

DECISION MAKING

Key Topics to Know

- Relevance refers to whether a revenue or cost will change as the result of the decision made. Relevant revenues or costs always change as the result of the decision.
- An avoidable cost is always a relevant cost.
- Differential revenues or costs are the differences in revenues or costs between the alternatives.
- Incremental revenues or costs are the additional costs or revenues that may be incurred.
- A sunk cost is any cost that has already been incurred in pursuing some course of action.
- Lease or sell equipment
- Analyze whether to keep or replace old equipment.
- Analyze the most profitable allocation of a constrained or scarce resource.
- Analyze make or buy decisions.
- Analyze whether a special order should be accepted or rejected.
- Analyze a decision to drop a segment or to drop a product line.

Problems

Problem #1

N Company is a retailer in the upper Midwest. The most recent monthly income statement for N Company is given below:

	<u>Total</u>	<u>Store I</u>	<u>Store II</u>
Sales	\$2,100,000	\$1,300,000	\$800,000
Variable expenses	<u>1,260,000</u>	<u>882,000</u>	<u>378,000</u>
Contribution margin	840,000	418,000	422,000
Traceable fixed expenses	<u>420,000</u>	<u>231,000</u>	<u>189,000</u>
Segment margin	420,000	187,000	233,000
Common fixed expenses	<u>350,000</u>	<u>210,000</u>	<u>140,000</u>
Operating income	\$70,000	(\$23,000)	\$93,000

N Company is considering closing Store I. If Store I is closed, one-fourth of its traceable fixed expenses would continue. Also, the closing of Store I would result in a 20% decrease in sales in Store II. N Company allocates common fixed expenses on the basis of sales dollars and none of these costs would be saved if a store were shut down.

Required: Compute the overall increase or decrease in the net operating income of N Company if Store I is closed.

Problem #2

F Company production manager is trying to decide if he should acquire a new machine to replace one of its older machines. The new machine would cost \$100,000; have a five year life and no salvage value. Variable operating costs would be \$50,000 per year. The present machine has a book value of \$125,000 and a remaining life of five years. Its disposal value now is \$10,000, but it would be zero after five years. Variable operating costs of the present machine are \$100,000 per year.

Required: a) Considering the five years in total, what would be the impact on operating income if the new machine is acquired?
 b) What is the sunk cost?

Problem #3

V Company puts four products through a common production process. This process costs \$100,000 each year. The four products can be sold when they emerge from this process at the "split-off point," or processed further and then sold. Data about the four products for the coming period are:

<u>Product</u>	<u>Volume</u>	<u>Selling Price per Unit at Split-Off Point</u>	<u>Selling Price per Unit after Further Processing</u>	<u>Additional Processing Costs</u>
Stroller	20,000 lb.	\$28.00	\$42.00	\$400,000
Walker	10,000 lb.	7.00	28.00	144,000
Jogger	5,000 lb.	36.00	58.00	120,000
Runner	5,000 lb.	18.00	22.00	40,000

Required: Determine which products should be sold at the split-off point and which should be processed further.

Problem #4

P Company currently produces a part used in the manufacture of one of its products. The production cost is \$28 per unit computed as follows:

Direct materials	\$10.00
Direct labor	5.00
Variable manufacturing overhead	3.00
Fixed manufacturing overhead	<u>10.00</u>
Total manufacturing cost	\$28.00

An outside supplier has offered to provide the annual requirement of 50,000 parts for only \$24 each. It is estimated that 20% of the fixed overhead cost above could be eliminated if the parts are purchased from the outside supplier.

Required: What are the annual and the per-unit dollar advantage or disadvantage of purchasing the part from the outside supplier?

Problem #5

H Company produces three products, with costs and selling prices as follows:

	<u>Product A</u>		<u>Product B</u>		<u>Product C</u>	
Selling Price per unit	\$30	100%	\$20	100%	\$15	100%
Variable costs per unit	18	60%	15	75%	6	40%
Contribution margin per unit	\$12	40%	\$5	25%	\$9	60%

A particular machine is a bottleneck. On that machine, 3 machine hours are required to produce each unit of Product A, 1 hour is required to produce each unit of Product B, and 2 hours are required to produce each unit of Product C.

Required: In which order should it produce the products?

Problem #6

L Company makes and sells electric fans. Each fan regularly sells for \$42. The following cost data per fan is based on capacity of 150,000 fans produced each period:

Direct materials	\$7.00
Direct labor	9.00
Manufacturing overhead (70% avoidable fixed)	<u>15.00</u>
Total manufacturing cost	\$31.00

A special order has been received for a sale of 25,000 fans at \$32 each to an overseas customer. The only selling costs that would be incurred on this order would be \$4 per fan for shipping. Landor is now selling 120,000 fans through regular channels each period.

Required: What effect would this special order have on operating income?

Multiple Choice Questions

1. M Company has two divisions – East and West. The divisions have the following revenues and expenses:

	East	West
Sales	\$720,000	\$350,000
Variable costs	370,000	240,000
Traceable fixed costs	130,000	80,000
Allocated common corporate costs	120,000	50,000
Operating income (loss)	\$100,000	(\$20,000)

M Company is pondering the elimination of the West division since it has shown an operating loss for the past several years. If the West division were eliminated, its traceable fixed costs could be avoided. The total common corporate costs would be unaffected by this decision. Elimination of the West Division would result in an overall company operating income of:

- a) \$100,000
 - b) \$ 80,000
 - c) \$120,000
 - d) \$ 50,000
2. B Company is using equipment with a book value of \$36,000 and a current resale value of \$15,000. B Company is considering buying replacement equipment costing \$154,000 with no salvage value at the end of its 5 year useful life. Annual operating cost of the new equipment is \$18,000. Annual operating cost of the existing equipment is \$45,000. It will have no salvage value at the end of five years. If the equipment is purchased, the change in total operating income over the next five years should be:
- a) \$ 5,000 increase
 - b) \$19,000 decrease
 - c) \$ 4,000 decrease
 - d) \$71,000 decrease
3. For which of the following decisions are sunk costs relevant?
- a) The decision to keep an old machine or buy a new one
 - b) The decision to sell a product at the split-off point or process further
 - c) Both of the above
 - d) None of the above

4. M Company has the capacity to produce 15,000 widgets each month. Current regular production and sales are 10,000 widgets per month at a selling price of \$15 each. Based on this level of activity, the following unit costs are incurred:

Direct materials	\$5.00
Direct labor	3.00
Variable manufacturing overhead	.75
Fixed manufacturing overhead	1.50
Variable selling expense	.25
Fixed selling expense	1.00

All fixed costs are constant in total within the relevant range of 10,000 to 15,000 widgets per month. The M Company has received a special order for 4,000 widgets from a customer who wants to pay a reduced price of \$10 per widget. There would be no selling expense in connection with this special order and this order would have no effect on the company's other sales. If this offer is accepted, the company's operating income for the month will:

- increase by \$6,000
- decrease by \$6,000
- increase by \$5,000
- decrease by \$5,000

The next 3 questions refer to the following information.

S Company uses 8,000 units of a part each year that is purchased from an outside supplier at \$12 per unit. There is idle capacity in the factory that could be utilized to make this part. The unit costs of making this part internally are:

Direct materials	\$3.25
Direct labor	2.75
Variable manufacturing overhead	2.00
Fixed manufacturing overhead	5.00

The fixed manufacturing overhead represents allocated fixed costs. If the part was made internally, there would be an increase of \$12,000 in fixed manufacturing overhead costs for the salary of a new supervisor.

5. If S Company chooses to make the part instead of buying it outside, the change in the company's operating income per year would be:
- \$20,000 decrease
 - \$20,000 increase
 - \$ 8,000 decrease
 - \$ 8,000 increase

6. At what price per unit from the outside supplier should S Company be indifferent (on economic grounds) to buying or making the part?
- \$8.00
 - \$8.50
 - \$9.00
 - \$9.50
7. Assume the idle capacity is presently being rented to another company for \$32,000 per year. If S Company chooses to make the part instead of buying it outside, the net advantage or disadvantage (per year) would be:
- \$15,000 disadvantage
 - \$ 4,000 advantage
 - \$12,000 disadvantage
 - \$10,000 advantage

8. For which of the following decisions are opportunity costs relevant costs?

	<u>Make or Buy a Part</u>	<u>Drop or Retain a Product Line</u>
A.	Yes	Yes
B.	Yes	No
C.	No	Yes
D.	No	No

- A
 - B
 - C
 - D
9. The opportunity cost of making a component in a factory with excess capacity for which there is no alternative use is:
- The variable manufacturing cost of the component.
 - The total manufacturing cost of the component.
 - The fixed manufacturing cost of the component.
 - Zero.
10. Allocated common fixed costs:
- Can make a product line appear profitable.
 - Are always incremental costs.
 - Are always relevant in decision making.
 - All of the above are correct.

11. In a make or buy decision, which of the following costs are irrelevant?

	<u>Fixed overhead incurred regardless of the decision</u>	<u>Freight charges incurred if the part is purchased</u>
1.	Yes	Yes
2.	Yes	No
3.	No	Yes
4.	No	No

- a) 1
- b) 2
- c) 3
- d) 4

12. A cost that is not relevant to a company considering whether to accept a special order is:

- a) Direct materials.
- b) Variable overhead.
- c) Fixed overhead that will be avoided if the special order is accepted.
- d) Common fixed overhead that will continue if the special order is rejected.

13. Which product would be selected in a decision involving the utilization of a constrained resource?

- a) The product that uses the least amount of the constrained resource.
- b) The product with the highest contribution margin.
- c) The product with the lowest total cost per unit.
- d) The product with the highest contribution margin per unit of constrained resource.

14. In a make-or-buy decision, relevant costs include:

- a) unavoidable fixed costs
- b) avoidable fixed costs
- c) fixed factory overhead costs applied to products
- d) fixed selling and administrative expenses

15. Two or more products produced from a common input are called:

- a) Common costs
- b) Joint products
- c) Joint costs
- d) Sunk costs

16. V Company currently has two divisions which had the following operating results for last year:

	<u>Cork Division</u>	<u>Rubber Division</u>
Sales	\$500,000	\$400,000
Variable costs	<u>210,000</u>	<u>300,000</u>
Contribution margin	290,000	100,000
Traceable fixed costs	<u>130,000</u>	<u>70,000</u>
Segment margin	160,000	30,000
Allocated common corporate fixed costs	<u>90,000</u>	<u>50,000</u>
Net operating income (loss)	<u>\$70,000</u>	<u>(\$20,000)</u>

Because the Rubber Division sustained a loss, the president of Vanikoro is considering the elimination of this division. All of the division's traceable fixed costs could be avoided if the division was dropped. None of the allocated common corporate fixed costs could be avoided. If the Rubber Division was dropped at the beginning of last year, how much higher or lower would total net operating income have been for the year?

- a) \$20,000 higher
 b) \$50,000 higher
 c) %50,000 lower
 d) \$30,000 lower
17. R Company' founder just donated a 1958 Chevy Impala to the company. The car was purchased 40 years ago for \$6,000. R Company is either going to sell the car for \$8,000 or have it restored and then sell it for \$22,000. The restoration will cost \$6,000. R Company would be better off by:
- a) \$2,000 to have it restored
 b) \$6,000 to have it restored
 c) \$8,000 to have it restored
 d) \$10,000 to have it restored

18. G Company manufactures a specialty barbecue sauce. It has the capacity to manufacture and sell 10,000 cases of sauce each year but is currently only manufacturing and selling 9,000. The following costs relate to annual operations at 9,000 cases:

	<u>Total Cost</u>
Variable manufacturing cost	\$126,000
Fixed manufacturing cost	\$45,000
Variable selling and administrative cost	\$18,000
Fixed selling and administrative cost	\$27,000

G Company normally sells its sauce for \$30 per case. A local school district is interested in purchasing G Company's excess capacity of 1,000 cases of sauce but only if they can get the sauce for \$15 per case. This special order would not affect regular sales or total fixed costs or variable costs per unit. If this special order is accepted, G Company's profits for the year will:

- a) increase by \$600
 b) decrease by \$1,000
 c) decrease by \$4,000
 d) decrease by \$6,600
19. H Company makes three products that use compound W, the current constrained resource. Data concerning those products appear below:

	<u>KI</u>	<u>LH</u>	<u>RP</u>
Selling price per unit	\$252.42	\$543.75	\$222.84
Variable cost per unit	\$199.92	\$426.30	\$163.80
Centiliters of compound W	4.20	8.70	3.60

Rank the products in order of their current profitability from most profitable to least profitable.

- a) RP, KI, LH
 b) RP, LH, KI
 c) KI, RP, LH
 d) LH, RP, KI

20. Y Company manufactures three distinct perfumes (I, II, and III) from a single joint process. The three perfumes can be sold to discount stores in the form they are in at the split-off point. However, if the perfumes are further processed, they can be sold to specialty stores. Costs related to each batch of perfume separation is as follows:

	Perfume I	Perfume II	Perfume III
Sales value at split-off point	\$1,500	\$800	\$900
Allocated joint costs	\$1,000	\$1,000	\$1,000
Sales value after further processing	\$3,500	\$2,500	\$2,000
Cost of further processing	\$1,600	\$1,400	\$500

For which product(s) above would it be more profitable for Y Company to sell after further processing rather than at the split-off point?

- a) I only
 b) III only
 c) I and II only
 d) I, II and III
21. Two alternatives, code-named X and Y, are under consideration at B Company. Costs associated with the alternatives are listed below.

	<u>Alternative X</u>	<u>Alternative Y</u>
Materials costs	\$39,000	\$39,000
Processing costs	\$44,000	\$58,000
Equipment rental	\$10,000	\$10,000
Occupancy costs	\$15,000	\$29,000

What is the differential cost of Alternative Y over Alternative X, including all of the relevant costs?

- a) \$122,000
 b) \$136,000
 c) \$108,000
 d) \$28,000

22. T Company makes three products that use the current constraint that is a particular type of machine. Data concerning those products is:

	<u>TC</u>	<u>KA</u>	<u>PA</u>
Selling price per unit	\$373.86	\$82.29	\$78.26
Variable cost per unit	\$304.42	\$60.97	\$64.22
Minutes on the constraint	6.20	1.30	1.30

Assume that sufficient constraint time is available to satisfy demand for all but the least profitable product. Up to how much should the company be willing to pay to acquire more of the constrained resource?

- a) \$10.80 per minute
 b) \$69.44 per unit
 c) \$16.40 per minute
 d) \$14.04 per unit
23. J Company manufactures three products from a common input in a joint processing operation. Joint processing costs up to the split-off point total \$300,000 per year. The company allocates these costs to the joint products on the basis of their total sales value at the split-off point. Each product may be sold at the split-off point or processed further. The additional processing costs and sales value after further processing for each product (on an annual basis) are:

	<u>Sales Value at Split-off</u>	<u>Further Processing Costs</u>	<u>Sales Value After Further Processing</u>
Product M	\$200,000	\$85,000	\$300,000
Product N	155,000	110,000	285,000
Product P	325,000	65,000	370,000

Which product or products should be processed further?

- a) M only
 b) M and N
 c) M and P
 d) P only

24. D Company costs up to the split-off point total \$38,400 a year. The company allocates these costs to the joint products on the basis of their total sales values at the split-off point. Each product may be sold at the split-off point or processed further. Data concerning these products appear below:

	<u>Product X</u>	<u>Product Y</u>	<u>Total</u>
Allocated joint processing costs	\$20,800	\$17,600	\$38,400
Sales value at split-off point	\$26,000	\$22,000	\$48,000
Costs of further processing	\$22,600	\$20,400	\$43,000
Sales value after further processing	\$45,000	\$45,900	\$90,900

What is the minimum amount the company should accept for Product X if it is to be sold at the split-off point?

- a) \$22,400
 - b) \$43,400
 - c) \$20,800
 - d) \$45,000
25. B Company has 1,000 obsolete bicycles that are included in inventory at their cost of \$35,000. If new parts are added, at a total cost of \$15,000, the bicycles could be sold for \$40,000. Alternatively, they could be sold to a "flea market" as-is for \$10,000. B Company should:
- a) Sell the bicycles at the flea market
 - b) Add the new parts and sell the bicycles for \$40,000
 - c) Keep the bicycles
 - d) Scrap the bicycles

Solutions to Problems

Problem #1

Loss in contribution margin if Store I is closed:

Store I contribution margin lost	(\$418,000)
Store II contribution margin lost $\$422,000 \times 20\%$	<u>(84,400)</u>
	<u>(\$502,400)</u>
Fixed costs avoided	173,250
Net decrease in income	(\$329,150)

Problem #2

a) Savings in operating costs of \$50,000 per year X 5 years	\$250,000
Plus the disposal value of present equipment	<u>10,000</u>
	260,000
Less the cost of the new equipment	<u>(100,000)</u>
Increase in operating income	\$160,000
b) The sunk cost is the book value of the old equipment	\$125,000

Problem #3

	<u>Stroller</u>	<u>Walker</u>	<u>Jogger</u>	<u>Runner</u>
<u>After Further Processing</u>				
Selling Price per Unit	\$42.00	\$28.00	\$58.00	\$22.00
Volume	<u>20,000</u>	<u>10,000</u>	<u>5,000</u>	<u>5,000</u>
Sales Value	\$840,000	\$280,000	\$290,000	\$110,000
<u>At Split-off Point</u>				
Selling Price per Unit	\$28.00	\$7.00	\$36.00	\$18.00
Volume	<u>20,000</u>	<u>10,000</u>	<u>5,000</u>	<u>5,000</u>
Sales Value	<u>560,000</u>	<u>70,000</u>	<u>180,000</u>	<u>90,000</u>
Incremental Sales Value	\$280,000	\$210,000	\$110,000	\$20,000
Incremental costs to process	<u>(400,000)</u>	<u>(144,000)</u>	<u>(120,000)</u>	<u>(40,000)</u>
Incremental profit (loss) from further processing	<u>(\$120,000)</u>	<u>\$66,000</u>	<u>(\$10,000)</u>	<u>(\$20,000)</u>
Decision	Sell at split-off	Process Further	Sell at split-off	Sell at split-off

Problem #4

	<u>Total</u>	<u>Per Unit</u>
Direct materials, direct labor and variable overhead avoided	\$900,000	\$18.00
Less Elimination of 20% of fixed overhead	<u>100,000</u>	<u>2.00</u>
Relevant expenses to make product	\$1,000,000	\$20.00
Outside purchase cost	<u>\$1,200,000</u>	<u>\$24.00</u>
Disadvantage to purchase	\$200,000	\$4.00

Problem #5

	<u>Product A</u>	<u>Product B</u>	<u>Product C</u>
Contribution Margin	\$12.00	\$5.00	\$9.00
Hours per unit	3	4	2
CM per hour	\$4.00	\$5.00	\$4.50

Produce in the order: B, C, A

Problem #6

Increased revenue from special order 25,000 fans * \$32 =		\$800,000
Increased variable manufacturing cost 25,000 * \$16.00	\$400,000	
Increased fixed manufacturing cost 25,000 * \$10.50	262,500	
Increased shipping cost 25,000 * \$4 =	<u>100,000</u>	<u>762,500</u>
Increased operating income		\$ 37,500

Solutions to Multiple Choice Questions

- 1. D
- 2. C
- 3. D
- 4. C
- 5. B
- 6. D
- 7. C
- 8. A
- 9. D
- 10. A
- 11. B
- 12. D
- 13. D
- 14. B
- 15. B
- 16. D
- 17. C
- 18. B
- 19. B
- 20. D
- 21. D
- 22. A
- 23. B
- 24. A
- 25. B