



# Mathematical Calculations for Pesticide and Fertilizer Applications.

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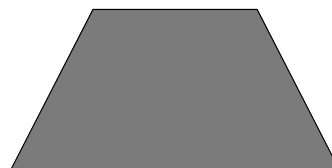
Robert Shortell Ph.D.

6/30/2011

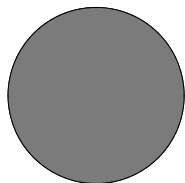
## Calculating Areas



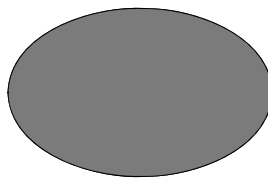
Rectangle



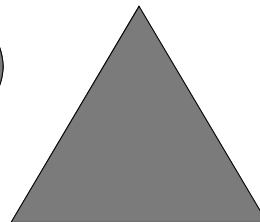
Trapezoid



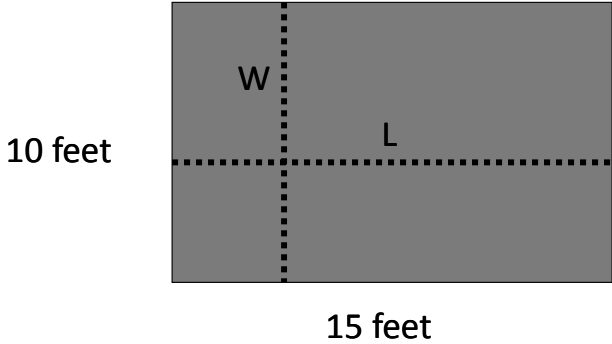
Circle



Oval



Triangle

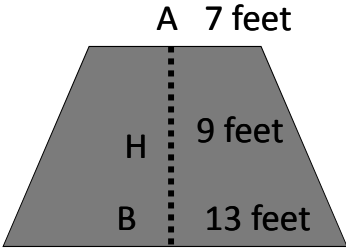


10 feet

15 feet

Rectangle and/or square

Area =  $L \times W$



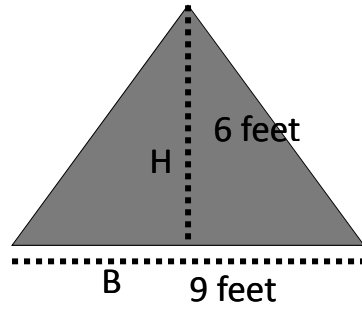
A 7 feet

H 9 feet

B 13 feet

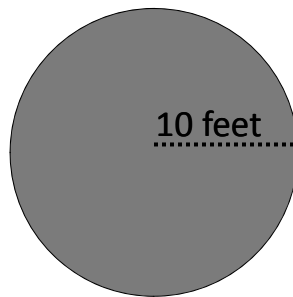
Trapezoid

Area =  $\frac{(A + B)}{2} \times H$



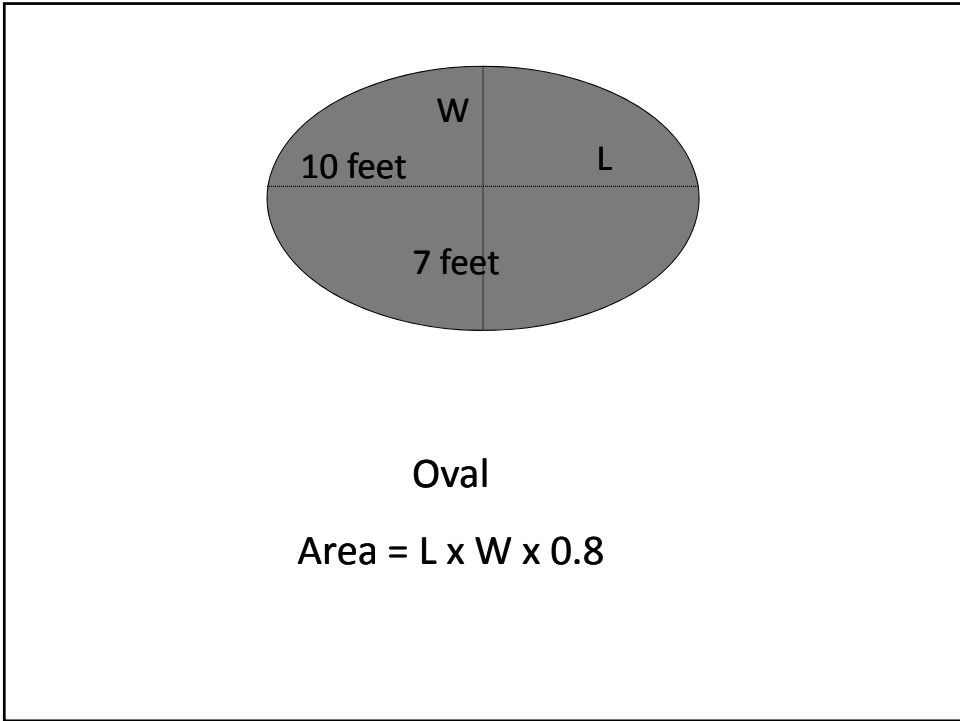
Triangle

$$\text{Area} = (B \times H) / 2$$



Circle

$$\text{Area} = (3.14) \times r^2$$



### Factors Affecting Liquid Applications

- Tank capacity (gallons)
  - Inaccurate measurement can cause under or over applications
  - Thought it was 200 gal tank, but was 250 gal = 25% error

## Factors Affecting Liquid Applications

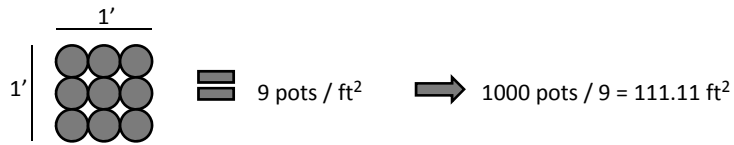
- Sprayer output (fl oz/min)
  - Watch, container, accurate liquid measuring device in fl oz
  - Use same operating parameters (nozzles, pressure, etc.)
  - Add output of each nozzle for total from a predetermined amount of time
  - Repeat at least two more times to accurately determine output

## Granular Calibration

- Calculate the area to be covered
  - Drop spreader – width of hopper x distance
  - Rotary spreader – swath width x distance
- Figure out the amount of pesticide that you need to put out over the predetermined area
- Collect and weigh the output
- Adjust settings as necessary

- The label says to apply 10 oz. in 100 gal. using 1 oz. of dilute per ft<sup>2</sup>, and you wish to treat 1000, 4" pots:

– How much concentrate do you need?



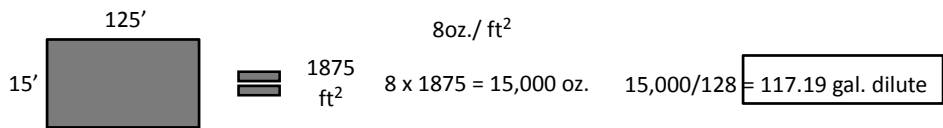
111.11 oz. diluted solution needed    →    111.11/128 = 0.868 gal. dilute needed

10/100 = X/0.868    →    X = 0.0868 oz. of concentrate needed

- If you wanted to drench with Adept for fungus gnats using 5 oz./100 gal.:

– How much total dilute will be needed to treat a 125 x 15 ft. bed using 8 oz/ ft<sup>2</sup>?

– How much Adept is needed?



5oz./100 gal. = X oz./117.19 gal.    →    X = 5.86 oz. Adept needed

- If you calibrate a sprayer to deliver 10 L/13,000 ft<sup>2</sup> :
  - How much will you need to spray an acre (in gal.)?
  - If you triple your ground speed, while holding all other factors the same, how much will you need?

$$10 \text{ L} / 13,000 \text{ ft}^2 = X \text{ L} / 43,560 \text{ ft}^2 \qquad X = 33.508 \text{ L to spray 1 A}$$

$$33.508 \text{ L} / 3.785 = 8.85 \text{ gal./A}$$

By tripling the ground speed, you use 1/3 of the volume per pass

- Apply Daconil Ultrex in 90 to 450 gal. of water per acre, at 1.8 to 3.5 oz. per 1000 ft<sup>2</sup> :
  - How much product do you need to add to your spray tank to treat 3 acres of fairway?
  - Your sprayer is calibrated to deliver 30 GPA at 5MPH, how many passes will you need to make on a 1 acre fairway?

$$3.5 \text{ oz./1000 ft}^2 = X \text{ oz./3A}$$

$$(3.5 \text{ oz.} \times 3A \times 43,560) / 1000 = X \text{ oz.} = 457.38 \text{ oz on 3A}$$

$$457.38 \text{ oz} / 128 = 3.57 \text{ gal/3A}$$

$$90 \text{ gal.} / 30 \text{ GPA} = 3 \text{ passes}$$

- You would like to apply Permit at 2.5 oz./1000 ft<sup>2</sup> and you will need to add a surfactant at 0.25 v/v, as per label directions. You have calibrated the sprayer to deliver 25 GPA:
  - How much product will you need to spray 5 acres?
  - How much solution will you need to spray 5 acres?
  - How much surfactant will you need to spray 5 acres?

How much product will you need to spray 5 acres?

$$2.5 \text{ oz./1600 ft}^2 = X \text{ oz./} (5 \times 43,560 \text{ ft}^2)$$

$$X \text{ oz.} = 340.31 \text{ oz Product}$$

$$340.31 \text{ oz./128} = 2.67 \text{ gal. product / 5A}$$

How much solution will you need to spray 5 acres?

$$25 \text{ gpa} \times 5 \text{ A} = 125 \text{ gal. solution}$$

How much surfactant will you need to spray 5 acres?

$$125 \text{ gal.} \times 0.0025 = 0.3125 \text{ gal. surfactant}$$

- It takes you 45 sec. to spray a swath 36" wide by 50 ft. (1 pass):
  - How many MPH are you walking?

1 hr. = 3600 sec.

50 ft. = 0.00947miles

45 sec. = 0.0125 hrs.

$$0.00947 / 0.0125 = 0.76 \text{ MPH}$$

**Always read and follow  
label instructions!!!**