BASIC CAPITAL BUDGETING

Rockyford Company must replace some machinery that has zero book value but a current market value of $1,800. One possibility is to invest in new machinery costing $40,000. This new machinery would produce estimated annual pretax operating cash savings of $12,500. Assume the new machine will have a useful life of four years and depreciation of $10,000 each year for book and tax purposes. It will have no salvage value at the end of four years. The investment in this new machinery would require an additional $3,000 investment of working capital.

If Rockyford accepts this investment proposal, the disposal of the old machinery and the investment in the new one will occur on December 31 of this year. The cash flows from the investment will occur during the next four calendar years.

Rockyford is subject to a 40 percent income tax rate for all ordinary income and capital gains and has a 10 percent after-tax cost of capital. All operating and tax cash flows are assumed to occur at year-end.

Required -- Determine:

1. The present value of the after-tax cash flow arising from disposing of the old machinery. $(1,800 - 0.8V) = 1,800 \times \left(1 - 0.40 \times 0.909\right) = 1,080$

2. The present value of the after-tax cash flows for the next four years attributable to the operating cash savings. $12,500 \times 0.607 \times 0.717 = 23,775$

3. The present value of the tax shield effect of depreciation at the end of year 1. 

4. Which one of the following is the proper treatment for the $3,000 working capital required in the current year?
   a. It should be ignored in capital budgeting because it is not a capital investment.
   b. It is a sunk cost that needs no consideration in capital budgeting.
   c. It should be treated as part of the initial investment when determining the net present value.
   d. It should be spread over the machinery’s four-year life as a cash outflow in each of the years.
   e. It should be included as part of the cost of the new machine and depreciated.

(CMA Adapted)
tax rate = 40%

$23,775$

Hurdle rate

Cost of Capital

i = 10%
CASH FLOW ANALYSIS AND NPV

Lou Lewis, the president of the Lewisville Company, has asked you to give him an analysis of the best use of a warehouse the company owns.

a. Lewisville Company is currently leasing the warehouse to another company for $5,000 per month on a year-to-year basis.

b. The warehouse's estimated sales value is $200,000. A commercial Realtor believes that the price is likely to remain unchanged in the near future. The building originally cost $60,000 and is being depreciated at $1,500 annually. Its current net book value is $7,500.

c. Lewisville Company is seriously considering converting the warehouse into a factory outlet for furniture. The remodeling will cost $100,000 and will be extremely modest because the major attraction will be rock-bottom prices. The remodeling will be depreciated over the next five years using the double-declining-balance method.

d. The inventory, cash, and receivables needed to open and sustain the factory outlet would be $600,000. This total is fully recoverable when operations terminate.

e. Lou is fairly certain the warehouse will be condemned in 10 years to make room for a new highway. The firm most likely would receive $200,000 from the condemnation.

f. Estimated annual operating data, exclusive of depreciation, are:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$900,000</td>
</tr>
<tr>
<td>Operation expenses</td>
<td>$500,000</td>
</tr>
</tbody>
</table>

\[
PV_{annual} = \frac{900,000 \times 60\%}{1 + \frac{0.75}{5}} = 240,000 \times \frac{PV_{annuity}}{n=5; i=14\%}
\]

\[
PV_{lump\ sum} = \frac{50,000 \times PV_{lump\ sum}}{n=5; i=14\%}
\]

Nonrecurring sales promotion costs at the beginning of year 1 are expected to be $100,000. Nonrecurring termination costs at the end of year 5 are $50,000.

h. The minimum annual rate of return desired is 14 percent. The company is in the 40 percent tax bracket.

The company saves 40\% \times 100,000 \times \text{taxes} = 60,000, so the remaining 60\% \times 100,000 = 60,000 is a negative cash outflow.
Complete the analysis form below for Lewisville Company to determine the best use of the warehouse.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>PV Factor</th>
<th>PV</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Foregone rent ($5,000 x 12 x 0.6)</td>
<td>3.433</td>
<td></td>
<td>$123,588</td>
<td>($36,000)</td>
<td>($36,000)</td>
<td>($36,000)</td>
<td>($36,000)</td>
<td>($36,000)</td>
</tr>
<tr>
<td>b.</td>
<td>All are irrelevant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Remodeling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depreciation</td>
<td>0.877</td>
<td></td>
<td>$14,032</td>
<td></td>
<td>$16,000</td>
<td>$9,600</td>
<td>$5,760</td>
<td>$4,320</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.769</td>
<td></td>
<td>$7,382</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.575</td>
<td></td>
<td>$3,888</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Investment in inventory &amp; receivables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.519</td>
<td></td>
<td>$2,242</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>Irrelevant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>Sales ($900,000 x 0.6)</td>
<td>3.433</td>
<td></td>
<td>$1,883,820</td>
<td>$540,000</td>
<td>$540,000</td>
<td>$540,000</td>
<td>$540,000</td>
<td>$540,000</td>
</tr>
<tr>
<td></td>
<td>Operating expenses ($500,000 x 0.6)</td>
<td>3.433</td>
<td></td>
<td>$1,029,900</td>
<td>($300,000)</td>
<td>($300,000)</td>
<td>($300,000)</td>
<td>($300,000)</td>
<td>($300,000)</td>
</tr>
<tr>
<td>g.</td>
<td>Sales promotion ($100,000 x 0.6)</td>
<td></td>
<td></td>
<td></td>
<td>($60,000)</td>
<td>($60,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h.</td>
<td>Termination ($50,000 x 0.6)</td>
<td>0.519</td>
<td></td>
<td>$15,570</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NPV $266,263 > 0

$200,000 to sell warehouse.

DDB Depreciation Schedule on back ➔
DDB = BV x 2 \left( \frac{1}{EUL} \right)

<table>
<thead>
<tr>
<th>End of YR</th>
<th>BV</th>
<th>Deprec Exp</th>
<th>Tax Shield</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>60,000</td>
<td>40,000 x 40% = 16,000</td>
<td>9,600</td>
</tr>
<tr>
<td>2</td>
<td>36,000</td>
<td>24,000 x 40% = 9,600</td>
<td>5,760</td>
</tr>
<tr>
<td>3</td>
<td>21,600</td>
<td>14,400 x 40% = 5,760</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10,800</td>
<td>\text{Avg.} = 4,320</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>10,800 x 40% = 4,320</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{Avg.} = \frac{4,320 + 4,320 + 4,320}{3} = 4,320 \]
11-45 Cash Flow Analysis and NPV (15 min)

<table>
<thead>
<tr>
<th>Item &amp; Description</th>
<th>PV Factor</th>
<th>PV</th>
<th>CASH FLOWS IN YEAR (in '000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Foregone rent</td>
<td>3.433</td>
<td>&lt;123,588&gt;</td>
<td>&lt;36&gt; &lt;36&gt; &lt;36&gt; &lt;36&gt; &lt;36&gt;</td>
</tr>
<tr>
<td>($5,000 x 12 x 0.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. All are irrelevant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Remodeling Depreciation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.877</td>
<td>14,032</td>
<td>&lt;100&gt;</td>
<td>16  9.6  5.76  4.32  4.32</td>
</tr>
<tr>
<td>0.769</td>
<td>7,382</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.675</td>
<td>3,888</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.592</td>
<td>2,557</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.519</td>
<td>2,242</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Investment in inventory and receivables</td>
<td>1.0</td>
<td>&lt;600,000&gt;</td>
<td>&lt;600&gt; 600</td>
</tr>
<tr>
<td>Recovery</td>
<td>0.519</td>
<td>311,400</td>
<td></td>
</tr>
<tr>
<td>e. Irrelevant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Sales ($900 x 0.6)</td>
<td>3.433</td>
<td>1,853,820</td>
<td>540 540 540 540 540</td>
</tr>
<tr>
<td>Operating expenses</td>
<td></td>
<td></td>
<td>&lt;300&gt; &lt;300&gt; &lt;300&gt; &lt;300&gt; &lt;300&gt;</td>
</tr>
<tr>
<td>($500 x 0.6)</td>
<td>3.433</td>
<td>&lt;1,029,900&gt;</td>
<td></td>
</tr>
<tr>
<td>g. Sales Promotion ($100 x 0.6)</td>
<td></td>
<td>&lt;60&gt;</td>
<td></td>
</tr>
<tr>
<td>h. Termination ($50 x 0.6)</td>
<td>0.519</td>
<td>&lt;15,570&gt;</td>
<td>&lt;30&gt;</td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td>$266,263</td>
<td></td>
</tr>
</tbody>
</table>

2. The positive net present value $266,263, suggests that, comparing to the leasing alternative it is financially advantageous to convert the facility into a factory outlet. The net present value from converting into the factory outlet is also better then the alternative of selling the warehouse for $200,000.
MACHINE REPLACEMENT WITH TAX CONSIDERATIONS

A computer chip manufacturer spent $2,500,000 to develop a special-purpose molding machine. The machine has been used for one year and will be obsolete after four years. The firm uses straight-line depreciation for this machine.

At the beginning of the second year, a machine salesperson offers a new, vastly more efficient machine. It will cost $2,000,000, will reduce annual cash manufacturing costs from $1,800,000 to $1,000,000, and will have zero disposal value at the end of three years. Management has decided to use the double-declining-balance depreciation method for tax purposes if this machine is purchased.

The old machine's salvage value is $300,000 now and will be $50,000 three years from now; however, no salvage value is provided in calculating straight-line depreciation for tax purposes.

Required:

Assume that income tax rates are 45 percent. The minimum rate of return desired, after taxes, is 8 percent. Using the net present value technique, show whether the firm should purchase the new machine.
PV of Costs with the Original Equipment (000)

2,500,000
4 yrs
$75,000\times 4\text{ yrs.}
\text{cost of}
\text{degree}
45%\text{ tax savings}
2,81,250\text{ tax savings}
2,551,230\text{ operating costs}
1,800,000\text{ operating costs}
\times (1-45%)
(990,000)
(990,000)\text{ operating costs}
(21,835)
(5,000).
(1,804,614)
**PV of costs with New Machine**

\[
P V = 0 \quad 1 \quad 2 \quad 3
\]

\[
\begin{align*}
(2,000,000) & \quad 600,000 \times 0.926 \quad (n=1 \quad i=8\%)
\end{align*}
\]

\[
(555,100) & \quad 2,000,000 \quad (n=2 \quad i=8\%)
\]

\[
(171,400) & \quad 100,000 \quad (n=3 \quad i=8\%)
\]

**Sale of old machine**

\[
\begin{align*}
300,000 \quad & 765,000 \quad 708,750
\end{align*}
\]

\[
\begin{align*}
\text{Tax Savings on loss} & \quad \text{NPV}
\end{align*}
\]

\[
(1,545,950) \quad 2,000,000
\]

\[
\begin{align*}
\div 3 \text{ yrs (even)} & \quad \times 2 \text{ (double)} \quad 1,333,333 \text{ yr.1 degree.}
\end{align*}
\]

\[
\times 45\% & \quad 600,000 \text{ tax savings} = \text{yr.1}
\]

\[
\begin{align*}
(1,000,000) & \quad x (1.45^2) \quad (2,000,000 - 1,333,333)
\end{align*}
\]

\[
\begin{align*}
(1,000,000) & \quad x (1.45^2) \quad 444,445 \text{ yr.2 degree}
\end{align*}
\]

\[
\begin{align*}
(1,000,000) & \quad x (1.45^2) \quad 200,000 \text{ tax savings} = \text{yr.2}
\end{align*}
\]

**Tax Savings of loss on disposal of old machine**

\[
2,500,000 \text{ HC}
\]

\[
\begin{align*}
- 500,000 \text{ yr.1 degree.} \quad (2,500,000 \div 5)
\end{align*}
\]

\[
\begin{align*}
2,000 \quad & \quad 300,000 \quad \text{BV at end of yr.1}
\end{align*}
\]

\[
\begin{align*}
\text{Sale} & \quad 1,700,000 \times 45\% = 765,000
\end{align*}
\]
### Present Value of Costs with the Original Equipment

Present value of tax savings on depreciation:

\[ \frac{2,500,000}{4} \times 0.45 \times 2.577 = 724,781 \]

Present value of operating costs:

\[ 1,800,000 \times (1 - 0.45) \times 2.577 = 2,251,230 \]

Present value of salvage value:

\[ 50,000 \times (1 - 0.45) \times 0.794 = 21,835 \]

Present value of costs with the original equipment:

\[ \<1,804,614> \]

**Present value of the costs with the new machine**

**Initial outlay**

\[ \<2,000,000> \]

<table>
<thead>
<tr>
<th>Year</th>
<th>Book Value</th>
<th>Depreciation</th>
<th>Tax Rate</th>
<th>Tax Saving</th>
<th>Tax Discount</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,000,000</td>
<td>1,333,333</td>
<td>0.45</td>
<td>600,000</td>
<td>0.926</td>
<td>555,600</td>
</tr>
<tr>
<td>2</td>
<td>666,667</td>
<td>444,445</td>
<td>0.45</td>
<td>200,000</td>
<td>0.857</td>
<td>171,400</td>
</tr>
<tr>
<td>3</td>
<td>222,223</td>
<td>222,223</td>
<td>0.45</td>
<td>100,000</td>
<td>0.794</td>
<td>79,400</td>
</tr>
</tbody>
</table>

Cash proceeds from sale of the old machine:

300,000

Tax saving of loss on disposal of the old machine:

\[ (1,875,000 - 300,000) \times 0.45 = 708,750 \]

Present value of operating costs:

\[ 1,000,000 \times (1 - 0.45) \times 2.577 = 1,471,350 \]

Total cost at present value:

\[ \<1,656,200> \]

**Savings from using the new machine:**

\[ 1,804,614 - 1,656,200 = 148,414 \]

The total cost of the new machine, including the purchase cost and the operating cost in each of the three years, is $148,414 below the total cost of continuing with the original equipment. Financially, purchase of the new machine is a good investment.
1. XYZ Manufacturing Company provides vending machines for soft-drink manufacturers. The company has been investigating a new piece of machinery for its production department. The old equipment has a remaining life of ten years and the new equipment has a value of $391,200 with a ten-year life. The expected additional cash inflows are $75,000 per year. What is the internal rate of return?

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c}
\hline
0 & 1000 & 75 & 75 & 75 & 75 & 75 & 75 & 75 & 75 & 75 \\
\hline
\end{array}
\]

\[
\frac{391,200}{75,000} = 5.216
\]

\[
\text{IRR} = 14.2\%
\]

2. Investment A requires a net investment of $1,435,000. The required rate of return is 18% for the five-year annuity. What are the annual cash inflows if the net present value equals 0? (rounded)

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c}
\hline
0 & 1 & 2 & 3 & 4 & 5 \\
\hline
\end{array}
\]

\[
\frac{1,435,000}{3.127} = $458,906.30
\]
The ZZZ Corporation wants to purchase a new machine for its factory operations at a cost of $800,000. The investment is expected to generate $400,000 in annual cash flows for a period of five years. The required rate of return is 10%. The old machine can be sold for $75,000. The machine is expected to have zero value at the end of the five-year period. What is the net present value of the investment? Would the company want to purchase the new machine? Income taxes are not considered.

\[
\begin{array}{cccccc}
0 & 1 & 2 & 3 & 4 & 5 \\
(800) & 400 & 400 & 400 & 400 & 400 \\
1,516.4 & & & & & \\
\end{array}
\]

\[
1,516.4 \times 3.791
\]

\[
\frac{75}{\$791,400} > 0
\]

**Yes**
4. The XXX Corporation wants to purchase a new machine for its factory operations at a cost of $800,000. The investment is expected to generate $400,000 in annual cash flows for a period of five years. The required rate of return is 10%. The old machine can be sold for $75,000. The machine is expected to have zero value at the end of the five-year period. Income taxes are considered. The new machine is depreciated under the straight-line method and the tax rate is 25%.

What is the net present value of the investment?
Would the company want to purchase the new machine?
What is the approximate IRR of the investment?
5. The DDB Corporation wants to purchase a new machine for its factory operations at a cost of $800,000. The investment is expected to generate $400,000 in annual cash flows for a period of five years. The required rate of return is 10%. The old machine can be sold for $75,000. The machine is expected to have zero value at the end of the five-year period. Income taxes are considered. The new machine is depreciated under the double-declining balance method and the tax rate is 25%.

What is the net present value of the investment?

Would the company want to purchase the new machine?

What is the approximate IRR of the investment?

\[
\begin{array}{c|c|c|c|c|c}
\text{Year} & \text{初} & \text{Depreciation} & \text{Tax rate} & \text{Cash Benefit} \\
\hline
1 & \frac{800 \times 40\%}{8} = \frac{320 \times .25}{.25} & 80 & 48 \\
2 & \frac{480 \times 40\%}{8} = \frac{192 \times .25}{.25} & 192 & 28.8 \\
3 & \frac{288 \times 40\%}{8} = \frac{115.2 \times .25}{.25} & 115.2 & 28.8 \\
4 & \frac{172.8 \times 50\%}{8} = \frac{86.4 \times .25}{.25} & 86.4 & 21.6 \\
5 & \frac{56.7 \times 50\%}{8} = \frac{28.35 \times .25}{.25} & 28.35 & 21.6 \\
\end{array}
\]

\[
\begin{array}{c|c|c|c|c|c}
\text{Year} & \text{Cash Flow} & \text{Depreciation} & \text{Tax} & \text{Net Cash Flow} \\
\hline
0 & -800,000 & \text{Initial Investment} & \text{Zero} & -800,000 \\
1 & 400,000 & 80 & 48 & 372,000 \\
2 & 400,000 & 192 & 28.8 & 371.2 \\
3 & 400,000 & 115.2 & 28.8 & 371.2 \\
4 & 400,000 & 86.4 & 21.6 & 374.4 \\
5 & 400,000 & 28.35 & 21.6 & 378.35 \\
\end{array}
\]

\[
\begin{align*}
0 & \text{ } 1 \text{ } 2 \text{ } 3 \text{ } 4 \text{ } 5 \\
\hline
(800) & \downarrow \text{ } 400 \text{ } 400 \text{ } 400 \text{ } 400 \text{ } 400 \\
75 & \downarrow \text{ } \times .75 \text{ } .75 \text{ } .75 \text{ } .75 \text{ } .75 \\
\hline
\text{300} & \text{300} & \text{300} & \text{300} & \text{300} \\
+ 80 & +48 & +28.8 & +21.6 & +21.6 \\
\downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\
\text{380} & \text{348} & \text{328.8} & \text{321.6} & \text{321.6} \\
\times .909 & \times .826 & \times .751 & \times .683 & \times .621 \\
\hline
1,299.1632 & \approx 345.42 & 287.448 & 246.928 & 219.6528 & 199.7136 \\
\approx 574.1632 & \approx 0 & \approx 0 & \approx 0 & \approx 0 & \approx 0 \\
\end{align*}
\]

Yes

\[
\text{IRR} = ?
\]