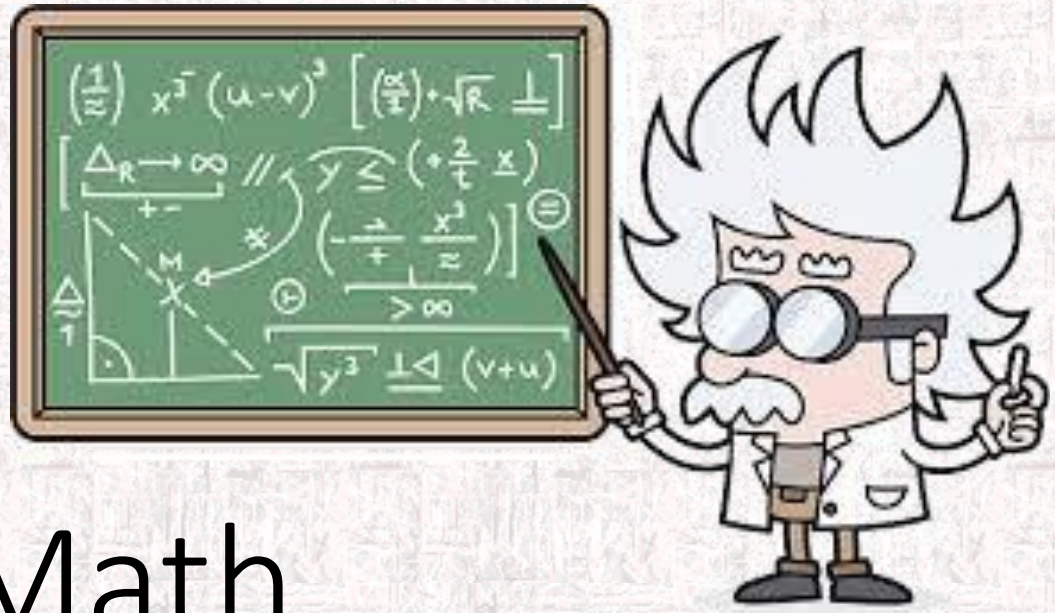
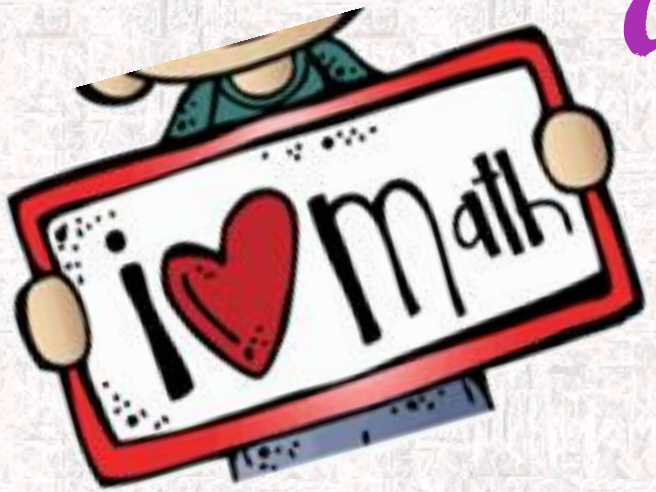
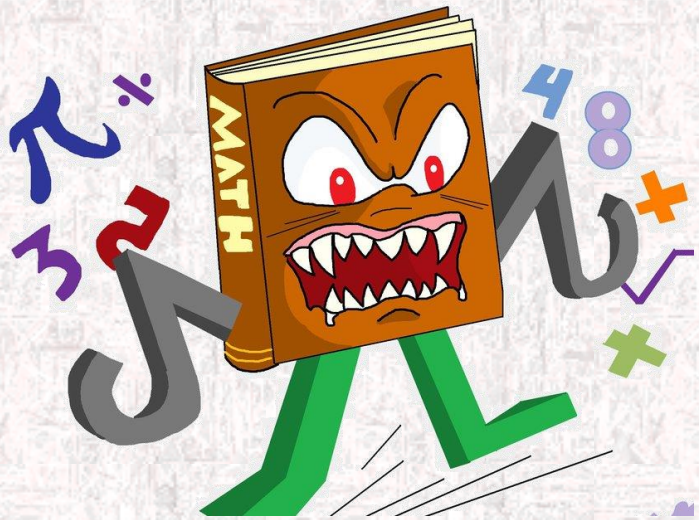
EQ KNOWLEDGE



Nutrition Math

Oh.... The horror!





Units

English Units

- Pounds
- Ounces

Metric Units

- Grams
  - Kilograms
  - milligrams

Other interesting units

- Percent
- Parts per million
- Calories (Kcal, Mcal)

Cool Words

"of" means multiply

"per" means divide

How do they compare?

Metric prefixes:

- BIG things
  - Kilo (K): 1,000 things
  - Mega (M): 1,000,000 things

THINGS

- Little things
  - centi (c): 1/100 or 0.01
  - milli (m): 1/1,000 or 0.001
  - micro (u): 1/1,000,000

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HOW DO THEY COMPARE?

POUNDS

- 1 lb = 16 oz
- 1 lb = 454 g

GRAMS

- 1 Kg = 1,000 grams
- 1 mg = 0.001 grams

Bridging the gap

- 1 Kg = 2.2 lb
- 1 lb = 454 g
- 1 oz = 28 g

HOW DO THEY COMPARE?

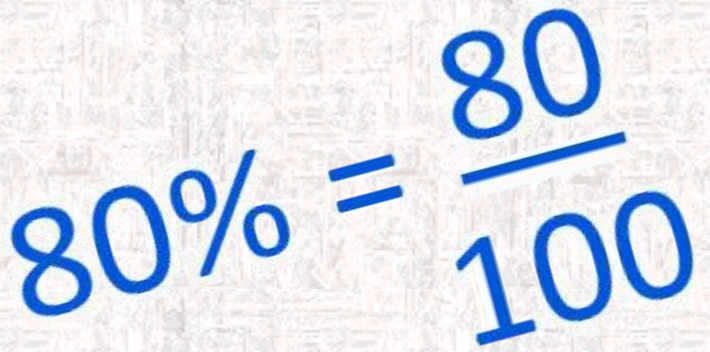
Percent

- "Per" means "divided by". "Cent" means 100. Divide percent by 100 to get the decimal quantity.
- 10% is 10/100 = 0.10

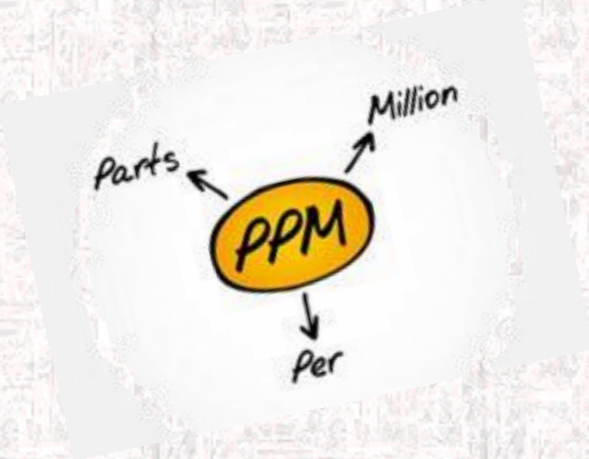
EXAMPLE: Find 22% of 342

"Of" means multiply.

So: 22/100 x 342 = .22 x 342 = 75.24



HOW DO THEY COMPARE?



Other interesting units

- Parts per million = mg/Kg or ug/g

- Calories (Kcal, Mcal) – units of (food) energy
  - What we think of as a “calorie” is really a Kcal
  - 1 Mcal = 1,000 KCal

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

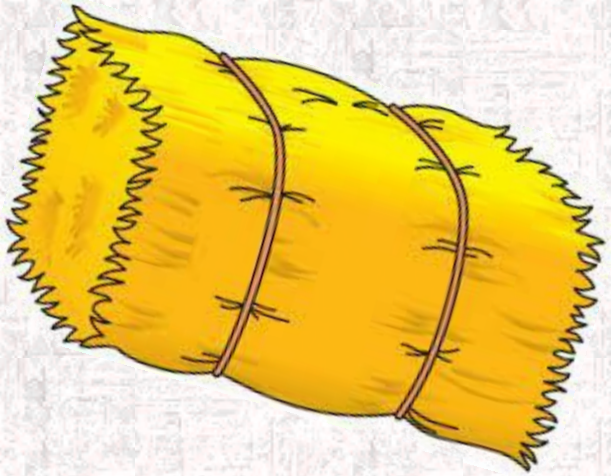
Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**

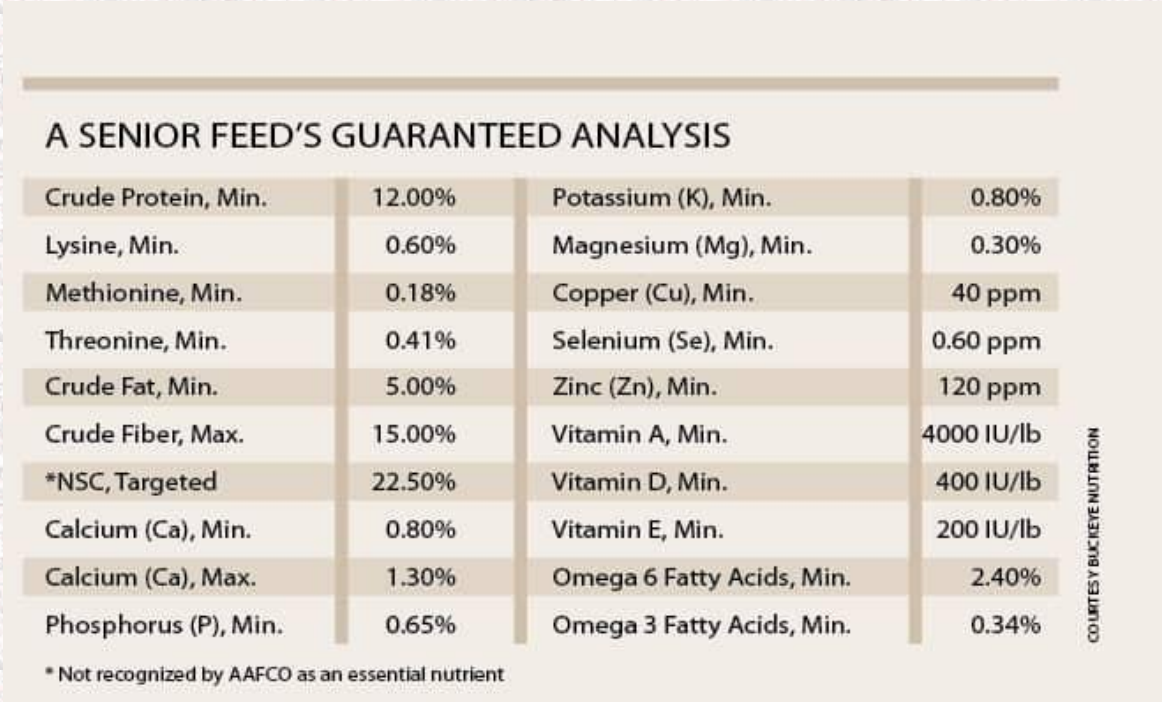
Amount Ingested vs Concentration

- Dose (or amount) vs. Concentration
  - Some Units of weight signify an amount
    - Pounds, ounces
    - Kilograms, grams, milligrams
    - KiloCalories, MegaCalories
  - Examples
    - Pounds (or Kg) of hay or concentrate fed daily
    - Kcal (or Mcal) consumed



Amount Ingested vs Concentration

- Dose (or amount) vs. Concentration
  - Some Units specify a Concentration or rate
    - Percent (10% = 10 / 100 = .10)
    - Parts per million (mg/Kg)
  - These units are useful but to determine how MUCH the horse consumes, you have to also know the amount fed.



A SENIOR FEED'S GUARANTEED ANALYSIS

Crude Protein, Min.	12.00%	Potassium (K), Min.	0.80%
Lysine, Min.	0.60%	Magnesium (Mg), Min.	0.30%
Methionine, Min.	0.18%	Copper (Cu), Min.	40 ppm
Threonine, Min.	0.41%	Selenium (Se), Min.	0.60 ppm
Crude Fat, Min.	5.00%	Zinc (Zn), Min.	120 ppm
Crude Fiber, Max.	15.00%	Vitamin A, Min.	4000 IU/lb
*NSC, Targeted	22.50%	Vitamin D, Min.	400 IU/lb
Calcium (Ca), Min.	0.80%	Vitamin E, Min.	200 IU/lb
Calcium (Ca), Max.	1.30%	Omega 6 Fatty Acids, Min.	2.40%
Phosphorus (P), Min.	0.65%	Omega 3 Fatty Acids, Min.	0.34%

* Not recognized by AAFCO as an essential nutrient

COURTESY BUCKEYE NUTRITION

Amount Ingested vs Concentration

- Example: Greyhorse weighs 500 Kg and is in light work.
- If he is fed 10 Kg daily of grass hay. The hay is tested at 8% protein. Is he meeting the NRC requirement (699 g)?

  Convert percent to a number: 8/100 = 0.08

  10 Kg hay x .08 = .8 Kg Protein (800g)

- If Greyhorse is fed 7.5 Kg daily of grass hay, is he meeting the NRC requirement?
  1. Convert percent to a number – 8/100 = 0.08
  2. 7.5 Kg hay x .08 = .60 Kg Protein (600g)

Getting from one to another

Multiplying Fractions

$$\frac{4}{5} \times \frac{3}{7} = \frac{4 \times 3}{5 \times 7} = \frac{12}{35}$$

Getting from one to another

$$\frac{\cancel{3}}{15} \times \frac{20}{\cancel{3}} = \frac{20}{15}$$

If something appears top and bottom, cancel them!

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Getting from one to another

$$\frac{3\ \cancel{lb}\ feed}{1} \times \frac{1\ Kg}{2.2\ \cancel{lb}} = 1.36\ Kg$$

As long as you can use units and cancel them, you can find the conversion!

Getting from one to another

Practical: Fluffy is an 1,100 lb horse in light work. She is currently Body Condition Score 5.5. Her diet consists of 20 pounds of grass hay daily and 1.5 pounds Purina Enrich ration balancer. Given that we don't want to change her body condition, is she getting adequate protein, zinc, and vitamin E?

Nutrient	Hay	Purina Enrich	NRC Requirement
Protein	9.5%	32%	699 g
Zinc	25 mg/Kg	500 ppm	400 mg
Vitamin E		600 IU/lb	800 IU

Getting from one to another

Nutrient	Hay	Purina Enrich	NRC Requirement
Protein	9.5%	32%	699 g

Hay: $\frac{20\ \text{lb}}{1} \times \frac{1\ \text{Kg}}{2.2\ \text{lb}} = 9.09\ \text{Kg} = 9{,}090\ \text{g}$

9.5 percent of 9,090 g: 9.5/100 = .095

.095 x 9,090 = 684g protein

Enrich: $\frac{1.5\text{lb}}{1} \times \frac{1\ \text{Kg}}{2.2\ \text{lb}} = 0.68\ \text{Kg} = 680\ \text{g}$

32 percent of 680 g: 32/100 = .32

.32 x 680 = 218g protein

Total protein intake = 684g + 218g = 902g ✓

Getting from one to another

Nutrient	Hay	Purina Enrich	NRC Requirement
Zinc	25 mg/Kg	500 ppm	400 mg

Hay: $\frac{20\ \text{lb}}{1} \times \frac{1\ \text{Kg}}{2.2\ \text{lb}} = 9.09\ \text{Kg}$

Enrich: $\frac{1.5\text{lb}}{1} \times \frac{1\ \text{Kg}}{2.2\ \text{lb}} = 0.68\ \text{Kg}$

ppm is the same as mg/Kg

25 mg/Kg x 9.09 Kg = 227 mg

500 mg/Kg x .68 Kg = 340 mg

Total zinc intake = 227mg + 340mg = 567mg ✓

Getting from one to another

Nutrient	Hay	Purina Enrich	NRC Requirement
Vitamin E		600 IU/lb	800 IU

$$\text{Enrich: } \frac{600 \text{ IU}}{1 \text{ lb}} \times \frac{1.5 \text{ lb}}{1} = 900 \text{ IU}$$

Getting from one to another

Practical: George is an 900 lb horse in light work. He is currently Body Condition Score 5. His diet consists of 15 pounds of grass hay daily and 2 ounces California Trace. Given that we don't want to change his body condition, is he getting adequate calories, copper, and vitamin A?

Nutrient	Hay	California Trace	NRC Requirement
DE	1.9 Mcal/Kg		16 MCal
Copper	8 mg/Kg	3200 ppm	80 mg
Vitamin A		120,000 IU/lb	18,000 IU

Getting from one to another

Nutrient	Hay	California Trace	NRC Requirement
DE	1.9 Mcal/Kg		16 MCal

$$\text{Hay: } \frac{15\ \text{lb}}{1} \times \frac{1\ \text{Kg}}{2.2\ \text{lb}} = 6.8\ \text{Kg}$$

$$\frac{1.9\ \text{MCal}}{\text{Kg}} \times \frac{6.8\ \text{Kg}}{1} = 12.9\ \text{MCal}$$

Getting from one to another

Nutrient	Hay	Cal. Trace	NRC Requirement
Copper	8 mg/Kg	3200 ppm	80 mg

Hay: $\frac{15\ \text{lb}}{1} \times \frac{1\ \text{Kg}}{2.2\ \text{lb}} = 6.8\ \text{Kg}$

Cal Trace: $\frac{2\ \text{oz}}{1} \times \frac{28\ \text{g}}{1\ \text{oz}} = 56\ \text{g} = .056\ \text{Kg}$

Hay: $\frac{8\ \text{mg}}{\text{Kg}} \times \frac{6.8\ \text{Kg}}{} = 54.4\ \text{mg}$

$\frac{3200\ \text{mg}}{\text{Kg}} \times \frac{.056\ \text{Kg}}{} = 179.2\ \text{mg}$

Total copper intake = 54.4 mg + 179.2 mg = 233.6 mg

Getting from one to another

Nutrient	Hay	Cal Trace	NRC Requirement
Vitamin A		120,000 IU/lb	18,000 IU

Cal Trace: $\frac{2\ \text{oz}}{} \times \frac{1\ \text{lb}}{16\ \text{oz}} = .125\ \text{lb}$

Cal Trace: $\frac{120{,}000\ \text{IU}}{1\ \text{lb}} \times \frac{.125\ \text{lb}}{1} = 15{,}000\ \text{IU}$

WATCH OUT!

- Units of measure are extremely important!
  - Manufacturers may use smaller units of measure to make a number bigger
    - In some cases, you may see ppm used instead of percent for macromineral content. 0.1% is the same as 1,000 ppm. People only see big numbers, and think the product is loaded with whatever, when really it isn't.

GUARANTEED ANALYSIS PER 4oz

Crude Protein..20,795mg	Salt.....13,466mg
Lysine.....10,000mg	Iodine.....3mg
Methionine.....5,000mg	Selenium.....2mg
Threonine.....2,000mg	Biotin..... 25mg
Magnesium.....6,000mg	Diamond V Yeast.....2oz
Copper.....300mg	
Zinc.....900mg	

NSC

When we talk about NSC, we ALWAYS talk about percent.. But it should be percent of total diet. EXAMPLE:

Cody is a 1300 lb horse at maintenance. He is diagnosed EMS, and we want his NSC to stay under 12%.

- He eats 25 lb of hay daily, which is tested at 9.1% NSC.
- He also gets 2 pounds Triple Crown Gold balancer daily 16.3% NSC

Is this OK? (Just for NSC… let's not worry about other things now)

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Getting from one to another

Nutrient	Hay	Triple Crown Gold	Requirement
NSC	9.1%	16.3%	12%

Total diet = 25 lb. hay + 2 lb. TC Gold = 27 lb.

NSC intake from hay = .091 x 25 lb = 2.27 lb NSC

NSC intake from TC Gold = .163 x 2 lb = 0.33 lb NSC

Total NSC intake = 2.27 lb + 0.33 lb = 2.6 lb NSC

$$\frac{\text{2.6 lb. NSC}}{\text{27 lb. diet}} \times 100 = \text{9.6\% NSC}$$

The GOOD news

It's not all math!!! Rounding and estimating is OK! This is not a precise science. We DO want to make sure the horse gets what he needs, but it can't ever be super-exact.

- Even if hay is tested, it varies from bale to bale
- Horses are individuals and have individual metabolisms and needs – which means you have to think and adjust

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WANT TO KNOW MORE?

I CAN HELP!

Contact me at www.eqknowledge.com or eqknowledge2@gmail.com