

CHAPTER 1
1.1 SIMPLE INTEREST

Refreshing Prior Knowledge

1. Calculate the following:	2. Find the percent
a) 5% of 223	a) 18 is what percent of 284?
b) 7% of 18	b) What percent of 21, 000 is 800?
c) 0.2% of 1,350	
d) 8% of 14, 500	3. Solve for the variable
e) 3.5% of 225	a) $300 = 50 + 0.8t$
	b) $800 = 25(1 + r)$

Definitions

- Term** → The contracted duration of an investment or loan
- Interest** → The amount of money earned on an investment or paid on a loan
- Fixed Rate** → An interest rate that is guaranteed not to change during the term of an investment or loan
- Principal** → The original amount of money invested or borrowed
- Simple Interest** → The amount of interest earned on an investment or paid on a loan based on the original amount and the simple interest rate
- Maturity** → The contracted end date of an investment or loan, at the end of the term
- Future Value** → The amount, A, that an investment will be worth after a specified period of time
- Rate of Return** → The ratio of money earned (or lost) on an investment relative to the amount of money invested, usually expressed as a decimal or a percent

Simple Interest Explained

Simple Interest is called 'simple' because the **interest is always based on the original amount**

i.e. If you invest \$100 in an account that earns 10% simple interest each year, that means that each year you earn...

...\$10 in interest that's 10% of \$100

And in 5 years you would earn...

...\$50 interest that's 10% of \$100
5 times

Exploring Simple Interest

Example – You invest your \$1,200 tax return into an account that earns simple interest at rate of 3% per annum.

Year	Value of Investment at Start of Year (\$)	Simple Interest Earned Each Year (\$)	Accumulated Interest (\$)	Value of Investment at End of the Year (\$)
0				
1				
2				
3				
4				

The Simple Interest Formula

- The amount of interest earned each year in the previous example was...

$$\begin{aligned} & \dots 3\% \text{ of } \$1,200 \\ & = \$1,200 \times 0.03 \\ & = \$36 \end{aligned}$$



So how much interest would you earn in 8 years?

$$\begin{aligned} & = \$1,200 \times 0.03 \times 8 \\ & = \$288 \end{aligned}$$

What about in t years?

$$= \$1,200 \times 0.03 \times t$$

In general, to calculate the amount of interest earned in t years, use

$$I = Prt$$

- The value of the investment at the end of each year is found by adding the interest earned to the principle amount: $A = P + Prt$

In general, to calculate the value of an investment after t years, use

$$A = P + Prt \xrightarrow{\text{*factor out the } P} A = P(1 + rt)$$

Using the Formula

Example - Chimpo invested \$12,000 in an account that earned a simple interest rate of 7%, paid semi-annually. He intends to hold the investment for 7.5 years, and then withdraw it to buy a frozen banana stand. Determine the value of the investment at the time of withdrawal.



$$\begin{aligned} A &= P(1 + rt) \\ &= 12,000(1 + (.07)(7.5)) \\ &= 12,000(1.525) \\ &= 18,300 \end{aligned}$$

$$\begin{aligned} A &=? \\ P &= 12,000 \\ r &= 0.07 \\ t &= 7.5 \end{aligned}$$

Examples

- Lil' Bigz invested \$18,000 at a simple interest rate of 3.5%. What is the value of the investment after...
 - 5 years?
 - 11 years?

Representing the growth of a simple interest investment

You can represent the growth of a simple investment using :

- A table or • A graph

Example – Broseph invested all his summer earnings of \$5000 at 8% simple interest, paid annually. He intends to withdraw it in 5 years to go on a vacation with his friend, Sisterette.

We can represent the growth of his investment with a table:

t	A
0	\$5000
1	\$5400
2	\$5800
3	\$6200
4	\$6600
5	\$7000

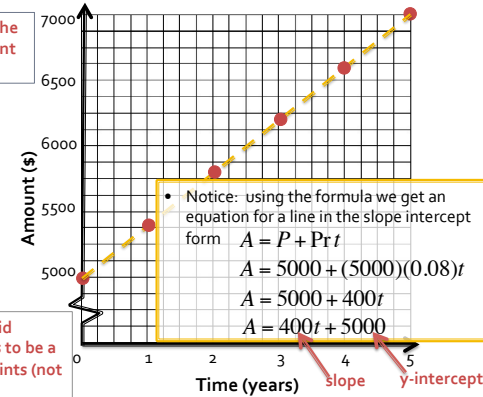
*After setting up the table, add \$400 to each year

His investment earns...
 $.08 \times 5000 = \$400$
 ...per year

Representing the growth of a simple interest investment cont.

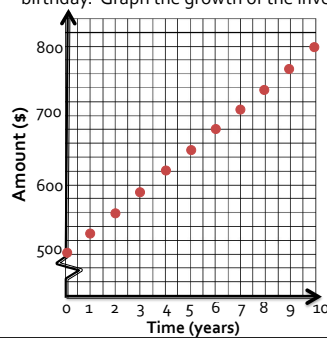
We can also represent the growth of his investment with a graph:

1. Start by setting up the grid. Use as much of the grid as possible
2. Next, place two discrete points on the grid
3. Since the amount of increase is constant, we can use a ruler to find the other points



Because the interest is paid annually, the graph needs to be a series of discrete value points (not connected)

2. Sharky is 18 years old and needs money to pay for Shark college. When she was born, her grandsharky bought her a \$500 Canada Savings Bond (CSB) with a term of 10 years. They chose a CSB as an investment because they liked the security of loaning money to the government. The interest earned was determined using a fixed interest rate of 6% per year on the original investment and was paid at the end of each year until Sharky's 10th birthday. Graph the growth of the investment until it's maturity.



Determining the duration of a simple interest investment

When solving for something other than the future value or interest earned, set up an equation and use algebra to solve for the unknown value.

Example – Barbie invested his \$2300 in profits from his mannequin sales at 8% simple interest, paid annually.

- a) How long will it take for the future value of the investment to grow to \$8000? b) What is Barbie's rate of return?

$$A = P + Prt$$

$$8000 = 2300 + (2300)(0.08)t$$

$$\begin{array}{r} -2300 \quad -2300 \\ 5700 = 184t \\ \hline 184 \quad 184 \\ 30.9 \approx t \end{array}$$

*Substitute the given values into the formula

*Since the interest is paid annually we need to round up

$$I = Prt$$

$$= 2300(0.08)(31)$$

$$= \$5704$$

*First, find the interest earned after 31 years

$$\frac{2300}{5704} \approx .403 \approx 40\%$$

*Next, calculate what percent of this the original investment is

It will take 31 years for the future value of the investment to be at least \$8000

The rate of return is 40% over 31 years

Determining the rate of interest on a simple interest investment

Recall, when solving for something other than the future value or interest earned, **set up an equation and use algebra to solve** for the unknown value.

Example – Barbie invested his \$2300 in profits from his mannequin sales in a simple interest account that paid interest annually. If the future value of his investment is \$8000 after 10 years, what interest rate did the account earn?

$$A = P + Prt \quad \text{*Substitute the given values into the formula}$$

$$8000 = 2300 + (2300)(r)(10)$$

$$\begin{array}{r} -2300 \quad -2300 \\ 5700 = 23000r \\ \hline 23000 \quad 23000 \\ .248 \approx r \end{array}$$

The interest rate was 24.8%

3. You invest \$4000 in an account earning simple interest at 8% per year, paid quarterly. How long would it take for your investment to grow to \$6000?

4. You invest a principal amount of \$23 000 into an account that earns simple interest pain annually. If your investment grew to \$23,500 in two years, what interest rate does the account earn?

Homework

Textbook pgs 14-15 #1-7, 9-11, 13, 15