Problem

There are 3 factories producing shirts at different capacities and 4 customers with different demands for the shirts. Some customers are located closer to the factory than others, so the transportation cost per unit varies. The table below contains the costs per unit transported to each customer from each factory, the supply of each factory, and each customer's demand.

Find the initial basic feasible solution using the **least cost method** and calculate the $\frac{Total\ cost}{30}$ ratio.

Transport cost	Customer A	Customer B	Customer C	Customer D	Supply (units)
Factory 1	13	14	22	18	6
Factory 2	12	11	17	12	1
Factory 3	17	19	26	20	10
Demand (units)	7	5	3	2	

Solution

Consider the values of the transport cost as a separate table from the one provided. What you want to do is identify the least expensive option available. Once you spot it, look at the demand and supply corresponding to the row and column of the cell. For example, the cell (Factory 2, Customer B) contains the lowest transportation cost value. Looking at the supply of Factory 2, we see 1 unit. Looking at the demand for Customer B, we observe 5 units. Now, you note that you will supply 1 unit to customer B at a transportation cost of 0. Once this is done, please update the demand and supply values accordingly. Customer B's demand is now 4, and Factory B's supply is fully utilized, meaning it is now 0. Because the supply is now 0, we can cross out the Factory 2 row because they won't be able to produce any other units. With the crossed row, the table of values changes. If demand becomes 0, a column is crossed out as the customer's demand was satisfied. It is time to look for the lowest value again and repeat the process until the demand is fully met.

The next parts:

The lowest value is 2 (Factory 1, Customer A). 6 units are supplied to the customer → Factory 1's supply becomes 0 and Customer A's demand becomes 1. Factory 1's row is dropped.

The lowest value is 5 (Factory 3, Customer A). 1 unit is supplied to the customer → Factory 3's supply becomes 9, and Customer A's demand becomes 0. Customer A's column is dropped.

The lowest value is 8 (Factory 3, Customer B). 4 units are supplied to the customer → Factory 3's supply becomes 5, and Customer B's demand becomes 0 (remember the first example, the demand was updated). Customer B's column is dropped.

The lowest value is 9 (Factory 3, Customer D). 2 units are supplied to the customer → Factory 3's supply becomes 3, and Customer D's demand becomes 0. Customer D's column is dropped.

The lowest and last value is 15 (Factory 3, Customer C). 3 units are supplied to the customer → Factory 3's supply becomes 0, and Customer C's demand becomes 0. Customer C's column is dropped and thus there are no values to be analyzed.

Looking at the notes, we multiply the units provided to customers by the cost of transporting them from the factories.

The total cost = 13 * 6 + 11 * 1 + 17 * 1 + 19 * 4 + 26 * 3 + 20 * 2 = 300

$$\frac{Total\ cost}{30} = \frac{300}{30} = 10$$

Answer: 10