#3. 18 months

$i = 4.9\%$ Q.

$FV = -12000$

N 18 months

$= 1.5$ yrs

$= 6$ quarters

$N = 6$

$i = 4.9$

$PV = 11154.61$ ~~367~~

$Pmt = 0$

$FV = -12000$

$P/y = 4$ } same when pmt = 0

$C/y = 4$ }

end

Chapter 1: Borrowing Money

2.1 Analyzing Loans

Some definitions to get us started...

1. asset: property owned by a person or company, regarded as having value
2. collateral: an asset that is held as security against the repayment of a loan
3. amortization table: a table that lists regular payments of a loan and shows how much of each payment goes toward the interest charged and the principal borrowed as the balance of the loan is reduced to zero

EXAMPLE 1 Solving for the term and total interest of a loan with regular payments

As described on page 80, Lars borrowed $12 000 at 5%, compounded monthly. After 1 year of payments, he still had a balance owing.

Pmts = $350.00 → monthly

a) In which month will Lars have at least half of the loan paid off?
b) How long will it take Lars to pay off the loan?
c) How much interest will Lars have paid by the time he has paid off the loan?

a) N = ? 19.25
i = 5
PV = 12000
Pmt = -350
FV = -6000
P/Y = 12
C/Y = 12

∴ Lars must make payments for 20 months

b) N = 37.07
i = 5
PV = 12000
Pmt = -350
FV = 0
P/Y = 12
C/Y = 12

∴ 38 months to repay

c) Total paid
= N × pmt
= (37.07...)(350)
= 12975.61

I = 12975.61
- 12 000
I = 975.61 $

Your Turn

Suppose that Lars had decided to make $400 monthly payments under the same loan conditions. What effect would the greater payments have had on the time to repay the loan and the amount of interest charged?

less → paid off faster

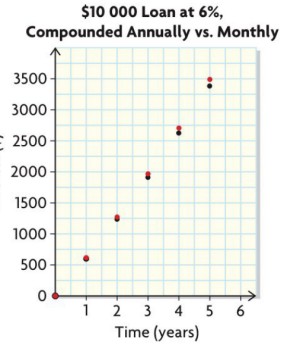
→ less

EXAMPLE 2 Solving for the future value of a loan with a single loan payment

Trina's employer loaned her $10 000 at a fixed interest rate of 6%, compounded annually, to pay for college tuition and textbooks. The loan is to be repaid in a single payment on the maturity date, which is at the end of 5 years.

a) How much will Trina need to pay her employer on the maturity date? What is the accumulated interest on the loan?
b) Graph the total interest paid over 5 years. Describe and explain the shape of the graph.
c) Suppose the interest was compounded monthly instead. Graph the total interest paid over 5 years. Compare it with your annual compounding graph from part b).

a) N = 5 periods
i = 6
PV = 10000
Pmt = 0
FV = 13382.26
P/Y = 1
C/Y = 1
I = 3382.26 $



black = annually
red = monthly
↳ higher interest

EXAMPLE 4 Solving for the payment and interest of a loan with regular payments

Jose is negotiating with his bank for a **mortgage** on a house. He has been told that he needs to make a 10% down payment on the purchase price of $225 000. Then the bank will offer a mortgage loan for the balance at 3.75%, compounded semi-annually, with a term of 20 years and with monthly mortgage payments.

mortgage
A loan usually for the purchase of real estate, with the real estate purchased used as collateral to secure the loan.

a) How much will each payment be?
b) How much interest will Jose end up paying by the time he has paid off the loan, in 20 years?
c) How much will he pay altogether?

N = 20 × 12 (total # of pmts)
i = 3.75
PV = 225000 − 10% of 225000
= 225000 − 22500
= 202500
Pmt = −1200.60
FV = 0
P/Y = 12
C/Y = 12

90%
or (0.9)(225000)

c) Total = N × pmt
= (240)(1200.5488...)
= 288143.72 $

d) I = Total − principal
= 288143.72 − 202500
I = 85643.72 $

EXAMPLE 5 Relating payment and compounding frequency to interest charged

Bill has been offered the following two loan options for borrowing $8000. What advice would you give?

Option A: He can borrow at 4.06% interest, compounded annually, and pay off the loan in payments of $1800.05 at the end of each year.

Option B: He can borrow at 4.06% interest, compounded weekly, and pay off the loan in payments of $34.62 at the end of each week.

(A) N = 5
i = 4.06
PV = 8000
Pmt = −1800.05
FV = 0
P/Y = 1
C/Y = 1
total paid: (5)(1800.05)
= 9000.25
I = 1000.25

(B) N = 254.929...
i = 4.06
PV = 8000
Pmt = −34.62
FV = 0
P/Y = 52
C/Y = 52
total paid = (254.929...)(34.62)
= 8825.67 $
I = 825.67 $

∴ Bill should pay weekly for two reasons → ① paid faster
② with less interest owed

Your turn pg. 90

Homefun pg. 92 #5, 7, 11, 12, 14, 18