4.2 Compound Interest

Recall: Compound interest pays interest on interest.

DON'T COPY... this is just like yesterdays process.

Eg. Chris puts $2500 in a bank account that earns 8% compound interest, per year. How much is earned after 5 years?

Year	Amount at start of year ($)	Interest ($)	Amount at end of year($)
1	2500	2500 * 0.08 = 200	2700
2	2700	2700 * 0.08 = 216	2916
3	2916	2916 * 0.08 = 233.28	3149.28
4	3149.28	3149.28 * 0.08 = 251.94	3401.22
5	3401.22	3401.22 * 0.08 = 272.10	3673.32

How can we get directly to the amount at the end of the year, i.e. without calculating the interest and adding?

2500 x **?** = 2700

⟶   **?** = 1.08

.08   interest rate

Why is it 1.08?

(start)(1.08) = (end)

Still DON'T COPY... this is just another way of looking at it...

Year	Amount at start of year ($)	Amount at end of year($)
1	2500	(2500)(1.08) = 2700
2	(2500)(1.08)	(2500)(1.08)(1.08)
3	(2500)(1.08)(1.08)	(2500)(1.08)(1.08)(1.08)
4	(2500)(1.08)(1.08)(1.08)	(2500)(1.08)(1.08)(1.08)(1.08)
5	(2500)(1.08)(1.08)(1.08)(1.08)	(2500)(1.08)(1.08)(1.08)(1.08)(1.08)

What's the pattern?

⭐ Amount after 5 years = $(2500)(1.08)^5$

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

⭐ COMPOUND INTEREST FORMULA !!!

May 23-9:45 AM

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5.2 Compound Interest

Quite often... interest is calculated more than once per year on an investment, yet the given rate is always expressed as an ANNUAL rate.

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

Notice it is exponential growth!

$$A = a_o(b)^x$$

⇨ A   Amount in $ at the end of the investment

i interest rate per period

$$i = \frac{\text{rate}}{\text{\# of compounding periods per year}}$$

P   Principal original $ invested or borrowed

n number of compounding periods

n = # of years x # of periods per year

Compounding Periods	# of periods per year
annually	1
semi annually	2
quarterly	4
monthly	12
weekly	52
daily	365

May 24-2:21 PM

Ex 1. Noah invests $800 in a GIC that pays 4% compounded annually for 5 years. Determine the amount when the investment matures.

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

$P = 800$

$i = 0.04$

$n = 5$

$A = ?$

$A = 800(1 + 0.04)^5$

$= 800(1.04)^5$

$= 973.32$

∴ The amount after 5 yr's is $973.32

Ex 2. Gregory invests $500 at 3.75% compounded quarterly. How much interest will he earn in 4.5 years?

$A = ?$

$P = 500$

$n = 4 \frac{\text{times}}{\text{year}} \times 4.5 \text{ yrs}$

$= 18$

$i = \frac{0.0375}{4}$ $\left(\begin{array}{l} \text{rate} \\ \overline{\text{\# times per year}} \end{array} \right)$

$= 0.009375$

$A = 500(1 + 0.009375)^{18}$

$= 500(1.009375)^{18}$

$= 591.45$

$I = A - P$

$= 591.45 - 500$

$= 91.45$

$\therefore$ Greg will earn $91.45 in interest

Homework:
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