

# 3-3 Student Loans

Advanced Financial Algebra

# Some information you need to know about student loans:

- FAFSA = Free Application for Federal Student Aid (you should fill this out even if you do not think you qualify due to scholarship and other requirements)
- Stafford Loan = need based loan (two types)
  - Subsidized means that interest is deferred (postponed until you finish)
  - Unsubsidized means that interest accrues (builds up) from the time you get the money
- Private Loans = loans from banks, your college, etc. (these often have higher interest rates and cannot usually be written off in bankruptcy)
- NOTE: there are other loans available, these are some of the most common

# Example 1 - unsubsidized loan interest

- College freshman, Ariana received a 10-year, \$9,100 Federal Direct Unsubsidized Loan with an interest rate of 4.29%. She knows that she can begin making loan payments 6 months after graduation but interest will accrue from the moment the funds are credited to her account. How much interest will accrue while she is still in school and over the 6-month grace period for this freshman-year loan? NOTE: 4 years, 6 months = 4.5 years

- SOLUTION:

- $A = P(1 + \frac{r}{n})^{nt} = 9100(1 + \frac{.0429}{1})^{(1 * 4.5)} \approx \$10,993.43$  total due

- Interest =  $10,993.43 - 9,100$  original loan = **\$1,893.43 interest accrued**

## Interest Capitalization related to previous example

- Ariana has a choice.
  1. She can wait until the end of the grace period and have all of the interest accrued added to the principal. Then she would start repaying her loan using the new principal, which is the sum of the loan amount and the interest accrued during the nonpayment period. In this case, she pays nothing for the 4 years in school and the 6-month grace period. During that time, interest still accrues at 4.29%. Her accumulated interest will be added to the loan when the repayment period begins. This is known as **interest capitalization**. The interest will increase the loan principal and she will then be paying interest on both the original loan amount and the interest accrued for the first 4.5 years.
  2. Or, she could pay only the interest each month while in school and during the grace period so that at the end of 4.5 years, her loan amount for freshman year is still \$9,100. The next few examples help you see how mathematics can assist in making the decision about which interest option is best for your circumstances.

## Example 2 - defer all payments

- If Ariana chooses option 1 and defers all payments during those 4.5 years, find the monthly payments, total payments, and interest for this “interest capitalized” loan (interest added into loan amount **from example #1**) if she pays off loan balance in 10 years.

- SOLUTION:

- Use monthly payment formula:  $M = \frac{\left(\frac{P}{12}\right)\left(1 + \frac{r}{12}\right)^{(12 \cdot t)}}{\left(1 + \frac{r}{12}\right)^{(12 \cdot t)} - 1}$  =

$$\frac{(10993.43)\left(\frac{.0429}{12}\right)\left(1 + \frac{.0429}{12}\right)^{(12 \cdot 10)}}{\left(1 + \frac{.0429}{12}\right)^{(12 \cdot 10)} - 1}$$

## Example 3 - at least pay interest while in college

- Suppose that Ariana only paid the interest during her 4 years in school and the 6-month grace period. What will Ariana now pay in interest over the term of her loan?

- SOLUTION:

- Use monthly payment formula:  $M = \frac{\left(\frac{P}{12}\right)\left(1 + \frac{r}{12}\right)^{(12 \cdot t)}}{\left(1 + \frac{r}{12}\right)^{(12 \cdot t)} - 1} =$

$$\frac{(9100)\left(\frac{.0429}{12}\right)\left(1 + \frac{.0429}{12}\right)^{(12 \cdot 10)}}{\left(1 + \frac{.0429}{12}\right)^{(12 \cdot 10)} - 1}$$

## Example 4 - savings

- How much did she save by paying interest only during college?
- SOLUTION:
- She only had to pay \$33.16 per month while in college and she saved money.
- $\$4,438.95 - \$2,107.10 = \underline{\$2,331.85 \text{ saved}}$

# Assignment: pg 171 #2-6, 8-13

Rich is attending a 4-year college. As a freshman, he was approved for a 10-year, federal unsubsidized student loan in the amount of \$7,900 at 4.29%. He knows he has the option of beginning repayment of the loan in 4.5 years. He also knows that during this non-payment time, interest will accrue at 4.29%.

• #2

How much interest will Rich accrue during the 4.5-year non-payment period?

• #3

If Rich decides to make no payments during the 4.5 years, the interest will be capitalized at the end of that period.

a. What will the new principal be when he begins making loan payments?

b. How much interest will he pay over the life of the loan?

• #4

Suppose Rich only paid the interest during his 4 years in school and the six-month grace period. What will he now pay in interest over the term of his loan?

• #5

Rich made his last monthly interest-only payment on November 1. His next payment is due on December 1. What will be the amount of that interest-only payment?



# Assignment: pg 171 #2-6, 8-13 con't

• #6

Suppose that Rich had decided to apply for a private loan rather than a federal loan. He is considering a 10-year loan with an interest rate of 5.9%.

a. Determine his monthly payment.

b. What is the total amount he will pay back?

c. What is the total interest amount?

• #8

Ted is a freshman attending a 4-year college. He has been approved for an \$8,000 subsidized federal loan at 4.29% for 10 years. How much will the U.S. Department of Education subsidize in interest costs during his 4.5-year non-payment period?

# Assignment: pg 171 #2-6, 8-13 con't

Britta has been accepted into a 2-year Medical Assistant program at a career school. She has been awarded a \$6,000 unsubsidized 10-year federal loan at 4.29%. She knows she has the option of beginning repayment of the loan in 2.5 years. She also knows that during this non-payment time, interest will accrue at 4.29%.

• #9

How much interest will Britta accrue during the 2.5-year non-payment period?

• #10

If Britta decides to make no payments during the 2.5 years, the interest will be capitalized at the end of that period. What will the new principal be when she begins making loan payments?

• #11

Suppose Britta only paid the interest during her 2 years in school and the six-month grace period. What will she pay in interest over the term of her loan?

# Assignment: pg 171 #2-6, 8-13 con't

• #12

Britta has been accepted into a 2-year Medical Assistant program at a career school. She has been awarded a \$6,000 unsubsidized 10-year federal loan at 4.29%. She knows she has the option of beginning repayment of the loan in 2.5 years. She also knows that during this non-payment time, interest will accrue at 4.29%.

Britta made her last monthly interest-only payment on May 5. Her next payment is due on June 5. What will be the amount of that interest-only payment?

• #13

Suppose that Britta decided to take out a private loan for \$6,000 for which loan payments start as soon as the loan amount is deposited in her account and continue for 10 years. The interest rate is 6.1%.

a. Determine her monthly payment.

b. What is the total amount she will pay back?

c. What is the total interest amount?