Chapter 1 Review
P. 71 #1, 2a, 3-5, 6a, 8, 9, 11a, 12

1. When Trish was 12, her grandmother bought
   her a $1500 CSB that earned simple interest.
   a) When Trish turned 18, her CSB was worth
      $2850. At what rate did the CSB earn interest?
   b) If the interest was paid <u>annually</u> and Trish
      redeemed the CSB when she was 18 and
      a half years old, how much would she get?
      Explain.

   a) $A = P + Prt$
   $2850 = 1500 + 1500 \, r \, (6)$
   $-1500 \quad -1500$

   $$\frac{1350}{1500 \cdot 6} = \frac{1500(r)(6)}{1500 \cdot 6}$$

   $0.15 = r$
   15%

   → she would get the same
   interest if she redeemed at
   18 years

   $A = 2850$

   or $A = 1500 + 1500 \, (0.15)(6)$
   $= 2850$

2. Steve is celebrating his 18th birthday.
   ① • On his 5th birthday, his grandmother bought
     him a $10 000 GIC that earns 6.3% <u>simple</u>
     interest.
   ② • On the same birthday, his grandfather bought
     him a $7000 CSB that earns 11.4% <u>simple</u>
     interest.

   a) What is the value of each investment now?

   ① $A = P + Prt$
   $A = 10 000 + 10 000 \, (0.063)(13)$
   $= \$18 190$

   ② $A = 7000 + 7000 \, (0.114)(13)$
   $= \$17 374$

3. Examine these two investments, and then
answer the questions below.
- Sonia invested in a $2000 GIC that earns 6.2%
  <u>simple</u> interest, paid annually, for 5 years.
- <u>Trent</u> bought a $2000 GIC that earns 5.3%,
  <u>compounded</u> monthly, for a 5-year term.

a) Predict which investment will have the
   greater rate of return. Explain.
b) Verify your prediction.
c) Explain the difference in the interest earned
   on the two investments.

a) predict Sonia because higher interest rate (r)

b) Sonia

$$A = P + Prt$$
$$= 2000 + 2000(0.062)(5)$$
$$= \$2620$$

Trent

$$A = P\left(1 + \frac{r}{n}\right)^{tn}$$
$$= 2000\left(1 + \frac{0.053}{12}\right)^{12 \cdot 5}$$
$$= \$2605.34$$

c) Sonia has simple interest (earned off principal)

Trent has compound interest (earned off principal
and interest earned)

4. James and Johnny received equal inheritances of
   $2000, which they invested for 5 years at 7.4%.
   James's account compounded semi-annually,
   and Johnny's account compounded weekly.
   a) Predict who will earn more interest. Verify
      your answer.
   b) Compare their rates of return.

a) JOHNNY because compounds more frequently.

b) JAMES $n=2$

$$A = 2000\left(1 + \frac{0.074}{2}\right)^{5 \cdot 2}$$
$$= 2876.19$$

$$I = A - P$$
$$= 2876.19 - 2000 = 876.19$$

$$r \text{ of } r = \frac{I}{P} = \frac{876.19}{2000} = 0.44 \quad \boxed{44\%}$$

JOHNNY $n=52$

$$A = 2000\left(1 + \frac{0.074}{52}\right)^{52 \cdot 5}$$
$$= 2894.71$$

$$I = 2894.71 - 2000 = 894.71$$

$$r \text{ of } = \frac{I}{P} = \frac{894.71}{2000} = 0.45 \quad \boxed{45\%}$$

5. Kyle invested $900 in an account that earned
   interest, compounded daily. After 1 year, her
   investment was worth $1000. What was the
   annual rate of interest?

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

$$\frac{1000}{900} = \frac{900}{900}\left(1 + \frac{r}{365}\right)^{365}$$

$$\sqrt[365]{1.11} = \sqrt[365]{\left(1 + \frac{r}{365}\right)^{365}}$$

$$1.0002887 = 1 + \frac{r}{365}$$
$$\quad -1 \qquad -1$$

$$365 \times 0.0002887 = \frac{r}{365} \times 365$$

$$0.1054 = r$$

$$\boxed{10.5\%}$$

6. Phil and his daughter Lina opened accounts at different times. Each account earned 6.5%, compounded semi-annually.
   - Phil kept his account for 18 years and now has $125 000 in the account.
   - Lina kept her account for 36 years and now has $125 000 in the account.

   a) Who invested the greater principal? How much more did he or she invest?

Phil

$$125\,000 = P\left(1 + \frac{0.065}{2}\right)^{2 \cdot 18}$$

$$\frac{125\,000}{3.16258E5} = \frac{3.16258E5\, P}{3.16258E5}$$

$$P = 39524.63$$

Lina

$$125\,000 = P\left(1 + \frac{0.065}{2}\right)^{2 \cdot 36}$$

$$\frac{125\,000}{10.001942} = \frac{P\,(10.001942)}{10.001942}$$

$$P = 12497.57$$

↑ Phil invested more.

8. Mary decided to invest $800 per month for the next 6 years. She plans to start her own business making lunches for the elementary schools in her area, but she needs to save enough money for her start-up costs.
   - Bank A has offered her 12.2%, compounded monthly.
   - Bank B has offered her 11.4%, compounded monthly.

   If Mary chooses bank A, how much more money will she end up with?

BANK A

$N = 12 \cdot 6 = 72$
$I = 12.2$
$PV = 0$
$PMT = 800$
$FV = \boxed{84319.81}$
$P/Y = 12$
$C/Y = 12$

BANK B

$N = 72$
$I = 11.4$
$PV = 0$
$PMT = 800$
$FV = \boxed{82139.03}$
$P/Y = 12$
$C/Y = 12$

$84319.81 - 82139.03$

$= \$2180.73$

↑ more with BANK A.

9. Two brothers, Josh and Jeff, held investments that earned 6%, compounded annually. Both of them made regular payments into their investments until they were 65.

   • Josh started making yearly payments of $1000 when he was 20.
   • Jeff did not start until he was 50, but made annual deposits of $3000.

   a) What is the future value of each investment?
   b) How much did each man invest altogether?
   c) How much interest did each man earn?
   d) What annual deposit would Jeff have needed to make if he had wanted his investment to have the same future value as Josh's investment at age 65?

a) JOSH

   N = 45
   I = 6
   PV = 0
   PMT = 1000
   FV = 212743.51
   P/Y = 1
   C/Y = 1

   JEFF

   N = 15
   I = 6
   PV = 0
   PMT = 3000
   FV = 69827.91
   P/Y = 1
   C/Y = 1

b) 1000 × 45 = 45000   3000 × 15 = 45000

c) A = P + I ⇒ I = A - P

   I = 212743.51 - 45000
     = $167743.51

   I = 69827.91 - 45000
     = $24827.91

d) N = 15
   I = 6
   PV = 0
   PMT = 9140.05
   FV = 212743.51
   P/Y = 1
   C/Y = 1

11. When Chandra was 8 years old, an investment portfolio was started for her education.

(1) • Her parents deposited $450 every 3 months into a savings account that earns 4.5%, compounded quarterly.

(2) • Her grandparents invested $5000 in a trust account that earns an average annual interest rate of 6%, compounded annually.

a) Chandra plans to redeem her portfolio when she turns 18 to pay for university.

   i) What will be the value of her portfolio?

   ii) What was the portfolio's rate of return?

(i)

(1) $N = 4 \cdot 10 = 40$
$I = 4.5$
$PV = 0$
$PMT = 450$
$FV = \boxed{22575.07}$
$P/Y = 4$
$C/Y = 4$

(2) $A = PC(1 + \frac{r}{n})^{tn}$
$= 5000(1 + \frac{0.06}{1})^{10}$
$= \boxed{8954.24}$

$$22575.07 + 8954.24 = 31529.31$$

(ii)

$A = P + I$ $P = 450 \times 4 \times 10 + 5000 = 23000$

$I = A - P$
$I = 31529.31 - 23000$
$\quad = 8529.31$

$\text{rate} = \frac{I}{P} = \frac{8529.31}{23000} = 0.37 \Rightarrow 37\%$

12. a) Predict which portfolio will have the greater rate of return over 10 years. Explain your prediction.

b) Verify your prediction. Was your prediction correct?

Portfolio 1:

- A 10-year $25 000 GIC, purchased 10 years ago, that earns 8.7%, compounded annually
- A 10-year $10 000 CSB, purchased 10 years ago, that earns 6.4% simple interest
- An investment involving deposits of $2500 at the end of every year for 10 years, which earns 4.9%, compounded annually

Portfolio 2:

- ① A 10-year $25 000 GIC, purchased 10 years ago, that earns 8.7%, compounded monthly
- ② A 10-year $10 000 CSB, purchased 10 years ago, that earns 6.4%, compounded annually
- ③ An investment involving deposits of $1250 at the end of every 6 months for 10 years, which earns 4.9%, compounded semi-annually

$$A = 25000\left(1 + \frac{0.087}{1}\right)^{10}$$
$$= \boxed{57575.20}$$

$$A = 10000 + 10000(0.064)(10)$$
$$= \boxed{16400}$$

$N = 10$
$I = 4.9$
$PV = 0$
$PMT = 2500$
$FV = \boxed{31298.35}$
$P/Y = 1$
$C/Y = 1$

Total
$$A = 57575.20 + 16400 + 31298.35 = 105273.55$$

Total
$$P = 25000 + 10000 + 2500 \times 10 = 60000$$

Total
$$I = 105273.55 - 60000 = 45273.55$$

$$ROR = \frac{45273.55}{60000}$$
$$= 0.75 \Rightarrow \boxed{75\%}$$

①
$$A = 25000\left(1 + \frac{0.087}{12}\right)^{12 \cdot 10}$$
$$= \boxed{59485.78}$$

②
$$A = 10000\left(1 + \frac{0.064}{1}\right)^{10}$$
$$= \boxed{18595.86}$$

③
$N = 2 \cdot 10 = 20$
$I = 4.9$
$PV = 0$
$PMT = 1250$
$FV = \boxed{31770.60}$
$P/Y = 2$
$C/Y = 2$

Total A: $59485.78 + 18595.86 + 31770.60$
$$= 109852.24$$

Total P = $25000 + 10000 + 1250 \times 20$
$$= 60000$$

Total I = $109852.24 - 60000 = 49852.24$

ROR = $\frac{49852.24}{60000} = 0.83 \Rightarrow \boxed{83\%}$