Chapter 15
Service Department Costing: An Activity Approach

Solutions to Questions

15-1   Operating departments are the units in an organization within which the central purposes of the organization are carried out. By contrast, service departments provide support or assistance to the operating departments. Examples of service departments include laundry services, internal auditing, airport maintenance services (ground crews), cafeteria, personnel, cost accounting, and so on.

15-2   Service department costs are allocated to products and services in two stages. Service department costs are first allocated to the operating departments. These allocated costs are then included in the operating departments' overhead rates, which are used to cost products and services.

15-3   Interdepartmental service costs exist whenever two service departments perform services for each other. Under the step method, the costs of the service department performing the greatest amount of service for the other service departments are allocated first, the costs of the service department performing the next greatest amount of service are allocated next, and so forth through all the service departments. Once a service department's costs have been allocated, costs are not reallocated back to it under the step method.

15-4   Under the direct method, costs are not allocated from one service department to another. Rather, all service department costs are allocated directly to operating departments.

15-5   If a service department generates revenues, these revenues should be offset against the department's costs and only the net amount of cost remaining after this offset should be allocated to other departments within the organization.

15-6   Two general guidelines govern the allocation of fixed service department costs to other departments: (1) allocate only budgeted costs, and (2) allocate fixed costs in predetermined, lump-sum amounts, according to how much of the service department's capacity is acquired to serve each of the other departments.

Two general guidelines also govern the allocation of variable service department costs to other departments: (1) allocate at budgeted rates, and (2) allocate the costs according to whatever activity (direct labor-hours, pounds of laundry, etc.) causes their incurrence.

15-7   If a variable base is used to allocate fixed costs, the costs allocated to one department will depend in large part on what is happening in other departments. As a consequence, the amount of service department cost allocated to a department will increase or decrease depending on the activity in other departments.

Exercise 15-1 (20 minutes)

	Service Departments			Operating Departments		
	Admini-strative	Jani-torial	Mainte-nance	Prep	Finishing	Total
Overhead costs...............................	$84,000	$67,800	$36,000	$256,100	$498,600	$942,500
Allocation:						
Administrative:(5%; 20%; 50; 25%)* ..	(84,000)	4,200	16,800	42,000	21,000	
Janitorial: (1/10; 2/10; 7/10)		(72,000)	7,200	14,400	50,400	
Maintenance: (1/4; 3/4)			(60,000)	15,000	45,000	
Total overhead costs after allocations......	$ 0	$ 0	$ 0	$327,500	$615,000	$942,500

* Allocations can be done using percentages, fractions, or a rate per unit of activity. Administrative allocations, for example, have been shown as percentages above, but they could have been shown as 1/20; 4/20; 10/20; and 5/20 or they could have been shown as $70 per employee. Fractions should be used if percentages result in rounding error.

Exercise 15-1 (continued)

Supporting computations:

Administrative allocated to:

Janitorial.............................	60 employees	5%
Equipment Maintenance	240 employees	20
Prep	600 employees	50
Finishing..............................	300 employees	25
Total....................................	1,200 employees	100%

Janitorial allocated to:

Equipment Maintenance	10,000 sq. ft.	1/10
Prep	20,000 sq. ft.	2/10
Finishing..............................	70,000 sq. ft.	7/10
Total....................................	100,000 sq. ft.	10/10

Equipment Maintenance allocated to:

Prep	10,000 MH	1/4
Finishing..............................	30,000 MH	3/4
Total....................................	40,000 MH	4/4

Exercise 15-2 (20 minutes)

	Service Departments			Operating Departments		
	Administrative	Janitorial	Equipment Maintenance	Prep	Finishing	Total
Overhead costs..................................	$84,000	$67,800	$36,000	$256,100	$498,600	$942,500
Allocation:						
Administrative: (2/3; 1/3)	(84,000)			56,000	28,000	
Janitorial: (2/9; 7/9).........................		(67,800)		15,067	52,733	
Equipment Maintenance: (1/4; 3/4)...			(36,000)	9,000	27,000	
Total overhead costs after allocations...	$ 0	$ 0	$ 0	$336,167	$606,333	$942,500

Supporting computations:

	Administrative		Janitorial		Equipment Maintenance	
Prep.................	600 employees	2/3	20,000 sq. ft.	2/9	10,000 MH	1/4
Finishing	300 employees	1/3	70,000 sq. ft.	7/9	30,000 MH	3/4
Total	900 employees	3/3	90,000 sq. ft.	9/9	40,000 MH	4/4

Exercise 15-3 (15 minutes)

	Arbon Refinery	Beck Refinery
Variable costs:		
$0.30 per gallon × 270,000 gallons...............	$ 81,000	
$0.30 per gallon × 130,000 gallons...............		$ 39,000
Fixed costs:		
60% × $200,000...	120,000	
40% × $200,000...		80,000
Total allocated costs......................................	$201,000	$119,000

Exercise 15-4 (15 minutes)

1. and 2.
   End-of-year allocations of variable costs should be based on the *actual* level of activity multiplied by the *budgeted* rate. End-of-year allocations of fixed costs should be based on the same predetermined lump-sum amounts as at the beginning of the year. Actual costs in excess of (or less than) the budgeted rate for variable costs or the budgeted total fixed costs should not be allocated to the refineries. Therefore, the allocations of transport services cost at the end of the year would be:

	Arbon Refinery	Beck Refinery	Total
Variable costs:			
$0.30 per gallon × 260,000 gallons....	$ 78,000		
$0.30 per gallon × 140,000 gallons....		$ 42,000	$120,000
Fixed costs:			
60% × $200,000	120,000		
40% × $200,000		80,000	200,000
Total allocated costs	$198,000	$122,000	$320,000

3. Part of the $365,000 in total actual cost will not be allocated to the refineries, as follows:

	Variable Cost	Fixed Cost	Total
Total cost incurred.............................	$148,000	$217,000	$365,000
Total cost allocated (above)	120,000	200,000	320,000
Amount of cost not allocated................	$ 28,000	$ 17,000	$ 45,000

   The "cost not allocated" represents cost incurred in excess of the budgeted $0.30 per gallon variable cost and budgeted $200,000 in fixed costs. This $45,000 in unallocated cost is the responsibility of the Transport Services Department and is a cost variance for the year.

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Exercise 15-5 (10 minutes)

The budgeted rate of $60 per employee should be multiplied by the actual number of employees in each operating department during the year for the end-of-year allocations.

	(1) Budgeted Rate	(2) Actual Number of Employees	(1) × (2) Total Allocation
Cutting Department...............	$60	500	$ 30,000
Milling Department	$60	400	24,000
Assembly Department............	$60	800	48,000
Total		1,700	$102,000

The difference between the budgeted and actual cost per employee is the responsibility of the Medical Services Department and will not be allocated to the operating departments. This variance totals $20,400 for the year.

1,700 employees × ($72 − $60 = $12 per employee) = $20,400.

Exercise 15-6 (15 minutes)

1.

	Janitorial Services	Medical Services	Cutting	Milling	Assembly
Cost to be allocated......................................	$350,000	$596,000			
Allocations:					
Janitorial Services					
(4%; 20%; 16%; 60%)...........................	(350,000)	14,000	$ 70,000	$ 56,000	$210,000
Medical Services (3/10; 2/10; 5/10)...........		(610,000)	183,000	122,000	305,000
Total costs after allocations..........................	$ 0	$ 0	$253,000	$178,000	$515,000

Supporting computations:

Janitorial Services:			Medical Services:		
Medical Services	6,000 sq. ft.	4%	Cutting	600 employees	3/10
Cutting...................	30,000 sq. ft.	20	Milling................	400 employees	2/10
Milling	24,000 sq. ft.	16	Assembly	1,000 employees	5/10
Assembly.................	90,000 sq. ft.	60	Total	2,000 employees	10/10
Total	150,000 sq. ft.	100%			

2. The allocations would be the same as in part 1, since budgeted fixed costs are always allocated to consuming departments. Thus, $11,000 of the actual fixed costs in Janitorial Services ($361,000 – $350,000) and $9,000 of the actual fixed costs in Medical Services ($605,000 – $596,000) would not be allocated to other departments.

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Exercise 15-7 (20 minutes)

1.

	Men's	Women's	Shoes	House-wares	Total
Percentage of 2002 sales	8%	40%	28%	24%	100%
Allocation of 2002 fixed administrative expenses (based on the above percentages)	$ 72,000	$360,000	$252,000	$216,000	$900,000

2.

	Men's	Women's	Shoes	House-wares	Total
2002 allocation (above)	$ 72,000	$360,000	$252,000	$216,000	$900,000
2001 allocation...	90,000	225,000	315,000	270,000	900,000
Increase (decrease) in allocation.................	$(18,000)	$135,000	$ (63,000)	$ (54,000)	$ 0

The manager of the Women's Department undoubtedly will be upset about the increased allocation to the department but will feel powerless to do anything about it. Such an increased allocation may be viewed as a penalty for an outstanding performance.

3. Sales dollars is not ordinarily a good base for allocating fixed costs. The costs allocated to a department will be affected by the sales in *other* departments. In our illustration above, the sales in three departments remained static and the sales in the fourth increased. As a result, less cost was allocated to the departments with static sales and more cost was allocated to the one department that showed improvement during the period.

Problem 15-8 (60 minutes)

1.

	Factory Admin.	Custodial Services	Personnel	Mainte-nance	Stamping	Assembly
Step method						
Operating department costs......					ω 752,600	ω351,800
Costs to be allocated	ω540,000	ω137,520	ω57,680	ω 90,400	—	—
Allocations:						
Factory Admin.						
@ ω1.80 per labor-hr.	(540,000)	10,800	18,000	79,200	108,000	324,000
Custodial Services						
@ ω1.44 per sq. meter		(148,320)	4,320	14,400	100,800	28,800
Personnel						
@ ω320/employee			(80,000)	16,000	25,600	38,400
Maintenance						
@ ω1.25 per MH				(200,000)	175,000	25,000
Total overhead after						
allocations............................	ω 0	ω 0	ω 0	ω 0	ω1,162,000	ω768,000
Divide by machine-hours					÷140,000	
Divide by direct labor-hours						÷160,000
Overhead rate..........................					ω 8.30	ω 4.80

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Problem 15-8 (continued)

2.

	Factory Admin.	Custodial Services	Personnel	Mainte-nance	Stamping	Assembly
Direct method						
Operating department costs......				-	ω 752,600	ω351,800
Costs to be allocated	ω540,000	ω137,520	ω57,680	ω90,400	—	—
Allocations:						
Factory Admin.						
(1/4 and 3/4)......................	(540,000)				135,000	405,000
Custodial Services						
(7/9 and 2/9)......................		(137,520)			106,960	30,560
Personnel						
(2/5 and 3/5)......................			(57,680)		23,072	34,608
Maintenance						
(7/8 and 1/8)......................				(90,400)	79,100	11,300
Total overhead after						
allocations.............................	ω 0	ω 0	ω 0	ω 0	ω1,096,732	ω833,268
Divide by machine-hours					÷140,000	
Divide by direct labor-hours						÷160,000
Overhead rate..........................					ω 7.83	ω 5.21

Problem 15-8 (continued)

3. *Plantwide rate*

$$\frac{\text{Total overhead cost}}{\text{Total direct labor-hours}} = \frac{\omega 1,930,000}{200,000 \text{ DLHs}} = \omega 9.65 \text{ per DLH}$$

4. The amount of overhead cost assigned to the job would be:

Step method:
  Stamping Department:
    ω8.30 per machine-hour × 190 machine hours ω1,577
  Assembly Department:
    ω4.80 per direct labor-hour × 75 direct labor-hours....   360
  Total overhead cost... ω1,937

Direct method:
  Stamping Department:
    ω7.83 per machine-hour × 190 machine-hours ω1,488
  Assembly Department:
    ω5.21 per direct labor-hour × 75 direct labor-hours....   391
  Total overhead cost... ω1,879

Plantwide method:
  ω9.65 per direct labor-hour × 100 direct labor-hours .... ω 965

The plantwide method, which is based on direct-labor hours, assigns very little overhead cost to the job since it requires little labor time. Assuming that Factory Administrative costs really do vary in proportion to labor-hours, Custodial Services with square meters occupied, and so on, the company will tend to undercost such jobs if a plantwide overhead rate is used (and it will tend to overcost jobs requiring large amounts of labor time). The direct method is better than the plantwide method, but the step method will generally provide the most accurate overhead rates of the three methods.

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Problem 15-9 (45 minutes)

1.

	Machine Tools Division	Special Products Division
Variable costs:		
$0.50 per machine-hour × 90,000 machine-hours	$45,000	
$0.50 per machine-hour × 60,000 machine-hours		$30,000
Fixed costs:		
65% × $80,000	52,000	
35% × $80,000		28,000
Total cost allocated	$97,000	$58,000

The variable costs are allocated by multiplying the budgeted rate per machine-hour by the budgeted number of machine-hours that will be worked in each division during the month. The fixed costs are allocated in predetermined, lump-sum amounts based on the peak-period maintenance needs in each division.

Problem 15-9 (continued)

2.

	Machine Tools Division	*Special Products Division*
Variable costs:		
$0.50 per machine-hour × 60,000 machine-hours.....................................	$30,000	
$0.50 per machine-hour × 60,000 machine-hours.....................................		$30,000
Fixed costs:		
65% × $80,000...	52,000	
35% × $80,000...		28,000
Total cost allocated..	$82,000	$58,000

The variable costs are allocated according to the budgeted rate per machine-hour and not according to the actual rate. Also notice that the fixed costs are again allocated in predetermined, lump-sum amounts based on budgeted fixed costs. Any difference between budgeted and actual costs is not allocated but rather is treated as a spending variance of the maintenance department:

	Variable	*Fixed*
Total actual costs for the month................	$78,000	$85,000
Total cost allocated above.........................	60,000	80,000
Spending variance—not allocated..............	$18,000	$ 5,000

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Problem 15-9 (continued)

3. Actual variable costs................ $ 78,000
    Actual fixed costs...................   85,000
    Total actual costs $163,000

    One-half of the cost, or $81,500, would be allocated to each division, since an equal number of machine-hours was worked in each division during the month.

4. This method has two major problems. First, the spending variances should not be allocated since this forces the inefficiencies of the service department onto the using departments. Second, the fixed costs should *not* be allocated according to month-by-month usage of services, since this causes the allocation to one division to be affected by what happens in another division.

5. Their strategy probably will be to underestimate their peak-period needs in order to force a greater proportion of any allocation onto other departments. Top management can control such ploys by careful follow-up, with rewards being given to those managers who estimate accurately, and severe penalties assessed against those managers who underestimate long-run usage. For example, departments that exceed their estimated peak-period maintenance requirements may be forced to hire outside maintenance contractors, at market rates, to do their maintenance work during peak periods.

Problem 15-10 (30 minutes)

1. Beginning-of-year allocations of variable costs are computed by multiplying the budgeted rate by the budgeted level of activity. Fixed costs are allocated in lump-sum amounts based on the peak-period needs of the using departments. The computations are:

	Milling Department	Finishing Department	Total
Variable costs:			
20K per meal × 10,000 meals..	200,000K		
20K per meal × 5,000 meals ...		100,000K	300,000K
Fixed costs:			
70% × 200,000K	140,000		
30% × 200,000K		60,000	200,000
Total cost allocated...................	340,000K	160,000K	500,000K

2. a. End-of-year allocations of variable costs are computed by multiplying the budgeted rate by the actual level of activity. Fixed costs are again allocated in predetermined lump-sum amounts based on budgeted costs. The computations are:

	Milling Department	Finishing Department	Total
Variable costs:			
20K per meal × 12,000 meals..	240,000 K		
20K per meal × 4,000 meals....		80,000 K	320,000 K
Fixed costs:			
70% × 200,000K	140,000		
30% × 200,000K		60,000	200,000
Total cost allocated...................	380,000 K	140,000 K	520,000 K

Problem 15-10 (continued)

b. Any difference between the budgeted and actual variable cost per meal or between the budgeted and actual total fixed cost would not be allocated to the other departments. The amount not allocated would be:

	Variable Cost	Fixed Cost	Total
Actual cost incurred during the year	384,000K	215,000K	599,000K
Cost allocated above............................	320,000	200,000	520,000
Cost not allocated (spending variance)...	64,000K	15,000K	79,000K

The costs that are not allocated to the other departments are spending variances of the cafeteria and are the responsibility of the cafeteria's manager.

Problem 15-11 (30 minutes)

1. Yes, there is merit to the complaint. The company is using a variable base (lines of print) to allocate costs that are largely fixed. Thus, the amount of cost that is charged to a division during a given month will depend to a large extent on usage in other divisions. A reduction in usage in one division can result in shifts of costs from it onto the other divisions, even though the other divisions receive no additional service.

2.

	Lines of Print	Total Cost
May activity	200,000	$182,000
June activity............	150,000	179,000
Difference...............	50,000	$ 3,000

$$\text{Variable cost element}=\frac{\text{Change in cost}}{\text{Change in activity}}$$

$$=\frac{\$3,000}{50,000 \text{ lines}}=\$0.06 \text{ per line}$$

Fixed costs per month:

Total cost, May	$182,000
Less variable cost ($0.06 per line × 200,000 lines)....	12,000
Fixed cost	$170,000

Problem 15-11 (continued)

3.

| | Division | | | |
	Lending	Retail	Com-mercial	Total
May allocation:				
Variable cost at $0.06 per line:				
$0.06 × 80,000 lines	$ 4,800			
$0.06 × 20,000 lines		$ 1,200		
$0.06 × 100,000 lines			$ 6,000	
Fixed cost:				
40% × $170,000...................	68,000			
12% × $170,000...................		20,400		
48% × $170,000...................			81,600	
Total cost allocated....................	$72,800	$21,600	$87,600	$182,000
June allocation:				
Variable cost at $0.06 per line:				
$0.06 × 75,000 lines	$ 4,500			
$0.06 × 30,000 lines		$ 1,800		
$0.06 × 45,000 lines			$ 2,700	
Fixed cost:				
40% × $170,000...................	68,000			
12% × $170,000...................		20,400		
48% × $170,000...................			81,600	
Total cost allocated....................	$72,500	$22,200	$84,300	$179,000

Problem 15-12 (45 minutes)

	Food Services	Admin. Services	X-Ray Services	Out-patient Clinic	OB Care	General Hospital
Variable costs	$73,150	$ 6,800	$38,100	$11,700	$ 14,850	$ 53,400
Food Services allocation:						
$1.90 per meal × 1,000 meals.......	(1,900)	1,900				
$1.90 per meal × 500 meals	(950)		950			
$1.90 per meal × 7,000 meals.......	(13,300)			0	13,300	
$1.90 per meal × 30,000 meals.....	(57,000)					57,000
Admin. Services allocation:						
$0.50 per file × 1,500 files...........		(750)	750			
$0.50 per file × 3,000 files...........		(1,500)		1,500		
$0.50 per file × 900 files..............		(450)			450	
$0.50 per file × 12,000 files		(6,000)				6,000
X-Ray Services allocation:						
$4 per X-ray × 1,200 X-rays..........			(4,800)	4,800		
$4 per X-ray × 350 X-rays			(1,400)		1,400	
$4 per X-ray × 8,400 X-rays..........			(33,600)			33,600
Total variable costs	$ 0	$ 0	$ 0	$18,000	$ 30,000	$150,000

Problem 15-12 (continued)

	Food Services	Admin. Services	X-Ray Services	Out-patient Clinic	OB Care	General Hospital
Fixed costs	$48,000	$33,040	$59,520	$26,958	$ 99,738	$344,744
Food Services allocation:						
2% × $48,000............................	(960)	960				
1% × $48,000............................	(480)		480			
17% × $48,000............................	(8,160)			0	8,160	
80% × $48,000............................	(38,400)					38,400
Admin. Services allocation:						
10% × $34,000		(3,400)	3,400			
20% × $34,000		(6,800)		6,800		
30% × $34,000		(10,200)			10,200	
40% × $34,000		(13,600)				13,600
X-Ray Services allocation:						
13% × $63,400			(8,242)	8,242		
3% × $63,400			(1,902)		1,902	
84% × $63,400			(53,256)			53,256
Total fixed costs	$ 0	$ 0	$ 0	$42,000	$120,000	$450,000
Total overhead costs	$ 0	$ 0	$ 0	$60,000	$150,000	$600,000

Problem 15-12 (continued)

Computation of allocation rates:

Variable Food Services:

$$\frac{\text{Variable food service cost}}{\text{Total meals served}} = \frac{\$73,150}{38,500 \text{ meals}} = \$1.90 \text{ per meal}$$

Variable Admin. Services:

$$\frac{\text{Variable administrative cost}}{\text{Files processed}} = \frac{\$6,800 + \$1,900}{17,400 \text{ files}} = \$0.50 \text{ per file}$$

Variable X-Ray Services:

$$\frac{\text{Variable X-ray cost}}{\text{X-rays taken}} = \frac{\$38,100 + \$950 + \$750}{9,950 \text{ X-rays}} = \$4.00 \text{ per X-ray}$$

Problem 15-13 (45 minutes)

	Grounds & Maint.	General Admin.	Laundry	Conven-tion Center	Food Services	Lodging
Variable costs	$ 0	$ 915	$13,725	$ 0	$ 48,000	$ 36,450
General Administrative allocation:						
$15 per employee × 10 employees ...		(150)	150			
$15 per employee × 5 employees		(75)		75		
$15 per employee × 25 employees ...		(375)			375	
$15 per employee × 21 employees ...		(315)				315
Laundry allocation:						
$0.30 per item × 1,000 items			(300)	300		
$0.30 per item × 5,250 items			(1,575)		1,575	
$0.30 per item × 40,000 items..........			(12,000)			12,000
Total variable costs	$ 0	$ 0	$ 0	$ 375	$ 49,950	$ 48,765

Problem 15-13 (continued)

	Grounds & Maint.	General Admin.	Laundry	Convention Center	Food Services	Lodging
Fixed costs	$17,500	$12,150	$18,975	$28,500	$ 64,000	$ 81,000
Grounds and Maintenance allocation:						
$0.14 per sq. ft. × 2,500 sq. ft..........	(350)	350				
$0.14 per sq. ft. × 3,750 sq. ft..........	(525)		525			
$0.14 per sq. ft. × 15,000 sq. ft........	(2,100)			2,100		
$0.14 per sq. ft. × 6,250 sq. ft..........	(875)				875	
$0.14 per sq. ft. × 97,500 sq. ft.	(13,650)					13,650
General Admin. allocation:						
20% × $12,500		(2,500)	2,500			
14% × $12,500		(1,750)		1,750		
36% × $12,500		(4,500)			4,500	
30% × $12,500		(3,750)				3,750
Laundry allocation:						
3% × $22,000			(660)	660		
13% × $22,000			(2,860)		2,860	
84% × $22,000			(18,480)			18,480
Total fixed costs	$ 0	$ 0	$ 0	$33,010	$ 72,235	$116,880
Total overhead costs	$ 0	$ 0	$ 0	$33,385	$122,185	$165,645

Problem 15-13 (continued)

Computation of allocation rates:

Variable General Admin. costs:

$$\frac{\text{Variable general administrative cost}}{\text{Number of employees}} = \frac{\$915}{75\text{-}14\text{=}61 \text{ employees}}$$

$$= \$15 \text{ per employee}$$

Variable Laundry costs:

$$\frac{\text{Variable laundry cost}}{\text{Items processed}} = \frac{\$13,725+\$150}{46,250 \text{ items processed}}$$

$$= \$0.30 \text{ per item}$$

Fixed Grounds and Maintenance cost:

General Admin.	2,500 sq. ft.
Laundry	3,750 sq. ft.
Convention Center	15,000 sq. ft.
Food Services	6,250 sq. ft.
Lodging	97,500 sq. ft.
Total	125,000 sq. ft.

$17,500 ÷ 125,000 sq. ft. = $0.14 per sq. ft.

Problem 15-14 (60 minutes)

1. and 2.

	Medical Services	Mainte- nance	Metals	Plastics
Variable costs to be allocated	$3,630	$12,536		
Medical services allocation:				
$33 per employee × 8 employees.....	(264)	264		
$33 per employee × 38 employees...	(1,254)		$ 1,254	
$33 per employee × 64 employees...	(2,112)			$ 2,112
Maintenance allocation:				
$0.80 per DLH × 6,000 DLH.............		(4,800)	4,800	
$0.80 per DLH × 10,000 DLH...........		(8,000)		8,000
Total variable costs	$ 0	$ 0	$ 6,054	$ 10,112

Problem 15-14 (continued)

	Medical Services	Mainte- nance	Metals	Plastics
Fixed costs to be allocated	$7,500	$6,000		
Medical services allocation:				
6.67% × $7,500.............................	(500)	500		
40.00% × $7,500	(3,000)		$ 3,000	
53.33% × $7,500	(4,000)			$ 4,000
Maintenance allocation:				
40% × $6,500.................................		(2,600)	2,600	
60% × $6,500.................................		(3,900)		3,900
Total fixed costs	$ 0	$ 0	$ 5,600	$ 7,900
Total allocated costs...............................	$ 0	$ 0	$ 11,654	$ 18,012
Other budgeted overhead costs.............			104,000	155,000
Total overhead costs (a).........................			$115,654	$173,012
Direct labor-hours (b)			6,000	10,000
Predetermined overhead rate (a) ÷ (b)..			$19.28	$17.30

Problem 15-14 (continued)

Supporting computations:

Variable medical services allocation:

Maintenance........	8 employees
Metals.................	38 employees
Plastics	64 employees
Total	110 employees

$3,630 ÷ 110 employees = $33 per employee

Variable maintenance allocation:

Metals.................	6,000 DLH
Plastics	10,000 DLH
Total	16,000 DLH

$12,800 ÷ 16,000 DLHs = $0.80 per DLH

Fixed medical services allocation:

Long-run employee needs:

Maintenance........	10	6.67%
Metals.................	60	40.00
Plastics	80	53.33
Total	150	100.00%

Fixed maintenance allocation:

Square footage occupied:

Metals.................	8,000 sq. ft.	40%
Plastics	12,000 sq. ft.	60
Total	20,000 sq. ft.	100%

Problem 15-14 (continued)

3. Direct labor cost per unit:

$$\frac{10{,}000 \text{ DLHs}}{20{,}000 \text{ units}} = 0.5 \text{ DLH per unit}$$

$$\frac{\text{Direct labor cost}}{\text{Direct labor-hours}} = \frac{\$40{,}000}{10{,}000 \text{ DLHs}} = \$4.00 \text{ per DLH}$$

0.5 DLH per unit × $4.00 per DLH = $2 per unit

Direct materials cost per unit:

$$\frac{\$80{,}000}{20{,}000 \text{ units}} = \$4.00 \text{ per unit}$$

Overhead cost per unit:

0.5 DLH per unit (above) × $17.30 per DLH = $8.65 per unit

Total cost per unit:

Direct labor	$ 2.00
Direct material	4.00
Overhead	8.65
Total	$14.65

Case 15-15 (75 minutes)

1. Step method:

	Cafeteria	Custodial Services	Mach- inery Mainte- nance	Milling	Finishing
Total costs before allocations.........................	$320,000	$65,400	$ 93,600	$416,000	$166,000
Allocations:					
Cafeteria (@ $640 per employee)*.............	(320,000)	25,600	38,400	64,000	192,000
Custodial Services (@ $1.30 per sq. ft.)** ..		(91,000)	13,000	52,000	26,000
Machinery Maintenance (4/5; 1/5)..............			(145,000)	116,000	29,000
Total overhead after allocations	$ 0	$ 0	$ 0	$648,000	$413,000
Divide by machine-hours...............................				÷160,000	
Divide by direct labor-hours..........................					÷ 70,000
Predetermined overhead rate				$ 4.05	$ 5.90

  * Based on 40 + 60 + 100 + 300 = 500 employees.
 ** Based on 10,000 + 40,000 + 20,000 = 70,000 sq. ft.

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Case 15-15 (continued)

2. Direct method:

	Cafeteria	Custodial Services	Mach-inery Mainte-nance	Milling	Finishing
Total costs before allocations............	$320,000	$65,400	$93,600	$416,000	$166,000
Allocations:					
Cafeteria (1/4; 3/4)*....................	(320,000)			80,000	240,000
Custodial Services (2/3; 1/3)**......		(65,400)		43,600	21,800
Machinery Maintenance					
(4/5; 1/5).....................................			(93,600)	74,880	18,720
Total overhead after allocations........	$ 0	$ 0	$ 0	$614,480	$446,520
Divide by machine-hours..................				÷160,000	
Divide by direct labor-hours..............					÷70,000
Predetermined overhead rate				$ 3.84	$ 6.38

 * Based on 100 + 300 = 400 employees.
** Based on 40,000 + 20,000 = 60,000 sq. ft.

Case 15-15 (continued)

3. a. The amount of overhead cost assigned to the job would be:

Step method:
  Milling Department:
    $4.05 per machine-hour × 2,000 machine-hours............ $ 8,100
  Finishing Department:
    $5.90 per DLH × 13,000 DLHs   76,700
  Total overhead cost... $84,800

Direct method:
  Milling Department:
    $3.84 per machine-hour × 2,000 machine-hours........... $ 7,680
  Finishing Department:
    $6.38 per DLH × 13,000 DLHs   82,940
  Total overhead cost... $90,620

b. The step method provides a better basis for computing predetermined overhead rates than the direct method because it gives recognition to services provided between service departments. If this interdepartmental service is not recognized, then either too much or too little of a service department's costs may be allocated to a producing department. The result will be an inaccuracy in the producing department's predetermined overhead rate.

For example, notice from the computations in (2) above that using the direct method and ignoring interdepartmental services causes the predetermined overhead rate in the Milling Department to fall to only $3.84 per MH (from $4.05 per MH when the step method is used), and causes the predetermined overhead rate in the Finishing Department to rise to $6.38 (from $5.90 when the step method is used). These inaccuracies in the predetermined overhead rate can cause corresponding inaccuracies in bids for jobs. Since the direct method in this case understates the rate in the Milling Department and overstates the rate in the Finishing Department, it is not surprising that the company tends to bid low on jobs requiring a lot of milling work and tends to bid too high on jobs that require a lot of finishing work.

Case 15-16 (90 minutes)

1. The plantwide rate would include overhead costs for both the service departments and the manufacturing departments. It would be computed as follows:

	Molding	Assembly	Finishing	Total
		Manufacturing Department		
Variable overhead..........	$ 100,000	$200,000	$ 50,000	$ 350,000
Fixed overhead..............	1,200,300	702,300	597,400	2,500,000
Total overhead...............	$1,300,300	$902,300	$647,400	$2,850,000

Service department costs:	
Quality Control Department	200,000
Maintenance Department...	86,000
Total company overhead costs...	$3,136,000

Estimated direct labor-hours:	
Molding	10,000
Assembly...	40,000
Finishing...	30,000
Total direct labor-hours	80,000

$$\frac{\text{Plantwide}}{\text{overhead rate}} = \frac{\text{Estimated overhead cost}}{\text{Estimated direct labor-hours}}$$

$$= \frac{\$3,136,000}{80,000 \text{ DLHs}}$$

$$= \$39.20 \text{ per DLH}$$

Case 15-16 (continued)

2. a. Allocation rates for variable service department costs are as follows:

Variable quality control costs:

$$\frac{\$60,000}{8,000 \text{ quality control hours}} = \$7.50 \text{ per quality control hour}$$

Variable maintenance costs:

$$\frac{\$8,000}{1,600 \text{ maintenance hours}} = \$5.00 \text{ per maintenance hour}$$

Case 15-16 (continued)

	Quality Control	Mainte- nance	Molding	Assembly	Finishing
Variable cost...	$ 60,000	$ 8,000			
Quality Control allocations at $7.50 per quality control hour:					
$7.50 per hour × 4,000 hours..................	(30,000)		$ 30,000		
$7.50 per hour × 3,000 hours..................	(22,500)			$ 22,500	
$7.50 per hour × 1,000 hours..................	(7,500)				$ 7,500
Maintenance allocations at $5 per maintenance hour:					
$5.00 per hour × 200 hours......................		(1,000)	1,000		
$5.00 per hour × 600 hours......................		(3,000)		3,000	
$5.00 per hour × 800 hours......................		(4,000)			4,000
Total variable costs	$ 0	$ 0	31,000	25,500	11,500
Fixed costs	$140,000	$ 78,000			
Quality Control allocations on the basis of peak-period quality control hours:					
50% × $140,000...	(70,000)		70,000		
35% × $140,000...	(49,000)			49,000	
15% × $140,000...	(21,000)				21,000
Maintenance allocations on the basis of peak-period maintenance hours:					
15% × $78,000		(11,700)	11,700		
40% × $78,000		(31,200)		31,200	
45% × $78,000		(35,100)			35,100
Total fixed costs	$ 0	$ 0	81,700	80,200	56,100
Total allocated costs...................................			$112,700	$105,700	$67,600

Case 15-16 (continued)

2. b.	*Molding*	*Assembly*	*Finishing*
Allocated service department costs (above)	$ 112,700	$ 105,700	$ 67,600
Manufacturing department overhead costs:			
Variable	100,000	200,000	50,000
Fixed	1,200,300	702,300	597,400
Total overhead costs...................	$1,413,000	$1,008,000	$715,000
Machine-hours			÷ 50,000
Direct labor-hours	÷ 10,000	÷ 40,000	
Predetermined overhead rate......	$ 141.30	$ 25.20	$ 14.30

3. a. Overhead cost allocated under the plantwide rate:
      $39.20 per direct labor-hour × 2,300 direct labor-hours = $90,160

   Overhead cost allocated under the departmental rates:

Molding department: $141.30 per direct labor-hour × 500 direct labor-hours................................	$ 70,650
Assembly department: $25.20 per direct labor-hour × 1,000 direct labor-hours	25,200
Finishing department: $14.30 per machine-hour × 1,500 machine-hours	21,450
Total cost allocated	$117,300

   b. The Pipeline model is allocated only $90,160 in overhead cost if a plantwide rate is used, whereas it is allocated $117,300 in overhead cost if departmental rates are used. Since Sun Concepts is using a plantwide rate, it is not surprising that the company is pricing this model well below the price of competitors.

   On the other hand, use of a plantwide rate is resulting in too much overhead cost being allocated to other products. This probably accounts for the fact that Sun Concepts' prices for some products are well above the prices of competitors.

Case 15-16 (continued)

4. Sun Concepts could take two additional steps to improve its overhead costing. First, it could use the step method to allocate service department costs. And second, it could use activity-based costing (as discussed in an earlier chapter) to assign overhead costs from operating departments to products.

Group Exercise 15-17

1. The answer to this part will depend on the industry the group selects.

2. The answer to this part will depend on the industry the group selects.

3. The answer to this part will depend on the industry the group selects.

4. & 5.
   Generally speaking, the wider the range of products made or services offered, the greater the support costs. More products and services require additional support resources for scheduling, planning, billing, shipping, and so on. As the resources demanded of the support departments increase, their costs increase as well.

6. Service department costs are reduced by decreasing spending on the resources the service departments consume. This can be accomplished by: (1) decreasing the activities the service departments are required to perform—perhaps by reducing the range and complexity of products and services offered by the company; (2) improving the business processes in the service departments so that fewer resources are required to carry out those activities; or (3) spending less on the resources—perhaps by negotiating for better prices from suppliers.