

**Conflict Resolution On The Definition Of Present and Future Value of An Annuity and Present and Future Value of An Annuity Due:**

Note that the definition of an annuity does not depend upon whether the deposits are made at the end or at the beginning of the period.

For example,

If the deposits are made at the end of each period, it is an annuity and if the deposits are made at the beginning of the period it also an annuity as well. The **POINT** in time at which the computation is made determines whether it is an annuity or annuity due.

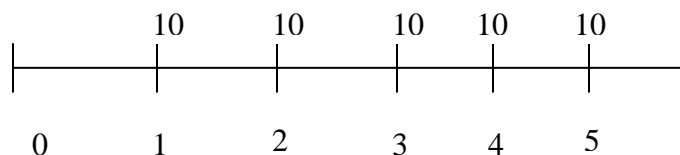
Consider the following example:

1. Deposits of \$10 are made at the end of each year for 5 years. If the simple rate of interest is 10 % year, obtain the present value of the annuity and annuity due.

**Solution:**

The problem did not say whether the deposits are made at the beginning or at the end of the period. As for convention, we will assume that the deposits are made at the end of the period.

Consider the following time line.



If we calculate the present value of this annuity at point 0, it is present value of an annuity.

If we calculate the present value of this annuity at point 1, it is present value of an annuity due.

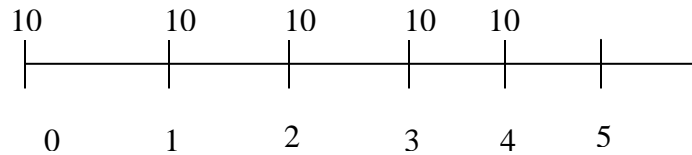
Therefore, the definition is

**IF THE PRESENT VALUE OF ANNUITY IS COMPUTED AT A POINT ONE PERIOD BEFORE THE FIRST PAYMENT, IT IS THE PRESENT VALUE OF ANNUITY.**

**IF IT IS COMPUTED RIGHT AT THE POINT WHERE THE FIRST DEPOSIT IS MADE IS THE PRESENT VALUE OF AN ANNUITY DUE.**

An exception to note:

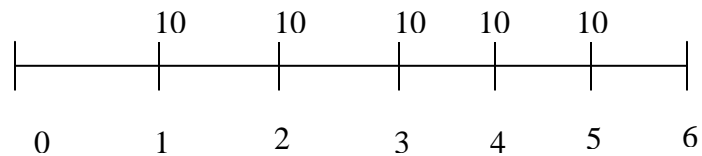
If you are making the deposits beginning today, as depicted in the following timeline,



Then there is no point one period before the first deposit. Therefore, by construction it is an ANNUITY DUE.

### **FUTURE VALUE OF AN ANNUITY AND ANNUITY DUE:**

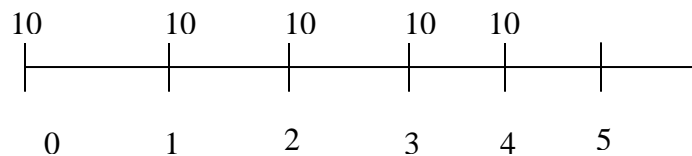
The future value of an annuity is computed at a point when the last deposit is made.



For example, if you compute the future value of the above annuity at point 5, it is an ANNUITY.

If you compute at point 6, it is an ANNUITY DUE.

Now, consider the following diagram,



In this case, if you compute the future value at 4, then it is an ANNUITY.

If you compute the future value at 5, then it is an ANNUITY DUE.

**POINTS TO REMEMBER:**

1. **It does not matter at what point in time (whether at the beginning or at the end) you make the deposit to define the annuity and annuity due. It is defined at what point in time, you are making the computation.**
2. **The present value of an annuity, the present value is computed at a point one period before the first deposit.**
3. **In the present value of an annuity due, the present value is computed right at a point where the first deposit is made.**
4. **The future value of an annuity is computed right at the point where the last deposit is made.**
5. **The future value of an annuity due is computed at a point one period after the last deposit is made.**

**These definitions do not change whether is the simple rate of interest or compound rate of interest.**