Simple Interest

$I = Prt$

- Interest calculated as a percentage of the principal.

I = Interest

P = Principal

r = rate (as a decimal)

t = time in years

Compound Interest

- The interest paid on the principal plus interest

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

A = final value of the investment ... (principal + interest)
P = principal (invest/borrow)
r = annual interest rate (as a decimal)
n = number of compounding periods in a year
t = term of the investment or loan in number of years

Terminology Tango

	# of compounds per year
annualy →	1
semi-annually →	2
quarterly →	4
monthly →	12
semi-monthly →	24
bi-weekly →	26
weekly →	52
daily →	365

Allison wants to invest $2000.00. Her bank offers an investment option that earns compound interest at a rate of 1.75% per year compounded annually for 3 years.

$P = 2000.00$

$r = 0.0175$

$t = 3$

Interest period	Investment value at beginning of period	Interest earned I = Prt	Investment value at end of period
1	$2000	$2000x0.0175x1= $35	$2035
2	$2035	$2035x0.0175x1= $35.61	$2070.61
3	$2070.61	$2070.61x0.0175x1= $36.24	$2106.85

Allison wants to invest $2000.00. Her bank offers an investment option that earns compound interest at a rate of 1.75% per year compounded annually for 10 years.

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??

Formula: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

A = final value of the investment ...(principal + interest) A = ?
P = principal P = 2000
r = annual interest rate r = 0.0175
n = number of compounding periods in a year n = 1
t = term of the investment or loan in number of years t = 10

Allison wants to invest $2000.00. Her bank offers an investment option that earns compound interest at a rate of 1.75% per year compounded annually for 10 years.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 2000\left(1 + \frac{0.0175}{1}\right)^{(1)(10)}$$

$$A = 2000(1 + 0.0175)^{10}$$

$$A = 2000(1.0175)^{10}$$

$$A = 2000(1.18944)$$

$$A = \$2378.89$$

Exponent Button:

y^x or x^y or $\wedge$

Calculate the final value of an initial investment of $6000.00. Interest is paid at 4% per annum, compounded semi-annually, for three years.

$A = ?$

$P = 6000.00$

$r = 4\%$

$r = 0.04$

$n = 2$

$t = 3$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 6000\left(1 + \frac{0.04}{2}\right)^{(2)(3)}$$

$$A = 6000\left(1 + 0.02\right)^{6}$$

$$A = 6000(1.02)^{6}$$

$$A = 6000(1.126162419)$$

$$A = \$6756.97$$

Calculate the final value of an initial investment of $8500.00. Interest is paid at 3.75% per annum, compounded semi-annually, for three years.

Given:

$A = ?$

$P = 8500$

$r = 0.0375$

$n = 2$

$t = 3$

y^x or x^y or $\wedge$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 8500\left(1 + \frac{0.0375}{2}\right)^{(2)(3)}$$

$$A = 8500(1 + 0.01875)^6$$

$$A = 8500(1.01875)^6$$

$$A = 8500(1.117907141)$$

$$A = \$9502.21$$

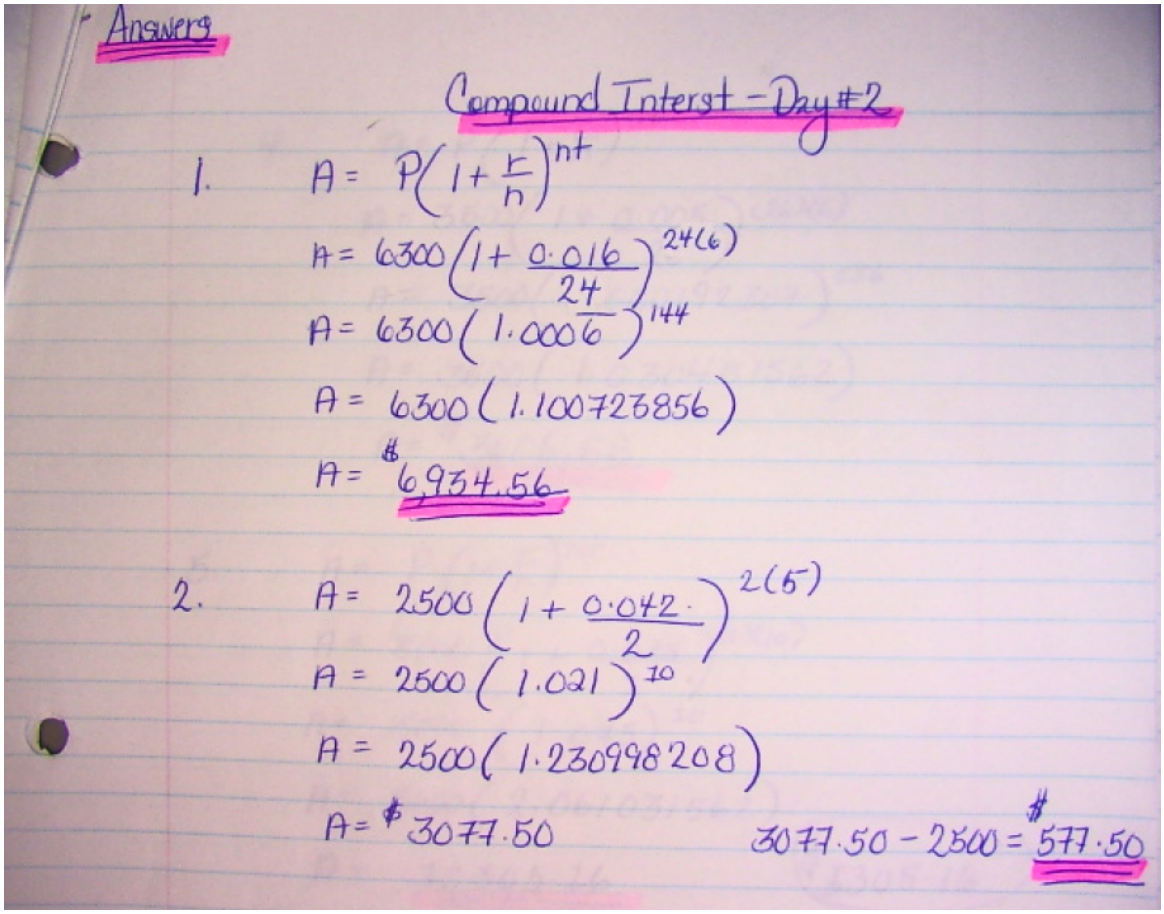
How much interest did they earn?

$$I = A - P$$

$$I = \$9502.21 - 8500.00$$

$$I = \$1002.21$$

Homework


Answers
Compound Interest - Day #2
1. $A = P\left(1+\frac{r}{n}\right)^{nt}$
$A = 6300\left(1+\frac{0.016}{24}\right)^{24(6)}$
$A = 6300\left(1.00066\right)^{144}$
$A = 6300(1.100723856)$
$A = \$6934.56$
2. $A = 2500\left(1+\frac{0.042}{2}\right)^{2(5)}$
$A = 2500\left(1.021\right)^{10}$
$A = 2500(1.230998208)$
$A = \$3077.50$
$3077.50 - 2500 = \$577.50$

3. $A = P\left(1 + \frac{r}{n}\right)^{nt}$

$2000 = P\left(1 + \frac{0.062}{12}\right)^{12(2)}$

$2000 = P(1.00516\overline{6})^{24}$

$\frac{2000}{1.13165455} = \frac{P(1.13165455)}{1.13165455}$

$P = 1767.32$

4. $A = P\left(1+\frac{r}{n}\right)^{nt}$

$A = 3500\left(1+\frac{0.005}{26}\right)^{(26)(6)}$

$A = 3500\left(1.000192307\right)^{156}$

$A = 3500\left(1.030451562\right)$

$A = \$3606.58$

5. $A = P\left(1+\frac{r}{n}\right)^{nt}$

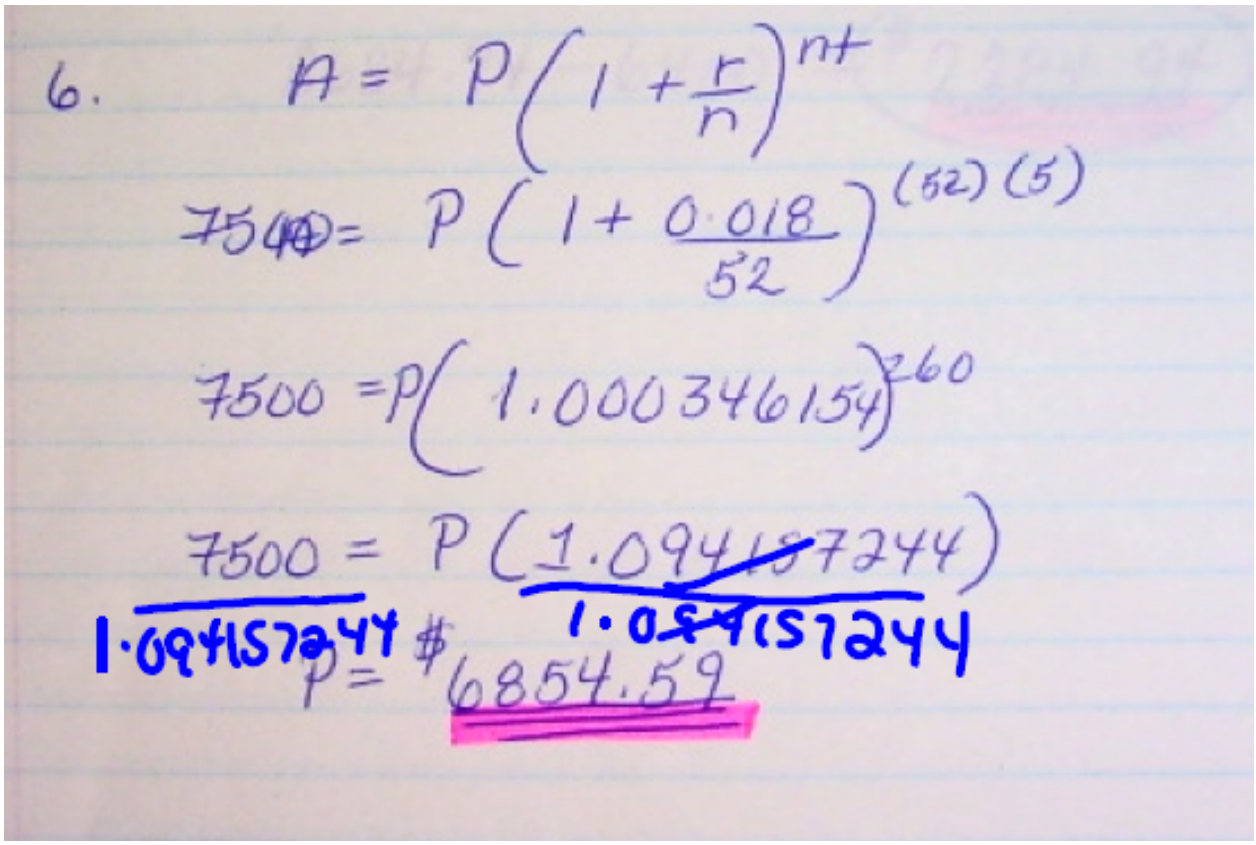
$A = 5000\left(1+\frac{0.075}{1}\right)^{(1)(10)}$

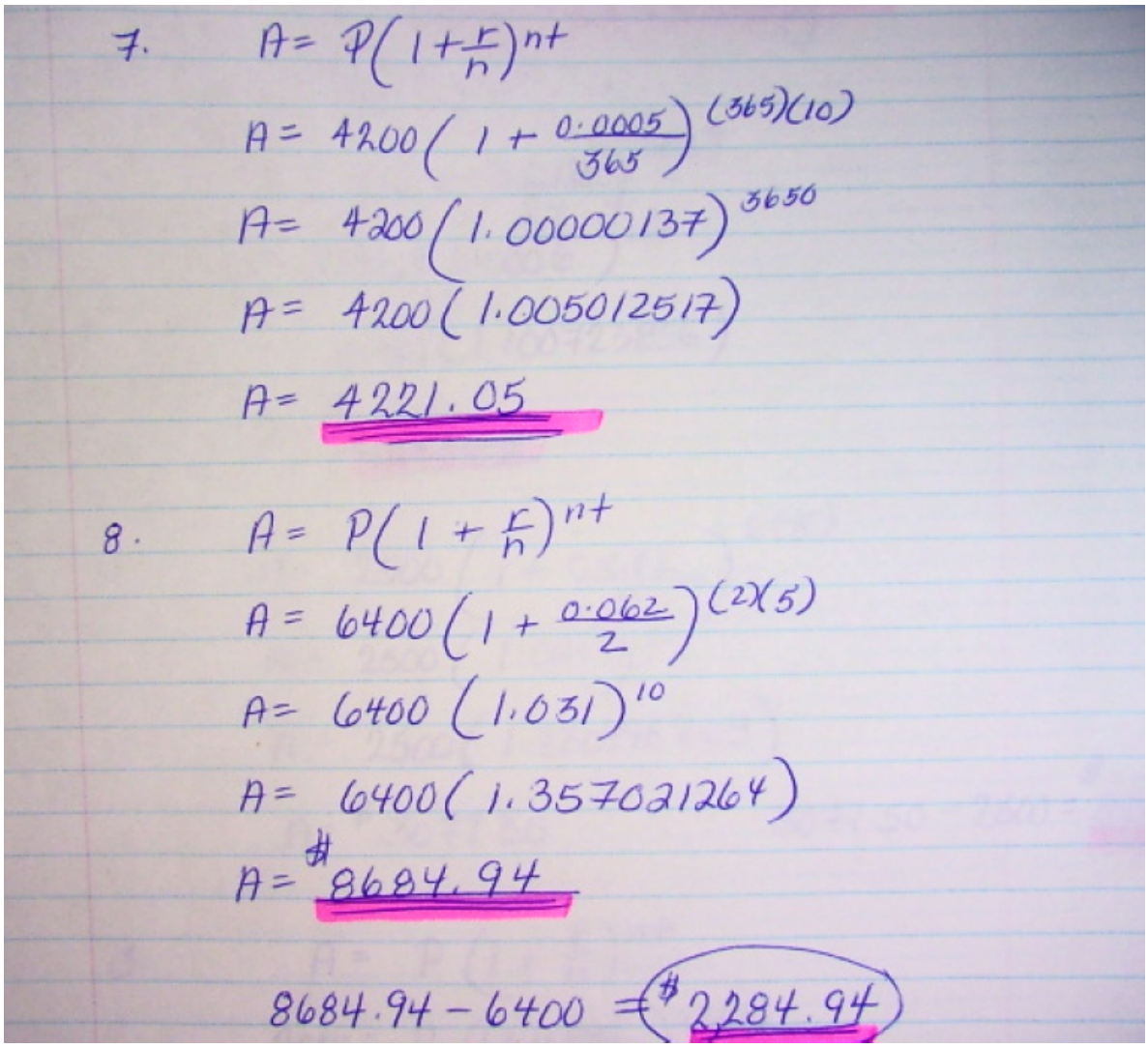
$A = 5000\left(1.075\right)^{10}$

$A = 5000\left(1.061031562\right)$

$A = 10305.16$

$\$5305.16$


6. $A = P\left(1 + \frac{r}{n}\right)^{nt}$
$7500 = P\left(1 + \frac{0.018}{52}\right)^{(52)(5)}$
$7500 = P(1.000346154)^{260}$
$7500 = P(1.094157244)$
1.094157244
1.094157244
$P = \$6854.59$



7. $A = P\left(1+\frac{r}{n}\right)^{nt}$

$A = 4200\left(1+\frac{0.0005}{365}\right)^{(365)(10)}$

$A = 4200\left(1.00000137\right)^{3650}$

$A = 4200\left(1.005012517\right)$

$A = 4221.05$

8. $A = P\left(1+\frac{r}{n}\right)^{nt}$

$A = 6400\left(1+\frac{0.062}{2}\right)^{(2)(5)}$

$A = 6400\left(1.031\right)^{10}$

$A = 6400\left(1.357021264\right)$

$A = \$8684.94$

$8684.94 - 6400 = \$2284.94$

the RULE of 72

Quick way to estimate how long it will take your money to double in value.

$$\frac{72}{\text{annual interest rate}}$$

How long will it take an investment to double with an interest rate of 3.00% per annum?

$$\frac{72}{3} = 24 \text{ years}$$