# ANNUITIES.docx Present and future values of annuity streams

*This file is in the elementsOfFinance algorithmic document collection. Share with any teacher or student subject to the non-profit teaching/learning objective in the EULAforAlgogen.pdf.*

## Part FV Future Values of Annuity Streams

*FV10m Multipart single-setup*

Family friends of yours got a tax refund of $2,600 today. Instead of spending the money, they plan to deposit it into an account that earns 9.90% compounded annually. They expect to receive 10 same-sized annual tax refunds and to immediately deposit them into this account. Otherwise, they’ll leave the account alone.

{xlADDRESS: GeneralPV!$B$472 }

### FV10am Find FV for simple annual plan

Find the account balance after their last deposit.

{ANSWER: B ; xlADDRESS: GeneralPV!$B$472 }

/\a. $49,899 b. $41,239 c. $60,378 d. $54,889 e. $45,363

### FV10bm Find Total Interest for simple annual plan

Find the amount of total interest that the account will earn.

{ANSWER: B ; xlADDRESS: GeneralPV!$F$472 }

/\a. $13,854 b. $15,239 c. $18,439 d. $20,283 e. $16,763

### FV7 Find FV for a simple annuity

Your parents contribute $90 monthly to a college savings plan for you that earns 6.80% compounded monthly. The first deposit was exactly 9 years ago. Find the account balance after today’s monthly deposit and crediting of monthly interest.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$420 ; CLUES: N=109}

/\a. $13,522 b. $16,361 c. $14,874 d. $17,997 e. $12,292

### FV8 Find AND(FV,Interest) for simple annuity

Your company contributes $1,250 each quarter to your college for setting up a scholarship fund. The account earns 6.50% compounded quarterly. The first deposit was exactly 15 years ago and no funds have thus far been withdrawn. Find the account balance and total amount of accumulated interest after today’s quarterly deposit and crediting of quarterly interest.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$433 ; CLUES: N=61}

/\a. The balance of $128,709 includes total interest of $52,459 .

/\b. The balance of $148,015 includes total interest of $45,616 .

/\c. The balance of $170,218 includes total interest of $52,459 .

/\d. The balance of $170,218 includes total interest of $45,616 .

/\e. The balance of $128,709 includes total interest of $45,616 .

### FV5 Find FV given PV and withdrawal history (annual compounding)

An account is today credited with its annual interest thereby bringing the account balance to $12,490 . The interest rate is 5.70% compounded annually. You plan to make annual withdrawals of $1,450 each. The first withdrawal is in exactly one year and the last in exactly 9 years. Find the account balance immediately after the last withdrawal.

{ANSWER: B ; xlADDRESS: GeneralPV!$B$446 }

/\a. $3,739 b. $4,113 c. $3,090 d. $3,399 e. $4,524

### FV9 Find FV given PV and withdrawal history (monthly compounding)

An account is today credited with its monthly interest thereby bringing the account balance to $8,290 . The interest rate is 6.40% compounded monthly. You plan to make monthly withdrawals of $70 each. The first withdrawal is in exactly one month and the last in exactly 12 years. Find the account balance immediately after the last withdrawal.

{ANSWER: C ; xlADDRESS: GeneralPV!$B$459 }

/\a. $2,997 b. $3,297 c. $2,725 d. $3,989 e. $3,626

*Multiple setup (FV2m)*

You wish to accumulate a total of $6,200 for a special purpose. You will make deposits quarterly, with the first one exactly 8 quarters from now and the last one, when you withdraw your desired accumulation, exactly 9 years from now. The savings rate is 10.20% compounded quarterly.

{xlADDRESS: GeneralPV!A70 ; CLUES: number of deposits = 29 }

### FV2am Find total lifetime interest given target FV, r, and deposit history

How much total interest does the bank contribute towards your accumulation?

{ANSWER: C ; xlADDRESS: GeneralPV!$B$80 }

/\a. $1,455 b. $1,323 c. $1,937 d. $1,761 e. $1,601

### FV2bm Find deposit size given target FV, r, and N

How much is each deposit?

{ANSWER: C ; xlADDRESS: GeneralPV!$F$80 }

/\a. $121 b. $110 c. $147 d. $134 e. $162

### FV2cm Find the total principal given a target FV, r, and N

How much total principal do you contribute towards your accumulation?

{ANSWER: E ; xlADDRESS: GeneralPV!!$J$80 }

/\a. $5,158 b. $3,523 c. $4,689 d. $3,875 e. $4,263

*Multiple setup (FV1m)*

Your first monthly deposit of $170 is made today and the last one is 2 years from today. You then increase the amount of each deposit. From 2 years and one month from today until exactly 9 years from today, you deposit $280 monthly. Upon making the last deposit you close the account. The savings rate always is 5.10% compounded monthly.

{xlADDRESS: GeneralPV!$A$88; CLUES: accumulation at end of first stream = $4,474 }

### FV1am Find FV given two different and consecutive deposit histories

When you close the account, how much is the total accumulation?

{ANSWER: B ; xlADDRESS: GeneralPV!$B$98 }

/\a. $31,439 b. $34,583 c. $41,846 d. $38,042 e. $28,581

### FV1bm Find lifetime total interest given two different and consecutive deposit histories

When you close the account, you withdraw the entire accumulation. How much total interest did you earn?

{ANSWER: E ; xlADDRESS: GeneralPV!$F$98 }

/\a. $8,244 b. $7,495 c. $6,194 d. $5,631 e. $6,813

### FV19a Find actual ROR given target FV, target ROR, CF, and surprise surplus

You wish to accumulate a total of $5,500 for a special purpose. Today you open a new account and make your first deposit. You make the last deposit when you withdraw your target accumulation exactly 6 years from now. You make equal-size deposits quarterly such that if the savings rate is 8.10% compounded quarterly then you’ll reach the target accumulation and your withdrawal will draw the account balance down to zero. After you go and make your target withdrawal, however, you are surprised to see that $560 is left-over in the account. Find the actual annual savings rate.

{ANSWER: E ; xlADDRESS: GeneralPV!$B$724; CLUES: #deposits= 25; deposit= $171.16 ; actual FV= $6,060 }

/\a. 7.6% b. 10.1% c. 9.2% d. 8.3% e. 11.1%

### FV3 Find the FV of a short annuity from college summer job left alone to compound

With wages from a summer job you make a total of 5 deposits at $430 per month into a savings account earning 5.10% compounded monthly. At the time of the last deposit, you close the savings account and invest all the money in stocks with the intention of leaving the stocks alone for the subsequent 21 years (dividends automatically are reinvested). The stocks are expected to provide an average annual geometric return of 12.00% compounded monthly. When you finally sell the stocks, how much do you get?

{ANSWER: C ; xlADDRESS: GeneralPV$B$62 initial investment in stocks = $2,168 }

/\a. $32,203 b. $29,276 c. $26,614 d. $35,424 e. $24,195

### FV11 Find FV given lumpsum inheritance followed by savings annuity

Today you inherit an account with a balance of $2,600 . For a while you don’t do anything with the account but it continues to accrue interest at a rate of 9.90% compounded monthly. Exactly 10 months from today you start an ambitious savings plan and deposit $230 monthly into the account. You make a total of 16 consecutive monthly deposits. Find the account balance immediately after the last deposit.

{ANSWER: D ; xlADDRESS: GeneralPV!$B$487; CLUES: FV\_lumpsum= $3,193 , FV\_annuity= $3,917 }

/\a. $6,463 b. $5,342 c. $7,821 d. $7,110 e. $5,876

### FV12 Find FV given lumpsum inheritance followed by withdrawal annuity

Today you inherit an account with a balance of $2,200 . For a while you don’t do anything with the account but it continues to accrue interest at a rate of 10.00% compounded monthly. Exactly 10 months from today you start withdrawing $150 monthly from the account. You make a total of 16 consecutive monthly withdrawals. Find the account balance immediately after the last withdrawal.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$502; CLUES: FV\_lumpsum= $2,707 , FV\_annuity= $2,556 }

/\a. $151 b. $183 c. $166 d. $221 e. $201

*Multiple Setup (FV4m)*

You are considering two different strategies for a savings account that you intend to close when you retire exactly 26 years from today. For Strategy 1, deposit $270 per month for 5 years (first deposit today; last one exactly 5 years from today); no new deposits will be made after the end of the deposit period, but interest continues to accrue until the account is closed. For Strategy 2, you’ll make your first monthly deposit exactly 5 years from today, each monthly deposit also equals $270 , and you’ll continue making monthly deposits for 21 years, so that you make the final deposit exactly 26 years from today when you close the account. The savings rate always is 4.60% compounded monthly.

{xlADDRESS: GeneralPV!R106C1 ; CLUES: FV(Strategy 1)= $48,557 ; FV(Strategy 2)= $114,993 }

### FV4am Compare FV from two different retirement strategies

How do the accumulations at time of retirement from the two alternative strategies compare?

{ANSWER: E ; xlADDRESS: GeneralPV!$B$116 CLUES: FV(Strategy 1)= $48,557 ; FV(Strategy 2)= $114,993 }

/\a. Strategy 2 accumulates $48557

/\b. Strategy 1 accumulates $65694 more than Strategy 2

/\c. Strategy 1 accumulates $53898

/\d. Strategy 2 accumulates $66436 less than Strategy 1

/\e. Strategy 2 accumulates $114993

### FV4bm Find FV from first of two different retirement strategies

How much does Strategy 1 accumulate at the time of retirement?

{ANSWER: D ; xlADDRESS: GeneralPV!$F$116 }

/\a. $53,413 b. $44,143 c. $40,130 d. $48,557 e. $36,482

### FV4cm Find FV from second of two different retirement strategies

How much does Strategy 2 accumulate at the time of retirement?

{ANSWER: C ; xlADDRESS: GeneralPV!$J$116 }

/\a. $126,492 b. $86,396 c. $114,993 d. $104,539 e. $95,036

### FV6 Find FV Given an initial endowment and later deposit stream

Today you inherit an account with a balance of $5,800 . For a while you don’t do anything with the account but it continues to accrue interest. Exactly 17 months from today you start an ambitious savings plan and deposit $220 into the account. You plan to deposit that much each month. Exactly 32 months from today you reconsider your plan, make your last deposit, and make no additional deposits. You nonetheless leave the account alone and it continues to accrue interest at a rate of 6.6% compounded monthly. You finally close the account exactly 7 years from today. How much is the total accumulation?

{ANSWER: A ; xlADDRESS: GeneralPV!$B$147 CLUES: FV(inheritance) = $9,194 ; FV(deposits)@time of last deposit = $3,669 }

/\a. $14,074 b. $11,632 c. $12,795 d. $10,574 e. $15,482

### FV13 Find CF given PV, r, and N (quarterly compounding)

You inherit an account with $6,000 that earns 8.80% compounded quarterly. One quarter later you make the first of 20 quarterly withdrawals, all the same size, and draw down the account to zero. Find the amount much of each withdrawal.

{ANSWER: D ; xlADDRESS: GeneralPV!$B$642 }

/\a. $340 b. $255 c. $281 d. $374 e. $309

### FV14 Find CF given current FV, r, and N (monthly compounding)

Exactly 5 years ago you made a deposit that opened an account earning 13.00% compounded monthly. Every month since that time you have made a deposit of exactly the same amount. After today’s deposit and crediting of monthly interest the account balance is $12,000 . Find the amount of each deposit.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$655 }

/\a. $140 b. $154 c. $169 d. $186 e. $127

### FV16 Find CF given target FV, r, and N (monthly compounding)

You wish to accumulate $11,200 for a special purpose. You today open an account that earns 5.60% compounded monthly by making the first of many deposits, all the same size. Your last monthly deposit is in exactly 4 years. After that last deposit and crediting of monthly interest your target balance is reached. Find the amount of each deposit.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$681 }

/\a. $204 b. $225 c. $248 d. $236 e. $214

### FV15 Find deposit CF given PV, FV, r, and N (quarterly compounding)

Exactly 5 years ago you inherited an account with balance of $16,000 that earns 10.30% compounded quarterly. One quarter later you made the first of many quarterly deposits, all the same size. After today’s deposit and crediting of quarterly interest the account balance is $68,200 . Find the amount of each deposit.

{ANSWER: C ; xlADDRESS: GeneralPV!$B$668 }

/\a. $2,186 b. $1,807 c. $1,493 d. $1,987 e. $1,642

### FV17 Find OR(deposit,withdrawal) given PV, FV, r, and N (annual compounding)

Today you open an account with a $17,600 deposit that earns 14.30% compounded annually. You’ve set a target for the account so that in exactly 5 years its balance will be $27,300 . To reach the target you’ll adjust the balance annually; each year’s adjustment will be exactly the same amount and the first adjustment occurs exactly one year from now. After the last annual adjustment in exactly 5 years, and crediting of that year’s interest, the account balance exactly equals the target. Describe the annual adjustment that you make each year.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$694 }

/\a. Each year you make a withdrawal of $1,058 .

/\b. Each year you make a withdrawal of $920 .

/\c. Each year you make a deposit of $800 .

/\d. Each year you make a deposit of $920 .

/\e. Each year you make a deposit of $1,058 .

### FV18 Find effect of ROR on CF given PV, FV, and N

You are investing $12,000 today. You expect to receive monthly returns for 216 months with the first one exactly one month from today. At the time of the last monthly return you also expect to sell the investment for $10,000 . You can either invest in a savings account earning 5.30% percent per annum or in a stock fund earnings 15.00% percent per annum (compounded monthly). How much difference in monthly cash flow do the alternative investments provide?

{ANSWER: E ; xlADDRESS: GeneralPV!$B$708 }

/\a. Monthly cash flow is $67 for the savings account and $175 for the stock fund.

/\b. Monthly cash flow is $51 for the savings account and $152 for the stock fund.

/\c. Monthly cash flow is $67 for the savings account and $152 for the stock fund.

/\d. Monthly cash flow is $59 for the savings account and $175 for the stock fund.

/\e. Monthly cash flow is $59 for the savings account and $152 for the stock fund.

## Part PV Present Values of Annuity Streams (excluding amortization)

### PV8 Find PV given CF and r (annual compounding, FV=0)

You might invest in an asset that will return after-tax cash flow to you of $1,200 per year for 8 years (first cash flow one year from now), after that the asset probably will be worthless. You make an offer to buy the asset so that you’ll get a 8.80% rate of return (compounded annually). Find the offer price.

{ANSWER: B ; xlADDRESS: GeneralPV!$B$554 }

/\a. $8,906 b. $6,691 c. $8,097 d. $7,361 e. $6,083

### PV5 Find PV given withdrawal history and rate (annual compounding)

You’re quite fortunate because this afternoon, just like this date during each of the preceding 6 years, you shall withdraw $2,200 from an account that your guardian angel established for you exactly 7 years ago. The account earns 10.10% per year (compounded annually, interest is being credited this morning). Except for your withdrawals the account has been untouched and after today’s withdrawal its balance will be zero. Find the initial deposit that your guardian angel used to establish the account.

{ANSWER: D ; xlADDRESS: GeneralPV!$B$515 ; CLUES: N= 6}

/\a. $11,743 b. $8,021 c. $9,705 d. $10,675 e. $8,823

### PV9 Find PV given CF, FV and r (annual compounding)

You might invest in a security that will return after-tax cash flow to you of $1,600 per year for 9 years (first cash flow one year from now), after which the security likely can be sold immediately for $7,700 . You make an offer to buy the security so that you’ll get a 8.50% rate of return (compounded annually). Find the offer price.

{ANSWER: D ; xlADDRESS: GeneralPV!$B$567 }

/\a. $19,744 b. $17,949 c. $16,318 d. $13,486 e. $14,834

### PV6 Find PV given deposit history, today's balance, and rate (quarterly compounding)

A friend received an inheritance 6 years ago and put all funds into an account earning 8.50% compounded quarterly. Exactly one quarter after establishing the account the friend started a savings plan that deposits $650 per quarter. Today the quarterly deposit is due and quarterly interest will be credited to the account, thereby bringing the balance to $49,924 . How much was the friend’s inheritance?

{ANSWER: A ; xlADDRESS: GeneralPV!$B$528 }

/\a. $18,018 b. $26,380 c. $19,820 d. $23,982 e. $21,802

### PV7 Find PV given withdrawal history, today's balance, and rate (quarterly compounding)

A friend received an inheritance 4 years ago and put all funds into an account earning 10.00% compounded quarterly. Exactly one quarter after establishing the account the friend started withdrawing $950 per quarter. Today she’ll make another quarterly withdrawal, and quarterly interest will be credited to the account, and then the balance will be $13,104 . How much was the friend’s inheritance?

{ANSWER: E ; xlADDRESS: GeneralPV!$B$541 }

/\a. $15,950 b. $17,545 c. $19,299 d. $14,500 e. $21,229

### PV4 Find PV of withdrawal stream when there is an ending balance

You wish to make a deposit into an account today so that you can withdraw $160 monthly for 14 months. The first withdrawal is a month from now. Immediately after the last withdrawal you want the account balance to equal $375 . If the account annual percentage rate equals 10.20%, compounded monthly, how much is today’s deposit?

{ANSWER: C ; xlADDRESS: GeneralPV!$B$16 }

/\a. $2,014 b. $1,831 c. $2,437 d. $2,215 e. $1,664

*PV10m Multipart single-setup*

You might invest in an asset that will return after-tax cash flow to you of $2,700 per month for 15 months (first cash flow one month from now), and after receiving the last cash flow you’ll immediately receive after-tax net proceeds from liquidation equal to $95,600 . You make an offer to buy the asset so that you’ll get your “target” annual rate of return of 18.20% (compounded monthly).

{xlADDRESS: GeneralPV!$B$580 }

### PV10am Find offer price for annuity given CF, FV, target r (CF>0)

Find the offer price.

{ANSWER: B ; xlADDRESS: GeneralPV!$B$580 }

/\a. $76,674 b. $112,259 c. $102,053 d. $84,342 e. $92,776

### PV10bm Find actual ROR for annuity given CF, FV, target r, and counteroffer (CF>0)

The seller makes a counteroffer that is $9,600 higher than your offer. Find your annual rate of return if you buy at the counteroffer price and receive the expected cash flows.

{ANSWER: D ; xlADDRESS: GeneralPV!$F$580; CLUES: pv = $112,259 }

/\a. 12.5% b. 13.8% c. 11.4% d. 10.4% e. 15.2%

*PV11m Multipart single-setup*

You might purchase an investment that incurs a large up-front cost today. Furthermore, it requires payments of $2,400 per month for 15 months (first payment one month from now). Immediately after making the last payment, however, you will receive after-tax net proceeds of $78,900 . You make an offer to purchase the asset so that you’ll get your “target” annual rate of return of 20.30% (compounded monthly).

{xlADDRESS: GeneralPV!$B$593 }

### PV11am Find offer price for annuity given CF, FV, target r (CF<0)

Find the up-front purchase price that you offer to pay today.

{ANSWER: C ; xlADDRESS: GeneralPV!$B$593 }

/\a. $43,609 b. $32,764 c. $29,786 d. $36,041 e. $39,645

### PV11bm Find actual ROR for annuity given CF, FV, target r, and counteroffer (CF<0)

The seller makes a counteroffer that is $6,000 higher than your offered purchase price. Find your annual rate of return if you buy at the counteroffer price and receive the expected cash flows.

{ANSWER: B ; xlADDRESS: GeneralPV!$F$593; CLUES: pv = $29,786 }

/\a. 8.5% b. 10.3% c. 11.3% d. 9.3% e. 12.4%

*Multiple setup (PV3m)*

You might invest in an asset that will return after-tax cash flow to you of $2,200 per month for 5 months (first payment one month from now), followed by $3,500 per month for 4 months . You make an offer to buy the asset so that you’ll get your “target” annual rate of return of 15.7% (compounded monthly ).

{xlADDRESS: GeneralPV!R306C1 ; CLUES: pv(inflows)=$23,282 }

### PV3am Quantitatively and qualitatively compare the target and actual ROR given the return stream and various cost scenarios

Describe how the actual cost determines whether the actual rate of return is smaller or larger than the target rate of return.

{ANSWER: A ; xlADDRESS: GeneralPV!$B$317 }

/\a. For every cost more than $25610 the actual rate of return is less than the target rate of return

/\b. For every cost more than $25610 the actual rate of return is more than the target rate of return

/\c. For every cost less than $25610 the actual rate of return is less than the target rate of return

/\d. For a cost of $25145 the actual rate of return equals the target rate of return

/\e. For every cost more than $20954 the actual rate of return is more than the target rate of return

### PV3bm Find PV given an investment's return stream and target rate of return

What is your offer price?

{ANSWER: C ; xlADDRESS: GeneralPV!$F$317 }

/\a. $28,171 b. $34,087 c. $23,282 d. $25,610 e. $30,988

### PV3cm Find the actual ROR given an investment's return stream, target ROR, and counteroffer purchase price

Instead, however, the seller makes a counter-offer that is $950 higher than your offer. If you buy at the counter-offer price, and receive the expected cash flows, what is your annual rate of return?

{ANSWER: B ; xlADDRESS: GeneralPV!$J$317 CLUES: pv(inflows)=$23,282 }

/\a. 10.0% b. 6.8% c. 9.1% d. 8.3% e. 7.5%

*PV15m Multipart single-setup*

You sign a specialized loan contract in which you promise to repay $3,000 per month for 8 months (first payment one month from now), followed by $3,100 per month for 9 months. These payments totally repay the loan. You have desperately negotiated an annual interest rate on the loan of 13.8% (compounded monthly). You receive the loan principal today.

{xlADDRESS: GeneralPV!$B$741 }

### PV15am Find the loan principal for a two-stage annuity stream

Find the principal that you receive today.

{ANSWER: B ; xlADDRESS: GeneralPV!$B$741 }

/\a. $51,547 b. $46,861 c. $56,702 d. $68,609 e. $62,372

### PV15bm Find the total interest for a two-stage annuity stream

Find the total lifetime interest.

{ANSWER: A ; xlADDRESS: GeneralPV!$F$741 }

/\a. $5,039 b. $4,581 c. $5,543 d. $6,097 e. $4,165

### PV2 Find each withdrawal given the initial deposit and N

You have received a windfall of $9,600 and today invest the entire sum in an account paying 11.70% compounded monthly. You intend to make monthly withdrawals (the first is one month from today) until the account is exhausted in 37 months. How much is each withdrawal?

{ANSWER: E ; xlADDRESS: GeneralPV!$B$163 }

/\a. $256 b. $282 c. $341 d. $375 e. $310

### PV1 Find N given the initial deposit long ago and the monthly rental payments it finances

A kind relative deposited $9,900 into an account earning 6.00% compounded monthly. You wish to pay your share of the rent with this money, and intend to withdraw $326.18 per month until the account is exhausted. The first withdrawal is one month from today. For how many months can you make withdrawals?

{ANSWER: B ; xlADDRESS: GeneralPV!$B$179 }

/\a. 27 b. 33 c. 30 d. 25 e. 36

### PV12 Find PV for perpetuity paying for business professor

An alumni group wants to establish an endowment fund for paying expenses associated with hiring a distinguished professor of business. The annual expenses should run about $150,000 (payable in 12 monthly installments). Find the size of the requisite endowment (in $millions) if the account earns 7.80% compounded monthly.

{ANSWER: D ; xlADDRESS: GeneralPV!$B$605 }

/\a. $2.12 b. $2.82 c. $2.56 d. $1.92 e. $2.33

### PV13 Find PV for $1million CF given r

Your unrealistic dream is to win the lottery, deposit the money into an account earning 6.20% interest compounded annually, and forevermore draw out $1 million per year. Find the amount in millions that you need to win.

{ANSWER: E ; xlADDRESS: GeneralPV!$B$616 }

/\a. $17.7 b. $12.1 c. $14.7 d. $13.3 e. $16.1

### PV14 Find change CF given PV and change r

Your college has a fixed and constant endowment fund of $59.6 million that each year generates interest income for paying student scholarships and faculty salaries. The interest rate has fallen from 11.30% a few years ago to 6.00% today (compounded annually). Find the decline in annual income that the college unfortunately faces.

{ANSWER: E ; xlADDRESS: GeneralPV!$B$629 }

/\a. $2.6 b. $3.5 c. $2.4 d. $2.9 e. $3.2

## Part AM Loans and Amortization

### AM1 How much is interest in a simple setting

How much is the monthly interest on a 10.30% (compounded monthly) loan with beginning of month outstanding balance equal to $9,900 ?

{ANSWER: D ; xlADDRESS: GeneralPV!$B$192 }

/\a. $77 b. $64 c. $93 d. $85 e. $70

### AM2 How much is the payment in a simple setting

How much is the payment for a loan of $139,000 with an annual interest rate of 8.10% (compounded annually) repayable over 30 years with payments due annually?

{ANSWER: D ; xlADDRESS: GeneralPV!$B$208 }

/\a. $11,331 b. $10,301 c. $9,364 d. $12,464 e. $8,513

### AM10a Payoff amount for loan midway into 1st billing cycle

You borrow $15,000 at 10.30% over 4 years (monthly payments) to finance your dream pre-owned car. Exactly 20 days after taking out the loan, you want to pay it off in-full because a better financing deal appears. There is no pre-payment penalty and 31 days are in the monthly billing cycle. Find the payoff amount (principal plus interest).

{ANSWER: E ; xlADDRESS: GeneralPV!$B$46 }

/\a. $15,234 b. $15,386 c. $14,934 d. $15,540 e. $15,083

### AM10b Payoff amount for loan midway into 2nd billing cycle

You borrow $15,000 at 10.30% over 4 years (monthly payments) to finance your dream pre-owned car. Exactly 20 days after making the first payment, you want to pay it off in-full because a better financing deal appears. There is no pre-payment penalty and 31 days are in the monthly billing cycle. Find the payoff amount (principal plus interest).

{ANSWER: E ; xlADDRESS: GeneralPV!$F$46 ; CLUES: pmt = $382.60 ; BOP bal = $14,746 }

/\a. $14,252 b. $13,699 c. $13,973 d. $14,537 e. $14,828

### AM10c Payoff amount for loan midway into N+1 billing cycle

You borrow $15,000 at 10.30% over 4 years (monthly payments) to finance your dream pre-owned car. Exactly 20 days after making payment number 3, you want to pay it off in-full because a better financing deal appears. There is no pre-payment penalty and 31 days are in the monthly billing cycle. Find the payoff amount (principal plus interest).

{ANSWER: A ; xlADDRESS: GeneralPV!$J$46 ; CLUES: pmt = $382.60 ; BOP bal = $14,746 }

/\a. $14,311 b. $14,597 c. $15,187 d. $14,030 e. $14,889

### AM6 How much of a loan can you afford

Your search for a new car surely depends on the monthly payment that you can afford. The absolute maximum income that you can allocate to your car payment is $325 per month. If the loan’s annual percentage rate is 8.10%, which statement is true?

{ANSWER: A ; xlADDRESS: GeneralPV!$B$331 }

/\a. the most you can afford to borrow is $15,991 if the loan is repaid over 5 years

/\b. the most you can afford to borrow is $15,991 if the loan is repaid over 3 years

/\c. the most you can afford to borrow is $18,389 if the loan is repaid over 4 years

/\d. the most you can afford to borrow is $18,389 if the loan is repaid over 3 years

/\e. the most you can afford to borrow is $18,389 if the loan is repaid over 5 years

### AM7 Contrast time required at front and backend to reduce loan by same percent

You are borrowing $312,000 for 25 years (monthly payments) at an annual interest rate of 8.60%. Contrast the length of time required for repaying the first 1/5 of the original principal with the time required to repay the final 1/5 of original principal.

{ANSWER: C ; xlADDRESS: GeneralPV!$B$406 ; CLUE: 1/5 of principal is $62,400 }

/\a. it takes approximately 8 years, 9 months to repay the first 1/5 of the original principal and 1 years, 10 months to repay the last 1/5

/\b. it takes approximately 8 years, 9 months to repay the first 1/5 of the original principal and 2 years, 3 months to repay the last 1/5

/\c. it takes approximately 10 years, 9 months to repay the first 1/5 of the original principal and 2 years, 3 months to repay the last 1/5

/\d. it takes approximately 9 years, 11 months to repay the first 1/5 of the original principal and 1 years, 10 months to repay the last 1/5

/\e. it takes approximately 9 years, 11 months to repay the first 1/5 of the original principal and 2 years, 3 months to repay the last 1/5

### AM8 Contrast interest during first and second halves of loan life

Suppose to purchase a car you borrow $20,000 repayable monthly over 4 years at an annual percentage interest rate of 9.80%. Contrast the interest paid during the first and second halves of the loan life.

{ANSWER: D ; xlADDRESS: GeneralPV!$B$346 CLUES: pmt = $505.33 , midway principal = $10,973 }

/\a. interest during first and second halves equal $2,696 and $1,155 respectively

/\b. interest during first and second halves equal $3,566 and $1,328 respectively

/\c. interest during first and second halves equal $2,696 and $1,328 respectively

/\d. interest during first and second halves equal $3,101 and $1,155 respectively

/\e. interest during first and second halves equal $3,101 and $1,328 respectively

### AM9a How much principal is in the last payment?

You have just bought a house by borrowing $260,000 at a 7.90% annual interest rate (compounded monthly) repayable with fixed payments over 35 years. When finally in the far-off future you make your last payment, how much of that last payment will be principal?

{ANSWER: E ; xlADDRESS: GeneralPV!$B$221 CLUE: payment $1,828 }

/\a. $1,651 b. $1,501 c. $1,364 d. $1,240 e. $1,816

### AM9b How much interest is in the last payment?

You have just bought a house by borrowing $100,000 at a 7.80% annual interest rate (compounded monthly) repayable with fixed payments over 35 years. When finally in the far-off future you make your last payment, how much of that last payment will be interest?

{ANSWER: E ; xlADDRESS: GeneralPV!$F$221; CLUE: payment $696 }

/\a. $4.08 b. $3.71 c. $4.94 d. $5.44 e. $4.49

### AM9c How much OR(Principal, Interest) is in the last payment?

You have just bought a house by borrowing $100,000 at a 7.80% annual interest rate (compounded monthly) repayable with fixed payments over 35 years. When finally in the far-off future you make your last payment, how much of that last payment will be principal?

{ANSWER: D ; xlADDRESS: GeneralPV!$J$221; CLUE: payment $696 }

/\a. $628.44 b. $519.37 c. $760.42 d. $691.29 e. $571.31

### AM5a How long to reduce principal by half

Your friend is taking out a mortgage for $153,000 at 9.80% repayable with monthly payments over 25 years. She respects your financial expertise and asks “how many payments will I have to make before I reduce the principal balance by half its original amount.” You pull out your calculator, and tell her the number of payments she’ll make to reduce the balance by half is:

{ANSWER: E ; xlADDRESS: GeneralPV!$B$238 CLUES: Nremaining=75 ; pmt= $1,369 , desired principal=$76,500 }

/\a. 300 b. 248 c. 205 d. 272 e. 225

### AM5b How long to reduce principal so x% remains

Your friend is taking out a mortgage for $153,000 at 9.80% repayable with monthly payments over 25 years. She respects your financial expertise and asks “how many payments will I have to make before I reduce the principal balance so that only 80% of its original amount remains.” You pull out your calculator, and tell her the number of payments she’ll make to reduce the balance to this amount is:

{ANSWER: C ; xlADDRESS: GeneralPV!$B$247 CLUES: Nremaining=161 ; pmt=$1,369 , desired principal=$122,400 }

/\a. 126 b. 168 c. 139 d. 153 e. 185

Multiple setup (AM3m)

The Company borrowed $170,000 at 9.60% to be repaid monthly over 15 years. They just remitted payment number 78.

{xlADDRESS: GeneralPV!R354C1 ; CLUES: interest thus far=$93,436 pmt=$1,785 ; prin outstanding after pmt=$124,171 ; pmts remaining=102 }

### AM3am Find payment

How much is the monthly payment?

{ANSWER: A ; xlADDRESS: GeneralPV!$B$371 }

/\a. $1,785 b. $1,964 c. $1,623 d. $1,476 e. $1,341

### AM3bm Find payment and interest for first month

Which statement about the first month’s payment is correct?

{ANSWER: A ; xlADDRESS: GeneralPV!$F$371; CLUES: interest thus far=$93,436 pmt=$1,785 ; prin outstanding after pmt=$124,171 ; pmts remaining=102 }

/\a. the payment is $1,785 and the interest due is $1,360

/\b. the payment is $1,553 and the interest due is $1,360

/\c. the payment is $2,053 and the interest due is $1,360

/\d. the payment is $1,553 and the interest due is $1,564

/\e. the payment is $2,053 and the interest due is $1,564

### AM3cm Find lifetime interest

How much total interest is scheduled to be paid over the life of the loan?

{ANSWER: D ; xlADDRESS: GeneralPV!$J$371 }

/\a. $183,172 b. $201,489 c. $137,620 d. $151,382 e. $166,520

### AM3dm Find interest-to-date

How much interest-to date has been paid?

{ANSWER: D ; xlADDRESS: GeneralPV!$N$371 }

/\a. $136,800 b. $102,780 c. $124,363 d. $93,436 e. $113,058

### AM3em Find principal-to-date

How much principal-to date has been paid?

{ANSWER: D ; xlADDRESS: GeneralPV!$B$379 }

/\a. $31,302 b. $41,663 c. $37,876 d. $45,829 e. $34,432

### AM3fm Find previous payment’s interest

How much of the payment just remitted is interest?

{ANSWER: D ; xlADDRESS: GeneralPV!$F$379 }

/\a. $1,464 b. $1,100 c. $1,331 d. $1,000 e. $1,210

### AM3gm Find previous payment’s principal

How much of the payment just remitted is repayment of principal?

{ANSWER: B ; xlADDRESS: GeneralPV!$J$379 }

/\a. $864 b. $786 c. $1,046 d. $951 e. $714

### AM3hm Find previous payment’s OR(interest, principal)

How much of the payment just remitted is principal repayment?

{ANSWER: D ; xlADDRESS: GeneralPV!$N$379 }

/\a. $590 b. $649 c. $537 d. $786 e. $714

### AM3im Find subsequent payment’s OR(interest, principal)

Which statement about the subsequent month’s payment is correct?

{ANSWER: C ; xlADDRESS: GeneralPV!$B$387 }

/\a. the principal repayment is $689

/\b. the interest is $689

/\c. the principal repayment is $792

/\d. the interest is $792

/\e. the interest is $599

*Multiple setup (AM4m)*

The Bank issued a home mortgage of $160,000 at 8.10% repayable monthly over 25 years. Today the bank received payment number 138 and, as a result, the Bank properly records the loan’s book value equal to the outstanding balance.

{xlADDRESS: GeneralPV!$A$290 ; CLUES: PMT = $1,246 ; # REMAINING = 162}

### AM4am Find loan’s book value

What is the loan’s book value?

{ANSWER: A ; xlADDRESS: GeneralPV!$B$298 }

/\a. $122,472 b. $179,311 c. $134,719 d. $163,010 e. $148,191

### AM4bm Find loan’s market value given new rate to sell loan

In order to raise cash the Bank intends to sell the loan for the highest price it can get. The selling price of the loan, its market value, is set so that the loan offers the buyer a rate of return equal to 9.40% ; this is slightly greater than the prevailing interest rate on new and similar loans. What is the loan’s market value?

{ANSWER: C ; xlADDRESS: GeneralPV!$F$298 }

/\a. $125,492 b. $151,845 c. $114,084 d. $138,041 e. $167,030

### AM4cm Find loan’s AND(book value, market value) given new rate to sell loan

In order to raise cash, however, the Bank intends to sell the loan for the highest price it can get. The selling price of the loan, its market value, is set so that the loan offers the buyer a rate of return equal to 9.40% ; this is slightly greater than the prevailing interest rate on new and similar loans. How does the loan’s book value compare to its market value?

{ANSWER: B ; xlADDRESS: GeneralPV!$J$298 }

/\a. The loan’s book value is $92,606 and its market value is $114,084

/\b. The loan’s book value is $122,472 and its market value is $114,084

/\c. The loan’s book value is $122,472 and its market value is $131,196

/\d. The loan’s book value is $92,606 and its market value is $131,196

/\e. The loan’s book value is $106,497 and its market value is $131,196

## Part TS Two Stage Annuity Problems

### TS1a Find each deposit for a perpetual endowment

You wish to establish an endowment fund that will provide students with a $1,900 scholarship every semiannum, perpetually. To finance the scholarships you will make a series of equal deposits into a savings account. The deposits will be made semiannually, with the first one today and the final one in 4 years. The first scholarship is to be awarded one semiannum after the last deposit. The savings rate is 7.90% compounded semiannually. How much is each deposit?

{ANSWER: D ; xlADDRESS: GeneralPV!$B$265 CLUES: fv target=$20,066 nsavings=9, }

/\a. $5,010 b. $5,511 c. $6,062 d. $4,555 e. $4,141

### TS1b Find each withdrawal for a perpetual endowment given the deposit history

You wish to establish an endowment fund that will provide student financial aid awards every month, perpetually. To finance the scholarships you will make a series of equal deposits into a savings account. The deposits will be made monthly equal to $2,800 each, with the first one today and the final one in 8 years. The first award is to be granted one month after the last deposit. The savings rate is 7.10% compounded monthly. How much is each award?

{ANSWER: C ; xlADDRESS: GeneralPV!$F$265 CLUES: fv target=$365,439 , nsavings=97, }

/\a. $1,477 b. $1,966 c. $2,162 d. $1,787 e. $1,624

### TS2a Save now & withdraw later; how long can you withdraw

Suppose an employee saves $235.17 per month for 34 years (each year there are 12 monthly deposits). The savings rate is 4.50% compounded monthly. The worker wishes to withdraw $2,090 per month, commencing exactly one month after making the last savings deposit. For how many months can they make withdrawals?

{ANSWER: D ; xlADDRESS: GeneralPV!$B$281 CLUES: PV(withdrawals) = FV(deposits) = $226,078 }

/\a. 126 b. 104 c. 115 d. 139 e. 95

### TS2b Save now & withdraw later; how much can you withdraw

Suppose an employee saves $188.23 per month for 30 years (each year there are 12 monthly deposits). The savings rate is 4.60% compounded monthly. The worker wishes to withdraw the same amount each month for a total of 185 months, with the first withdrawal exactly one month after the last savings deposit. How much is each monthly withdrawal?

{ANSWER: D ; xlADDRESS: GeneralPV!$F$281 PV(withdrawals) = FV(deposits) = $145,567 }

/\a. $1,464 b. $1,331 c. $1,000 d. $1,100 e. $1,210

## END OF DOCUMENT