of \$10K for the first 3 years only. (Annualized cash flows can only be used if they start in year 1. Otherwise years 4 and 5 would have to be dealt with as independent future payments of an additional \$10K which is equally valid but creates a bit more work.) Set the present value equal to zero and determine the revenue that will make the ROI 18%. Use the 18% Factor Table as needed.

$$PV = -\$50,000 - \$40,000\,(P/A, 18\%, 5) + \$10,000\,(P/A, 18\%, 3) + R\,(P/A, 18\%, 5) = 0$$

$$PV = -\$50,000 - \$40,000\,(3.1272) + \$10,000\,(2.1743) + R\,(3.1272) = 0$$

$$-\$50,000 - \$125,088 + \$21,743 + R\,(3.1272) = 0$$

$$R\,(3.1272) = \$153,345$$

$$R = \$49,036$$

Answer B

45.19 A company undertakes an energy saving initiative that costs \$100,000 up front and \$1000 per month for recurring service. The project will save \$30,000 per year. The equipment involved in the upgrade will have a salvage value of \$40,000 after 12 years. What is the annual savings for the project if the interest rate is 7%?

A. \$3,200

B. \$7,600

C. \$18,600

D. \$32,800

Draw a cash flow diagram or make a list of cash flows. Since the problem is asking for annual savings, this solution treats costs as negative and revenues as positive.

For year 0 there is a payment for the original purchase of -\$100K.

For years 1 through 12 there is an annualized cost of \$1K per month which equals \$12K per year and a savings of \$30K per year for a net annual savings of \$18K per year.

For year 12 there is a positive cash flow of \$40K for the salvage value.

Write an expression for the annualized savings. Only the initial cost and salvage value need to be transformed to annualized figures.

$$EUAC = \$18,000 - \$100,000\,(A/P, 7\%, 12) + \$40,000\,(A/F, 7\%, 12)$$

Since there is no Factor Table for 7%, there are two workarounds for calulating the cash flow factors needed. The first is to use the 6% and 8% tables and interpolate i.e. take the average to get the 7% cash flow factors.

$N = 12$	A/P	A/F
6%	0.1193	.0593
7%	0.1260	0.0560
8%	0.1327	0.0527

The alternative is to use the Economic Factor Conversions table to find A/F and A/P.

$$(A/P, 7\%, 12) = \frac{i(1+i)^n}{(1+i)^n - 1} = \frac{0.07(1.07)^{12}}{(1.07)^{12} - 1} = 0.1259$$

$$(A/F, 7\%, 12) = \frac{i}{(1+i)^n - 1} = \frac{0.07}{(1.07)^{12} - 1} = 0.0559$$

Determine the annual savings.

$$EUAC = \$18,000 - \$100,000(0.1259) + \$40,000(0.0559) = \$7646$$

Answer B

45.20 A company invests $100K to make a product which will generate $25K of annual revenue over the next 12 years. Expenses will be $5,000 per year. The manufactured product is depreciated over the 12 years using straight-line depreciation. There is no salvage value as all the product is expected to be sold. The income tax rate is 35%. What is the after-tax rate of return?

A. -0.5%

B. 5.9%

C. 11.7%

D. 18.3%

Draw a cash flow diagram or make a list of cash flows.

In Year 0, there is an initial payment of $100K (negative).

In Years 1-12, there is a net profit before tax of $\$25K - \$5K = \$20K$. To calculate the tax, it is necessary to consider the depreciation. Depreciation is not an actual cash flow; rather, it is applied as a deduction from the profits, thereby lowering the taxable income for that year. Depreciation is like a fictitious expense which provides tax benefits of offsetting income without actually spending in that year. Straight line deperciation is calculated using the formula below, where C is the initial cost, S_n is the salvage value (if applicable), and n is the number of years.

$$D_j = \frac{C - S_n}{n} = \frac{\$100,000 - \$0}{12} = \$8333$$

Determine the tax basis (i.e. taxable income).

$$Tax\,basis = \$20,000 - \$8333 = \$11,667$$