Exercise 12-15

1. 

<table>
<thead>
<tr>
<th></th>
<th>Division A</th>
<th>Division B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales..........................</td>
<td>$2,500,000</td>
<td>$1,200,000</td>
<td>$3,200,000</td>
</tr>
<tr>
<td>Less expenses:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added by the division ....</td>
<td>1,800,000</td>
<td>400,000</td>
<td>2,200,000</td>
</tr>
<tr>
<td>Transfer price paid........</td>
<td></td>
<td>500,000</td>
<td></td>
</tr>
<tr>
<td>Total expenses...............</td>
<td>1,800,000</td>
<td>900,000</td>
<td>2,200,000</td>
</tr>
<tr>
<td>Operating income..............</td>
<td>$ 700,000</td>
<td>$ 300,000</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

120,000 units x $125 per unit = $2,500,000.
24,000 units x $300 per unit = $1,200,000.
3Division A outside sales
   (16,000 units x $125 per unit)...................... $2,000,000
Division B outside sales
   (4,000 units x $300 per unit)......................  1,200,000
Total outside sales ............................... $3,200,000

Note that the $500,000 in intracompany sales has been eliminated.

2. Division A should transfer the 1,000 additional circuit boards to Division B. Note that Division B’s processing adds $175 to each unit’s selling price (B’s $300 selling price, less A’s $125 selling price = $175 increase), but it adds only $100 in cost. Therefore, each board transferred to Division B ultimately yields $75 more in contribution margin ($175 – $100 = $75) to the company than can be obtained from selling to outside customers. Thus, the company as a whole will be better off if Division A transfers the 1,000 additional boards to Division B.
**Exercise 12-17**

1. The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

   \[
   \text{Transfer price} = \frac{\text{Variable cost per unit} + \left( \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}} \right)}{\text{Number of units transferred}}
   \]

   There is no idle capacity, so each of the 40,000 units transferred from Division X to Division Y reduces sales to outsiders by one unit. The contribution margin per unit on outside sales is $20 ( = $90 - $70).

   \[
   \text{Transfer price} = \left( \frac{70 - 3}{40,000} \right) + \frac{20 \times 40,000}{40,000}
   \]

   \[= \frac{67 + 20}{40,000} = \frac{87}{40,000} \]

   The buying division, Division Y, can buy a similar unit from an outside supplier for $86. Therefore, Division Y would be unwilling to pay more than $86 per unit.

   Transfer price £ Cost of buying from outside supplier = $86

   The requirements of the two divisions are incompatible and no transfer will take place.

2. In this case, Division X has enough idle capacity to satisfy Division Y’s demand. Therefore, there are no lost sales and the lowest acceptable price as far as the selling division is concerned is the variable cost of $60 per unit.

   \[
   \text{Transfer price} = \frac{60 + 0}{40,000} = \frac{$60}{40,000}
   \]

   The buying division, Division Y, can buy a similar unit from an outside supplier for $74. Therefore, Division Y would be unwilling to pay more than $74 per unit.

   Transfer price £ Cost of buying from outside supplier = $74

   In this case, the requirements of the two divisions are compatible and a transfer hopefully will take place at a transfer price within the range: $60 £ Transfer price £ $74
Problem 12-24

1. The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

\[
\text{Transfer price} = \text{Variable cost per unit} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}
\]

The Pulp Division has no idle capacity, so transfers from the Pulp Division to the Carton Division would cut directly into normal sales of pulp to outsiders. Since the costs are the same whether the pulp is transferred internally or sold to outsiders, the only relevant cost is the lost revenue of $70 per tonne from the pulp that could be sold to outsiders. This is confirmed below:

\[
\text{Transfer price} = 42 + \frac{(70 - 42) \times 5,000}{5,000} = 42 + (70 - 42) = 70
\]

Therefore, the Pulp Division will refuse to transfer at a price less than $70 a tonne.

The Carton Division can buy pulp from an outside supplier for $70 a tonne, less a 10% quantity discount of $7, or $63 a tonne. Therefore, the Division would be unwilling to pay more than $63 per tonne.

\[
\text{Transfer price} = \text{Cost of buying from outside supplier} = 63
\]

The requirements of the two divisions are incompatible. The Carton Division won’t pay more than $63 and the Pulp Division will not accept less than $70. Thus, there can be no mutually agreeable transfer price and no transfer will take place.

2. The price being paid to the outside supplier, net of the quantity discount, is only $63. If the Pulp Division meets this price, then profits in the Pulp Division and in the company as a whole will drop by $35,000 per year:

\[
\begin{align*}
\text{Lost revenue per tonne} & \quad \text{\$70} \\
\text{Outside supplier’s price} & \quad \text{\$63} \\
\text{Loss in contribution margin per tonne} & \quad \text{\$7} \\
\text{Number of tonnes per year} & \quad \times 5,000 \\
\text{Total loss in profits} & \quad \text{\$35,000}
\end{align*}
\]
**Problem 12-24** (continued)

Profits in the Carton Division will remain unchanged, since it will be paying the same price internally as it is now paying externally.

3. The Pulp Division has idle capacity, so transfers from the Pulp Division to the Carton Division do not cut into normal sales of pulp to outsiders. In this case, the minimum price as far as the Carton Division is concerned is the variable cost per tonne of $42. This is confirmed in the following calculation:

Transfer price $42 + $0 $0 5,000 = $42

The Carton Division can buy pulp from an outside supplier for $63 a tonne and would be unwilling to pay more than that for pulp in an internal transfer. If the managers understand their own businesses and are cooperative, they should agree to a transfer and should settle on a transfer price within the range:

$42 \leq \text{Transfer price} \leq $63

4. Yes, $59 is a bona fide outside price. Even though $59 is less than the Pulp Division’s $60 “full cost” per unit, it is within the range given in Part 3 and therefore will provide some contribution to the Pulp Division.

If the Pulp Division does not meet the $59 price, it will lose $85,000 in potential profits:

<table>
<thead>
<tr>
<th>Price per tonne</th>
<th>$59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less variable costs</td>
<td>42</td>
</tr>
<tr>
<td>Contribution margin per tonne</td>
<td>$17</td>
</tr>
</tbody>
</table>

5,000 tons x $17 per tonne = $85,000 potential increased profits

This $85,000 in potential profits applies to the Pulp Division and to the company as a whole.

5. No, the Carton Division should probably be free to go outside and get the best price it can. Even though this would result in suboptimization for the company as a whole, the buying division should probably not be forced to buy inside if better prices are available outside.
Problem 12-24 (continued)

6. The Pulp Division will have an increase in profits:

Selling price .............................................. $70
Less variable costs................................. 42
Contribution margin per tonne ................. $28

5,000 tonnes x $28 per tonne = $140,000 increased profits

The Carton Division will have a decrease in profits:

Inside purchase price................................. $70
Outside purchase price............................... 59
Increased cost per tonne........................... $11

5,000 tons x $11 per tonne = $55,000 decreased profits

The company as a whole will have an increase in profits:

Increased contribution margin in the Pulp Division .......... $28
Decreased contribution margin in the Carton Division ...... 11
Increased contribution margin per tonne ....................... $17

5,000 tonnes x $17 per tonne = $85,000 increased profits

So long as the selling division has idle capacity, profits in the company as a whole will increase if internal transfers are made. However, there is a question of *fairness* as to how these profits should be split between the selling and buying divisions. The inflexibility of management in this situation damages the profits of the Carton Division and greatly enhances the profits of the Pulp Division.
Problem 12-32

1. The Quark Division will probably reject the $340 price because it is below the division’s variable costs of $350 per set. This variable cost includes the $140 transfer price from the Cabinet Division, which in turn includes $30 per unit in fixed costs. Nevertheless, from the perspective of the Quark Division, the entire $140 transfer price from the Cabinet Division is a variable cost. Thus, it will reject the offered $340 price.

2. If both the Cabinet Division and the Quark Division have idle capacity, then from the perspective of the entire company the $340 offer should be accepted. By rejecting the $340 price, the company will lose $60 in potential contribution margin per set:

\[
\begin{align*}
\text{Price offered per set} & \quad \$340 \\
\text{Less variable costs per set:} & \\
\quad \text{Cabinet Division} & \quad \$70 \\
\quad \text{Quark Division} & \quad 210 \\
\text{Potential contribution margin per set} & \quad \$60
\end{align*}
\]

3. If the Cabinet Division is operating at capacity, any cabinets transferred to the Quark Division to fill the overseas order will have to be diverted from outside customers. Whether a cabinet is sold to outside customers or is transferred to the Quark Division, its production cost is the same. However, if a set is diverted from outside sales, the Cabinet Division (and the entire company) loses the $140 in revenue. As a consequence, as shown below, there would be a net loss of $10 on each TV set sold for $340.

\[
\begin{align*}
\text{Price offered per set} & \quad \$340 \\
\text{Less:} & \\
\quad \text{Lost revenue from sales of cabinets to outsiders} & \quad \$140 \\
\quad \text{Variable cost of Quark Division} & \quad 210 \\
\text{Net loss per TV} & \quad (\$10)
\end{align*}
\]
4. When the selling division has no idle capacity, as in part (3), market price works very well as a transfer price. The cost to the company of a transfer when there is no idle capacity is the lost revenue from sales to outsiders. If the market price is used as the transfer price, the buying division will view the market price of the transferred item as its cost—which is appropriate since that is the cost to the company. As a consequence, the manager of the buying division should be motivated to make decisions that are in the best interests of the company.

When the selling division has idle capacity, the cost to the company of the transfer is just the variable cost of producing the item. If the market price is used as the transfer price, the manager of the buying division will view that as his/her cost rather than the real cost to the company, which is just variable cost. Hence, the manager will have the wrong cost information for making decisions as we observed in parts (1) and (2) above.
**Problem 12-35**

1. The variable cost of the new tube will be:
   
   Direct materials ........................................ $60  
   Direct labour .......................................... 49  
   Variable overhead (1/3 x $54) ................. 18  
   Total variable cost ................................ $127  

   The lost contribution margin on outside sales will be:
   
   Selling price (regular tubes) .................. $170  
   Less variable expenses:  
   Direct materials ........................................ $38  
   Direct labour ........................................ 27  
   Variable overhead (25% x $40) ............. 10  
   Variable selling and administrative* ..... 5 80  
   Contribution margin per tube ............ $ 90  
   
   *Total selling and administrative........ $390,000  
   Less fixed portion .................................. 350,000  
   Variable portion .................................. $ 40,000  

   $40,000 ÷ 8,000 tubes = $5 per tube.

   The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

   \[
   \text{Transfer price} = \frac{\text{Variable cost} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}}{2500} 
   \]

   Transfer price \( \frac{127 + \frac{90 \times 3,000}{2,500}}{2,500} = $127 + $108 = $235 \)

2. Any price below $235 will result in a decline in the profits of both the Tube Division and the entire company. If the Tube Division meets a price of $200, then profits will decrease by $87,500 as show below:

   Minimum transfer price ........................................ $235  
   Outside supplier’s price .................................... 200  
   Potential decrease in contribution margin ........ $ 35  
   Number of units .............................................. \( \times 2,500 \)  
   Total potential decrease in contribution margin and operating income ................................ $87,500