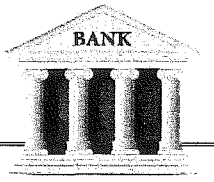
Day4-MCR3U

# Regular Payments of an Annuity (Present Value)




***Goal: Calculate the regular deposit/payment of an annuity***

***RECALL: FUTURE VALUE***

*Use to find the value **at the end of an annuity** (after all deposits are made & interest is accrued)*

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

***RECALL: PRESENT VALUE***

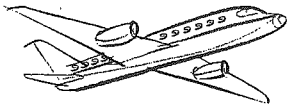
*Use to find the money needed **at the beginning of an annuity** to provide regular annuity payments*

$$PV = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

## *Calculating the Regular Payment of an Annuity*

When we know the future value or the present value of annuity, we can ***rearrange the formula*** to ***ISOLATE R*** to ***solve for the regular payment***. Remember, rearranging formulas means you do BEDMAS backwards.

***EXAMPLE 1*** ***Determining Payments given the Amount (Future Value)***



Brianne wants to save $6000 for a trip she plans to take in 5 years. What **regular deposit** should she make at the end of every 6 months into an account that earns 6% per year compounded semi-annually?

$FV = 6000$

$R = ?$

$i = \frac{0.06}{2} = 0.03$

$n = 5 \times 2 = 10$

$$6000 = R\left[\frac{1.03^{10} - 1}{0.03}\right]$$

$$6000 = 11.46R$$

$$R = 523.38$$

***EXAMPLE 2*** ***Determining Payments Given the Present Value***

Donald borrows $1200 from an electronics store to buy a computer. He will repay the loan in equal monthly payments over 3 years, starting 1 month from now. He is charged interest at 12.5% per year compounded monthly. How much is Donald's monthly payment?

$PV = 1200$

$R = ?$

$i = \frac{0.125}{12}$

$n = 3 \times 12 = 36$

$$1200 = R\left[\frac{1-\left(1+\frac{0.125}{12}\right)^{-36}}{\frac{0.125}{12}}\right]$$

$$1200 = 29.89R$$

$$R = \$40.14$$

***EXAMPLE 3*** ***Comparing Loan Options***

PV=9500

Sheri borrows $9500 to buy a car. She can repay her loan in 2 ways.

- **Option A:** 36 monthly payments at 6.9% per year compounded monthly
- **Option B:** 60 monthly payments at 8.9% per year compounded monthly

**a)** What is Sheri's monthly payment for each option?

OPTION A:

PV = 9500

n = 36

$i = \frac{0.069}{12} = 0.00575$

R = ?

$9500 = R\left[\frac{1-1.00575^{-36}}{0.00575}\right]$

$9500 = 32.43R$

$R = 292.90$

$9500 = R\left[\frac{1-\left(1+\frac{0.089}{12}\right)^{-60}}{\frac{0.089}{12}}\right]$

$9500 = 48.29R$

$R = 196.74$

**b)** How much interest does Sheri pay for each option? $I = Rn - PV$

OPTION A: $I = 36(292.90) - 9500$

$= \$1044.40$

OPTION B: $I = 60(196.74) - 9500$

$= \$2304.40$

**c)** Give a reason why Sheri might choose each option.

OPTION A: If Sheri can afford $292.90 for 3 years, she would save lots of money in interest.

OPTION B: If Sheri can not afford $292.90, $196.74 is more manageable.

**Homework:** p. 520 #1a, 3bd, 4,8,13