

Cost Accounting 2

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USC



Lecture 4

جامعة مدينة السادات —

Fourth Reciprocal allocation method

- The previous three methods are considered inaccurate, if the service departments exchange services between them.
- For example, if we return to the method of step-down allocation we find that it assumes that the warehouses center serves the maintenance center only.

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Methods to distribute the costs of service centers on production centers

- On the other hand, the maintenance center serves the warehouses.
- If the maintenance center actually performed part of its services to the warehouses center and we did not consider it, the results will be inaccurate.

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Methods to distribute the costs of service centers on production centers

➤ In order to determine the share of a service center from the cost of another service center and vice versa, we formulate a set of mathematical equations that reflect the services exchanged between the center and the relationships between them, and formulate this in the form of a mathematical relationship.

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Methods to distribute the costs of service centers on production centers

□ Example (4):

The following data were extracted from the books of a manufacturing firm:

1. Total indirect manufacturing costs estimated for the two production centers, A, B, **15,000** pounds, **17,000** pounds, and the service centers X, Y **12,000** pounds and **9,000** pounds, respectively.

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Methods to distribute the costs of service centers on production centers

2- The service center (X) serves the production center A, B, and the service center Y, and the services provided for each of them is **20%, 30%, 50%**, and the service center (Y) serves the production centers A and B and the service center (X). The amount that each of them benefits from its services is **50%, 30%, 20%**.

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Methods to distribute the costs of service centers on production centers

3- The machine hours at the production center (A) reached **10,000** hours, and the direct labor hours at the production center (B) were **2000** hours.

Required:

Prepare a statement of the allocation of the estimated indirect manufacturing costs using the reciprocal allocation method.

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Methods to distribute the costs of service centers on production centers

Solution

There are mutual services between the two service centers X, Y, meaning that the service center (X) benefits by **20%** of the services of center (Y), while the service center (Y) benefits by **50%** of the services of the service center (X).

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Solution

- The total estimated indirect manufacturing costs for the service centers (X), (Y) **12,000** pounds and **9,000** pounds, respectively, and this is before determining the share of each center from the cost of the other center in exchange for mutual services.

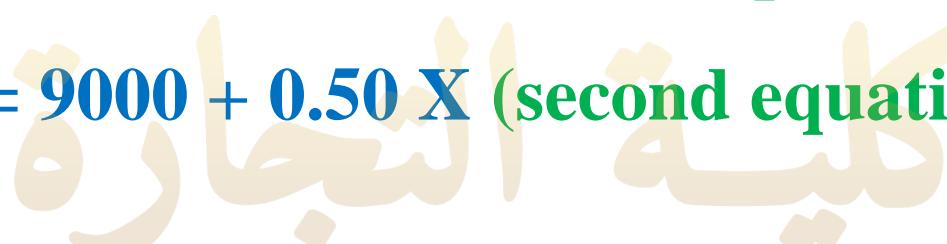
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Methods to distribute the costs of service centers on production centers

Solution

- So the mutual services are allocated between the two service centers (X), (Y), then determining the total costs of each of them as follows:

- $X = 12000 + 0.20 Y$ (first equation)
- $Y = 9000 + 0.50 X$ (second equation)



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Methods to distribute the costs of service centers on production centers

Whereas:

- X is the total cost of the service center
- Y is the total cost of the service center

And by substitution in the first equation:

- $X = 12000 + 0.20 (9000 + 0.50 X)$
- $X = 12000 + 1800 + 0.10 X$
- $X = 13,800 + 0.10 X$
- $0.90 X = 13,800$
- $X = 15,333$

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And by substitution in the second equation:

- $Y = 9000 + 0.50 X$
- $Y = 9000 + 0.50 \times 15,333$
- $Y = 9000 + 7667 = 16,667$

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Methods to distribute the costs of service centers on production centers

- In order to determine the total costs of each service center, a statement is prepared for the allocation of indirect manufacturing costs, in which the total costs of each service center are allocated among the production and service centers benefiting from them as follows:



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Methods to distribute the costs of service centers on production centers

	Production centers		Service centers		total
	A	B	X	Y	
Total estimated indirect manufacturing costs	15,000	17,000	12,000	9,000	53000
<input type="checkbox"/> Cost Allocation of Service Center (Y)	8,334	5,000	3,333	(16667)	
<input type="checkbox"/> Cost Allocation of Service Center (X)	<u>3,067</u>	<u>4,599</u>	(15333)	7,667	
Total estimated indirect manufacturing costs for production centers	26,401	26,599	-	-	53000
Allocation base	<u>10,000</u>	<u>2,000</u>			
Allocation rate	= 2.6	= 13.3			

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Methods to distribute the costs of service centers on production centers

The allocation of service centers is as follows:

1- allocation of center (Y):

- The share of (A) = 16,667 \times 0.50 = 8,334
- The share of (B) = 16,667 \times 0.30 = 5,000
- The share of (X) = 16,667 \times 0.20 = 3,333.4

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Methods to distribute the costs of service centers on production centers

The allocation of service centers is as follows:

1- allocation of center (X):

- The share of (A) = $15,333 \times 0.20 = 3,067$
- The share of (B) = $15,333 \times 0.30 = 4,600$
- The share of (Y) = $15,333 \times 0.50 = 7,667$

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Methods to distribute the costs of service centers on production centers

- This method is considered one of the most accurate methods of allocating indirect manufacturing costs, as it took into account all the criticisms directed to the previous allocation methods, as follows:
 - It allocates the costs of each service center on a basis appropriate to its nature.
 - It takes into consideration the cost of the service that each production center benefited from each service center separately.

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Methods to distribute the costs of service centers on production centers

3- This method takes into account the possibility that the service center could benefit from the services of other service centers.

4-This method was distinguished from other allocation methods in that it effectively applied the idea of exchanging services between different production service centers.

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Methods to distribute the costs of service centers on production centers

□ Example (5):

Shady Foods Co. has two production centers—**Cooking and Packaging**—and two service centers (human resources and information systems). Shady Foods Co. uses number of employees to allocate human resources costs and processing time to allocate information systems costs. The following data are available for September 2022:

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Methods to distribute the costs of service centers on production centers

□ Example (5):

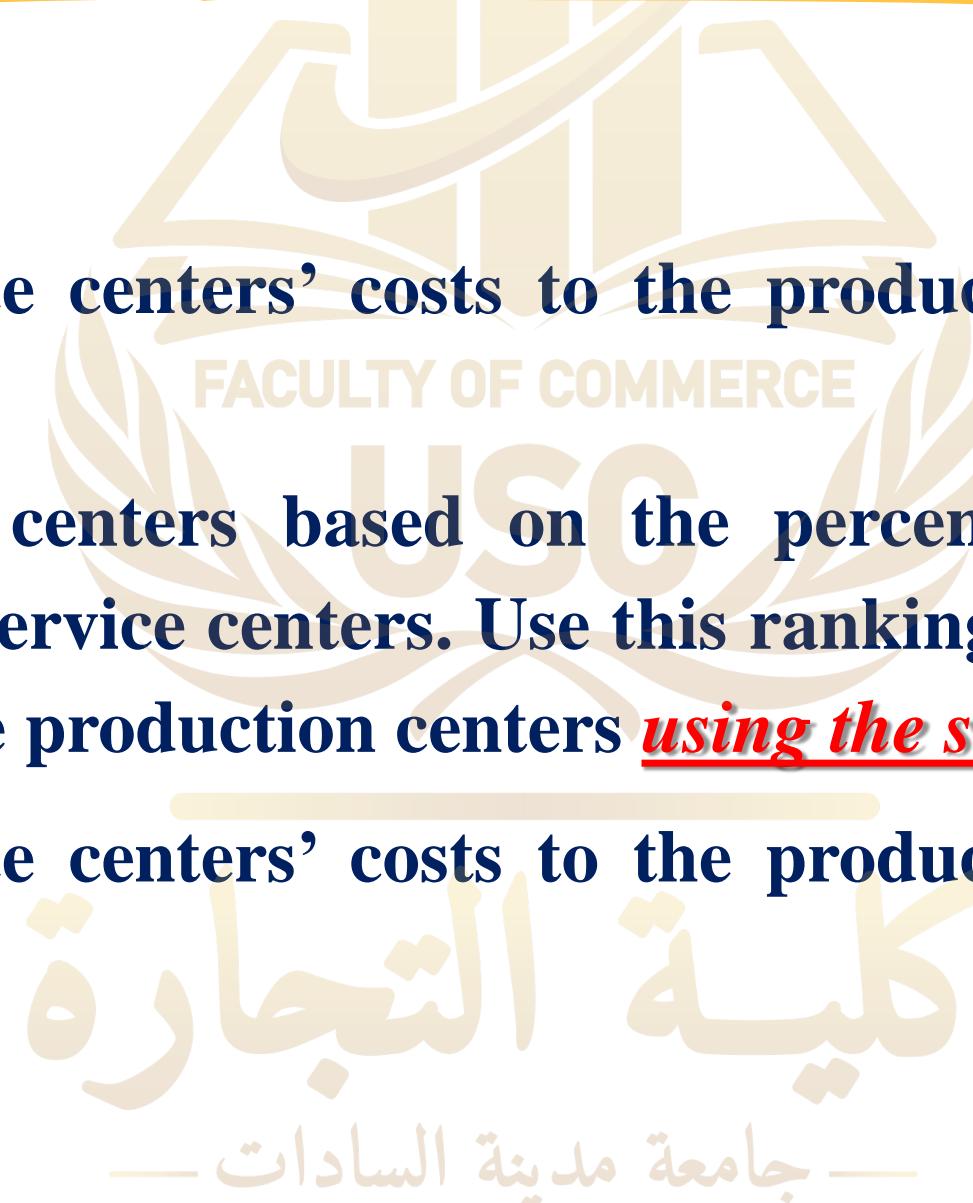
	Service centers		Production centers	
	HR	IS	Cooking	Packaging
Costs before allocation	72,700 EGP	234,400 EGP	998,270 EGP	489,860 EGP
Budgeted number of employees	-	21	42	28
Minutes of processing	320	-	1,920	1,600

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Methods to distribute the costs of service centers on production centers

□ Required:

1. Allocate the service centers' costs to the production centers *using the direct method.*
2. Rank the service centers based on the percentage of their services provided to other service centers. Use this ranking to allocate the service centers' costs to the production centers *using the step-down method.*
3. Allocate the service centers' costs to the production centers *using the reciprocal method.*



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Methods to distribute the costs of service centers on production centers

Solution

1- Direct allocation method:

	Service centers		Production centers		Total
	HR	IS	Cooking	Packaging	
Costs Incurred	72,700 EGP	234,400 EGP	998,270 EGP	489,860	1,795,230
Alloc. of HR costs (42/70, 28/70)	(72,700)		43,620	29,080	
Alloc. of Info. Syst. costs (1,920/3,520, 1,600/3,520)		(234,400)	127,855	106,545	
	<u>0</u>	<u>0</u>	<u>1,169,745</u>	<u>625,485</u>	<u>1,795,230</u>

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Methods to distribute the costs of service centers on production centers

2. Rank on percentage of services rendered to other service centers.

Step 1: HR provides 23.077% of its services to information systems:

$$\text{Percentage} = 21 / (42+28+21) = 21/91 = 23.077\%$$

▪ This 23.077% of 72,700 EGP HR department costs is 16,777 EGP.

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Methods to distribute the costs of service centers on production centers

Step 2: Information systems provides 8.333% of its services to HR:

$$\text{■ } = 320 / (1920+1600+320) = 320 / 3840 = 8.333\%$$

This 8.333% of 234,400 EGP information systems department costs is 19,533 EGP.

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Methods to distribute the costs of service centers on production centers

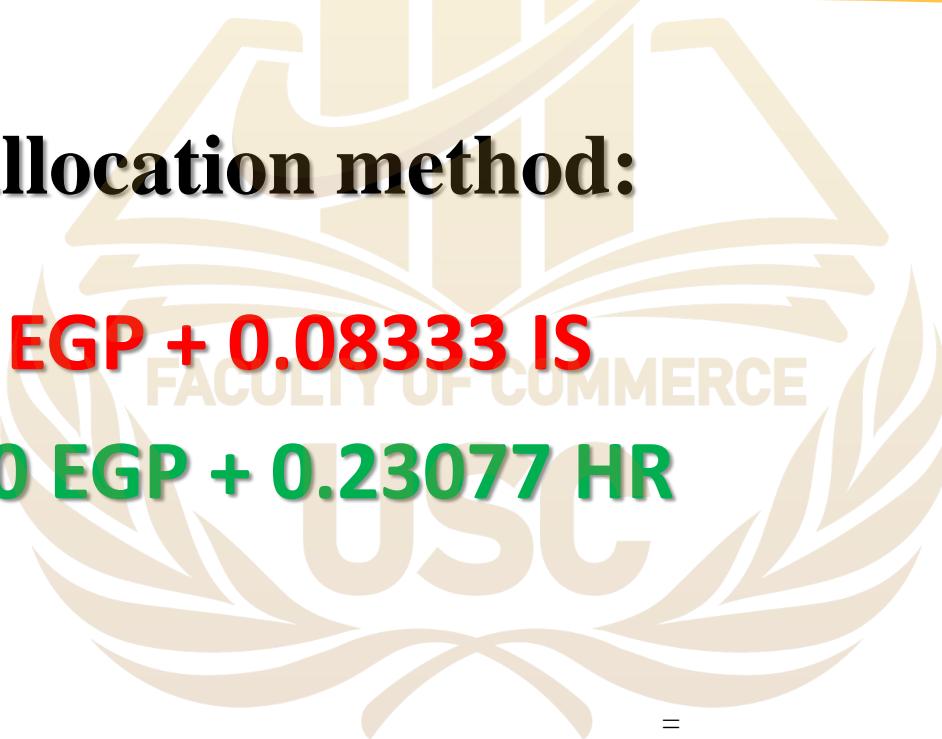
	Service centers		Production centers		Total
	HR	IS	Cooking	Packaging	
Costs Incurred	72,700 EGP	234,400 EGP	998,270 EGP	489,860 EGP	1,795,230 EGP
Alloc. of HR costs					
(21/91, 42/91, 28/91)	<u>(72,700)</u>	<u>16,777</u>	33,554	22,369	
	<u>0</u>	<u>251,177</u>			
Alloc. of Info. Syst. costs					
(1,920/3,520, 1,600/3,520)		<u>(251,177)</u>	<u>137,006</u>	<u>114,171</u>	
		<u>0</u>	<u>1,168,830</u>	<u>626,400</u>	<u>1,795,230</u>

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Methods to distribute the costs of service centers on production centers

3. The reciprocal allocation method:

- HR = 72,700 EGP + 0.08333 IS
- IS = 234,400 EGP + 0.23077 HR



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Methods to distribute the costs of service centers on production centers

3. The reciprocal allocation method:

- $HR = 72,700 + [0.08333 \times (\$234,400 + 0.23077 HR)]$
- $= 72,700 + [19,532.55 + 0.01923 HR]$
- $0.98077 HR = 92,232.55$
- $HR = 92,232.55 \div 0.98077$
- $= 94,041 EGP$

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Methods to distribute the costs of service centers on production centers

3. The reciprocal allocation method:

- $IS = 234,400 + (0.23077 \times 94,041)$
- $= 256,102$ EGP



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Methods to distribute the costs of service centers on production centers

	Service centers		Production centers		
	HR	IS	Cooking	Packaging	Total
Costs Incurred	72,700	234,400	998,270	489,860	1,795,230
Alloc. of HR costs					
(21/91, 42/91, 28/91)	(94,041)	21,702	43,404	28,935	
Alloc. of Info. Syst. costs					
(320/3,840, 1,920/3,840,					
1,600/3,840)	<u>21,341</u>	<u>(256,102)</u>	<u>128,051</u>	<u>106,710</u>	
	0	0	1,169,725	625,505	1,795,230

Using Repeated Iterations

	Service centers		Production centers		Total
	HR	IS	Cooking	Packaging	
Budgeted manufacturing overhead costs					
before any interdepartmental cost allocation	72,700 EGP	234,400 EGP	998,270 EGP	489,860 EGP	1,795,230 EGP
1st Allocation of HR (21/91, 42/91, 28/91)	(72,700)	16,777	33,554	22,369	
1st Allocation of Information Systems (320/3,840, 1,920/3,840, 1,600/3,840)	20,931	(251,177)	125,589	104,657	
2nd Allocation of HR (21/91, 42/91, 28/91)	(20,931)	4,830	9,661	6,440	
	0				

2nd Allocation of Information Systems (320/3,840, 1,920/3,840, 1,600/3,840)	402	<u>(4,830)</u>	2,415	2,013	
3rd Allocation of HR (21/91, 42/91, 28/91)^(a)	<u>(402)</u>	93	185	124	
3rd Allocation of Information Systems (320/3,840, 1,920/3,840, 1,600/3,840)	8	<u>(93)</u>	46	39	
4th Allocation of HR (21/91, 42/91, 28/91)	<u>(8)</u>	2	4	2	
4th Allocation of Information Systems: (320/3,840, 1,920/3,840, 1,600/3,840)	0	<u>(2)</u>	1	1	
Total budgeted manufacturing overhead of operating departments	<u>0</u>	<u>0</u>	<u>1,169,725</u>	<u>625,505</u>	<u>1,795,230</u>

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Methods to distribute the costs of service centers on production centers

The reciprocal method is more accurate than the direct and step-down methods when there are reciprocal relationships among support departments.

A summary of the alternatives is:

	Cooking	Packaging
Direct method	1,169,745	625,485
Step-down method (HR first)	1,168,830	626,400
Reciprocal method	1,169,725	625,505

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Methods to distribute the costs of service centers on production centers

□ Example (6):

Adam steel Co. consists of two production centers (A and B), two service centers, motors, and maintenance. The following data were extracted from the factory cost books and records:

Desc.	Production centers		Service centers		
	A	B	Maintenance	Motors	Total
Indirect materials	8000	6000	3000	5000	22,000
Indirect labor	1000	8000	5000	7000	21,000
Depreciation of machinery	12000	8000	3000	5000	28,000
Building's value	60,000	50,000	40,000	30,000	180,000
Quantitative data:					
Area in meters	200	150	50	100	500
Machine hours	10,000	15000			
Direct labor hours	3000	2000			
The number of radiators	10	5	2	3	20
The number of lamps	20	10	5	10	45
Maintenance hours	800	400	400		

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Methods to distribute the costs of service centers on production centers

□ Example (6):

If you know that the items of joint indirect industrial costs are as follows:

The rent is 6000 pounds, lighting expenses 450 pounds, heating expenses 2000 pounds, and insurance of the factory buildings 9000 pounds.

Required:

Prepare allocation statement of indirect manufacturing costs as follows:

- 1. Allocate common (joint) costs to cost centers using appropriate bases.*
- 2. Allocate service centers to production centers using Direct allocation method.*

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Methods to distribute the costs of service centers on production centers

□ Solution:

First: Allocation of common costs:

1. Rent expenses (based on area):

- Production center (A) = $6000 \times 200 / 500 = 2400$
- Production center (B) = $6000 \times 150 / 500 = 1800$
- Maintenance Center = $6000 \times 50 / 500 = 600$
- Motors Center = $6000 \times 100 / 500 = 1200$

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Methods to distribute the costs of service centers on production centers

□ Solution:

2. Lighting expenses (based on the number of lamps):

- Production center (A) = $450 \times 20 / 45 = 200$
- Production center (B) = $450 \times 10 / 45 = 100$
- Maintenance Services Center = $450 \times 5 / 45 = 50$
- Center of Motors = $450 \times 10 / 45 = 100$

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Methods to distribute the costs of service centers on production centers

□ Solution:

3-Heating expenses (based on the number of radiators):

- Production center (A) = $2000 \times 10/20 = 1000$
- Production center (B) = $2000 \times 5/20 = 500$
- Maintenance center = $2000 \times 2/20 = 200$
- Motors Center = $2000 \times 3/20 = 300$

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Methods to distribute the costs of service centers on production centers

□ Solution:

4- Building insurance expenses (based on the value of the buildings):

- Production center (A) = $9,000 \times 60,000 / 180,000 = 3,000$
- Production Center (B) = $9000 \times 50000 / 180000 = 2500$
- Maintenance Center = $9000 \times 40000 / 180000 = 2000$
- Motors Center = $9000 \times 30000 / 180000 = 1500$

The Cost allocation statement

Description	A	B	Maintenance	Motors	Total
<u>special costs</u>					
Indirect materials	8000	6000	3000	5000	22000
Indirect wages	1000	8000	5000	7000	21000
Machinery depreciation	12000	8000	3000	5000	28000
<u>Common costs</u>					
Factory rent	2400	1800	600	1200	6000
Lighting expenses	200	100	50	100	450
Heating expenses	1000	500	200	300	2000
Buildings insurance	<u>3000</u>	<u>2500</u>	<u>2000</u>	<u>1500</u>	<u>9000</u>
Total manufacturing indirect costs	27600	26900	13850	20100	88450
<u>allocation of the costs of production services centers</u>					
Motors center	5540	8310			
Maintenance center	<u>13400</u>	<u>6700</u>			
Total indirect manufacturing costs in production centers	46540	41910			88450

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Methods to distribute the costs of service centers on production centers

Notes on the allocation statement:

1. The allocation of Motors Services Center to the production centers A and B (based on the number of the machine hours).

- Production Center (A) = $13850 \times 10000 / 25000 = 5540$
- Production Center (B) = $13850 \times 15000 / 25000 = 8310$

2. The allocation of maintenance services center to the production centers A and B (based on the number of maintenance hours)

- Production Center (A) = $20100 \times 800 / 1200 = 13400$
- Production Center (B) = $20100 \times 400 / 1200 = 6700$



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The End
Thank You

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