1.4 - Compound Interest: PRESENT VALUE

Compound Interest – The interest that is earned on **both** the principal **and** the accumulated interest

Present Value – The amount that must be invested now to result in a specific future value. (Really it is just the **PRINCIPAL**)

Compound Interest Formula: $\sqrt{1 - P(1 + i)^n}$

FV = Amount the investment is worth in the end. The future value (also known as / P = The Principal (Starting Amount) -> Present Value.

 $i = interest \ \underline{per \ compounding \ period} = \frac{rate}{\# \ times \ compounded \ per \ year}$

n = Number of compoundings during the investment $n = (\# times compounded per year) \times (\# years)$

Example 1: What is the present value of \$5860.13 if it was invested at 3.2%, compounded semi-annually for 5 years?

FV = \$5860.13 P = ? i = 0.032 = 0.016n = 2x5 = 10

$$FV = P(1+i)^{n}$$

$$5860.13 = P(1+0.016)^{n}$$

$$5860.13 = P(1.016)^{n}$$

$$5860.13 = P(1.7202555)$$

$$1.7202555$$

\$ 5000.00 = P

The present value (Principal) / Was \$5000

Example 2: Ginny is 18 years old. She has inherited some money from a relative. Ginny wants to invest some of the money so that she can buy a home in Mile River, Alberta, when she turns 30. She estimates that she will need about \$170 000 to buy a home. How much does she have to invest now, at 6.5% compounded annually? (What is the present value?)

$$FV = 170000$$

 $i = 0.065 = 0.065$
 $n = 1 \times 12 = 12$

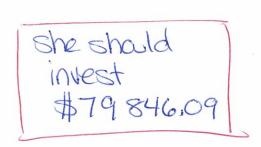
$$FV = P(1+i)^{7}$$

$$170000 = P(1+0.065)^{12}$$

$$\frac{170000 = P(1.065)^{12}}{1.065^{12}}$$

$$\frac{1.065^{12}}{1.065^{12}}$$

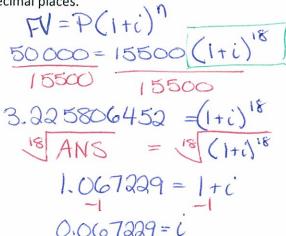
$$\frac{1.065^{12}}{1.065^{12}}$$



Example 3:

Laura has invested \$15 500 in a Registered Educations Savings Plan (RESP). She wants her investment to grow to at least \$50 000 by the time her newborn enters university, in 18 years.

a) What interest rate, compounded annually, will result in a future value of \$50 000? Round your interest rate to two decimal places.



(compounded annually so i=r)

Interest Rate
is 6.72%

b) Suppose that Laura wants her \$15 500 to grow to at least \$60 000 at the interest rate from part a. How long will this take?

FV = 60000 P=15500

n=?

$$60000 = 15500 (1.0672)^{10}$$
 $15500 = 15500$

Trial & Error to Find n.

$$1.0672^{5} = 1.384$$
 (small)
 $1.0673^{10} = 1.916$ (small)
 $1.0672^{20} = 3.672$ (small)
 $1.0672^{21} = 3.9188$ (big) > 3.87
 $1.0672^{21} = 3.9188$ (big)

>3.87 is between. so have to use n=21

Compounded annually so n= years

Assignment: Pg. 40 #3-7, 9, 11a, 12,13