Test 2 will be on Sections 2.1 - 2.5 of the text.

You will be given these formulas, and need to be able to use them: \[ F = P(1 + i)^m = P\left(1 + \frac{r}{n}\right)^{nt} \]

\[
\begin{align*}
FA &= \frac{PMT \left((1 + i)^m - 1\right)}{i} \\
PV &= \frac{PMT \left(1 - (1 + i)^{-m}\right)}{i} \\
PMT &= \frac{FA \times i}{\left((1 + i)^m - 1\right)} \\
PMT &= \frac{PV \times i}{\left(1 - (1 + i)^{-m}\right)}
\end{align*}
\]

Be sure you understand the meaning of each of the variables in these formulas. A common mistake is to not use \( i = (\text{nominal annual interest rate}) / (\# \text{ of compoundings per year}) \)

On many problems your task will be to analyze and interpret the problem in order to:

i) Determine whether the problem involves a present value or future accumulation,

ii) Decide which variables are known and their values, and which quantity is sought,

iii) Determine the appropriate formula(s) above to use,

iv) Substitute the values of the appropriate variables, and

v) Calculate the value of the resulting expression(s).

A time line can be very helpful in this, but will not be required. Review Exercises #1 - 9 in Section 2.8 (p. 151-152), except 5de and 9b, provide good practice for the way you will do this process on test questions.

Make sure you are able to:

1. Calculate the future accumulation of a sequence of payments by adding the future values of the individual payments.

2. Use the formulas above to calculate the present value or future accumulation of a sequence of payments, given the periodic payment amount, time, number of payments per year, and annual interest rate. In this situation the Total Amount of Interest is the difference between \( FA \) or \( PV \) and \( PMT \times m \). (You will not be given a formula for Total Amount of Interest in either situation.)

3. Use the formulas above to calculate the periodic payment amount required to achieve a certain future accumulation or pay off a certain loan, given the number of payments, payment interval, and the annual interest rate.

4. Calculate the cash value of a lottery as the value of the first payment + the \( PV \) of the remaining payments.

5. Construct one or more lines of an amortization schedule for payment of a loan. Be able to determine the final payment, which may differ from the others. (See p. 110)

6. Calculate the principal of a mortgage when the mortgage involves a down payment; calculate the monthly payment, the part of the first payment that goes to interest and the part that goes to principal, and total amount of interest paid over the term of the loan. (You will not have to deal with “points” on a mortgage.)

7. Calculate the payoff amount of a loan, given the number of payments made, the amount of each payment, and the interest rate. Given the current balance and payment amount, be able to compute the part of the next payment that goes for interest and the part that goes to repay the original principal.

(over)
General Principles:

(1) The Future Accumulation of a sequence of payments (FA) is the value of the lump sum to which the sequence of payments (plus interest) accumulates just after the last payment. Questions that involve

i) Accumulation,

ii) That ask “how much will (s)he have?”,

iii) That ask “what payment is required in order to accumulate ___ after so many years?”

usually involve Future Accumulation.

(2) The Present Value of a sequence of payments (PV) is the value just before the first payment interval of the lump sum that can be paid off (principal plus interest) by making the sequence of payments. Questions involving

i) A loan or debt, or borrowing money, or financing a car, or

ii) Finding a “cash equivalent” or “cash value”, or

iii) Using a lump sum to purchase a sequence of payments, or

iv) Finding the payoff amount of a loan,

usually involve Present Value. In particular, when evaluating a transaction for purchase of an item:

Price or cash value of item = (PV of periodic payments to finance item) + (down payment) +

(value of trade-in)

and so PV of loan = Price – (down payment) – (value of trade-in).

(You will not be given these formulas.)

(3) An amortization schedule makes explicit the way in which each payment on a loan is a sum of an interest part and a principal repayment part. Be able to apply the procedure on p. 110 to calculate one or more lines in an amortization schedule. Be sure to use \( i \) = interest rate per payment interval in your calculations! Note how the calculation of the last payment differs from the calculations in the other lines.

(4) The total interest paid on a loan can be found by:

Total Interest = (Periodic Payment) x (Number of Payments) - Original Principal

(5) The total interest earned if \( m \) payments of $PMT$ are made into an account earning \( i \) interest rate per payment period is: Future Accumulation - (Periodic Payment) x (Number of Payments).

You will not be given a formula for the Total Amount of Interest calculation in either (4) or (5).

(6) The payoff amount for a loan at a rate of \( i \) per payment period, on which there are \( k \) remaining payments of \$PMT, is found using the formula to calculate PV, with \( m \) replaced by \( k \). (See p. 112.)