Tuesday

Section 3.1 – Interest, Investments, and Loans

Investments

- Financial investing is the act of setting aside money with the hope of receiving a greater amount back in the future
- A particular way to get this back is to invest in low-risk, low interest savings
- These types of investment pay interest on the money invested, either: **Simple or Compound**

Simple Interest

- Interest money that is added to the PRINCIPAL (money invested or borrowed)
- It is decided based on a given percentage rate
- Low Interest Rates
  - Awesome for a borrower, you pay less to the lender
  - Bad if you are trying to grow interest on savings

- High Interest Rates
  - Brutal/Crippling for a borrower, you pay more to the lender
  - Great if it is interest earned in savings

- **Simple Interest** is calculated this way: $\boldsymbol{I = Prt}$

- I: *is the amount of interest calculated*
- P: *is the Principal (the amount of money borrowed or saved)*
- r: *is the Percentage Rate, expressed as a decimal* $(25\% = 0.25)$
- t: *is Time, in years*

Example: Find the future amount of an investment of \$8000 at simple interest for $5yrs$ at 6%.

Solution: $I = Prt$ $\quad A = P + I$

Here: $P = \$8000 \quad t = 5 \quad r = 6\% = 0.06$

$I = P \cdot r \cdot t$

$= (8000)(0.06)(5)$

$= \$2400$

So, in 5 years without touching the money, you earn an extra \$2400, giving a new total of:

$A = P + I$

$= \$8000 + \$2400$

$= \$10\,400$

Example: Yazia borrowed \$5200 at 7.5% simple interest to build a swimming pool. If she paid \$2340 in interest, find the term of the loan and the monthly payments.

Solution: Since $I = Prt$, We need t **alone,** and doing algebra give us:

$$\frac{I}{Pr} = \frac{Prt}{Pr} \Rightarrow t = \frac{I}{Pr}$$

So... $I = \$2340$ $r = 0.075$ $P = \$5200$

$$t = \frac{I}{Pr} = \frac{2340}{5200(0.075)} = 6 \text{ yrs}$$

- The term of the loan is 6 years, which is 72 months.
- The total amount paid is the principal plus interest.

$A = P + I$ $A = \$7540$

$= 5200 + 2340$

- Divide by 72 to find the monthly payment: $\frac{\$7540}{72} = \$104.73$

$6 \text{ yr} \cdot \frac{12 \text{ payments}}{\text{yr}} = 72$

Discount Loans

- Sometimes the interest on a loan is paid up front by deducting the amount of the interest the lender gives you. **This is called a Discounted Loan.**

Example: Katrina obtained a 2 *year* \$6000 loan for university. The rate was 8% simple interest and the loan was a discounted loan.

a) Find the discount
b) Find the amount of money Katrina received
c) Find the actual interest rate

Solution:

a) The discount is the total interest of the loan: $I = Prt$ $I = 6000(0.08)(2) = \$960$

b) Katrina receives: $\$6000 - \$960 = \$5040$

c) The actual interest rate should be calculated on \$5040 with \$960 in interest.

$$\frac{I}{Pt} = \frac{Prt}{Pt} \Rightarrow r = \frac{I}{Pt} = \frac{\$960}{(5040)(2)} = 0.0952$$

The actual interest rate was: 9.52%

Practice Problems #1-5, 12, 13

Thursday - work period.

Compound Interest

❖ **Compound Interest** is much more complicated. You build/owe on the ***Principal*** + ***the Interest*** earned in a compounding period

- It can be used to your benefit when savings, but it can drown you when it's used against your debt

- **Compound Interest** is calculated this way: $A = P\left(1 + \frac{r}{n}\right)^{n(t)}$
  - A: *is the final amount earned*
  - P: *is the Principal (the initial amount of money borrowed or saved)*
  - r: *is the* ***Yearly*** *Percentage Rate, expressed as a decimal* $(25\% = 0.25)$
  - n: is the number of times yearly interest is compounded per year
  - t: *is time, in years*

- Compounding periods means the number times the interest is calculated in a year
  - Yearly: $n = 1$
  - Quarterly: $n = 4$
  - Monthly: $n = 12$
  - Daily: $n = 365$

Example: To have savings for university, the parents of a child invest \$25 000 in a savings plan paying 6% interst compounded quarterly. How much money will they have in 18 years?

Solution: $A = P\left(1 + \frac{r}{n}\right)^{n(t)}$

$= 25000\left(1 + \frac{0.06}{4}\right)^{4(10)}$ $\quad A = \$73028.95$

$= 25000\,(1.015)^{72}$

How much do you earn in interest?

$A = P + I \Rightarrow I = A - P = 73028.95 - 25000$

$= \$48028.95$

Example: How much would you have to invest into a 10-year bond paying 4.2% compounded weekly to make it worth \$5000 at the end of its term?

Solution: $A = P\left(1 + \frac{r}{n}\right)^{n(t)}$

$5000 = P\left(1 + \frac{0.042}{52}\right)^{52(10)}$

$5000 = P(1.5217)$

$P = \frac{5000}{1.5217}$

$P = \$3285.75$

Need to invest \$3285.75

Practice Problems # 7-11 # 14-17

Section 3.1 – Practice Problems

Find the future value of the loan using Simple Interest

1. $P = \$1080, r = 3.45\%, t = 4.5\ years$

2. $P = \$4250, r = 5.3\%, t = 42\ months$

3. $P = \$6625, r = 4.7\%, t = 130\ weeks$

4. $P = \$3360, r = 9.5\%, t = 240 days$

The following loans are discounted. For each question find: the discount, the amount of money received, and the true interest rate

5. $P = \$6500, r = 6.5\%, t = 4\ years$

6. $P = \$9600, r = 8.25\%, t = 2\ years$

Find the future amount and interest, using the Compound Interest formula

	Principal	Rate	Compounded	Time	Future Amount	Interest
7.	$6200	4.5%	Semi-annually	3 *year*		
8.	$7500	5.3%	Quarterly	4.5 *years*		
9.	$9600	8%	Monthly	1.5 *years*		
10.	$2500	7.5%	Weekly	6 *years*		
11.	$5000	6%	Daily	3 *years*		

Work Space

12. A new computer has a 3-year payment plan with monthly payments of $36.80. The cost of the computer is 964.20. Find the interest rate of the computer using simple interest.

13. For a set of new tires costing $648.48 including tax, you are offered low monthly payments of $42.60 over 18 months. Find the interest rate for the tires using simple interest.

14. An 18-year-old plans to retire at age 55. She decided to invest her inheritance of $50 000 at 6% compounded quarterly. How much will she have at 55?

15. The Smiths hope to accumulate $40 000 for a new car in 5 years. How much would they need to invest right now at 5.2% compounded monthly to reach their goal?

16. An investor deposits $8000 into an account paying 6% compounded quarterly. Three years later he deposits $5000 into the same account. How much money was there at the end of 5 years?

17. What percentage of Simple Interest would be needed on a 12-year investment to have the same future value as one that pays 6% compounded quarterly?