Compound Interest 2 **Name:** Answers

If you invest money with interest compounded ***n*** times a year, you can determine the value of the account after ***x*** years using the formula $A = P(1+\frac{r}{n})^{nt}$ where ***A*** = value of the investment in dollars after t years, ***P*** = principal invested (i.e. the starting value in dollars) , ***r*** = annual interest rate, and ***n*** = number of times compounded per year. Answer the questions below.

1) Suppose you invest $10,000 in an account that has an annual interest rate of 1.6%.

a) Write an equation that expresses the amount of money you have in this account if interest is compounded annually. Then find how much money you'd have in the account after 1 year? After 10 years? Round to nearest cent.

x years: $y = 10{,}000\left(1+\frac{.016}{1}\right)^{1x}$

1 year: $y = 10{,}000(1+.016)^{1} \rightarrow \$10{,}160$

10 years: $y = 10{,}000(1+.016)^{10} \rightarrow \$11{,}720.26$

b) Write an ~~equation~~ that expresses the amount of money you have in this account if interest is compounded semi-annually (twice per year). Then find how much money you'd have in the account after 1 year? After 20 years? Round to nearest cent.

x years: $y = 10{,}000\left(1+\frac{.016}{2}\right)^{2x}$

1 year: $y = 10{,}000\left(1+\frac{.016}{2}\right)^{(2\cdot 1)} \rightarrow \$10{,}160.64$

20 years: $y = 10{,}000\left(1+\frac{.016}{2}\right)^{(2\cdot 20)} \rightarrow \$11{,}727.64$

c) Write an equation that expresses the amount of money you have in this account if interest is compounded quarterly. Then find how much money you'd have in the account after 1 year? After 50 years? Round to ~~nearest~~ cent.

x years: $y = 10{,}000\left(1 + \frac{.016}{4}\right)^{4x}$

1 year: $y = 10{,}000\left(1 + \frac{.016}{4}\right)^{(4\cdot 1)} \rightarrow \$10{,}160.96$

50 years: $y = 10{,}000\left(1 + \frac{.016}{4}\right)^{(4\cdot 50)} \rightarrow \$11{,}731.36$

2) Sometimes banks advertise their APY, which stands for annual percent yield. This is the percent interest that will be added to an account at the end of the year and it's not always the same as the annual interest that the bank offers. How could this be?

Yes. See questions 1 a-c! The more frequently a bank compounds interest, the more money you earn in interest.

3) Which investment would make more money at the end of a 5-year period?

Investment A: Invest $100,000 in 60 month CD with 3.05% interest rate compounded ~~continuously~~ daily.

Investment B: Invest $100,000 in money market account that has 3.1% interest rate compounded quarterly.

Show your work and explain your thinking below. Make sure you convince us that your answer is correct.

A: $y = 100{,}000\left(1 + \frac{.0305}{365}\right)^{365\cdot 1}$

$= \$103{,}096.86$ ← You earn more with daily compound

B: $y = 100{,}000\left(1 + \frac{.031}{4}\right)^{4\cdot 1}$

$= \$103{,}085.06$