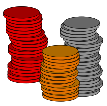
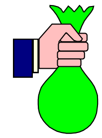
Algebra  Name:____________________Date:_______Per:__

LENDERS' National Bank and the Bank of "*e*"

1) Lenders' National Bank is offering a 12% simple interest rate on savings accounts. If you deposit a principal amount of $1,000.00.



a) How much interest is earned after 1 year?



b) How much will the balance be after 1 year?

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2) Across the street from Lenders' the First Bank of "*e*" wants to attract more customers by offering a better rate; however, the market and government have fixed the interest rate at 12%. One of the bankers had a solution to the problem. Instead of 12% compounded once a year, offer a 6% interest rate but compounded twice a year.

a) How much interest is earned after 6 months?

b) What will the new balance be after 6 months?

c) What is the balance after one full year?

d) Is this more than Lenders' National?

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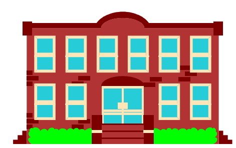
3) Losing its customers to the Bank of "*e*", Lenders' National counters by compounding the 12% quarterly.



a) What interest rate should be used to compound quarterly?

b) List interest earned and new principal amount after each quarter.

$1000	1^{st} quarter	2^{nd} quarter	3^{rd} quarter	4^{th} quarter
Interest earned				
New Principal				

c) What amount does $1000(1.03)(1.03)(1.03)(1.03)$ give?

d) Rewrite this expression using a single exponent.

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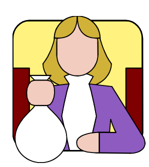
4) The Bank of "*e*" retaliates by compounding 12% monthly. What will the ending balance be after one year?



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5) What will the ending balance be if compounded:

a) weekly?

b) daily?

6) The competition between the two banks is escalating and creating tedious work for everyone. They started compounding interest rates every hour, and then every minute, and finally, every second. Several factors complicated the process. The employees started to complain about carpal tunnel syndrome in their fingers from pressing all the calculator buttons. Many calculators broke and had to be replaced. Then interest rates changed and all the numbers previously worked out were no longer valid. Someone thought there must be a better way. So Lenders' National hired a Mathematician to develop an equation that gives the principal balance P using the following variables:

P = initial deposit
r = yearly interest rate
n = # of times compounded per year

What is this equation? $\boxed{A =}$

7) Use this equation to determine the balance for an account with:

a) $5000 deposit on 8% compounded hourly =

b) $10,000 deposit on 5.5% compounded every minute =

c) $50,000 deposit on 3.25% compounded every second =

8) Now the banks want to know if there is a limit if they compound 100% interest rate continuously (that is infinitely many times a year). The Bank of "*e*" wants you to find the limit "*e*" by filling in the table below.

Compounded	n	$\left(1+\frac{1}{n}\right)^n$
Annually	1	2
Semi-annually	2	
3 times a year		2.370370370
Quarterly		
Bi-monthly	6	
	12	2.61303529
	52	
Daily		
Hourly		
Every minute	525600	2.718279215
Every second	31536000	

9) a) What is the value of "*e*"?

$$\left(1+\frac{1}{n}\right)^n \doteq$$

b) How is this number like π?

10) a) Punch these buttons into your calculator to find $1000 compounded continuously at 12%

$$1000 \cdot e^{0.12} =$$

b) How does this amount compare with all other methods of compounding in relation to what you did on the front side?