Problem 2/4

Problem 2.

0 points possible (ungraded)

Smithson Steel is a major supplier of stainless steel planks for kitchen construction and other industrial purposes across the United States. Their stainless steel is highly valued for its superior food-grade quality and the longevity of its luster. Every stainless steel plank manufactured by Smithson Steel is shipped from a production facility to an independent quality inspection site, and then to a distribution center (DC). Details are provided below:

Production Facilities

Smithson Steel has four *production facilities* located in Texas, Rhode Island, Illinois and Missouri. Each facility has a supply capacity for the week that cannot be exceeded.

Supply Capacity (planks/week)			
Texas	**Rhode Island**	**Illinois**	**Missouri**
38	23	27	36

What is the sum of the supply capacity of all four production facilities?
Give your answer in planks, as an integer.

124 ✔

124

Inbound Transportation

From the production facility, the planks are shipped to quality inspection sites, referred to as *inbound transportation*. There are different costs to transport a plank from each production facility to each inspection site.

	Inbound Transportation Costs (USD/plank)		
	Alaska	**Tennessee**	**Michigan**
Texas	44	36	38
Rhode Island	37	33	46
Illinois	47	26	50
Missouri	40	27	35

Inspection Sites

Smithson uses any of three independently operated inspection sites in Alaska, Tennessee and Michigan. The inspection site cannot hold inventory.

Each quality inspection site charges Smithson a fixed cost for every week it inspects any planks for Smithson. If an inspection site receives zero planks during a week, there is no fixed cost charged by that site for that week.

Inspection Site Fixed Cost (USD/week)		
Alaska	**Tennessee**	**Michigan**
700	500	850

Additionally, there is a maximum capacity in the number of planks that each quality inspection site can inspect per week.

Inspection Site Maximum Capacity (planks/week)		
Alaska	**Tennessee**	**Michigan**
40	49	34

What is the sum of the capacity in the inspection centers?

Give your answer in planks, as an integer.

123 ✔

123

Outbound Transportation

The planks are then shipped from the quality inspection sites to the DCs, referred to as *outbound transportation*. There are different costs to transport a plank from each inspection site to the DCs.

	Outbound Transportation Costs (USD/plank)			
	Minnesota	**North Carolina**	**South Carolina**	**California**
Alaska	43	21	42	36
Tennessee	35	43	15	34
Michigan	30	45	23	47

What is the cost of moving one plank from Texas through Tennessee into South Carolina?
Give your answer in USD, round to nearest integer.

551 ✖

551

State DCs

The planks are then delivered to DCs in four states: Minnesota, North Carolina, South Carolina, and California. The DCs in each state have their own weekly demand requirements which must be satisfied.

Demand Requirement (planks/week)			
Minnesota	**North Carolina**	**South Carolina**	**California**
9	6	27	18

What is the sum of the demand requirement from all four DCs?
Give your answer in planks, as an integer.

60 ✔

60

Submit You have used 1 of 3 attempts

✱ Partially Correct

Question 1.

5/5 points (graded)
Determine the optimal solution for the shipments that satisfy customer demand and minimize costs (including the fixed cost at the inspection site), while respecting the capacities of the production facilities and the inspection sites.

What is the total cost of the optimal solution?
Give your answer in USD, rounded to the nearest integer. Please notice that the answer to this question is graded with a 0.1% tolerance. In other words, your answer to this question may be graded as correct even if it does not correspond to the optimal solution, as long as it falls within the 0.1% tolerance.

4371 ✔

4371

Submit You have used 1 of 2 attempts

✔ Correct (5/5 points)

Question 2.

6/6 points (graded)
What is the flow between the production facility in Texas and the inspection site in Michigan?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow between the production facility in Missouri and the inspection site in Alaska?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow between the inspection site in Michigan and the DC in Minnesota?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow between the inspection site in Tennessee and the DC in South Carolina?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

27 ✔

27

Submit You have used 1 of 2 attempts

✔ Correct (6/6 points)

Question 3.

6/6 points (graded)
What is the flow leaving the production facility in Texas?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow leaving the production facility in Rhode Island?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

11 ✔

11

What is the flow leaving the production facility in Illinois?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

27 ✔

27

What is the flow leaving the production facility in Missouri?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

22 ✔

22

Submit You have used 1 of 2 attempts

✔ Correct (6/6 points)

Question 4.

6/6 points (graded)
What is the flow leaving the inspection site in Alaska?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

11 ✔

11

What is the flow leaving the inspection site in Tennessee?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

49 ✔

49

What is the flow leaving the inspection site in Michigan?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

Submit You have used 1 of 2 attempts

✔ Correct (6/6 points)

Fixed Cost in Production Facilities.

5/5 points (graded)

From now on, you are asked to consider that each production facility incurs a fixed cost for every week it ships any planks to any inspection site. If a production facility ships zero planks during a week, there is no fixed cost incurred by that facility for that week.

Production Facility Fixed Cost (USD/week)			
Texas	**Rhode Island**	**Illinois**	**Missouri**
540	580	200	480

Question 5.

Determine the optimal solution for the shipments that satisfies customer demand and minimizes costs (including all the fixed costs), while respecting the capacities of the production facilities and the inspection sites.

What is the total cost of the new optimal solution?

Give your answer in USD, rounded to the nearest integer. Please notice that the answer to this question is graded with a 0.1% tolerance. In other words, your answer to this question may be graded as correct even if it does not correspond to the optimal solution, as long as it falls within the 0.1% tolerance.

5084 ✔

5084

Submit You have used 1 of 2 attempts

✔ Correct (5/5 points)

Question 6.

6/6 points (graded)

What is the flow between the production facility in Missouri and the inspection site in Michigan?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow between the production facility in Texas and the inspection site in Alaska?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow between the inspection site in Alaska and the DC in North Carolina?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

6 ✔

6

What is the flow between the inspection site in Michigan and the DC in Minnesota?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

Submit You have used 1 of 2 attempts

✔ Correct (6/6 points)

Question 7.

6/6 points (graded)

What is the flow leaving the production facility in Texas?

Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow leaving the production facility in Rhode Island?

Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

What is the flow leaving the production facility in Illinois?

Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

27 ✔

27

What is the flow leaving the production facility in Missouri?

Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

33 ✔

33

Submit You have used 1 of 2 attempts

✔ Correct (6/6 points)

Question 8.

5/5 points (graded)

What is the flow leaving the inspection site in Alaska?

Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

11 ✔

11

What is the flow leaving the inspection site in Tennessee?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

49 ✔

49

What is the flow leaving the inspection site in Michigan?
Give your answer in planks, as an integer. If the flow is zero, enter 0 as your answer. Your answer will be graded with a tolerance of 1 plank.

0 ✔

0

Submit You have used 1 of 2 attempts

✔ Correct (5/5 points)