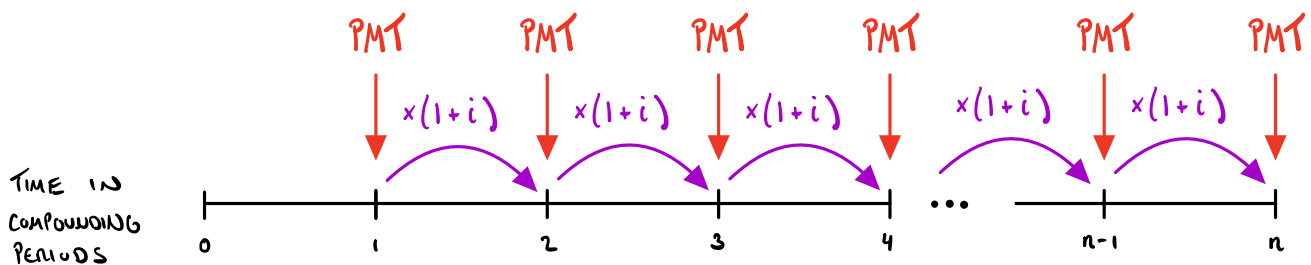


§ 3.4 Present Value of an Annuity

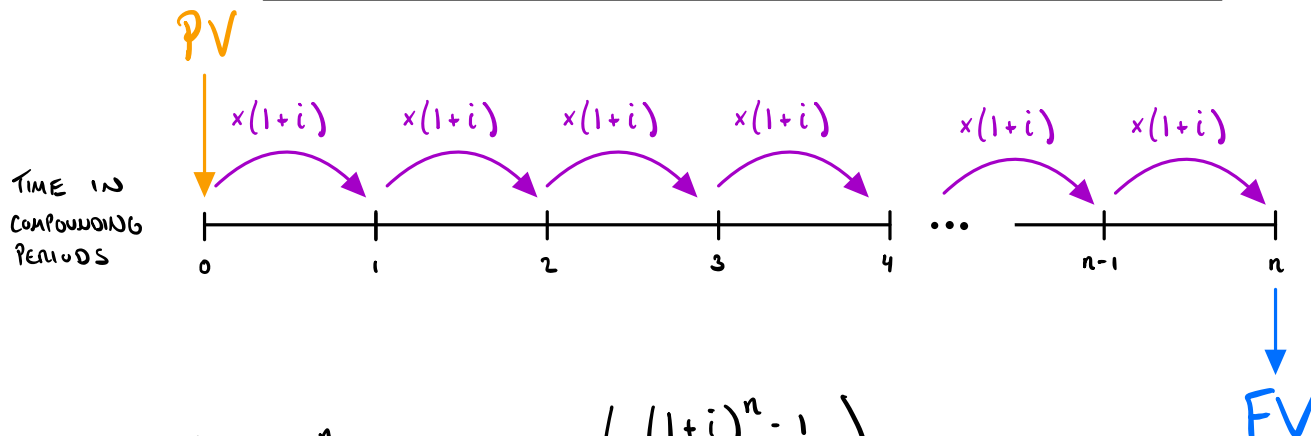
RECALL: AN **ANNUITY** IS A SEQUENCE OF EQUAL SIZE PAYMENTS/WITHDRAWALS INTO/OUT OF AN ACCOUNT EARNING COMPOUND INTEREST.

AN **ORDINARY ANNUITY** IS WHEN THE PAYMENTS/WITHDRAWALS OCCUR AT THE END OF EACH COMPOUNDING PERIOD.

THE **FUTURE VALUE OF AN ANNUITY** IS THE END BALANCE OF THE ACCOUNT CREATED FOR THE ANNUITY.



DEF: THE PRESENT VALUE OF AN ANNUITY IS THE PRINCIPAL WHICH WOULD GROW TO MATCH THE FUTURE VALUE OF THE ANNUITY IF DEPOSITED IMMEDIATELY.



$$PV(1+i)^n = FV = PMT \left(\frac{(1+i)^n - 1}{i} \right)$$

$$PV(1+i)^n (1+i)^{-n} = PMT \left(\frac{(1+i)^n - 1}{i} \right) (1+i)^{-n}$$

$$PV = PMT \left(\frac{1 - (1+i)^{-n}}{i} \right)$$

PV = PRESENT VALUE
 PMT = PERIODIC PAYMENT
 i = INTEREST RATE PER COMP. PER.
 n = # COMP. PER. / PAYMENTS

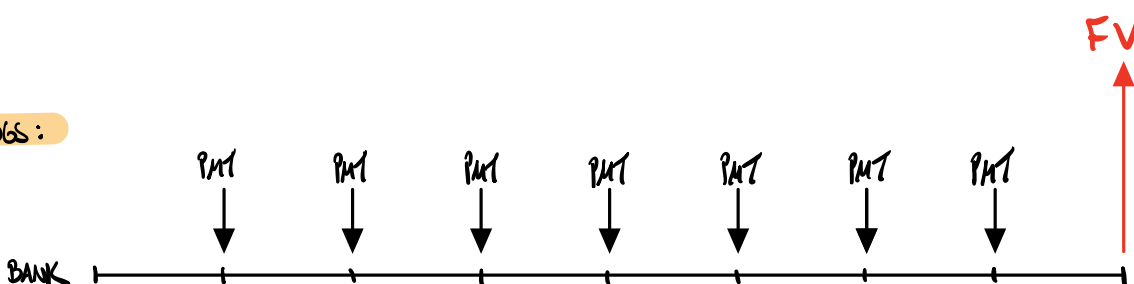
WHEN YOU CREATE AN ANNUITY SAVINGS ACCOUNT, THE BANK IS PURCHASING THE ANNUITY FROM YOU AND PAYING YOU ITS FUTURE VALUE IN THE FUTURE, AFTER PAYMENTS HAVE BEEN MADE.

SAVINGS

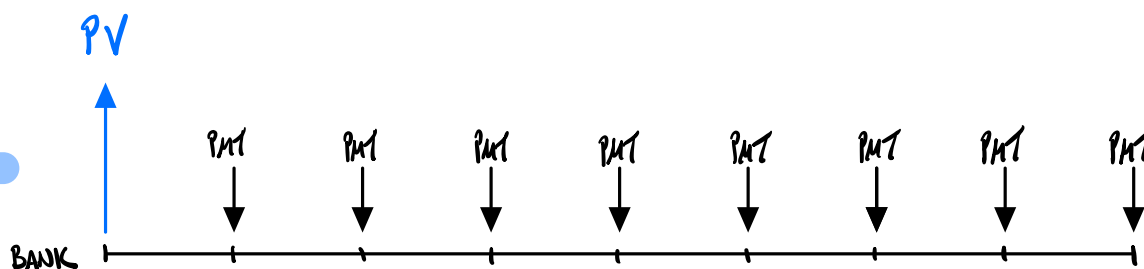
ALTERNATIVELY, THE BANK WILL PURCHASE THE SAME ANNUITY FROM YOU TODAY FOR ITS PRESENT VALUE, BEFORE ANY PAYMENTS HAVE BEEN MADE.

CREDIT / LOAN

SAVINGS:



LOAN:



30. E-Loan offers a 36-month auto loan at 9.84% compounded monthly to applicants with fair credit ratings. If you have a fair credit rating and can afford monthly payments of \$350, how much can you borrow from E-Loan? What is the total interest you will pay for this loan?

32. If you buy a computer directly from the manufacturer for \$3,500 and agree to repay it in 60 equal installments at 1.75% interest per month on the unpaid balance, how much are your monthly payments? How much total interest will be paid?

amortization formula:

$$PMT = PV \frac{i}{1 - (1 + i)^{-n}}$$

38. The ad for a Bison SUV claims that a monthly payment of \$399 constitutes 0% financing. Explain why that is false. Find the annual interest rate compounded monthly that is actually being charged for financing \$23,997 with 72 monthly payments of \$399.

$$72 \times 399 = 28,728$$

$$23,997 \left(1 + \frac{r}{12}\right)^{72} = 28,728$$

