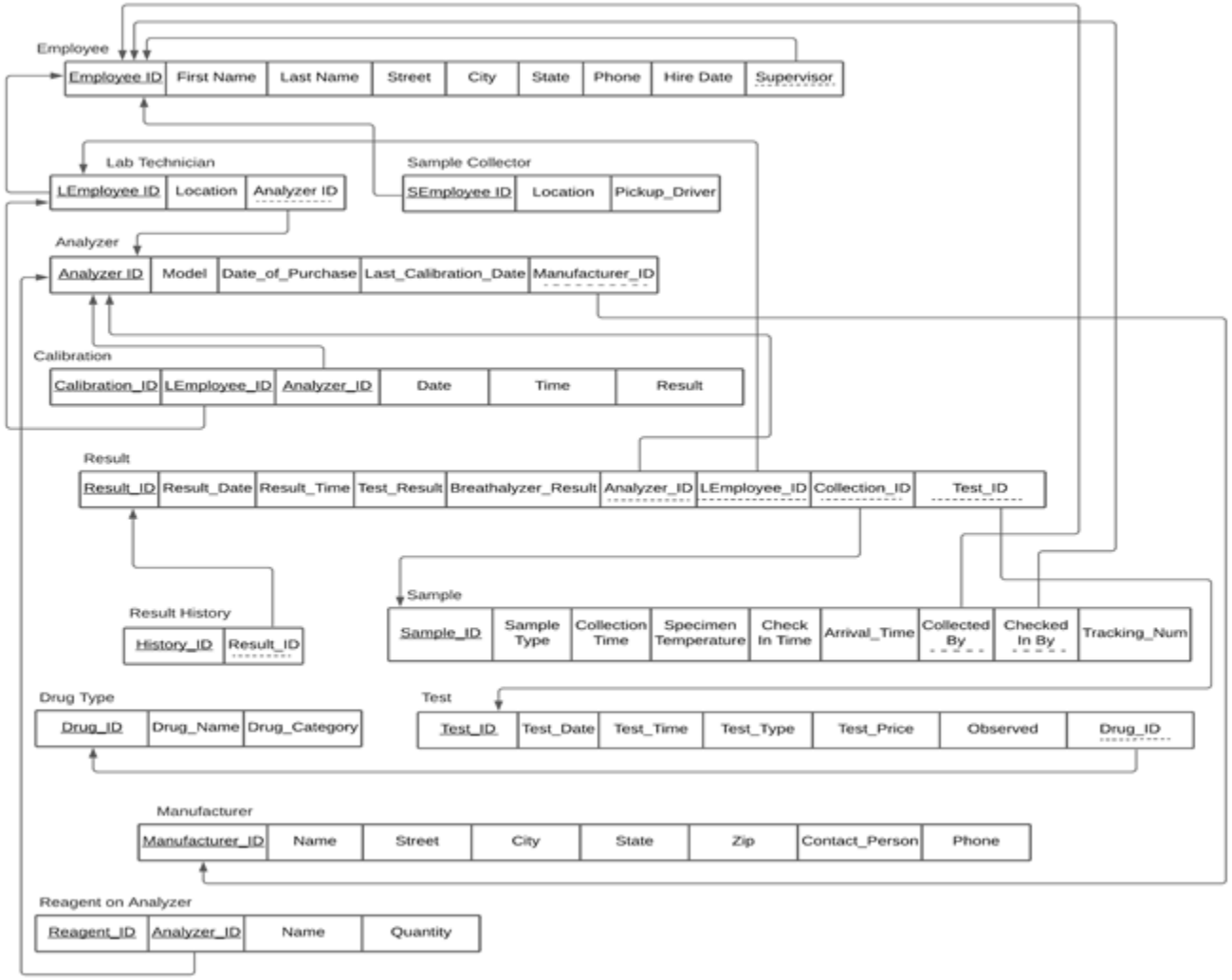
Main Outputs for the Drug Testing Industry Include:

- Statistical Data Report
- Periodic Drug Screening Reports
- Weekly Drug Test Results
- Calibration Reports
- Check-In / Check-Out Logs
- Picked Up Samples Log
- Release Forms



Conceptual Model





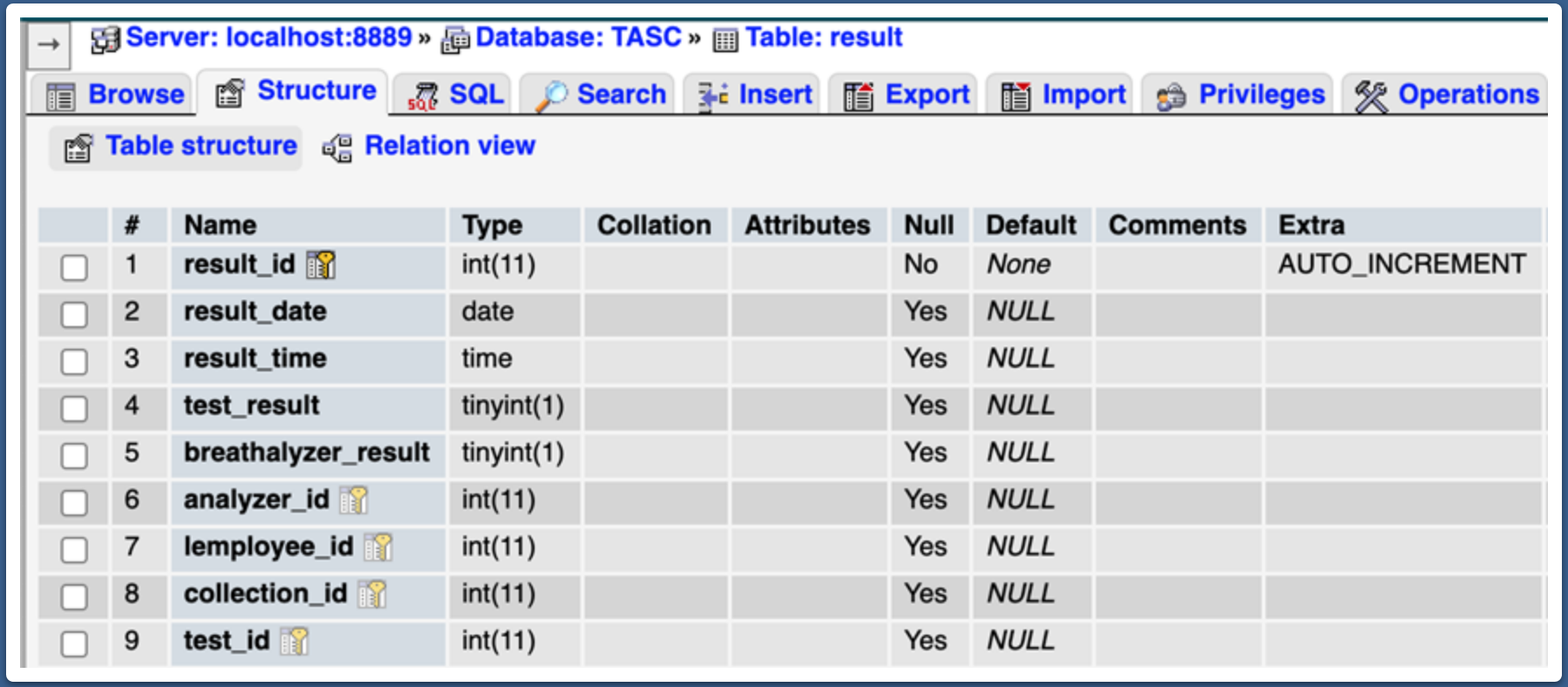
Logical Model

Database Implementation

Result Table Creation

```sql
-- Result
CREATE TABLE result(
  result_id int(11) NOT NULL AUTO_INCREMENT,
  result_date DATE,
  result_time TIME,
  test_result BOOLEAN,
  breathalyzer_result BOOLEAN,
  analyzer_id INT(11),
  lemployee_id INT(11),
  collection_id INT(11),
  test_id INT(11),
  CONSTRAINT resultpk PRIMARY KEY (result_id),
  CONSTRAINT resultfk1 FOREIGN KEY (analyzer_id) REFERENCES analyzer(analyzer_id) ON UPDATE CASCADE,
  CONSTRAINT resultfk2 FOREIGN KEY (lemployee_id) REFERENCES lab_technician(lemployee_id) ON UPDATE CASCADE,
  CONSTRAINT resultfk3 FOREIGN KEY (collection_id) REFERENCES sample(sample_id) ON UPDATE CASCADE,
  CONSTRAINT resultfk4 FOREIGN KEY (test_id) REFERENCES test(test_id) ON UPDATE CASCADE
);
```

Result Table Creation



	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	result_id	int(11)			No	*None*		AUTO_INCREMENT
☐	2	result_date	date			Yes	*NULL*		
☐	3	result_time	time			Yes	*NULL*		
☐	4	test_result	tinyint(1)			Yes	*NULL*		
☐	5	breathalyzer_result	tinyint(1)			Yes	*NULL*		
☐	6	analyzer_id	int(11)			Yes	*NULL*		
☐	7	lemployee_id	int(11)			Yes	*NULL*		
☐	8	collection_id	int(11)			Yes	*NULL*		
☐	9	test_id	int(11)			Yes	*NULL*		

Employee & Sample Collector Table Creation

```sql
CREATE DATABASE TASC;
USE TASC;
-- Employee
CREATE TABLE employee (
  employee_id INT (11) NOT NULL AUTO_INCREMENT,
  first_name VARCHAR (50),
  last_name VARCHAR (50),
  street VARCHAR (100),
  city VARCHAR (100),
  state VARCHAR (100),
  zip VARCHAR (8),
  phone BIGINT,
  hire_date DATE,
  supervisor INT (11),
  CONSTRAINT employee_pk PRIMARY KEY (employee_id),
  CONSTRAINT employee_fk FOREIGN KEY (supervisor) REFERENCES employee(employee_id)
);
-- Sample Collector
CREATE TABLE sample_collector(
  semployee_id INT(11) NOT NULL,
  location VARCHAR(100),
  pickup_driver VARCHAR(50),
  CONSTRAINT sample_collector_pk PRIMARY KEY (semployee_id),
  CONSTRAINT sample_collector_fk FOREIGN KEY (semployee_id) REFERENCES employee(employee_id) ON UPDATE CASCADE
);
```

Employee & Sample Collector Table Creation

	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	employee_id	int(11)			No	*None*		AUTO_INCREMENT
☐	2	first_name	varchar(50)	utf8_general_ci		Yes	*NULL*		
☐	3	last_name	varchar(50)	utf8_general_ci		Yes	*NULL*		
☐	4	street	varchar(100)	utf8_general_ci		Yes	*NULL*		
☐	5	city	varchar(100)	utf8_general_ci		Yes	*NULL*		
☐	6	state	varchar(100)	utf8_general_ci		Yes	*NULL*		
☐	7	zip	varchar(8)	utf8_general_ci		Yes	*NULL*		
☐	8	phone	bigint(20)			Yes	*NULL*		
☐	9	hire_date	date			Yes	*NULL*		
☐	10	supervisor	int(11)			Yes	*NULL*		

	#	Name	Type	Collation	Attributes	Null	Default	Co
☐	1	semployee_id	int(11)			No	*None*	
☐	2	location	varchar(100)	utf8_general_ci		Yes	*NULL*	
☐	3	pickup_driver	varchar(50)	utf8_general_ci		Yes	*NULL*	

Calibration Table Values Insertion

```
INSERT INTO calibration (lemployee_id, analyzer_id, calibration_date, calibration_time, result) VALUES
    (2,1, '2020-09-11', '9:17','complete'),
    (4,2, '2020-09-12', '12:15','complete'),
    (5,3, '2020-09-15', '1:34','error'),
    (7,4, '2020-09-18', '2:45','complete'),
    (8,5, '2020-09-21', '7:02','error'),
    (10,6, '2020-09-24', '3:50','complete'),
    (12,7, '2020-09-27', '2:50','complete'),
    (18,8, '2020-09-29', '4:56','complete'),
    (19,9, '2020-10-01', '1:04','error'),
    (2,10, '2020-10-02', '11:50','complete'),
    (4,11, '2020-10-04', '7:06','complete'),
    (5,12, '2020-10-07', '8:59','complete'),
    (7,13, '2020-10-10', '9:37','complete'),
    (8,14, '2020-10-13', '10:50','error'),
    (10,15, '2020-10-15', '4:56','complete');
```

calibration_id	lemployee_id	analyzer_id	calibration_date	calibration_time	result
1	2	1	2020-09-11	09:17:00	complete
2	4	2	2020-09-12	12:15:00	complete
3	5	3	2020-09-15	01:34:00	error
4	7	4	2020-09-18	02:45:00	complete
5	8	5	2020-09-21	07:02:00	error
6	10	6	2020-09-24	03:50:00	complete
7	12	7	2020-09-27	02:50:00	complete
8	18	8	2020-09-29	04:56:00	complete
9	19	9	2020-10-01	01:04:00	error
10	2	10	2020-10-02	11:50:00	complete
11	4	11	2020-10-04	07:06:00	complete
12	5	12	2020-10-07	08:59:00	complete
13	7	13	2020-10-10	09:37:00	complete
14	8	14	2020-10-13	10:50:00	error
15	10	15	2020-10-15	04:56:00	complete

Employee Table Values Insertion

```sql
INSERT INTO employee (first_name, last_name, street, city, state, zip, phone, hire_date) VALUES
('Tanya','Brown','4126 E Crocus Dr','Phoenix','AZ','85032','6022884432','2010-05-05'),
('Russell','Jones','2413 W Augusta Ave','Phoenix','AZ','85051','6022882391','2008-09-04'),
('Freya','Peterson','9424 N 15th Dr','Phoenix','AZ','85015','6237158392','2018-04-17'),
('Brad','Shaw','4324 E Jicarilla St','Phoenix','AZ','85044','6236980493','2015-07-01'),
('Meegan','Walker','3809 E Bronco Trl','Phoenix','AZ','85044','6028708848','2000-03-04'),
('Bob','Ross','1500 W Baseline Rd','Phoenix','AZ','85041','6026598372','2019-10-28'),
('Eddy','Clark','1120 Rainbow Road','Glendale','AZ','85301','4804593921','2020-02-20'),
('Biff','Tannen','2672 W Lawrence Rd','Phoenix','AZ','85017','4804433344','2018-03-10'),
('Tobias','Miller','4329 Hillside Street','Mesa','AZ','85225','6028709983','2011-08-24'),
('Randall','Smith','71622 N 7th St #2193','Phoenix','AZ','85037','6022882293','2012-11-23'),
('Elaina','Johnson','3823 S 51st St','Phoenix','AZ','85030','4808180483','2018-12-10'),
('Dennis','Mckay','2372 Elmwood Avenue','Mesa','AZ','85205','4804590015','2017-01-29'),
('Chris','Kagel','3298 W Pima St','Phoenix','AZ','85003','6026594444','2019-06-22'),
('Tatum','Nayer','732 E Roosevelt St','Phoenix','AZ','85006','6237153829','2017-05-25'),
('Ciara','Williams','7832 W Crown King Rd','Phoenix','AZ','85043','6026608493','2015-09-18'),
('Jovie','Marcs','4934 W Julie Dr','Phoenix','AZ','85032','6026514446','2016-11-16'),
('Matt','Daniels','4320 Dye Street','Mesa','AZ','85205','4806413829','2017-09-10'),
('Ashley','Montgomery','1857 W Carson Rd','Phoenix','AZ','85041','6026532910','2018-10-05'),
('Kaylie','Summers','921 E Aire Libre Ave','Phoenix','AZ','85022','4804435839','2013-03-20'),
('Thomas','Schoen','1563 Cambridge Drive','Glendale','AZ','85301','6236984282','2008-05-20'),
('Makayla','Thomas','17235 N Central Ave','Phoenix','AZ','85225','6236984283','2019-04-22');

-- to insert the foreign keys into the employee table, id's 15 and 16 are the supervisors --
UPDATE employee SET supervisor = 16 where employee_id IN (1,3,6,9,11,13,14,17,20,21);
UPDATE employee SET supervisor = 15 where employee_id IN (2,4,5,7,8,10,12,18,19);
```

Employee Table Values Insertion

employee_id	first_name	last_name	street	city	state	zip	phone	hire_date	supervisor
1	Tanya	Brown	4126 E Crocus Dr	Phoenix	AZ	85032	6022884432	2010-05-05	16
2	Russell	Jones	2413 W Augusta Ave	Phoenix	AZ	85051	6022882391	2008-09-04	15
3	Freya	Peterson	9424 N 15th Dr	Phoenix	AZ	85015	6237158392	2018-04-17	16
4	Brad	Shaw	4324 E Jicarilla St	Phoenix	AZ	85044	6236980493	2015-07-01	15
5	Meegan	Walker	3809 E Bronco Trl	Phoenix	AZ	85044	6028708848	2000-03-04	15
6	Bob	Ross	1500 W Baseline Rd	Phoenix	AZ	85041	6026598372	2019-10-28	16
7	Eddy	Clark	1120 Rainbow Road	Glendale	AZ	85301	4804593921	2020-02-20	15
8	Biff	Tannen	2672 W Lawrence Rd	Phoenix	AZ	85017	4804433344	2018-03-10	15
9	Tobias	Miller	4329 Hillside Street	Mesa	AZ	85225	6028709983	2011-08-24	16
10	Randall	Smith	71622 N 7th St #2193	Phoenix	AZ	85037	6022882293	2012-11-23	15
11	Elaina	Johnson	3823 S 51st St	Phoenix	AZ	85030	4808180483	2018-12-10	16
12	Dennis	Mckay	2372 Elmwood Avenue	Mesa	AZ	85205	4804590015	2017-01-29	15
13	Chris	Kagel	3298 W Pima St	Phoenix	AZ	85003	6026594444	2019-06-22	16
14	Tatum	Nayer	732 E Roosevelt St	Phoenix	AZ	85006	6237153829	2017-05-25	16
15	Ciara	Williams	7832 W Crown King Rd	Phoenix	AZ	85043	6026608493	2015-09-18	*NULL*
16	Jovie	Marcs	4934 W Julie Dr	Phoenix	AZ	85032	6026514446	2016-11-16	*NULL*
17	Matt	Daniels	4320 Dye Street	Mesa	AZ	85205	4806413829	2017-09-10	16

Supervisors

Answer Business Questions

- **What quantity of each type of tests have we completed?**

```
SELECT test_type, COUNT(test_id) AS test_information FROM test GROUP BY test_type;
```

- **How many tests were performed this month (including ones pending results)?**

```
SELECT test.test_id, test.test_date, test.test_type, test.drug_id,
result.test_result, result.breathalyzer_result FROM test LEFT OUTER JOIN result ON
test.test_id = result.test_id WHERE result.result_date > "2020-10-01";
```

- **What is the percentage of positive tests results?**

```
SELECT AVG (test_result) FROM result;
```

- **At what time was a specific sample checked in?**

```
SELECT check_in_time from sample where sample_ID = 4;
```

- **View: See information about employees that are pickup drivers**

```
CREATE VIEW pick_up_drivers as (select employee.*, sample_collector.location FROM
employee LEFT JOIN sample_collector on employee.employee_id =
sample_collector.semployee_id where sample_collector.pickup_driver = '1');
```