Output Data

SQL injection attacks can occur to a poorly protected database. An SQL injection is where a database's queries are interfered with by an attacker. The attacker will take advantage of any web security vulnerabilities in the database and attempt to sabotage or manipulate the existing data. A lack of proper coding can make a person vulnerable to a SQL injection. Parameters, field values and cookies can all be vulnerable to attack. One measure to combat SQL attacks is to have stored procedures. Stored procedures are SQL statements that produce a logical unit to perform a specific task. Like tables, they are database objects. Advantages of stored procedures include effective validation, encapsulation of business logic in a single entity and faster exception handling. A stored procedure is used in the database for its protection.

Queries

Query 1 | 2.2

SELECT Orders.Order_Time, Customer.*

FROM Orders

RIGHT JOIN Customer ON Orders.Customer_Email = Customer.Customer_Email;

+ Options

Order_Time	Customer_Email	Customer_FirstName	Customer_LastName	Customer_HouseNumber	Customer_StreetName	Customer_City	Customer_Postcode	Customer_Number
2019-09-30 09:20:51	aquttolin-8530@yopmail.com	Andrea	Hester	140	Queensway	Rochester	ME58 7XU	07349785514
2019-08-24 11:42:27	cruzooz88@outlook.com	Zoe	Cruz	93	Swan Walk	Portmouth	PO2 7MQ	07465436548
2019-10-02 11:45:23	day.simon22@outlook.com	Simon	Day	5	Lavender Avenue	Lincoln	LN12 7ET	07542175612
2019-08-30 14:23:44	ellusuddob-6914@gmail.com	Ellen	Suddon	45	Park Lane	Bolton	BL11 8VQ	07824672686
NULL	ghan.r@hotmail.com	Riley	Ghan	90	Fartherly Walk	Leeds	LE2 2LK	07964545723
NULL	holloway.amy52@yahoo.com	Amy	Holloway	09	Arch Steet	Glasgow	G1 2AC	07160740896
2019-08-30 11:06:10	jones.gina11@yahoo.com	Gina	Jones	9	Pathstone Road	Grimsby	DN6 10KJ	07567213498
2019-08-22 09:09:29	kelenoqagy-5121@outlook.com	Hellen	Borrke	55	High Street	Harrow	HA63 3EJ	07345790289
NULL	lilpete223@gmail.com	Pete	Lilliker	51	Dogget Road	Nottingham	NG3 9OW	07175884652
2019-08-16 11:08:11	mat.perry-6914@yahoo.com	Mathew	Perry	20	King Street	Dundee	DD27 6UY	07687252457
2019-09-14 12:09:21	mike.fimme-3910@outlook.com	Micheal	Winnifred	14	Victoria Street	Sunderland	SR53 5VG	07523526236
2019-09-05 10:14:34	myaic@gmail.com	Mia	Smith	67	Coburn Road	London	WC94 0MC	07567256123
2019-08-27 13:55:24	nazossuzibe-4163@yahoomail.com	Natalie	Zenia	290	Grange Road	Lerwick	ZE5 5UP	07386892165
2019-09-07 16:30:01	owatehox-6397@gmail.com	Omar	Nineve	90	New Road	Edinburgh	EH72 7PD	07265959589
2019-09-29 15:12:49	pete.chappers432@outlook.com	Peter	Chapman	2	Richmond Road	Dartford	DA13 4HQ	07658764412
2019-09-14 15:17:18	richardlang@gmail.com	Richard	Langford	61	Wellesley Road	Manchester	MA3 2MN	07466823145
NULL	smith.s554@outlook.com	Samantha	Smith	141	Acacia Avenue	London	LN4 GTN	07567115686
2019-09-08 15:35:15	stee.corrig@yahoo.com	Steve	Corrigan	9	Grove Walk	Birmingham	B58 5HN	07653322984
NULL	themazzeti@hotmail.com	Liam	Mazzeti	75	Rawter Road	Liverpool	L1 8JW	07753753654
2019-10-04 09:58:38	wright.alice99@gmail.com	Alice	Wright	54	South Street	Sheffield	SH4 9OW	07456498414

Query 2 | 2.3

SELECT Staff.*, Orders.*

FROM Staff

LEFT JOIN Orders ON Staff.Staff_Email = Orders.Staff_Email;

Staff_Email	Staff_FirstName	Staff_LastName	Order_Time	Customer_Email	Service_Name	Staff_Email	Total_Cost	Discount	Quantity
abigailzz@gmail.com	Abigail	Bray	2019-09-08 15:35:15	stee.corrig@yahoo.com	Training	abigailzz@gmail.com	70.00	No	5
abigailzz@gmail.com	Abigail	Bray	2019-09-29 15:12:49	pete.chappers432@outlook.com	Computer Optimisation	abigailzz@gmail.com	30.00	No	1
Chambers9@outlook.com	Everlyn	Chambers	2019-09-14 15:17:18	richardlang@gmail.com	Cable Management	Chambers9@outlook.com	40.00	No	4
clarkeff@gmail.com	Harry	Clarke	2019-08-22 09:09:29	kelenoqagy-5121@outlook.com	PC Building	clarkeff@gmail.com	75.00	No	1
clifden12@outlook.com	Hayden	Clifton	2019-10-02 11:45:23	day.simon22@outlook.com	Reboot PC	clifden12@outlook.com	30.00	No	1
clifden12@outlook.com	Hayden	Clifton	2019-10-04 09:58:38	wright.alice99@gmail.com	Cloud Backup	clifden12@outlook.com	25.00	No	1
OHorton778@outlook.com	Oliver	Horton	NULL	NULL	NULL	NULL	NULL	NULL	NULL
preston.alex77@outlook.com	Alex	Preston	NULL	NULL	NULL	NULL	NULL	NULL	NULL
rogerfhansen51@yahoo.com	Roger	Hansen	NULL	NULL	NULL	NULL	NULL	NULL	NULL
s.polley@yahoo.com	Sally	Polley	NULL	NULL	NULL	NULL	NULL	NULL	NULL
stanjason222@gmail.com	Jason	Stanhope	2019-08-27 13:55:24	nazossuzibe-4163@yahoomail.com	Customer Support & Advice Subscription	stanjason222@gmail.com	10.00	No	1
stanjason222@gmail.com	Jason	Stanhope	2019-09-14 12:09:21	mike.fimme-3910@outlook.com	Software	stanjason222@gmail.com	60.00	No	3
terry12@gmail.com	Terry	White	2019-08-30 14:23:44	ellusuddob-6914@gmail.com	Cloud Backup	terry12@gmail.com	25.00	No	1
thehutch.s@gmail.com	Samuel	Hutchinson	2019-08-24 11:42:27	cruzooz88@outlook.com	Training	thehutch.s@gmail.com	70.00	No	1
theolivia@outlook.com	Olivia	Taylor	2019-08-16 11:08:11	mat.perry-6914@yahoo.com	Hardware Repairs	theolivia@outlook.com	42.00	No	7
theolivia@outlook.com	Olivia	Taylor	2019-09-07 16:30:01	owatehox-6397@gmail.com	Cable Management	theolivia@outlook.com	20.00	No	2
walker.nathan@yahoo.com	Nathan	Walker	2019-09-05 10:14:34	myaic@gmail.com	Upgrading	walker.nathan@yahoo.com	90.00	No	2
waraddis55@outlook.com	Warren	Addison	2019-08-30 11:06:10	jones.gina11@yahoo.com	Antivirus & Firewall Setup	waraddis55@outlook.com	50.00	No	2
williams.ian555@yahoo.com	Ian	Williams	2019-09-30 09:20:51	aquttolin-8530@yopmail.com	Antivirus & Firewall Setup	williams.ian555@yahoo.com	25.00	No	1

Query 3 | 2.4

SELECT Orders.*, Customer.Customer_FirstName, Customer.Customer_LastName

FROM Orders

INNER JOIN Customer ON Orders.Customer_Email = Customer.Customer_Email;

Order_Time	Customer_Email	Service_Name	Staff_Email	Total_Cost	Discount	Quantity	Customer_FirstName	Customer_LastName
2019-08-16 11:08:11	mat.perry-6914@yahoo.com	Hardware Repairs	theolivia@outlook.com	42.00	No	7	Mathew	Perry
2019-08-22 09:09:29	kelenoqagy-5121@outlook.com	PC Building	clarkeff@gmail.com	75.00	No	1	Hellen	Borrke
2019-08-24 11:42:27	cruzooz88@outlook.com	Training	thehutch.s@gmail.com	70.00	No	1	Zoe	Cruz
2019-08-27 13:55:24	nazossuzibe-4163@yahoomail.com	Customer Support & Advice Subscription	stanjason222@gmail.com	10.00	No	1	Natalie	Zenia
2019-08-30 11:06:10	jones.gina11@yahoo.com	Antivirus & Firewall Setup	waraddis55@outlook.com	50.00	No	2	Gina	Jones
2019-08-30 14:23:44	ellusuddob-6914@gmail.com	Cloud Backup	terry12@gmail.com	25.00	No	1	Ellen	Suddon
2019-09-05 10:14:34	myaic@gmail.com	Upgrading	walker.nathan@yahoo.com	90.00	No	2	Mia	Smith
2019-09-07 16:30:01	owatehox-6397@gmail.com	Cable Management	theolivia@outlook.com	20.00	No	2	Omar	Nineve
2019-09-08 15:35:15	stee.corrig@yahoo.com	Training	abigailzz@gmail.com	70.00	No	5	Steve	Corrigan
2019-09-14 12:09:21	mike.fimme-3910@outlook.com	Software	stanjason222@gmail.com	60.00	No	3	Micheal	Winnifred
2019-09-14 15:17:18	richardlang@gmail.com	Cable Management	Chambers9@outlook.com	40.00	No	4	Richard	Langford
2019-09-29 15:12:49	pete.chappers432@outlook.com	Computer Optimisation	abigailzz@gmail.com	30.00	No	1	Peter	Chapman
2019-09-30 09:20:51	aquttolin-8530@yopmail.com	Antivirus & Firewall Setup	williams.ian555@yahoo.com	25.00	No	1	Andrea	Hester
2019-10-02 11:45:23	day.simon22@outlook.com	Reboot PC	clifden12@outlook.com	30.00	No	1	Simon	Day
2019-10-04 09:58:38	wright.alice99@gmail.com	Cloud Backup	clifden12@outlook.com	25.00	No	1	Alice	Wright

Stored Procedure

```
DELIMITER $$

CREATE PROCEDURE `selectOrders`() NOT DETERMINISTIC CONTAINS SQL SQL SECURITY DEFINER SELECT * FROM Orders;

CALL `selectOrders`();

SET @p0='2019-09-05 10:14:34';

CALL `selectOrders`(@p0, @p1);

SELECT @p1 AS `Quantity2`;

END$$

DELIMITER;

Call selectOrders;
```

The main advantage of this stored procedure is that it requires the input of a specific date and time to access the quantity of the order. This makes it less likely to be accessed by an intruder as they are unlikely to have the exact date and time of the order they want to alter. The images below show its results: