Slide 1

Don't Say the M word.

MATH?

--

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Slide 2

Topics

- FERTILIZER CALCULATIONS
  - How much product is needed
  - How much nutrient was spread
  - Find the lowest cost nitrogen
- IRRIGATION CALCULATIONS
  - Acre inches to gallons
- TOPDRESSING

- POSSIBLY Granular and liquid Active Ingredients

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Slide 3

Fertilizer Topics:

- What's in the bag - what do those number mean?
- How to figure the amount of nutrients in a given bag
- How much fertilizer to apply - per acre, per 1,000ft^2
- Which is the least expensive fertilizer?

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Slide 4

Fertilizer bag labels

- **Fertilizer labels all have 3 numbers on the label. They are important !!**
-
- **The sequence [order of the numbers] is important.**
- **N - P - K –other plant available nutrients not the ELEMENTAL form of the nutrients**

- P_2O_5 = plant available Phosphorus (P)
- K_2O = plant available Potassium (K)

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Slide 5

Fertilizer labels

- **ORDER is important –First 3 # are the same order on EVERY bag** it's the law

- **NITROGEN - PHOSPHORUS - POTASSIUM**

N   P   K

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Slide 6

NUMBERS ON A FERTILIZER BAG ARE A PERCENTAGE

- A 100 lb bag of 46-0-0 has
  100 lb * 0.46 = 46 lbs on Nitrogen

  SO   **TIP # 1**
  A 50 lb bag has ½ of a 100 lb bag = 23 lb N
  50 lb * 0.46 = 23 lbs of N

- A 100 lb bag of 6-0-0 has
  100 lb * 0.06 = 6 lbs on Nitrogen

  How much is in a 50 lb bag of 6-0-0 ?   *3.0 lb of Nitrogen*

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NUMBERS ON A FERTILIZER BAG ARE A PERCENTAGE

- **46-0-0 =** 46% NITROGEN - 0% PHOSPHORUS - 0% POTASSIUM

- **0-46-0 =** 0% NITROGEN - 46% PHOSPHORUS - 0% POTASSIUM

- **0-0-60 =** 0% NITROGEN - 0% PHOSPHORUS - 60% POTASSIUM

- **25-5-15 =** 25% NITROGEN - 5% PHOSPHORUS - 15% POTASSIUM

- **15-30-15 =** __% NITROGEN - __% PHOSPHORUS - __% POTASSIUM

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The amount of fertilizer will always be larger than the rate

- **NO SUCH THING AS 100% NUTRIENT FERTILIZER**
- EXAMPLE: One pound of 50 %
  - = 50 orange balls and 50 maroon balls
- YOU want one lb of orange balls:
  - That will be 100 orange balls
- How many lbs of 50% are needed?
  - WANT / HAVE = NEED
  - **1.0 lb** orange / 0.5 orange = **2.0 lbs** of product

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How you can know your answer is right !!

- If your product has **50% good stuff** [what you want]
  - **= ½ what you want and ½ other stuff**

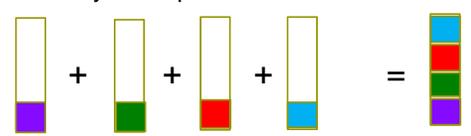- So if you want 1 lb of good stuff, you will need how many lbs of product?

50 goes into 100 two times = 2 lbs of product

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How you can know your answer is right !!

- If your product has **25% good stuff** [what you want]
  - **= ¼ what you want and ¾ other stuff**
- So if you want 1 lb of good stuff, you will need how many lbs of product?

25 goes into 100 FOUR times = 4 lbs of product

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- **50%** = 100/50 = 2
  - So **2 lbs of product** are needed to get one lb good stuff
- **33%** = 100/33 = 3 [real close]
  - So **3 lbs of product** are needed to get one lb good stuff
- **25%** = 100/25 = 4
  - So **4 lbs of product** are needed to get one lb good stuff
- **20%** = 100/20 = 5
  - So **5 lbs of product** are needed to get one lb good stuff
- **10%** = 100/10 = 10
  - So **10 lbs of product** are needed to get one lb good stuff

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Use this information to see if your answer is in the same ballpark as your calculator answer !!

- **46%** is close to 50%   2 lb product for 1 lb good stuff
- **32%** is close to 33%   3 lb product for 1 lb good stuff
- **27%** is close to 25%   4 lb product for 1 lb good stuff
- **19%** is close to 20%   5 lb product for 1 lb good stuff
- **8%** is close to 10%   10 lb product for 1 lb good stuff

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- To find amount of nutrient = **multiplication**

- To find amount of **fertilizer = division**

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Several ways to figure **amount of nutrients:**

- **Using a %:** A 50 lb bag has a label of 28-0-0. How much nitrogen is in the bag?
  - -bag method =

  100 lb = 28 lb N   so ½ of 28 = 14 lb N

  Remember percentages?   Math way = ?

  50 lb /bag * 0.28 = 14 lb N /bag

  size of package * % nutrient   = amount of nutrient in the package

  This the method to determine how much nutrient is in a given amount of fertilizer

- **How much potassium?**

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Practice

- A 50 lb Bag of 26-8-16

  - Has ____**13**____ lb Nitrogen?

  - Has ____**4**____ lb Phosphorus?

  - Has ____**8**____ lb Potassium?

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What is this "per thousand square feet" thing about?

When do we talk about acres?

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If one acre = 43,560 ft^2

divide by 1,000 ft^2

Then, there are **43.56 blocks of 1,000ft^2 each in one acre**

1 acre has **43.56   1,000 ft^2 boxes**

10% = 0.10   5% = 0.05   1,000 ft^2 = M

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Convert 1,000 ft^2 to Acre

- Remember there are how many 1,000 ft^2 in one acre ?

  43.56 thousand square foot blocks in one acre

  If we put **1 lb into each block**, how many lbs are needed?
      43.56 lb = **43.56 lb per acre**

  If we put **2.5 lb into each block**, how many lbs are needed?
      43.56 lb = **108.9 lb per acre**

  If we put **5.7 lb into each block**, how many lbs are needed?
      43.56 lb = **248.3 lb per acre**

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Slide 19

- To find amount of nutrient = **multiplication**

- To find amount of **fertilizer = division**

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Slide 20

How much fertilizer do you need to apply?

DIVISION

- There are several methods to calculate the amount of material needed.
- This is the easiest!

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Slide 21

$$\frac{WANT}{HAVE} = NEED$$

$$\frac{Rate}{Fertilizer \%} \ [in \ decimal]$$

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Slide 22

$$\frac{WANT}{HAVE} = NEED \qquad \frac{Rate}{Fertilizer \% \ in \ decimal}$$

You want 1.0 lb N / **1,000 ft^2** using 20-0-10. *How much fertilizer is needed?*

WANT >> 1.0 lb. N/**1,000ft^2** >> 1.0

HAVE >> 20 % N fertilizer >> 0.20

= **5.0 lb of Product** [20-0-10] **per 1,000 ft^2**

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Slide 23

YOU WANT TO APPLY 35 LB OF NITROGEN **PER ACRE**

YOU HAVE 46 - 0 – 0

$$\frac{WANT}{HAVE} \quad \frac{35 \ LB \ N \ /A}{0.46} = 76.09 \ LB \ PRODUCT \ / ACRE$$

YOU WANT TO APPLY 0.75 LB OF NITROGEN **PER 1,000 FT^2**

YOU HAVE 21 – 0 – 0

$$\frac{WANT}{HAVE} \quad \frac{0.75 \ LB \ N \ /M}{0.21} = 3.57 \ LB \ PRODUCT \ / 1,000 \ FT^2$$

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Slide 24

The area in the ANSWER is the same as the RATE

Answer in in pounds of product per same area as the rate.

Example: If the rate is per 1,000ft^2 then the answer is per 1,000ft^2

Example: If the rate is per **ACRE** then the answer is per **ACRE**

Example: If the rate is per hectare then the answer is per hectare

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Your boss **wants to apply 0.75 lb. N /M** and you have some 25-5-15 in the shed.

How much fertilizer per *1,000ft² ?*

WANT	0.75 LB N /M	=	3.0 LB PRODUCT / 1,000 FT²
HAVE	0.25		

0.75 / 0.25 =   *3.0 lb fertilizer / 1,000ft²*

How much fertilizer per Acre ?

3.0 lb/M * 43.56 M/A   **= *130.68 lb fertilizer/A***

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- PRACTICE

You want 0.7 lb N / **1,000 ft²** using
25-0-10. *How much fertilizer is needed?*
2.8 lb fertilizer / 1,000 ft²

You want 30.5 lb N / **acre** using
16-0-10. *How much fertilizer is needed?*
190.62 lb fertilizer / Acre

You want 0.9 lb N / **1,000 ft² [M]** using
46-0-0. *How much fertilizer is needed?*
1.96 lb fertilizer / 1,000 ft²

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MAKE SENSE ??

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What if you want to find the amount of Nitrogen that you applied?

- To find amount of **fertilizer needed = division**
  (or how much product)

- To find amount of
   nutrient = **multiplication**

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Find the amount *of nutrient*

MULTIPLICATION   **TIP # 2**

- ***The size of the package* times the *% nutrient*.**

Remember 50 lb bag 25-0-0 =   50lb * 0.25 =12.5 lb of N

- How much N is a 500 lb of a 25-5-15?

  500lb *package* *   0.25 *% of N* = 125 lb of Nitrogen

  125 lb nitrogen in that size package

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How many pounds of N, P, & K are in a ton of 5-10-20?   Ton = 2,000 lb

- N_____
  2,000 * 0.05 = **100 lb N per ton**

- P_____
  2,000 * 0.10 **= 200 lb N per ton**

- K_____
  2,000 * 0.20 **= 400 lb N per ton**
  Notice a pattern?

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Practice time = Find the N

- A 100 lb bag of 32-0-0 has
  100 lb * 0.32 = 32 lbs on Nitrogen
- A 2,000 lb bag of 25-0-0 has
  2,000 lb * 0.25 = 500 lbs on Nitrogen
- A 50 lb bag of 28-0-0 has
  50 lb * 0.28 = 14 lbs on Nitrogen
- A 50 lb bag of 16-0-0 has
  50 lb * 0.16 = 8.0 lbs on Nitrogen

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Money saver alert   Money saver alert

Find the lowest cost per pound of Nitrogen?

- Compare several fertilizers quickly
- Using "cell phone calculator"

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How much does one lb of N cost?

If the cost of a 50 lb bag of 28-5-17 is $30.25
How much is one lb of Nitrogen?

First – remember you want **Dollar per lb N**

this is   **Cost of *the package***
          Lb N in *the package*   **TIP # 2**

so $30.25   = **$2.16 per lb N**
50 lb * 0.28 =   14 lb. N

HOW MUCH NITROGEN is "size of the package times the % of Nitrogen"

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Which is the cheapest source of plant available N?

A) 34-0-0 @ $22.10/ 50 lb bag
   $22.10 / 17 lb N = $1.30 lb N

B) 21-0-0 @ $14.70/ 50 lb bag
   $14.70 / 10.5 lb N = $ 1.40 lb N

C) 46-0-0 @ $1,104.00/ ton
   $1,104 / 920 lb N = $1.20 lb N

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Questions

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Quick IRRIGATION calculations

TWO STEPS

- **1)** FIND THE TOTAL NUMBER OF ACRE INCHES NEEDED

  THEN

- **2)** MULTIPLY ACRE INCHES BY 27,154 GALLONS

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1/21/2019

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Total acre inches

- Multiply
  - inches of water required per week by
    - Acres [of your fields] by
      - Weeks [you need to irrigate]

  Example: **How many acre inches of water are needed to irrigate 10 acres with 1.25 inches per week for 8 weeks?**

  1.25 inches * 10 acres * 8 weeks = **100 acre inches**

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Examples of acre inches

Example: **How many acre inches of water are needed to irrigate 18.5 acres with 0.75 inches per week for 8 weeks?**

0.75 inches/week * 18.5 acres * 8 weeks = **110 acre inches**

Example: **How many acre inches of water are needed to irrigate 60 acres with 1.0 inch per week for 4 weeks?**

1.0 inches/week * 60 acres * 8 weeks = **480 acre inches**

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• FIND THE GALLONS OF WATER NEEDED

- FIND THE ACRE INCHES
  - MULTIPLY ACRE INCHES PER WEEK BY
  - ACRES THEN BY
  - WEEKS

- EQUAL TOTAL ACRE INCHES REQUIRED

  - **MULTIPLY THIS BY GALLONS IN AN ACRE INCH**
    - 27,154 gallons per acre inch

- **EQUALS THE TOTAL GALLONS REQUIRED**

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Example: How many acre inches of water are needed to irrigate 10 acres with 1.25 inches for 8 weeks?

1.25 inches/week * 10 acres * 8 weeks = **100 acre inches**

HOW MANY GALLONS IS THIS?

- MULTIPLY THE REQUIRED ACRE INCHES BY 27,154 [GALLONS IN ONE ACRE INCH]

- SO: 100 acre inches * 27,154 gallons/ acre inch =

  2,715,400 gallons

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EXAMPLES

- How many gallons are used to irrigate 15 acres with 0.75 inches of water for 8 weeks?
  - **Use 90 acre inches = 2,443,860 gallons**

- How many gallons are saved if you use ½ acre inch less of water per week over 40 acres for 10 weeks?
  - **Save 200 acre inches = 5,430,800 gallons**

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Questions

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TOP DRESSING CALCULATIONS

- Again two steps:

- 1) FIND THE THICKNESS USED *IN FEET*
  - **This is the tricky bit !!!**

- 2) MULTPLY THICKNESS BY TOTAL AREA [IN SQUARE FEET]

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1) Thickness (must be) in feet

- **Convert measurement to a decimal**
  - Usually starts with a fraction of an inch
    - 1/2" = 0.50   3/8" = 0.3750   3/16" = 0.1875"

  - Convert the inch to feet by **dividing by 12**
    - 12 inches in one foot   number gets smaller – divide

    - 0.50" / 12 = 0.0417'   0.1875" / 12 = 0.0156'

    - OMG, that's a small number – yes it is!

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2) Multiply the thickness by area

[feet times square feet = cubic feet]

$ft \quad * \quad ft^2 \quad = \quad ft^3$

Thickness * Area = Volume

- How much topdressing is needed to put ½" over 25,000 ft^2?
- ½" = 0.50"
- 0.50" / 12 = 0.0417'   [note: the answer is **in feet**]
- 0.0417' * 25,000 ft^2 =
  1,041.7 cubic feet

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- How much topdressing is needed to put 3/16" over 5,000 ft^2?
- 3/16" = 0.1875"
- 0.1875" / 12 = 0.0156'
- 0.0156' * 5,000 ft^2 =
  78.13 cubic feet

- How much **MULCH** is needed to put 3" over 5,000 ft^2?
- 3" = 3.0"
- 3.0" / 12 = 0.25'
- 0.25' * 5,000 ft^2 =
  1,250.0 cubic feet

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YOU TRY:
- How much topdressing is needed to put 9/16" over 35,000 ft^2?
- 9/16" = 0.5625"
- 0.5625" / 12 = 0.0469'
- 0.0469' * 35,000 ft^2 =
  1640.6 cubic feet

- How much **MULCH** is needed to put 2.5" over 2,000 ft^2?
- 2.5" = 2.5.0"
- 2.5" / 12 = 0.2083'
- 0.2083' * 2,000 ft^2 =   **416.67 cubic feet**
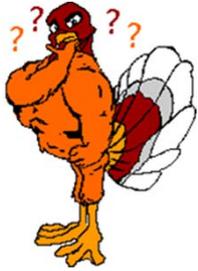
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Cubic feet to cubic yards

- Divide your cubic feet by 27 = cubic yards

  - *3' * 3' * 3' = 27 cubic ft in one cubic yard*

  1640.6 cubic feet / 27ft^3/yd^3 **= 60.76 yd^3**

  416.67 cubic feet / 27ft^3/yd^3 **= 15.43 yd^3**

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Questions

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FOR MORE PRACTICE QUESTIONS GO TO:

**HTTP://WWW.TURFPROFESSIONAL.ORG/PUBS/CALCU
LATIONS_REVIEW_SOME_ANSWERS.PDF**

Most answers are correct!

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