6-1

\[ C = \$15 + \$15 \times (A/P, 10\%, 4) \]
\[ = \$15 + \$15 \times (1.381) = \$35.72 \]

6-2

\[ B = [\$100 + \$100 \times (F/P, 15\%, 4)] \times (A/F, 15\%, 5) \]
\[ = [\$100 + \$100 \times (1.749)] \times (0.1483) = \$40.77 \]

6-5

\[ A = \$100 \times (A/P, 3.5\%, 3) \]
\[ = \$100 \times (0.3569) = \$35.69 \]
$$500 = D \cdot (F/A, 12\%, 3) + 0.5D + D \cdot (P/A, 12\%, 2)$$
$$= D \cdot (3.374 + 0.5 + 1.690)$$
$$D = \frac{500}{5.564}$$
$$= \$89.86$$

**6-17**

A = $44

A = $84

F = $2,600

Compute the equivalent future sum for the $2,600 and the four $44 payments at F.

$$F = \$2,600 \cdot (F/P, 1\%, 4) + \$44 \cdot (F/A, 1\%, 4)$$
$$= \$2,600 \cdot 1.041 + \$44 \cdot 4.060 = \$2,527.96$$

This is the amount of money still owed at the end of the four months. Now solve for the unknown n.

$$2,527.96 = \$84 \cdot (P/A, 1\%, n)$$

$$(P/A, 1\%, n) = \$2,572.96/\$84 = 30.09$$

From the 1% interest table n is almost exactly 36. Thus 36 payments of $84 will be required.
A diagram is essential to properly see the timing of the 11 deposits:

These are beginning of period deposits, so the compound interest factors must be adjusted for this situation.

\[
P_{\text{now-1}} = 500,000 \times (P/F, 1\%, 12) = 500,000 \times (0.8874) = 443,700
\]

\[
A = P_{\text{now-1}} \times (A/P, 1\%, 11) = 443,700 \times (0.0951) = 42,196
\]

Quarterly beginning of period deposit = $42,196

\[
P = 40 \times (P/A, 10\%, 4) - 10 \times (P/G, 10\%, 4) + [20 \times (P/A, 10\%, 3) + 10 \times (P/G, 10\%, 3)]
\]

\[
\begin{align*}
&= 40 \times (3.170) - 10 \times (4.378) + [20 \times (2.487) + 10 \times (2.329)] \times (0.6830) \\
&= 132.90
\end{align*}
\]

\[
A = 132.90 \times (A/P, 10\%, 7)
\]

\[
= 132.90 \times (0.2054)
\]

\[
= 27.30
\]
Given:

P = −$150,000
A = −$2,500
F_4 = −$20,000
F_5 = −$45,000
F_8 = −$10,000
F_{10} = +$30,000

EUAC = $150,000(A/P, 5%, 10) + $2,500 + $20,000(P/F, 5%, 4)(A/P, 5%, 10) +
$45,000(P/F, 5%, 5)(A/P, 5%, 10) + $10,000(P/F, 5%, 8)(A/P, 5%, 10) −
$30,000 (A/F, 5%, 10)
= $19,425 + $2,500 + $2,121 + $4,566 + $876 − $2,385
= $27,113

6-27

(a) EUAC = $6,000 (A/P, 8%, 30) + $3,000 (labor) + $200 (material)
− 500 bales ($2.30/bale) − 12 ($200/month trucker)
= $182.80

Therefore, baler is not economical.

(b) The need to recycle materials is an important intangible consideration. While the project does not meet the 8% interest rate criterion, it would be economically justified at a 4% interest rate. The baler probably should be installed.
EUAC Comparison

**Gravity Plan**
Initial Investment: = $2.8 million (A/P, 10%, 40)
= $2.8 million (0.1023) = $286,400
Annual Operation and maintenance = $10,000
Annual Cost = $296,400

**Pumping Plan**
Initial Investment: = $1.4 million (A/P, 10%, 20)
= $1.4 million (0.1023) = $143,200

Additional investment in 10th year:
= $200,000 (P/F, 10%, 10) (A/P, 10%, 40)
= $200,000 (0.3855) (0.1023) = $7,890

Annual Operation and maintenance = $25,000
Power Cost: = $50,000 for 40 years = $50,000

Additional Power Cost in last 30 years:
= $50,000 (F/A, 10%, 30) (A/F, 10%, 40)
= $50,000 (164.494) (0.00226) = $18,590

Annual Cost = $244,680

*Select the Pumping Plan.*

---

6-36

(a)

\[ A = 9,000 \times \frac{1 - (1 + 0.01)^{-24}}{0.01} \]
\[ A = 9,000 \times 0.4762 \]
\[ A = 4,286 \text{ per month} \]
Note that interest is compounded quarterly

\[ A' = \frac{9,000}{1 + \frac{0.015}{4}} \]

\[ = 9,000 \times (1.00375)^8 \]

\[ = 9,000 (1.186) \]

\[ = 1,067.40 \]

Monthly Deposit = \( \frac{1}{2} \) of \( A' = \frac{(1,067.40)}{3} = $355.80 \text{/month} \)

(c) In part (a) Bill Anderson’s monthly payment includes an interest payment on the loan. The sum of his 24 monthly payments will exceed $9,000.

In part (b) Doug James’ savings account monthly deposit earns interest for him that helps to accumulate the $9,000. The sum of Doug’s 24 monthly deposits will be less than $9,000.

---

6-37

With neither input nor output fixed, maximize (EUAB – EUAC)

Continuous compounding capital recovery:

\[ A = P \left( \frac{(e^r (e^n - 1))}{(e^r - 1)} \right) \]

For \( r = 0.15 \) and \( n = 5 \),

\[ \left( \frac{(e^{0.15} (e^{0.15} - 1))}{(e^{0.15} - 1)} \right) = \left( \frac{(e^{0.15} (0.30672))}{(0.30672 - 1)} \right) \]

\[ = 0.30672 \]

Alternative A

EUAB – EUAC = $845 - $3,000 (0.30672) = -$75.16

Alternative B

EUAB – EUAC = $1,400 - $5,000 (0.30672) = -$133.60

To maximize (EUAB – EUAC), choose alternative A (less negative value).
Alternative A
EUAB – EUAC = $10 – $100 (A/P, 8%, ∞) = $10 – $100 (0.08) = +$2.00

Alternative B
EUAB – EUAC = $17.62 – $15 (A/P, 8%, 20) = $17.62 – $150 (0.1019) = +$2.34

Alternative C
EUAB – EUAC = $55.48 – $200 (A/P, 8%, 5) = $55.48 – $200 (0.2505) = +$5.38

Select C.

It is important to note that the customary “identical replacement” assumption is not applicable here.

Alternative A
EUAB – EUAC = $15 – $50 (A/P, 15%, 10) = $15 – $50 (0.1993) = +$5.04

Alternative B
EUAB – EUAC = $60 (P/A, 15%, 5) (A/P, 15%, 10) – $180 (A/P, 15%, 10) = +$4.21

Choose A.

Check solution using NPW:
Alternative A
NPW = $15 (P/A, 15%, 10) – $50 = +$25.28

Alternative B
NPW = $60 (P/A, 15%, 5) – $180 = +$21.12
Use 20-year analysis period.

**Net Present Worth Approach**

\[
\text{NPW}_{\text{Mas.}} = -250 - (250 - 10) [(P/F, 6\%, 4) + (P/F, 6\%, 8) + (P/F, 6\% \times 16)] + 10 (P/F, 6\%, 20) - 20 (P/A, 6\%, 20)
\]

\[
= -250 - 240 [0.7921 + 0.6274 + 0.4970 + 0.3936] + 10 (0.0263)
\]

\[
= 20 (11.470)
\]

\[
= -1,031
\]

\[
\text{NPW}_{\text{BRK}} = -1,000 - 10 (P/A, 6\%, 20) + 100 (P/F, 6\%, 20)
\]

\[
= -1,000 - 10 (11.470) + 100 (0.3118)
\]

\[
= -1,083
\]

Choose Masonite to save $52 on Present Worth of Cost.

**Equivalent Uniform Annual Cost Approach**

\[
\text{EUAC}_{\text{Mas.}} = 20 + 250 (A/P, 6\%, 4) - 10 (A/F, 6\%, 4)
\]

\[
= 20 + 250 (0.2886) - 10 (0.2286)
\]

\[
= 90
\]

\[
\text{EUAC}_{\text{BRK}} = 10 + 1,000 (A/P, 6\%, 20) - 100 (A/F, 6\%, 20)
\]

\[
= 10 + 1,000 (0.872) - 100 (0.0272)
\]

\[
= 94
\]

Choose Masonite to save $4 per year.