What's Going On?

Checking In

Minds on What's an Annuity?

Action! Finding the Formula

Consolidation Using the Formula

Learning Goal - I will be able to determine the future value of an annuity.

LGL

How much do you need to invest now to have $1,000,000 in 43 years if you earn 5% interest compounded monthly?

A

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

solve for P

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{1000000}{\left(1+\frac{0.05}{12}\right)^{(43\times 12)}}$$

$$P = 117,005.63$$

Minds on

What's an Annuity?

Minds on

By the Book

Annuity

A series of payments or investments made at regular intervals. A **simple** annuity is an annuity in which payments coincide with the compounding period, or *conversion* period. An **ordinary** annuity is an annuity in which the payments are made at the end of each interval. We will only deal with simple, ordinary annuities.

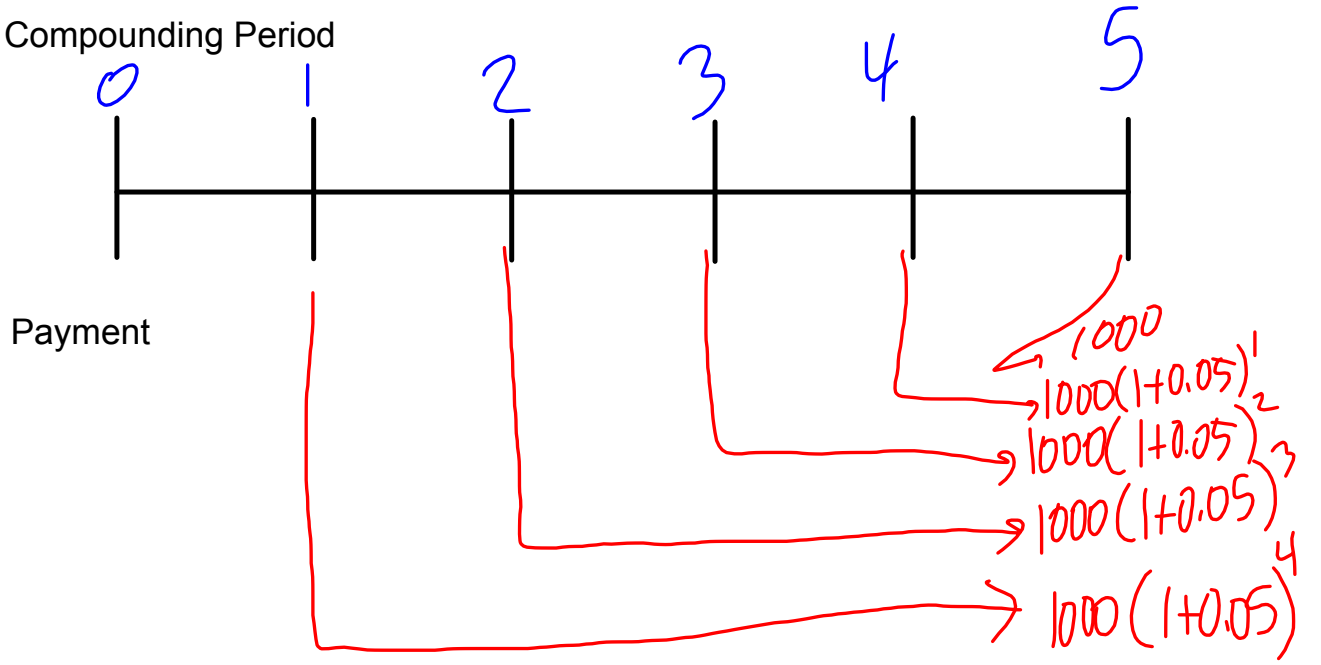
Action!

Future Value Formula

You plan to put away $1000 per year in an annuity that earns 5% interest compounded annually for the next 5 years.

What will this annuity be worth in 5 years?

*Remember, payments are made **at the end** of each year.



$FV = 1000 + 1000(1+0.05) + 1000(1+0.05)^2 \ldots + 1000(1+0.05)^4$

Action!

Future Value Formula

You plan to put away $R per year in an annuity that earns i% interest compounded annually for the next n years.

What will this annuity be worth in n years?

Action!

Future Value Formula

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

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

Action!

Future Value Formula

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

Action!

Future Value Formula

You plan to put away $1000 per year in an annuity that earns 5% interest compounded annually for the next 5 years.

What will this annuity be worth in 5 years?

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

$R = 1000$

$i = \frac{0.05}{1}$

$n = 1 \times 5$

$FV = 1000 \times \left(\frac{(1+0.05)^5 - 1}{0.05} \right)$

$FV = 5,525.63$

Consolidation

Annuity Examples

You plan to invest $1,000 at the end of each 6-month period in an annuity that earns 4.8% interest compounded semi-annually for the next 20 years.

What will be the future value of your investment?

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

$R = 1000$

$i = \frac{0.048}{2}$

$n = 2 \times 20$

$$FV = 1000 \times \left(\frac{\left(1 + \frac{0.048}{2}\right)^{40} - 1}{\frac{0.048}{2}} \right)$$

$$FV = 1000 \times \left(\frac{\left(1 + \frac{0.048}{2}\right)^{40} - 1}{\frac{0.048}{2}} \right)$$

$$FV = 1000 \times \left(\frac{(1.024)^{40} - 1}{0.024} \right)$$

$$FV = 1000 \times (65.9271)$$

$$= 65,927.06$$

Consolidation

Annuity Examples

You put away $500 every 3 months at 5.2% compounded quarterly. What will your investment be worth in 25 years?

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

$R = 500$

$i = \frac{0.052}{4}$

$n = 4 \times 25$

$$FV = 500 \times \left(\frac{\left(1 + \frac{0.052}{4}\right)^{100} - 1}{\frac{0.052}{4}} \right)$$

$$FV = 500 \times \left(\frac{(1.013)^{100} - 1}{0.013} \right)$$

$$FV = 500 \times (202.9754)$$

$$FV = 101,487.91$$