

Name: \_\_\_\_\_

MA162-020  
2010-07-13

## Quiz 5.1: Compound interest

Write the formula, the values of the known variables, and box the value of the sought-after variable.

1. If you invest \$1,759.76 at 8% simple interest, how much will your investment be worth in 14 months?
2. If you invest \$762.40 and after 17 months it is worth \$838.00, what simple interest rate, expressed as a percentage and rounded to .01, did you receive?
3. If you invest \$1,911.47 at 6% simple interest, after how many months, rounded to .01, will your investment be worth \$2,008?
4. If you invest \$13,000 at 7% compounded bi-weekly, how much will your investment be worth in 4 years?
5. Homer won a prize in the lottery of \$3,000, payable \$1,500 immediately and \$1,500 plus 5% simple interest payable in 230 days. Getting impatient, Homer sells the promissory note to Moe for \$1,460 cash after 140 days. Using a nominal 360 day year, find the simple interest rate, rounded to .01, earned by Moe.

## Examples 5.1: Compound interest

We calculate interest in two main ways: **simple interest** in which only the principal amount is “borrowed”, and **compound interest** a more flexible and lucrative method in which both the principal and the interest are “borrowed”. Simple interest is used for short term loans. Compound interest is used in most situations, especially if money can be reinvested during the loan period (i.e. especially in finance).

Accumulated amount = principal + interest ( $A = P + I$ )

Simple interest = principal times rate times time ( $I = Prt$ )

- $A$  is the future value of the investment
- $I$  is the interest, the extra amount paid in the future
- $P$  is the present value of the investment, the principal
- $r$  is the annual interest rate
- $t$  is the number of years until the “future”

Compound interest:  $A = P(1 + i)^n$  or  $A = P(1 + \frac{r}{m})^{mt}$

- $A$  is the future value of the investment
- $P$  is the present value of the investment, the principal
- $i$  is the interest rate per conversion period
- $n$  is the number of conversion periods until the “future”
- $r$  is the nominal annual interest rate
- $m$  is the number of conversion periods per year
- $t$  is the number of years until the “future”

Effective interest rate:  $r_{eff} = (1 + \frac{r}{m})^m - 1$ , the interest on one dollar over one year. Notice that

$$A = P(1 + r_{eff})^t$$

so that  $r_{eff}$  makes it look like  $m = 1$ . It changes any conversion period into an annual conversion.