

payments be? (\$288.86)

20 You are given two loans, with each loan to be repaid by a single payment in the future.

The first loan is to be repaid by a single payment of \$3,000 at the end of four years. The interest on this loan is accrued at a semi-annual rate of 5%.

The second loan is to be repaid by a single payment of \$4,000 at the end of five years. The interest on this loan is accrued at a semi-annual rate of 4%.

Basically, $3000 \leftarrow 4000$ is replaced by 2 x's. so equal k of the 2 loans to the x's at appropriate time-wise.

Now suppose that the two loans are to be consolidated (i.e. considered as one). The consolidated loan is to be repaid by two equal instalments of size X, with interest at 6% per half year. The first payment is due immediately and the second payment is due one year from now. Calculate the instalment X. (\$2,504.12)

21 A consumer buys goods worth \$1,500, paying \$500 down and \$500 at the end of six months. If the store charges interest at $r_{1/2} = 1.5\%$ on the unpaid balance, what final payment will be necessary at the end of one year? (\$648.90)

22 If money is worth 0.028% daily, what equal payments X at the end of six months and two years will equitably replace the obligations: \$1,000 due now and \$2,000 due in three years? (\$1,401.57)

23 To pay off a loan of \$5,000 at a monthly rate of 1.25%, Mrs. Jones agrees to make three payments in two, five and ten months respectively. The second payment is to be double the first and the third payment is to be triple the first. What is the size of the first payment? (\$908.34)

24 The management of a company must decide between two proposals, on the basis of the following information:

Proposal	Investment	Net Cash Inflow at the End of		
		Year 1	Year 2	Year 3
A	80 000	95 400	39 000	12 000
B	100 000	35 000	58 000	80 000

Advise management regarding the proposal that should be selected, assuming that on projects of this type the company can earn $r = 14\%$. (Proposal A is the best. Hint: Calculate the Net Present Value (Link to Investopedia) of each proposal and choose the proposal with the highest Net Present Value)

25 A company wishes to replace the following three debts:

\$20,000 due on July 1, 2011

\$30,000 due on January 1, 2014

\$35,000 due on July 1, 2017

with a single debt of \$Y payable on January 1, 2014. Calculate the value of Y if $r_{1/2} = 6\%$ prior to January 1, 2014 and $r_{1/2} = 5\%$ after January 1, 2014. (\$81,638.36)

26 On June 1, 2016, Sheila borrows \$2,000 at 12% annually. She pays \$800 on August 1, 2016, \$400 on November 1, 2016 and \$500 on February 1, 2017. What is the balance due on April 1, 2017? (\$406.43)

27 \$1,000 was deposited on January 1, 2009 and \$2,000 was deposited in an account on July 1, 2011. Interest was paid on the account at 1.75% quarterly from January 1, 2009 to October 1, 2011 and at 2.5% semi-annually from that day onwards. Find the amount in the account on April 1, 2013 and the equivalent monthly interest rate actually earned on the investment over the whole investment period. (\$3,494.79; 0.49%)

28 A debt of €50,000 due in four years and a debt of €100,000 due in 11 years will be replaced by two equal payments in five and in ten years respectively. If money is worth 6% per annum (real rate of return), what are these payments? (€70,675.91)

29 You don't have the €10,000 you are due today. Your banker proposes to replace your debt by payments of €3,000 today and payments of €4,000 in one year and in two years respectively. Compute the real rate of return your banker charges. (9.38%)

Previous exam question

Elisabeth and Philip, a young couple, decide to rent a house and see how living together works out. As a starting budget, Elisabeth deposits € 10,000 on February 1 2019 and Philip deposits € 5,000 on March 1, 2019 on a savings account with an annual rate of return of 2%. On April 1, 2019, they buy some new furniture and on July 1, 2019 they buy some other decorating stuff. If the cost of the decoration is half the cost of the furniture, how much can they spend maximum on the furniture if there is still € 3,000 on their savings account on September 1, 2019? (€ 8,057.24)

Handwritten solutions for the problems above, including cash flow diagrams, equations, and calculations.

Problem 20: Cash flow diagram showing payments of 3000 at t=4 and 4000 at t=5. Equation: $3000 = \frac{X}{1.025^4} + \frac{X}{1.025^5} + \frac{X}{1.025^6}$. Solution: $X = 288.86$.

Problem 21: Cash flow diagram showing payments of 500 at t=0, 500 at t=0.5, and a final payment at t=1. Equation: $1500 = 500 + \frac{500}{(1.015)^{0.5}} + \frac{X}{(1.015)^1}$. Solution: $X = 648.90$.

Problem 22: Cash flow diagram showing payments of 1000 at t=0 and 2000 at t=3. Equation: $1000 + \frac{2000}{(1.028)^3} = \frac{X}{(1.028)^{0.5}} + \frac{X}{(1.028)^2}$. Solution: $X = 1401.57$.

Problem 23: Cash flow diagram showing payments of 5000 at t=0, 2X at t=2, and 3X at t=10. Equation: $5000 = \frac{X}{1.0125} + \frac{2X}{1.0125^5} + \frac{3X}{1.0125^{10}}$. Solution: $X = 908.34$.

Problem 24: Cash flow diagrams for Proposal A and Proposal B. Proposal A: Investment 80,000 at t=0, inflows 95,400 at t=1, 39,000 at t=2, 12,000 at t=3. Proposal B: Investment 100,000 at t=0, inflows 35,000 at t=1, 58,000 at t=2, 80,000 at t=3. NPV calculations show Proposal A is better.

Problem 25: Cash flow diagram showing debts of 20,000 at t=0, 30,000 at t=3, and 35,000 at t=6. Equation: $20000 \cdot 1.06^3 + \frac{30000}{1.05^3} + \frac{35000}{1.05^6} = Y$. Solution: $Y = 81,638.36$.

Problem 26: Cash flow diagram showing a loan of 2000 at t=0, payments of 800 at t=0.25, 400 at t=0.5, and 500 at t=0.75. Equation: $2000 = \frac{800}{1.06^{0.25}} + \frac{400}{1.06^{0.5}} + \frac{500}{1.06^{0.75}} + \frac{X}{1.06^{1.0}}$. Solution: $X = 406.43$.

Problem 27: Cash flow diagram showing deposits of 1000 at t=0 and 2000 at t=2. Equation: $1000 \cdot 1.0175^{12} + 2000 \cdot 1.025^4 = X$. Solution: $X = 3494.79$.

Problem 28: Cash flow diagram showing debts of 50,000 at t=4 and 100,000 at t=11. Equation: $\frac{50000}{(1.06)^4} + \frac{100000}{(1.06)^{11}} = \frac{X}{(1.06)^5} + \frac{X}{(1.06)^{10}}$. Solution: $X = 70,675.91$.

Problem 29: Cash flow diagram showing a loan of 10,000 at t=0, payments of 3,000 at t=0, 4,000 at t=1, and 4,000 at t=2. Equation: $10000 = 3000 + \frac{4000}{(1+r)} + \frac{4000}{(1+r)^2}$. Solution: $r = 9.38\%$.

EXAM QUESTION: Cash flow diagram showing deposits of 10,000 at t=0 and 5,000 at t=1, and withdrawals of 2X at t=4, X at t=7, and 3,000 at t=9. Equation: $10000 \cdot 1.02^{12} + 5000 \cdot 1.02^{10} = 2X \cdot 1.02^4 + X \cdot 1.02^7 + 3000 \cdot 1.02^9$. Solution: $X = 8,057.24$.

$$10\,000 \cdot 1,001^3 + 5000 \cdot 1,001^6 = 3000 + 2x \cdot 1,001^5 + x \cdot 1,001^8$$

$$x = 4029,46$$

$$2x = 8058,92$$