General Education Mathematics
Class Notes
Consumer Math: Consumer Loans (Section 8.3)

We will look at simple interest loans and credit cards.

If you take out a **simple interest** loan, you will pay back the amount you borrowed plus a percentage, called **interest** or **finance charge**. You might agree to pay it back in equal payments (maybe monthly). This is called an **installment loan**. Each payment is an **installment**.

Our general formulas are below.

$$I = P \times R \times T$$

$$A = P + I$$

*I = **interest earned***
*P = **principal** (initial deposit or investment, aka **Face Value**)*
*R = **annual interest rate** (decimal form)*
*T = **time** money is invested (years)*

*A = **maturity value** (total amount to be repaid) This is sometimes called **future value**.*

This second formula just makes it clear that the amount of money you repay is the amount you borrowed plus any interest. You may remember learning about **compound interest**; we will *not* cover that.
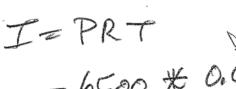
Monthly Payment:

If you agree to pay this loan back in n equal payments, then your **monthly payment** would be found by following this formula.

$$\text{monthly payment} = \frac{P + I}{n}$$

*This is called the **Add-on Interest Method**, because we add on the interest to the loan before calculating the payments.*

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expl 1: Bob has taken out a loan that he will repay in equal monthly payments. He borrowed $6,500 for 3 years at 6.45% simple interest. Answer the following questions. Use the add-on method.

a.) How much interest will he pay?

Be sure to turn the 6.45% into decimal form.

$$I = PRT$$
$$= 6500 * 0.0645 * 3$$
$$I = \$1257.75$$

b.) How much will he pay in total? This is called the maturity value.

$$A = P + I$$
$$= 6500 + 1257.75$$
$$A = \$7,757.75$$

c.) How much will he pay monthly?

How many payments will he have over the 3 years?

$$\text{monthly payment} = \frac{7757.75}{36}$$

36 payments

$$\approx \$215.49$$

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Minimum Monthly Payment:

Sometimes the minimum payment changes as time goes by. The bank may use a different formula to determine the minimum monthly payment than what we used in the previous example.

principal

expl 2: Maria owes $8,840 on her student loan as of last month. Her annual interest rate is 6%. Her minimum monthly payment is calculated as "finance charge + 3% of principal". Find this month's minimum payment.

$$I = PRT$$
$$= 8840 * 0.06 * 1/12$$
$$I = 44.20 \text{ (finance charge)}$$

Find the interest for a single month, or $\frac{1}{12}$ of a year.

minimum monthly payment = finance charge + 3% of principal

$$= 44.20 + 0.03 * 8840$$

$$= \$309.40$$

Maria's minimum monthly payment.

Credit Cards:

Open-end credit means there are no fixed payments, like we have seen in the previous examples. You pay monthly until no balance remains, making at least the minimum payment. This is also called **revolving credit**.

Finance charges (interest owed plus other miscellaneous fees) are based on the balance on an account, by finding some percent of it. There are two main methods banks use to find a credit card's **balance** (total amount owed). They are

1. **Unpaid balance method:** The stated balance is the unpaid balance at the end of the *previous* month. We will need to find the unpaid balance for the current month.

2. **Average daily balance method:** The balance is found at the end of *each day* and then those balances are averaged for the whole month.

We will not *cover the unpaid balance method.*

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Finding Finance Charges for Accounts:

You will be asked to find the finance charge for an account. We will only cover the average daily balance method that credit cards employ.

Average Daily Balance Method:

expl 3: For the following account, first find the average daily balance. Second, find the finance charge if the *annual* interest rate is 21 %. Lastly, find the new balance for this account.

Previous month's balance: $240
Month: April (30 days)

April 3	Walmart charge $135	+
April 13	Payment $150	—
April 23	Music store charge $30	+
April 28	Restaurant charge $28	+

MML will ask for finance charge but we need to find average daily balance first.

Which of these get added to balance and which get subtracted?

$12 - 3 = 9$

X 2 3 4 5 6 7 8 9 10 11 12

$+1 = 10 \text{ days}$

We will work this problem step-by-step. First, we will find the average daily balance. For that, we need to know what the balance was for every day from April 1 to April 30 (one month). Fill out the table to summarize the daily balances.

Dates	Number of days	Balance during this time
April 1 – April 2	2	$ 240
April 3 – April 12	10	$240 + 135 = $375
April 13 – April 22	$22 - 13 + 1 = 10$	$375 - 150 = $225
April 23 – April 27	$27 - 23 + 1 = 5$	$225 + 30 = $255
April 28 – April 30	3	$255 + 28 = $283

To find the **average daily balance**, we average these balances, but need to take into account that the balances each stood for several days. For instance, the balance was $240 for 2 days. We use what they call a **weighted average**.

Multiply each balance by the number of days it held, adding those values, and then divide by the total number of days (30).

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avg daily balance = $286.80

expl 3 (continued): Next, we will find the **finance charge** with simple interest. We were given that interest is 21% per year on the average daily balance. The time (*T*) will be $\frac{30}{365}$ for 30 days out of a year (365 days). Remember a dollar sign and proper rounding.

$$I = PRT$$

$$= 286.80 * 0.21 * 30/365$$

$$I \approx \$4.95 \quad \text{finance charge}$$

If you are asked to find the **new balance**, we take the last balance from our table and add the interest (finance charge). Do it now. Remember a dollar sign.

new balance

$$= 283 + 4.95$$

$$= \$287.95$$

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