

Ch3 HW

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1

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Pittsburgh Custom Products (PCP) purchased a new machine for ram-cambering large I beams. PCP expects to bend 75.0 beams at \$1,400 per beam in each of the first 3 years, after which it expects to bend 100 beams per year at \$2,800 per beam through year 10.00. If the company's minimum attractive rate of return is 14.00% per year, what is the present worth of the expected revenue? (Round the final answer to three decimal places.)

The present worth of the expected revenue is \$ 1054132.086 ✓.

Explanation

$$P = 75 (1,400) \left(\frac{P}{A}, 14\%, 3 \right) + 100 (2,800) \left(\frac{P}{A}, 14\%, 7 \right) \left(\frac{P}{P}, 14\%, 3 \right)$$

$$P = (75 \times 1,400 \times (2.322)) + (100 \times (2,800) \times (4.288) \times (0.675))$$

$$P = \$1,054,227$$

Solution

The present worth of the expected revenue is \$1054226.776.



2

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Hint



References

A maker of micromechanical systems can reduce product recalls by 10% with the installation of new packaging equipment. If the cost of the new equipment is expected to be \$45,000, 5.00 years from now, how much could the company afford to spend now (instead of 5.00 years from now) at a minimum attractive rate of return of 5.000% per year? (Round the final answer to three decimal places.)

The sum of money the company could afford to spend now is \$

Explanation

$$P = 45,000 \left(\frac{P}{F}, 5\%, 5 \right)$$

$$P = 45,000 (0.784)$$

$$P = \$35,259$$

Solution

The sum of money the company could afford to spend now is \$35258.677.



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3

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Hint



References

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A commercial real estate developer plans to borrow money to finance an upscale mall in an exclusive area of the city. The developer plans to get a loan that will be repaid with uniform payments of \$325,000 beginning in year 2 and ending in year 16. How much will a bank be willing to loan at an interest rate of 9.00% per year? (Round the final answer to three decimal places.)

The bank will be willing to loan the developer a sum of \$ 2,403,416 ✓.

Explanation

$$P = 325,000 \left(\frac{P}{A}, 9\%, 15 \right) \left(\frac{P}{F}, 9\%, 1 \right)$$

$$P = 325,000 (8.061) (0.917)$$

$$P = \$2,403,416$$

Solution

The bank will be willing to loan him a sum of \$2,403,416.

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4

Find the value of x that makes the equivalent annual worth in years 1 through 8.00 equal to \$500 per year. Use an interest rate of 8.00% per year.

The cash flows in year 0 and year 8.00 has an unknown value x , and 1 through 7.00 has an annual worth of \$500. (Round the final answer to three decimal places.)

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The value of x is determined to be \$.

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Hint

References

Explanation

Find P in year 0 and then determine P , so that $A = \$500$.

$$P_0 = x + 500 \left(\frac{P}{A}, 8\%, 7 \right) + x \left(\frac{P}{P}, 8\%, 8 \right)$$

$$A = P_0 \left(\frac{A}{P}, 8\%, 8 \right) = 500$$

Substitute for P_0 in the given equation.

$$\left(x + 500 \left(\frac{P}{A}, 8\%, 7 \right) + x \left(\frac{P}{P}, 8\%, 8 \right) \right) \times \left(\frac{A}{P}, 8\%, 8 \right) = 500$$

$$(x + (500 \times 5.206) + x(0.54)) \times (0.174) = 500$$

v = 175 321

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5

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References

What is the equivalent annual cost in years 1 through 11.00 of a contract that has a first cost of \$64,000 in year 0 and annual costs of \$19,000 in years 3 through 11.00? Use an interest rate of 15.00% per year. (Round the final answer to three decimal places.)

The equivalent annual cost is determined to be \$.

Explanation

$$F = 64,000 \left(\frac{F}{P}, 15\%, 11 \right) + 19,000 \left(\frac{F}{A}, 15\%, 9 \right)$$

$$F = 64,000 \times (4.652) + 19,000 \times (16.786)$$

$$F = \$616,684$$

$$A = 616,684 \left(\frac{A}{F}, 15\%, 11 \right)$$

$$A = 616,684 \times 0.041$$

$$A = \$25,327$$

Solution



6

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Marcia observed the following cash flow series (in \$1000 units) in an accounting report at work. The actual amounts in years 1 and 4 are missing; however, the report states that the present worth in year 0 was \$390,000 at an interest rate of 13.00% per year. Calculate the value of x . (Enter your answer in thousands of dollars.)

Year	0	1	2	3	4	5	6
Cash flow, \$×1000	40	x	40	40	x	40	40



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Hint



References

The value of x is determined to be \$ **166,878** .

Explanation

$$P = 40,000 + x \left(\frac{P}{F}, 13\%, 1 \right) + 40,000 \left(\frac{P}{A}, 13\%, 2 \right) \left(\frac{P}{F}, 13\%, 1 \right) + x \left(\frac{P}{F}, 13\%, 4 \right) + 40,000 \left(\frac{P}{A}, 13\%, 2 \right) \left(\frac{P}{F}, 13\%, 4 \right)$$

$$390,000 = 40,000 + (x(0.885)) + 40,000 \times (1.668) \times (0.885) + (x(0.613)) + 40,000 \times (1.668) \times (0.613)$$

$$x = \$166,878$$

Solution

The value of x is determined to be **\$166,878**.





7

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A company that manufactures air-operated drain valve assemblies currently has \$150,000 available to pay for plastic components over a 5-year period. If the company spent only \$52,000 in year 1, what uniform annual amount can the company spend in each of the next 4 years to deplete the entire budget? Let $i = 14.00\%$ per year. (Round the final answer to three decimal places.)

The uniform annual amount the company can spend is \$

Explanation

Move \$150,000 to year 1, subtract \$52,000, and find the equivalent over the remaining 4 years.

$$A = (150,000 \left(\frac{F}{P}, 14\%, 1 \right) - 52,000) \left(\frac{A}{P}, 14\%, 4 \right)$$

$$A = (150,000 \times (1.14) - 52,000) \times (0.343)$$

$$A = \$40,841$$

Solution

The uniform annual amount the company can spend is \$40841.369.

[Show correct answers](#)

8

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A construction management company is examining its cash flow requirements for the next few years. The company expects to replace software and in-field computing equipment at various times. Specifically, the company expects to spend \$7,000 1 year from now, \$10,000 3 years from now, and \$20,000 each year in years 6 through 10. What is the future worth in year 10 of the planned expenditures, at an interest rate of 15.00% per year? (Round the final answer to three decimal places.)

The future worth is determined to be \$



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Hint



References

Explanation

$$F = 7,000 \left(\frac{F}{P}, 15\%, 9 \right) + 10,000 \left(\frac{F}{P}, 15\%, 7 \right) + 20,000 \left(\frac{F}{A}, 15\%, 5 \right)$$

$$F = 7,000 \times (3.518) + 10,000 \times (2.66) + 20,000 \times (6.742)$$

$$F = \$186,073$$

Solution

The future worth is determined to be \$186072.958.

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9

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Hint

References

A recently hired chief executive officer wants to reduce future production costs to improve the company's earnings, thereby increasing the value of the company's stock. The plan is to invest \$78,000 now and \$60,000 in each of the next 3.00 years to improve productivity. By how much must annual costs decrease in years 4.00 through 15.00 to recover the investment plus a return of 14.00% per year? (Round the final answer to three decimal places.)

The annual cost decreases by \$.

Explanation

$$A = \left(78,000 \left(\frac{F}{P}, 14\%, 3 \right) + 60,000 \left(\frac{F}{A}, 14\%, 3 \right) \right) \left(\frac{A}{P}, 14\%, 12 \right)$$

$$A = (78,000 \times (1.482) + 60,000 \times (3.44)) \times (0.177)$$

$$A = \$56,876$$

Solution

The annual cost decreases by \$56876.293.

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10

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Hint

References

For the cash flows shown, calculate the future worth in year 8.00 using $i = 14.00\%$ per year. (Round the final answer to three decimal places.)

Year	0	1	2	3	4	5	6
Cash flow, \$	200	200	200	200	300	300	300

The future worth is calculated to be \$ ✓.

Explanation

First, find P in year 0 and then move to year 8.

$$P = 200 + 200 \left(\frac{P}{A}, 14\%, 3 \right) + 300 \left(\frac{P}{A}, 14\%, 3 \right) \left(\frac{P}{P}, 14\%, 3 \right)$$

$$P = 200 + 200 \times (2.322) + 300 \times (2.322) \times (0.675)$$

$$P = \$1,134.437$$

$$F = 1,134.437 \left(\frac{F}{P}, 14\%, 8 \right)$$

$$F = 1,134.437 \times (2.853)$$

$$F = \$3,236$$

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11

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For the cash flows shown in the diagram, determine the value of x and $2x$ that will make the future worth in year 14.00 equal to \$150,000. (Round the final answers to three decimal places.)

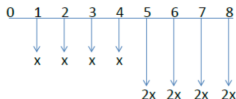
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Hint

References

 $i = 10\%$ per year

The value of x is determined to be \$ ✓.

The value of $2x$ is determined to be \$ ✓.

Explanation

$$150,000 = x \left(\frac{F}{A}, 10\%, 4 \right) \left(\frac{F}{P}, 10\%, 10 \right) + 2x \left(\frac{F}{A}, 10\%, 4 \right) \left(\frac{F}{P}, 10\%, 6 \right)$$

$$150,000 = x \times (4.641) \times (2.594) + 2x \times (4.641) (1.772)$$

$$x = \$5,267$$

$$2x = \$10,533$$



12

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Hint



References

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For the cash flows shown, calculate the future worth in year 11.00 at $i = 11.00\%$ per year. (Round the final answer to three decimal places.)

Year	0	1	2	3	4	5	6	7
Cash flow, \$	500	500	500	0	800	800	800	800

The future worth is calculated to be \$

Explanation

$$F = 500 \left(\frac{F}{A}, 11\%, 3 \right) \left(\frac{F}{P}, 11\%, 9 \right) + 800 \left(\frac{F}{A}, 11\%, 4 \right) \left(\frac{F}{P}, 11\%, 4 \right)$$

$$F = 500 \times (3.342) \times (2.558) + 800 \times (4.71) \times (1.518)$$

$$F = \$9,994$$

Solution

The future worth is calculated to be \$9994.370.

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13

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Hint

References

A manufacturer of industrial grade gas handling equipment wants to have \$600,000 in an equipment replacement contingency fund 10 years from now. If the company plans to deposit a uniform amount of money each year beginning now and continuing through year 10.00 (total of 11.00 deposits), what must be the size of each deposit? Assume the account grows at a rate of 11.00% per year. (Round the final answer to three decimal places.)

The size of each deposit should be \$ ✓.

Explanation

$$A = 600,000 \left(\frac{A}{F}, 11\%, 11 \right)$$

$$A = 600,000 \times (0.051)$$

$$A = \$30,673$$

Solution

The size of each deposit should be \$30672.604.



14

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Hint



References

How much money would be accumulated 16.00 years from now from deposits of \$17,000 per year for 5 consecutive years, starting 4.000 years from now, if the interest rate is 12.00% per year? (Round the final answer to three decimal places.)

The amount that would be accumulated is determined to be \$.

Explanation

$$F_8 = 17,000 \left(\frac{F}{A}, 12\%, 5 \right)$$

$$F_8 = 17,000 \times (6.353)$$

$$F_8 = \$107,998$$

$$F_{16} = 107,998 \left(\frac{F}{P}, 12\%, 8 \right)$$

$$F_{16} = 107,998 \times (2.476)$$

$$F_{16} = \$267,400$$

Solution



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15

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Hint



References

Lifetime savings accounts, known as LSAs, allow people to invest after-tax money without being taxed on any of the gains. If an engineer invests \$19,000 now and \$19,000 each year for the next 16.00 years, how much will be in the account immediately after the last deposit, provided the account grows by 9.00% per year? (Round the final answer to three decimal places.)

After the last deposit, the balance in the account will be \$ ✓.

Explanation

$$F = 19,000 \left(\frac{F}{A}, 9\%, 17 \right)$$

$$F = 19,000 \times (36.974)$$

$$F = \$702,500$$

Solution

After the last deposit, the balance in the account will be \$702500.387.

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16

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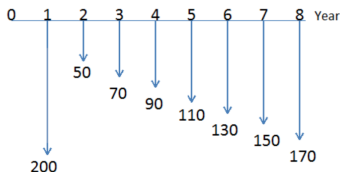
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Hint

References

Show correct answers

Find the present worth in year 0 for the cash flows shown. Let $i = 15.00\%$ per year. (Round the final answer to three decimal places.)The present worth is determined to be \$ ✓.

Explanation

$$P = 200 \left(\frac{P}{F}, 15\%, 1 \right) + \left(50 \left(\frac{P}{A}, 15\%, 7 \right) + 20 \left(\frac{P}{F}, 15\%, 7 \right) \right) \left(\frac{P}{F}, 15\%, 1 \right)$$

$$P = 200 \times (0.86957) + (50 \times (4.16042) + 20 (10.1924)) \times (0.86957)$$

$$P = \$532.06$$

Solution

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Hint

References

A software company that installs systems for inventory control using RFID technology spent \$800,000 per year for the past 3 years in developing their latest product. The company optimistically hopes to recover its investment in 5 years on a single contract beginning immediately (year 0). The company is negotiating a contract that will pay \$280,000 now and a to-be-agreed-upon annual increase of a constant amount each year through year 5. How much must the income increase (an arithmetic gradient) each year if the company wants to realize a return of 14.00% per year? (Round the final answer to three decimal places.)

The income must increase by \$.

Explanation

Development cost, year 0 = $800,000 \left(\frac{P}{A}, 14\%, 3 \right)$

Development cost, year 0 = $800,000 \times (3.44)$

Development cost, year 0 = \$2,751,680

Present worth of contract, year -1 = $280,000 \left(\frac{P}{A}, 14\%, 6 \right) + G \left(\frac{P}{G}, 14\%, 6 \right)$

Present worth of contract, year -1 = $280,000 \times (3.889) + G (8.251)$

Move the development cost to year -1 and set it equal to the income.

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18

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References

A uniform series of payments begins in year four and ends in year 11. If you use the P/A factor with $n = 8$, the P value you get will be located in year

Multiple Choice

☐ 0.

☐ 5.

☒ 3.

☐ 4.



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19

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References

For the cash flows shown, you have been asked to calculate the present worth (in year 0) using $i = 10\%$ per year. Which of the following solutions is *not correct*?

Year	0	1	2	3	4	5	6
Cash flow,	200	200	200	200	300	300	300
\$							

Multiple Choice



$$P = [200(P/A, 10\%, 7) + 100(P/A, 10\%, 3)](F/P, 10\%, 1).$$



$$P = 200 + 200(P/A, 10\%, 3) + 300(P/A, 10\%, 3)(P/F, 10\%, 3).$$



$$P = 200(P/A, 10\%, 4) + 300(P/A, 10\%, 3)(P/F, 10\%, 3).$$



$$P = [200(F/A, 10\%, 7) + 100(F/A, 10\%, 3)](P/F, 10\%, 6).$$

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20

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References

You plan to pay \$38,000 cash for the new truck you want to buy five years from now. You are a very astute investor; all your money earns at 20% per year. If you have already saved \$9,500, the amount your rich aunt has to give you two years from now (as a graduation present) in order for you to have the total amount of \$38,000 is closest to

Multiple Choice

☒ \$8,310.

☐ \$9,880.

☐ <\$7,500.

☐ \$7,654.

Explanation

$$9,500 (F/P, 20\%, 5) + x (F/P, 20\%, 3) = 38,000$$

$$9,500 (2.4883) + x (1.7280) = 38,000$$

$$x = \$8311$$

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21

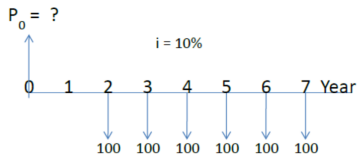
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References

For the diagram shown below, the respective values of n to calculate the present worth in year 0 by the equation $P_0 = 100 (P/A, 10\%, n_1) (P/F, 10\%, n_2)$ are



Multiple Choice

☐ $n_1 = 7, n_2 = 1.$ ☐ $n_1 = 7, n_2 = 2.$ ☐ $n_1 = 5, n_2 = 2.$ ☒ $n_1 = 6, n_2 = 1.$

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22

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References

An arithmetic gradient has cash flows of \$1,000 in year 4, \$1,200 in year 5, and amounts increasing by \$200 per year through year 10. If you use the factor $200(P/G, 10\%, n)$ to find P_G in year 3, the value of n you have to use in the P/G factor is

Multiple Choice

☐ 9.☐ 8.☒ 7.☐ 10.



23

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References

In order to establish a contingency fund to replace equipment after unexpected breakdowns, a manufacturer of thin-wall plastic bottles plans to deposit \$100,000 now and \$150,000 two years from now into an investment account. Assuming the account grows at 15% per year, the equation that does *not* represent the future value of the account in year 5 is

Multiple Choice



$$F = 100,000(F/P, 15\%, 5) + 150,000(F/P, 15\%, 3).$$



$$F = [100,000(F/P, 15\%, 2) + 150,000](F/P, 15\%, 3).$$



$$F = [100,000 + 150,000(P/F, 15\%, 2)](F/P, 15\%, 5).$$



$$F = 100,000(F/P, 15\%, 5) + 150,000(F/P, 15\%, 2).$$



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24

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References

You found a report stating that the equivalent annual worth of chemical costs associated with a water treatment process were \$125,000 per year for a 5-year period. The report stated that the cost in year 1 was \$190,000 and the cost decreased by a uniform amount each year over that 5-year period. However, it did not say how much the decrease was each year. If the interest rate was 20% per year, the amount of the annual decrease, G , is closest to

Multiple Choice



\$39,622.



\$27,358.



\$31,136.



\$33,093.

Explanation

$$125,000 = 190,000 - G (A/G, 20\%, 5)$$

$$125,000 = 190,000 - G (1.6405)$$

$$G = \$39,662$$

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25

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References

Assume you borrow \$10,000 today and promise to repay the loan in two payments, one in year 2 and the other in year 4, with the one in year 4 being only half as large as the one in year 2. At an interest rate of 10% per year, the size of the payment in year 4 is closest to

Multiple Choice

☐ \$3,850.☒ \$4,280.☐ \$3,690.☐ \$3,975.**Explanation**

$$10,000 = 2x (P/F, 10\%, 2) + x (P/F, 10\%, 4)$$

$$10,000 = 2x (0.8264) + x (0.6830)$$

$$2.3358x = 10,000$$

$$x = \$4281$$

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26

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References

Wanamaker-DuChang Products is planning to upgrade an aging manufacturing operation for safety compliance five years from now at an estimated cost of \$100,000. If the company plans to deposit money into an account each year for four years beginning two years from now (first deposit is in year 2) to pay for the expansion, the amount of the deposit at 10% per year interest is closest to

Multiple Choice



\$16,380.



\$14,392.



\$21,547.



\$30,211.

Explanation

$$\begin{aligned} A &= 100,000 (A/F, 10\%, 4) \\ &= 100,000 (0.21547) \\ &= \$21,547 \end{aligned}$$



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Submitted

15/15 Total points awarded Help Exit

27

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References

The maker of a motion-sensing towel dispenser is considering adding new products to enhance offerings in the area of touchless technology. If the company does not expand its product line now, it will definitely do so in 2 years. Assume the interest rate is 10% per year. The amount the company can afford to spend *now* if the cost 2 years from now is estimated to be \$100,000 is closest to

Multiple Choice

☐ \$75,130.☐ \$91,000.☒ \$82,640.☐ \$93,280.**Explanation**

$$\begin{aligned} P &= 100,000 (P/F, 10\%, 2) \\ &= \$100,000 (0.8264) \\ &= \$82,640 \end{aligned}$$