Making the Connection:

INTEGRATIVE EXERCISE

COST BEHAVIOR AND COST-VOLUME-PROFIT ANALYSIS FOR MANY GLACIER HOTEL

1. The variable and fixed costs for each product line—canoes and paddles—possess both a manufacturing and a marketing component. However, the manufacturing and marketing data are recorded separately, which means that four separate high-low analyses must be conducted. The manufacturing and marketing variable costs per unit can then be added together to arrive at the variable cost per unit for the canoe product line and the paddle product line. Similarly, the manufacturing and marketing total fixed costs can be added together to arrive at the total fixed cost for the canoe product line and the paddle product line.

a. Canoe: High-Low (Manufacturing costs):
($140,000 – $108,000)/(400 – 240) = $200 variable cost per unit

Total fixed cost = Total cost – Total variable cost
= $140,000 – ($200 variable cost per unit × 400) = $60,000 total fixed cost

Canoe: High-Low (Marketing costs):
($60,000 – $44,000)/(400 – 240) = $100 variable cost per unit

Total fixed cost = Total cost – Total variable cost
= $44,000 – ($100 variable cost per unit × 240) = $20,000 total fixed cost

Thus, the variable cost per unit for canoes is $300 ($200 + $100) and the total fixed cost for canoes is $80,000 ($60,000 + $ 20,000).

b. Paddle: High-Low (Manufacturing costs):
($66,500 – $38,500)/(1,700 – 900) = $35 variable cost per unit

Total fixed cost = Total cost – Total variable cost
= $38,500 – ($35 variable cost per unit × 900) = $7,000 total fixed cost

Paddle: High-Low (Marketing costs):
($11,500 – $7,500)/(1,700 – 900) = $5 variable cost per unit

Total fixed cost = Total cost – Total variable cost
= $7,500 – ($5 variable cost per unit × 900) = $3,000 total fixed cost

Thus, the variable cost per unit for paddles is $40 ($35 + $5), and the total fixed cost for paddles is $10,000 ($7,000 + $ 3,000).

2. The operating income equation for determining the breakeven in units is as follows:

BE units = Total fixed costs/(Price – VC per unit)

a. Canoes—using the results from 1a:
BE units = $80,000/($500 – $300) = 400 canoes

b. Paddles—using the results from 1b:
BE units = $10,000/($50 – $40) = 1,000 paddles

3. The sales mix of canoes to paddles is 300:1,200, which can be reduced to 1:4.

Product	Price	Unit VC	Unit CM	Package	Package CM
Canoe	$500	$300	$200	1	$200
Paddle	50	40	10	4	40
Package total					$240

BE packages = Total fixed cost/Package CM = $120,000/$240 = 500 packages
[Remember that in Requirement 3, an additional $30,000 of common fixed costs must be incorporated into the analysis.]

Canoe BE units = 500 × 1 = 500 canoes
Paddle BE units = 500 × 4 = 2,000 paddles

4. a. All manufacturing costs are product costs. All marketing costs and customer hotline costs are period costs.

b. Marketing costs are selling oriented; therefore, the marketing period costs would be further classified as Selling Expenses. Customer hotline costs relate to the customer service section of the value chain and would be further classified as General & Administrative costs.

5. The canoe production (or manufacturing) expenses are as follows (see solution for Requirement 1a):

$200 variable manufacturing cost per canoe and $60,000 total fixed manufacturing cost for canoes

Therefore, if these costs were 5% higher than the above high-low estimates, they would increase to: $210 (i.e., $200 × 1.05) variable cost per canoe and $63,000 (i.e., $60,000 × 1.05) total fixed cost for canoes.

The sales mix of canoes to paddles is unchanged at 300:1,200, which can be reduced to 1:4. However, the increase in canoe costs reduces the package contribution margin as follows:

Product	Price	Unit VC	Unit CM	Package	Package CM
Canoe	$500	$310	$190	1	$190
Paddle	50	40	10	4	40
Package total					$230

The necessary adjustment to the break-even equation used in the solution to Requirement 3 is to add the target income of $96,000 to the fixed cost of $123,000 (i.e., $63,000 + $20,000 + $7,000 + $3,000 + $30,000) as follows:

= (Total fixed cost + Target income)/(Package CM)
= ($123,000 + $96,000)/($230)
= 952.17 packages or 953 packages required to achieve the target income

Canoe target income units = 953 × 1 = 953 canoes
Paddle target income units = 953 × 4 = 3,812 paddles

6. **Margin of safety (MOS) is the units sold above the break-even volume.**
MOS = Units sold – BE total units sold
700 canoes sold – 500 canoe units at BE (see solution to Requirement 3)
= 200 canoe MOS units, and 2,500 paddles sold – 2,000 paddle units at BE (see solution to Requirement 3) = 500 paddle MOS units

= Total MOS units of 200 canoes + 500 paddles
= 700 total MOS units above total BE units, and

200 canoes × $500 selling price per canoe + 500 paddles × $50 selling price per paddle

= $125,000 MOS in sales dollars