LCM, GCD & Economics

Least Common Multiple
Greatest Common Divisor

- The Greatest Common Divisor of a and b is the largest number that will divide *both* a and b

- The Least Common Multiple of a and b is the smallest number that *both* a and b will divide

Least Common Multiple
Greatest Common Divisor

- Start with two numbers, a and b. For convenience say a > b

- Divide b into a, getting a remainder, r_1

- If r_1 is 0, b is the greatest common divisor

- If r_1 > 0, divide b by r_1 getting r_2

- Continue dividing until the remainder is 0. The previous remainder is the greatest common divisor of a and b

Least Common Multiple
Greatest Common Divisor

- The Least Common Multiple of a and b is a*b/Greatest Common Divisor of a and b

- To get the Greatest Common Divisor of a group of numbers, x_1, x_2, x_3, … x_{n-1}, x_n get g_1 = GCD of x_1 and x_2, then g_2 = GCD of g_1 and x_3, etc to get g_{n-1} = GCD of g_{n-2} and x_n The GCD of all of the numbers is g_{n-1}

- To get the Least Common Multiple of a group of numbers, x_1, x_2, x_3, … x_{n-1}, x_n :

    compute $(\prod_{i=1}^{n} x_i)/(g_{n-1})^{n-1}$ = Least Common Multiple

Least Common Multiple
Greatest Common Divisor

Hot Dogs and Hot Dog Buns

- 10 Hot Dogs to a Package

- 8 Buns to a Package

- GCD of 8 and 10:
  - ➢ 10 / 8 = 1 remainder 2
  - ➢ 8 / 2 = 4 remainder 0
  - ➢ So: GCD = 2 and LCM = 10*8/2 = 40

- 4 Packages of Hot Dogs and 5 Packages of Buns

Least Common Multiple
Greatest Common Divisor

The Taco Shop Again

- Hamburger, at $1.50 per pound, and that will make 6 tacos

- Taco Shells at $2.40 a dozen, which will make 12 tacos

- Lettuce at $0.96 a head, which will make enough shredded lettuce for 12 tacos

- Tomatoes at $1.28/lb, which will make enough chopped tomatoes for 32 tacos

- Onions at $0.84/lb which will make chopped onions for 14 tacos

- Taco seasoning at $0.90 a package, which will spice up one pound of hamburger, or 6 tacos

Least Common Multiple
Greatest Common Divisor

- We need the Least Common Multiple of 6, 12, 14 and 32 so we must calculate the Greatest Common Divisor of 6, 12, 14 and 32

- GCD of 6 & 12 is obviously 6

- GCD of 6 and 14 is 2

- GCD of 2 and 32 is 2

- LCM is 6*12*14*32/2^3 = 2016

- Need: 336 lbs. of hamburger, 336 packages of taco seasoning, 168 packs of taco shells, 168 heads of lettuce, 63 lbs. tomatoes & 144 lbs. onions

Economics

Some Basic Definitions

- **Economics:** the study of how a society uses its limited resources to satisfy its needs and wants

- **Needs:** things we *must* have to survive: food, water, shelter, etc.

- **Wants:** things we do not *have* to have to survive, but still wish to have

Economics

Some Basic Definitions

- **Land:** all natural resources used to produce goods and services, including crops, minerals and rent paid for use of the land

- **Goods:** Tangible items bought

- **Durable goods:** Things that are bought but last for a long period of time: cars, refrigerators, washers & dryers, etc

- **Non-durable goods:** Things bought and consumed, such as fuel, pizza, shoes, towels

- **Services:** Deeds or actions performed by one person or group for another person or group, such as haircuts, wiring a house, delivering pizza

Economics
Some Basic Definitions

- **Labor:** Human effort expended to make goods or provide services, such as factory workers, teachers and medical personnel

- **Capital:** Resources used to produce goods, such as machinery to make the goods or perform the services, vehicles to transport the goods or the people providing the service, buildings used to manufacture, store and sell goods, or buildings where a service is provided

Economics

Key Economic Questions

- What and how many goods and services should be produced?

- How should those goods and services be produced?

- Who gets to consume those goods and services?

Economics
Goals of Economies

- **Efficiency:** maximizing consumer satisfaction with limited resources

- **Growth:** ongoing expansion of the ability to produce goods and services

- **Security and Stability:** Limiting fluctuation in prices, employment and production

- **Equity:** Two meanings
  - ➢Fairness of the distribution of goods and services
  - ➢Things owned by individuals

- **Freedom:** the ability of individuals to decide how they will provide and consume goods and services

Economics

Economic Freedom: Kinds of Economies

- **Traditional:** access to jobs, goods and services are determined by tradition, often based on personal demographics. Feudal Europe is an example, as is the caste system in India, and the allocation of poorly paid jobs and limited access to goods and services to women and minorities

- **Market:** Supply and demand allocate the flow of goods and services. Decisions are made by the marketplace

- **Central:** A central authority decides what and how many goods and services will be supplied, and who will be allowed access to how much of the goods and services

Economics

- All economies are mixed, but have one form or another that dominates

- Wartime economies generally are *central* economies

- The US economy is predominantly *market* with a dwindling amount of traditional and a growing amount of central

- The Chinese economy is predominantly *central* with a growing amount of market and some degree of traditional

Economics

- **Central** economies are best suited to wartime economies, but function poorly otherwise, requiring the ability to accurately predict future needs and wants

- **Traditional** economies are very stable, but tend to produce little equality of access, and often keep individuals from rising to their full potential while locking poor performers in positions of power

- **Market** economies tend to distribute goods and services most efficiently, but have a tendency to be unstable, often showing alternating times of boom and bust

- None of these is always the best for whole economies

- Some sectors of an economy may be better handled one way, while other sectors may be better handled by a different one