20_Maximize Prime Item Inventory Hard - Solution

Source - https://datalemur.com/questions/prime-warehouse-storage

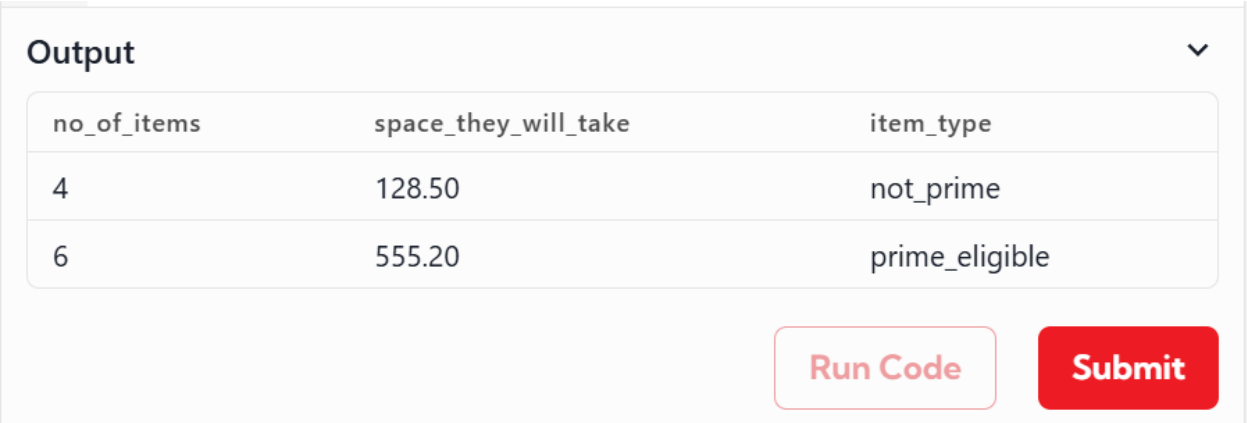
Running notes

- amazon wants to maximize storage of warehouse
- it wants to prioritize a specific batch of prime items
- The specific prime product batch detailed in the `inventory` table must be maintained.
- if the prime product batch specified in the `item_category` column included 1 laptop and 1 side table, that would be the base batch. We could not add another laptop without also adding a side table; they come all together as a batch set.
- After prioritizing the maximum number of prime batches, any remaining square footage will be utilized to stock non-prime batches, which also come in batch sets and cannot be separated into individual items.
- Question
    - Write a query to find the maximum number of prime and non-prime batches that can be stored in the 500,000 square feet warehouse based on the following criteria:
    - Prioritize stocking prime batches
    - After accommodating prime items, allocate any remaining space to non-prime batches
- Output

item_type item_count
prime_eligible 9285
not_prime 6

now thats what I call a HARD HARD problem

```
SELECT
count(item_id) as no_of_items,
sum(square_footage) as space_they_will_take,
item_type
FROM inventory
GROUP BY item_type
```



now I want to maximize this to the complete space that I have - 500,000

but I cant break the number of items, and not_prime can never be left out

okay I needed to visualise this question better by writing and understanding things out ... so I have started from the start and gonna merge them here hehe

```
WITH main_CTE AS
(SELECT item_type,
sum(square_footage) as sum_f,
count(item_id) as count_of_items
FROM inventory
GROUP BY item_type),
prime_CTE AS (
SELECT item_type,
500000/sum_f::INT as no_of_batches,count_of_items,
500000-((500000/sum_f::INT)*(sum_f)) as remaining_space
FROM main_cte
WHERE item_type='prime_eligible'
```

```
),
not_prime_CTE AS (
SELECT item_type,
((SELECT remaining_space FROM prime_CTE)/sum_f)::INT as no_of_ba
FROM main_cte
WHERE item_type='not_prime'
)
(SELECT item_type,
count_of_items*no_of_batches as item_count
FROM prime_CTE
UNION ALL
SELECT item_type,
count_of_items*no_of_batches as item_count
FROM not_prime_CTE)
```

Aim: maximize prime item in inventory

Inventory: 500,000 sq

Query 1:

→ select * from inventory

I have item_id, item type, category, sq footage

prime eligible

not prime

Query Requirements:

→ maximize storage capacity (500 000)
→ priority: prime items.
→ so now I have a batch details the query above showed that
→ I can't break the prime batch items, all the items in this batch have to be added together in the warehouse
→ 1st prioritize: to fit the maximum number of prime items in the warehouse

2) → Find the remaining space & see how many non prime batches can be fitted together

non prime items could never be zero.

Rough work.

batch	
1	555.20
x	500 000

$x = \frac{500\,000}{555.20}$

$= 900.67$

↓ round down

$\approx$ 900 (prime)

$= 500\,000 - (900 \times 555.20)$

$= 320$ sq feet remaining

1	128.5
x	320

$$x = \frac{320}{128.5}$$

$$= 2.49$$

$$\approx 2 \text{ (not prime)}$$

CODE BREAKDOWN.

this is the main cte where I am finding the type of the total of the square footage for each item type & the no. of items in each batch

for each batch → total square footage
→ no. of items

```
1) WITH main_CTE AS
(SELECT item_type,
sum(square_footage) as sum_f,
count(item_id) as count_of_items
FROM inventory
GROUP BY item_type),
prime_CTE AS (
2) SELECT item_type,
500000/sum_f::INT as no_of_batches,count_of_items,
500000-((500000/sum_f::INT)*(sum_f)) as
remaining_space
FROM main_cte
WHERE item_type='prime_eligible'
),
not_prime_CTE AS (
3) SELECT item_type,
((SELECT remaining_space FROM prime_CTE)/
sum_f)::INT as no_of_batches,count_of_items
FROM main_cte
WHERE item_type='not_prime'
)
4) (SELECT item_type,
count_of_items*no_of_batches as item_count
FROM prime_CTE
UNION ALL
SELECT item_type,
count_of_items*no_of_batches as item_count
FROM not_prime_CTE)
```

warehouse max space ÷ by the space of prime batch converting to int for whole no

formula to find remaining space

remainingspace ÷ by sum_f of not prime & to get no. of batches

formula to find the no. of items
→ no. of items in each batch x no. of batches

Written By

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