



SECTION 6.1: INTEREST AND EFFECTIVE RATES

Pr 1. You invest \$600 in an account paying simple interest at a rate of 8% per year.

(a) How much interest does the account earn in two years?

$$\begin{aligned} P &= 600 \\ r &= 0.08 \\ t &= 2 \end{aligned}$$

$$I = Prt$$

$$I = 600(0.08)(2)$$

$$I = 96$$

The account earns \$96 in interest in two yrs.

(b) How much money is in the account at the end of the two years?

$$\begin{aligned} P &= 600 \\ I &= 96 \end{aligned}$$

$$A = P + I \quad \text{or} \quad A = P(1 + rt)$$

$$A = 600 + 96$$

$$A = 696$$

The account has \$696 at the end of two yrs.

Pr 2. You borrow \$5000 from a payday loan company and when you payback the loan you owe \$7500. How long did you borrow the money for, if the payday loan charges a simple interest rate of 67% per year?

$$\begin{aligned} P &= 5000 \\ r &= 0.67 \\ t &=? \\ A &= 7500 \end{aligned}$$

$$A = P(1 + rt)$$

$$7500 = 5000(1 + (0.67)t)$$

$$\frac{3}{2} = 1 + 0.67t$$

$$\frac{1}{2} = 0.67t$$

$$\frac{50}{67} \text{ yrs} = t \approx 0.74627$$

Pr 3. Determine the annual simple interest rate at which \$1500 will grow to \$1580 in 7 month? Round your answer to two decimal places?

$$\begin{aligned} P &= 1500 \\ r &=? \\ t &= \frac{7}{12} \text{ yrs} \\ A &= 1580 \end{aligned}$$

$$A = P(1 + rt)$$

$$1580 = 1500(1 + r(\frac{7}{12}))$$

$$\frac{79}{75} = 1 + \frac{7}{12}r$$

$$\frac{4}{75} = \frac{7}{12}r$$

$$\frac{16}{175} = r \approx 9.14286\%$$

Pr 4. You put \$2,000 into an account and 5 years later have \$8,450.50 in the account. If the account earned interest compounded monthly, what was the account's annual interest rate? Round your answer to two decimal places?

$$N = 5 \cdot 12$$

$$I\% = ? \longrightarrow 29.17047419$$

you invest \rightarrow

$$PV = -2000$$

$$PMT = 0 \text{ (no mention)}$$

$$FV = 8450.50$$

$$P/Y = 12$$

$$C/Y = 12$$

$$PMT: \text{END}$$

The account's annual interest rate 29.17%.

Pr 5. You want to take a trip in 3 years that will cost \$18,000. How much should you deposit now, making no additional deposits, into an account that earns 8% per year, compounded daily, so you will have enough money for the trip?

$$N = 3 \cdot 365$$

$$I\% = 8$$

$$PV = ? \longrightarrow -14159.67386$$

not mentioned - $PMT = 0$

$$FV = 18000$$

$$P/Y = 365$$

$$C/Y = 365$$

$$PMT: \text{END}$$

you should invest \$14,159.67 now.

Pr 6. You invest \$12000 into an account that pays annual interest at a rate of 5.96%, compounded monthly.

$$N = \frac{4}{12} \cdot 12$$

$$I\% = 5.96$$

you invest \rightarrow PV = -12000
not deposits - PMT = 0

$$FV = ? \rightarrow 12240.18197$$

$$P/Y = 12$$

$$C/Y = 12$$

PMT: END

(a) How much money will you have in the account at the end of 4 months? Assuming no addition deposits are made.

There is \$12,240.18 in the account.

(b) How much interest did the account earn in the 4 months?

$$\text{Interest: } A - P$$

$$I = 12240.18 - 12000$$

$$I = 240.18$$

you earn \$240.18 in interest.

Pr 7. You invest \$12000 into an account that pays annual interest at a rate of 5.96% per year, compounded continuously. How much money is in the account at the end of 4 months?

$$P = 12000$$

$$r = 0.0596$$

$$t = \frac{4}{12}$$

$$A = ?$$

$$A = P e^{rt}$$

$$A = 12000 \cdot e^{0.0596(4/12)}$$

$$A = 12240.78387$$

The account will have \$12,240.78 after 4 months.

Pr 8. What is the annual interest rate, as a percent, on an account that is compounded continuously, if \$2000 grows to \$3500 in 4 years? Round your answer to two decimal places.

$$P = 2000$$

$$r = ?$$

$$t = \frac{4}{12}$$

$$A = 3500$$

$$A = P e^{rt}$$

$$3500 = 2000 \cdot e^{r(4)}$$

$$\frac{7}{4} = e^{4r}$$

$$\ln\left(\frac{7}{4}\right) = 4r \ln(e)$$

$$\ln\left(\frac{7}{4}\right) = 4r$$

$$\frac{\ln\left(\frac{7}{4}\right)}{4} = r \approx 13.99\%$$

Pr 9. While binge watching Magnum P.I. reruns (that mustache is mesmerizing) you see ads for accounts from three different banks. Bank A advertises a nominal rate of 7.15% per year, compounded semi-annually. Bank B advertises a nominal rate of 7% per year, compounded daily. Bank C advertises an APR of 6.95%, compounded continuously.

(a) What is the effective rate for each account?

$$\text{Bank A: } r_{\text{eff}} = \text{Eff}(7.15, 2) = 7.27780625$$

$$\text{Bank B: } r_{\text{eff}} = \text{Eff}(7, 365) = 7.25009837$$

$$\text{Bank C: } r_{\text{eff}} = (e^r - 1) 100 = (e^{0.0695} - 1) 100 = 7.19720612$$

(b) Which bank has the best interest rate for an investment?

Bank A with an interest rate of 7.15% has the highest effective yield, which means you will earn the most interest each year.

(c) If you were to borrow money instead, which account would be the best for you?

Bank C with an interest rate of 6.95% has the lowest effective yield, which means you will owe the least amount of interest each year.