Name:_____ Math _____, Period _____

Mr. Rogove Date: _____

LEARNING OBJECTIVE: We will differentiate between simple and compound interest and calculate both. (Alg1M3L4)

ACTIVATING PRIOR KNOWLEDGE

What do we know about banks and other financial institutions?

Deposit $. Generates interest

Borrow $ - Mortgage, Student loans, small business loans, car. They charge interest

CONCEPT DEVELOPMENT

INITIAL VALUE

Principal: An amount you borrow or invest in a bank or other financial institution.
Examples: Lance opens a bank account with a $500 deposit. His principal is $500. Kai borrows $300 from Lance to buy a refurbished computer. Kai's principal is $300.

Simple Interest: Interest that is calculated once per year on the original amount borrowed or invested. The interest does not become a part of the amount borrowed or invested (principal).
Example: Nicole's bank account pays 3% interest every year. She starts out with $500. This money is sent to her in the form of a bank check.

After year 1 → $515
After year 2 → $530
After year 3 → $545

After year 10 → $650

Calculating Simple Interest:

$I = P \cdot r \cdot t$

interest = (principal) · (rate) · (time)

$I = Prt$

Do we see a sequence developing? What type of sequence—arithmetic or geometric? $f(n+1) = f(n) + 15, f(0) = 500, n \geq 0$

Compound Interest: Interest is calculated once per period on the current amount borrowed or invested. Each period, the interest becomes a part of the principal.
Example: Mandy earns 5% interest on a $1000 investment. After one year, she has $1,050 invested, and this is the new amount that will earn 5% interest.

Year 1 = $1050. $1000 \cdot 1.05$
Year 2 = $1102.50 $1050 \cdot 1.05$
Year 3 = $1157.63 $1102.50 \cdot 1.05$

$= 1000(1.05)^3$

Calculating Compound Interest: $FV = PV(1+r)^n$

Do we see a sequence developing? What type of sequence—arithmetic or geometric?

$f(n+1) = f(n) \cdot 1.05 \quad f(0) = 1000 \quad n \geq 0$

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Mr. Rogove Date: _____

GUIDED PRACTICE

Steps for Calculating Interest (Simple and Compound)

1. Determine whether you are calculating simple of compound interest.
2a. If simple interest, use the formula: $I = Prt$
2b. If compound interest, use the formula: $FV = PV(1 + r)^n$
3. Answer any questions and relate your answer to the context of the problem.

Jenna has $2000 to invest. She places her money in a certificate of deposit (CD) that offers 4% simple interest per year. Her certificate matures after 7 years. At the time of maturity, how much money will be in her CD?

$I = Prt$

$P = 2000$
$r = .04$
$t = 7$

$I = 2000 \cdot .04 \cdot 7$
$I = 560$
$\$2,560.$

Evan needs $400 to open up a snow cone and lemonade stand in the summer months. He borrows the money from US Bank, who gives him a loan but charges him 3% simple interest EACH MONTH. How much money will he owe if he waits 1 year to pay back the loan? What about 5 years?

$I = Prt$

$I = 400 \cdot .03 \cdot 12$
$= 400 \cdot .36$
$= 144$

1 year → $544
5 year → $1120

$I = 400 \cdot .03 \cdot 60 = 400 \times 1.8 = 720$

Paige is opening an art studio and needs to borrow $7,500 to cover her initial start up costs. She takes out a small business loan from Bank of America. The loan has a life of 15 years, and an annual compounding interest rate of 6%. How much money will she pay back when she is done paying the bank?

$FV = PV(1+r)^n$
$FV = 7500(1+.06)^{15}$
$= 7500(1.06)^{15}$
$= 7500(2.396)$
$= \$17,974.19$

Miles received $15,000 in cash for his birthday. He decided to place his money in a high yield savings account at Valley Savings and Loan. They offered a 2% interest rate that compounds annually. How much money will he save if he leaves his money in the bank for 12 years?

$FV = 15000(1.02)^{12}$
$15000 \cdot 1.268$
$= \$19,023.63$

Name:_____ Math _____, Period _____

Mr. Rogove Date: _____

Fritz has $2,500 to invest and he goes to Provident Credit Union to look at their investment options. He wants to invest his money for 6 years. He is trying to decide between an account that will pay a simple interest of 6% and an account that will pay 5% compound interest. Which one will generate more interest?

SIMPLE 6%

$2500 \cdot .06 \cdot 6$

$2500 \times .36$

$900 + 2500$

3400.00

COMPOUND 5%

$2500(1.05)^6$

$2500 \cdot 1.341$

3350.24

SIMPLE INTEREST BETTER

Andrew is deciding between two investment opportunities for the long haul. He is wanting to invest $10,000 in a bank account and let it accumulate interest until he is 65 years old. This is 52 years! He is looking at two accounts. One that pays 3% interest, compounded annually, and one that pays simple interest of 6%. After 52 years, which account would be bigger?

SIMPLE 6%

$10000 \cdot .06 \cdot 52$

$600 \cdot 52$

$31,200$

$10,000$

$41,200$

COMPOUND 3%

$10000(1.03)^{52}$

$10000(4.651)$

$46,508.86$

COMPOUND BETTER

Jessi has foolproof way to earn an 8% annual return on her investment of $6,000. The best part is that the investment compounds annually. If she is able to duplicate this performance each year, how much money will she have in 9 years?

$6000 \cdot (1.08)^9$

6000×1.999

$11,994.83$

Akanshya also has a way to generate a fixed return on her investment, but her rate of return is only 4%, compounding annually. If she starts with $6,000, how much money will she have after 18 years?

$6000(1.04)^{18}$

$6000(2.026)$

$12,154.90$

What is the rule of 72?

Name:_____ Math _____, Period _____

Mr. Rogove Date: _____

CLOSURE

Some banks offer annual interest rates that compound annually. Other banks offer annual interest rates that compound monthly, and still others offer rates that compound daily. Calculate the difference in a $10,000 investment that offers a 5% annual interest rate if the interest is compounded annually, monthly, and daily if you plan on investing for 3 years.

INDEPENDENT PRACTICE

Jack has $5,000 to invest. The bank offers a 3.5% interest rate compounded annually. How much money will Jack have after 1 year? 2 years? 5 years? 10 years?	Kate is investing $10,000. Wells Fargo will pay her 4.5% in simple interest each year. Bank of the West offers her the opportunity to earn a compounding annual rate of 3.5%. How long will she need to invest her money at Bank of the West to make that account the better choice?
Akshat was smart and invested $15,000 for retirement when he was 22 years old. Bradly was smart too but not as smart as Akshat—he waited until he was 32 years old to invest his $15,000. If they are investing in the same mutual fund that generates a guaranteed fixed return of 7% compounded annually, how much more money will Akshat have when he retires compared to Bradly? (assume there are no deposits or withdrawals from this account). They both retire when they're 65.	

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NOTES

This maps to lesson 4 Mod 3 Alg 1