Lesson 6.7 Regular Payments of an Annuity

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)*

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

RECALL: PRESENT VALUE

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

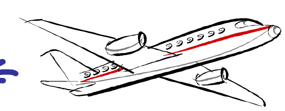
$$PV = \frac{R[1-(1+i)^{-n}]}{i}$$

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?



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

$$6000 = \frac{R[(1+0.03)^{10} - 1]}{0.03}$$

$$\frac{6000}{11.4639} = \frac{R(11.4639)}{11.4639}$$

$$R = \frac{6000}{11.4639} = 523.38$$

$A = 6000$

$R = ?$

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

$n = 5\text{yrs} \times 2 \frac{\text{times}}{\text{yr}} = 10$ times

$\therefore$ The regular payment Brianne must make is \$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?

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

$PV = \$1200$

$R = ?$

$i = \frac{0.125}{12} = 0.0104$

$n = 3\text{yrs} \times 12 \frac{\text{times}}{\text{yr}} = 36$

$$1200 = \frac{R[1-(1+0.0104)^{-36}]}{0.0104}$$

$$1200 = R(29.9607)$$

$$\frac{1200}{29.9607} = R$$

$$R = 40.13$$

$\therefore$ Donald's monthly payment is \$40.13

EXAMPLE 3 Comparing Loan Options

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?

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

$$PV = 9500$$

Option A

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

$$n = 36$$

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

$$9500 = R(32.43)$$

$$\frac{9500}{32.43} = R$$

$$R = \$292.93$$

Option B

$$i = \frac{0.089}{12} = 0.00741$$

$$n = 60$$

$$9500 = R\left[\frac{1-(1+0.00741)^{-60}}{0.00441}\right]$$

$$9500 = R(48.295)$$

$$\frac{9500}{48.295} = R$$

$$R = \$196.71$$

b) How much interest does Sheri pay for each option?

Option 1: 36 months × \$292.93 = 10 545.48

Interest = \$10 545.48 − 9500 = \$1045.48

Option 2: 60 months × \$196.71 = \$11 802.60

Interest = \$11 802.60 − 9500 = \$2302.60

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

- In option A you pay over \$1000 less overall.
- In option B you pay less money per month.

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