Date: _____

SIMPLE INTEREST
It Really Is Simple

CALCULATING SIMPLE INTEREST

Simple interest is calculated as a percentage of the deposit on an investment or loan using the formula $I = Prt$ where:

I = Interest (accumulated over _____)

P = Principal (the deposit amount)

r = rate (expressed as a decimal)

t = time (expressed in terms of years.)

Simple interest is added to the principal at the end of the period using the formula $A = P + I$, where

A = P + Prt (principal + interest)

$A = P(1 + rt)$ Simple Interest.

Interest Rate (***r***)

Show the following interest rates as they would appear in the simple interest formula as ***r***.
*(Hint: Divide by 100, **or** move decimal 2 spaces to the **left**)*

a) 13% 0.13

b) 2.5% 0.025

c) 0.5% 0.005

In the simple interest formula, time **MUST** be expressed in terms of years.
So... if ***time*** is given in:

- Months → ÷ by 12
- Weeks → ÷ by 52
- Days → ÷ by 365

Time (***t***)

Express the following lengths of time in terms of years (***t*** in the simple interest formula)

b) 24 months 2

c) 8 months $\frac{2}{3}$ years.

d) 14 weeks $\frac{7}{26}$

e) 82 days $\frac{82}{365}$

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EXAMPLE 1 P r=0.045

a) Calculate how much interest is earned if $2 000 is invested at 4.5% simple interest for 26 weeks.

t = 0.5 years.

$I = Prt$

$= 2000(0.045)(0.5) = \$45$

b) How much is the investment worth?

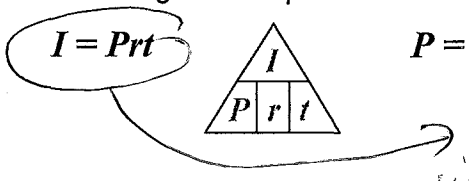
$A = P + I$

$= \$2045$

∴ Investment was worth $2045.

The Simple Interest Triangle → Finding *P*, *r*, and *t*

Rearrange the simple interest formula to find the principal, interest rate, and time.



rearranging.

$P = \frac{I}{rt}$ $r = \frac{I}{Pt}$ $t = \frac{I}{Pr}$

EXAMPLE 2

How much principal is needed to earn $500 in interest in 2 years invested at 2.5% simple interest?

P = ?
I = 500
t = 2
r = 0.025

$I = Prt$

$500 = P(0.025)(2)$

$\frac{500}{0.05} = \frac{0.05P}{0.05}$ ⇒ $P = \$10{,}000$

∴ 10,000 were needed as a deposit.

EXAMPLE 3

What rate of simple interest is needed to get $7 000 to grow to $10 000 in 5 years?

r

r = ?
P = 7000
A = 10000
t = 5

$A = P + Prt$

$10000 = 7000 + 7000(r)(5)$

$\frac{3000}{35000} = \frac{35000r}{35000}$

$r = 0.0857 \Rightarrow 8.57\%$

$I = Prt$

$3000 = 7000(r)(5)$

$r = 8.57\%$

EXAMPLE 4

How long would it take $1 500 to grow to $2 000 at a simple interest rate of 3%?

I = 500
r = 0.03
t = ?
P = 1500

$I = Prt$

$500 = 1500(0.03)(t)$

$t = \frac{500}{45} = 11.\overline{1}$

11 years.
1 month.
10 days.

Date: _____

COMPOUND INTEREST

REVIEW

Simple Interest

- Interest paid on ONLY the ___principal___ of an investment or loan.
- Has a ___constant___ growth.

Compound Interest

- Interest paid on the ___principal___ **AND** it's accumulated ___interest___.
- Calculated at regular compounding ___period___ and ___added___ to the principal for the next compounding period.
- Has ___exponential___ growth.

COMPOUND INTEREST FORMULA $A = P(1+i)^n$

A = ___accumulated amount___ (or future value)

P = ___deposit/principal___ (the initial amount)

i = ___interest rate___ per ___compounding___ period

n = number of ___Compounding___ periods

Compounding Frequency Terminology

- Annually – once a year
- Semi-annually – ___2___ times per year (every 6 months)
- Quarterly – ___4___ times per year (every 3 months)
- Semi-monthly – ___24___ times per year (twice a month)
- Bi-weekly – ___26___ times per year (every 2 weeks)
- Weekly – ___52___ times per year (but **NOT** 4 times a month)

Monthly 12

Interest Rate (i)

Calculate the interest rate (i) as it would appear in the compound interest formula.
(Hint: Convert to decimal and divide by the number of compounding periods)

a) 6% semi-annually

$i = \frac{0.06}{2} = 0.03$

b) 5% weekly

$i = \frac{0.05}{52}$

c) 1.75% quarterly

$i = \frac{0.0175}{4}$

Compounding Periods (n)

Calculate the number of compounding periods (n) as it would appear in the compound interest formula. *(Hint: multiply the length of time (in years) by the # of compounding periods in the compounding frequency)*

a) Compounded **quarterly** for 5 years

$n = 5 \times 4$

$= 20$

b) Compounded **semi-annually** for 18 months

years.

$n = 1.5 \times 2$

$= 3$

c) Compounded **bi-weekly** for 8 months

$n = \frac{8}{12} \times 26$

$= 17\frac{1}{3} = \frac{52}{3}$

Date: _____

EXAMPLE 1

a) Calculate the amount of a $500 investment, invested at 3% compounded quarterly for 3 years.

$A = ?$

$P = 500$

$i = 0.03/4 = 0.0075$

$n = 3 \times 4 = 12$

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

$= 500(1.0075)^{12}$

$= \$546.90$

b) How much interest was earned?

$I = A - P$

$= \$46.90$

EXAMPLE 2

Peter borrowed $5 000 to buy a used car? The interest rate on the loan was 5.45% per year, compounded monthly. He plans to repay the loan in four years.

a) How much must Peter repay?

$A = ?$

$P = 5000$

$i = \frac{0.0545}{12}$

$n = 4 \times 12 = 48$

$A = 5000\left(1 + \frac{0.0545}{12}\right)^{48}$

$= \$6214.87$

Interest = 1214.87

b) If Peter repays the loan 6 months early, how much interest will he save (not have to repay)?

$A = ?$

$P = 5000$

$i = \frac{0.0545}{12}$

$n = 42$

$A = 6008.17$

$I = 1008.17$

Saving = 1214.87 − 1008.17

$\$166.70$

EXAMPLE 3

Jennifer's investment has grown by an average of 12.6% per year, compounded annually, over the past seven years. How much would her investment of $2000 made ~~eight~~ seven years ago be worth today?

$i = 0.126$

$n = 7$

$P = 2000$

$A = \$2000(1.126)^7 = \$4589.85$

3 RULES OF THUMB FOR CALCULATING COMPOUND INTEREST

- Always identify the value of each variable first.
- Remember to use BEDMAS
- Keep all decimal places in your calculator and round to 2 decimal places at the end.

p. 481 #3, 4, 5ad, 10-12, p. 490 #4-6, 9