
The Chapter Problem—Financial Planning Answers

By the end of this chapter, students should be able to provide comprehensive, well-explained solutions to the problem. Students should also be able to recognize whether a problem involves present value or future value and apply the calculations they have learned to different financial situations in their everyday life and to give them some ideas about planning for their own financial futures.

Section 2.1

CPI. Visit a local bank or credit union, or search the Internet to obtain information about registered retirement savings plans (RRSPs), guaranteed investment certificates (GICs), registered education savings plans (RESPs), and registered income funds (RIFs). Briefly describe each type of savings plan and explain its purpose.

Answers will vary depending on current tax laws and the source of the information, but should include a description and purpose of each type of savings plan. For example,

An RRSP is a registered retirement savings plan. Deposits to a plan can be made at any time, but the total amount invested in any one year is limited. This limit is predetermined for each individual by the Canada Customs and Revenue Agency. The purpose of an RRSP is to allow the taxpayer to postpone taxes on income until a later date when the expected rate of income tax will be lower. In other words, the RRSP shelters income from tax while the tax rate is higher.

Section 2.2

CP2. Bart's education fund earns interest at 6%/a, compounded monthly. Find the value of the first \$25 deposit after

- (a) 1 month (b) 2 months (c) 3 months (d) 4 months (e) 36 months

In each case, $A = P(1 + i)^n$, $P = 25$, and $i = \frac{6\%}{12}$ or 0.005.

- (a) For $n = 1$,

$$\begin{aligned} A &= 25(1 + 0.005)^1 \\ &= 25.13 \end{aligned}$$

The deposit is worth \$25.13 after the first month.

- (b) For $n = 2$,

$$\begin{aligned} A &= 25(1.005)^2 \\ &= 25(1.010\,025) \\ &= 25.25 \end{aligned}$$

The deposit is worth \$25.25 after the first two months.

- (c) For $n = 3$,

$$\begin{aligned} A &= 25(1.005)^3 \\ &= 25.38 \end{aligned}$$

The deposit is worth \$25.38 after the first three months.

(d) For $n = 4$,

$$\begin{aligned} A &= 25(1.005)^4 \\ &= 25.50 \end{aligned}$$

The deposit is worth \$25.50 after the first four months.

(e) For $n = 36$,

$$\begin{aligned} A &= 25(1.005)^{36} \\ &= 29.92 \end{aligned}$$

The deposit is worth \$29.92 after the first 36 months.

CP3. Show why the sequence of the monthly values of the \$25 deposit is a geometric sequence. Determine an expression for t_n , the value of the first deposit after n months.

From CP2, the sequence is $25(1.005)^1, 25(1.005)^2, 25(1.005)^3, \dots$, and, in this form, you can see the common ratio, and the number of the term. The sequence in this form tells you more than the same sequence in the form 25.13, 25.25, 25.38, $\dots$.

Since $t_3 \div t_2 = 1.005$ and $t_2 \div t_1 = 1.005$, the common ratio, r , is 1.005 and the sequence is geometric. Also, $a = 25(1.005)^1$.

$$\begin{aligned} t_n &= ar^{n-1} \\ &= 25(1.005)^1(1.005)^{n-1} \\ &= 25(1.005)^n \end{aligned}$$

CP4. Find the sum of the first eight terms of the sequence in CP3.

Note that the sum of the first eight terms has no meaning in the context of the chapter problem.

$$S_n = \frac{a(r^n - 1)}{r - 1}, \text{ and } a = 25(1.005)^1, r = 1.005, \text{ and } n = 8$$

$$\begin{aligned} S_n &= \frac{25(1.005)^1(1.005^8 - 1)}{1.005 - 1} \\ &= \frac{25(1.005)(0.040\ 707\ 043\ 9)}{0.005} \\ &= 204.55 \end{aligned}$$

Section 2.5

CP5. Bart's education fund earns 6%/a, compounded monthly. Create a spreadsheet to represent the monthly balance in the fund. Use it to determine the balance after the 20th payment.

CP6. How many payments will take place by the time Bart reaches his 18th birthday? Determine the accumulated value of Bart's education fund on his 18th birthday.

Deposits to Bart's account begin when he is 4 years old. Assume the \$25 deposit is made at the end of the month and every month until he is 18 years old, that is, for 14 years or 168 months. The fund earns 6%/a compounded, monthly, and is an ordinary simple annuity.

This portion of a spreadsheet shows the formulas and data needed.

	A	B	C	D	E
1	Payment Number	Balance	Interest at 0.5%	Payment Made	New Balance
2	1	0	=B2*0.005	25	=B2+C2+D2
3	=A2+1	=E2	=B3*0.005	=\$D\$2	

Complete the spreadsheet using **Fill Down** or another copying command. This portion of the spreadsheet shows different rows.

	A	B	C	D	E
1	Payment Number	Balance	Interest at 0.5%	Payment Made	New Balance
2	1	\$0.00	\$0.00	\$25.00	\$25.00
3	2	\$25.00	\$0.13	\$25.00	\$50.13
4	3	\$50.13	\$0.25	\$25.00	\$75.38
...	...	...	...	...	...
19	18	\$442.43	\$2.21	\$25.00	\$469.64
20	19	\$469.64	\$2.35	\$25.00	\$496.99
21	20	\$496.99	\$2.48	\$25.00	\$524.48
...	...	...	...	...	...
168	167	\$6,442.90	\$32.21	\$25.00	\$6,500.12
169	168	\$6,500.12	\$32.50	\$25.00	\$6,557.62

The balance after the 20th payment is \$524.48. Since the deposits begin on Bart's 4th birthday, there will be $14 \times 12 = 168$ monthly payments by his 18th birthday. The accumulated amount of the fund on his 18th birthday is \$6557.62.

- CP7.** Create an amortization table to represent the repayment of Mr. Sacchetto's car loan. Print the table. This portion of a spreadsheet shows the formulas and data needed. The interest rate is $\frac{0.102}{12} = 0.0085$. Note that the values in H1 to H3 are treated as absolute values in other columns of the spreadsheet.

	A	B	C	D	E	F	G	H
1	Payment Number	Payment	Interest Paid	Principal Paid	Outstanding Balance		Balance	8986
2	0	—	—	—	=\$H\$1		Payments	300
3	=A2 + 1	=\$H\$2	=E2*\$H\$3	=B3–C3	=E2–D3		Interest Rate	0.0085

Complete the spreadsheet using **Fill Down** or another copying command. This portion of a spreadsheet shows different rows.

	A	B	C	D	E	F	G	H
1	Payment Number	Payment	Interest Paid	Principal Paid	Outstanding Balance		Balance	8986
2	0				\$8,986.00		Payments	300
3	1	\$300.00	\$76.38	\$223.62	\$8,762.38		Interest Rate	0.0085
4	2	\$300.00	\$74.48	\$225.52	\$8,536.86			
5	3	\$300.00	\$72.56	\$227.44	\$8,309.42			
...	...	...	...	...	...			
35	33	\$300.00	\$6.82	\$293.18	\$508.91			
36	34	\$300.00	\$4.33	\$295.67	\$213.24			
37	35	\$300.00	\$1.81	\$298.19	-\$84.95			

CP8. When will the car loan be paid? What is the amount of the final payment?

The car loan will be paid after a larger 34th payment or a smaller 35th payment.

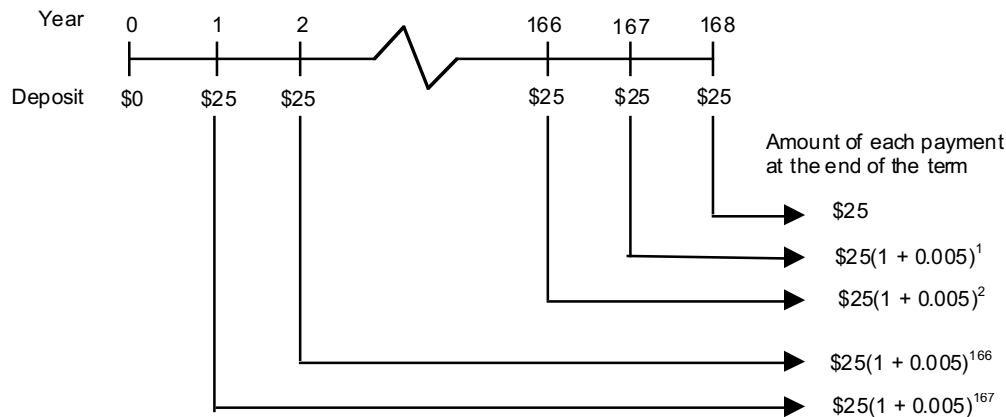
The 34th payment would be $\$300 + \$213.24 = \$513.24$, or the 35th payment would be $\$300 - \$84.95 = \$215.05$.

CP9. Can you create an amortization table to represent the repayment of Mr. Sacchetto's mortgage? Explain.

The semiannual interest conversion period is different from the monthly payment interval. If the period and the interval were the same, you could create an amortization table like the amortization table for the car loan, making adjustments as the term changes.

Section 2.7

CP10. Confirm the accumulated value of Bart's education fund on his 18th birthday, including the payment on his 18th birthday. Use the formula for the accumulated value of an ordinary simple annuity.



Substitute $R = 25$, $i = 0.005$, $n = 14 \times 12$ or 168 to find FV .

$$\begin{aligned} FV &= R \times \frac{(1+i)^n - 1}{i} \\ &= 25 \times \frac{(1.005)^{168} - 1}{0.005} \\ &= 25 \times \frac{2.311\,523\,83 - 1}{0.005} \\ &= 6557.62 \end{aligned}$$

The accumulated amount of Bart's education fund is \$6557.62, which agrees with the answer in CP6.

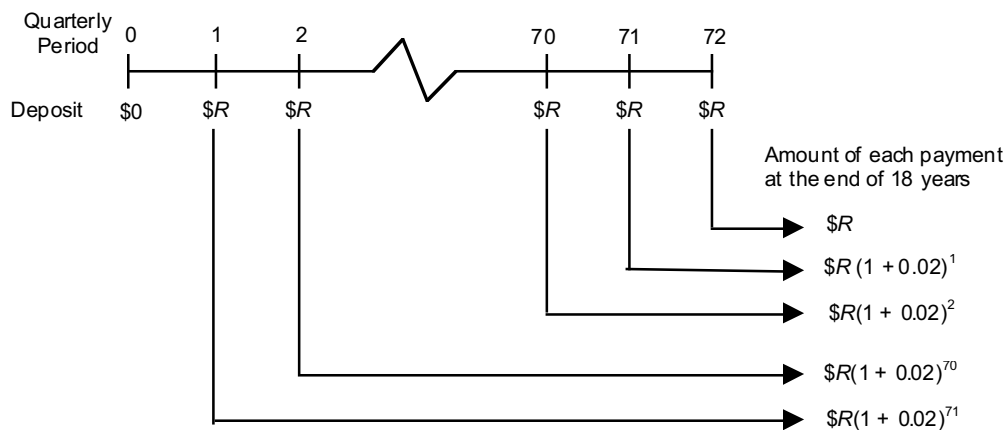
- CP11.** Can you determine the periodic payment for the registered income fund (RIF) given what you know about the accumulated value of an annuity? Explain.

Reverse the process. The arrows in the time line would point left instead of right. The formula for each withdrawal would be $P = A(1+i)^{-n}$. Use the formula for the sum of a geometric series to calculate the periodic payment.

- CP12.** Mr. Sacchetto intends to make a deposit at the end of every three months in a savings account that earns 8%/a, compounded quarterly, to meet his retirement goal of having \$120 000 in savings at age 55.

- (a) Draw a time line to represent the accumulated values of Mr. Sacchetto's deposits in the savings account.

Mr. Sacchetto plans to make quarterly deposits from age 37 to 55. He will make a total of four deposits each year for 18 years, $n = 4 \times 18$ or 72. The interest rate is 8%/a, compounded quarterly, $i = 0.02$. He deposits \$ R at the end of every quarter.



- (b) List the series that represents the accumulated values of the RIF.

$$R + R(1.02)^1 + R(1.02)^2 + \dots + R(1.02)^{71}$$

- (c) For his savings account, determine the quarterly deposit that Mr. Sacchetto must make to meet his retirement goal.

His retirement savings goal for this RIF is \$120 000.

$FV = 120\,000$, $R = ?$, $i = 0.02$, and $n = 72$

$$FV = R \times \frac{(1+i)^n - 1}{i}$$

$$120\,000 = R \times \frac{(1.02)^{72} - 1}{0.02}$$

$$120\,000 \div R \times \frac{4.161140\,375 - 1}{0.02}$$

$$120\,000 = R \times 158.057\,018\,8$$

$$R = 759.22$$

Every quarter, Mr. Sacchetto must deposit \$759.22 to meet his goal of saving \$120 000 by age 55.

- (d) Determine how much more money in total he would have to deposit if the account pays only 6%/a, compounded quarterly.

The interest rate changes to 6%/a, compounded quarterly, so $i = \frac{6\%}{4}$ or 0.015, but every other value is the same.

$$FV = R \times \frac{(1+i)^n - 1}{i}$$

$$120\,000 = R \times \frac{(1.015)^{72} - 1}{0.015}$$

$$120\,000 \div R \times \frac{2.921157\,961 - 1}{0.015}$$

$$120\,000 = R \times 128.077\,197\,4$$

$$R = 936.93$$

Every quarter, Mr. Sacchetto must deposit \$936.93 to meet his goal of saving \$120 000 by age 55. He would have to deposit $\$936.93 - \$759.22 = \$177.71$ more every quarter, if the interest rate changes from 8%/a, compounded quarterly, to 6%/a, compounded quarterly.

Section 2.8

- CP13.** Can you apply the formula for the present value of an ordinary simple annuity to determine Mr. Sacchetto's new monthly mortgage payment? Explain.

You could apply the formula for the present value of an ordinary simple annuity if the interest conversion period were the same as the payment interval. Then you could use a time line with arrows pointing left and each payment would be $P = A(1+i)^{-n}$. To solve for R , use the formula for present value such that $PV = 77\,000$, $n = 20 \times 12$ or 240, and i is the monthly rate equivalent to 8.4%/a, compounded semiannually.

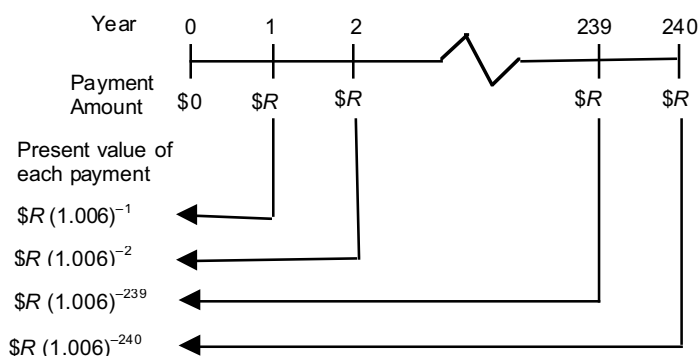
CP14. At age 55, Mr. Sacchetto may choose between two RIF options for investing the \$120 000 savings. Option A provides monthly payments from an RIF that pays 7.2%/a, compounded monthly. Option B provides monthly payments from an RIF that pays 7.25%/a, compounded quarterly.

- (a) Can you use the formula for the present value of an ordinary simple annuity to solve for the RIF payment under each option? Explain.

Both options provide monthly payments. Option A pays 7.2%/a, compounded monthly. Option B pays 7.25%/a, compounded quarterly. You can use the formula for present value for Option A, which is a simple annuity, because the payment interval corresponds to the interest conversion period. You cannot use the formula for present value for Option B, which is a general annuity, because the payment interval does not correspond to the interest conversion period.

- (b) For option A, draw a time line to represent the present value of the payments he would receive.

$$S_{240} = 120\,000, R = ?, n = 240, i = \frac{7\%}{12} \text{ or } 0.06$$



- (c) Determine the monthly RIF payment he would receive under option A.

$$PV = R \times \frac{1 - (1 + i)^{-n}}{i}$$

$$120\,000 = R \times \frac{1 - (1.006)^{-240}}{0.006}$$

$$120\,000 \div R \times \frac{1 - 0.237\,949\,407\,2}{0.006}$$

$$120\,000 = R(127.008\,432\,1)$$

$$R = 944.82$$

Mr. Sacchetto would receive \$944.82 every month for 20 years under Option A.

CP15. Use the formula for the present value of an ordinary simple annuity to estimate the term of Mr. Sacchetto's car loan.

He owes \$8986 on his car loan, so $PV = 8986$. Each monthly payment is \$300, so

$R = 300$. The interest rate is 10.2%/a, compounded monthly, so $i = \frac{10.2\%}{4}$ or 0.0085.

This annuity is simple since the interest and payment are both monthly. The number of payments is unknown, so solve for n .

$$PV = R \times \frac{1 - (1 + i)^{-n}}{i}$$

$$8986 = 300 \times \frac{1 - (1.0085)^{-n}}{0.0085} \quad \text{Multiply both sides by 0.0085.}$$

$$76.381 = 300 \times [1 - (1.0085)^{-n}] \quad \text{Divide both sides by 300.}$$

$$0.254\ 603\ 333\ 3 \doteq 1 - (1.0085)^{-n} \quad \text{Subtract 1 from both sides.}$$

$$-0.745\ 396\ 666\ 7 \doteq -(1.0085)^{-n} \quad \text{Multiply both sides by } -1.$$

$$0.745\ 396\ 666\ 7 = (1.0085)^{-n} \quad \text{Take the reciprocal of each side.}$$

$$1.341\ 567\ 577 = (1.0085)^n$$

Estimate n by trial and error. Ignore interest and start with $n = 30$, because 30 payments $\times$ \$300 is close to \$8986.

$$(1.0085)^{30} \doteq 1.298\ 071\ 707$$

$$(1.0085)^{36} \doteq 1.356\ 227\ 33$$

$$(1.0085)^{35} \doteq 1.344\ 796\ 559$$

$$(1.0085)^{34} \doteq 1.333\ 462\ 131$$

1.344 796 559 is closest to 1.341 567 577, so n is about 35. Therefore, the term of the loan is about 35 payments, or just under three years.

Section 2.10

CP16. What interest rate, compounded monthly, is equivalent to 8.4%/a, compounded semiannually? Without technology, use this rate to find Mr. Sacchetto's new monthly mortgage payments. Recall that he owes \$77 000 and has 20 years remaining in the term. Determine the principal still owing on his mortgage after five years.

$i\%/a$, compounded monthly = 8.4%/a, compounded semiannually

$$(1 + i)^{12} = \left(1 + \frac{8.4\%}{2}\right)^2$$

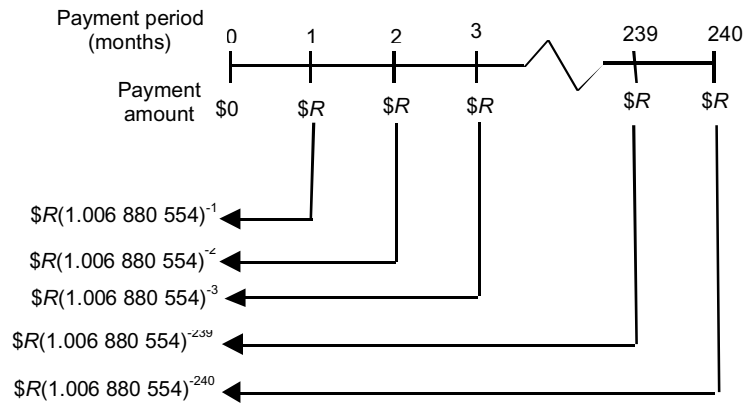
$$(1 + i)^{12} = (1.042)^2 \quad \text{Take the 12th root of each side.}$$

$$1 + i = (1.042)^{\frac{2}{12}}$$

$$1 + i \doteq 1.006\ 880\ 554$$

$$i \doteq 0.006\ 880\ 554$$

Then $12 \times 0.006\ 880\ 554$ is about $0.082\ 566\ 425$. So 8.256% , compounded monthly, is about equivalent to $8.4\%/a$, compounded semiannually. The present value, S_{240} , is $77\ 000$, $n = 20 \times 12$ or 240 , and $R = ?$.



$$PV = R \times \frac{1 - (1 + i)^{-n}}{i}$$

$$77\ 000 = R \times \frac{1 - (1.006\ 880\ 554)^{-240}}{0.006\ 880\ 554}$$

$$77\ 000 \div R \times \frac{1 - 0.192\ 881\ 775}{0.006\ 880\ 554}$$

$$77\ 000 = R(117.304\ 249\ 8)$$

$$R = 656.41$$

Mr. Sacchetto's new mortgage payments are \$656.41 per month.

The next step is to calculate the principal still owing on the mortgage after five years. Some of each \$656.41 payment is interest. Suppose you calculated the present value of 60 payments and subtracted this value from the original mortgage. The result would reflect interest and principal, not just the principal. So calculate the present value of the last 180 payments to get the principal still owing on the mortgage after the first five years of the term.

Substitute $R = 656.41$, $i = 0.006\ 880\ 554$, and $n = 240$.

$$\begin{aligned} PV &= R \times \frac{1 - (1 + i)^{-n}}{i} \\ &= 656.41 \times \frac{1 - (1.006\ 880\ 554)^{-180}}{0.006\ 880\ 554} \\ &\div 656.41 \times \frac{1 - 0.291\ 050\ 530\ 7}{0.006\ 880\ 554} \\ &= 67\ 634.31 \end{aligned}$$

Therefore, the outstanding balance after 60 payments is \$67 634.59.

CP17. Use the **TVM Solver** to verify the new payment and outstanding balance.

$N = 240$, because $12 \times 20 = 240$.

$I\% = 8.4$, which is the annual interest rate

$PV = 77\,000$, which is the present value of the mortgage calculated

$FV = 0$, because the mortgage will be paid fully in the future

$P/Y = 12$, because there are 12 payments each year

$C/Y = 2$, because interest is compounded semiannually

PMT: END, because the annuity is ordinary

```
N=240
I%=8.4
PV=77000
PMT=-656.41267...
FV=0
P/Y=12
C/Y=2
PMT:END BEGIN
```

```
ΣPrn(1,60,6)
-9365.411848
ΣInt(1,60,6)
-30019.34889
bal(60,6)
67634.58815
```

From the screen on the left, the new payment is \$656.41. From the screen on the right, the outstanding balance is \$67 634.59 after 60 payments or 5 years.

CP18. Recall that, at age 55, Mr. Sacchetto may choose between two RIF options for investing the \$120 000 savings. Option A provides monthly payments from an RIF that pays 7.2%/a, compounded monthly. Option B provides monthly payments from an RIF that pays 7.25%/a, compounded quarterly. Without using the **TVM Solver**, determine the monthly RIF payment Mr. Sacchetto would receive if he selects Option B.

Option B: The interest rate is 7.25%/a, compounded quarterly, but the payments are monthly. $i\%/a$, compounded monthly = 7.25%/a, compounded quarterly

$$(1+i)^{12} = \left(1 + \frac{7.25\%}{4}\right)^4$$

$$(1+i)^{12} = (1.018125)^4 \quad \text{Take the 12th root of each side.}$$

$$1+i = (1.018125)^{\frac{4}{12}}$$

$$1+i \doteq 1.006005528$$

$$i = 0.006005528$$

Store the value for i in the calculator's memory. Substitute $PV = 120\,000$, $n = 240$, and $i = 0.006005528$ to find R .

$$PV = R \times \frac{1 - (1+i)^{-n}}{i}$$

$$120\,000 = R \times \frac{1 - (1.006005528)^{-240}}{0.006005528}$$

$$120\,000 \doteq R \times \frac{1 - 0.2376358055}{0.006005528}$$

$$120\,000 = R(126.9437425)$$

$$R = 945.30$$

Mr. Sacchetto would receive \$945.30 every month for 20 years under Option B.

CP19. Write the values that you would enter for *N*, *I%*, *PV*, *FV*, *P/Y*, and *C/Y* into the **TVM Solver** to find the monthly RIF payment Mr. Sacchetto would receive if the fund pays 7.25%/a, compounded quarterly. Verify your solution for question CP18.

N = 240, because $12 \times 20 = 240$

I% = 7.25, which is the annual interest rate

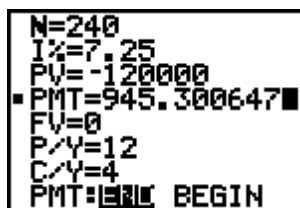
PV = -120 000, which is the present value of the mortgage calculated

FV = 0, because the mortgage will be paid fully in the future

P/Y = 12, because there are 12 payments each year

C/Y = 4, because interest is compounded quarterly

(**PMT**: END, because the annuity is ordinary)



N=240
I%=7.25
PV=-120000
PMT=945.300647
FV=0
P/Y=12
C/Y=4
PMT: [END] BEGIN

Mr. Sacchetto will receive \$945.30 every month for 20 years under Option B.

CP20. Which RIF payment option should he choose?

The payment under option A is \$944.82. By choosing Option B, he earns \$0.48 more per month.

Section 2.12

In the solutions for **CP21** to **CP24**, $i = 0.006\,880\,554$. The solutions for these questions that involve the TVM Solver follow **CP24**.

Spreadsheet Solution

CP21. Use technology to create an amortization table for the repayment of his mortgage for the first two years.

This portion of a spreadsheet shows the formulas and data needed.

	A	B	C	D	E	F	G	H
1	Payment Number	Payment	Interest Paid	Principal Paid	Outstanding Balance		Balance	77 000
2	0	—	—	—	=\$H\$1		Payments	656.41
3	=A2 + 1	=\$H\$2	=E2*\$H\$3	=B3-C3	=E2-D3		Interest Rate	0.006 880 554

Here are portions of the completed spreadsheet.

	A	B	C	D	E	F	G	H
1	Payment Number	Payment	Interest Paid	Principal Paid	Outstanding Balance		Balance	77 000
2	0				\$77,000.00		Payments	656.41
3	1	\$656.41	\$529.80	\$126.61	\$76,873.39		Interest Rate	0.006 880 554
4	2	\$656.41	\$528.93	\$127.48	\$76,745.91			
5	3	\$656.41	\$528.05	\$128.36	\$76,617.56			
...	...	...	...	...	...			
25	23	\$656.41	\$509.19	\$147.22	\$73,856.65			
26	24	\$656.41	\$508.17	\$148.24	\$73,708.41			
...	...	...	...	...	...			
32	30	\$656.41	\$501.95	\$154.46	\$72,797.33			
33	Total		\$15,489.63	\$4,202.67				
...	...	...	...	...	...			
62	59	\$656.41	\$467.97	\$188.44	\$67,824.53			
63	60	\$656.41	\$466.67	\$189.74	\$67,634.79			

CP22. Determine how much principal he still owes on the mortgage after five years.

After five years or 60 monthly payments, he still owes \$67 634.79.

CP23. Determine the total amount of interest paid and the amount of principal repaid after the 30th payment.

After the 30th payment, he has paid a total of \$15 489.63 in interest and only \$4202.67 on the principal.

CP24. *At the end of the second year of his mortgage, Mr. Sacchetto wins \$7500 at bingo. He decides to make a lump-sum payment on the mortgage at the end of the second year. How much sooner will the mortgage be repaid if he continues to make payments equal to the payment in question CP19?*

This spreadsheet is similar the one in CP21. In row 27, the \$7500 is subtracted from the outstanding balance of \$73 708.41. The cell references for the formulas in row 28 may have to be adjusted.

	A	B	C	D	E	F	G	H
1	Payment Number	Payment	Interest Paid	Principal Paid	Outstanding Balance		balance	77 000
2	0				\$77,000.00		payments	656.41
3	1	\$656.41	\$529.80	\$126.61	\$76,873.39		interest rate	0.006 880 554
4	2	\$656.41	\$528.93	\$127.48	\$76,745.91			
5	3	\$656.41	\$528.05	\$128.36	\$76,617.56			
...	...	...	...	...	...			
25	23	\$656.41	\$509.19	\$147.22	\$73,856.65			
26	24	\$656.41	\$508.17	\$148.24	\$73,708.41			
27	Bingo	\$7,500.00			\$66,208.41			
28	25	\$656.41	\$455.55	\$200.86	\$66,007.55			
29	26	\$656.41	\$454.17	\$202.24	\$65,805.31			
...	...	...	...	...	...			
199	196	\$656.41	\$7.59	\$648.82	\$454.71			
200	197	\$656.41	\$3.13	\$653.28	-\$198.57			

The mortgage will be paid completely if the 196th payment is adjusted to

$$\$656.41 + \$454.71 = \$1111.12$$

More likely, the 197th payment should be adjusted to $\$454.71 + \$3.13 = \$457.84$.

Applying the \$7500 in bingo winnings has reduced the number of payment periods from 240 to 197, or 41 months earlier.

The solutions for CP21 to CP24 using the TVM Solver follow.

TVM Solver Solution

CP21. Use technology to create an amortization table for the repayment of his mortgage for the first two years.

See CP17 for the calculation of the monthly mortgage payment. X is the payment number. Y_1 is the interest paid. Y_2 is the principal paid. Y_3 is the balance after the x th payment.

```

Plot1 Plot2 Plot3
Y1=ΣInt(X,X,6)
Y2=ΣPrn(X,X,6)
Y3=bal(X,6)
Y4=
Y5=
Y6=
Y7=

```

These screens show the beginning of the repayment schedule.

X	Y1	Y2
1	-529.8	-126.6
2	-528.9	-127.5
3	-528.1	-128.4
4	-527.2	-129.2
5	-526.3	-130.1
6	-525.4	-131
7	-524.5	-131.9
Y1=-529.802623		

X	Y2	Y3
1	-126.6	76873.389944
2	-127.5	76746
3	-128.4	76618
4	-129.2	76488
5	-130.1	76358
6	-131	76227
7	-131.9	76095
Y3=76873.389944		

To see other payments on the TI-83 Plus amortization schedule, enter a different value for TblStart in the TABLE SETUP screen, **TBLSET**, rather than scrolling, which is slower.

These screens show the interest paid, the principal paid, and the balance from the 24th to the 30th payment.

X	Y1	Y2
24	-508.2	-148.2
25	-507.2	-149.3
26	-506.1	-150.3
27	-505.1	-151.3
28	-504.1	-152.4
29	-503	-153.4
30	-501.9	-154.5
Y1=-501.948122		

X	Y2	Y3
24	-148.2	73708
25	-149.3	73559
26	-150.3	73409
27	-151.3	73257
28	-152.4	73105
29	-153.4	72952
30	-154.5	72797
Y3=72797.241849		

CP22. Determine how much principal he still owes on the mortgage after five years.

X	Y2	Y3
55	-183.3	68570
56	-184.6	68386
57	-185.9	68200
58	-187.2	68013
59	-188.4	67824
60	-189.7	67634.588152
61	-191	67444
Y3=67634.588152		

After 5 years or 60 payments, he still owes \$67 634.59.

- CP23.** Determine the total amount of interest paid and the amount of principal repaid after the 30th payment.

After the 30th payment, the total interest paid is \$15 489.62, and the total principal repaid is \$4202.76. Note that the balance after 30 payments corresponds to Y_3 in the last screen for CP21, TVM Solver solution.

bal(30,6)
72797.24185
ΣPrn(1,30,6)
-4202.758151
ΣInt(1,30,6)
-15489.62222

- CP24.** At the end of the second year of his mortgage, Mr. Sacchetto wins \$7500 at bingo. He decides to make a lump-sum payment on the mortgage at the end of the second year. How much sooner will the mortgage be repaid if he continues to make payments equal to the payment in question CP19?

Enter new values for **N** and **PV** in the TVM Solver. The number of payments, **N**, is $240 - 24 = 216$. The new balance is $\$73\,708.41 - \$7500 = \$66\,208.34$. Do not recalculate the payment. Set the table to start at 25 (the 25th payment).

N=216
I%=8.4
PV=66208.34
PMT=-656.4126...
FV=0
P/Y=12
C/Y=2
PMT: ☐ ☒ BEGIN

X	Y ₁	Y ₂
1	-455.6	-200.9
2	-454.2	-202.2
3	-452.8	-203.6
4	-451.4	-205
5	-450	-206.4
6	-448.5	-207.9
7	-447.1	-209.3
X=1		

X	Y ₂	Y ₃
1	-200.9	65805
2	-202.2	65805
3	-203.6	65802
4	-205	65397
5	-206.4	65190
6	-207.9	64982
7	-209.3	64773
Y ₃ =66007.477349		

The screen on the far right highlights the balance after one payment. Again enter a different value for **TblStart** in the TABLE SETUP screen, **TBLSET**, rather than scrolling, which is slower, to find the first negative balance. It may be necessary to enter a few different values.

X	Y ₁	Y ₂
170	-16.42	-640
171	-12.02	-644.4
172	-7.585	-648.8
173	-3.124	-653.3
174	1.374	-657.8
175	5.9	-662.3
176	10.457	-666.9
Y ₁ =-3.12099		

X	Y ₂	Y ₃
170	-640	1746.8
171	-644.4	1102.4
172	-648.8	0158.1
173	-653.3	-199.7
174	-657.8	-857.5
175	-662.3	-1520
176	-666.9	-2187
Y ₃ =453.59575		

The right screen highlights the balance after the 172nd payment, which is really the $172 + 24 = 196$ th payment. If this payment is adjusted to $\$656.41 + \$453.60 = \$1110.01$, the mortgage will be paid off. More likely, the next payment, the 197th, will be adjusted to $\$453.60 + \$3.12 = \$456.72$. The interest, $\$3.12$, is highlighted in the left screen. The mortgage will be repaid 44 or 43 months early, by applying the bingo winnings to the principal of the mortgage.

Note: There is a slight discrepancy between the spreadsheet answers and the TVM Solver answers. The calculator used 656.412 67 ... as the payment, whereas the spreadsheet used 656.41.