EXERCISE 6-4 (15–20 minutes)

(a) Future value of an ordinary annuity of $4,000 a period for 20 periods at 8% $183,047.84 ($4,000 X 45.76196)
Factor \((1 + .08)\) X 1.08
Future value of an annuity due of $4,000 a period at 8% $197,691.67

(b) Present value of an ordinary annuity of $2,500 for 30 periods at 10% $23,567.28 ($2,500 X 9.42691)
Factor \((1 + .10)\) X 1.10
Present value of annuity due of $2,500 for 30 periods at 10% $25,924.00 (Or see Table 6-5 which gives $25,924.03)

(c) Future value of an ordinary annuity of $2,000 a period for 15 periods at 10% $63,544.96 ($2,000 X 31.77248)
Factor \((1 + 10)\) X 1.10
Future value of an annuity due of $2,000 a period for 15 periods at 10% $69,899.46

(d) Present value of an ordinary annuity of $1,000 for 6 periods at 9% $4,485.92 ($1,000 X 4.48592)
Factor \((1 + .09)\) X 1.09
Present value of an annuity due of $1,000 for 6 periods at 9% $4,889.65 (Or see Table 6-5)

EXERCISE 6-5 (10–15 minutes)

(a) $30,000 X 4.96764 = $149,029.20.

(b) $30,000 X 8.31256 = $249,376.80.

(c) ($30,000 X 3.03735 X .50663 = $46,164.38.
or (5.65022 – 4.11141) X $30,000 = $46,164.30 (difference of $.08 due to rounding).
EXERCISE 6-6 (15–20 minutes)

(a) Future value of $12,000 @ 10% for 10 years
   ($12,000 X 2.59374) = $31,124.88

(b) Future value of an ordinary annuity of $600,000
    at 10% for 15 years ($600,000 X 31.77248) $19,063,488.00
    Deficiency ($20,000,000 – $19,063,488) $936,512.00

(c) $70,000 discounted at 8% for 10 years:
    $70,000 X .46319 = $32,423.30
    Accept the bonus of $40,000 now.
    (Also, consider whether the 8% is an appropriate discount rate
     since the president can probably earn compound interest at a
     higher rate without too much additional risk.)

EXERCISE 6-7 (12–17 minutes)

(a) $50,000 X .31524 = $15,762.00
    + $5,000 X 8.55948 = 42,797.40
    $58,559.40

(b) $50,000 X .23939 = $11,969.50
    + $5,000 X 7.60608 = 38,030.40
    $49,999.90
    The answer should be $50,000; the above computation is off by 10¢
    due to rounding.

(c) $50,000 X .18270 = $ 9,135.00
    + $5,000 X 6.81086 = 34,054.30
    $43,189.30
EXERCISE 6-8 (10–15 minutes)

(a) Present value of an ordinary annuity of 1
    for 4 periods @ 8%  
    Annual withdrawal  
    Required fund balance on June 30, 2013  
    $20,000  
    $66,242.60

(b) Fund balance at June 30, 2013
    Future value of an ordinary annuity at 8%  
    for 4 years

    Amount of each of four contributions is $14,700.62

EXERCISE 6-9 (10 minutes)

The rate of interest is determined by dividing the future value by the present value and then finding the factor in the FVF table with n = 2 that approximates that number:

$123,210 = $100,000 \times (FVF_{2, i\%})

$123,210 \div $100,000 = (FVF_{2, i\%})

1.2321 = (FVF_{2, i\%})—reading across the n = 2 row reveals that i = 11%.

EXERCISE 6-10 (10–15 minutes)

(a) The number of interest periods is calculated by first dividing the future value of $1,000,000 by $92,296, which is 10.83471—the value $1.00 would accumulate to at 10% for the unknown number of interest periods. The factor 10.83471 or its approximate is then located in the Future Value of 1 Table by reading down the 10% column to the 25-period line; thus, 25 is the unknown number of years Mike must wait to become a millionaire.

(b) The unknown interest rate is calculated by first dividing the future value of $1,000,000 by the present investment of $182,696, which is 5.47357—the amount $1.00 would accumulate to in 15 years at an unknown interest rate. The factor or its approximate is then located in the Future Value of 1 Table by reading across the 15-period line to the 12% column; thus, 12% is the interest rate Venus must earn on her investment to become a millionaire.
EXERCISE 6-11 (10–15 minutes)

(a) Total interest = Total payments—Amount owed today
$162,745.30 (10 X $16,274.53) – $100,000 = $62,745.30.

(b) Sosa should borrow from the bank, since the 9% rate is lower than the manufacturer’s 10% rate determined below.

\[
PV-OA_{10,i\%} = \frac{100,000}{16,274.53} = 6.14457
\]

—Inspection of the 10 period row reveals a rate of 10%.

EXERCISE 6-12 (10–15 minutes)

Building A—PV = $600,000.

Building B—
Rent X (PV of annuity due of 25 periods at 12%) = PV
$69,000 X 8.78432 = PV
$606,118.08 = PV

Building C—
Rent X (PV of ordinary annuity of 25 periods at 12%) = PV
$7,000 X 7.84314 = PV
$54,901.98 = PV

Cash purchase price $650,000.00
PV of rental income $54,901.98
Net present value $595,098.02

Answer: Lease Building C since the present value of its net cost is the smallest.
EXERCISE 6-13 (15–20 minutes)

Time diagram:

Lance Armstrong, Inc.

\[ PV = ? \]
\[ PV\text{–OA} = ? \]

\[ \text{PV\text{–OA}} = R \left( PVF\text{–OA}_{n, i} \right) \]
\[ \text{PV\text{–OA}} = \$110,000 \left( PVF\text{–OA}_{30, 5\%} \right) \]
\[ \text{PV\text{–OA}} = \$110,000 \times 15.37245 \]
\[ \text{PV\text{–OA}} = \$1,690,970 \]

\[ \text{PV} = \text{FV} \left( PVF_{n, i} \right) \]
\[ \text{PV} = \$2,000,000 \left( PVF_{30, 5\%} \right) \]
\[ \text{PV} = \$2,000,000 \times 0.23138 \]
\[ \text{PV} = \$462,760 \]

The selling price of the bonds = $1,690,970 + $462,760 = $2,153,730.
(a) Given no established value for the building, the fair market value of the note would be estimated to value the building.

Time diagram:

\[ i = 9\% \]

\[ \text{PV} = ? \quad \text{FV} = \$275,000 \]

\[ 1/1/07 \quad 1/1/08 \quad 1/1/09 \quad 1/1/10 \]

\[ n = 3 \]

Formula: \[ \text{PV} = \text{FV} \cdot (\text{PVF}_{n, i}) \]

\[ \text{PV} = \$275,000 \cdot (\text{PVF}_{3, 9\%}) \]

\[ \text{PV} = \$275,000 \cdot .77218 \]

\[ \text{PV} = \$212,349.50 \]

Cash equivalent price of building \$212,349.50

Less: Book value (\$250,000 – \$100,000) \$150,000.00

Gain on disposal of the building \$62,349.50
(b) Time diagram:

\[
i = 11\%
\]

Present value of the principal

\[
FV (PVF_{10, 11\%}) = \$200,000 \times .35218 = \$70,436.00
\]

Present value of the interest payments

\[
R (PVF–OA_{10, 11\%}) = \$18,000 \times 5.88923 = 106,006.14
\]

Combined present value (purchase price)

\[
\$176,442.14
\]

(c) Time diagram:

\[
i = 8\%
\]

Formula:

\[
PV–OA = R \times (PVF–OA_{n,i})
\]

\[
PV–OA = \$4,000 \times (PVF–OA_{10, 8\%})
\]

\[
PV–OA = \$4,000 \times 6.71008
\]

\[
PV–OA = \$26,840.32 \text{ (cost of machine)}
\]
PROBLEM 6-1 (Continued)

(d) Time diagram:

\[ i = 12\% \]

\[ \text{PV–OA} = ? \]

\begin{array}{ccccccccc}
\$20,000 & \$5,000 & \$5,000 & \$5,000 & \$5,000 & \$5,000 & \$5,000 & \$5,000 & \$5,000 \\
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\end{array}

\[ n = 8 \]

Formula: \[ \text{PV–OA} = R \times (PVF–OA_{n, i}) \]

\[ \text{PV–OA} = \$5,000 \times (PVF–OA_{8, 12\%}) \]

\[ \text{PV–OA} = \$5,000 \times (4.96764) \]

\[ \text{PV–OA} = \$24,838.20 \]

Cost of tractor = $20,000 + $24,838.20 = $44,838.20

(e) Time diagram:

\[ i = 11\% \]

\[ \text{PV–OA} = ? \]

\begin{array}{cccccc}
\$100,000 & \$100,000 & \$100,000 & \$100,000 \\
0 & 1 & 2 & 8 & 9 \\
\end{array}

\[ n = 9 \]

Formula: \[ \text{PV–OA} = R \times (PVF–OA_{n, i}) \]

\[ \text{PV–OA} = \$100,000 \times (PVF–OA_{9, 11\%}) \]

\[ \text{PV–OA} = \$100,000 \times (5.53705) \]

\[ \text{PV–OA} = \$553,705 \]
Time diagram:

\[
PV-OA = ? \quad R = \\
\begin{array}{ccccccccc}
($36,000) & ($36,000) & $23,000 & $23,000 & $63,000 & $63,000 & $63,000 & $63,000 & $43,000 & $43,000 & $43,000 \\
0 & 1 & 5 & 6 & 10 & 11 & 12 & 29 & 30 & 31 & 39 & 40 \\
\end{array}
\]

\[
i = 12\%
\]

\[
\begin{array}{cccccc}
n = 5 & n = 5 & n = 20 & n = 10 \\
(0 – $27,000 – $9,000) & ($60,000 – $27,000 – $10,000) & ($100,000 – $27,000 – $10,000) & ($80,000 – $27,000 – $10,000) \\
\end{array}
\]

Formulas:

\[
PV-OA = R (PVF-OA_n, i) \\
PV-OA = ($36,000)(PVF-OA_5, 12\%) \\
PV-OA = $23,000 (PVF-OA_{10-5, 12\%}) \\
PV-OA = $63,000 (PVF-OA_{30–10, 12\%}) \\
PV-OA = $43,000 (PVF-OA_{40–30, 12\%}) \\
PV-OA = ($129,772.08) \\
PV-OA = $23,000 (5.65022 – 3.60478) \\
PV-OA = $63,000 (8.05518 – 5.65022) \\
PV-OA = $43,000 (8.24378 – 8.05518) \\
PV-OA = ($129,772.08) (3.60478) \\
PV-OA = $23,000 (2.04544) \\
PV-OA = $63,000 (2.40496) \\
PV-OA = $43,000 (.18860) \\
PV-OA = ($129,772.08) \\
PV-OA = $47,045.12 \\
PV-OA = $151,512.48 \\
PV-OA = $8,109.80
\]

Present value of future net cash inflows:

\[
\begin{array}{cccc}
$(129,772.08) & 47,045.12 & 151,512.48 & 8,109.80 \\
\end{array}
\]

$76,895.32

Nicole Bobek should accept no less than $76,895.32 for her vineyard business.