Online Course Manual

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Module 9

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Module 9 Summary

I. Short-term Decision Making. Managerial accountants are directly involved in management decision-making. Some of the situations that require decisions seem to recur frequently in business, and generalizations about the way they should be approached have become a standard part of any managerial accounting course.

A. Business decision-making usually requires an analysis of costs and revenues. However, only ***relevant costs and revenues*** are useful in making the decision.

1. *Relevant* costs and revenues are those that will change depending on the decision that is made, and they are the only ones that matter when making the decision.
2. *Relevant costs* are also called ***differential costs***, *avoidable costs*, *marginal costs*, or *incremental costs.*

B. ***Irrelevant costs and revenues*** are those that will remain the same no matter what decision is made. They are of two types:

1. ***Sunk costs*** are those that have already been incurred sometime in the past and, therefore, cannot change when the decision is made. For this reason, *sunk costs are never relevant costs.*
2. ***Future costs and revenues that will not change*** regardless of the decision that is made. These costs and benefits have no bearing on the decision and *are also never relevant* considerations when making it.

Click the link below to play an audio file that presents and discusses the example below.

Link to Relevant Cost Audio Discussion

Here's an Example:
Suppose you are planning to use your one-week paid vacation time to drive to the Grand Canyon. You recently paid $500 for new tires and a tune-up for your car so you would be ready for the trip. Gas, oil and depreciation from the trip would total $700. You'll drive straight through to the Grand Canyon. Once at the Grand Canyon you plan to stay at a lodge at a cost of $80 per night. Meals and other expenses will total $150. Before you leave, you discover that an airline is running a round trip special to the Grand Canyon at a cost of $250. If you do choose to fly, you can rent a car once you arrive for a total cost of $500 during your stay. What are the relevant costs to consider in deciding whether to drive or to fly? Which costs are irrelevant?

Irrelevant Costs:
New tires and tune-up ($500) – this is a *sunk cost* and is irrelevant.
Lodging ($80) and meals and miscellaneous costs ($150) – these future costs *will not change* whether you drive or fly. They are not avoidable.

Example, Continued

Relevant Costs:
Gas, oil and depreciation ($700) – these costs are *avoidable* if you choose to fly, so they are relevant to the decision.
Cost of tickets ($250) and rental car ($500) – these costs are *avoidable* if you choose to drive and are also relevant.

Irrelevant Cost Items	Irrelevant Costs	Relevant Costs to Drive	Relevant Costs to Fly
Tires and tune-up (sunk)	$500		
Lodging and entertainment	$230		
Relevant Cost Items			
Gas, Oil Depreciation		$700	
Airline tickets			$250
Rental car			$500
Total Relevant Costs		$700	$750

Since the *differential costs* of driving ($700) are less than the *differential costs* of flying ($750), you should choose to drive instead of fly. Caution: this decision is based only on the cost differential. Other, non-cost considerations should also be factored into the decision. Since the cost difference is only $50, you may still decide to fly in order to avoid the long, tiring drive!

II. Common Types of Short-Term Decision-Making

A. ***Unprofitable product line and segment decision analysis*** refers to the evaluation of product lines, departments, and other segments of the organization. If a segment is truly unprofitable, it should be discontinued. However, it is often difficult to determine which costs would be eliminated if the segment is discontinued, and what the effect on the "bottom line" would actually be.

1. An incremental profit analysis approach requires the determination of company income as it would be without the segment so that the differential increase or decrease in profits that would result from discontinuance of the segment can be identified.
2. ***Variable costs*** incurred by the segment are always avoidable and therefore relevant to the decision.
3. ***Traceable fixed costs*** are those fixed costs that can be traced directly to the segment in question. Normally these costs will be eliminated if the segment is discontinued and are relevant costs to include in the analysis. An example would be depreciation of plant equipment that is used only for the production of a particular product. If the equipment would be sold if the product is discontinued then the traceable depreciation expense is a relevant cost.
4. Some ***allocated fixed costs*** may be *unavoidable costs* that were simply assigned to the segment and will not be eliminated if the segment is discontinued. They are irrelevant to the decision. An example would be property taxes that were applied to the product, but that would not change if the product were eliminated.

5. Once costs have been traced to the segment and the avoidable costs have been identified, the analysis is completed by identifying the revenues that would be lost if the segment were discontinued. The *disadvantage of eliminating the segment* (loss in revenues) is subtracted from the *advantage of eliminating the segment* (reduction in avoidable costs) to determine the net effect of eliminating the segment. If the difference is positive, the segment should be eliminated; if it is negative, the segment should be retained.

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Segment Analysis Example:

Alpha Company is considering the elimination of Calco, one of its three product lines. The income statement, separated by product line, is presented below:

	Product Line			
	Attro	Barlo	Calco	Total
Sales	$1,000	$2,000	$1,500	$4,500
Variable Costs	(600)	(1,200)	(900)	(2,700)
Contribution Margin	$400	$800	$600	$1,800
Traceable Fixed Costs	(200)	(400)	(500)	(1,100)
Allocated Fixed Costs	(100)	(150)	(150)	(400)
Net Income	$100	$250	$(50)	$300

If all of the traceable fixed costs are avoidable and if none of the allocated fixed costs are avoidable, then the elimination of Calco will result in the loss of $1,500 of revenues, a $900 reduction in avoidable variable costs, and a $500 decrease in avoidable fixed costs:

Loss in Revenues	$(1,500)
Reduction in Variable Costs	900
Reduction in Fixed Costs	500
Net Disadvantage of Eliminating Product Line	$(100)

This nets out to a $100 negative effect on net income. Therefore, the elimination of Calco reduces overall net income by $100, so Calco should be retained. Here is the income statement as it would appear if Calco were no longer produced and the production and sale of Attro and Barlo remained constant (the new, reduced income figure is highlighted):

	Product Line			
	Attro	Barlo	Calco	Total
Sales	$1,000	$2,000	$ 0	$3,000
Variable Costs	(600)	(1,200)	(0)	(1,800)
Contribution Margin	$400	$800	$0	$1,200
Traceable Fixed Costs	(200)	(400)	(0)	(600)
Allocated Fixed Costs	(100)	(150)	(150)	(400)
Net Income	$100	$250	$(150)	$200

Calco has been left on the statement to make the columns more comparable. The $150 in fixed costs previously allocated to Calco would actually have to be reallocated to Attro and Barlo, if Calco is eliminated, and the Calco column would no longer appear on the statement.

(Continued below)

Opportunity Costs

It is tempting to stop our analysis here and make the decision to retain the Calco product line. However, we should also realize that the elimination of Calco will free up production capacity that can be used to expand the production of the other products or for the manufacture of an entirely new product line. This will produce additional costs and revenues which then become relevant to the decision.

Suppose there is more demand for Barlo than the company can presently meet. In fact, if Calco is eliminated the production and sale of Barlo can be doubled. If Barlo sales are doubled, revenues will increase by $2,000, variable costs will increase by $1,200, causing net income will increase by $800. Now a new cost, an *opportunity cost*, has been introduced into the decision regarding the discontinuance of Calco.

The *opportunity* to expand Barlo's production and earn an additional $800 of income will be lost if Calco is retained. This is the *opportunity cost* of continuing Calco's production.

The differential cost analysis is now as shown below. The elimination of Calco will result in the loss of $1,500 of revenues, the elimination of $900 of avoidable variable costs and $500 of avoidable fixed costs, and the avoidance of an *opportunity cost* of $800.

Loss in Revenues	$(1,500)
Reduction in Variable Costs	900
Reduction in Fixed Costs	500
Avoidance of Barlo Opportunity Cost	800
Net Advantage of Eliminating Product Line	$700

This nets out to a $700 positive effect on net income. Therefore, Calco should be eliminated and the production of Barlo should be expanded. If the company does this, the total net income rises from $300 to $1,000:

	Product Line			
	Attro	Barlo	Calco	Total
Sales	$1,000	$4,000	$ 0	$5,000
Variable Costs	(600)	(2,400)	(0)	(3,000)
Contribution Margin	$400	1,600	$0	$2,000
Traceable Fixed Costs	(200)	(400)	(0)	(600)
Allocated Fixed Costs	(100)	(150)	(150)	(400)
Net Income	$100	$1,050	$(50)	$1,000

6. Note that there are many ways the analysis in the example above could have been carried out. It could have been stated that the elimination of Calco will produce a $500 net increase in revenue ($2,000 from Barlo minus $1,500 from Calco); a $300 increase in variable costs ($1,200 - $900), and a $500 decrease in avoidable fixed costs. Also, we might have said that the elimination of Calco causes a $600 loss of contribution margin (from Calco), an $800 increase in contribution margin (from Barlo), and a $500 decrease in avoidable fixed costs (from Barlo). Any of these approaches will produce the same $700 net increase in income and result in a decision to eliminate Calco.

B. ***"Make or Buy" decisions*** are those relating to whether the company should make its own parts or produce its own materials instead of buying them from outside suppliers. Relevant costs must again be identified and analyzed in order to determine the least-cost alternative.

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Make-or-Buy Decision Example:
Alpha company is considering the manufacture of 500 parts needed for its Barlo product line. Presently these parts are purchased from a supplier at $2 per unit. If the parts are manufactured, additional variable costs will be incurred. There will be an increase in avoidable fixed costs as well since new equipment must be purchased, causing increases in depreciation and insurance. In addition, some of the common fixed costs already present will be applied to the parts. Their cost is estimated to be the following:

Variable direct materials cost per unit	$.55
Variable direct labor cost per unit	.85
Traceable and Avoidable Fixed Costs	.25
Unavoidable Fixed Costs Applied to Production	.50
Total Cost Per Unit	$2.15

The relevant costs to consider are those that will *only* be incurred if the parts are manufactured, namely the variable costs and the avoidable fixed costs. The unavoidable fixed costs applied to production will not change regardless of the decision and are not relevant. Therefore, if the parts are manufactured the differential costs incurred will be just $1.65 per unit ($.55 + .85 + .25), a savings of $.35 compared to the $2 purchase price.

Opportunity Costs:
If Alpha Company has excess capacity that is sufficient to absorb the production of the needed parts, then our analysis is complete and we should decide to manufacture the parts "in house." However, suppose there is no excess capacity and the Attro product line will have to be scaled back by 50% in order to produce them. Now another relevant cost enters the picture, an opportunity cost. The opportunity to produce Attro and generate contribution margin of $200 ($400 x 50%) from their sale has been lost. If this lost contribution totals $200 and if 500 parts are to be manufactured, then the opportunity cost of producing them is $.40 per unit ($200 ÷ 500 parts). Now the total relevant cost per unit is $2.05 ($1.65 + $.40), and management should decide to continue to buy the parts from the supplier.

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C. ***Special order decisions*** refer to decisions regarding whether a customer's "special order" for goods at prices below normal selling price should be accepted.

1. In order for these discounted price orders to be considered, there must be unused manufacturing capacity available that would merely sit idle if the order is not accepted. After all, if there is sufficient demand for the product at normal selling prices to utilize all the plant capacity, then there is no need to consider making sales at discounted prices. Also, the special price must

not violate state and federal laws relating to price discrimination.

2. Once again, the relevant costs and revenues are those that will change if the special order is accepted, and they are the only ones that matter in making the decision.
3. As long as the differential revenues received from the sale of the items is greater than the differential costs of producing it, the order should be accepted.
    a. Suppose the item is usually sold for $5 per unit and has variable costs of $2 per unit. Its contribution margin is therefore $3. If a special order is received at a price that is greater than the variable cost of producing the unit, it will prove profitable to accept the order (1) *as long as excess capacity exists that cannot be used in the production of goods to be sold at normal prices,* and (2) *as long as avoidable fixed costs do not increase so much as to eliminate the profit from the sale*.
    b. For example, suppose a special order for 1,000 of these units is received at a price of just $2.50 per unit. The contribution margin per unit sold will only be $0.50 ($2.50 - 2.00), but the company can still generate $500 of total contribution margin (1,000 units x $0.50 contribution margin per unit) by accepting the order. If fixed costs do not rise, the $500 represents additional income that would not have been earned had the units not been produced.

D. The problem of ***constrained resources***, often resulting from production ***bottlenecks***, frequently occurs in business. A materials, labor, machine or space limitation may prevent the company from producing as many products as it can sell. The problem then becomes selecting the products that should be manufactured and the ones that should be cut back. *Sales mix* refers to the "mix" (i.e., the combination) of products that the company decides to produce and sell. The following comments concern the determination of the optimum sales mix under three possible scenarios.

1. ***No production constraints***. If an unlimited number of the company's products can be produced and sold, then no problem regarding sales mix exists and no choices have to be made. The company would produce an infinite number of *all* its products and earn an infinitely large profit. This, however, is not reality (much to the chagrin of the stockholders). ☺

   This still isn't close to reality, but if demand is limited and production capacity is *not*, then the company should produce as many units of each one of its products as it can sell, but no more. Additional production would only generate more variable cost and produce no revenue.
2. ***Unlimited demand and limited production capacity***. We're getting a little closer to reality now. If demand is unlimited but some factor constrains production, the company must consider two factors in deciding which of its product lines to manufacture and sell: the contribution margin each product provides and the factor that constrains their production. *If more demand exists than the company can satisfy, it will always maximize profits by*

producing only the product that produces the greatest contribution margin per unit of constraint variable. See the example below for further explanation.

3. ***Limited demand and limited production capacity***. This is reality. When production constraints exist and the demand for products is also limited, the company must consider three factors in selecting a sales mix: the contribution margin each product provides, the factor that constrains their production, and the number of units that can be sold. *If demand is limited, the company will always maximize profits by producing as many units as it can sell of the product with the greatest contribution margin per unit of constraint variable. It should then produce as many units of the product with the next greatest contribution margin per unit of constraint variable as it can sell; and then the next, and so on until the constraint is reached and production must stop.* (See the example below).

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Constrained Resources Example:

To illustrate these considerations, suppose product A requires very little material but a great deal of labor time to produce, while B uses more material but requires less labor time. Labor time is the constraint variable. The contribution margin and forecasted demand for the two products is as follows:

	Product A	Product B
Selling Price per Unit	$20	$ 8
Direct Materials Cost (@ $1 per pound)	(1)	(2)
Direct Labor Cost (@ $10 per hour)	(10)	(2)
Other Variable Costs	(5)	(1)
Contribution Margin per Unit	$ 4	$ 3
Labor Hours Required Per Unit	÷ 1	÷ .2
Contribution Margin per Labor Hour	$ 4	$15

Suppose that labor hours are limited so that no more than 10,000 hours may be used in production during the period. Note that A's contribution margin of $4 per unit is greater than B's ($3). You might think, then, that A should be produced instead of B. However, it takes one hour to produce a unit of A and only .2 hours to produce one B.

Given the labor constraint, if the company decides to produce only A then 10,000 units of A can be manufactured (10,000 hours ÷ 1 hour per unit), and the production and sale of these units will generate $40,000 of total contribution margin (10,000 units x $4). If the company produces only B, then 50,000 units (10,000 hours ÷ .2 hours per unit) will be produced. Their sale will generate $150,000 of total contribution margin (50,000 x $3). Obviously, product B is more profitable than product A. The reason B is more profitable is because $15 of contribution margin is generated for every labor hour spent producing B while only $4 of contribution margin per hour is provided by A. Since the company only has 10,000 labor hours available to use, it will maximize its profits by earning $15 from each labor hour used instead of just $4.

Conclusion: If production capacity is constrained in some way, the company does not maximize contribution margin by producing the units with the greatest contribution margin per unit, but rather the product that produces the greatest contribution margin per unit of constraint variable.

Two further points:

(1) In the example above we assumed that all the units of A and B that could be produced could also be sold. What if demand is limited? Suppose the following sales forecast has been obtained by the company:

	Product A	Product B
Demand for product (in units)	18,000	41,000

What *product mix* should the company produce (i.e., how many units of A and how many of B should be manufactured)? We know that the production and sale of B is preferred over A. However, only 41,000 B's can be sold. Therefore, 41,000 B's should be produced, which will consume 8,200 labor hours (41,000 x .2 hours per unit). This will leave 800 labor hours that can be used for the production of 800 units of A (800 hours ÷ 1 hour per unit). Therefore, the company should produce 41,000 B's and 800 A's. This is the sale mix that will maximize profits, given the production constraint.

(2) Another way to deal with this bottleneck problem is to adjust A's selling price to compensate for the bottleneck constraint and make it just as profitable as product B. If product B provides $15 in contribution margin per labor hour, what would product A's selling price have to be in order to also provide $15 in contribution per labor hour? Product A presently generates $4 of contribution per labor hour, so this would have to increase by $11 in make it equal to product B's contribution. If we add $11 to A's selling price, making it $31, then A will produce just as much contribution per labor hour as B, and we'll be indifferent about which we produce. We may not, though, sell many A's at this (much) higher price!

E. ***Sell or process-further decisions*** often relate to *joint products* and the decision regarding whether a product should be sold now or processed further and then sold. A joint process is one in which more than one product is produced. For example, logs may be sawn, with different grades of boards produced from this joint process. The boards may then be processed further into different types of specialty boards, or they may be sold as they are. The costs incurred in sawing the logs and producing the different grades of boards are called *joint costs*. In order to process the boards further, it will be necessary to incur additional costs.

1. The major point in these decisions is that *joint costs are irrelevant to the decision*. These costs are sunk costs that have already been incurred, and they cannot be changed no matter what decision is made.
2. An incremental analysis approach should be applied to joint products and sell or process-further decisions. That is, if the differential revenue that will be received from processing the product further is greater than the differential costs that will be incurred to do so, then the product should be processed further.
3. For example, suppose Product A and Product B are joint products. Total joint costs incurred up to the split-off point amount to $50,000. Product B could be sold at this point for $10 per unit, or it could be processed further and sold for $20 per unit. As long as the additional cost incurred in order to

process B further is less than $10, then it should be done. The $50,000 of joint costs that have already been incurred are irrelevant to the decision.

III. Theoretical Basis for Pricing Decisions

A. The prices that companies charge for the goods and services they produce must be set in accordance with the ***strategies*** the company employs in its operations. These strategies are determined by the type of customer they wish to reach. For example, low-volume specialty shops have adopted a strategy of selling exclusive, high-quality goods to a select customer base. These companies can set very high prices relative to cost, while high-volume merchandisers of every-day items cannot.

B. A company's ***pricing policy*** is determined by the *objectives* it wishes to accomplish through its selling price. These objectives may include many things, some of which are:
   1. As discussed above, the setting of prices that are in accordance with the firm's long-range and short-term operational strategies.
   2. Obtaining additional *market share* (ie., attracting customers to the company and away from other firms in the industry) by offering competitive prices.
   3. Increasing profits.
   4. Setting ethical and socially responsible prices (eg., a hospital or nursing home).
   5. Meeting a target return on investment and/or return on equity ratio value.
   6. Satisfying the customer's needs in order to retain existing customers and attract new ones.

C. Pricing methods may be ***market-based*** or ***cost-based***, or a combination of the two. Market-based methods include establishing prices based upon the prices charged by competitors (a competition-based method) or upon the demand for the company's products that appears to exist in the market (a demand-based method).

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IV. Cost-Plus Pricing Methods

A. ***Product Cost pricing*** (also called gross profit pricing) determines the amount that must be charged for the product in order to provide a target gross profit amount.
   1. We begin by estimating the total cost of *producing* a unit. This is the sum of all the variable manufacturing costs (direct labor, direct materials, and variable overhead) and the fixed manufacturing overhead costs. Let's call this amount, C_{prod}.
   2. Next add the desired net income amount to the budgeted operating expenses (variable and fixed selling and general & administrative expenses). This gives us the total amount of gross margin that must be generated from the units sold in order to produce the target net income

figure, GM_{req}. We may then "work backwards" on the income statement to determine the Sales amount and the selling price per unit.

3. To illustrate, suppose total manufacturing costs (Cost of Goods Sold on our income statement) for 1,000 units are estimated to be $10,000 ($10 per unit); operating expenses are estimated to total $5,000 ($5 per unit); and we wish to produce net income of $1,000. To determine the required selling price, we only need to fill in the question marks in the schedule below:

Sales (1,000 units @ $?)	$?
COGS (1,000 units @ $10)	(10,000)
Gross Profit	$?
Operating Expenses	(5,000)
Net Income	$1,000

a. Step 1: Determine total production cost, C_{prod}.
C_{prod} = $10,000 (given to us above).

b. Step 2: Determine required gross profit, GP_{req}.
GP_{req} = $1,000 + 5,000 = $6,000. We can now fill in an amount for gross profit on the income statement:

Sales (1,000 units @ $?)	$?
COGS (1,000 units @ $10)	(10,000)
Gross Profit	***$6,000***
Operating Expenses	(5,000)
Net Income	$1,000

c. Step 3: Determine the required sales amount, and the price per unit. We can see that the required total Sales will have to be $16,000 ($6,000 GP_{req} + $10,000 COGS) in order to produce the desired $1,000 of net income. And, therefore, selling price will need to be $16 per unit ($16,000/1,000 units).

Sales (1,000 units @ $ ***16***)	***$ 16,000***
COGS (1,000 units @ $10)	(10,000)
Gross Profit	***$6,000***
Operating Expenses	(5,000)
Net Income	$1,000

d. Alternatively, in step 3, we could have calculated the required ***product cost markup percentage*** and then used it to determine the required unit selling price:

Step 3: Determine the product cost markup percentage:

Product Cost Markup Percentage = GP_{req}/COGS = 6,000/10,000 = 60%

Then, since production cost ($10,000) needs to be "marked up" by 60% ($6,000) in order to produce the desired net income amount, each unit must be marked up by 60% as well. The unit cost is $10 per unit, so unit selling price would need to be 60% higher than this.

Product Cost-based Price = $10 + ($10 x 60%) = $16

B. ***Total Cost Pricing*** is similar to gross margin pricing except that now the markup percentage is based upon *net income* and *total cost* instead of gross profit and production cost.

1. Begin by estimating the total cost of producing *and selling* a unit (total production costs *and* total operating expenses). This is the total variable and fixed manufacturing costs plus all of the operating expenses, C_{total}.
2. Returning to the illustration above, where total costs amounted to $15,000, the problem is to fill in the question marks in the following schedule:

Sales (1,000 units @ $?)	$?
Total Costs (1,000 units @ $15)	(15,000)
Net Income	$1,000

a. Step 1: Determine the total production costs and operating expenses, C_{total}:

C_{total} = $15,000 (given above).

b. Step 2: Determine the required sales amount by working backwards on the income statement:

Required Sales = $1,000 + 15,000 = $16,000.

From this we could again determine that selling price needs to be $16 per unit ($16,000/1,000 units).

c. Alternatively, in step 2, we could have calculated the required ***total cost markup percentage*** and then used it to determine the required unit selling price.

Total Cost Markup Percentage = NI/C_{total} = 1,000/15,000 = 6.6667%

Then, since total cost ($15,000) needs to be "marked up" by 6.6667% ($1,000) in order to produce the desired net income amount, each unit must be marked up by 6.667% as well. The unit cost is $15 per unit, so unit selling price would need to be 6.667% higher:

Total Cost-based Price = $15 + ($15 x 6.667%) = $16.

3. Note that operating expenses are difficult to allocate to production on a per-unit basis, making this approach more difficult to apply than the product cost pricing method.

C. ***Variable Cost Pricing*** is another approach that may be taken to pricing products.

1. Let's return to the example used above, where the total manufacturing costs for 1,000 units are estimated to be $10,000 ($10 per unit); operating expenses are estimated to total $5,000 ($5 per unit); and the desired net income is $1,000. Suppose the total manufacturing costs ($10,000) are composed of $6,000 in variable costs ($6 per unit) and $4,000 in fixed costs; and that the total operating expenses ($5,000) are composed of $2,000 in variable costs ($2 per unit) and $3,000 of fixed costs.

a. To determine the required selling price, we only need to fill in the question marks in the schedule below:

Sales (1,000 units @ $?)	$?
Variable COGS (1,000 units @ $6)	(6,000)
Variable Op. Exp.s (1,000 units @ $2)	(2,000)
Contribution Margin(1,000 units @ $?)	$?
Fixed COGS	(4,000)
Fixed Operating Expenses	(3,000)
Net Income	$ 1,000

b. Step 1: Determine the required total contribution margin amount, CM_{req}, by working backwards on the income statement:

Required Contribution Margin = $1,000 + 3,000 + 4,000 = $8,000

The income statement now looks like so:

Sales (1,000 units @ $?)	$?
Variable COGS (1,000 units @ $6)	(6,000)
Variable Op. Exp.s (1,000 units @ $2)	(2,000)
Contribution Margin(1,000 units @ ***$ 8***)	***$8,000***
Fixed COGS	(4,000)
Fixed Operating Expenses	(3,000)
Net Income	$ 1,000

b. Step 2: Determine the required sales amount by working backwards on the income statement:

Required Sales = $8,000 + 2,000 + 6,000 = $16,000

From this we could again determine that selling price needs to be $16 per unit ($16,000/1,000 units).

c. Alternatively, in step 2, we could have calculated the required ***variable cost markup percentage*** and then used it to determine the required unit selling price.

Variable Cost Markup Percentage = CM/VC$_{total}$ = $8,000/$8,000 = 100%

Then, since total variable cost ($8,000) needs to be "marked up" by 100% ($8,000) in order to produce the desired net income amount, then each unit must be marked up by 100% above its total variable cost as well. The variable cost per unit is $8 per unit, so unit selling price would need to be 100% higher:

Total Cost-based Price = $8 + ($8 x 100%) = $16.

D. In the illustrations above, all the cost-based methods provide the same answer regarding the price that should be charged for the company's product. They differ only in the cost base they use to determine price. *Product cost pricing* is based upon total *production* cost per unit, while *total cost pricing* and *variable cost pricing* is based upon product cost plus operating expenses. Since product cost per unit is normally easier to estimate and more reliable, product cost pricing is often preferred. Standard or actual costs may be used with any of these methods to establish prices, but when standard costs are used it is important to avoid the use of ideal standards since this can easily result in under pricing the product.

E. ***Target costing*** is a concept that is useful in making decisions about the feasibility of introducing new products as well as in the determination of their prices.
   1. The cost-based methods discussed above relate only to the determination of the price that must be charged for the product to produce some desired income level, not to whether the product *can be sold* at that price.
   2. Target costing requires the following steps:
      a. The price that *can* be charged for the product in the competitive marketplace is first determined.
      b. The required profit from the sale is then calculated.
      c. The ***target cost*** of the product is then determined by subtracting the target profit from the competitive price.
   3. If the target cost is less than the current estimated cost of production, the product is reengineered in order to reduce its cost. If it is impossible to reduce its estimated cost to the target cost, the product is not produced.

Instructor's Lecture Notes :
You should view the discussion in this section as supplementary to the text's content. It is provided to expand upon the text coverage and enhance your understanding of the subject. You will not be tested directly over these comments.

Service providers must also determine prices for their services. Instead of production cost, service providers incur labor and materials (parts and supplies) costs. Therefore, these firms

often apply what is called a ***time and materials pricing*** method. Customers must be charged for the time (labor cost) and materials (parts and supplies) cost incurred in providing services to them; but they also must be charged enough to cover the indirect overhead costs and provide a profit. If the desired income is $1,000, materials costs are $5,000 and overhead amounts to $11,000, the income statement is now as follows:

Services Revenue (1,000 hours @ $?)	$?
Direct Labor Cost (1,000 hours @ $10)	(10,000)
Direct Materials Cost	(5,000)
Overhead Costs	(11,000)
Net Income	$ 1,000

In this case, it is clear that services revenue must be $27,000 and that services must be billed at $27 per hour in order to produce the target net income amount. Alternatively, to provide for overhead cost and for the required gross profit, a markup percentage could be calculated:

$$\text{Markup Percentage} = \frac{\text{Total Overhead + Required Net Income}}{\text{Total Labor Costs + Total Materials Cost}}$$

$$= (\$11{,}000 + 1{,}000) / (\$10{,}000 + 5{,}000) = 80\%$$

In order to apply the markup percentage method to bill services, the labor and materials costs must first be charged to the customer, and then the percentage may be used to apply charges for overhead and profit:

Customer Billing Computations:	
Direct Labor Cost (100 hours @ $10)	$1,000
Overhead and Profit Charge ($1,000 x 80%)	$800
Parts and Supplies Used	$500
Add Overhead and Profit Charge ($500 x 80%)	$400
Total Billing (@ $27 per hour)	$2,700

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