What's Going On?

Checking In

Minds on Whiteboard Basics

Action! Compound Interest

Consolidation Compound Interest Problem Solving

Learning Goal - I will review the finance material from Grade 11 and will be able to solve problems involving compound interest.

Minds on

Whiteboard Basics

Express each time period in years.

6 months → 0.5 years

$\frac{6}{12}$ 6 months → 0.67 years

7.5 months → 0.63 years

$\frac{26}{52}$ 26 weeks → 0.5 years

65 weeks → 1.63 years

$\frac{156}{52}$ 156 weeks → 3 years

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40 days → 0.11 years

10,000 days → 27.40 y

31,025 days → 85 years

Minds on

Whiteboard Basics

Depositing $100 per month means depositing how much in each time period?

1 year → $1200

$100 x 12

10 years → 12,000

40 years → 46,000

45 years → 54,000

Minds on

Whiteboard Basics

If you earn $40,000 in a year. How much do you earn in

one month?

$\frac{40000}{12} = 3333.33$

one week? $\div 52$ $\frac{40000}{52} = 769.23$

one day? $\frac{40000}{365} = 109.59$

6.5 months?

$\left(\frac{40000}{12}\right) \times 6.5 = 21,666.67$

per month

6.5 months

How many payments are made in one year for each payment frequency?

Daily	365 times a year
Weekly	52 times a year (but **not** 4 times a month!)
every other	
Bi-Weekly	26 times per year (every 2 weeks)
Monthly	12 times a year
every half	
Semi-monthly	24 times a year (twice a month)
Annually	Once a year
Semi-annually	2 times per year (every 6 months)
Quarterly	4 times a year (every 3 months)

Predict whether each exponential expression will give a value greater or less than the initial value.

Initial Value ($)	Exponential Expression
1,000	$1{,}000(1.0325)^1$
30,000	$30{,}000(0.84)^2$
750	$750(1.0075)^{-6}$
3,250	$3{,}250(1.00125)^{24}$
1,450	$1{,}450\left(\frac{1}{4}\right)^5$
68,000	$68{,}000(0.65)^{-4}$

larger than 1 → greater

less

greater to right

moving to left

larger to right

to right } greater

0.25 less

Action!

Compound Interest

$$FV = PV(1 + i)^n$$

Total value of investment (Future Value)

Principle (Initial Investment) (Present Value)

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

Total number of compounding periods

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

To determine the value of i:

as a decimal

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

→ 0.03

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

→ compounds 52 times in a year

i = .03/52 = 0.00054

Interest Rate **as a decimal**

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

0.054% per week

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

Example: If you invested $ 5,000 at 5.5 %

interest compounded monthly for 6 years.

$\frac{5.5}{100}$ $i = 0.055 / 12 = 0.0046$

Interest Rate

Number of times interest is compounded per year.

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.

$n = 52 \times 3 = 156$

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

Number of **years** money will be invested

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

$$FV = PV(1+i)^n$$

$$PV = 2500$$

$$i = \frac{0.03}{52} = 0.00056$$

$$n = 52 \times 3 = 156$$

$$FV = 2500(1+0.00056)^{156}$$

$$FV = 2500(1.00056)^{156}$$

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

Example: If you invested $ 342,000 at 2.5 %

interest compounded bi-weekly for 7 years.

26/year

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

Determine what your initial investment will be worth at maturity.

$$FV = PV(1 + i)^n$$

You decide to invest your money for 30 years at an interest rate of 5.2% compounded monthly.

How much do you need to invest now to have $100,000 when the investment matures?

$$FV = PV(1 + i)^n$$

Consolidation

Problem Solving with Compound Interest

You have decided to start saving for a car. You decide to deposit $400 at the end of each month into an account that pays 3.6% per year, compounded monthly.

How much money will you have saved, in total, after 6 months?

Consolidation

Problem Solving with Compound Interest

You want to make sure that you have money available for "fun" while you are away at college.

How much do you need to invest before you go to school, in an account that earns 3.5% interest compounded monthly, to be able to withdraw $200 per month for 8 months?

Assume that you will withdraw the money at the end of each month, and that you will deposit all of the money one month before the initial withdraw.