The term (in years) is 9 years.
The future value is unknown.
The GIC is worth $6299.36.
CSB: The principal is $2000.
The annual interest rate is 3.1%.
The compounding period is semi-annual, or 2 times per year.
The term (in years) is 4 years.
The future value is unknown.
The CSB is worth $2261.88.
Savings account: The regular payment amount is $15.
The payment frequency is weekly, or 52 times per year.
The number of payments is 260.
The payments are made at the end of each payment period.
The annual interest rate is 1.4%.
The compounding frequency is weekly, or 52 times per year.
The future value is unknown.
The account is worth $4039.18.
Total: 6299.36 + 2261.88 + 4039.18 = 12 600.42
The total value of Alex's portfolio is $12 600.42.
Jamie: Bond: $A = P(1 + rt)$
P is $3000; r is 2.7% or 0.027; t is 9
$A = 3000(1 + (0.027)(9))$
$A = 3729$
The bond is worth $3729.
CSB: The principal is $700.
The annual interest rate is 2.8%.
The compounding period is semi-annual, or 2 times per year.
The term (in years) is 3 years.
The future value is unknown.
The CSB is worth $760.90.
Savings account: The regular payment amount is $100.
The payment frequency is monthly, or 12 times per year.
The number of payments is 72.
The payments are made at the end of each payment period.
The annual interest rate is 1.7%.
The compounding frequency is monthly, or 12 times per year.
The future value is unknown.
The account is worth $7574.37.
Total: 3729 + 760.90 + 7574.37 = 12 064.27
The total value of Jamie's portfolio is $12 064.27.
b) Alex:
Principal: 5000 + 2000 + 15(52)(5) = 10 900
Interest: 12 600.42 – 10 900 = 1700.42

$$\text{Rate of return} = \frac{1700.42}{10\ 900}$$

Rate of return = 0.156…
Alex's rate of return on his investment is 15.6%.
Jamie:
Principal: 3000 + 700 + 100(12)(6) = 10 900
Interest: 12 064.27 – 10 900 = 1164.27

$$\text{Rate of return} = \frac{1164.27}{10\ 900}$$

Rate of return = 0.1068…
Jamie's rate of return on her investment is 10.7%.
Alex has a greater rate of return on his portfolio than Jamie does.

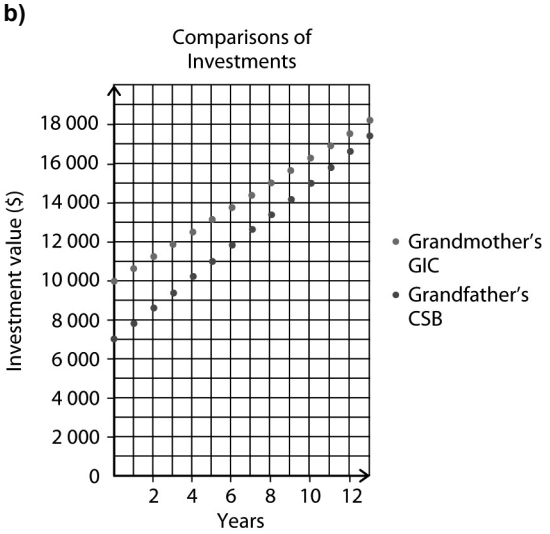
Chapter Review, page 71

1. a) $A = P + Prt$
A is $2850; P is $1500; t is 6
$2850 = 1500 + (1500)(r)(6)$
$1350 = 9000r$
$r = 0.15$
The CSB earned an annual interest rate of 15%.
b) Trish would get $2850. The interest is paid annually so the amount will be the same whether she redeems the CSB when she is 18 or 18 and a half.

2. a)

	GIC	**CSB**
Principal ($)	10 000	7000
Interest Rate per Annum	0.063	0.114
Value at End of Year		
1	10 630.00	7798.00
3	11 890.00	9394.00
5	13 150.00	10 990.00
7	14 410.00	12 586.00
9	15 670.00	14 182.00
11	16 930.00	15 778.00
13	18 190.00	17 374.00

After 13 years, the GIC is worth $18 190 and the CSB is worth $17 374.
b)



Time (years)	Value of Investment ($)	
	GIC	**CSB**
1	10 630.00	7798.00
3	11 890.00	9394.00
5	13 150.00	10 990.00
7	14 410.00	12 586.00
9	15 670.00	14 182.00
11	16 930.00	15 778.00
13	18 190.00	17 374.00

c) The CSB is earning more interest is increasing in value faster than the GIC. The CSB will soon be worth more than the GIC.

3. a) Sonia's investment will have the greatest return because the term is short. Simple interest investments earn more interest than compound interest investments over a short time.
b) Sonia: $A = P(1 + rt)$
P is \$2000; r is 6.2% or 0.062; t is 5
$A = 2000(1 + (0.062)(5))$
$A = 2620$
Interest: 2620 – 2000 = 620

$$\text{Rate of return} = \frac{620}{2000}$$

Rate of return = 0.31
Sonia's rate of return is 31%.
Trent: $A = P(1 + i)^n$
$P = 2000$; $r = 5.3\%$ compounded monthly,
$i = 0.004\,416\ldots$: $t = 5$ years, $n = 60$
$A = 2000(1 + 0.004\,416\ldots)^{60}$
A = 2605.34
Interest: 2605.34 – 2000 = 605.34

$$\text{Rate of return} = \frac{605.34}{2000.00}$$

Rate of return = 0.3026…
Trent's rate of return is 30.3%.
Sonia has a slightly higher rate of return than Trent does.
c) Sonia's investment earned more interest because the annual interest rate was higher and the term was too short for the compounding of interest in Trent's account to be noticeable.

4. a) Johnny will earn more interest because the interest on his account is compounded more frequently.
James: The principal is \$2000.
The annual interest rate is 7.4%.
The compounding period is semi-annual, or 2 times per year.
The term (in years) is 5 years.
The future value is unknown.
James's investment is worth \$2876.19.
Interest: 2876.19 – 2000 = 876.19
James earned \$876.19 in interest.
Johnny: The principal is \$2000.
The annual interest rate is 7.4%.
The compounding period is weekly, or 52 times per year.
The term (in years) is 5 years.
The future value is unknown.
Johnny's investment is worth \$2894.71.
Interest: 2894.71 – 2000 = 894.71
Johnny earned \$894.71 in interest.
Johnny's investment earned more interest than James's did.
b) James:

$$\text{Rate of return} = \frac{876.19}{2000.00}$$

Rate of return = 0.438…
James's rate of return is 43.8%.

Johnny:

$$\text{Rate of return} = \frac{894.71}{2000.00}$$

Rate of return = 0.447…
Johnny's rate of return is 44.7%.
Johnny's rate of return is higher than James's rate of return.

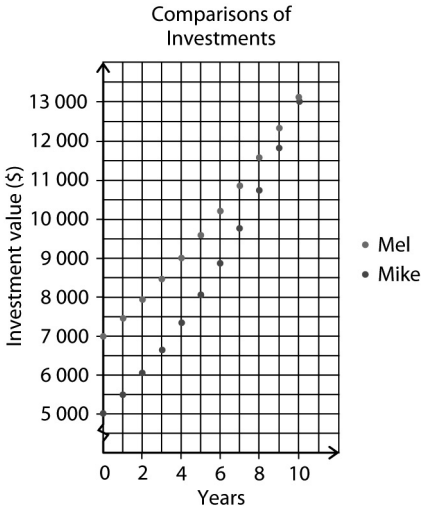
5. The principal is \$900.
The annual interest rate is unknown.
The compounding period is daily, or 365 times per year.
The term (in years) is 1 year.
The future value is \$1000.
I used the financial application on my calculator:
Kyle's annual interest rate was 10.54%.

6. a) Phil: *The principal is unknown.*
The annual interest rate is 6.5%.
The compounding period is semi-annual, or 2 times per year.
The term (in years) is 18 years.
The future value is \$125 000.
Phil invested a principal of \$39 524.63.
Lina: *The principal is unknown.*
The annual interest rate is 6.5%.
The compounding period is semi-annual, or 2 times per year.
The term (in years) is 36 years.
The future value is \$125 000.
Lina invested a principal of \$12 497.57.
39 524.63 – 12 497.57 = 27 027.06
Phil invested \$27 027.06 more than Lina did.
b) The principal is \$39 524.63.
The annual interest rate is 6.5%.
The compounding period is semi-annual, or 2 times per year.
The term (in years) is 36 years.
The future value is unknown.
Lina would have \$395 323.07 in her account after 36 years.

7. a) Mel: *The principal is unknown.*
The annual interest rate is 6.5%.
The compounding period is annual, or once per year.
The term (in years) is 10 years.
The future value is \$13 140.
Mel invested a principal of \$7000.02.
Mike: *The principal is unknown.*
The annual interest rate is 9.6%.
The compounding period is monthly, or 12 times per year.
The term (in years) is 10 years.
The future value is \$13 009.
Mike invested a principal of \$5000.12.
Mel invested more principal 10 years ago.

b) Calculate the investment values every two years.

	Mel	**Mike**
Principal ($)	7000.02	5000.12
Interest Rate per Annum	6.5	9.6
Compounding period	annual	monthly
Value at End of Year		
0	7000.02	5000.12
2	7939.60	6053.87
4	9005.29	7329.70
6	10214.03	8874.39
8	11585.00	10744.63
10	13140.00	13009.01



Time (years)	Value of Investment ($)	
	Mel	**Mike**
0	7000.02	5000.12
2	7939.60	6053.87
4	9005.29	7329.70
6	10214.03	8874.39
8	11585.00	10744.63
10	13140.00	13009.01

c) e.g., The future value of Mike's investment will become larger and grow faster than the future value of Mel's investment. Mike's investment earns more interest and is compounded more frequently, so the graph is steeper and more curved.

8. Bank A: The regular payment amount is $800.
The payment frequency is monthly, or 12 times per year.
The number of payments is 72.
The payments are made at the end of each payment period.
The annual interest rate is 12.2%.
The compounding frequency is monthly, or 12 times per year.
The future value is unknown.
Bank A account is worth $84 319.81.
Bank B: The regular payment amount is $800.
The payment frequency is monthly, or 12 times per year.
The number of payments is 72.
The payments are made at the end of each payment period.
The annual interest rate is 11.4%.
The compounding frequency is monthly, or 12 times per year.
The future value is unknown.
Bank B account is worth $82 139.03.
Difference: 84 319.81 – 82 139.03 = 2180.78
Mary will have $2180.78 more if she chooses bank A.

9. a) Josh: The regular payment amount is $1000.
The payment frequency is annual, or once per year.
The number of payments is 45.
The payments are made at the end of each payment period.
The annual interest rate is 6%.
The compounding frequency is annual, or once per year.
The future value is unknown.
Josh's investment is worth $212 743.51.
Jeff: The regular payment amount is $3000.
The payment frequency is annual, or once per year.
The number of payments is 15.
The payments are made at the end of each payment period.
The annual interest rate is 6%.
The compounding frequency is annual, or once per year.
The future value is unknown.
Jeff's investment is worth $69 827.91
b) Josh: 1000(45) = 45 000
Jeff: 3000(15) = 45 000
They both invested $45 000.
c) Josh: 212 743.51 – 45 000 = 167 743.51
Jeff: 69 827.91 – 45 000 = 24 827.91
Josh earned $167 743.51 in interest and Jeff earned $24 827.91 in interest.
d) *The regular payment amount is unknown.*
The payment frequency is annual, or once per year.
The number of payments is 15.
The payments are made at the end of each payment period.
The annual interest rate is 6%.
The compounding frequency is annual, or once per year.
The future value is $212 743.51.
I used the financial application on my calculator:
Jeff would need to deposit $9140.05 every year for 15 years to have the same final value as Josh.

10. a) It is difficult to predict who will be able to purchase the more expensive car in five years because the monthly deposit amounts and compounding rates are very similar. Drew deposits $200 per month total and has interest compounded biweekly. John deposits a slightly higher monthly amount, $217, and his interest is compounded slightly less frequently (monthly).

b) Drew: The regular payment amount is $100.
The payment frequency is biweekly, or 26 times per year.
The number of payments is 130.
The payments are made at the end of each payment period.
The annual interest rate is 4.8%.
The compounding frequency is biweekly, or 26 times per year.
The future value is unknown.
Drew will have $14 677.43 in five years.
John: The regular payment amount is $217.
The payment frequency is monthly, or 12 times per year.
The number of payments is 60.
The payments are made at the end of each payment period.
The annual interest rate is 4.8%.
The compounding frequency is monthly, or 12 times per year
The future value is unknown.
John will have $14 682.26 in five years.
John will be able to purchase a more expensive car.

11. a) i) Regular deposit investment: The regular payment amount is $450.
The payment frequency is quarterly, or 4 times per year.
The number of payments is 40.
The payments are made at the end of each payment period.
The annual interest rate is 4.5%.
The compounding frequency is quarterly, or 4 times per year.
The future value is unknown.
The savings account is worth $22 575.07.
Lump sum investment: The principal is $5000.
The annual interest rate is 6%.
The compounding period is annual, or once per year.
The term (in years) is 10 years.
The future value is unknown.
The trust account is worth $8954.24.
Total: 22 575.07 + 8954.24 = 31 529.31
The value of Chandra's portfolio is $31 529.31.
ii) Principal: 450(40) + 5000 = 23 000
Interest: 31 529.31 – 23 000 = 8529.31

$$\text{Rate of return} = \frac{8529.31}{23\,000}$$

Rate of return = 0.3708…
Chandra's rate of return is 37.1%.
b) No, she will not have enough for 4 years.
31 529.31 – 10 000 = 21 529.31
$21 529.31 invested for 1 year at 6.2% compounded annually grows to $22 864.13.
22 864.13 – 10 000 = 12 864.13
$12 864.13 invested for 1 year at 6.2% compounded annually grows to $13 661.71.
13 661.71 – 10 000 = 3661.71
$3661.71 invested for 1 year at 6.2% compounded annually grows to $3888.74.
$3888.74 is less than $10 000, so Chandra will not have enough for 4 years.

12. a) Portfolio 2 will have a greater future value.

Portfolio 1	**Portfolio 2**
GIC compounded annually	GIC compounded monthly
CSB with simple interest	CSB with compound interest
Annual deposits of $2600, annual compounding	Semi-annual deposits of $1250, semi-annual compounding

Each investment in portfolio 2 has interest that is compounded more frequently than the corresponding portfolio 1 investment.
b) Portfolio 1:
GIC: The principal is $25 000.
The annual interest rate is 8.7%.
The compounding period is annual, or once per year.
The term (in years) is 10 years.
The future value is unknown.
The GIC is worth $57 575.20.
CSB: $A = P(1 + rt)$
P is $10 000; r is 6.4% or 0.064; t is 10
$A = 10\,000(1 + (0.064)(10))$
$A = 16\,400$
The CSB is worth $16 400
Deposit investment: The regular payment amount is $2500.
The payment frequency is annual, or once per year.
The number of payments is 10.
The payments are made at the end of each payment period.
The annual interest rate is 4.9%.
The compounding frequency is annual, or once per year.
The future value is unknown.
The investment is worth $31 298.35.
Total: 57 575.20 + 16 400 + 31 298.35 = 105 273.55
Portfolio 1 is worth $105 273.55.
Portfolio 2:
GIC: The principal is $25 000.
The annual interest rate is 8.7%.
The compounding period is monthly, or 12 times per year.
The term (in years) is 10 years.
The future value is unknown.
The GIC is worth $59 485.78.
CSB: The principal is $10 000.
The annual interest rate is 6.4%.
The compounding period is annual, or once per year.
The term (in years) is 10 years.
The future value is unknown.
The CSB is worth $18 595.86.
Deposit investment: The regular payment amount is $12500.
The payment frequency is semi-annual, or 2 times per year.
The number of payments is 20.
The payments are made at the end of each payment period.
The annual interest rate is 4.9%.
The compounding frequency is semi-annual, or 2 times per year.
The future value is unknown.
The investment is worth $31 770.60.

Total: 59 485.78 + 18 595.86 + 31 770.60 = 109 852.24
Portfolio 2 is worth $109 852.24
Portfolio 2 is worth more than portfolio 1.

Chapter Task, page 73

A. Yes, they can invest the $6000 now in a GIC that earns as high an interest rate as possible and then begin investing their monthly savings in the savings account, which earns a good rate of interest.

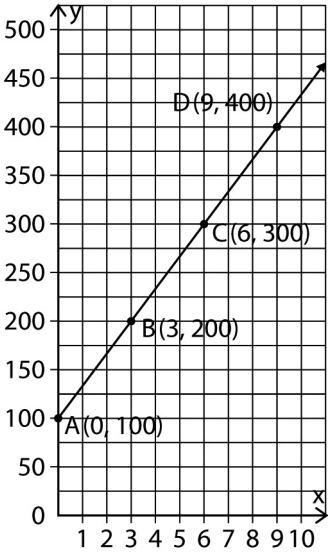
B. It will take about 32 years. $\frac{72}{4.5}$ = 16 years, so $6000 will grow to $12 000 in 16 years and then $12 000 will grow to $24 000 in 32 years.)
They also need to save money each month to be able to go in 3 years.

C. Since $23 280 – $6846 = $16 434, they need a regular payment investment with a future value of $16 434, which will require a regular payment of $431.06. Therefore, they need to save $431.06 each month.

D. They will need to wait another 4 months. In 4 more months, their savings account will grow to $18 381.33 and, combined with their GIC, which is still worth $6846 (it will not earn any interest over those 4 months since the compounding is annual), they will have $25 227.33. They will need $23 280(1.08) = 25 142.40.

Chapter 1 Diagnostic Test, TR page 56

1. a)



A. (0, 100), **B.** (3, 200), **C.** (6, 300), **D.** (9, 400)

b) $\text{slope} = \frac{\text{rise}}{\text{run}}$

$\text{slope} = \frac{100}{3}$

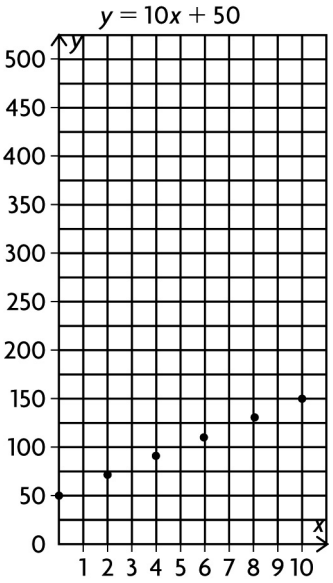
c) $b = 100$

d) $y = mx + b$

$y = \frac{100}{3}x + 100$

$3y = 100x + 300$

2. To plot $y = 10x + 50$, first determine some points of the function. e.g., If $x = 1$, $y = 10(1) + 50 = 60$ so $(x, y) = (1, 60)$ is a point.
$x = 2$, $y = 10(2) + 50 = 70$, $(x, y) = (2, 70)$
$x = 4$, $y = 10(4) + 50 = 90$, $(x, y) = (4, 90)$
$x = 6$, $y = 10(6) + 50 = 110$, $(x, y) = (6, 110)$
$x = 8$, $y = 10(8) + 50 = 130$, $(x, y) = (8, 130)$
$x = 10$, $y = 10(10) + 50 = 150$, $(x, y) = (10, 150)$



3. e.g., ratio: $\frac{\text{girls}}{\text{boys}} = \frac{654}{589}$

decimal: $\frac{654}{589} = 1.110...$ or 1.11 to two decimal places

percent: 1.11 · 100 = 111%

4. a) $10 000 · 0.06 = $600 **b)** $25 000 · 0.06 = $1500
c) $50 000 · 0.06 = $3000

5. a) $10 000 · 1.12 = $11 200
b) $25 000 · 1.12 = $28 000
c) $50 000 · 1.12 = $56 000

6. a) $\frac{3}{52}$; 0.06 **b)** $\frac{5}{12}$; 0.42

c) $\frac{60}{52}$ or $\frac{5}{13}$; 1.15 **d)** $\frac{27}{12}$; 2.25

7. a) The pattern is to add 71 to get the next number in the sequence: 214, 285, 356, **427**, **498**, 569
b) The pattern is to add half of the number to get the next number in the sequence: 4, 6, 9, **13.5**, **20.25**, 30.375
c) The pattern is the double the number to get the next number in the sequence: 7, **14**, 28, 56, **112**, 224