

Date: \_\_\_\_\_

## Today's Learning Goal(s):

By the end of the class, I will be able to:

- a) calculate the "future value" of an annuity earning compound interest.

Last day's work: pp. 498-499 #3 – 6, 8, 9, 11

## 8.4 Annuities: Future Value

Date: June 8/18

**Annuity:** an investment with regular deposits or withdrawals.

The **future value** of an annuity is the **sum** of all the regular payments **AND** interest earned.

Note: A **simple** annuity is an annuity in which the payments coincide with the compounding period.

An **ordinary** annuity is an annuity in which the payments are made at the end of each interval.

**Unless otherwise stated, each annuity in this chapter is a simple, ordinary annuity.**

Ex.1 You quit smoking a pack a day "cold turkey".

You save the money for cigarettes and deposit it at the end of each half year in an account earning 6% /a compounded semi-annually.

Determine the future value of this annuity in 20 years.

① 1 pack a day @ \$10/pack

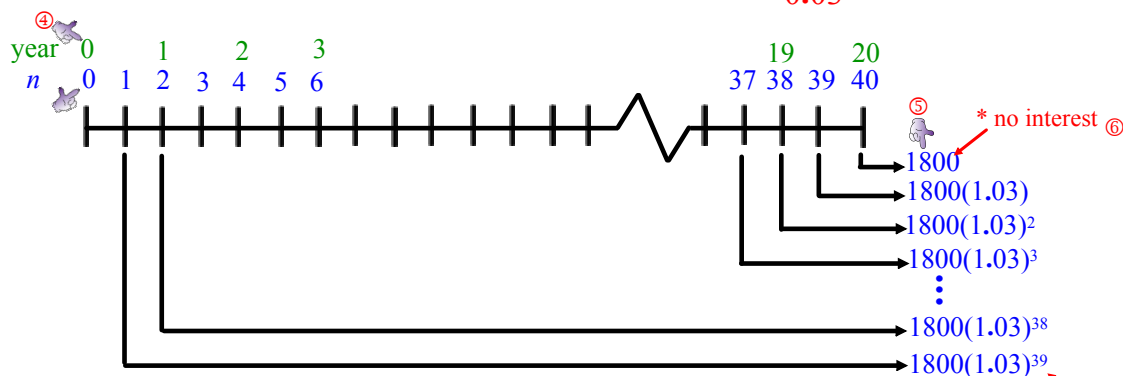
Each deposit = \$10 x 30 x 6

② = \$1800

$$A = P(1 + i)^n$$

$$\textcircled{3} i = \frac{0.06}{2} \quad n = 20 \times 2$$

$$= 0.03 \quad = 40$$



$$\textcircled{4} S_{40} = 1800 + 1800(1.03) + 1800(1.03)^2 + \dots + 1800(1.03)^{39}$$

This is a **Geometric Series**, with  $a = 1800$ ,  $r = 1.03$ ,  $n = 40$

$$\text{Note: } r = 1 + i$$

\* deposited at the end, so only 39 compounding periods

$$\text{Use } S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_{40} = \frac{1800(1.03^{40} - 1)}{1.03 - 1}$$

$$= \$135\,722.27$$

\$135 722.27

you would have \$135 722.27 in 20 years.

Discuss Interest earned?

$$\begin{aligned} & \$1800 \times 40 \\ &= \$72\,000 \\ & \$63\,722.27 \end{aligned}$$

Making a formula:

Let  $R$  represent the regular payment.

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_n = \frac{R((1+i)^n - 1)}{(1+i) - 1}$$

$$FV = \frac{R((1+i)^n - 1)}{i}$$

where  $R$  is the regular payment

$i$  is the interest rate per compound period

$n$  is the number of compound periods

Read pp. 507-508 Example 2 (both solutions)

Read the Key Ideas/Need to Know p.510

Today's Homework Practice includes:

pp. 511-512 #2, 5ac, 6, 7