MA111: Contemporary mathematics

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Entrance Slip (due 5 min past the hour):

- Which is the better deal: (a) \$10 now or (b) \$15 in February?
- Which is the better deal: (a) regular price or (b) 30% markup first, then 25% discount?

SCHEDULE:

- HW 10.1 is due Friday, Sep 21st, 2012.
- HW 10.2,10.3 is due Friday, Sep 28th, 2012.
- HW 10.6 is due Friday, Oct 5th, 2012.
- The second exam is Monday, Oct 8th, during class.
- First exam grades on Monday (first three pages graded), key on website.

Today we will look at the time value of money in its **simple**st form

Context: Time value of money

- Entrance slip #1: Again the answer is "it depends"
- If you forgot your lunch and need to go get some food, $10 now might sound a lot better than $15 in February
- If you are doing fine, why not wait until Feb and get $5 extra?
- How much value do you place on "now"?
- Is money worth the same now as in February?
- If it is, you should not care if you get the $10 now or in February.
- Would you loan Jack $10 today for $10 in February?

Activity: Reasons for different values

- In small groups, make a list of at least five reasons why \$10 today is different than \$10 in February.
- For each reason, determine whether it means \$10 now is worth more or \$10 in Feb is worth more
- Try to find reasons that apply generally
- In 2 minutes we'll put some on the board

Activity: Standard answers

- Inflation: money buys less in the future, prices go up
- Risk: Jack might not be there to give you the money, you might not be there to get it
- Immediate gratification: why wait when you can have it all now?
- Investment: money now, invested wisely, is more money in the future (plant seeds, sell the fruit)

Activity: How much is now worth?

- We can put a price on anything. What price do we put on now?
- Let's be specific, but purely hypothetical.

  Jack is willing to loan you some money now.
- What price are you willing to pay?
- What particulars of the deal do you need to pay attention to?
- Would you take the loan if I asked for an extra $100 back in Feb?

Fast: Simple interest

- **Interest** is the extra money paid later in order to get money now
- Main issues for the loan:
  - how much money and
  - how soon do you need it back?
- Roughly speaking:

  double the loan, means double the price
- Time is a little trickier, but a simple answer:

  double the time, means double the price

Fast: Example use of simple interest

- First we have to decide one deal is fair: say \$10 now for \$15 in Feb

- This first decision is basically setting the **interest rate**

- If we only change the time and the amount of money, then we can use simple interest to change the interest

- \$20 now for \$30 in Feb

  (not \$20+\$5; the loan is double, the interest is doubled)

- \$10 now for \$20 in July (about twice as long)

  (not $\$30 = 2 \times \$15$, only the interest $\$5 \to \$10$ is double, the original \$10 of the loan remains \$10)

- \$10 now for \$12 in Nov (about 2 months, instead of about 5)

  Basically we are charging \$1 per month for the \$10

Fast: Simple interest formulas

- This chapter has too many formulas
  Understand them; only memorize a few
- **Variables**:
  - P: present value; how much money now
  - F: future value; how much money then
  - $I = F - P$: interest; how much extra money then
  - t: time; often measured in years
  - r: interest rate; often measured in dollars per dollar per year (APR)

$$I = Prt$$

$$F = P(1 + rt)$$

Fast: Savings Bond example

- Savings bond is worth more and more each year, until you cash it in
- \$1000 present value, 5% annual percentage rate

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Fast: Savings Bond example

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- \$1000 present value, 5% annual percentage rate
- The interest is 5% of \$1000 $=$ (0.05)(\$1000) $=$ \$50 per year
- After 2 years, worth \$1100
- After 4 years, worth \$1200

Fast: Treasury bond

- Treasury bonds are named by their future value
- A \$1000 bond with 5% APR (simple) and 7 year maturity
- Gives you \$1000 in 7 years
- $\$1000 = P + P(0.05)(7) = P(1.35)$, so
  $P = \$1000/1.35 = \$740.74$ now
- Moving from future value to present value is often called **discounting**

Assignments and exit slip

- Reread and understand section 10.2, especially the first two examples
- Read section 10.3
- **Exit slip:** Make sure to show your work and explain your answer!

  My Kentucky Utilities power bill:

  On time: $130.56

  Late: $137.09 (3 or more days)
- What would the late price be if the bill was only $50?
- Entrance slip answer #2:

  Which is the better deal: (a) regular price or
  (b) 30% markup first, then 25% discount?

  $(1.3)(0.75) = 0.97$, 3% discount is better than regular price