

Task 7: Analyse and Optimize

Selected Query(from products.php, getProducts(\$db,\$input):

```
SELECT * FROM products
WHERE category = ?
AND price >= ?
AND price <= ?
ORDER BY price | rating | nr_reviews ASC/DESC
```

Test Query (to show it works):





































































































Run SQL query/queries on database u23525984_indexfive_db:

```
1 SELECT * FROM products
2 WHERE category = 'Laptops'
3 AND price >= 1400
4 AND price <= 1500
5 ORDER BY rating DESC;
6
```

Showing rows 0 - 24 (25 total. Query took 0.0012 seconds.) [rating: 5.00...]

SELECT * FROM products WHERE category = 'Laptops' AND price >= 1400 AND price <= 1500 ORDER BY rating DESC

Options | Show all | Number of rows: 500 | Filter rows: Search this table | Sort by key: None

	product_id	rating	title	image_url	product_link	price	discount_price	nr_reviews	category	retailer
  	3345	5.00	MSI Katana 15 Gaming Laptop Kit		https://www.google.com/shopping/product/179uua8p...	1498.45	N/A	5	Laptops	B&H Photo
  	3351	5.00	MSI Cyborg 15 A13V Gaming Laptop		https://www.google.com/shopping/product/7817488315...	1400.00	1388.00	3	Laptops	PC Richard & Son
  	52	4.80	Apple MacBook Air 15" M1 Chip (Early 2024)		https://www.google.com/shopping/product/179uua8p...	1499.00	1388.00	7800	Laptops	Adorama
  	72	4.50	Apple MacBook Air M2 13" Starlight		https://www.google.com/shopping/product/179uua8p...	1400.00	1299.99	7000	Laptops	Mac Store Cameras & Electronics
  	392	4.80	Acer Nitro V15 Gaming Laptop		https://www.google.com/shopping/product/179uua8p...	1449.00	N/A	2500	Laptops	Newegg.com
  	3179	4.70	Acer Predator Helios Neo 16 Laptop		https://www.google.com/shopping/product/1744004192...	1499.99	N/A	838	Laptops	Best Buy
  	3578	4.70	HP 17 3" i7-1355u Laptop		https://www.google.com/shopping/product/7865852415...	1431.99	N/A	69	Laptops	Walmart
  	278	4.60	Msi Katana A15 AI 15.6 Gaming Laptop Ryzen		https://www.google.com/shopping/product/1457385667...	1400.00	1239.00	123	Laptops	MSI Online Store
  	3506	4.60	Microsoft Surface Laptop u2013 Copilot+ PC - 7th E...		https://www.google.com/shopping/product/179uua8p...	1409.99	N/A	890	Laptops	CDW
  	3481	4.50	Microsoft Surface Pro Copilot+ PC		https://www.google.com/shopping/product/1540435323...	1300.00	1199.99	1200	Laptops	Microsoft Store
  	3505	4.50	Microsoft Surface Laptop 5 15		https://www.google.com/shopping/product/1563089592...	1487.18	N/A	4	Laptops	Walmart
  	3510	4.50	Microsoft Surface Pro Copilot+ PC Touchscreen 13.1"		https://www.google.com/shopping/product/179uua8p...	1490.00	1480.99	1200	Laptops	Walmart
  	3512	4.50	Microsoft Surface Pro - Copilot+ PC - 13" Sapph...		https://www.google.com/shopping/product/179uua8p...	1499.00	N/A	1200	Laptops	4Day
  	17	4.40	ASUS Zenbook Duo OLED		https://www.google.com/shopping/product/1547552751...	1500.00	1309.99	942	Laptops	Best Buy
  	3154	4.30	Asus ROG Zephyrus Duo 16 OLED 2.5k 240Hz Gaming L...		https://www.google.com/shopping/product/1504212545...	1499.99	N/A	1300	Laptops	Best Buy
  	322	4.20	Asus Vivobook Pro 15 OLED Laptop Ultra 7-155H		https://www.google.com/shopping/product/7342205833...	1499.99	N/A	6100	Laptops	B&H Photo
  	415	4.10	Dell XPS 14 9440		https://www.google.com/shopping/product/9362405105...	1499.99	N/A	808	Laptops	Dell
  	3162	3.90	Asus Zenbook 5 15 10" 3K OLED Touch Screen Laptop		https://www.google.com/shopping/product/7005955695...	1400.00	1099.99	243	Laptops	Best Buy
  	3210	3.90	HP OmniBook X Laptop 14" 2.2K Touch Screen Qualcomm...		https://www.google.com/shopping/product/8058477344...	1500.00	1199.99	15	Laptops	HP
  	433	3.80	Dell XPS 13 9340 First Ultra 7 156H		https://www.google.com/shopping/product/1564715654...	1579.29	N/A	863	Laptops	Duxton
  	420	3.80	NextDay XPS 13 9340 Copilot+ Laptop 13.4 inch FH...		https://www.google.com/shopping/product/179uua8p...	1499.00	N/A	4300	Laptops	Amazon.com
  	396	N/A	Msi Thin 15.6" 144Hz Fhd Gaming Laptop		https://www.google.com/shopping/product/179uua8p...	1449.00	N/A	N/A	Laptops	4Day
  	403	N/A	Acer Nitro V15 Gaming Laptop		https://www.google.com/shopping/product/1135172814...	1400.00	1219.99	N/A	Laptops	Newegg.com
  	435	N/A	Dell XPS 13 Business Laptop		https://www.google.com/shopping/product/1179uua8p...	1499.99	N/A	N/A	Laptops	Amazon.com
  	438	N/A	XPS 13" Laptop		https://www.google.com/shopping/product/1179uua8p...	1499.00	N/A	N/A	Laptops	University Store on Fifth

Options | Show all | Number of rows: 500 | Filter rows: Search this table | Sort by key: None

Explain Query:

Run SQL query/queries on database u23525984_indexfive_db: ⓘ

```

1 EXPLAIN SELECT * FROM products
2 WHERE category = 'Electronics'
3   AND price >= 1400
4   AND price <= 1500
5 ORDER BY rating DESC;
6

```

Your SQL query has been executed successfully.

```

EXPLAIN SELECT * FROM products WHERE category = 'Electronics' AND price >= 1400 AND price <= 1500 ORDER BY rating DESC

```

+ Options

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	products	ALL	NULL	NULL	NULL	NULL	4938	Using where; Using filesort

What does this mean:

- Type = ALL:
 - This is scanning all rows in the products table (rows = 4983) which is very inefficient.
- Key = NULL:
 - No indexing is being used.
- Using filesort:
 - This appears when using "SELECT *".
 - MYSQL is sorting the data in memory.

Initial optimization:

- Add a composite index only used for this sorting.

Run SQL query/queries on database u23525984_indexfive_db: ⓘ

```

1 CREATE INDEX idx_sort
2 ON products (category, price, rating DESC);
3

```

Run SQL query/queries on database u23525984_indexfive_db: ⓘ

```

1 EXPLAIN SELECT * FROM products
2 WHERE category = 'Laptops'
3   AND price >= 1400
4   AND price <= 1500
5 ORDER BY rating DESC;
6

```

Your SQL query has been executed successfully.

```
EXPLAIN SELECT * FROM products WHERE category = 'Laptops' AND price >= 1400 AND price <= 1500 ORDER BY rating DESC
```

+ Options

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	products	range	idx_sort	idx_sort	1029	NULL	25	Using index condition; Using filesort

Type = range:

- This is more efficient as it is now only looking through that index (rows = 25) and getting the same results as before.

Key = idx_sort:

- Indexing is being used, so that there is less data to look through.

Ran the query again to check and it only used the 25 rows from the index:

Showing rows 0 - 24 (25 total, Query took 0.0020 seconds) [rating: 5.00...]

```
SELECT * FROM products WHERE category = 'Laptops' AND price >= 1400 AND price <= 1500 ORDER BY rating DESC
```

Options

	product_id	rating	title	image_url	product_link	price	discount_price	nr_reviews	category	retailer
<input type="checkbox"/>	3345	5.00	MSI Katana 15 Gaming Laptop Kit	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1456.45	NULL	5	Laptops	B&H Photo
<input type="checkbox"/>	3351	5.00	MSI Cyborg 15 A13VF Gaming Laptop	https://www.google.com/shopping/product/7037408010...	https://www.google.com/shopping/product/7037408010...	1400.00	1088.00	3	Laptops	PC Richard & Son
<input type="checkbox"/>	52	4.80	Apple MacBook Air 13" M3 Chip (Early 2024)	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1499.00	1399.00	7600	Laptops	Adorama
<input type="checkbox"/>	72	4.80	Apple MacBook Air M3 13" Starlight	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1400.00	1299.99	7600	Laptops	Mac Star Cameras & Electronics
<input type="checkbox"/>	392	4.80	Acer Nitro V15 Gaming Laptop	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1449.00	NULL	2500	Laptops	Newegg.com
<input type="checkbox"/>	3179	4.70	Acer Predator Helios Neo 16 Laptop	https://www.google.com/shopping/product/1744504182...	https://www.google.com/shopping/product/1744504182...	1499.99	NULL	636	Laptops	Best Buy
<input type="checkbox"/>	3578	4.70	HP 17.3" 17-1355u Laptop	https://www.google.com/shopping/product/7658593415...	https://www.google.com/shopping/product/7658593415...	1431.99	NULL	99	Laptops	Walmart
<input type="checkbox"/>	278	4.60	MSI Katana A15 AI 15.6 Gaming Laptop Ryzen	https://www.google.com/shopping/product/1457395907...	https://www.google.com/shopping/product/1457395907...	1400.00	1239.00	123	Laptops	MSI Online Store
<input type="checkbox"/>	3506	4.60	Microsoft Surface Laptop 2013 Copilot+ PC - 7th E...	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1499.99	NULL	890	Laptops	CDW
<input type="checkbox"/>	3461	4.50	Microsoft Surface Pro Copilot+ PC	https://www.google.com/shopping/product/1840433233...	https://www.google.com/shopping/product/1840433233...	1500.00	1199.99	1200	Laptops	Microsoft Store
<input type="checkbox"/>	3505	4.50	Microsoft Surface Laptop 5 15	https://www.google.com/shopping/product/1583090582...	https://www.google.com/shopping/product/1583090582...	1487.18	NULL	4	Laptops	Walmart
<input type="checkbox"/>	3510	4.50	Microsoft Surface Pro Copilot+ PC Touchscreen 13.1...	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1490.00	1149.99	1200	Laptops	Walmart
<input type="checkbox"/>	3512	4.50	Microsoft - Surface Pro - Copilot+ PC - 13" - Sapph...	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1490.00	NULL	1200	Laptops	eBay
<input type="checkbox"/>	17	4.40	ASUS Zenbook Duo OLED	https://www.google.com/shopping/product/1547252761...	https://www.google.com/shopping/product/1547252761...	1400.00	1309.99	942	Laptops	Best Buy
<input type="checkbox"/>	3154	4.30	Asus ROG Zephyrus G16 16" OLED 2.5k 240Hz Gaming L...	https://www.google.com/shopping/product/1547252761...	https://www.google.com/shopping/product/1547252761...	1459.99	NULL	1300	Laptops	Best Buy
<input type="checkbox"/>	322	4.20	Asus Vivobook Pro 15 OLED Laptop Ultra 7-155H	https://www.google.com/shopping/product/2342012045...	https://www.google.com/shopping/product/2342012045...	1499.99	NULL	8100	Laptops	B&H Photo
<input type="checkbox"/>	415	4.10	Dell XPS 14 9440	https://www.google.com/shopping/product/9382405108...	https://www.google.com/shopping/product/9382405108...	1499.99	NULL	608	Laptops	Dell
<input type="checkbox"/>	3182	3.80	Asus Zenbook S 16 16" 3K OLED Touch Screen Laptop	https://www.google.com/shopping/product/7089596968...	https://www.google.com/shopping/product/7089596968...	1600.00	1099.99	243	Laptops	Best Buy
<input type="checkbox"/>	3210	3.80	HP OmniBook X Laptop 14" 2.2K Touch Screen Qualcomm...	https://www.google.com/shopping/product/1803473344...	https://www.google.com/shopping/product/1803473344...	1500.00	1199.99	15	Laptops	HP
<input type="checkbox"/>	433	3.80	Dell XPS 13 9340 Thin Client Ultra 7 155H	https://www.google.com/shopping/product/1599179504...	https://www.google.com/shopping/product/1599179504...	1476.29	NULL	563	Laptops	Ultratone
<input type="checkbox"/>	420	3.50	New Dell XPS 13 9345 Copilot+AI Laptop 13.4 inch FH...	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1499.00	NULL	4300	Laptops	Amazon.com
<input type="checkbox"/>	296	NULL	Msi Thin 15.6" 144Hz Fhd Gaming Laptop	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1440.86	NULL	NULL	Laptops	eBay
<input type="checkbox"/>	403	NULL	Acer Nitro 17 Gaming Laptop	https://www.google.com/shopping/product/1135172514...	https://www.google.com/shopping/product/1135172514...	1400.00	1219.99	NULL	Laptops	Newegg.com
<input type="checkbox"/>	435	NULL	Dell XPS 13 Business Laptop	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1499.99	NULL	NULL	Laptops	Amazon.com
<input type="checkbox"/>	438	NULL	XPS 13 Laptop	https://www.google.com/shopping/product/17gusdpr...	https://www.google.com/shopping/product/17gusdpr...	1499.00	NULL	NULL	Laptops	University Store on Fifth

Further optimisation:

- Only Query using necessary columns

Run SQL query/queries on database u23525984_indexfive_db:

```
1 SELECT product_id, title, price, rating
2 FROM products
3 WHERE category = 'Laptops'
4 AND price BETWEEN 1400 AND 1500
5 ORDER BY rating DESC;
6
```

✓ Showing rows 0 - 24 (25 total, Query took 0.0015 seconds.) [rating: 5.00... - ...]

```
SELECT product_id, title, price, rating FROM products WHERE category = 'Laptops' AND price BETWEEN 1400 AND 1500 ORDER BY rating DESC
```

☐ Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

+ Options

	product_id	title	price	rating
<input type="checkbox"/> Edit Copy Delete	3345	MSI Katana 15 Gaming Laptop Kit	1456.45	5.00
<input type="checkbox"/> Edit Copy Delete	3351	MSI Cyborg 15 A13VF Gaming Laptop	1400.00	5.00
<input type="checkbox"/> Edit Copy Delete	52	Apple MacBook Air 13.6" M3 Chip (Early 2024)	1499.00	4.80
<input type="checkbox"/> Edit Copy Delete	72	Apple MacBook Air M3 13" Starlight	1400.00	4.80
<input type="checkbox"/> Edit Copy Delete	392	Acer Nitro V15 Gaming Laptop	1449.00	4.80
<input type="checkbox"/> Edit Copy Delete	3179	Acer Predator Helios Neo 16 Laptop	1499.99	4.70
<input type="checkbox"/> Edit Copy Delete	3578	HP 17.3" I7-1355u Laptop	1431.99	4.70
<input type="checkbox"/> Edit Copy Delete	278	Msi Katana A15 AI 15.6 Gaming Laptop Ryzen	1400.00	4.60
<input type="checkbox"/> Edit Copy Delete	3506	Microsoft Surface Laptop u2013 Copilot+ PC - 7th E...	1409.99	4.60
<input type="checkbox"/> Edit Copy Delete	3481	Microsoft Surface Pro Copilot+ PC	1500.00	4.50
<input type="checkbox"/> Edit Copy Delete	3505	"Microsoft Surface Laptop 5 15	1487.18	4.50
<input type="checkbox"/> Edit Copy Delete	3510	Microsoft Surface Pro Copilot+ PC Touchscreen 13 i...	1490.00	4.50
<input type="checkbox"/> Edit Copy Delete	3512	Microsoft - Surface Pro - Copilot+ PC - 13"- Sapph...	1499.00	4.50
<input type="checkbox"/> Edit Copy Delete	17	ASUS Zenbook Duo OLED	1500.00	4.40
<input type="checkbox"/> Edit Copy Delete	3154	Asus ROG Zephyrus G16 16" OLED 2.5k 240Hz Gaming L...	1459.99	4.30
<input type="checkbox"/> Edit Copy Delete	322	Asus Vivobook Pro 15 Oled Laptop Ultra 7-155h	1499.99	4.20
<input type="checkbox"/> Edit Copy Delete	415	Dell XPS 14 9440	1499.99	4.10
<input type="checkbox"/> Edit Copy Delete	3162	Asus Zenbook S 16 16" 3K OLED Touch Screen Laptop	1400.00	3.90
<input type="checkbox"/> Edit Copy Delete	3210	HP OmniBook X Laptop 14" 2.2K Touch Screen Qualcom...	1500.00	3.90
<input type="checkbox"/> Edit Copy Delete	433	Dell XPS 13 9340 Fhd+ Ultra 7 155H	1476.29	3.80
<input type="checkbox"/> Edit Copy Delete	420	NewDell XPS 13 9345 Copilot+AI Laptop 13.4 inch FH...	1499.00	3.50
<input type="checkbox"/> Edit Copy Delete	266	Msi Thin 15.6" 144hz Fhd Gaming Laptop	1440.68	NULL
<input type="checkbox"/> Edit Copy Delete	403	Acer Nitro 17 Gaming Laptop	1400.00	NULL
<input type="checkbox"/> Edit Copy Delete	435	Dell XPS 13 Business Laptop	1499.99	NULL
<input type="checkbox"/> Edit Copy Delete	438	XPS 13" Laptop	1499.00	NULL

This is more efficient than the initial optimisation, we can see this in how quickly it took to execute the query.

- Initial optimisation: 0.002 seconds
- further optimisation: 0.0015 seconds

These might not seem like alot but when working with large datasets, and making lots of queries, it can all add up.