

Simple Interest

$$I = Prt$$

$$A = P + I \rightsquigarrow$$

$$A = P + Prt$$

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



$$I = A - P$$

Compound Interest

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

Rate of Return

$$ROR = \frac{\$earn \times 100\%}{\$invest}$$

Rule of 72

Double $\rightarrow t = \frac{72}{Rate}$

Present Value

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

HOMEWORK: Review questions...

QUESTIONS???

p. 483 - #1, 2, 5, 7, 10

2. a) For how long would \$6000 need to be invested, at 6.4% simple interest, to earn \$1200 in interest?
- b) How long would it take if the interest for part a) was paid yearly?
- c) How long would it take if the interest was paid quarterly?

a) $t = ?$



$$t = \frac{I}{Pr}$$

$$t = \frac{1200}{6000(0.064)}$$

$$t = 3.125 \text{ years}$$

b) 4 years

c) 3.25 years

7. a) How much should Desiree invest at 6%, compounded monthly, to have \$10 000 in 3 years?
- b) How much should Desiree invest if the compounding period is semi-annual?

a) $10000 / (1 + 0.06/12)^{36} = 8356.449188$

b) $10000 / (1 + 0.06/2)^6 = 8374.842567$

8374.84

$P = ?$

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

$P = \frac{10000}{(1 + \frac{0.06}{12})^{12 \times 3}}$

$P = 8356.45$

10. An investment of \$250 grew to \$1000 at 6% interest, compounded semi-annually. Estimate how long it took for the investment to grow, and then verify your estimate.

$$t = ?$$

$$250 \xrightarrow{x^2} 500 \xrightarrow{x^2} 1000$$

$$12 \text{ yrs} + 12 \text{ yrs}$$

$$= 24 \text{ yrs}$$

$$t = \frac{72}{6}$$

$$t = 12 \text{ years}$$

SOLUTION WITH TI-84 (Finance APP)...

NOTE: Invest: $PV = 0$
 $FV \rightarrow$ Amount

```

N=
I%=0
PV=0
PMT=0
FV=0
P/Y=1
C/Y=1
PMT: [END] BEGIN
    
```

- ← Total number of payments
- ← Yearly interest rate (as a percent)
- ← Present Value (money invested/borrowed)
- ← Payment
- ← Future Value (money at the end of the term)
- ← Number of payments/year
- ← Number of times interest gets compounded/year

Payment is given at the beginning/end of pay period

Set
END

$$\text{Pay out} = PMT \times N$$

EXAMPLE 1 | Determining the future value of an investment involving regular deposits
 p. 485

Darva is saving for a trip to Australia in 5 years. She plans to work on a student visa while she is there, so she needs only enough money for a return flight and her expenses until she finds a job. She deposits \$500 into her savings account at the end of each 6-month period from what she earns as a server. The account earns 3.8%, compounded semi-annually. How much money will be in the account at the end of 5 years? How much of this money will be earned interest?



SOLUTION WITH TVM-Solver...

N=10
I%=3.8
PV=0
PMT=-500
FV=5449.896878
P/Y=2
C/Y=2
PMT: <input type="checkbox"/> END <input checked="" type="checkbox"/> BEGIN

Amount
 \$ 5449.90
Interest
 5449.90 - 500(10)
 449.90

SOLUTION by hand...

EXAMPLE 2
p. 487

Comparing a regular payment investment with a single payment investment

Adam made a \$200 payment at the end of each year into an investment that earned 5%, compounded annually. Blake made a single investment at 5%, compounded annually. At the end of 5 years, their future values were equal.

NOTE
Payments → APP
Once → Formula

- a) What was their future value?
- b) What principal amount did Blake invest 5 years ago?
- c) Who earned more interest? Why?

Adam (APP)

$N = 5$
 $I\% = 5$
 $PV = 0$
 $PMT = -200$
 $FV = 1105.13$
 $P/Y = 1$
 $C/Y = 1$
 $\hat{=} NO$

Payment
 200×5
 $\$1000$

b)

Blake (Formula)

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

$$= \frac{1105.13}{(1 + \frac{0.05}{1})^5}$$

$$= \$865.90$$

c) Better

Blake
 1105.13
 $- 865.90$
 $\hline 239.23$

Adam
 1105.13
 $- 1000$
 $\hline 105.13$

EXAMPLE 3 | Determining the interest rate of a regular payment investment
 p. 489 *Payments → All*

Jeremiah deposits \$750 into an investment account at the end of every 3 months. Interest is compounded quarterly, the term is 3 years, and the future value is \$10 059.07. What annual rate of interest does Jeremiah's investment earn?

r = 8%

```

N=12
I%=8.000019121
PV=0
PMT=-750
FV=10059.07
P/Y=4
C/Y=4
PMT: [ ] [ ] BEGIN
    
```


EXAMPLE 4
p. 490

Determining the regular payment amount of an investment

Celia wants to have \$300 000 in 20 years so that she can retire. Celia has found a trust account that earns a fixed rate of 10.8%, compounded annually.

- a) What regular payments must Celia make at the end of each year to meet her goal of \$300 000?
- b) How much interest will she earn over the 20 years?

```

a)
N=20
I%=10.8
PV=0
PMT=-4781.08988
FV=300000
P/Y=1
C/Y=1
PMT: [ ] [ ] BEGIN
    
```

← PMT
\$4781.09

b) $P_i = PMT \times N$
 $P_i = 4781.09 \times 20$
 $P_i = 95621.80$

$I = A - P$
 $I = 300000 - 95621.80$
 $I = \$204378.20$

EXAMPLE 5 | Determining the term of a regular payment investment
 p. 491

On Luis's 20th birthday, he started making regular \$1000 payments into an investment account at the end of every 6 months. He wants to save for a down payment on a home. His investment earns 3.5%, compounded semi-annually. At what age will he have more than \$18 000?

```

    N=15.78433191
    I%=3.5
    PV=0
    PMT=-1000
    FV=18000
    P/Y=2
    C/Y=2
    PMT: [ ] BEGIN
    
```

$$\frac{15.78 \text{ Payments}}{2} \rightarrow \text{Age} = 20 + 7.89$$

$$t = 7.89 \rightarrow = 27.89$$

$$= \boxed{28 \text{ years}}$$

HOMEWORK...

p. 493: #3, 5, 6, & 9

NOTE: When using the TI-84...

Each question must have the following completed for homework
AND beginning of class tomorrow you will be given time to solve.

```
N=  
I%=  
PV=  
PMT=  
FV=  
P/Y=  
C/Y=  
PMT:  END  BEGIN
```