3.1: Simple Interest

Simple interest is generally only used on short-term loans (1 year or less).

Principal: Amount of money on which interest is earned.

Interest: Cost to borrow money.

Simple Interest:

$$I = Prt$$

where

P = principal
r = annual simple interest rate (written as a decimal)
t = time in years

The future value, A, (the amount of money after simple interest accrues) is given by

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

Example 1: Your car needs repairs, but you are short on cash. Uncle Albert has agreed to loan you \$500, but you have to pay it back with interest. How much will you owe Uncle Albert after 5 months at 9% simple interest?

$I = Prt$

$I = \$500(0.09)\left(\frac{5}{12}\right)$
$= \$18.75$

$A = P + I = \$500 + \$18.75$
$= \$518.75$

$P = \$500$
$r = 0.09$
$t = 5 \text{ months}\left(\frac{1 \text{ year}}{12 \text{ months}}\right) = \frac{5}{12} \text{ yrs}$

We must pay back \$518.75.

Example 2: How much should you invest so that you will receive \$1000 after 10 months at 10% simple interest?

$A = \$1000$
$t = \frac{10}{12}$
$r = 0.10$

$A = P + Prt$
$A = P(1+rt)$
$\$1000 = P\left(1+0.10\left(\frac{10}{12}\right)\right)$
$P = 923.0769231 \Rightarrow P = \$923.08$

You must invest \$923.08.

Our book: uses a 360-day year in 3.1
uses a 365-day year in 3.2 – 3.4

Example 3: You put $10,000 into a short-term simple interest account for 180 days. After that time, the bank pays you $10,150. What was the interest rate?

$P = \$10\,000$

$t = 180 \text{ days} \left(\frac{1 \text{ yr}}{360 \text{ days}}\right) = \frac{1}{2} = 0.5$

$A = \$10\,150$

$r = ?$

$A = P + Prt$

$10\,150 = 10\,000 + 10\,000(r)(0.5)$

$150 = 10000(r)(0.5)$

$150 = 5000\,r$

$\frac{150}{5000} = r$

$0.03 = r$

The interest rate is 3%.

Example 4: You are due to receive a tax refund of $1685. IRS guidelines state that you should receive your refund 21 days after electronically filing your tax return. Instead of waiting, you utilize a "rapid refund" tax service. In addition to the tax preparation fee, which starts at $59 for the simplest tax return, you must also pay $40 to receive your refund in a refund transfer account set up by the tax preparation service. This allows you to access your refund amount immediately, less deductions and fees. While this is technically a tax product rather than a loan, you can calculate the annual interest rate that corresponds to a loan that has the same length of time, principal, and payback amount. What is this equivalent interest rate?