What's Going On?

Checking In

Minds on LGL

Action! Compound Interest

Consolidation Minding Your i's and n's

Learning Goal - I will be able to determine the value of investments earning compound interest .

Minds on

LGL

A $2,500 credit card debt accrues $82.15 in interest in a period of 60 days. What percent interest is being charged?

$$\frac{I}{Pt} = \frac{Prt}{Pt} \qquad \frac{60}{365}$$

$$r = \frac{I}{Pt}$$

$$r = \frac{82.15}{2500 \times \left(\frac{60}{365}\right)}$$

$$r = 0.199$$

$$r = 20\%$$

Action!

Compound Interest

A Simple Interest Investment only earns interest on the Principal; that's bad!

A Compound Interest Investment pays interest on the total value of the investment (including interest earned); that's good!

Action!

Compound Interest

Compound Interest

Interest that is added to the principal *before* new interest earned is calculated. So interest is calculated on the principal *and* on interest already earned. Interest is paid at regular time intervals called the **compounding period**.

Compounding Period

The intervals at which interest is calculated; for example,

annually	- 1 time per year
semi-annually	- 2 times per year
quarterly	- 4 times per year
monthly	- 12 times per year

Action!

Compound Interest

What would be the total value of a $10,000 initial investment that earned 3.25% **compound** interest for 5 years?

Hint: You may have to perform several calculations...

After Year 1

$A = P(1+r)$

$A = 10000(1+0.0325)$

$A = 10,325$

After Year 2

$A = 10,325(1+0.0325)$

$A = 10,660.56$

After Year 3

$A = 10660.56(1+0.0325)$

$A = 11007.03$

After Year 4

$A = 11007.03(1+0.0325)$

$A = 11364.76$

After Year 5

$A = 11364.76(1+0.0325)$

$A = 11734.11$

Action!

Compound Interest

What would be the total value of a $P initial investment that earned i% **compound** interest for n years?

End of First Year

$$A = P + Pi$$

$$A_1 = P(1 + i)$$

End of Second Year

$$A_2 = P(1 + i)(1 + i)$$

$$A_2 = P(1+i)^2$$

End of Third Year

$$A_3 = (P(1 + i)(1 + i))(1 + i)$$

$$A_3 = P(1+i)^3$$

End of n^{th} Year

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

Action!

The Compound Interest Formula

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

Total value of investment

Principle

Interest rate as a decimal, **per compounding period**.

Total number of compounding periods

Consolidation

Minding Your **i's** and n's

To determine the value of i:

divide the interest rate by the number of compounding periods in a year

52

0.03

Example: If you invested $2,500 at 3% interest compounded weekly for 3 years.

i = .03/52

Interest Rate **as a decimal**

Number of **times** interest is compounded **per year**.

i = 0.00059

Consolidation

Minding Your **i's** and n's

Example: If you invested $ 3,000 at 6 %

interest compounded monthly for 8 years.

i = 0.06 / 12

Interest Rate

Number of times interest is compounded per year.

$i = 0.005$

Consolidation

Minding Your i's and **n's**

To determine the value of ***n***:

multiply the number of compounding periods in a year by the number of years the money is invested

52 3

Example: If you invested $2,500 at 3% interest compounded weekly for 3 years.

n = 52 x 3

n = 156

Number of **times** interest is compounded **per year**.

Number of **years** money will be invested

Consolidation

Minding Your i's and **n's**

Example: If you invested $ 3000 at 6 %

interest compounded monthly for 8 years.

$n = \frac{12}{\text{Number of times interest is compounded per year.}} \times \frac{8}{\text{Number of years money will be invested}}$

$n = 96$

Consolidation

Example

You decide to invest $5,000 for 3.5 years at 2.5% interest compounded monthly.

What is the total final value of your investment?

$A = ?$

$P = 5,000$

$i = 0.025 / 12 = 0.0021$

$n = 12 \times 3.5 = 42$

$$A = 5000(1 + 0.0021)^{42}$$

$$= 5000 \times 1.0921$$

$$= 5460.50$$

Consolidation

Exit Question

You decide to invest $15,000 ~~for~~ at 4% interest compounded monthly. After 5 years, the interest rate changes to 3.25% compounded quarterly.
You leave the investment for another 3 years.
What is the total value of your investment after the full 8 years?

1. Amount after 5 years.
2. Calculate value with new conditions after another 3 years. * start with amount from (1)

Consolidation

Exit Question

You decide to invest $15,000 for at 4% interest compounded monthly. After 5 years, the interest rate changes to 3.25% compounded quarterly.
You leave the investment for another 3 years.
What is the total value of your investment after the full 8 years?

After first 5 years

$P = 15000$

$i = \frac{0.04}{12} = 0.0033$

$n = 12 \times 5 = 60$

$A = 15000(1+0.0033)^{60}$

$= 18314.95$

After next 3 years

$P = 18,314.95$

$i = \frac{0.0325}{4} = 0.00081$

$n = 4 \times 3 = 12$

$A = 14,314.95(1+0.00081)^{12}$

$A = 20142.66$

Final value is $20,142.66