BREAKFAST OF CHAMPIONS AND THE BIRD!
How to do it!

1) Estimate the following, using the Washington Data Book (2003 figures).

a) Total population in OLT area is 87,840 people

b) No. of kids in OLT is 17,568 children

c) No. adults in OLT is 70,272 adults

1a – add up Lacey + Oly + Tumwater numbers, page 242 Data Book

1b- No. of kids is not given. "Kids" in this context means young enough to eat less. Demographers usually isolate ages 0-15 for this category. How to estimate it? P. 243 show 42,543 people *in the county* are in this age group, out of 214,800 total. It is not unreasonable to assume that the proportion of kids in the OLT population is the same as that of the whole county. 42543/214800 = 0.20 [rounded off]. Thus assume 0.20 * 87840 is the number of kids in OLT. That is, 17,568.

1c – If 17568 of 87840 people are children, the rest (87840 – 17568) are adults.

Use these data in the following:

No. gm protein needed per kid per day = 40 gm/kid*day

No. gm protein needed per adult per day = 80 gm/adult*day

No. Calories needed per kid per day = 1000 Cal/kid*day

No. Calories needed per adult per day = 2000 Cal/adult*day

2) Calculate the following for the whole OLT population.

a) No. Calories needed per day = $19.32 * 10^7$ Cal/day

b) No. Calories needed per year = $70.52 * 10^9$ Cal/year

c) No. grams protein needed per day = $7.72 * 10^6$ gm/day

d) No. grams protein needed per year = $2.82 * 10^9$ gm/yr

e) No. metric tons protein needed per year = $2.82 * 10^3$ tonnes/yr

2a –No. Cal/day is number required by kids + no. required by adults. Calculate both & add ‘em up. Here is where to start using powers of 10.

Adults – $8.78 * 10^4$ adults x $2.00 * 10^3$ Cal/adult*day = $17.56*10^7$ Cal/day;

Kids – $1.76*10^4$ kids x $1.00 * 10^3$ Cal/kid*day = $1.76*10^7$ Cal/day

+ ______________

Total is $19.32 * 10^7$ Cal/day

Reminder – when you multiply powers of 10, you simply add up the exponents, as in the adults and kids lines above. When you add numbers expressed as powers of 10, you can ONLY add them up if all numbers to be added are to the same power of 10 – in this case, 10^7. If they are not, move decimal places and change powers until they are.

2b – is line 2a x 365 days/year = $19.32*10^7$ Cal/day x $3.65*10^2$ days/year
= $70.52*10^9$ Cal/yr

2c – Adults – $8.78 * 10^4$ adults x 80 gm/adult*day = $7.02 * 10^6$ gm/day

Kids – $1.76 * 10^4$ kids x 40 gm/kid*day = $7.04 * 10^5$ gm/day

Adjust power of 10 to be same as for adults = $0.70 * 10^6$ gm/day

Add kids & adults [$(7.02 * 10^6) + (0.70 * 10^6)$]gm/day = $7.72 * 10^6$ gm/day

2d is line 2c x 365 days/year or $7.72 * 10^6$ gm/day x 3.65×10^2 days/yr
= $2.82 * 10^9$ gm/yr

2e – $2.82 * 10^9$ gm/yr x (1 kg/1000 gm) x (1 metric ton/1000 kg) = $2.82 * 10^3$ metric tons/yr … multiply line 2d by the 2 conversion factors shown.

3) Suppose that the OLT population obtained ALL of its food Calories from Wheaties.

a) How many pounds of Wheaties are in one box? 0.75 lb/box

b) How many Calories in one box? (Betty sez no milk, folks) 1210 Cal/box

If the OLT population got all of its Calories from Wheaties, calculate the following;

c) No. boxes eaten/day = $1.60 * 10^5$ boxes/day;

d) No. boxes eaten/year = $5.84 * 10^7$ boxes/year;

e) What’s the volume of a box of Wheaties? 0.83 ft x 0.67 ft x 0.17 ft = 0.09 ft^3.

3a – box shows contents = 12 ounces; 12 oz * (1 lb/16 oz) = 0.75 lb

3b – box shows 110 Cal per serving, contains11 servings;
11 serving/box x 110 Cal/serving = 1210 Calories/box

3c – line 2a shows 19.32 * 10^7 Cal/day eaten; divide by line 3b to get (19.32 * 10^7 Cal/day)/(1210 Cal/box) = (0.01597 * 10^7 box/day) = 1.60 * 10^5 boxes/day

3d – line 3c x 365 days/yr or 1.60 * 10^5 boxes/day x 3.65 * 10^2 day/yr
= 5.84 * 10^7 boxes/year

3e – measurement gives H = 10 inches, W = 8 inches, D = 2 inches. [estimate to nearest inch to save yourself calculation grief ...] Convert all to feet. 10/12 ft = 0.83 ft, 8/12 ft = 0.67 ft, 2/12 ft = 0.17 ft. Volume is 0.83 x 0.67 x 0.17 ft^3 = 0.09 ft^3.

4) Now suppose that the whole OLT population obtained ALL of its protein from chickens ...

a) How many grams of meat are in a chicken?

(<u>5</u> lb/chicken) x 1000 gm/2.2 lb = <u>2,300</u> gm/chicken

b) How many chickens per day must OLT eat? <u>3.36 * 10</u>^{3} chickens/day

c) ... pounds of chicken per year? <u>6.13 * 10</u>^{6} pounds/yr

d) no. of chickens per year? <u>1.23 * 10</u>^{6} chickens/yr

e) What is the volume of a chicken? <u>0.1</u> cubic feet/chicken

4a – estimate size of the edible part of a chicken from personal experience -- say, 5 lb/chicken. (5 lb/chicken) x (1000 gm/2.2lb) = 2272.727 gm
call it 2300 gm/chicken.

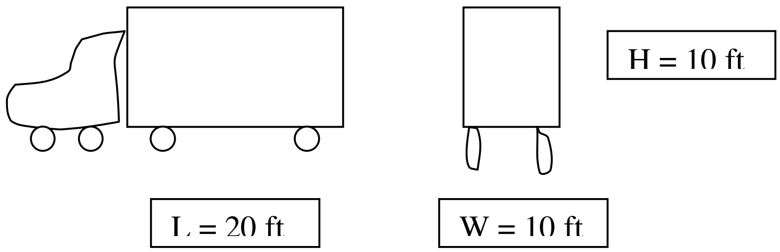
4b – from line 2c, OLT needs 7.72 * 10^6 gm/day of protein. Assume all of the chicken meat is protein. (7.72 * 10^6 gm/day)/2300 gm/chicken) = 3.36 * 10^3 hens/day
= 3,360 chickens/day ... awesome ...

4c – (3.36 * 10^3 chickens/day) x (5lb/chicken) x (3.65 * 10^2 days/yr) = 61.32 * 10^5 lb/yr = 6.13 * 10^6 lb/yr [that's about 3000 tons/yr]

4d – (3.36 * 10^3 chickens/day) x (365 days/yr) = 12.26 * 10^5
= 1.23 * 10^6 chickens/yr. That is, about a million per year.

4e – estimate by your guess of size of one chicken and an imaginary box 1 ft x 1ft x 1ft .... My guess is that 10 5-lb chickens would fill a 1- cubic foot box. Thus each chicken occupies 1/10 of a cubic foot.

5) In the space below, draw a big rig truck (side view and back view) and show its dimensions.



a) What's the volume of the truck? <u>20 ft</u> x <u>10 ft</u> x <u>10 ft</u> = <u>2000</u> cubic feet
L H W

b) How many deliveries of Wheaties are needed per day to feed OLT? <u>7.2</u> trucks/day

c) How many deliveries of chickens are needed per day to feed OLT? <u>0.17</u> trucks/day

d) What is the total number of deliveries needed per day to feed OLT? <u>7.4</u> trucks/day

5a – estimate size of a big truck from your experience. Volume is L x W x H or 20 ft x 10 ft x 10 ft = 2000 ft^3. [notice I estimated easy numbers to multiply]

5b – from line 3e, 1 Wheaties box occupies 0.09 ft^3/box. OLT requires $1.60 * 10^5$ boxes/day as in line 3c. The number of cubic feet needed per day is given by ($1.60 * 10^5$ boxes/day) x (0.09 ft^3/box) = $0.144 * 10^5$ = $1.44 * 10^4$ ft^3/day. If each truck carries 2000 ft^3, the number of truckloads per day is given by ($1.44 * 10^4$ ft^3/day)/(2000 ft^3/truck) = 7.2 trucks/day. [= 72 trucks every 10 days].

5c – From line 4c, OLT needs $3.36 * 10^3$ chickens/day. From line 4e, each chicken takes up 0.1 ft^3. OLT needs ($3.36 * 10^3$ chickens/day) x 0.1 ft^3/chicken = $3.36 * 10^2$ ft^3 of chicken per day [= 336 ft^3]. (336 ft^3)/2000 ft^3/truck = 0.17 trucks/day. That is about one truck every 6 days.

5d – total is (7.2 + 0.17) = about 7.4 trucks/day. [= 74 trucks every 10 days].

6) (for visualization.) If the trucks all enter OLT from the north via southbound I-5 and deliver their loads uniformly over the 24 hour day, how often would you see one enter the OLT area?

= one truck every <u>3 hours & 15 minutes</u>

(24 hr/day) / (7.4 trucks/day) = 3.25 hours per truck. That is, every 3 and a quarter hours you would see a food truck enter town. That is one truck about every 3 hours & 15 minutes.

7) How many hectares are needed to raise the amount of Wheaties shown in line 3d above? [use this figure; wheat yield in the US is about 2200 kilograms wheat per hectare of farmland. This is for *good farmland*.]

a) Hectares needed to grow the OLT annual Calorie supply = $\underline{9.05 * 10^3}$ hectares

b) Amount of land needed to grow a typical person's Calorie supply = $\underline{0.10}$ ha/person

7a – from line 3d, OLT needs $5.84 * 10^7$ boxes/year. Each box contains 0.75 lb [line 3a]. calculate ($5.84 * 10^7$ boxes/year) x (0.75 lb/box) / (2.2 lb/kg) to get $1.99 * 10^7$ kg needed per year. ($1.99 * 10^7$ kg/yr)/(2200 kg/ha) = $9.05 * 10^3$ ha. At 1 ha = 2.47 acres, that is about $9.05 * 10^3$ ha x 2.47 acre/ha = 22,354 acres.

7b – if we were doing this in detail, we would figure that each child requires only half as much land as each adult. We would then do somewhat tricky math to separate out what an adult requires, and what a child requires. That's too much work for a first pass estimate. Assume the whole 87,840 people in OLT divide up the 9,050 hectares equally. $9.05 * 10^3$ ha/$8.78 * 10^4$ people = 0.10 ha/person.

8) How many hectares are needed to raise the grain eaten by the number of chickens required for OLT's annual protein supply (line 4d above)? Assume as follows ...

Suppose each chicken ate twice its weight in wheat and took one year to mature.

a) hectares needed to grow the annual chicken feed = $\underline{2.53 * 10^3}$ hectares
or is it $\underline{5.06 * 10^3}$ ha??

b) Amount of land needed to grow the chicken feed for a typical person's annual protein supply = $\underline{0.06}$ ha

8a – from line 4c, OLT needs $6.13 * 10^6$ pounds/yr of chicken. Thus twice that number of pounds of wheat are needed for chicken feed each year, or $12.26 * 10^6$ lb wheat/yr. The land needed to grow it is given by ($12.26 * 10^6$ lb/yr) divided by this quantity [(2.2 lb/kg) x (2200 kg/ha)] gives $2.53 * 10^3$ ha.

At this point think about this. The part we eat isn't all there is. The chicken once also consisted of a head, feet, feathers, bones, innards, etc. It had to eat to grow those parts. Let's guess that half the chicken is edible, and that it had to eat as much to grown the inedible parts as to grow the edible parts. That doubles the amount of land needed for chicken feed to $5.06 * 10^3$ ha.

8b – Land needed to grow the chicken feed for a typical person is $5.06 * 10^3$ ha/$8.78 * 10^4$ persons = 0.06 ha.

9) YOUR ECOLOGICAL FOOTPRINT! (the food part of it, at least) (assumes you are a typical person ...ha ha ... bwa ha ha ...)

a) How much land is needed in permanent reserve somewhere to provide you with food?

*** <u>0.16</u> ha = <u>0.40</u> acres

b) Make it visual. Draw a sketch that gives some idea of how big your permanent food reserve is.

9a – land needed to support one OLT person is line 8a + 8b or 0.06 + 0.10 ha = <u>0.16</u> ha
That is about 0.16 ha x 2.47 acres/ha = 0.40 acres = not quite half an acre.

9b ... over to you, get creative!