

35. (a)

```

N=1157.969684
I%=8.8
PV=115800
PMT=-225
FV=0
P/Y=52
C/Y=2
PMT:BEGIN

```

It will take about 1158 weeks or 22.27 years to repay the mortgage.

(b) The interest charge is

$(\$225)(1157.969\ 684) - \$115\ 800 = \$144\ 743.18$ and the total cost of the house is $\$282\ 543.18$ ($\$144\ 743.18 + \$137\ 800$).

(c) Interest with \$250 payments:

$(\$250)(881.553\ 437) - 115\ 800 = \$104\ 588.41$

She would save $\$40\ 154.77$ ($\$144\ 743.18 - \$104\ 588.41$) in interest by increasing the weekly payments to \$250.

36. (a)

```

N=300
I%=8.6
PV=182000
PMT=-1459.3671...
FV=0
P/Y=12
C/Y=2
PMT:BEGIN

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The monthly payment needed is \$1459.37.

(b) Outstanding balance at the end of year 1 is \$179 781.71, end of year 2 is \$177 368.55, year 3 is \$174 743.39, year 4 is \$171 887.61, and year 5 is \$168 780.96.

(c) \$209.10 of the 20th payment is applied to the principal.

\$415.00 of the 120th payment is applied to the principal.

(d) At the end of 5 years the balance outstanding is

\$168 780.96. They renew for a \$150 780.96 mortgage. The new monthly payment is \$1195.25.

(e) The Wongs still owe \$139 573.91.

Chapter 2 Review Test, page 203

1. (a) $a = -11$, $d = 8$, $t_n = 125$

$$t_n = a + (n - 1)d$$

$$125 = -11 + (n - 1)8$$

$$125 = -11 + 8n - 8$$

$$144 = 8n$$

$$n = 18$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$S_{18} = \frac{18}{2}[2(-11) + 17(8)]$$

$$= 9(114)$$

$$= 1026$$

(b) $a = 6$, $d = -3$, $t_n = 39\ 366$

$$t_n = ar^{n-1}$$

$$39\ 366 = 6(-3)^{n-1}$$

$$6561 = (-3)^{n-1}$$

$$(-3)^8 = (-3)^{n-1}$$

$$8 = n - 1$$

$$n = 9$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_9 = \frac{6[(-3)^9 - 1]}{-3 - 1}$$

$$= \frac{6(-19\ 684)}{-4}$$

$$= 29\ 526$$

2. (a) Use an arithmetic series with $a = 262$, $d = 18$, and $S_n = 15\ 690$. Solve for n .

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$15\ 690 = \frac{n}{2}[2(262) + (n - 1)18]$$

$$15\ 690 = \frac{n}{2}(524 + 18n - 18)$$

$$15\ 690 = \frac{n}{2}(506 + 18n)$$

$$15\ 690 = 253n + 9n^2$$

$$9n^2 + 253n - 15\ 690 = 0$$

Use the quadratic formula.

$$n = \frac{-253 \pm \sqrt{253^2 - 4(9)(-15\ 690)}}{2(9)}$$

$$n = \frac{-253 \pm 793}{18}$$

$$n = \frac{-253 + 793}{18} \text{ or } n = \frac{-253 - 793}{18}$$

$$n = 30 \text{ or } n = -58.\bar{1}$$

There are 30 rows of seats in the arena.

(b) Find the number of seats in the 31st, 32nd, and 33rd rows.

$$t_{31} = 262 + 30(18) = 802$$

$$t_{32} = 262 + 31(18) = 820$$

$$t_{33} = 262 + 30(18) = 838$$

Adding three rows increases the capacity by 2460 seats.

$$\text{Increase in capacity}(\%) = \frac{2460}{15\ 690} \times 100\% = 15.7\%$$

3. The sum of the prizes awarded can be represented by the geometric series $20 + 50 + 125 + \dots$ with $a = 20$ and $r = 2.5$. Find S_{14} , the cost of 14 prizes.

$$S_{14} = \frac{a(r^{14} - 1)}{r - 1}$$

$$= \frac{20(2.5^{14} - 1)}{2.5 - 1}$$

$$= \frac{20(372\ 528.0298)}{1.5}$$

$$= \$4\ 967\ 040.40$$

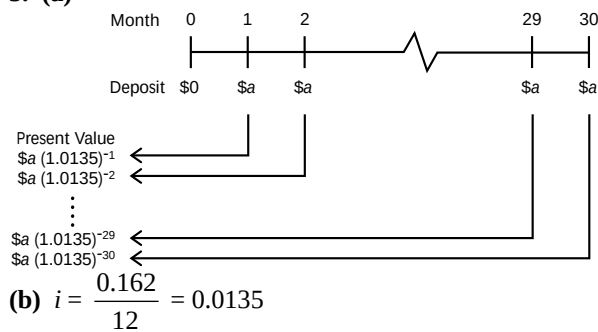
Therefore, the lottery has sufficient funds for 14 prizes.

4. (a) The monthly interest rate is $\left(\frac{15.6}{12}\right)\%$ or 1.3%.

Payment Number	Amount Paid	Interest Paid	Principal Paid	Outstanding Balance
0				\$1400.00
1	\$110	\$18.20	\$91.80	\$1308.20
2	\$110	\$17.01	\$92.99	\$1215.21
3	\$110	\$15.80	\$94.20	\$1121.01
4	\$110	\$14.57	\$95.43	\$1025.58
5	\$110	\$13.33	\$96.67	\$928.91
6	\$110	\$12.08	\$97.92	\$830.99

- (b) \$95.43 of the 4th payment is used to reduce the principal of the loan.

5. (a)



$$S_{30} = 2100$$

$$S_{30} = R(1.0135)^{-30} + R(1.0135)^{-29} + \dots + R(1.0135)^{-2} + R(1.0135)^{-1}$$

- (c)

$$S_{30} = \frac{a(r^{30} - 1)}{r - 1}$$

$$2100 = R(1.0135)^{-30} \frac{1.0135^{30} - 1}{1.0135 - 1}$$

$$2100 = R(24.534\ 34)$$

$$R = \$85.59$$

6. Can also be solved using technology such as the TI 83 Plus calculator.

- (a) First find the future value of her deposits at age 45.

$$R = 3200, i = 0.09, \text{ and } n = 20.$$

$$\begin{aligned} FV &= R \times \frac{(1+i)^n - 1}{i} \\ &= 3200 \frac{[(1.09)^{20} - 1]}{0.09} \\ &= \$163\ 712.38 \end{aligned}$$

Find the future value of a \$163 712.38 deposit at age 55.

$$\begin{aligned} FV &= A(1+i)^n \\ &= 163\ 712.38(1.09)^{10} \\ &= \$387\ 566.74 \end{aligned}$$

Penny will have \$387 566.74 on her 55th birthday.

- (b) We must find the regular payment, R , that will produce a future value of \$387 566.75 after 20 years.

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

$$387\ 566.75 = \frac{R(1.09^{20} - 1)}{0.09}$$

$$387\ 566.75 = R(51.160\ 119\ 6)$$

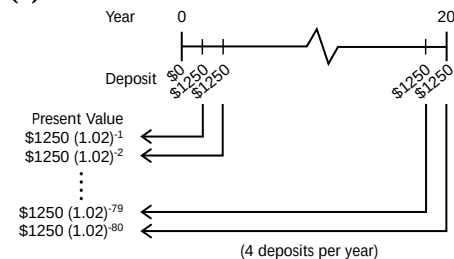
$$R = \$7575.56$$

Susie must make yearly payments of \$7575.56.

7. We must find the present value of \$1250 payments every 3 months for 20 years.

$$i = 0.02$$

- (a)



$$(b) S_{80} = 1250(1.02)^{-80} + 1250(1.02)^{-79} + \dots + 1250(1.02)^{-2} + 1250(1.02)^{-1}$$

- (c)

$$\begin{aligned} S_{80} &= \frac{1250(1.02)^{-80}(1.02^{80} - 1)}{1.02 - 1} \\ &= \$49\ 680.64 \end{aligned}$$

Marisa should choose the \$50 000 cash option since the payment option has a present value of \$49 680.64.

8. Can also be solved using technology such as the TI-83 Plus calculator.

- (a) We must find the bi-weekly interest rate, i , equivalent to 7.6%/a compounded semiannually.

$$(1+i)^{26} = (1.038)^2$$

$$1+i = \sqrt[26]{(1.038)^2}$$

$$i = \sqrt[26]{1.038} - 1$$

$$i = 0.002\ 873\ 026$$

We find the regular bi-weekly payment that yields a present value of \$116 800.

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

$$116\ 800 = R \frac{(1 - 1.002\ 873\ 026^{-520})}{0.002\ 873\ 026}$$

$$116\ 800 = R(269.764\ 262)$$

$$R = \$432.97$$

The bi-weekly payment required is \$432.97.

- (b) Total interest paid = \$432.97 $\times$ 520 - \$116 800 = \$108 344.40

- (c) Answers will vary. *Example:* negotiate a lower rate, make weekly payments, shorten the term of the mortgage, make extra payments, or increase the size of the payment.