$$PV = -\$100,000 + \$10,000\,(5.7590) + \$100,000\,(0.3855) = -\$3,860 < 0$$

Since the present value is *less* than zero, the interest rate must be *lower*, thereby discounting the future (positive) cash flows *less* and *increasing* the present value.

Looking at the answer choices, it is possible at this stage to eliminate choices A and D as they are outside the range of 8-10% which is now known to contain the interest rate that drives the present to zero. Furthermore, it is possible to infer that the interest rate will be closer to 10% than 8% since the resulting present value obtained for $i = 10\%$ was closer to zero.

If time allows, interpolate and solve for i.

i [%]	PV [$]
8	8,789
i	0
10	−3,860

$$\frac{i-8}{10-8} = \frac{0-8,789}{-3,860-8,789} = 0.695$$

$$i - 8 = 1.39$$

$$i = 9.4\%$$

Answer C

45.18 A contractor leases a piece of equipment for $50K down and $30K per year for a project expected to take 3 years. After the third year, the equipment is still needed due to a schedule delay and the contractor must pay $40K per year to continue to lease for the fourth and fifth years. After the fifth year, the project is completed and the equipment is returned. How much annual revenue is required to ensure the project has a 18% return on investment?

A. $33K

B. $44K

C. $49K

D. $56K

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

For year 0 there is a payment (negative cash flow) of -$50K.

For years 1 through 3 there is a negative cash flow of -$30K.

For years 4 and 5 there is a negative cash flow of -$40K.

For years 1 through 5 there is a positive cash flow of R, the unknown revenue.

Write an expression for the present value. For convenience, overstate the costs in years 1 through 3 by showing a negative -$40K cash flow for the entire 5 years, then offset with a *positive* cash flow

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.