GRADE 12 APPLIED
UNIT B – PERSONAL FINANCE
COMPOUND INTEREST AND TECHNOLOGY

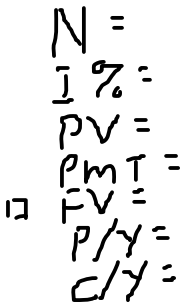
Name: _____
Date: _____

Formula for Compound Interest	○ **A** is the total accumulated compounded amount [$] sometimes called the '**FV**', Future Value ○ **P** is the Principal investment of loan ○ **r** is the Annual Percentage Rate (**APR**) ○ **s** is the number of times per year the interest owing is calculated ○ **n** is the number of years

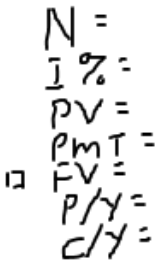
$$A = P\left(1 + \frac{r}{s}\right)^{n*s}$$

1. **$5,000** is to be invested at **10%** for **4** years. Find the 'Future Value' (sometime called A, sometimes FV) of the **$5,000** when interest is calculated:

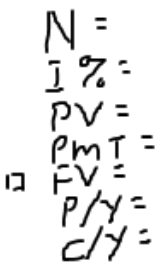
a. annually (Manually)



b. quarterly (Manually); and



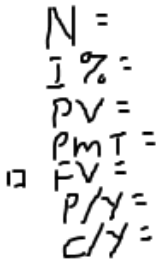
c. daily (Manually)



d. **compare** your answers for a. through c. What can you say about the effect of the frequency of compounding (s) and the interest earned.

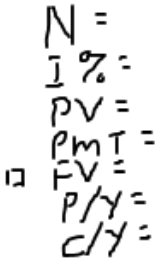
2. Lisa would like to deposit her income tax refund in an account earning **5.4%** annual interest compounded monthly. She will withdraw her money at the end of **7 months** for Christmas. If her income tax return was **$389.00**, what will her balance be in the account at that time? (*Hint*: 7 months = 7/12ths of a year)

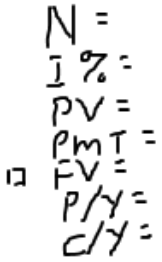
Manually:



3. A depositor had **$10,000** on deposit in a bank that pays interest at a rate of **5%** APR compounded **semi-annually**. ***How much more*** *interest* would the depositor have earned during the first year if the bank had compounded the interest quarterly rather than semi-annually?

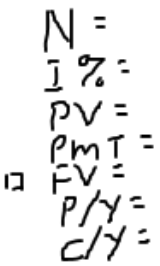
Manually:



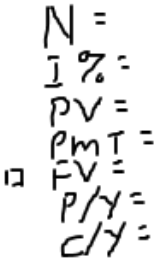


4. A grand-parent of a new born child decided to invest **$5,000** in a GIC for the child that pays interest at the rate of **6% APR** compounded semi-annually. The GIC was bought the day the child was born. What compound amount will the child have at age 21 on his **21st** birthday?

Manually:



5. A person borrowed **$2,000** from a friend at an interest rate of **1.5%** ***per month [note!]***, the interest being calculated on the amount outstanding monthly. **How much** will he need to pay back his friend **after two years**? (notice this is about the same interest rate that a 'reasonable' credit card will charge on a cash advance).



The following are just for fun, ***optional***, but I find students love using complicated formulas. Try a few. Answers are provided.

7. Complete the blanks in the following table for Compound Interest **only if** you want extra practice. Using a **TVM App** would be very useful as well Answers are overleaf.

	A Total Amount Accumulated [$]	**P Principal [$]**	**R Interest Rate APR [%]**	**S # times Interest Calculated per year**	**Frequency Of Interest Calculation**	**N Term of investment or loan [Years]**
A		2,400	5%	1		10 years
B		2,400	5%		Monthly	10 years
C		2,400	5%		Daily	10 years
D		2,400	5%	4		10 years
E	10,000		10%	12		45 years
F	10,000		5%		Quarterly	45 years
G		10,000	10%		Daily	90 days
H		20,000	10%		Daily	90 days
I		3,400	5%	1		10 years
J		7,400	5.25%		Monthly	10 years
K		9,700	4¾ %		Daily	10 years
L		2,400	5½ %	4		10 years
	The next two are tricky! You can likely only solve them by graphing unless you know 'logarithms'					
M	4,567	4,000		1	Annual	1 year
N	7,200	4,000		2		10 years
O	10,000		7½ %		Daily	10 years
P	20,000		7½ %		Daily	10 years
Q	30,000		7½ %		Daily	10 years
R		1,000	¾ %		Daily	5 years
S		10,000	¾ %	12	Monthly	5 years
T	1 Million		4.5%	12		45 years

Questions like N will require EXCEL or a TI-83 TVM App or some serious Algebra and logarithms

ANSWERS

	A Total Amount Accumulated [$]	**P Principal [$]**	**r Interest Rate APR [%]**	**s # times Interest Calculated per year**	**Frequency Of Interest Calculation**	**n Term of investment or loan [Years]**
A	***3909.34***	2,400	5%	1	***Annually (per annum)***	10 years
B	***3952.82***	2,400	5%	***12***	Monthly	10 years
C	***3956.79***	2,400	5%	***365***	Daily	10 years
D	***3944.68***	2,400	5%	4	***Quarterly***	10 years
E	10,000	***113.18***	10%	12	***Monthly***	45 years
F	10,000	***1068.80***	5%	***4***	Quarterly	45 years
G	***10,249.60***	10,000	10%	***365***	Daily	90days
H	***20,499.21***	20,000	10%	***365***	Daily	90 days
I	***5,538.24***	3,400	5%	1	***Annual***	10 years
J	***12,495.07***	7,400	5.25%	***12***	Monthly	10 years
K	***15,597.25***	9,700	4¾ %	***365***	Daily	10 years
L	***4,144.24***	2,400	5½ %	4	***Quarterly***	10 years
M	4,567	4,000	***14.175%***	1	***Annually***	1 year
N	7,200	4,000	***5.96%***	2	***Semi-Annually***	10 years
O	10,000	***4,724.02***	7½ %	***365***	Daily	10 years
P	20,000	***9,448.06***	7½ %	***365***	Daily	10 years
Q	30,000	***14,172.08***	7½ %	***365***	Daily	10 years
R	***$1,038.21***	1,000	¾ %	***365***	Daily	5 years
S	***10,381.99***	10,000	¾ %	12	Monthly	5 years
T	1 Million	*132494.70*	4.5%	12	***Monthly***	45 years

Do you know how to check for reasonableness that these answers are reasonable by using the Rule of 72? Don't forget, for short periods and low interest rates, simple and compound interest are not that different. Further, compound interest and FV will always be more than simple.

ANSWERS TO MAIN QUESTIONS:

1a. $7,320.50 1b. *$7422.53* 1c. $7458.71
2. $401.12 3. $10.506.25; $10,509.45; diff = $3.20
4. $17,303.48
5. $2,859 (careful! Need interest rate, r, as *per year* for formula!)