

1) (5 points) Frank invests in the Darko Bank that offers a 1.25% simple interest rate. He invests \$550 at this rate for 16 years. How much is in the account after that time?

Simple  
interest

$$A = 550(1 + 0.0125 \cdot 16)$$

$$= \boxed{\$660}$$

2) (5 points) If \$12,300 was deposited into an account that offered a 1.75% annual interest rate compounded monthly for 8 years, how much would be in the account after that time and how much interest was earned? Be sure to label your answers.

Compound  
interest

$$A = 12300 \left(1 + \frac{0.0175}{12}\right)^{12 \cdot 8} = \boxed{\$14,146.92}$$

↳ total

$$14146.92 - 12300 = \boxed{\$1846.92}$$

↳ interest

3) (5 points) How much should be invested now so that in 15 years there will be \$7,800 in an account that offers a 2.35% annual interest rate compounded quarterly?

Present  
value

$$P = 7800 \left(1 + \frac{0.0235}{4}\right)^{-4 \cdot 15}$$

$$= \boxed{\$5488.50}$$

4) (5 points) Which is a better way to invest? Option A: 6.3% compounded semi-annually or Option B: 6.25% compounded monthly? Write answer as a percent rounded to two decimal places.

APY

A

$$APY = \left(1 + \frac{0.063}{2}\right)^2 - 1$$

$$= 6.40\%$$

B

$$APY = \left(1 + \frac{0.0625}{12}\right)^{12} - 1$$

$$= \boxed{6.43\%}$$

→  
better!

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5) (6 points each) Atrus borrowed \$155,000 for a home on a 30-year loan that carried a 6.25% annual interest rate compounded monthly. After 12 years, he was able to refinance down to a 15-year loan that carried a 2.85% annual interest rate compounded monthly.

- a) Determine the monthly payment for the beginning 30-year loan:      b) How much was left on the balance after paying for 12 years?

Amount

$$PMT = \frac{155000 \left( \frac{0.0625}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0625}{12} \right)^{-12 \cdot 30} \right)}$$

$$= \$954.36$$

$$155000 \left( 1 + \frac{0.0625}{12} \right)^{12 \cdot 12} - \frac{954.36 \left( \left( 1 + \frac{0.0625}{12} \right)^{12 \cdot 12} - 1 \right)}{\left( \frac{0.0625}{12} \right)}$$

$$= \$1,235,753.37$$

Amount owed on loan

- c) Determine the monthly payment for the new 15-year loan:      d) How much money did Atrus save by refinancing his mortgage?

Amount

$$PMT = \frac{1235753.37 \left( \frac{0.0285}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0285}{12} \right)^{-12 \cdot 15} \right)}$$

$$= \$844.50$$

$$954.36 \cdot 12 \cdot 18 - 844.50 \cdot 12 \cdot 15 = \$54,131.76$$

6) (4 points) Fill in the chart with the appropriate name of the formula. Assume that this chart is used for those formulas related to multiple deposits/payments:

	Working Years	Retirement Years
Know the Payment	\$	€
Do not Know the Payment	£	¥

7) (6 points each) Schmidt works out that he would need \$5,700 a month during his retired years. He is currently 25 years old and plans to work until his is 65. He assumes that he would need to make withdraws for 30 years past his retirement and that he's in a 25% tax bracket. Assuming he finds an account that will offer him a 6.25% annual interest rate compounded monthly for the entire duration of the account...

a) How much should he have in his account at retirement?

$$PV = \frac{5700 \left( 1 - \left( 1 + \frac{0.0625}{12} \right)^{-12 \cdot 30} \right)}{\left( \frac{0.0625}{12} \right)}$$

$$= \$9,257,496.68 \text{ After taxes}$$

b) How much should he deposit monthly during his working years to ensure he meets his goal?

$$PMT = \frac{1234332.91 \left( \frac{0.0625}{12} \right)}{\left( \left( 1 + \frac{0.0625}{12} \right)^{12 \cdot 40} - 1 \right)}$$

$$= \$578.98$$

PV of A

$$0.75x = 9257496.68$$

$$x = 1,234,332.91 \text{ before taxes}$$

keep 75%

Sinking fund

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8) Balthier is 30 years old and is working as a local sky pirate. He is able to deposit \$525 a month into a Pirate Bank 401-k which offers a 7.25% annual interest rate. He does this for 30 years. After that time, he will retire. He wishes, over the next 25 years, to take out equal withdraws until the account is emptied. Assume the interest rate is the same after retirement.

a) (12 points) What are the equal withdraws he is able to take out?

FV

$$FV = \frac{525 \left( \left( 1 + \frac{0.0725}{12} \right)^{12 \cdot 30} - 1 \right)}{\left( \frac{0.0725}{12} \right)}$$

$$= 672,993.98$$

b) (2 points) How much did he deposit before retirement?

$$\$ 525 \cdot 12 \cdot 30$$

$$= \$ 189,000$$

Mort

$$PMT = \frac{672,993.98 \left( \frac{0.0725}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0725}{12} \right)^{-12 \cdot 25} \right)} = \$ 4,864.45$$

c) (2 points) How much did he withdraw after retirement?

$$\$ 4,864.45 \cdot 12 \cdot 25$$

$$= \$ 1,459,335.00$$

d) (2 points) How much interest did he earn overall?

$$\$ 1,459,335.00 - 189,000$$

$$= \$ 1,270,335$$

9) (3 points each) Consider the problem below. For each part, only determine the formula that is needed to answer the question **but do not find the value, just write the name of the formula and explain why.**

*For the first 10 years of Holly's life, her parents were able to deposit \$275 a month into an account that offered a 8.25% annual interest rate compounded monthly. After that time, the parents could no longer contribute to the account and just allowed the balance to sit there for the next 8 years at the same interest rate and rate of compounding.*

a) Which formula would be needed to determine the amount of money in the account after the first 10 years? Explain why.

Future Value of Annuity - multiple payments to build up the account

b) Which formula would be needed to determine the amount of money in the account after the 18 years? Explain why.

Compound Interest - a lump sum to build up the account.

c) Now after those 18 years, Holly wishes to take equal withdraws from the account at the same interest rate over the next 5 years until the account has a balance of \$0. Which formula would be needed and why?

Amortization - want the balance to go to zero.

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10) Mike goes furniture shopping several times during the month of January. His I-E-I credit card has a \$0 balance as of January 1. Assume that the cycle ends on the first of each month.

a) (7 points) Based on the purchases below, fill in the last column of the table and determine the average daily balance for the account.

Day of Purchase	Item Purchased	Purchase Price	Daily Balance
January 1	Gaflunkenfurter Couch	\$659.00	659
January 12	Schoo Moo Chair	\$249.00	908
January 18	Myshoono Lamp	\$49.00	957
January 22	Rubadubdub Rug	\$79.00	1036

11 C  
6 C  
4 C  
10

$$\frac{11 \cdot 659 + 6 \cdot 908 + 4 \cdot 957 + 10 \cdot 1036}{31} \approx \text{\$} 867.26$$

b) (3 points) Assuming there is a 14.25% annual finance charge on the card and that Mike made no payment on the card, what will be the finance charge for the month of January? Use the  $I = Prt$  formula where  $t$  is the number of days in cycle divided by 365.

$$I = 867.26 (0.1426) \left(\frac{31}{365}\right) \approx \text{\$} 10.50$$

11) (3 points) What is the major theoretical distinction between Compound Interest and Future Value of an Annuity?

One of them puts pineapple on their pizza.

→  
Boo!  
criss!

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