Name: _____ Date: _____

Compound interest is the addition of interest to the principle amount of the loan or deposit during a given time frame

- calculate, and add simple interest to your principle many times over your term.
- interest is made on previously accrued interest

Lengths of Time/Compounding Periods

- Annually compounding interest once a year.
- Semi-Annually compounding interest twice a year (every 6 months)
- Quarterly compounding interest 4 times a year (every 3 months)
- Monthly compounding interest 12 times a year (once a month)
- Bi-Monthly compounding interest 24 times a year (twice a month)
- Bi-Weekly compoundinding interest 26 times a year (every other week)
- Weekly compounding interest 52 times a year (every week)
- Daily compounding interest 365 times a year (every day)

- Can be calculated using the simple interest formula in a chart to show the value of the investment after each compounding period.

Example Calculate the value of an investment of $5000 that earns 2.35% per year, compounded **semi-annually**, for 4 years. Use a table to show the value of the investment at the end of each compounding period.

P = 5000

r = 2.35% = 0.0235

t = $\frac{4}{0.5} = 8$

$2.35\% = \frac{2.35}{100} = 0.0235$

$I = Prt$ $A = P + I$

INTEREST TABLE			
Interest period	Investment value at the beginning of the period	Interest earned ($) $I = Prt$	Investment value at the end of the period $A = P+I$
1	5000	$I = (5000)(0.0235)(0.5)$ $= 58.75$	$5000 + 58.75 = 5058.75$
2	5058.75	$= (5058.75)(0.0235)(0.5)$ $= 59.44$	$5058.75 + 59.44 =$
3	5118.19	$= (5118.19)(0.0235)(0.5)$ $= 60.14$	$5118.19 + 60.14$
4	5178.33	$= (5178.33)(0.0235)(0.5)$ $= 60.85$	$5178.33 + 60.85$
5	5239.18	$= (5239.18)(0.0235)(0.5)$ $= 61.56$	$5239.18 + 61.56$
6	5300.74	$= (5300.74)(0.0235)(0.5)$ $= 62.28$	$5300.74 + 62.28$
7	5363.02	$= (5363.02)(0.0235)(0.5)$ $= 63.02$	$5363.02 + 63.02$
8	5426.04	$= (5426.04)(0.0235)(0.5)$ $= 63.76$	$5426.04 + 63.76$

The value of the investment after 4 years is: $5489.80

only simple interest $I = (5000)(0.0235)(4)$ $= 470$ $A = 5000 + 470$ $= \$5470$

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

A	full amount of loan or investment after the term is up	
P	principle or initial amount	
r	interest rate as a decimal	
t	term, in years	
n	compounding period	
	Annually	1
	Semi-Annually	2
	Quarterly	4
	Monthly	12
	Bi-Monthly	24
	Bi-Weekly	26
	Weekly	52
	Daily	365

Example What is the compounded amount if $5000 is deposited in an account for 2 years that pays 4.5% interest annually? compounded monthly

A	
P	5000
r	4.5%
t	2
n	12

1 mark

0.045

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

$$= 5000\left(1+\frac{0.045}{12}\right)^{(12)(2)}$$ ← one mark

↑ monthly interest rate

1 mark

$$= 5000(1+0.00375)^{24}$$

$$= 5000(1.00375)^{24}$$

$$= 5000(1.09399)$$

1 mark

$$= \$5469.95$$

Example Find the compounded amount if you were to put $400 in a bank account if the interest rate is 4.75% for 5 years and the interest is compounded weekly.

A	
P	400
r	4.75%
t	5
n	52

= 0.0475

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

$$= 400\left(1+\frac{0.0475}{52}\right)^{(52)(5)}$$

$$= 400(1+0.000913)^{260}$$

$$= 400(1.000913)^{260}$$

$$= 400(1.2679)$$

$$= \$507.18$$

Because the compounded amount, A, is made up of the principal and the interest earned,

$$A = P + I,$$

the amount of interest earned can be calculated by first calculating A, and then subtracting the original principal from that amount.

$$I = A - P$$

Example Margaret invested $2000 in an account with an interest rate of 8% for 3 years, compounded quarterly. How much interest does she earn?

1 mark

A	
P	2000
I	
r	8% = 0.08
t	3
n	4

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

1 mark → $= 2000\left(1 + \frac{0.08}{4}\right)^{(4)(3)}$

1 mark
$= 2000(1 + 0.02)^{12}$
$= 2000(1.02)^{12}$
$= 2000(1.2682)$

1 mark → $= \$2536.48$

1 mark
$I = A - P$
$= 2536.48 - 2000$
$= \$536.48$