Task: Planning for Post Secondary Education

Student Text Pages
416–417

Suggested Timing
45–75 min

Materials and Technology Tools
- TVM solver
- computer with Internet access (optional)

Related Resources
- BLM A–17 Learning Skills Checklist
- BLM 8–14 Chapter 8 Task Rubric

Accommodations

Motor–allow extra time and assist with recording of calculations. Encourage the use of technology for calculations.

Language–allow students to work with a partner to ensure students understand what they are being asked to do. Have them provide some responses orally to check for comprehension.

Memory–have students use index cards with calculator sequences

Ongoing Assessment
- Use **BLM 8–14 Chapter 8 Task Rubric** to assess student achievement.

Specific Expectations

3.5, 3.6, 3.7

Teaching Suggestions

- Have students read the entire Task. Discuss the Task and ensure students understand what they are being asked to do.
- Discuss strategies and review necessary skills and concepts for solving the problems.
- Circulate as students complete the Task and assist them as necessary.

Hints for Evaluating a Response

Student responses are being assessed for the level of mathematical understanding they represent. As you assess each response, consider the following questions:

- How much assistance did the student need to understand what information was required?
- How much assistance did the student need to search the Internet to find Canadian prime interest rates?
- How much assistance did the student need to complete the Task?
- What parts of the Task did the student complete/not complete?
- Did the student present work that is clear and easy to follow and understand?
- Did the student demonstrate an understanding of the costs of tuition for post-secondary education?
- Did the student demonstrate an understanding of the costs involved in attending college or university?
- Did the student demonstrate an understanding of loans, repayments, and investments?

Level 3 Notes

- Student finds a reasonable Canadian prime interest rate.
- Student identifies the given values for each question.
- Student chooses the correct formulas to solve the problems.
- Student correctly substitutes values into formulas. There are very few errors in the calculations.
- Students draws timelines correctly.

Level 3 Sample Response

1. a) The Canadian prime interest rate is currently 6.00%.

b) I rearranged the present value of an annuity formula to solve for the payment.

$$\text{PMT} = \text{PV}\left[\frac{i}{1-(1+i)^{-n}}\right]$$

$$\text{PV} = 8000,\ i = \frac{9\%}{12},\ n = 60$$
$$= 0.0075$$

$$\text{PMT} = 8000\left[\frac{0.0075}{1-(1+0.0075)^{-60}}\right]$$
$$\doteq 166.07$$

Tim will need to make a monthly payment of $166.07.

c) $\text{PV} = \text{PMT}\left[\dfrac{1-(1+i)^{-n}}{i}\right]$

$n = 48$ since Tim needs to make 48 more payments after 1 year.

$\text{PMT} = 166.07$, $i = \dfrac{9\%}{12}$, $n = 48$

$= 0.0075$

$\text{PV} = 166.07\left[\dfrac{1-(1+0.0075)^{-48}}{0.0075}\right]$

$\doteq 6673.49$

Tim still needs to pay approximately \$6673.49 after his first year of loan repayment. Since Tim's monthly payment was approximate, this figure is not exact.

d) I would like to buy new car valued at \$16 000 in the near future. The payments would be made monthly over a period of 5 years.

e) $\text{PMT} = \text{PV}\left[\dfrac{i}{1-(1+i)^{-n}}\right]$

$\text{PV} = 16\,000$, $i = \dfrac{8.5\%}{12}$, $n = 60$

$= 0.00708\overline{3}$

$\text{PMT} = 16\,000\left[\dfrac{0.00708\overline{3}}{1-(1+0.00708\overline{3})^{-60}}\right]$

$\doteq 328.26$

I will need to make a monthly payment of \$328.26.

f) Insurance, fuel, parking, and maintenance are some of the costs associated with owning a car.

2. a) $\text{FV} = \text{PMT}\left[\dfrac{(1+i)^{n}-1}{i}\right]$

$\text{PMT} = 700$, $i = \dfrac{4.2\%}{12}$, $n = 24$

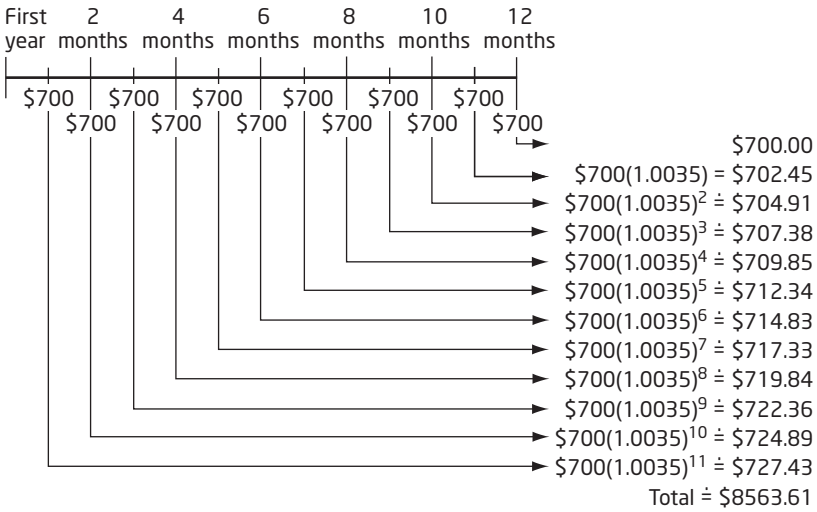
$= 0.0035$

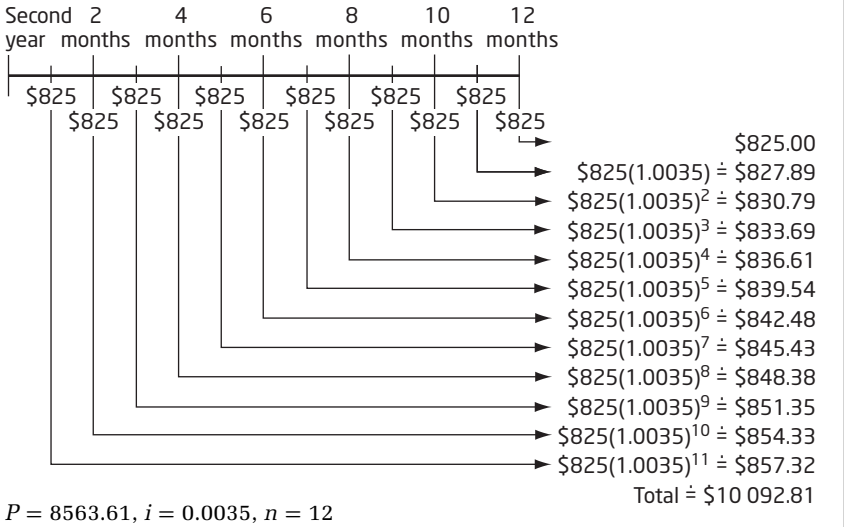
$\text{FV} = 700\left[\dfrac{(1+0.0035)^{24}-1}{0.0035}\right]$

$\doteq 17\,493.88$

Hannah will have saved \$17.493.88 in 2 years time.

b)





$P = 8563.61$, $i = 0.0035$, $n = 12$

$A = P(1 + i)^n$
$= 8563.61(1 + 0.0035)^{12}$
$\doteq 8930.29$

Hannah's first year savings total approximately \$8930.29 at the end of the second year. Her second year savings total approximately \$10 092.81. The amount Hannah will have saved after the full two years is approximately \$8930.29 + \$10 092.81 = \$19 023.10.

c) Hannah's first year savings totaled \$8563.61 at the end of the first year.

$P = 8563.61$, $i = 0.0035$, $n = 6$

$A = P(1 + i)^n$
$= 8563.61(1 + 0.0035)^6$
$\doteq 8745.03$

Hannah's first year savings total approximately \$8745.03 at the end of 18 months.

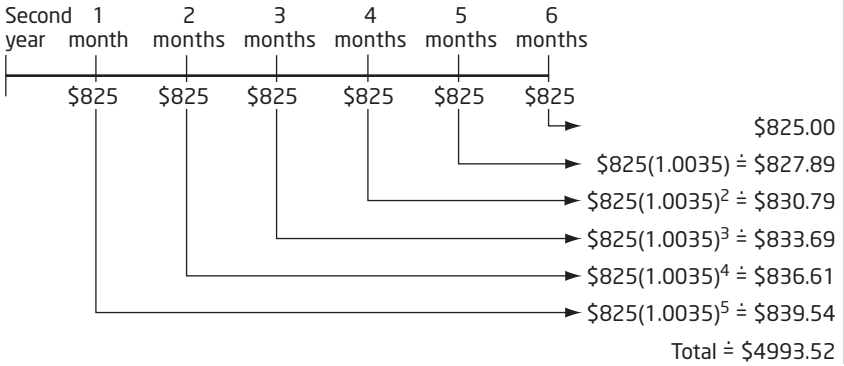
Use the compound interest formula with the new interest rate per compounding period of $\frac{3.9\%}{12}$, or 0.003 25, to determine the value of her first year savings at the end of 2 years.

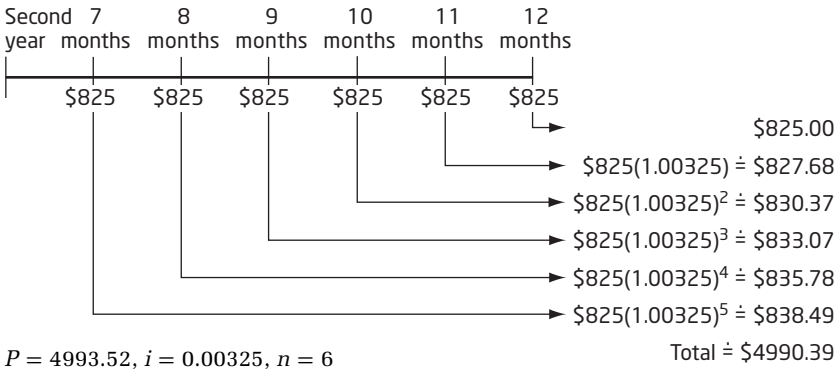
$P = 8745.03$, $i = 0.00325$, $n = 6$

$A = P(1 + i)^n$
$= 8745.03(1 + 0.00325)^6$
$\doteq 8916.95$

Hannah's first year savings total approximately \$8916.95 at the end of the second year.

To calculate the compound interest for the second half of the year, use the new interest rate per compounding period of 0.00325.





$P = 4993.52$, $i = 0.00325$, $n = 6$

$A = P(1 + i)^n$
$= 4993.52(1 + 0.00325)^6$
$\doteq 5091.69$

The first six months of Hannah's savings in the second year total approximately $5091.69 at the end of the second year. The second six months of Hannah's savings in the second year total approximately $4990.39. The amount Hannah will have saved after the full two years is approximately $8916.95 + $5091.69 + $4990.39 = $18 999.03.

d) **i)** I would like to purchase a new car in five years.

ii) I would like to invest monthly. For the TVM solver, these are the values: N = 60, I% = 3.8, PV = 0, PMT = 0, FV = 16 000, P/Y = 12, C/Y = 12, PMT:END. My monthly payment will be $242.56 in order to save enough money for the car in five years.

e) The total amount paid in part d) is: $242.56 × 60 = $14 553.60. The total amount paid in part f) of question 1 is: $328.26 × 60 = 19 695.60. The difference is $19 695.60 − $14 553.60 = $5142.00, so I would end up paying $5142 more by taking a loan rather than saving in advance.

f) I found that the interest rate for most savings accounts with a balance of less than $5000 is 0.10% or 0.05%, and the interest rate for most savings accounts with a balance of $5000 or greater is 0.30%, both compounded monthly.

g) The interest rate of 3.8% is not realistic for a savings account. A more realistic interest rate is 0.30%. N = 60, I% = 0.30, PV = 0, PMT = 0, FV = 16 000, P/Y = 12, C/Y = 12, PMT:END. My monthly payment amount will be $264.70 at this new interest rate. The lower interest rate increased my monthly payment amount, but it is still much less than the monthly repayment amount for taking a loan to pay for the car.

What Distinguishes Level 2

- Student finds a reasonable Canadian prime interest rate.
- Student identifies the given values for each question.
- Student chooses incorrect formulas to solve some of the problems.
- Student incorrectly substitutes values into formulas. There are several errors in the calculations.
- Students draws timelines incorrectly, without the appropriate labels, and with errors in the calculated values.

What Distinguishes Level 4

- Student finds a reasonable Canadian prime interest rate.
- Student identifies the given values for each question.
- Student chooses the correct formulas to solve the problems.
- Student correctly substitutes values into formulas. There are no errors in the calculations.
- Students draws timelines correctly.
- Student includes graphs, organises answers into a report, and gives full justifications and explanations for decisions made.