Compound Interest Warm-Up (Not included on the handout)

1a) If you received something *semi-annually*, how often would you receive it?　　2 times per year

1b) If you received something *quarterly*, how often would you receive it?　　4 times per year

2. Calculate:
　　　a) one half of $200　　　b) one quarter of $100　　　c) one twelfth of $900

$$= \frac{1}{2} \times \$200$$

$100

$$= \frac{1}{4} \times 100$$
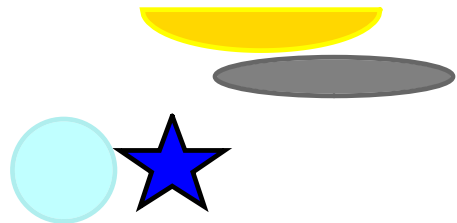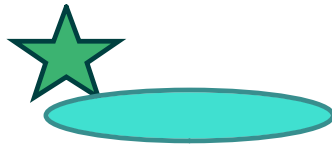$$= \$25$$
$25

$$= \frac{1}{12} \times 900$$
$$= \$75$$

3. Use your calculator to evaluate:　$A = 575\left(1 + \dfrac{0.03}{4}\right)^{8}$

You may need to input your calculator as follows:

575 x (1 + 0.03 ÷ 4) x^y 8 =

$610.42

Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

By the end of the class, I will be able to:
- a) Understand the compound interest formula.
- b) Calculate the final amount of money for different compounding period
- c) Determine the total interest earned.

MBF3CI   **Compound Interest**   💲   Date: _May 21/15_

Suppose you deposit $1000 into an investment at a bank that pays you 7% **compound interest** per year.
The original investment of $1000 is known as the original **principal**.
Compound interest is calculated on the original principal PLUS any interest that has already been earned!
This is a chart that shows how the money grows over the first few years:

Example:

Years	Principal @ start of year ($)	Compound Interest ($)	Balance @ end of year ($)
0	$ 1000	1000(0.07) = $ 70	$ 1070.00
1	$ 1070	1070(0.07) = $74.90	$ 1144.90
2	$1144.90	1144.90(0.07) = $80.14	$ 1225.04

Does the money grow **linearly, exponentially,** or as a **quadratic relation**? Explain!

☞ Compound interest grows **exponentially.**

The chart above shows how $1000 grows when the interest is 7% per year, **compounded annually,** for several years.

"Compounded annually" means the interest is calculated on the <u>outstanding principal</u>.

What **formula** can be made to find the final balance at the end of 2 years?

1st year   2nd year

☞$A=1000(1.07)(1.07)$
☞$A=1000(1.07)^2$

Compound interest can be calculated more than just once per year!
How many mes **per year** is interest calculated, if money is compounded...?

	annually	semi-annually	quarterly	monthly	daily
Number of interest periods per year	☞1	2	4	12	365

EX. 1:

If a bank states that an investment earns 7% per year, calculate the interest rate per compounding period:

	annually	semi-annually	quarterly	monthly	daily
	7% = 0.07	☞$\dfrac{0.07}{2}$	$\dfrac{0.07}{4}$	$\dfrac{0.07}{12}$	$\dfrac{0.07}{365}$

2
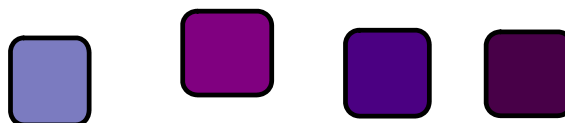
Rather than using a table or a graph to see how the value of an investment/loan grows ,
you can use a formula:

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

A is the final amount
P is the principal (original amount)
n is the number compounding periods
i is the interest rate per compounding period

EX. 2: State the values that would be substuted into the above formula. **Do not evaluate.**
a) A loan of $750 is taken out for 3 years at a rate of 7%/a, compounded quarterly.
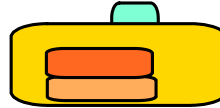
A = ?
P = 750 $i = \dfrac{0.07}{4}$

n = 3 x 4
  =12

b) $600 is invested for 5 years at $3\frac{3}{4}$% per year, compounded semi-annually.

A = ?
P = 600   Note: $3\frac{3}{4}$% $i = \dfrac{0.0375}{2}$
n = 5 x 2   = 3.75%
  =10   = 0.0375

EX. 3: USING THE NEW FORMULA, now evaluate.
a)   b)
$A = 750\left(1+\dfrac{0.07}{4}\right)^{12}$ $A = 600\left(1+\dfrac{0.0375}{2}\right)^{10}$

$\doteq 923.579$ $\doteq 722.482$
$\doteq \$923.58$ $\doteq \$722.48$

(last) Note: These values are NOT the interest earned!!!
(How would you calculate the interest earned?)
Don't forget that A = P + I, and I = A - P

EX. 4: Determine the amount of, and total interest earned on a $1400 investment at
5% per year, compounded monthly for 4 years.

A = ?

P = 1400

$i = \dfrac{0.05}{12}$

n = 4 x 12
  = 48

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

$A = 1400\left(1+\dfrac{0.05}{12}\right)^{48}$

$\doteq 1709.253$
$\doteq \$1709.25$

If you can't get this on your calculator, ask for help now!

$I = A - P$

$\doteq 1709.25 - 1400$

$\doteq \$309.25$

the amount of the investment is $\$1709.25$,
and total interest earned is $\$309.25$.

Entertainment: pp. 432-434 #2, 3, 6, 8, 12, 15
Quiz 8.1 on **Monday** on Simple and Compound Interest