Week 9 - Annuities

The topic for week 9 is annuities. The part of this topic that seems to be the most challenging for students is deciding the type of annuity that is required. Below is a suggested thought process that students might find a useful tool.

The formulas listed on page 135 of the study guide for Present Value (right before Example 8-3) are for use with one single payment or one lump sum. The formula for Compound Interest is for use with one single payment or one lump sum and can be thought of as a Future Value type problem, just with a special name.

The formulas listed on page 145 of the study guide for Present Value of an Annuity are for use with regular payments R that are made at the END of the period when you are interested in the value of the money NOW. Think: NOW = PRESENT.

Notice the difference between the two Present Value calculations is that the first one is about ONE SINGLE PAYMENT (usually at the beginning of the investment and there are no more deposits ever) and the second one is about REGULAR PAYMENTS (usually at the beginning of each period).

The formulas listed on page 149 of the study guide for Future Value of an Annuity are for use with regular payments R that are made at the END of the period when you are interested in the value of the money LATER. Think: LATER = FUTURE.

Notice the difference between Present Value and Future Value is when the amount of money matters to you. Present Value means you need the money NOW (for example, loans). Future value means you need the money LATER (for example, retirement).

The formulas listed at the bottom of page 151 of the study guide for Annuities Due are for use with regular payments that are made at the BEGINNING of the period. Annuities Due can be applied to either Present Value or Future Value, but the regular payments occur at a different time of the period.

The thought process for these are typically as follows:

1) Figure out what type of value you are looking for, Present or Future. Ask yourself: "When do you need the money?" If you
   1a) need the money NOW = Present Value
   1b) need the money LATER = Future Value

2) Next, figure out how often the payments are made. Ask yourself: "Is the payment a single lump sum or a regular payment?"

   2a) If it is a single lump sum and that amount is
      2a i) needed now (from decision for question 1), use Present Value formula from page 135
      2a ii) needed later (from decision for question 1), use Compound Interest formula

   * from there you should know which formula you are meant to be using. Go to Step 4.

If it is not a single lump sum, continue...
2b) If it is a regular payment \( R \), then further analysis is needed.

3) You must make note WHEN the payment is made. Ask yourself: "Is the regular payment \( R \) made at the end or the beginning of the period?"

3a) If the regular payment is made at the END of the period, use the Ordinary Annuity Formulas based on the decision for question 1. If it is a regular payment at the END of the period and the total amount is
   3a i) needed now (from decision for question 1), use Present Value (A) formula from page 145
   3a ii) needed later (from decision for question 1), use Future Value (S) formula from page 149

3b) If the regular payment is made at the BEGINNING of the period, use Annuity Due Formulas based on the decision for question 1. If it is a regular payment at the BEGINNING of the period and the total amount is
   3b i) needed now (from decision for question 1), use Present Value of an Annuity Due (A) formula from page 151
   3b ii) needed later (from decision for question 1), use Future Value of an Annuity Due (S) formula from page 151

* from there you should know which formula you are meant to be using. Go to Step 4.

4) Extract all relevant known information from the problem and identify the value needed. What is \( P \), \( R \), \( S \), \( A \), \( r \), or \( n \) (these variables will highly depend on the formula you are meant to be using)? What value are you being asked to look for?

5) Substitute known values into the decided formula and solve for the unknown value.

6) Apply the correct label or units, round the value appropriately, and be sure to answer the question that is being asked.

Be aware that this is only a suggested tool for students. Use it, or not. There are also other avenues available that might suit students better.