



COMM 294 SOLUTIONS

MIDTERM REVIEW SESSION

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Cost Terms, Concepts and Classifications

Manufacturing Costs = PRODUCT COSTS

- Recorded as inventory when incurred (aka inventoriable costs)
- Expensed as COGS when product is sold

- **Direct Materials (DM)**
 - Raw materials and other parts that can be directly traced to a product
 - E.g. Wood, copper, fabric, stereos for cars

- **Direct Labour (DL)**
 - “Touch labour” that can be traced to the creation of a product/service
 - E.g. Assembly line worker, hairdresser

- **Manufacturing Overhead (MOH)**
 - Factory-related costs incurred to make a product, but cannot be directly traced to specific units produced
 - Includes Indirect Labour and Indirect Materials
 - E.g. Janitors, security guards, manufacturing manager’s salary, machine lubricants, electricity to power the factory



Classification of Manufacturing Costs

- **Prime Costs**
 - DM and DL
 - Directly traceable to product
- **Conversion Costs**
 - DL and MOH
 - Costs incurred to convert raw materials into finished goods

Non-Manufacturing Costs = PERIOD COSTS

- Not part of the manufacturing process, so it cannot be assigned to a specific product
- Expensed in period incurred
- Includes Selling, General & Administrative costs
- E.g. Sales commissions, delivery costs for finished goods, CEO salary, electricity to power the HQ

Tip:

- Factory related = Manufacturing (Product)
- Headquarter/Sales office related = Non-Manufacturing (Period)



Cost Classifications for Predicting Cost Behaviour

- **Variable Costs (VC)**
 - Costs that vary in direct proportion to the level of activity/cost driver
- **Fixed Costs (FC)**
 - Costs that remain constant regardless of the level of activity (within a relevant range)
- **Mixed Costs**
 - Include both variable and fixed costs
 - Separate VC and FC portions using the High-Low Method

Cost Classifications for Decision Making

- **Differential Costs/Incremental Costs**
 - A cost that differs between 2 alternatives
 - Relevant for decision-making
- **Opportunity Costs**
 - Value of the best alternative forgone
 - Relevant for decision-making but does not show up on financial statements
- **Sunk Costs**
 - Costs incurred in the past and irreversible
 - NOT relevant for decision-making
 - E.g. Depreciation/Amortization



Question 1: Cost Classification

Please categorize the following costs for the CUS Agenda manufacturing plant:

			Product Costs			Period Costs		
			Direct	Indirect				
	VC	FC	DM	DL	MOH	SG&A	Opp	Sunk
Wages of workers who assemble the agendas, \$13/hr	X			X				
Supervisor's salary, \$3,000/month		X			X			
Paper to produce agendas, \$5/unit	X		X					
Factory rent, \$2,500/month		X			X			
Sales office rent, \$2,600/month		X				X		
Depreciation of factory building, \$8,000/year		X			X			X
Depreciation of HQ, \$9,000/year		X				X		X
Shipping cost, \$7/unit	X					X		
Advertising cost, \$3,000/month		X				X		
Electricity for the factory, \$5/unit	X				X			
CEO salary, \$180,000/year		X				X		
Rental revenue forgone, \$20,000/year							X	



Inventory Equations (Very Useful!)

Basic Equation:

Beginning Balance + Additions = Ending Balance + Withdrawals

Raw Materials:

Beginning RM + Purchases = Ending RM + DM used

Work-in-Process (WIP):

Beginning WIP + Manufacturing costs = Ending WIP + COGM

Manufacturing costs = DM used + DL + MOH applied

Finished Goods:

Beginning FG + COGM = Ending FG + COGS

COGAS = Beginning FG + COGM

Raw Materials Inventory	
DR. (+)	CR. (-)
Beg. Bal.	
Purchases	
	DM used
	IDM used
End. Bal.	

Work-in-Process Inventory	
DR. (+)	CR. (-)
Beg. Bal.	
DM	
DL	
MOH	
	COGM
End. Bal.	

Finished Goods Inventory	
DR. (+)	CR. (-)
Beg. Bal.	
COGM	
	COGS
End. Bal.	



Question 2: Inventory Equations

Manufacturer Ltd. provides you with the following inventory balances:

	Beginning Balance	Ending Balance
Raw Materials	\$80,000	\$45,000
Work-in-Process	110,000	210,000
Finished Goods	230,000	245,000

The cost of raw materials used for the year was \$175,000 and they spent \$230,000 on direct labour. They allocated \$380,000 in manufacturing overhead and incurred \$90,000 in selling and administrative expenses.

- a) How much did Manufacturer Ltd. spend to purchase raw materials during the year?

$$\begin{aligned}\text{Purchases} &= \text{Ending RM} + \text{DM used} - \text{Beginning RM} \\ &= 45,000 + 175,000 - 80,000 \\ &= 140,000\end{aligned}$$

- b) What are the total manufacturing costs for the year at Manufacturer Ltd.?

$$\begin{aligned}\text{Manufacturing costs} &= \text{DM} + \text{DL} + \text{MOH} \\ &= 175,000 + 230,000 + 380,000 \\ &= 785,000\end{aligned}$$



c) Determine Cost of Goods Sold for the year.

$$\begin{aligned}\text{COGM} &= \text{Beginning WIP} + \text{Manufacturing costs} - \text{Ending WIP} \\ &= 110,000 + 785,000 - 210,000 \\ &= 685,000\end{aligned}$$

$$\begin{aligned}\text{COGS} &= \text{Beginning FG} + \text{COGM} - \text{Ending FG} \\ &= 230,000 + 685,000 - 245,000 \\ &= 670,000\end{aligned}$$



Job-Order Costing

Types of Costing Systems

- **Process Costing**
 - Used for mass production (many units of a single, indistinguishable product)
 - Assign the same average cost per unit
- **Job-Order Costing**
 - Used for products that are individually manufactured or made in small batches
 - Products are distinguishable/identifiable
 - Trace/allocate costs to each specific job
 - DM and DL is charged as work is performed
 - MOH is allocated based on an estimate

Allocating MOH

1. **Determine the allocation base/driver (given in an exam)**

e.g. #DLH, \$DL, #MH

2. **Set a predetermined overhead rate (POHR)**

$$\text{POHR} = \frac{\text{Estimated Total MOH for the period}}{\text{Estimated Total Units of Allocation Base}}$$



3. Use the POHR to assign MOH costs to jobs based on actual driver level

$$\text{MOH Applied} = \text{POHR} * \text{Actual Activity}$$

4. Adjust for variances between the predetermined MOH and actual MOH incurred

- Actual MOH is recorded as a DR.
- Applied MOH is recorded as a CR.

Applied MOH > MOH Incurred = OVER-APPLIED

- MOH account has an ending CR. balance
- Adjusting journal entry:

DR. MOH
CR. COGS

Applied MOH < MOH Incurred = UNDER-APPLIED

- MOH account has an ending DR. balance
- Adjusting journal entry:

DR. COGS
CR. MOH

***Ending balance of MOH needs to be 0**



Question 3: Job-Order Costing

CMP produces unique review packages based on requests by Sauder students. For the COMM 294 review package, CMP incurred \$500 in direct materials and #25 direct labour hours at \$16 per hour. MOH is allocated to jobs based on the number of direct labour hours. The MOH budget is \$640,000 and a total of #160,000 direct labour hours are expected for the entire year.

By the end of the year, CMP has incurred total of #175,000 direct labour hours. In addition, they discover that actual manufacturing overhead costs were \$685,000.

- a) Please help CMP determine the cost of the COMM 294 review package.

DM	500	
DL	400	#25 DLH x \$16
MOH	100	#25 DLH x \$4
Total	\$1,000	

$$\begin{aligned} \text{POHR} &= \text{Estimated \$MOH} / \text{Estimated \#DLH} \\ &= \$640,000 / \#160,000 \\ &= \$4/\text{DLH} \end{aligned}$$



b) Did CMP over or under apply MOH? What is the consequence and how should it be corrected?

Applied MOH = $\$4/\text{DLH} \times \#175,000 \text{ DLH} = \$700,000$

Actual MOH = $\$685,000$

Applied MOH > Actual MOH → OVER-APPLIED by $\$15,000$

Consequence: COGS is overstated and therefore net income is understated

Adjusting journal entries:

DR. MOH	15,000
CR. COGS	15,000



Activity-Based Costing

- Assigning MOH based on the activities that drive the cost, rather than using a single POHR for everything
- Every activity will have a different cost driver, which results in many “mini POHRs”
 - E.g. Purchasing costs → # purchase orders

Machine maintenance → #MH

Steps to Activity-Based Costing (ABC)

1. Identify activities, activity cost pools and activity measures
2. Assign overhead costs to activity cost pools
3. Calculate activity rates (“mini POHR”)

$$\frac{\text{Estimated Total Activity **Cost** Pool}}{\text{Estimated Total **Activity** Allocation Base}}$$

4. Assign MOH costs based on activity levels

$$\text{Allocated MOH} = \text{Activity Rate} * \text{Actual Activity}$$

5. Prepare management reports (not asked for in exams, but you may be asked to provide qualitative comments regarding the use of ABC in general compared to traditional costing)



Question 4: ABC

Joey, Chandler and Ross share an apartment. Their total costs for the apartment are \$1,692 per month, which they split equally (each roommate pays \$564).

The costs cover rent, Wi-Fi, Netflix and groceries. Chandler isn't around a lot because he spends a lot of time at Monica's. He feels as if he's paying more than he should. He suggests that they use Activity-Based Costing to figure out how much they should each be paying. They identify the following costs:

Rent	\$1,200
Wi-Fi	\$100/month
Netflix	\$14/month
Groceries	\$378/month

They decide that rent should be shared equally, but the rest of the categories should be split based on the "activity level" of each roommate:

- Ross, as a professor, spends a lot of time on the computer. With all the paleontology research he does, he consumes about 35 GB of their Wi-Fi usage. Joey uses about 10 GB and Chandler only uses about 3 GB.
- Joey watches a lot of Netflix, which they estimate to be about 30 hours per week. Ross watches about 4 hours per week and Chandler only watches 1 hour a week.
- Joey eats a lot at home (and in general). He eats about 20 meals at the apartment each week. Ross eats at home around 15 meals a week, while Chandler only has about 8 meals.



Using ABC, figure out the actual cost per roommate.

Activity	Driver	Cost Pool	Total Activity	Activity Rate	Joey		Chandler		Ross	
					Activity	Cost Assigned	Activity	Cost Assigned	Activity	Cost Assigned
Rent	Month	\$1,200	1	\$1,200.00	0.33	\$400.00	0.33	\$400.00	0.33	\$400.00
Wi-Fi	GB	\$100	48	\$2.08	10	\$20.83	3	\$6.25	35	\$72.92
Netflix	Hours	\$14	35	\$0.40	30	\$12.00	1	\$0.40	4	\$1.60
Groceries	Meals	\$378	43	\$8.79	20	\$175.81	8	\$70.33	15	\$131.86
				Cost per roommate:		\$608.65		\$476.98		\$606.38



Cost Behaviour

High-Low Method

A method to estimate the variable costs (VC) and fixed costs (FC) when given total costs (TC) in two or more time periods.

Steps:

1. Identify the highest and lowest levels of **activity**
2. Identify the total costs relating to those levels of activity
3. Calculate the change in cost and change in activity

$$\text{Variable Cost} = \frac{\Delta \text{ Cost}}{\Delta \text{ Activity}}$$

4. Calculate fixed cost using either the high point or low point

$$\text{Fixed Cost} = \text{Total Cost} - \text{Total Variable Cost}$$

5. Write cost equation in the format $Y=a+bX$



Question 5: High-Low Method

The CUS has provided you with the following data from its operations of printing agendas over the past few years. Predict the total cost the CUS will incur if it expects to print #1,375 agendas in 2019.

Year	# Agendas printed	Total Cost
2013	1,000 Low	\$13,890
2014	1,100	14,230
2015	1,250	15,500
2016	1,400 High	17,490
2017	1,300	16,290
2018	1,350	16,980

$$\text{Variable Cost} = \frac{\Delta \text{ Cost}}{\Delta \text{ Activity}} = \frac{\$17,490 - \$13,890}{1,400 - 1,000} = \frac{\$3,600}{400} = \$9/\text{agenda}$$

$$\text{Fixed Cost (using high point)} = \$17,490 - \$9 * 1,400 = \$4,890$$

$$\text{Total Cost} = \$4,890 + \$9 \times \# \text{ of agendas}$$

$$\text{Total Cost for 2019} = \$4,890 + (\$9 \times \#1,375) = \$17,265$$



Cost-Volume-Profit (CVP) Analysis

Contribution Margin (CM)

- Amount remaining from sales revenue after all variable expenses have been deducted

	Total	Per Unit
Contribution Margin	Sales Revenue – Variable Costs	Unit Selling Price – Unit Variable Cost
CM Ratio	TCM/Sales Revenue	UCM/USP

Break-Even Analysis

- At Break-Even, Contribution Margin = Fixed Costs →
Net Income = 0

- **Equation Method**

$$\text{Profit} = \text{Sales} - \text{Variable Costs} - \text{Fixed Costs}$$

- **Contribution Margin Method**

$$\text{BE point (\#units)} = \frac{\text{Fixed Costs}}{\text{UCM}}$$

$$\text{BE point(\$)} = \frac{\text{Fixed Costs}}{\text{CM Ratio}}$$



Target Profit Analysis

- Used to determine the sales volume needed to achieve a certain target profit

$$\text{Unit sales to attain target profit} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{UCM}}$$

$$\text{Dollar sales to attain target profit} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{CM Ratio}}$$

$$\text{Before – tax Target Profit} = \frac{\text{After – tax Target Profit}}{(1 - \text{Tax rate})}$$

Tip: Always do the problem using **Before-Tax** Target Profit

Margin of Safety

- Excess of budgeted/actual sales over the break-even volume of sales

$$\text{Margin of Safety (\$)} = \text{Total Sales} - \text{Breakeven Sales}$$

$$\text{Margin of Safety (\%)} = \frac{\text{Total Sales} - \text{Breakeven Sales}}{\text{Total Sales}}$$

$$\text{Margin of Safety (\#units)} = \frac{\text{Total Sales} - \text{Breakeven Sales}}{\text{USP}}$$



Cost Structure

- **Cost Structure:** relative proportion of fixed and variable costs
 - **High FC (and low VC)**
 - Income is higher in good years and lower in bad years compared to companies with low FC
 - **High VC (and low FC)**
 - Income is more stable across good and bad years

Operating Leverage

- How sensitive net income is to a % change in sales

$$\text{Degree of Operating Leverage (DOL)} = \frac{\text{Contribution Margin}}{\text{Net Income}}$$

- Interpretation: If DOL = 5, a 10% increase in sales will result in a 50% increase in income

Sales Mix (Multi-Product Break-Even Analysis)

- **Sales Mix:** Relative proportion in which a company's products are sold
- Assume proportion of different products remain constant for CVP analysis

$$\text{Overall CM Ratio} = \frac{\text{Total CM of all products}}{\text{Total Sales}}$$



Question 6: CVP Analysis

Kim's Koffee has developed the following formula to estimate its monthly costs:

$$\text{Total Costs} = \$28,000 + \$3 * \text{\#cups of coffee}$$

Customers are charged \$5 per cup of coffee. The company has a tax rate of 40%.

- a) How many cups of coffee must Kim sell in a month in order to break-even?

$$\begin{aligned}\text{UCM} &= \text{USP} - \text{UVC} \\ &= \$5 - \$3 \\ &= \$2\end{aligned}$$

$$\begin{aligned}\text{Break-even point} &= \text{FC}/\text{UCM} \\ &= \$28,000/\$2 \\ &= \text{\#14,000 cups of coffee}\end{aligned}$$

- b) What is the margin of safety (in #cups of coffee) if Kim expects to sell #19,500 cups of coffee per month?

$$\begin{aligned}\text{Margin of Safety} &= \text{Total Sales} - \text{Breakeven Sales} \\ &= 19,500 - 14,000 \\ &= \text{\#5,500 cups of coffee}\end{aligned}$$



- c) If the CM Ratio drops to 25%, how much must fixed costs be reduced by to ensure Kim breaks even each month at \$50,000 sales revenue?

$$\text{Breakeven (\$)} = \text{FC} / \text{CM Ratio}$$

$$\text{FC} = \text{Breakeven (\$)} \times \text{CM Ratio}$$

$$= \$50,000 \times 25\%$$

$$= \$12,500 \rightarrow \text{FC needs to be this much to breakeven}$$

$$\text{Currently, FC} = \$28,000$$

$$\$28,000 - \$12,500 = \$15,500 \text{ reduction in FC is required}$$

- d) If Kim expects to sell #19,500 cups of coffee per month, what price should be charged to generate a monthly before-tax profit of \$15,000?

$$\text{Unit sales to attain target profit} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{USP} - \text{UVC}}$$

$$\#19,500 = \frac{\$28,000 + \$15,000}{\text{USP} - \$3}$$

Solve for USP:

$$\text{USP} = \frac{\$28,000 + \$15,000}{\#19,500} + 3 = \$5.21$$

- e) How many cups of coffee must Kim sell to generate after-tax profits of \$8,500 per month?

$$\text{Before-tax target profit} = \$8,500 / (1 - 40\%) = \$14,166.67$$

$$\begin{aligned} \# \text{Cups of coffee} &= \frac{\$28,000 + \$14,166.67}{\$2} \\ &= \#21,084 \text{ cups} \end{aligned}$$

