

# Solutions Manual

## Management Accounting

First edition

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## Organizations and Accounting

### Analysis and Interpretation Problems

#### AIP 1.1: Using Accounting for Making Planning Decisions (10 minutes)

- a. Historical costs are not as useful in making planning decisions when the environment is changing rapidly. With changing products, processes and prices the historical cost is not a good approximation of the current value of a resource.

Historical costs, however, may be useful for control purposes. Historical costs provide information about the activities of managers and can be used as performance measures to evaluate managers.

- b. The purpose of accounting systems is to provide information for planning purposes and control. Historical costs are not generally appropriate for planning purposes. Alternatively, additional measures are costly to make. An accounting system should include additional measures if the benefits of improved decision making are greater than the costs of the additional information.

#### AIP 1.2: Goals of a Corporation (15 minutes)

Finance and economics textbooks traditionally state that the goal of a profit organization is the maximization of shareholder wealth. Managers are frequently presumed to act in the best interest of the shareholder, although recent finance literature recognizes that appropriate incentives are necessary to align manager interests with shareholder interests. The goal, however, remains the same: to maximize shareholder wealth. Finance textbooks, however, are not very clear about how maximization of shareholder wealth is achieved. Most finance textbooks focus on financing decisions and not on the use of assets and dealing with customers.

Marketing's goal of satisfying customers recognizes that customers are the source of revenue for the organization. Customers are the means through which shareholder value is increased. Customer satisfaction as the sole goal of the organization, however, does not recognize the need to satisfy other stakeholders in the organization including the shareholders. Customers will be very satisfied if you give them products free of charge, but that won't increase shareholder wealth.

In summary, achieving customer value is necessary to create shareholder wealth, but is not sufficient.

#### AIP 1.3: Accounting and Control (15 minutes)

- a. Two possible roles exist for the monthly report: facilitating planning decisions and control. Monthly reports provide more timely information than annual reports. With monthly reports, the principal can identify problem areas more quickly and make corrective actions. The principal may also use the monthly reports to evaluate the work of his administrators.

The monthly reports provide information about whether managers are performing well or poorly.

- b. If the principal of the university is not too familiar with accounting numbers, the finance director must adapt the monthly report to make it more understandable. He/she may even want to highlight areas in the report that might need attention.

**AIP 1.4: Control and Internal Auditors (15 minutes)**

- a. Internal auditors serve multiple roles. One role is to assist the decentralized managers in following directives from central administration. The internal auditors are also often used to evaluate the performances of the managers. If internal auditors are viewed as performance evaluators, managers will be very careful in how they interact with the internal controllers and how much information to release.
- b. One solution to this problem is to have internal auditors perform only one of the tasks described in (a). If managers could be convinced that internal auditors would have no impact on their performance evaluation, they would be much more open to working with managers to achieve the organization's goals.

**AIP 1.5: Financial Reporting and Ethics (15 minutes)**

- a. The reported profit of the company can be improved at the end of the year by making sure that all the orders get shipped before the end of the year so that the revenue from those orders can be recognized. The profit figure also can be affected by accounting estimates and accounting methods. For example, by assuming less uncollectible accounts receivable, profit is improved. A change to straight-line depreciation from accelerated depreciation also will generally improve profits. Any accounting estimate or method changes, however, must be acceptable to the external auditor.
- b. The financial director should consider all the stakeholders in responding to the chairman. Stockholders and bondholders may be harmed if the financial director manipulates financial reports. The financial director should look to the code of ethics for guidance and explain to the chairman any criminal implications of distorting reported profit figures.

**AIP 1.6: One Cost System Isn't Enough (15 minutes)**

The first part of the quote describes the tension (and conflict) that arises when a single accounting system is used for multiple purposes. This part of the statement is an accurate description of practice. However, the quote has a couple of problems, including:

- While the quote describes the costs of using a single system ('a single system ... can't perform important managerial functions adequately'), the quote does not describe the benefits derived from using a single system (lower bookkeeping costs, a single audit, less confusion).
- Because the quote ignores the benefits of a single system, it ignores the concept of economic Darwinism. It does not address the question of how surviving (successful) companies can compete if a single system 'can't perform important managerial functions adequately'.

- Also, the quote assumes that managers are bound to their internal accounting systems and no other alternative information sources are available. Often managers develop their own *ad hoc*, ‘offline’ information systems for decision making. These systems include PC-based spreadsheets, index cards, informal observation, and ‘walking around’.

### **AIP 1.7: Tax Reporting and Accounting Systems (15 minutes)**

The internal accounting system supports multiple uses, including: financial reporting, taxes, contracting (debt and management compensation), internal decision making and internal control. Because multiple purposes are served, trade-offs must be made among the competing demands. When more emphasis is placed on one purpose (taxes), less consideration can be given to other uses (internal planning and control). By linking taxes to external reporting, Japanese firms’ financial reports will be based on accounting procedures that give more weight to tax considerations. In the UK, Canada and the US, companies can keep two sets of books, one for taxes and the other for financial reporting. Thus, in these jurisdictions, there is more of a separation of taxes and everything else. Except for the additional bookkeeping costs of producing the two separate sets of reports, tax considerations are predicted to have less influence on the choice of internal (and thus external) accounting procedures in the UK, Canada and the US than in Japan.

The question is raised as to why firms use the same accounting procedures for internal reports as they do for external reports. Or for that matter, why tax laws and external financial reporting considerations have any effect on internal accounting procedures? Why don’t firms maintain multiple sets of accounts, one for each purpose (e.g. financial reporting, internal decision making and internal control)? Clearly, additional bookkeeping costs exist to maintain multiple sets of accounts. Also, there are confusion costs and, in many instances, firms explicitly link senior executive compensation to externally-reported financial statements. Such explicit linkage of executive pay to externally-reported net profit presumably exists to control agency costs between management and shareholders. Once senior management performance and rewards are linked to external reports, the internal reporting system will become linked to the external reports and basically less consideration will be given to choosing accounting procedures that aid in internal decision making and internal control.

In Japan, the firm’s accounting systems are less likely to be used for internal uses (planning and control) than in the UK, Canada and the US. They cannot rely as much on their accounting systems for internal uses (because more weight is placed on using accounting procedures to reduce taxes), thus, Japanese managers are more likely to use non-accounting-based systems for internal decision making and control.

### **AIP 1.8: Making Planning Decisions and Financial Reporting (10 minutes)**

The method of accounting for external reports should not necessarily dictate how accounting is performed for internal use. The CEO may decide that including research and development and selling costs in the product cost is important for making planning decisions even though those costs are not part of product costs for external reporting.

**AIP 1.9: Role of the Divisional Controller (25 minutes)**

- a. Line activities are those which are primary for the purposes of the organization. They create and distribute the goods and services of the organization. Line reporting refers to the reporting relation between different hierarchical management levels in line activities, e.g. the reporting relation between the general supervisor and the plant managers.

Staff activities are services provided by departments in the organization in support of its line activities. The role of the division controller in the division is an example of a staff activity. The reporting relationship between the division controller and the division manager is an example of a staff reporting relationship.

Functional activity is the collection of all the similar specialized support services in an organization. The controllership activity, spread throughout the company and directed by the corporate controller's office, is an example of functional activity. The reporting relationship between the division controller and the corporate controller is an example of functional reporting.

- b. 1. The division controller is responsible to both the corporate controller and the division manager, i.e. a dual relationship. The corporate controller assigns the division controller to the division and has final responsibility for promotion and salary. Thus, the division controller is an employee of the controller's department and reports to the corporate controller. At the same time, the division controller also serves as a staff resource to the division manager. The division controller is required to file an independent commentary on the division's financial results, which could well differ from the division manager's commentary. The division manager does evaluate the division controller's performance and makes salary and promotion recommendations.
2. The motivation of the division controller would be affected by this dual reporting relationship. The division controller is evaluated by two people whose responsibilities are not always congruent. What one person may consider good performance may be considered unsatisfactory by the other. Thus, the division controller will have difficulty knowing what factors influence his progress in the company. The circumstances described in the problem do not provide positive motivation for the division controller.

**AIP 1.10: Responsibilities, Information, and Performance Measures (15 minutes)**

- a. Steve has the best information about the likelihood of the retail shops paying their bills. By giving Steve the responsibility to make the decision, the wholesaler is more likely to make correct credit decisions.
- b. If Steve is not given the responsibility to make the credit decision, he should not be held responsible for failure of customers to pay. A possible performance measure for Steve could be total sales at the time of delivery rather than at the time of payment.
- c. If Steve is given the responsibility to make credit decisions, he is responsible for both sales and customer payments. Therefore, a possible performance measure is total sales less losses from non-payment by customers.
- d. The appropriate performance measure depends on Steve's responsibilities. If Steve makes the credit decision, then the performance measure should include uncollectible accounts receivable. Without the responsibility for credit decisions, an increased sale is a better performance measure.

**AIP 1.11: Global Competition (15 minutes)**

As long as Peter Jensen can distinguish his guitars from those of his competitors, Peter can maintain his present style of business. But guitar construction is a business that is not very costly to enter, so Peter should expect competition in handcrafted guitars in the near future. If these guitars are made in countries with low labour costs but highly skilled craftsmen, Peter is likely to find himself in a poor competitive position. At a minimum, Peter should follow closely the quality of the guitars of his competitors.

**AIP 1.12: The Role of Managers (10 minutes)**

- a. Planning
- b. Control
- c. Planning
- d. Control
- e. Planning
- f. Control
- g. Planning
- h. Planning
- i. Control

**AIP 1.13: Total Quality Management (TQM) (10 minutes)**

TQM is not solely about having the highest quality product. In fact, under TQM a quality product is not necessarily the most expensive product, but the product that most closely meets the customer's demand. Customers may prefer a cheaper and simpler product.

TQM is also about the process of continually working to improve the product and customer service. TQM is a team effort focused on building quality into a product rather than identifying defective products through inspection.

**AIP 1.14: Computer-Aided Manufacturing (CAM) (10 minutes)**

The main advantage of a CAM welding machine is the ability to re-programme the machine to make different types of welds for different products. Machines that only have to make the same welds over and over again do not have to be programmed. Mechanical welding machines can be made at a lower cost to perform repetitive tasks.

**AIP 1.15: Just-In-Time (JIT) (15 minutes)**

JIT can also be used in service organizations. Service organizations do not have the problem of excess inventory, but do have customers that expect to be served in a timely manner. Service organizations should examine the way they serve their customers to minimize waiting periods between the demand for the service and the provision of the service.

Hospitals must deal with an uneven flow of patients throughout a typical week. Friday and Saturday evenings tend to be busy times because alcohol- and drug-related injuries occur more frequently. But, sometimes extra patients arrive at the hospital at unexpected times. To accomplish JIT, the hospital must carefully schedule health care workers for expected peaks in patient flow and to have contingency plans for unexpected patient flows. Having doctors 'on call' is one way of forming contingency plans. The hospital should also consider re-deployment of health-care personnel during emergencies.

Hospitals do have some inventories such as medicines and supplies for patients. Hospitals should be sure that these items are resupplied on a timely basis.

### **AIP 1.16: Computer-Integrated Manufacturing (CIM) (10 minutes)**

Any change in an organization needs the support of both top-level and lower-level managers. The top-level managers can offer leadership and motivation in making any change. The lower-level managers must implement the change. If one group is reluctant to make a change, the change is unlikely to be successful.

### **AIP 1.17: International and Domestic Differences (10 minutes)**

It is certainly true that purely domestic companies face multiple taxing authorities, languages and cultures. However, there is a difference of degree. While multiple languages are spoken in Milan, Italian is still the official language in which all business contracts are written. Each European country has its own tax system, even if they are patterned closely after regulations established by the European Union.

Just because a company can successfully compete domestically does not automatically mean they have the knowledge and expertise to solve the more complicated problems they will encounter internationally.

Exchange rate fluctuations affect all managers the same in any given time period. But exchange rate differences can cause some managers' performance to be improved and others harmed in the same time period. Again, fluctuating exchange rates is a more serious, and therefore, a potentially more difficult problem to solve than inflation.

## **Extended Analysis and Interpretation Problems**

### **AIP 1.18: Ethical Behaviour (20 minutes)**

- a. Richardson's considerations are determined largely by his position as a cost accountant, with responsibilities to FulRange Inc., others in the company and himself. Richardson's job involves collecting, analyzing and reporting operating information. Although not responsible for product quality, Richardson should exercise initiative and good judgement in providing the management with information having a potentially adverse economic impact.

Richardson should determine whether the controller's request violates his professional or personal standards or the company's code of ethics, and whether FulRange should have such a code. As Richardson decides how to proceed, he should protect proprietary information and should not violate the chain of command by discussing this matter with the controller's superiors.

- b.
  1. The controller has reporting responsibilities and should protect the overall company interests by encouraging further study of the problem by those in his department, by informing his superiors in this matter and by working with others in the company to find solutions.
  2. The quality control engineer has responsibilities for product quality and should protect the overall company interests by continuing to study the quality of reworked rejects, informing the plant manager and his staff in this matter, and working with others in the company to find solutions.
  3. The plant manager and his staff have responsibilities for product quality and cost and should protect the overall company interests by exercising the stewardship expected by them. Plant management should be sure that products meet quality standards. Absentee owners need information from management, and the plant manager and his staff have a responsibility to inform the board of directors elected by the owners of any problems that could affect the well being of FulRange.
- c. Richardson needs to protect the interests of FulRange, others in the company and himself. Richardson is vulnerable if he conceals the problem and it eventually surfaces. Richardson must take some action to reduce his vulnerability. One possible action that Richardson could take would be to obey the controller and prepare the advance material for the board without mentioning or highlighting the probable failure of reworks. Because this differs from his long-standing practice of highlighting information with potential adverse economic impact, Richardson should write a report to the controller detailing the probable failure of reworks, the analysis made by him and the quality control engineer, and the controller's instructions in this matter.

**AIP 1.19: Strategies, Organizational Goals and Management Accounting**  
(60 minutes)

a. External Forces:

*Technological Change.* The popularity of the Internet and e-commerce posed a threat to Albo's record store businesses. Consumers were more willing to purchase books, CDs and other merchandise through the Web. Retail prices on the Web were equal to, if not less than, the prices of merchandise sold in bricks-and-mortar stores. Virtual stores such as Amazon.com also provided quick, door-to-door delivery to their customers. The Internet also presented an opportunity to Albo; anyone with a computer and modem was a potential customer for the virtual store.

By acquiring the CD Plus website, Albo was able to combine his company's experience in record selling and his extensive inventory, with the virtual store's convenience and market coverage.

*Globalization.* The Internet opened up a global market for online businesses. In one respect, companies could save money by not having to establish bricks-and-mortar stores all over the world. Secondly, American consumers might be lured to the Canadian website because of the favourable currency exchange rate. However, the low barrier to entry would increase the threat of new competitors, in particular, large American companies with vast resources.

Albo maintained both bricks-and-mortar stores and the virtual store. He benefited from economies of scope – experience and customer data in record selling were transferable to the virtual store. Secondly, he could use the Web to attract customers who did not live in Canada.

*Customer Needs.* In order to meet the changing demands of teen-driven, big city markets, Albo would need an alternative strategy to operating record stores in small Canadian cities. Lower inventories and building costs allowed such companies as Amazon.com to pass along the savings to their customers, in the form of lower prices. Over time, the rapidly changing customer tastes and increased price sensitivity would render Albo's business obsolete.

Albo had to integrate all components of the value chain in order to offer customers the products they wanted, at the price they wanted, at the time they wanted, no matter where they lived.

Strategies:

*Quality of Service.* CD Plus adds value through a large selection of products, speed of delivery, competitive pricing and convenience. The company's physical stores and warehouses provide a large selection of CDs, all of which are listed in the catalogue and on the Web. A large selection of CDs increases the likelihood that a customer will find the specific product he/she wants. If the CD is on hand, then the company does not have to place a special order for it, and therefore, the customer will receive the product quicker. CDs are priced at the same level on the Web as in the bricks-and-mortar stores. This reduces the risk of cannibalization of the bricks-and-mortar stores by the virtual store, and makes the product more attractive to customers from other countries where the currency exchange rate is favourable. Finally, the virtual store offers convenience to the customer – he/she can order and receive products without him/her leaving home.

By adding value to the service it provides, CD Plus intends to receive sufficient resources (in the form of sales) in order to achieve the goals of the company and to benefit its stakeholders.

- b. Management accounting provides information to assist in planning decisions and control. In the case of CD Plus, the company would have to make decisions about service design, production and delivery, and customer service. In addition, CD Plus must have a system for measuring performance and rewarding the employees. Management accounting would provide both financial and non-financial information to the managers. The following information would help managers to achieve the company's strategies – a large selection of products, speed of delivery, competitive pricing and convenience.

CD Plus cannot offer all of the CDs produced in the world. However, it can try to offer a large enough selection of CDs to satisfy the majority of its regular customers. Accounting can provide information on revenues of CDs by category (e.g. rock, alternative, jazz, classical), by artist (U2, Feist, Diana Krall, Kennedy), by title, by region (where customers live) and by season (e.g. Christmas favourites). Managers can use this information to identify the best sellers, and predict future sales. Secondly, information on wholesale costs can help the managers to identify the most profitable units. Accounting can also provide information on inventory, warehouse costs, percentage of returned products and the costs associated with processing those returns. Managers can use this information to reduce unwanted inventory and free up resources to order other, more popular products.

In order to evaluate the delivery process, CD Plus can use such information as delivery costs, time of delivery and frequency of deliveries. Secondly, CD Plus must evaluate the feasibility of maintaining the website. Information such as number of visits to the website, and sales generated from the website, would be useful. CD Plus must also compare the costs of running a bricks-and-mortar store with the costs of running a virtual store. Accounting can provide costs of leasing and owning store buildings, costs of utilities, costs of warehouses, labour costs, property taxes, maintenance costs and so on. The website has its own costs, such as Internet service, hardware, software, technical support staff, utilities and security.

The quality of customer service can be measured by number of repeat customers, number of complaints received, number of returns and other data provided by in-store and online surveys. Since the cost of acquiring new customers is much greater than the cost of retaining old customers, information about customer service quality is extremely useful.

CD Plus also requires information about employee performance. Marketing and sales staff could be evaluated by measures of sales and profitability. Delivery staff could be evaluated by the number of on-time deliveries and cost per delivery. Website staff could be evaluated by the amount of traffic to the site and revenue generated by the site. The company would try to reduce costs in non-value-adding departments such as warehousing and administration.

Finally, the company should implement a system of rewards in order to encourage employees to work for the company's goals. Rewards should be connected to the performance of the company as a whole. Information about sales and profits of each division, costs attributable to each division, customer satisfaction and customer retention would assist the company to reward employees for working towards company goals.

## SOLUTIONS FOR CHAPTER 2

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# Measuring and Analyzing Activity Costs

## Numerical Exercises

### NE 2.1: Cost–Benefit analysis and Differential Costs (5 minutes)

The temporary worker ((4 hours)(£6/hour) or £24) is cheaper to use than the owner ((3 hours) (£10/hour) or £30)). The transportation and machinery costs are irrelevant because they are the same for both solutions.

### NE 2.2: Opportunity Costs and Sunk Costs (5 minutes)

- If the raw materials won't be replaced, the opportunity cost is £5/pound.
- If the raw materials must be replaced for use in another product, the opportunity cost is £6/pound.

### NE 2.3: Opportunity Costs (5 minutes)

The opportunity cost of using the employee's time is £12 + £4 or £16. If the other project could be done by another employee, the opportunity cost is £12/hour.

### NE 2.4: Opportunity Costs and Varying Rates of Output (15 minutes)

<u>Number of units</u>	<u>Total costs</u>	<u>Marginal costs</u>	<u>Average costs</u>
1	£ 25	£ 25	£ 25.00
2	40	15	20.00
3	52	12	17.33
4	62	10	15.50
5	72	10	14.40
6	82	10	13.67
7	100	18	14.28
8	130	30	16.25

Start-up costs are in evidence in the making of the first three units and capacity constraints are in evidence in the making of the 7th and 8th units.

### NE 2.5: Activity Costs (5 minutes)

Estimated total costs = fixed costs + (variable cost/kilometre)(number of kilometres)  
(£0.50/kilometre)(500 kilometres) = £300

**NE 2.6: Fixed and Variable Costs (10 minutes)**

- a. The expected cost of making 20,000 pairs of skis is €1,000,000 + (20,000 pairs of skis)(€100 per pair of skis) = €3,000,000.
- b. The expected cost of making 30,000 pairs of skis is €1,000,000 + (30,000 pairs of skis)(€100 per pair of skis) = €4,000,000.
- c. The manufacture of 30,000 pairs of skis may be beyond the capacity of the company. Therefore, fixed and variable costs may not be representative of the opportunity cost of making skis in that range.

**NE 2.7: Fixed, Variable, and Average Costs (15 minutes)**

- a. The vice-chancellor of Midlands University has calculated the average cost of each student. If the decision is to add more students, the vice-chancellor should be looking at the marginal cost of another student. The marginal cost can be approximated by the variable cost as long as the university is below capacity.
- b. The cost of adding 100 students is £300,000. Therefore, the variable cost per unit is £300,000/100 or £3,000/student. The total variable costs of 4,000 students is (4,000 students)(£3,000/student), or £12,000,000. The remaining cost of 4,000 students is £30,000,000 – £12,000,000, or £18,000,000, which is equal to the fixed costs.

**NE 2.8: Fixed and Variable Costs (10 minutes)**

Costs under the CAM approach:

$$£1,000,000 + (10,000 \text{ chips})(£20/\text{chip}) = £1,200,000$$

Costs under the more manual approach:

$$£500,000 + (10,000 \text{ chips})(£50/\text{chip}) = £1,000,000$$

The manual approach is less costly in making 10,000 chips per month.

**NE 2.9: Opportunity Costs (5 minutes)**

Opportunity cost for Emily for making the fence herself:

Cost of materials	£100
Cost of labour (£10/hour)(15 hours)	<u>150</u>
Total	<u>£250</u>

The opportunity cost of building the fence herself is less than the cost of paying someone else to build the fence (£300). Therefore, Emily should make the fence herself.

**NE 2.10: Opportunity Costs (5 minutes)**

The opportunity cost of playing video games for an hour:

Cost of playing video games	£5
Forgone revenue from job opportunities	<u>200</u>
Total	<u>£205</u>

**NE 2.11: Variable and Fixed Costs (10 minutes)**

a. Expected cost of 3,000 copies of the school newspaper:

$$£5,000 + (£0.03/\text{copy})(3,000 \text{ copies}) = £5,090$$

b. Expected cost of 5,000 copies of the school newspaper:

$$£5,000 + (£0.03/\text{copy})(5,000 \text{ copies}) = £5,150$$

**Numerical Problems**

**NP 2.1: Differential Costs and Revenues (10 minutes)**

Costs and revenues of leasing a freezer and selling ice cream treats:

Revenues from ice cream treats	£10,000
Lost revenues from other ice cream sales	(2,000)
Leasing costs	(1,000)
Cost of ice cream treats	<u>(5,000)</u>
Differential revenues greater than costs	<u>£2,000</u>

Costs and revenues of selling artisan bakery items:

Revenues from artisan bakery items	£7,000
Cost of bakery items	(3,000)
Rental cost of shelving	<u>(500)</u>
Differential revenues greater than costs	<u>£3,500</u>

Selling artisan bakery items is the preferred choice because the differential revenues over costs are greater.

**NP 2.2: Differential, Variable, and Fixed Costs (10 minutes)**

Currently, the monthly profit for Darien from its cafeteria is as follows:

Sales	£12,000
Variable costs (0.40)(£12,000)	(4,800)
Fixed costs	<u>(4,700)</u>
Profit	<u>£2,500</u>

With vending machines the profit would be  $(0.16)(1.40)(£12,000)$  or £2,688.

The profit is greater with the vending machines by £2,688 – £2,500 or £188 per month.

**NP 2.3: Differential Costs and Revenues (15 minutes)**

a. Profit of Sunday opening if no effect on other sales:

Revenues	£10,000	
Cost of goods sold (£10,000/1.2)		(8,333)
Other costs		<u>(1,000)</u>
Profit		<u>£ 667</u>

It is profitable to operate on Sundays if other sales are not affected.

b. Profit if 60% of sales would have occurred on other days:

Revenues		£10,000
Cost of goods sold (£10,000/1.2)		(8,333)
Other costs		(1,000)
Forgone profit from lost sales (£6,000 – £6,000/1.2)		<u>(1,000)</u>
Profit		<u>(£ 333)</u>

Do not operate on Sundays because the forgone profits on lost sales from other days are larger than the profits from sales on Sundays.

**NP 2.4: Opportunity Cost of Space (15 minutes)**

	<u>Home furnishings</u>	<u>Electronics</u>
Profits	£64,000	£82,000
Lease payments	<u>72,000</u>	<u>79,200</u>
Forgone profits	<u>(£ 8,000)</u>	<u>£ 2,800</u>

JP Max should rent out the home furnishings as lease rental receipts are more than the profits in the Home Furnishings Department. Alternatively, profits generated by the Electronics Department are more than the lease rentals if leased out, so we continue running the Electronics Department. However, neither is being charged inventory holding costs, which could easily change the decision.

Also, one should examine externalities. What kind of merchandise is being sold in the leased store and will this increase or decrease overall traffic and hence sales in the other departments?

**NP 2.5: Opportunity Cost of Using Materials (15 minutes)**

Opportunity costs are usually positive. In this case, opportunity costs are negative (opportunity benefits) because the firm can avoid disposal costs if it accepts the rush job.

The original £1,000 price paid for GX-100 is a sunk cost. The opportunity cost of GX-100 is – £400. That is, Emrich will increase its cash flows by £400 by accepting the rush order because it will avoid having to dispose of the remaining GX-100 by paying Environ the £400 disposal fee.

How to price the special order is another question. Just because the £400 disposal fee was built into the previous job does not mean it is irrelevant in pricing this job. Clearly, one factor to consider in pricing this job is the reservation price of the customer proposing the rush order. The £400 disposal fee enters the pricing decision in the following way: Emrich should be prepared to pay up to £399 less in any out-of-pocket costs to get this contract.

**NP 2.6: Opportunity Cost of Using Display Space (20 minutes)**

- a. The question involves computing the opportunity cost of replacing one of the special promotions being considered with Armadillo car wax. If the car wax is substituted, what is the forgone profit from the dropped promotion? Also, which special promotion is dropped? Answering this question involves calculating the opportunity cost of each planned promotion. The opportunity cost of dropping a planned promotion is its forgone profit: (retail price less unit cost) × volume. The table below calculates the expected profit of each of the three planned promotions.

Planned promotion displays for next week			
	End-of- aisle	Front door	Cash register
Item	Ensea oil	Wiper blades	Floor mats
Projected volume (week)	5,000	200	70
Sales price	69p	£9.99	£22.99
Unit cost	<u>62p</u>	<u>7.99</u>	<u>17.49</u>
Profit per unit	7p	£2.00	£5.50
Total profit (margin × volume)	£350	£400	£385

Ensea oil is the promotion yielding the lowest contribution and therefore is the one Armadillo must beat out. The contribution of Armadillo car wax is:

Selling price	£2.90
less Unit cost	<u>2.50</u>
Contribution margin	0.40
× Expected volume	<u>800</u>
Contribution	<u>£320</u>

Clearly, since the Armadillo car wax yields a lower contribution margin than all three of the existing planned promotions, management should not change their planned promotions and should reject the Armadillo offer.

b. With 50 free units of car wax, Armadillo's contribution is as follows:

Profit from 50 free units ( $50 \times \text{£}2.90$ )	£145
Profit from remaining 750 units:	
Selling price	£2.90
<i>less</i> Unit cost	<u>£2.50</u>
Contribution margin	0.40
× Expected volume	<u>750</u>
Contribution	<u>300</u>
	<u>£445</u>

With 50 free units of car wax, it is now profitable to replace the oil display area with the car wax. The opportunity cost of replacing the oil display is its forgone profit (£350), whereas the benefits provided by the car wax are £445.

***Additional discussion point to consider:***

- (i) This problem introduces the concept of the opportunity cost of retail shelf space. With the proliferation of consumer products, the supermarkets' valuable scarce commodity is shelf space. Consumers often learn about a product for the first time by seeing it on the grocery shelf. To induce the store to stock an item, food companies often give the store a number of free cases. Such a giveaway compensates the store for allocating scarce shelf space to the item.
- (ii) This problem also illustrates that retail stores track profit margins and volumes very closely in deciding which items to stock and where to display them.
- (iii) One of the simplifying assumptions made early in the problem was that the sale of the special display items did not affect the unit sales of competitive items in the store. Suppose that some of the Ensea oil sales came at the expense of other oil sales in the store. Discuss how this would alter the analysis.

**NP 2.7: Opportunity Cost of Time (20 minutes)**

Airfare per person	€500	
Operating cost Lx-0100/day	€5100	Capacity of Lx-0100 10
Operating cost Lx-0200/day	€5200	Capacity of Lx-0200 7
Wage of managers	€200,000	
Hours per year	2,500	
Cost per hour	€80	
Time on commercial flight	7 hours	
Time on Lx-0100	6 hours	
Time on Lx-0200	4 hours	

	<u>Commercial</u>	<u>Lx-0100</u>	<u>Lx-0200</u>
Airfare (€500 × 10)	€5,000		
(€500 × 3)			1,500
Opportunity cost of managers' time on the jet (€80 × 10 × 7 × 2)	11,200		
(€80 × 10 × 6 × 2)		9,600	
(€80 × 7 × 4 × 2)			4,480
Opportunity cost of time of managers forced to take commercial jet (€80 × 3 × 7 × 2)			3,360
Operating cost		5,100	5,200
Total	<u>€16,200</u>	<u>€14,700</u>	<u>€14,540</u>

The firm should lease the Lx-0200.

**NP 2.8: Marginal and Average Costs (15 minutes)**

a. The marginal cost is the additional cost of making one more unit.

<u>Number</u>	<u>Calculation</u>	<u>Marginal cost</u>
1	£100,000 – 0	£100,000
2	£150,000 – £100,000	50,000
3	£190,000 – £150,000	40,000
4	£220,000 – £190,000	30,000
5	£250,000 – £220,000	30,000
6	£280,000 – £250,000	30,000
7	£340,000 – £280,000	60,000
8	£400,000 – £340,000	60,000
9	£500,000 – £400,000	100,000

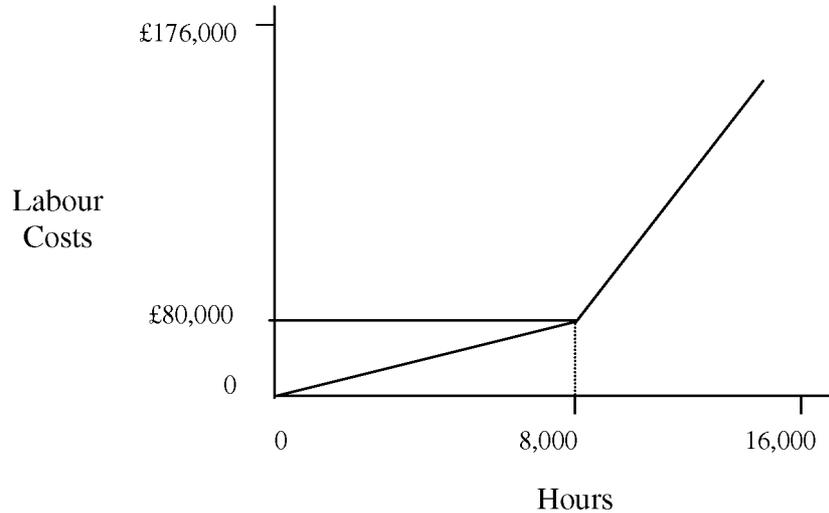
b. The marginal cost probably increases after 6 units due to limited capacity.

c. The average cost of making 5 sorting machines is (£250,000 ÷ 5), or £50,000

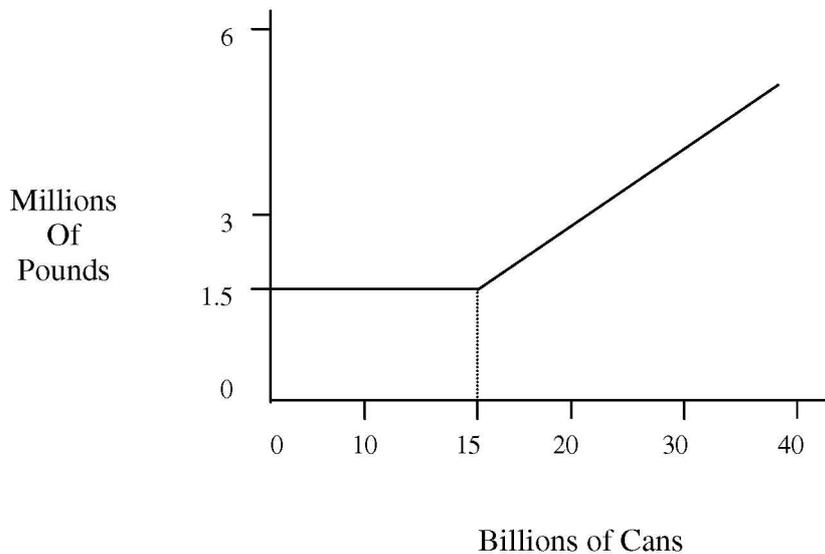
d. Sorting machines should be manufactured and sold as long as the marginal revenue (£70,000) is greater than the marginal cost. This occurs at 8 units. If the company made a ninth unit the marginal cost is £100,000, but the marginal revenue is only £70,000.

**NP 2.9: Cost Behaviour Patterns (15 minutes)**

- a. The first (200 workers)(40 hours/week) or 8,000 hours of labour will cost £10 per hour. The second 8,000 hours will cost (£10/hour)(1.2) or £12/hour.



- b. The plant can make  $(150,000,000/10)(1,000)$  or 15 billion cans with the initial flat fee of £1,500,000. The remaining cans will cost (£0.0175/cubic metre)(10 cubic metres/1,000 cans) or £0.000175/can for gas.



**NP 2.10: Variable and Fixed Costs (10 minutes)**

Revenues (£475/scan)(45 scans)	£21,375
Fixed costs (rent)	<u>-18,000</u>
Variable costs	<u>£3,375</u>

Variable cost per scan (£3,375/45 scans) = £75/scan

**NP 2.11: Opportunity Costs (10 minutes)**

The monthly opportunity cost of operating a homeless shelter follows:

Full-time employee	£1,200
Supplies	400
Use of space (forgone revenue: 5 parties × £200/party)	1,000
Increase in utilities £1,300 – £1,000	<u>300</u>
Total	<u>£2,900</u>

**NP 2.12: Average, Variable, and Fixed Costs (10 minutes)**

- a. The total cost per month of having 5,000 students is as follows:

$$£1,000,000 + (£100/\text{student})(5,000 \text{ students}) = £1,500,000$$

The average monthly cost per student is £1,500,000/5,000 students, or £300/student.

- b. The cost of adding 50 more students is as follows:

$$(£100/\text{student})(50 \text{ students}) = £5,000$$

**NP 2.13: Average, Variable, and Fixed Costs (15 minutes)**

- a. The annual fixed costs are the total costs less the variable costs:

$$£630,000 - £200,000 - £150,000 = £280,000$$

- b. The variable cost per soccer ball is (£200,000 + £150,000)/100,000 balls, or £3.50/ball.

- c. The average cost per ball is £630,000/100,000 balls, or £6.30 per ball.

- d. The expected cost of making 1,000 more balls only includes the variable costs:

$$(£3.50/\text{ball})(1,000 \text{ balls}) = £3,500$$

**NP 2.14: Fixed and Variable Costs (15 minutes)**

- a. The variable cost of one more spectator is the cost of clean-up:

$$(2 \text{ minutes}/60 \text{ minutes/hour})(£8/\text{hour}) = £0.2667$$

- b. The opportunity cost with 10,000 spectators is:

Cost of relocating the fencing match	£ 200
Cost of labour for preparation (20 hours)(£8/hour)	160
Cost of additional utilities	500
Cost of clean-up (10,000)(£0.2667)	<u>2,667</u>
Total	<u>£3,527</u>

- c. The opportunity cost with 12,000 spectators is as follows:

Cost of relocating the fencing match	£ 200
Cost of labour for preparation (20 hours)(£8/hour)	160
Cost of additional utilities	500
Cost of clean-up (12,000)(£0.2667)	<u>3,200</u>
Total	<u>£4,060</u>

**NP 2.15: Estimations with Fixed and Variable Costs (15 minutes)**

- a. Expected costs of making 18,000 units = £400,000 + (£200/unit)(18,000 units) = £4,000,000.
- b. Potential dangers of using fixed and variable costs per unit include the following:
- 1) Accurate estimation of fixed and variable costs;
  - 2) Estimation outside the relevant range (18,000 units is greater than in prior production and could be beyond current capacity);
  - 3) Operations that generated past costs may no longer be accurate estimates of future costs because of a different process or a changing business environment.

**NP 2.16: Variable and Fixed Costs Estimated Through Account Classification (15 minutes)**

- a. Fixed costs:

Cost of container	£ 5,000
Cost of purchasing agent's trip	10,000
Cost of processing order (20 hours)(£50/hour)	<u>1,000</u>
Total fixed costs	<u>£16,000</u>
Fixed cost per bead (£16,000/1,000,000)	£0.016

- b. Variable cost per bead:

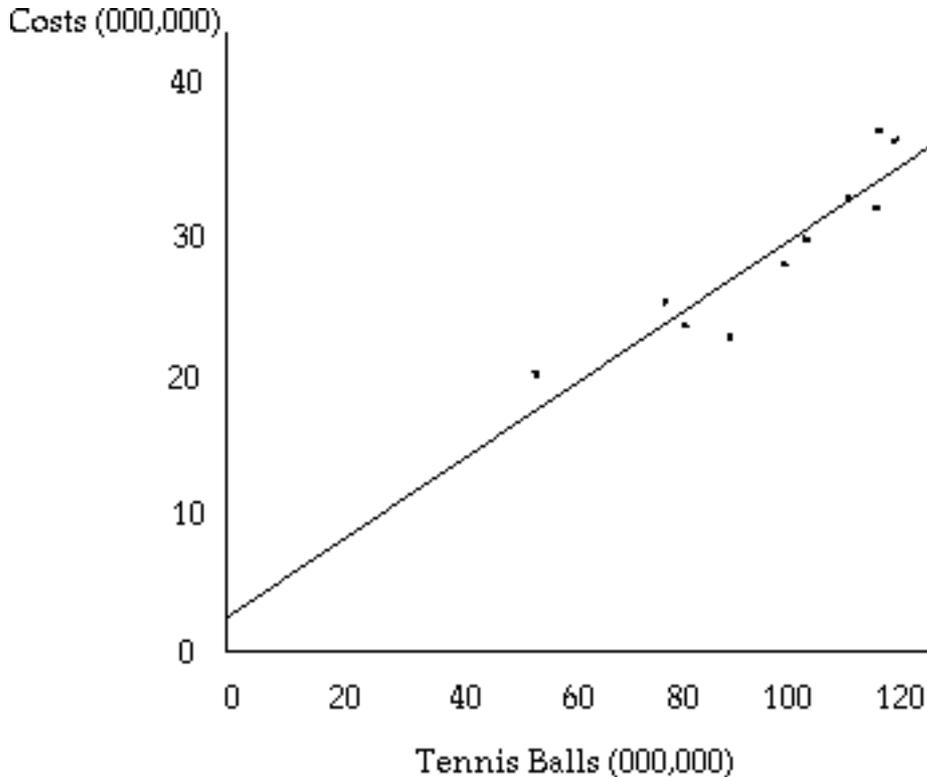
Purchase price of bead	£0.10
Inspection costs (£20/hour)/(1,000 beads/hour)	<u>0.02</u>
Total variable costs per bead	<u>£0.12</u>

- c. Total costs of purchasing 1,500,000 beads:

$$£16,000 + (1,500,000 \text{ beads})(£0.12/\text{bead}) = £196,000$$

**NP 2.17: Identifying Variable and Fixed Costs Through Visual Fitting (20 minutes)**

a. Plot of data



b. Highest output in 2005, 120 million balls at a cost of €35 million.

Lowest output in 1999, 50 million at a cost of €20 million.

c. and d.

$$\text{Variable cost per unit: } (\text{€}35 - \text{€}20) / (120 - 50) = \text{€}15 / 70 = \text{€}0.2143$$

$$\text{Total variable cost @ 120 million balls} = \text{€}0.2143 \times 120 \text{ million} = \text{€}25.7 \text{ million}$$

$$\text{Total fixed cost (€35 million - €25.7 million)} = \text{€}9.3 \text{ million}$$

$$\text{Total variable cost @ 50 million balls} = \text{€}0.2143 \times 50 \text{ million} = \text{€}10.7 \text{ million}$$

$$\text{Total fixed cost (€20 million - €10.7 million)} = \text{€}9.3 \text{ million}$$

e. Total cost of 112 million balls = €9.3 million + 112 million × €0.2143 = €33.3 million.

f. Since the firm has not produced over 120 million balls, 150 million is outside the relevant range. The firm may not have sufficient capacity to produce this many balls and may have to acquire additional capacity, thereby driving up fixed costs.

**NP 2.18: Use of Regression to Estimate Fixed and Variable Costs (20 minutes)**

Based on the regression analysis, the fixed costs of making tennis balls is €6,639,570. The variable costs per ball is €0.223888.

**NP 2.19: Sales Estimation (15 minutes)**

- a. If the retailer orders 80 trees, all will be sold for a profit of  $(£25/\text{tree} - £10/\text{tree})(80 \text{ trees}) - £100 = £1,100$ .

If the retailer orders 100 trees, there is a .5 probability that all will sell and the profit would be  $(£25/\text{tree} - £10/\text{tree})(100 \text{ trees}) - £100 = £1,400$ . There is also a 0.5 probability that only 80 will sell and the profit would be  $(£25/\text{tree})(80 \text{ trees}) - (£10/\text{tree})(100 \text{ trees}) - (£2/\text{tree})(20 \text{ trees}) - £100 = £860$ . Therefore, the expected profit of ordering 100 trees is  $(0.5)(£1,400) + (0.5)(£860) = £1,130$ .

Therefore, the order of 100 trees creates a higher expected profit.

- b. If a survey could more accurately estimate customer demand, the retailer would be able to order more accurately. A more accurate order would lead to less lost sales from ordering too few Christmas trees and less inventory and disposal costs from ordering too many Christmas trees.

**NP 2.20: Changing Variable Costs with Rate of Output (15 minutes)**

- a. The higher variable cost per bus for production of 5 buses or less is consistent with start-up costs. The lower variable cost/bus from 6 to 25 buses is consistent with normal operations. Capacity appears to affect operations beyond 25 buses because of the increase in the variable cost per bus.
- b. At normal operations, the variable cost per unit is €100,000/bus. The cost of making 5 buses is  $(€150,000/\text{bus})(5 \text{ buses})$  or €750,000. That point is on the total cost line estimate for normal operations.

Total costs = fixed costs + (variable cost/bus)(number of buses)

€750,000 = fixed costs + (€100,000/bus)(5 buses)

Fixed costs = €250,000

## Analysis and Interpretation Problems

**AIP 2.1: Variable and Fixed Costs (20 minutes)**

Matt's intuition is correct regarding the behaviour of fixed costs. As the table below shows, average fixed costs per unit falls from £6 per unit in Lab A to £4.62 in Lab D. However, unlike the usual textbook assumption that variable costs per unit are constant, these labs exhibit increasing variable costs per unit. Lab A has average variable costs per roll of £3.90 and this rises to £5.42 per roll in Lab D. The increase in variable costs per unit more than offsets the lower fixed costs per roll. Thus, profits fall as volume increases in Labs B through D. One likely reason for the increasing variable cost per roll is higher labour costs due to overtime. If the high-volume labs add extra work shifts and if wage shift differentials exist between day and night work, average variable costs will increase. Finally, average variable costs per unit will increase with volume if lab congestion forces the firm to hire workers whose sole job is to manage the congestion (i.e. searching for misplaced orders, expediting work flows, etc.)