Lesson 07 Process Selection & Capacity Planning Homework

Solved Problem #1: see textbook

Solved Problem #2: see textbook

Solved Problem #3: see textbook

Solved Problem #4: see textbook (manual example)

#1: A producer of pottery is considering the addition of a new plant to absorb the backlog of demand that now exists. The primary location being considered will have fixed costs of $9,200 per month and a variable cost of 70 cents per unit produced. Each item is sold to retailers at a price that averages 90 cents. Answer the following questions.

a. Display a graph of the cost, revenue relationship to volume.

b. What volume per month is required to break even?

c. What profit would be realized for a monthly volume of 61,000 units? 87,000 units?

d. What volume is needed to obtain a profit of $16,000 per month?

e. What volume is needed to obtain revenue of $23,000 per month?

#2: A small firm intends to increase the capacity of a bottleneck operation by adding a new machine. Two alternatives exist, machine A and machine B. The associated costs and revenues have been estimated as follows: annual fixed costs would be $40,000 for A and $30,000 for B; variable costs per unite would be $10 for A and $11 for B; and revenue per unit would be $15.

a. Determine the break even point for each alternative. Verify that there are two templates in this lesson which calculate this answer.

b. Manually calculate the volume at the point of indifference between the two alternatives.

c. Use one of the lesson templates to verify the answer you obtained in b., and show a graph of the cost/volume relationship.

d. What is the total cost at the point of indifference?
e. At what volume would the two alternatives yield the same profit? What is the profit at this volume? Show a graph of the profit/volume relationship.

f. If the expected demand is 12,000 units, determine the costs and profits for each alternative?

#3: A producer of felt tip pens has received a forecast of demand of 30,000 pens for the coming month from its marketing department. Fixed costs are $25,000 per month are allocated to the operation which produces the pens, and variable costs are 37 cents per pen. Answer the following questions.

a. Find the monthly breakeven point if the pens sell for $1 each?

b. At what price (rounded to 2 decimal points) should the pens be sold to obtain a monthly profit of at least $15,000, assuming that monthly demand of 30,000 pens materializes? This is a manual problem!

c. Verify the answer you obtained in b. by using the break even analysis template. What is the actual calculated profit using the price you obtained in b?

#4: A firm plans to begin production of a new small appliance. The manager must decide whether to purchase the motors for the appliance from a vendor at $7 each or to produce them in-house. There are two possible alternatives for in-house production: Alternative A would have an annual fixed cost of $160,000 and a variable cost of $5 per unit; and alternative B would have an annual fixed cost of $190,000 and a variable cost of $4 per unit. Answer the following questions.

a. Display a graph of the cost/volume relationship.

b. Over what volume range is Buy best?

c. Over what volume range is alternative A best?
d. Over what volume range is alternative B best?

e. What is the point of indifference between Buy and alternative B? What is the cost at this point?

f. What is the point of indifference between the two in-house alternatives? What is the cost at this point?

g. Assume the annual volume is 100,000 units, what is the cost for each alternative at this volume?

h. Assume the annual volume is 120,000 units and the products are sold for $10 each, what is the profit for each alternative at this volume?

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#5: A manager is trying to decide whether to purchase a certain part or to have it produced internally. Internal production could use either of two processes: IHA or IHB. IHA would entail a variable cost of $17 per unit and an annual fixed cost of $200,000. IHB would entail a variable cost of $14 per unit and an annual fixed cost of $240,000.

Three vendors are willing to provide the part.
- Vendor A (VA) has a price of $20 per unit for any volume up to 30,000 units.
- Vendor B (VB) has a price of $22 per unit for demand of 1,000 units or less, and $18 per unit for larger quantities.
- Vendor C offers a price of $21 per unit for the first 1,000 units and $19 for each additional unit.

Answer the following questions. This is a manual problem.

a. If the manager anticipates an annual volume of 10,000 units what is the cost for each alternative?

b. Sketch the cost/volume relationship for Vendor each alternative on the same graph.
c. Determine the point of indifference between the two internal alternatives.

d. Can you use one of the templates in the lesson to determine the answer to c?

#6: A manager must decide which type of machine to buy A, B or C. Machine purchase costs are as follows

<table>
<thead>
<tr>
<th>Machine</th>
<th>Purchase cost in $</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>40,000</td>
</tr>
<tr>
<td>B</td>
<td>30,000</td>
</tr>
<tr>
<td>C</td>
<td>80,000</td>
</tr>
</tbody>
</table>

Each machine can produce 4 products. The product forecasts and processing times on each machine is shown below:

<table>
<thead>
<tr>
<th>Product</th>
<th>Annual Demand (units)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16,000</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>12,000</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>6,000</td>
<td>5</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>30,000</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Answer the following questions. This is a manual problem.

a. How many processing minutes per year are needed for each machine?

b. Assume machines operate 10 hours per day for 250 days per year, how many of each machine are needed?

c. Assume you are making your decision on which machine to buy on the lowest total purchase cost, which machine and how many would you buy?

d. Consider the additional information: The machines differ in terms of hourly operating costs: A’s have an hourly operating cost of $10, B’s have an hourly cost of $11; and, C’s have an hourly cost of $12. What is the total operating cost of each machine considering this additional information? Hints: Total operating cost = purchase cost + operating cost; and, convert processing minutes into processing hours)
e. Based on total operating costs as defined in d, which machine and how many would you buy?

#7: A manager must decide how many machines of a certain type to purchase. Each machine can process 100 customers per day. One machine will result in a fixed cost of $2,000 per day, while two machines will result in a fixed cost of $3,800 per day. Variable costs will be $20 per customer, and revenue will be $45 per customer. Answer the following questions.

a. Display a graph of the cost/revenue/volume relationship.

b. Calculate the daily break even volume for 1 machine and 2 machines?

c. What is the profit at the break even volume? Hint: you do not need a template to answer this, merely recall the definition of the break even volume.

d. If the range of customer volume is between 90 and 120 customers per day; how many machines should the manager buy? Why?

e. What is the profit the manager will make if the customer demand is 90?

f. What is the profit the manager will make if the customer demand is 100? Hint: You can use the lesson template to answer this question without doing it manually.

g. How much will the manager lose if he/she buys 2 machines and the customer demand is 101?

h. What should the manager do if he/she only buys one machine and more than 100 customers show up on a given day? What would you do?
#8: The manager of a car wash must decide whether to have one or two wash lines. One line will mean a fixed cost of $6,000 per month, and two lines will mean a fixed cost of $10,500 per month. Each line will be able to process 15 cars per hour. Variable costs will be $3 per car and revenue will be $5.95 per car. The car wash operates 300 hours per month.

a. Display a graph of the monthly cost/revenue/volume relationship.

b. Calculate the monthly break even volume for 1 line and 2 lines?

c. If the range of customer volume is between 14 and 18 cars per hour; how many lines should the manager install? Why?

Just in case you are not able to answer this question, d – g provide some insight to the answer. Do them and then see if you can answer c.

d. What is the monthly profit the manager will make if the demand is 4200 cars and he/she installs one line?

e. What is the monthly profit the manager will make if the demand is 4200 cars and he/she installs two lines?

f. What is the maximum monthly profit the manager can make for the demand range scenario if he/she installs one line?

g. What is the maximum monthly profit the manager can make for the demand range scenario if he/she installs two lines?