Final exam task 1 — Fundamentals of Databases

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1. Changing the order of the index will help.

```
CREATE INDEX tbl_idx ON tbl(b, a)
```

2. (a) Block access means that the data from disk is fetched in blocks.

   (b) Fetching small bits of data that's scattered around different *pages* (blocks).

   (c) It's very performant and when inserting, the data is sorted.

3.
```
explain select * from 0256_bank where postalCode between 20000 and 70000;
```

Result:

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	0256_bank	ALL	PostalCodeIndex	NULL	NULL	NULL	19822	Using where

   (a) There is a suitable index available (*PostalCodeIndex*). The suitable index is **not** used. It is not used because of the asterisk (*). It still has to do full table scan.

   (b)
```
explain select postalCode from 0256_bank where postalCode between 20000 and 70000;
```

Result:

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	0256_bank	range	PostalCodeIndex	PostalCodeIndex	4	NULL	18954	Using where; Using in

   Now, the index is used. After looking up the records in the index, nothing else is needed.

   (c)
```
explain select postalCode from 0256_bank where postalCode between 20000 and 70000
ORDER BY postalCode;
```

Result:

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	0256_bank	range	PostalCodeIndex	PostalCodeIndex	4	NULL	18954	Using where; Using in

   Nothing changes in the processing since the data in the index is already ordered.

   (d)
```
explain select postalCode from 0256_bank where postalCode between 20000 and 70000
ORDER BY `bankID`;
```

Result:

id	select_type	table	type	possible_keys	key	key_len	ref	rows	Extra
1	SIMPLE	0256_bank	index	PostalCodeIndex	PRIMARY	4	NULL	19822	Using where

   Since *bankID* has nothing to do with *postalCode*, after looking the records up in the index, sorting needs to happen.

   (e)
```
select avg(postalCode) as averageEvenPostalCode from 0256_bank
where `postalCode` % 2 = 0;
```

Result:

averageEvenPostalCode
59877.5833

This query (even though we will never need it) calculates the average postal code of the banks that have even postal codes. For this, it only needs to look in the *PostalCodeIndex*.