

1. NTU Community College has two service departments (Library and Computing Services) to assist the School of Music and School of Health. The College uses the direct method of service-department cost allocation, allocating Library cost on the basis of square feet and Computing Services cost on the basis of employees. Budgeted allocation-base and operating data for the four departments follow.

	Library	Computing Services	School of Music	School of Health
Square feet	----	9,000	270,000	90,000
Employees	150	----	360	540
Music Teaching Hours	----	----	240,000	60,000
Health Teaching Hours	----	----	300,000	450,000

Additional information:

- Budgeted costs of Library and Computing Services respectively amount to \$4,680,000 and \$2,850,000.
- Company policy holds that a school's overhead application rate is based on a school's own overhead plus an allocated share of service-department cost.
- The school overhead application rates used by NTU Community College are: School of Music, \$65 per music teaching hour; School of Health, \$22 per health teaching hour.

Required:

- (1) Compute the school overhead application rates for School of Health using the step-down method when NTU Community College allocates the cost of Computing Services first. (10 %)
  - (2) Compute the school overhead application rates for School of Music using the reciprocal method. (10 %)
2. Denver Water company drills small commercial water wells and is considering replacing all 10 of its old drills with new ones. The following information is available on the investment. The old drills are fully depreciated and have no disposal value. The new drills cost \$2,249,100 (in total). Because the new drills are more efficient than the old drills, Denver will have annual incremental cash savings from using the new drills in the amount of \$480,000 per year. The drills have a seven-year useful life and no terminal disposal value, and are depreciated using the straight-line method. Denver faces a 30% tax rate and an inflation rate of 5.5%. The company requires an 8% real rate of return.

Required:

Using NPV, should the company buy the new drills? (10%)

3. Moto Corp allows its three divisions to operate as autonomous units. The historical-cost accounting system reports the following information for 2021:

	Plows Division	Tractors Division	Combines Division
<b>Income Statement Items</b>			
Revenues	\$3,000,000	\$4,200,000	\$6,600,000
Operating costs (excluding plant depreciation)	1,800,000	2,280,000	3,600,000
Plant depreciation	420,000	600,000	720,000
Operating income	\$780,000	\$1,320,000	\$2,280,000
<b>Balanced Sheet Items</b>			
Current assets	\$1,200,000	\$1,500,000	\$1,800,000
Long-term assets—plant	840,000	5,400,000	7,920,000
Total assets	\$2,040,000	\$6,900,000	\$9,720,000

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Moto estimates the useful life of each plant to be 12 years, with no terminal disposal value. The straight-line depreciation method is used. At the end of 2021, the Plows plant is 8 years old, the Tractors plant is 3 years old, and the Combines plant is 1 year old. An index of construction costs over the 10-year period that Moto has been operating (2011 year-end = 100) is as follows:

2011	2013	2016	2018	2020	2021
100	115	128	136	160	170

Given the high turnover of current assets, management believes that the historical-cost and current-cost measures of current assets are approximately the same. The company's desired rate of return is 15%.

**Required**

- (1) Compute the 2021 residual income of Combines division using historical cost. (10%)
- (2) Compute 2021 ROI of Tractors division, using current-cost measure (incorporate current-cost estimates as of 2021 for depreciation expense and long-term assets). (10%)

4. The Brown Corporation makes wire harnesses for the aircraft industry only upon receiving firm orders from its customers. Brown is currently producing wire harnesses for China Airlines airplanes (C8). The monthly demand for C8 ranges from 240 to 300 units. The average demand for C8 is 276 units. The machine operates 900 hours a month. Each C8 takes approximately 1.5 hours.

The company is deciding whether to add wire harnesses orders from Eva Air airplanes (A5) to the production line. The initial demand for A5 will be 60 per month. Each A5 will take 1 hour to make. To offset approaching production capacity, expanding the current assembly line is possible. This expansion in assembly line will decrease manufacturing time for all products by 20%. However, this will increase the costs of C8 from \$1,200 to \$1,500 and A5 from \$600 to \$720. The change will also cause increases in prices from \$2,100 to \$2,250 for C8 and from \$1,350 to \$1,500 for A5.

**Required:**

- (1) What is the expected monthly margin without A5 if the company sells all 276 units of C8 it manufactures? (10%)
- (2) If A5 is added to the production line, what is the change in expected monthly contribution margins due to the expansion in assembly line? Assume average sales and that sales equal production. (10%)

5. The Razooks Company, which manufactures office equipment, has established the following cost pools and cost drivers.

Activity Cost Pool	Budget	Cost Driver	Budgeted	Pool Rate
	Overhead		Level for	
	Cost		Driver	
Machine setups	\$600,000	Number of setups	300	\$2,000 per setup
Material handling	300,000	Pounds of raw material	150,000	\$2 per pound
Hazardous waste control	150,000	Pounds of hazardous chemicals	30,000	\$5 per pound
Quality control	225,000	Number of inspections	3,000	\$75 per inspection
Other overhead costs	600,000	Machine hours	60,000	\$10 per machine hour
Total	\$1,875,000			

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An order KA1120 for 1,200 units of office equipment has the following production requirements:

Order: KA1120	
Direct material	\$50,000
Direct labor	\$22,000
Number of setups	24
Pounds of raw material	48,000
Pounds of hazardous chemicals	None
Number of inspections	12
Machine hours	1,200

Razooks established a target price by adding a 40% markup to total manufacturing cost.

**Required:**

Using the activity-cost pools, determine the target price for order KA1120. (10%)

6. Pelmo Company produces and sells mash of grains. The raw material moves through three departments, before the mash of grains are delivered to the customer.

**Department I:** The raw material comes in and is purified and mixed with vitamins and minerals. Due to purification, 2% of the raw material is lost. Normal production of Department I is 140,000 tons of purified and mixed raw material. The expected production of 2022 is 130,000 tons of purified and mixed raw material. The raw material has a standard price of \$284 per ton. \$19 of vitamins and minerals are added per purified ton. The weight of this addition is negligible. The overhead costs of Department I are as follows:

Fixed budgeted overhead costs per year: \$3,640,000

Variable budgeted overhead costs for 2022: \$1,365,000

**Department II:** In this department, the purified and mixed material is pressed into mash. The presses have a normal capacity utilization of 7,000 hours a year. Per hour, 20 tons of purified and mixed material is transformed into mash. The expected capacity utilization for 2022 is 6,500 hours. After the pressing, the mash is dried, and normally 4% of the mash is lost. The overhead costs of Department II are as follows:

Fixed budgeted overhead costs per year: \$3,080,000

Variable budgeted overhead costs for 2022: \$ 845,000

**Department III:** This is the selling department. The mash of grains is stored in silos and loaded into trucks to be delivered to the customer. The normal sales are 134,400 tons of mash. The expected sales for 2022 is 248,800 tons of mash. The selling price is \$555 per ton of mash. The selling costs of Department III are as follows:

Fixed budgeted overhead costs per year: \$ 470,400

Variable budgeted overhead costs for 2022: \$1,435,200

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The above leads to the following standard cost per ton:

**Department I**

Raw material $100/98 * \$294 =$	\$300
Vitamins and minerals	\$ 19
Fixed overhead costs $\$3,640,000/140,000 =$	\$ 26
Variable overhead costs $\$1,365,000/130,000 =$	\$ 10.50

**Department II**

Fixed overhead costs $\$3,080,000/7,000 * 20 =$	\$ 22
Variable overhead costs $\$845,000/6,500 * 20 =$	<u>\$ 6.50</u>
	\$384
Standard Manufacturing costs $\$384 * 100/96 =$	\$400

**Department III**

Standard Manufacturing costs $\$384 * 100/96 =$	\$400
Fixed overhead costs $\$470,400/134,400 =$	\$3.50
Variable overhead costs $\$ 1,435,200/124,800 =$	<u>\$11.50</u>
Commercial standard costs	<u>\$415</u>

The actual overhead costs for 2022 are:

	Fixed Overhead Cost	Variable Overhead Cost	Total Overhead Cost
Department I	3,600,000	1,475,000	5,075,000
Department II	3,000,000	875,000	3,875,000
Department III	460,000	1,460,000	1,920,000

In 2022, 139,000 tons of raw material are used at a total cost of \$41,000,000. The vitamins and minerals added a cost of \$2,606,800.

Department I delivered 137,200 tons of purified and mixed material to Department II.

From Department II, 132,000 tons of grain were stored into the silos. The presses turned for 6.860 hours.

In both Departments I and II, the beginning and ending inventory was 0.

Department III sold and delivered 125,000 tons. The selling price was \$555 per ton of mash of grains.

**Required:**

- (1) Calculate Pelmo's gross margin for 2022. (5%)
- (2) Calculate the material price variance of raw material for Department I. (5%)
- (3) Calculate the variable overhead efficiency variance for Department II. (5%)
- (4) Calculate the fixed overhead volume variance for Department III. (5%)

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