Chapter

8

RRSP

RESP

Mutual Funds

Financial Mathematics: Investing Money

Stocks

Bonds

8.5 Investments Involving Regular Payments

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From grade 10...

Principal: the original amount invested or borrowed
Interest rate: the percentage charged, usually stated as a per year rate
Simple interest: interest calculated as a percentage of the principal
Term: the time in years for an investment or loan
Compound interest: the interest paid on the principal plus interest
Compounding period: the time between calculation of interest, also called the interest period

To calculate simple interest $I=Prt.$

P= the principal r = rate of interest t = term of the investment

To calculate the value of investment with compound interest over a long term students will use the following formula:

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

P = the principle r = annual interest rate
n = number of compounding periods in a year
t = term of the investment or loan in years

Example 1:

$1.75\% = 0.0175$

Gordon wants to invest $2000.00. His bank offers an investment option that earns simple interest at a rate of 1.75% per year.

a) If he invests the money for 1 year, how much interest will Gordon earn?

b) If he invests the money for 2 years, how much interest will Gordon earn?

c) Based on your answers above, write an equation that can be used to calculate simple interest.

$\frac{1.75}{100} = 0.0175$

(a) $2000 \times 1.75\%$

$2000 \times 0.0175 \; (1)$

$= 35$

(b) $2000 \times 1.75\% \times 2$

$= 2000 \times 0.0175 \times (2)$

$= 70$

(c) $I = Prt$

I → amount of Interest

P ← Principle

r ← Rate of interest

t ← term in years

You Try:

Becky wants to invest $1000. Her bank offers an investment option that earns simple interest at a rate of 1.25% per year.

How much will she have at the end of the year?

$I = Prt$

$I = (\$1000)(1.25\%)(1)$

$I = (\$1000)(0.0125)(1)$

$I = \$12.50$

$\$12.50 + 1000 = \$1012.50$

How much will she earn at the end of 2? 5 years?

$I = Prt$

$I = (\$1000)(1.25\%)(2)$

$I = \$25$

$\$25 + \$1000 = \$1025$

$I = Prt$

$I = (\$1000)(1.25\%)(5)$

$I = \$62.50$

$62.50 + \$1000$

$= \$1062.50$

Formula re-ranged: Looking for *t*

$2.5\% = 0.025$

$I = Pr\boxed{t}$

$500 = 2000(2.5\%)\boxed{t}$?

$\frac{500}{2000(2.5\%)} = \frac{50t}{50}$

$10 = t$

Example 2

Allison wants to invest $2000.00. Her bank offers an investment option that earns compound interest at a rate of 1.75% per year, compounded annually.

a) If she invests the money for 1 year, how much interest will Allison earn?

b) If she invests the money for 2 years, how much money will Allison have at the end of the investment term?

c) Would you use the method from part b) for calculating the total value if Allison decides to invest her money for 10 years? Why or why not?

(a) $I = 2000(1.75\%)(1)$
$= \$35$
Total: $2035

(b) $I = 2035(1.75\%)(1) = 35.61$

$2070.61(1.75)(1)$

b)

INTEREST TABLE

Interest period	*Investment value at beginning of period ($)*	*Interest earned ($) (I = Prt)*	*Investment value at end of period ($)*
1	$2000.00	$2000.00 × 0.0175 × 1 = $35.00	$2000.00 + $35.00 = $2035.00
2	$2035.00	$2035.00 × 0.0175 × 1 = $35.61	$2000.00 + $35.00 + 35.61 = $2070.61

Way too long of a method.....

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Example 2

Allison wants to invest $2000.00. Her bank offers an investment option that earns compound interest at a rate of 1.75% per year, compounded annually.

a) If she invests the money for 1 year, how much interest will Allison earn?

b) If she invests the money for 2 years, how much money will Allison have at the end of the investment term?

c) Would you use the method from part b) for calculating the total value if Allison decides to invest her money for 10 years? Why or why not?

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$P = \$2000$ $r = 1.75\% = 0.0175$ $n = 1$

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A is the final value of the investment (principal plus interest).

P is the principal.

r is the annual interest rate expressed as a decimal.

n is the number of compounding periods in a year.

t is the term of the investment or loan in years.

interest:

(c)

$$A = \left(1 + \frac{r}{n}\right)^{(n \cdot t)}$$ Exponent

$$A = \$2000\left(1 + \frac{0.0175}{1}\right)^{(1)(10)}$$

$$A = \$2000(1 + 0.0175)^{10}$$

$$A = \$2000(1.0175)^{10}$$

$$A = 2000(1.189)$$

$$\boxed{A = \$2378.89}$$

B
E ^ y^x
D . x^y
M
A
S

$2^3 = 2 \cdot 2 \cdot 2$

$2 \wedge 3$

Compound Interest Worksheets

Name_____

Calculate the total amount of the investment or total paid in a loan in the following situations:

1.) You invested $52,400 at 6% compounded annually for 5 years. What is your total return on this investment?

Answer: $70,123.02

$P = 52\,400$
$r = 6\% = 0.06$
$n = 1$
$t = 5$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = (52\,400)\left(1 + \frac{0.06}{1}\right)^{(1)(5)}$$

1.) You invested $52,400 at 6% compounded annually for 5 years. What is your total return on this investment?
Answer:

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

$$A = 52{,}400\left(1+\frac{0.06}{1}\right)^{(1)(5)}$$

$$A = \$70{,}123.02$$

2.) You borrowed $10,400 for 4 years at 12.7% and the interest is compounded semi-annually. What is the total you will pay back?

Answer: $17,018.97

2) $n = 2$

$$A = 10{,}400\left(1 + \frac{0.127}{2}\right)^{2\times 4}$$

$$A = 10{,}400(1.0635)^{8}$$

$$A = \$17{,}018.97$$

3.) Your 2 year investment of $5,300 earns 2.9% and is compounded annually. What will your total return be?

Answer: $5,611.86

4.) You invested $100 at 8.2% which is compounded annually for 7 years. How much will your $100. be worth in 7 years?

Answer: $173.62

5.) Your investment of $18,100 at 13.6% compounded quarterly for 71/2 years will be worth how much?

Answer: $49,350.86