Compound Interest Name: _____ Date: _____ Per: ____

Notes

Compound interest is interest added to the principal of a deposit or loan so that the added interest also earns interest from then on. This addition of interest to the principal is called compounding (interest on interest). This is very powerful because it allows a sum to grow at a faster rate. This rate depends on the frequency of compounding, the actual interest rate, and the initial amount, called the principal. The formula below allows us to calculate compound interest.

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

- A is the final amount
- P is the principal, or initial amount
- n is the number of times the amount is compounded per year (quarterly n=4, monthly n=12, annually n=1, etc)
- r is the interest rate (as a decimal)
- t is the time in years

It is important to simplify using the correct order of operations.

Do not round values until the very end of the calculation.

Examples:

Your 3 year investment of $20,000 received 5.2% interest compounded semi-annually. What was your total return?

Identify each variable:
A is what we want to find (total return)
P = $20,000
r = 0.052 (the rate as a decimal)
t = 3 (# of years it will be in the account)
n = 2 (semi-annually means twice per year)
Plug all these variables in to the formula:

$$A = 20{,}000\left(1+\frac{.052}{2}\right)^{2(3)} = 20{,}000(1+.026)^{6}$$
$$= 20{,}000(1.026)^{6}$$
$$= 20{,}000(1.1664984462)$$
$$= \$23{,}329.97$$

SO the final amount after 3 years would be $23,329.97

Jane borrowed $59,000 for 2 years at 11% which was compounded annually. What was the total that Jane paid back after two years?

A is what we want to find (total return)
P = $59,000
r = 0.11 (the rate as a decimal)
t = 2 (# of years it will be in the account)
n = 1 (annually means once per year)
Plug all these variables in to the formula:

$$A = 59{,}000\left(1+\frac{.11}{1}\right)^{1(3)} = 59{,}000(1+.11)^{3}$$
$$= 59{,}000(1.11)^{3}$$
$$= 59{,}000(1.367631)$$
$$= \$80{,}690.23$$

SO the final amount after 2 years would be $80,690.23

Please do #1-10 to turn in.

1. A diamond ring was purchased twenty years ago for $500. The value of the ring increased by 8% each year. What is the value of the ring today?	2. You loan a friend $500 to help them get their first apartment. They want to pay you back in 3 years with 5% interest each year. How much money will they pay you?
3. You want to have $2000 at the end of college to put toward a new car. If you plan to spend 5 years in college, how much should you invest your first year if you can get an interest rate of 10%?	4. Your parents are saving for your college tuition. They want to give you $10,000 for the first year. If they invested 10 years before you go to college, how much do they need to invest at a rate of 8%?
5. You want 25,000 for a down payment on a house in 15 years. How much should you invest if you can get an interest rate of 6.5%?	6. You deposit $1000 in an account that pays 8% annual interest. Find the balance after 1 year if the interest is compounded with the given frequency. a) annually b) quarterly c) monthly d) daily
7. You deposit $1600 in a bank account that pays 2.5% interest compounded monthly. Find the balance after 3 years.	8. You want to have $25,000 to buy a new car in 4 years. If you can get a 12% dividend compounded quarterly how much must you deposit?
9. You want to have $150,000 for retirement in 25 years. How much money must you deposit into an account that pays 4.2% compounded monthly to have this amount?	10. You deposit $3,200 in a bank account that pays 1.2% interest. Find how much you will have in ten years compounded annually, bi-annually, quarterly, and monthly.