

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?

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

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

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

$$r = 0.1999$$

$$r = 20\%$$

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
<u>semi-annually</u>	- <u>2</u> 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

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

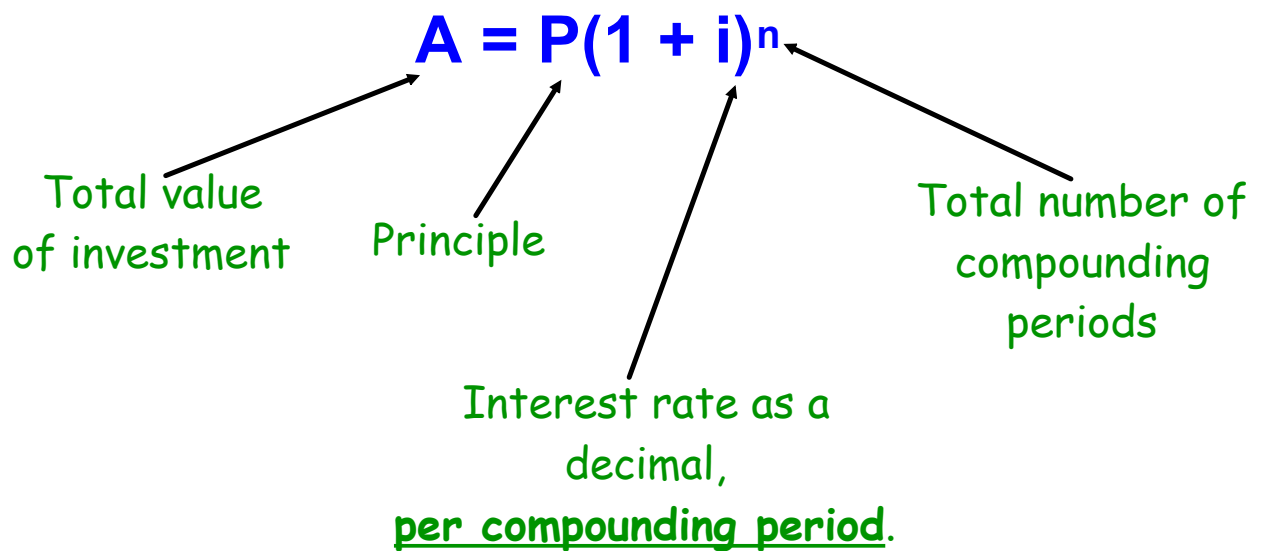
$$A_3 = P(1 + i)^3$$

End of n^{th} Year

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

Action!

The Compound Interest Formula



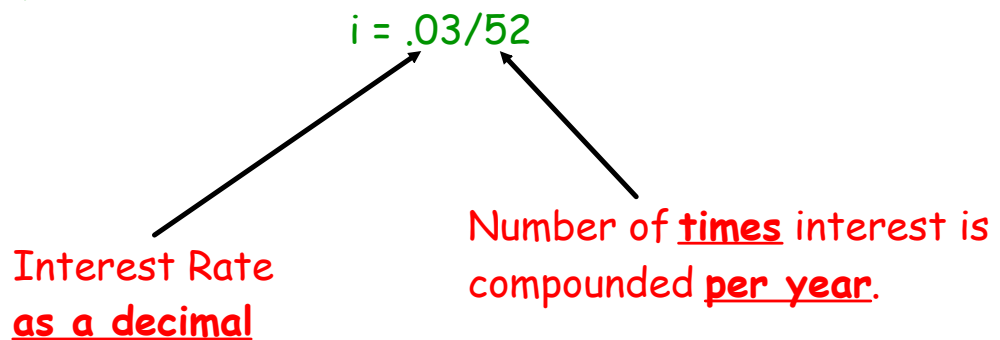
Consolidation

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**

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



$$i = 0.00059$$

Consolidation

Minding Your i's and n's

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

interest compounded monthly for 8 years.

$i = \underline{0.06}, \underline{12}$

Interest Rate

Number of times interest is compounded per year.

$$i = 0.005$$

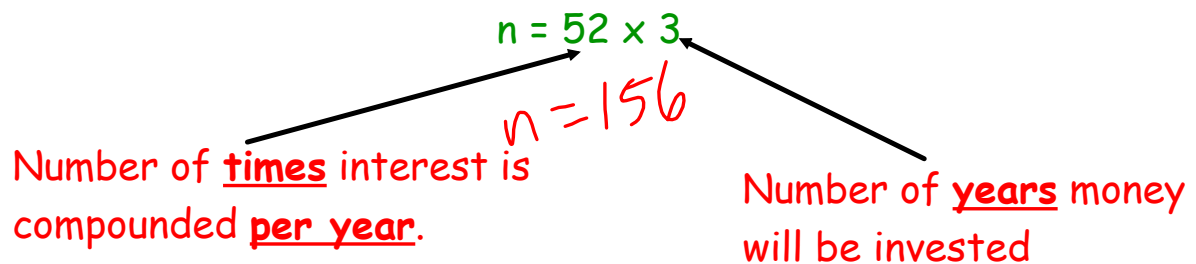
Consolidation

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

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



Consolidation

Minding Your i's and n's

Example: If you invested \$ 3000 at 6%

interest compounded monthly for 8 years.

$$n = \frac{12}{1} \times \frac{8}{1}$$

Number of times interest
is compounded per year.

$$n = 96$$

Number of years money
will be invested

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

$$P = 15000$$

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

$$n = 12 \times 5 = 60$$

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

$$= \underline{18314.95}$$

After next 3 years

$$P = 18,314.95$$

$$i = \frac{0.0325}{4} = 0.0081$$

$$n = 4 \times 3 = 12$$

$$A = 18,314.95(1 + 0.0081)^{12}$$

$$A = 20142.66$$

Final value is \$20,142.66