Problem 1: Solution

1. Selling price - Variable cost per unit = Contribution margin
   $12.00 - $8.00 = $4.00

   Contribution margin / Selling price = Contribution margin ratio
   $4.00 / $12.00 = .333

2. Selling price - Variable cost per unit = Contribution margin
   $11.00 - $7.75 = $3.25

   Contribution margin / Selling price = Contribution margin ratio
   $3.25 / $11.00 = .295

3. Total fixed cost / (Selling price - Variable cost per unit) = Units sold
   $200.00 / ($11.00 - $7.75) = 62 lunch covers

Problem 2: Solution

1. Total fixed cost / (Selling price - Variable cost per unit) = Units sold at breakeven
   $100,000 / ($80 - $15) = 1,539 rooms

2. Rooms sold to break even / Rooms sold per day = Day breakeven occurs
   1,539 / 60 = 25.65 or the 26th day

3. Annual fixed costs increase / 12 months = Monthly fixed costs increase
   $72,000 / 12 = $6,000

   Total fixed costs / (Selling price - Variable cost per unit) = Units sold at breakeven
   $106,000 / ($80 - $12) = 1,559 rooms

   Units sold at breakeven × Selling price = Breakeven revenues
   1,559 × $80 = $124,720
Problem 3: Solution

Transportation costs are fixed only on a daily basis. Treat this as a variable cost at $.02 per glass.

1. Cost per drink + Other variable costs = Total variable cost per unit
   
   $0.20 + $0.05 + $0.02 = $0.27

   Selling price - Variable cost per unit = Contribution margin
   
   $0.75 - $0.27 = $0.48

2. Total fixed cost / (Selling price - Variable cost per unit) = Units sold at breakeven
   
   $750 / ($0.75 - $0.27) = 1,563 lemonades

3. Lemonades sold to break even / Lemonades sold per day = Day breakeven occurs
   
   1,563 / 75 = 20.84 or the 21st day or Monday, June 29.

Problem 4: Solution

1. Mixed
   
<table>
<thead>
<tr>
<th>Cost</th>
<th>Low Month</th>
<th>High Month</th>
<th>Variable Costs per 1% Occ.</th>
<th>Fixed Costs Per Room</th>
<th>Fixed Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repairs</td>
<td>$3,000</td>
<td>$3,500</td>
<td>$25</td>
<td>$0.83</td>
<td>$1,500</td>
</tr>
<tr>
<td>Utilities</td>
<td>$4,000</td>
<td>$5,000</td>
<td>$50</td>
<td>$1.67</td>
<td>$1,000</td>
</tr>
</tbody>
</table>

   Variable cost per room:
   
   $20 + $.83 + $1.67 = $22.50

2. Monthly fixed costs:
   
   $100,000 + $1,500 + $1,000 = $102,500

3. Day breakeven occurs = Rooms sold to break even / Rooms sold per day
   
   25 = X / 75

   X = 1,875 rooms sold to break even

   (Total fixed costs / Units sold) + Variable cost per unit = Selling price at breakeven

   ($102,500 / 1,875) + $22.50 = $77.17

Problem 5: Solution

1. Fixed costs = (1-VC%) × Sales
   
   550,000 = .8 × Sales
   
   Sales = 687,500

2. Required return = investment × ROI
   
   = 1,500,000 × .2
   
   = 300,000
Problem 6: Solutions

1. a. Breakeven Point
   \[ CMRw = ((60/100) \times ((60 - 12)/60)) + ((40/100) \times ((40 - 20)/40)) \]
   \[ CMRw = 0.68 \]
   \[ R = $410,000/0.68 \] Breakeven Point = \$602,941.18

b. NI
   Variable Expense % Rooms = $120,000/$600,000 = 0.2
   Variable Expense % Coffee Shop = $200,000/$400,000 = 0.5

   \[ \begin{align*}
   \text{Calculations} \\
   \text{Rooms Sales} & \quad 720,000 \quad .6(1,200,000) \\
   \text{Coffee Shop Sales} & \quad 480,000 \quad .4(1,200,000) \\
   \text{Variable Expense Rooms} & \quad 144,000 \quad .2(720,000) \\
   \text{Variable Expense C.S.} & \quad 240,000 \quad .5(480,000) \\
   \text{Total Contrib. Margin} & \quad 816,000 \\
   \text{Fixed Costs:} & \\
   \text{Rooms} & \quad 50,000 \\
   \text{Coffee Shop} & \quad 60,000 \\
   \text{Overhead} & \quad 300,000 \\
   \text{Pre-tax earnings} & \quad 406,000 \\
   \text{Taxes} & \quad 81,200 \quad .2(406,000) \\
   \text{Net Income} & \quad \boxed{324,800} \\
\end{align*} \]

c. Net Income = $200,000
   Fixed Costs:
   \[ \begin{align*}
   \text{Rooms} & \quad 50,000 \\
   \text{Coffee Shop} & \quad 60,000 \\
   \text{Overhead} & \quad 300,000 \\
   \text{Total} & \quad 610,000 \\
   \end{align*} \]

   \[ \frac{\text{NI} + \text{Fixed costs}}{CMRw} = \text{annual revenue} \]
   \[ 610,000/0.68 = \boxed{897,058.82} \]
2. a. Breakeven Point
   \[ CMRw = \left( \frac{75}{100} \times 0.8 \right) + \left( \frac{25}{100} \times 0.5 \right) \]
   \[ CMRw = 0.725 \]
   \[ R = \frac{410,000}{0.725} \]
   Breakeven Point = $565,517.24

b. Net Income
   Calculations
   Total Revenue $1,200,000
   Fixed Costs:
   Rooms 50,000
   Coffee Shop 60,000
   Overhead 300,000
   Variable Costs:
   Rooms 180,000  \(0.2 \times (0.75 \times 1,200,000)\)
   Coffee Shop 150,000  \(0.5 \times (0.25 \times 1,200,000)\)
   Pre-tax earnings 460,000
   Taxes 92,000  \(0.2 \times 460,000\)
   Net Income $368,000

c. Net Income $200,000
   Fixed Costs:
   Rooms 50,000
   Coffee Shop 60,000
   Overhead 300,000
   $610,000

\[ \frac{(NI + Fixed \ costs)}{CMRw} = annual \ revenue \]
\[ \frac{610,000}{0.725} = $841,379.31 \]
Problem 7: Solution

1. Revenue at breakeven point:
   \[ B = \frac{F}{CM} = \frac{20,000}{20} = 1,000 \text{ rooms} \]
   Revenue = rooms sold \times selling price = 1,000 \times $30 = $30,000

2. Margin of safety:
   Stated revenues \hspace{1cm} $450,000
   Breakeven ($30,000 \times 12) \hspace{1cm} 360,000
   Margin of safety–revenue \hspace{1cm} $90,000
   Margin of safety–rooms: $90,000/30 = \underline{3,000} \text{ rooms}

3. Rooms sold when pretax profit is $100,000
   \[ x = F + I_b = \frac{240,000 + 100,000}{20} = \underline{17,000} \]

4. Paid occupancy percentage:
   \[ \frac{\text{rooms sold}}{\text{rooms available}} = \frac{17,000}{50 \times 365} = 93.15\% \]

Problem 8: Solution

Part 1

<table>
<thead>
<tr>
<th></th>
<th>Revenue</th>
<th>Var. Cost</th>
<th>Dept. Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooms</td>
<td>$2,500,000</td>
<td>$750,000</td>
<td>$1,750,000</td>
</tr>
<tr>
<td>Coffee Shop</td>
<td>750,000</td>
<td>300,000</td>
<td>450,000</td>
</tr>
<tr>
<td>Restaurant</td>
<td>1,200,000</td>
<td>750,000</td>
<td>450,000</td>
</tr>
<tr>
<td></td>
<td>$4,450,000</td>
<td>$1,800,000</td>
<td>$2,650,000</td>
</tr>
</tbody>
</table>

\[ CMR_w = \frac{\text{Total Dept. Income}}{\text{Total Sales}} = \frac{2,650,000}{4,450,000} = 59.55\% \]

Part 2

\[ \frac{(I_n + F)}{CMR_w} = \text{Sales} \]
\[ \frac{500,000 + 1,000,000}{.5955} = 2,518,891.69 \]

Part 3

\[ I_b = \frac{I_n}{(1 - t)} \]
\[ = \frac{500,000}{1 - .3} = 714,285.71 \]

\[ \frac{(I_b + F)}{CMR_w} = \text{Sales} \]
\[ \frac{1,000,000 + 714,285.71}{.5955} = 2,878,733.35 \]
Problem 9: Solution

Required annual profit = ROI(investment) = .18($1,500,000) = $270,000

Pretax income (Ib) = I_n/(1 – t) = $270,000/0.7 = $385,714.29

CMRw = .8(.76) + .2(.55) = .608 + .110 = .718

Revenue = (F + Ib)/CMRw = $240,000 + $385,714.29 = $871,468.37

Problem 10: Solution

1. Total Revenues - Total Variable Costs = Contribution Margin
   $2,000,000 - $700,000 = $1,300,000
   Contribution Margin Percentage
   $1,300,000 = 0.65
   $2,000,000
   Breakeven Point
   $1,000,000 = $1,538,462
   0.065

2. $520,000 = $1,155,556
   0.45
Problem 11: Solution

1) CMR

\[ \frac{($60 - $20)}{$60} = 0.6667 \]

2) Breakeven Point

\[ \frac{$20,000}{0.6667} = $29,998.50 \]

\[ \frac{$29,998.50}{$60} = 500 \text{ rooms} \]

3) Total Revenue

Net Income $10,000.00

Pretax Income $10,000 / (1 - .2) = $12,500.00

Total Revenue \((\frac{$12,500 + $20,000}{0.6667}) = $48,747.56 \)

4) June breakeven point

Total Revenue $48,747.56

Rooms sold per day \((\frac{$48,747.56}{60}/30) = 27.08 \)

Daily Revenue $27.08 \times 60 = $1,624.80

Breakeven point $29,998.50

Days to break even $29,998.50 / $1,624.80 = 18.4629

The Meyer Motel will break even on: June 19th

5) Increase in ADR

Revised variable costs $20 \times 1.5 = $30

To maintain the CM of $40, ADR must increase by: $10
Problem 12: Solution

1. Mackinaw Hotel Minier Hotel

\[ \text{B = } \frac{\text{F}}{\text{CMR}'} \text{ } \frac{\$1,200,000}{.6} = \frac{\$2,000,000}{.5} \text{ } \frac{\$1,000,000}{.5} = \frac{\$2,000,000}{.5} \]

2. Profit-volume graph:

3. The Mackinaw Hotel is riskier because it has a higher level of fixed costs and a lower variable cost percentage than the Minier Hotel. With zero sales, the Mackinaw Hotel would lose $1,200,000 (its fixed costs). With zero sales, the Minier Hotel would lose only $1,000,000.
**Problem 13: Solution**

1. **Level of sales under each lease option**

   **Var.:** \[ X = 0.3X + 0.2X + 0.1X + 0.06X + 100,000 \]
   \[ X = 294,117.65 \]

   **Mixed:** \[ X = 0.3X + 0.2X + 0.1X + 0.02X + 12(1,500) + 100,000 \]
   \[ X = 310,526 \]

   **Fixed:** \[ X = 0.3X + 0.2X + 0.1X + 12(2,500) + 100,000 \]
   \[ X = 325,000 \]

2. **Net Income**

   **Var.:** \[ 700,000 - (0.66(700,000) + 100,000) \]
   \[ NI = 138,000 \]

   **Mixed:** \[ 700,000 - (0.62(700,000) + 12(1,500) + 100,000) \]
   \[ NI = 148,000 \]

   **Fixed:** \[ 700,000 - (0.6(700,000) + 12(2,500) + 100,000) \]
   \[ NI = 150,000 \]

3. **Recommendation**

   **Var.:** \[ 400,000 - (0.66(400,000) + 100,000) \]
   \[ NI = 36,000 \]

   **Mixed:** \[ 400,000 - (0.62(400,000) + 12(1,500) + 100,000) \]
   \[ NI = 34,000 \]

   **Fixed:** \[ 400,000 - (0.6(400,000) + 12(2,500) + 100,000) \]
   \[ NI = 30,000 \]

   The variable lease is the better option at the given level of sales.
Problem 14: Solution

1. Breakeven point:
\[
B = \frac{F}{CMR_v} = \frac{1,000,000.00}{.65} = 1,538,461.54
\]

2. Revised breakeven point:
\[
\text{Revised CMR}_v = .65 - .20 = .45
\]
\[
B = \frac{F}{CMR_v} = \frac{520,000}{.45} = 1,155,555.56
\]

3. Increase in sales required to cover an increase in variable costs:
\[
\text{Revised revenue} = I_b + F
\]
\[
\text{Revised CMR}_v = .65 - .065
\]
\[
= \frac{300,000 + 1,000,000}{.585}
\]
\[
= 2,222,222.22
\]

Original revenue = 2,000,000.00
Increase in revenue = 222,222.22
Percentage increase = 11% in sales

4. Room sales when net income equals $300,000:
\[
\text{Revenue} = \frac{I_b + F}{CMR_v} = \frac{I_b}{1 - t}
\]
\[
= \frac{400,000 + 1,000,000}{.65} = \frac{300,000}{1 - .25}
\]
\[
= \frac{1,400,000}{.65} = 400,000
\]
\[
= 2,153,846.15
\]

Room sales = 0.75(total sales)
\[
= 0.75(2,153,846.15)
\]
\[
= 1,615,384.62
\]
Problem 15: Solution

Part 1

Revenue = \( \frac{I_b + F}{CMR_w} \)

\[ I_b = \frac{I_n}{1 - t} = \frac{40,000}{1 - 0.25} = 53,333 \]

\[ CMR_w = \frac{\text{Contribution Margin}}{\text{Total Revenue}} = \frac{100,000}{140,000} = 71.43\% \]

Revenue = \( 53,333 + 80,000 = 186,662.47 \)

\[ \frac{1}{0.7143} \]

Part 2

\[ CF_b = \frac{\text{CF}_d + \text{NECD} - \text{NCE}}{1 - t} - \text{NECD} + \text{NCE} \]

\[ = \frac{20,000 + 5,000 - 20,000 - 5,000 + 20,000}{1 - 0.25} \]

\[ = 5,000 + 15,000 \]

\[ = 21,666.67 \]

\[ R = \frac{\text{CF}_d + F - \text{NCE} + \text{NECD}}{CMR_w} \]

\[ = \frac{21,666.67 + 80,000 - 20,000 + 5,000}{0.7143} \]

\[ = 121,330.91 \]

*depreciation
**reduction of mortgage:
  mortgage payment $15,000
  less: interest exp. $10,000
  $5,000

Note: The cash flow calculation assumes income taxes are based on cash flows.
**Problem 16: Solution**

1. Contribution Margin Ratio  
   \[
   \frac{5,000,000 - 1,000,000}{5,000,000} = 0.8
   \]

2. Weighted Ave. CMR  
   \[
   \frac{8,500,000 - 2,700,000}{8,500,000} = 0.6824
   \]

3. Breakeven Point  
   \[
   R = \frac{F}{CMR_w} = \frac{3,600,000}{0.6824} = $5,275,498.24
   \]

4. Room sales when NI= 1.5M  
   \[
   Ib = \frac{In}{1 - t} = \frac{1,500,000}{1 - 6/22} = $2,062,500
   \]

   \[
   R = \frac{(Ib + F)}{CMR_w} = \frac{(3,600,000 + 2,062,500)}{0.6824} = $8,297,919.11
   \]

   Room Sales = \[R \times Room Sales\]  
   \[
   \frac{8,297,919.11 \times 5,000,000}{8,500,000} = $4,881,128.89
   \]

**Problem 17: Solution**

**Part 1**  
Food department's CMR:  
\[
\frac{$50,000}{$200,000} = 25\%
\]

**Part 2**  
CMR\(_x\):  
\[
\frac{$401,000}{$705,000} = 56.88\%
\]

**Part 3**  
Breakeven point:  
\[
\frac{$151,000}{.5688} = $265,471.17
\]

**Part 4**  
Increase in room sales to yield a $30,000 increase in net income:  
\[
\Delta I_b = \frac{\Delta I_n}{1 - .5} = \frac{$30,000}{1 - .5} = $60,000
\]

CMR\(_{rooms}\):  
\[
\frac{$350,000}{$500,000} = .7
\]

Increased room sales =  
\[
\frac{\Delta I_b}{CMR_{rooms}} = \frac{$60,000}{.7} = $85,714.29
\]

Cost-Volume-Profit Analysis 12
Problem 17: Solution (continued)

Part 5
Stable sales to cover increase in fixed costs of $500:
\[
CMR_{\text{stables}} = \frac{$1,000}{5,000} = .2
\]
Increase in stable sales = \( \frac{\Delta F}{CMR_{\text{stables}}} = \frac{$500}{.20} = $2,500 \)

Part 6
Total revenue to cover increase in fixed costs of $1,500:
Increase in total sales = \( \frac{\Delta F}{CMR_{w}} = \frac{$1,500}{.5688} = $2,637.13 \)

Problem 18: Solution

1. \( \frac{($7,000,000 - $2,850,000)}{7,000,000} = 0.5929 \)
2. \( \frac{($200,000 + $400,000 + $100,000 + $100,000 + $2,800,000)}{0.5929} = $6,071,850 \)
3. \( \frac{($2,000,000 - $1,000,000 + $200,000 + $100,000 + $2,800,000)}{0.5929} = $8,264,463 \)
4. \( \frac{($300,000 - $150,000)}{0.5929} = 0.5 + 0.1* = .6 \)
   *Management Fee
   \( \frac{($2,000 + $4,000 + $3,143**)}{0.4} = $22,858 \)
   **$2,000/(1 - .3636) = $3,143
5. Room \( \frac{($4,000,000 - $800,000)}{4,000,000} = 0.8000 \) 50% 0.4
   Food \( \frac{($2,400,000 - $1,000,000)}{2,400,000} = 0.5833 \) 35% 0.2042
   Other \( \frac{($300,000 - $200,000)}{300,000} = 0.3333 \) 5% 0.0167
   Gift \( \frac{($300,000 - $150,000)}{300,000} = 0.5000 \) 10% 0.05
   Shop \( \frac{CMR_{\text{stables}}}{0.5929} = $300,000 \)
   Management Fee 0.6709
   CMR = 0.5709
Problem 19: Solution

1. Expected net income during June. Expected number of room sales: \(100 \times .8 \times 30 = 2,400\)

\[
\begin{align*}
\text{Sales} & \quad 2,400 \times 35 \quad 84,000 \\
\text{Variable costs} & \quad 2,400 \times 9 \quad 21,600 \\
\text{Monthly fixed costs} & \quad 21,500 \\
\text{Pre-tax income} & \quad 40,900 \\
\text{Income taxes} & \quad 12,270 \\
\text{Net income} & \quad 28,630
\end{align*}
\]

2. Breakeven point in rooms sold in June

\[
\frac{21,500}{26} = 826.9 \text{ rooms, on June 11}
\]

3. Net income expected to be earned during November. Expected number of room sales: \(100 \times .7 \times 30 = 2,100\)

\[
\begin{align*}
\text{Sales} & \quad 2,100 \times 35 \quad 73,500 \\
\text{Variable costs} & \quad 2,100 \times 10 \quad 21,000 \\
\text{Fixed costs} & \quad 19,500 \\
\text{Pre-tax income} & \quad 33,000 \\
\text{Income taxes} & \quad 9,900 \\
\text{Net income} & \quad 23,100
\end{align*}
\]

4. Breakeven point during November:

\[
\frac{19,500}{25} = 780 \text{ rooms, on November 12}
\]

Problem 20: Solution

1. \(\frac{5,000,000 - 1,000,000}{5,000,000} = 0.8\)

2. \(\frac{8,500,000 - 2,700,000}{8,500,000} = 0.6824\)

3. \(\frac{1,000,000 + 500,000 + 100,000 + 2,000,000}{5,275,498} = 0.6824\)

4. Desired pretax income: \(\frac{1,500,000}{1 - 0.2728} = 2,062,706\)

\[
\begin{align*}
\text{Total revenue} & \quad (2,062,706 + 3,600,000) = 8,298,221 \\
\text{Room sales} & \quad 5,000,000 \times 8,298,221 = 4,881,307
\end{align*}
\]