Simple Interest

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

$$I = A - P$$

Compound Interest

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

Rate of Return

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

Rule of 72

Double →

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

Present Value

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

HOMEWORK: Review questions...

Help?

$ invest   P
$ earn   I
$ end   A

P
I
A
↕
FV

p. 483 - #1, 2, ⑤, ⑦, 10

t?

2. **a)** For how long would $6000 need to be
   invested, at 6.4% simple interest, to earn
   I $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) $t = \dfrac{I}{Pr}$

$t = \dfrac{1200}{6000 \times 0.064}$

$t = 3.125 \text{ years}$

b) 4 years

c) 3.25 years

5. An alumnus of a local high school donated $50 000 to the school. The amount was invested for 3 years at 7.75%, compounded quarterly. The school has agreed to use only the interest earned on the investment to buy sports equipment. How much money will be available for sports equipment at the end of the investment's term?
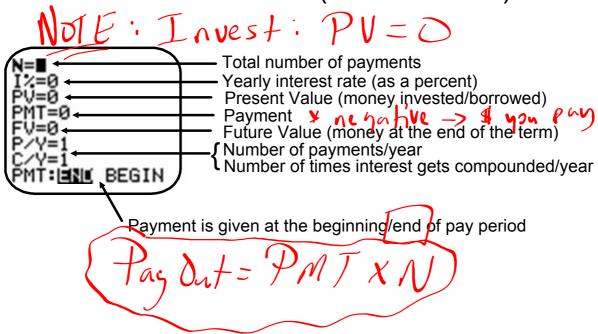
$$A = 50000\left(1 + \frac{0.0775}{4}\right)^{4 \times 3}$$

$$A = \$62\,947.39$$

$P = 50\,000$

$t = 3\text{ yrs}$

$r = 0.0775$

$n = 4$

$I = ?$

$I = A - P$

$= 62\,947.39$

$- 50\,000$

$\$12\,947.39$

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

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

$P = \$8356.45$

$P \rightarrow ?$

$r = 0.06$

$n = 12$

$A = 10000$

$t = 3 \text{ yrs}$

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

NOTE: Invest: $PV = 0$

```
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 **× negative → $ you pay**
→ 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

$Pay Out = PMT \times N$

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

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          ← 2x5
I%=3.8
PV=0
PMT=-500
▪FV=5449.896878
P/Y=2
C/Y=2
PMT:END BEGIN
```

Amount
$5449.90

SOLUTION by hand...

Pay Out = 500 x 10
        = 5000

$$I = A - P$$
$$= 5449.90 - 5000$$
$$= \$449.90$$

EXAMPLE 2
p. 487

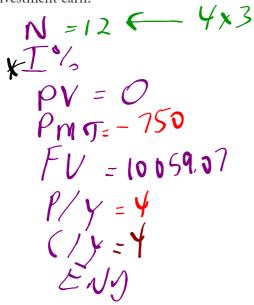Comparing a regular payment investment with a single payment investment

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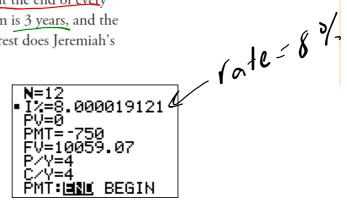
a) What was their future value?
b) What principal amount did Blake invest 5 years ago?
c) Who earned more interest? Why?

Payments → A.P.P.
Once → Formula

Adam (APP)

```
N=5
I%=5
PV=0
PMT=-200
▪FV=1105.12625
P/Y=1
C/Y=1
PMT:END BEGIN
```

a) $1105.13

$Pay\ Out = 200 \times 5$
$= 1000$

$I = 1105.13 - 1000$
$I = \$105.13$

Blake (Formula)

$$P = \frac{A}{\left(1 + \frac{5}{n}\right)^{nt}}$$

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

$$P = \$865.90$$

c) Blake's Interest

```
1105.13-865.90
            239.23
■
```

EXAMPLE **3** p. 489	Determining the interest rate of a regular payment investment

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?
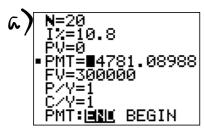
$N = 12 \leftarrow 4 \times 3$

★$I\%$

$PV = 0$

$Pmt = -750$

$FV = 10059.07$

$P/Y = 4$

$C/Y = 4$

END

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

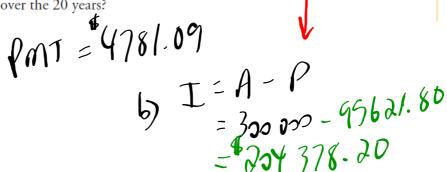rate = 8 %

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:END BEGIN
```

$PMT = {}^\$4781.09$

$P = 4781.09 \times 20$

$P = 95621.80$

$PMT = {}^\$4781.09$

b) $I = A - P$

$= 300\,000 - 95621.80$

$= {}^\$204\,378.20$

EXAMPLE 5
p. 491

Determining the term of a regular payment investment

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:END BEGIN
```

$$\frac{15.78 \text{ payments}}{2} = 7.89 \text{ years} \xrightarrow{+20} 27.89$$

$$\boxed{28}$$

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
```