# Section 8.3 – Installment Buying

Homework (pg 450) 1-4, also problems with the 'new' formula

- *Definition*: With installment buying you repay a loan on a monthly basis. You get charged interest, known as a finance charge, which is worked into the monthly price. The advantage is that you get to have the product right away, even though you haven't completely paid for it.

- *Definition*: The amount you finance is the total you borrow. This would be the price of the item minus the down payment. The down payment is the amount of money you pay right away
  *Amount Financed = Cash Price – Down Payment*

- *Definition*: The total installment price is the total amount you pay (all monthly payments plus down payment)
  *Total Installment Price = Monthly payment* (*Number of payments*) + *Down payment*

- *Definition*: The finance charge is the amount you pay for borrowing the money (the interest paid)
  *Finance Charge = Total Installment Price – Cash Price*

- *Example (Checkpoint 1)*: The cost of a new car is $14,000. You can finance it by paying $280 down and $315 per month for 60 months. Find the amount financed, total installment price and finance charge.
  *Solution*: Amount Financed = 14000 – 280 = $13720
  Total Installment Price = (315) 60 + 280 = $19,180
  Finance Charge = 19180 – 14000 = $5180

- *Definition*: The interest rate per year is called the annual percentage rage (APR), and lenders are required by law to inform you of the APR on any loan. This is why we will not go over Table 8.3 (finding APR)

- The formula $A=\frac{R}{i}\left[1-\left(\frac{1}{1+i}\right)^{n}\right]$ relates the quantities
  $A$ = amount borrowed
  $R$ = monthly payment
  $i$ = monthly interest rate, and
  $n$ = total number of payments
  This formula will prove to be useful in two cases. One, you can compute the monthly payment on a given loan, or two, you can compute the amount of money paid in finance charges.

*Example*: If you purchase a truck for \$9000 with no money down at 0.9% per month for 60 months what is your monthly payment?
*Solution*: $A$ = 9000, $i$ = 0.009, and $n$ = 60

$$R=\frac{Ai}{1-\left(\frac{1}{1+i}\right)^{n}}=\frac{9000\times 0.009}{1-\left(\frac{1}{1+0.009}\right)^{60}}=194.79$$ You will owe \$194.79 per month

*Example*: In the above example, what is amount paid in finance charges?
*Solution*: Amount Paid = 194.79 (60) = 11687.40
Finance Charge = 11687.40 – 9000 = 2687.40

- Actually, this formula gives the values in table 8.3 on page 443. For example, if you have a loan of \$100 for 18 months at 11.5% APR, your finance charge can be computed…

  $$R=\frac{Ai}{1-\left(\frac{1}{1+i}\right)^{n}}=\frac{100\times(0.115/12)}{1-\left(\frac{1}{1+(0.115/12)}\right)^{18}}=6.075 \text{ per month}$$

  Total amount you pay = 6.075 (18) = 109.35
  Finance Charge = 109.35 – 100 = \$9.35
  This is the dollar amount found at the intersection of 18 monthly payments at 11.5% APR

- Early payoff is a valuable lesson, but requires the use of Table 8.3 (to be done accurately). I have outlined this on the excel sheet (which is online) if you need to use it for future reference, but we will not spend any class time on this.

- Balance Due on a Credit Card is variable, depending on not only the interest rate but how it is calculated
  *Unpaid Balance*: The principal is the balance on the first day of the billing period less payments/credits
  *Previous Balance*: The principal is the unpaid balance on the first day of the billing period
  *Average Daily Balance*: The principal is the average of the daily balance, found by adding the unpaid balances for each day in the period and dividing by the number of days in the billing period
  The *Balance Owed* will also depend on the way the company calculates it, which often depends on how much you owe. For example, if you owe less than \$360 there is a minimum payment of \$10. That means if you owe 1 cent to \$360 your payment is \$10. Otherwise you owe at least 1/36th of what is due

*Example (Check Point 5)*: Here is your bill for a credit card charging 1.6% per moth

May 1 Unpaid Balance \$4720
Payment Received May 8: \$1000
Purchases: \$1070
Last Day of Billing Cycle: May 31
Payment Due: June 9

*Solution*: If your bill is computed using Unpaid Balance

$I = Prt = ( 4720 – 1000 )\ 0.016 = 59.52$
You owe = unpaid balance + interest + new charges = 3720 + 59.52 + 1070 = \$4849.52
Balance owed = 4849.52 / 36 = \$135 (rounded up to nearest dollar)

*Solution*: If your bill is computed using Previous balance

$I = Prt = ( 4720 )\ 0.016 = 75.52$
You owe = unpaid balance + interest + new charges = 3720 + 75.52 + 1070 = \$4865.52
Balance owed = 4865.52 / 36 = \$136 (rounded up to nearest dollar)

*Solution*: If your bill is computed by the average daily balance method

We don't have enough information to do this, we need the average daily balance, or the balance on each day of the cycle

- Why are credit cards a bad idea?

*Example*: Say your unpaid balance on a credit card with a 1.2% per month interest rate is \$600. For this card, the minimum payment is \$10. The interest rate is computed using the previous balance method. If you only pay the minimum and make no other purchases, track your bill.

*Solution*:

| **Month** | **Balance** |
|---|---|
| 0 | 600 |
| 1 | $1.012(600) – 10$ |
| 2 | $1.012[1.012(600) – 10] – 10$<br>$=1.012^2(600) – 10(1.012 + 1)$ |
| 3 | $1.012[1.012^2(600) – 10(1.012 + 1)] – 10$<br>$=1.012^3(600) – 10(1.012^2 + 1.012 + 1)$ |
| 4 | $1.012[1.012^3(600) – 10(1.012^2 + 1.012 + 1)] – 10$<br>$=1.012^4(600) – 10(1.012^3 + 1.012^2 + 1.012 + 1)$ |
| 5 | $1.012[1.012^4(600) – 10(1.012^3 + 1.012^2 + 1.012 + 1)] – 10$<br>$=1.012^5(600) – 10(1.012^4 + 1.012^3 + 1.012^2 + 1.012 + 1)$ |
| etc. | |
| n | $1.012^n(600) – 10(1.012^{n-1} + 1.012^{n-2} +\ldots+ 1.012^2 + 1.012 + 1)$ |

Actually, using this formula* (don't worry, it is in Excel online if you want it) you'll find it will take you over 8.9 years to pay this off! Which at \$10 a month is about \$1070.00

* The sum in the above problem is what is called a geometric series, it is of the form $r^5 + r^4 + r^3 + r^2 + r + 1$. It's sum can be computed directly with the formula $\dfrac{1-r^6}{1-r}$