

## 8.5 Effects of Changing the Conditions on Investments and Loans

### A Formulas

Simple Interest	Compound Interest
$A = P(1 + rt)$	$A = P(1 + i)^n$
$P = \frac{A}{1 + rt}$	$P = \frac{A}{(1 + i)^n}$
$I = Prt$	$I = A - P$
$I = A - P$	$i = \frac{r}{m} \quad n = m \cdot t$
<a href="#">Calculator</a>	<a href="#">Calculator</a>

where:

$P$  is the *principal* or the *present value*

$A$  is the *amount* or the *future value*

$I$  is the total accumulated *interest*

$r$  is the *interest rate* per year

$i$  is the *interest rate* per compounding period

$n$  is the *total number of compounding periods*

$m$  is the *number of compounding periods* per year

$t$  is the *time* (in years)

Example 1. Nicolas invests \$1000. How long would it take for his investment to double for each type of interest earned?

a) 5%/a simple interest

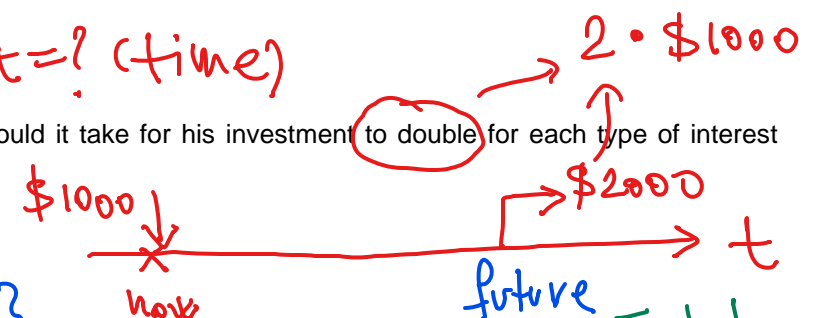
$$r = 5\%$$

$$P = PV = \$1000$$

$$A = FV = \$2000$$

$$t = ?$$

$\therefore$  It takes 20 years to double



$\therefore$  Total interest is \$1000

b) 5%/a compounded semi-annually

$$r = 5\%$$

$$PV = \$1000$$

$$FV = \$2000$$

$$m = 2 \text{ (semi-annually)}$$

$$t = ?$$

It takes 14 years, 1 week and 4 days to double.

$$P = \$949.99 \xrightarrow{\text{now}} \xrightarrow{A = FV = ?} t$$

Example 2. Margaret can finance the purchase of a \$949.99 refrigerator one of two ways:

Plan A: 10% simple interest for 2 years  $t = 2 \text{ years}$

$$P = \$949.99$$

$$r = 10\%$$

$$FV = \$1,139.99$$

Plan B: 5% compounded quarterly for 2 years  $t = 2 \text{ years}$

$$P = \$949.99$$

$$r = 5\%$$

$$FV = \$1,049.25$$

Which plan should she choose? Justify your answer.

→ We pay back less money!

Plan B is better

Example 3. Suppose you need \$10,000 in five years to repay some college expenses. Compare the amounts you would need to invest in these three options to reach your goal.

A) A bond that pays interest at 7% per year, compounded monthly.

$$r = 7\%$$

monthly

$$PV = \$7,054.05$$

$$FV = \$10,000$$



B) An investment fund that pays interest at 8% per year, compounded semi-annually.

$$r = 8\%$$

Semi-annually

$$PV = \$6,755.64$$

best plan!

C) A term deposit account that pays interest at 6.5% per year, compounded daily.

$$r = 6.5\%$$

daily

$$PV = \$7,225.48$$