PESTICIDE CALIBRATION FORMULAS AND INFORMATION

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Acres covered/hour: = MPH x Swath (ft) x 0.1212 or $\frac{\text{MPH x Swath (ft)}}{8.25}$

Gallons Per Acre (GPA):

= $\frac{\text{GPM (whole boom) x 495}}{\text{MPH x Swath (ft)}}$ or $\frac{\text{GPM per nozzle x 495}}{\text{MPH x nozzle spacing (ft)}}$

= $\frac{\text{GPM per nozzle x 5940}}{\text{MPH x nozzle spacing (inches)}}$ or $\frac{\text{GPM per nozzle x 5940}}{\text{MPH x width of nozzle spray (inches)}}$

= $\frac{\text{fl.oz collected per nozzle in 100 ft x 40.8375}}{\text{nozzle spacing (inches)}}$ or $\frac{\text{fl.oz. collected per nozzle x 4084}}{\text{ft. traveled x nozzle spacing (inches)}}$

= $\frac{\text{gallons collected per nozzle x no. nozzles x 43560}}{\text{ft. traveled x Swath (ft)}}$ or $\frac{\text{gallons per 1000 sq.ft.}}{0.023}$

Gallons per 1000 sq.ft. = 0.023 x GPA

Ounces per 1000 sq.ft. = 2.94 x GPA

Gallons Per Minute (GPM): = $\frac{\text{GPA x MPH x Swath (ft)}}{495}$ or $\frac{\text{fl.oz per minute}}{128}$

= $\frac{\text{GPA x MPH x nozzle spacing (inches) x no. nozzles}}{5940}$

GPM/Nozzle: = $\frac{\text{GPA x MPH x nozzle spacing (inches)}}{5940}$ or $\frac{\text{GPA x MPH x nozzle spacing (ft)}}{495}$

= $\frac{\text{Test jar fl.oz x 0.46875}}{\text{seconds to fill test jar}}$ or $\frac{7.5}{\text{seconds to fill 1 pint (16 fl.oz.)}}$

= $\frac{15}{\text{seconds to fill 1 quart (32 fl.oz.)}}$

Minutes/Acre: = $\frac{495}{\text{MPH x Swath (ft)}}$

Acres covered per tank: = $\frac{\text{Gallons per tank}}{\text{GPA}}$

Minutes/load: = $\frac{\text{gallons/load x 495}}{\text{MPH x GPA x Swath (ft)}}$

Material needed per tank = $\frac{\text{rate/A x gallons/tank}}{\text{GPA}}$

Travel Speed (Miles Per Hour, MPH) = $\frac{\text{Distance traveled (ft) x 0.68}}{\text{time (seconds) to travel distance}}$

Flow Rate (as influenced by pressure):

$$\frac{GPA_1}{GPA_2} = \frac{\sqrt{PSI_1}}{\sqrt{PSI_2}} \quad \text{or} \quad GPA_2 = GPA_1 x \sqrt{\frac{PSI_2}{PSI_1}} \quad \text{or} \quad PSI_2 = PSI_1 x \left(\frac{GPA_2}{GPA_1}\right)^2$$

For any change in travel speed (mph), calculate the resulting GPA_2 by:

$$GPA_2 = \frac{GPA_1 x MPH_1}{MPH_2} \quad \text{or} \quad \frac{GPA_1}{GPA_2} = \frac{MPH_2}{MPH_1} \quad \text{or} \quad MPH_2 = \frac{GPA_1 x MPH_1}{GPA_2}$$

Fluid Application

lbs/acre nutrient applied = 0.226464 x element concentration (ppm) x acre inches of solution applied

PPM = $\frac{1{,}000{,}000 \times \text{lbs ai used}}{\text{gal/tank} \times 8.34}$ or $\frac{\text{wt. of material to be used (lbs)} \times 1{,}000{,}000}{\text{wt. of tank mixture (lbs)}}$

= $\frac{1{,}000{,}000 \times \text{oz commercial material used} \times \%\text{ ai (decimal)}}{\text{gal/tank} \times 8.34 \times 16}$ or $\frac{1{,}000{,}000 \times \text{fl.oz. used} \times \text{lb ai/gal}}{\text{gal/tank} \times 8.34 \times 128}$

lbs nutrients applied/acre = ppm of the element in the water x acre-inches water applied x 0.226464

lb ai to use per tank = $\frac{\text{PPM desired} \times \text{gal/tank} \times 8.34}{1{,}000{,}000}$ or $\frac{\text{ppm desired x gal/tank x 8.34}}{1{,}000{,}000 \times \%\text{ ai}}$

lb commercial material to use per tank = $\frac{\text{PPM desired} \times \text{gal/tank} \times 8.34}{1{,}000{,}000 \times \%\text{ ai (decimal)}}$ or $\frac{\%\text{ desired x gal/tank x 8.34}}{\%\text{ ai (decimal)}}$

fl. oz. to use per tank = $\frac{\text{PPM desired} \times \text{gal/tank} \times 8.34 \times 128}{1{,}000{,}000 \times \text{ai per gal}}$

gal commercial material to use per tank = $\frac{\text{ai (decimal)} \times 8.34 \times \text{gal/tank}}{\text{ai per gal} \times 100}$

% ai in a spray mix = $\frac{\text{lbs. commercial material used} \times \%\text{ ai (decimal)}}{\text{gal/tank} \times 8.34}$

gal commercial material for total treated acres = $\frac{\text{PPM desired} \times \text{GPA} \times \text{acres} \times 8.34}{1{,}000{,}000 \times \text{lb ai/gal}}$

Active Ingredients (ai)

lbs commercial material/acre = $\frac{\text{lbs ai to be applied per acre}}{\%\text{ ai of material}}$

gal commercial material/tank = $\frac{\text{gallons/tank x lb ai to be applied per acre}}{\text{gallons/acre x lbs ai per gallon}}$

gal commercial material/acre = $\frac{\text{lbs ai to be applied per acre}}{\text{lbs ai per gallon}}$

Time (seconds) required to cover a specific distance to obtain a desired speed (MPH).

Desired MPH	Feet per minute	Time Required (Seconds) to Travel a Distance of		
		100 ft.	200 ft.	300 ft.
2.0	176	34	68	102
2.5	220	27	54	81
3.0	264	23	45	68
3.5	308	20	39	58
4.0	352	17	43	51
4.5	395	15	30	45
5.0	440	14	27	41
6.0	528	--	23	34
7.0	616	--	19	29
8.0	704	--	17	26
9.0	792	--	15	23

Metric Prefix Definitions (basic metric unit = 1)

tera	=	10^{12}	deci	=	10^{-1}	**Example (weight):**	**Example (volume):**
giga	=	10^{9}	centi	=	10^{-2}	$1kg = 10^{3}g = 10^{6}mg = 10^{9}\mu g = 10^{12}ng$	$1L = 10^{3}mL = 10^{6}\mu L$
mega	=	10^{6}	milli	=	10^{-3}	$1g = 10^{-3}kg = 10^{3}mg = 10^{6}\mu g = 10^{9}ng$	$1mL = 10^{-3}L = 10^{-6}\mu L$
kilo	=	10^{3}	micro	=	10^{-6}	$1mg = 10^{-6}kg = 10^{-3}g = 10^{3}\mu g = 10^{6}ng$	$1\mu L = 10^{-6}L = 10^{-3}mL$
hecto	=	10^{2}	nano	=	10^{-9}	$1\mu g = 10^{-9}kg = 10^{-6}g = 10^{-3}mg = 10^{3}ng$	
deca	=	10^{1}	pico	=	10^{-12}	$1ng = 10^{12}kg = 10^{-9}g = 10^{-6}mg = 10^{-3}\mu g$	

Approximate Rates of Application Equivalents

Weights

1 oz/ft^2	= 2722.5 lbs/A	
1 oz/yd^2	= 302.5 lbs/A	
1 oz/100 ft^2	= 27.2 lbs/A	
1 oz/1000 ft^2	= 43.46 oz/A	= 2.72 lbs/A
1 lb/A	= 1 oz/2733 ft^2	= 8.5 g/1000 ft^2
100 lb/A	= 2.5 lb/1000 ft^2	
1 yd^3 sand	= 1.3 to 1.5 tons	
1 bushel	= 1¼ ft^3	= 0.046 yd^3

Liquid

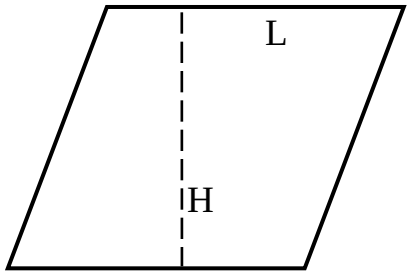
1 oz/1000 ft^2	= 43.56 oz/A	= 1.4 qt/A
1 pt/1000 ft^2	= 5.4 gal/A	
100 gal/A	= 2.3 gal/1000 ft^2	= 1 qt/100 ft^2

Helpful Calculations and Formulas:

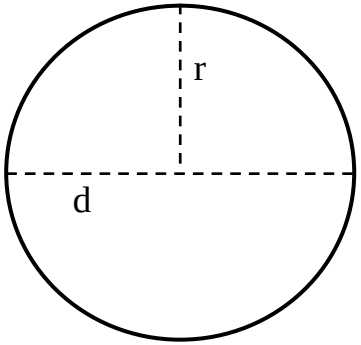
Rectangle, square or parallelogram:	**area**	=	length (L) x width (W)		
Trapezoid:	**area**	=	[a + (b x h)]) 2		
Circle:	**area**	=	radius (r)^2 x 3.1416 (or π)	=	diameter (d)^2 x 0.7854
	radius	=	d ÷ 2		
	diameter	=	r x 2		
	circumference	=	π x d		
Sphere:	**volume**	=	r^3 x 4.1888	=	d^3 x 0.5236
Triangle:	**area**	=	(W x H)) 2		
Cylinder:	**volume**	=	r^2 x π x L		

Finding Tank Capacity (gallons):

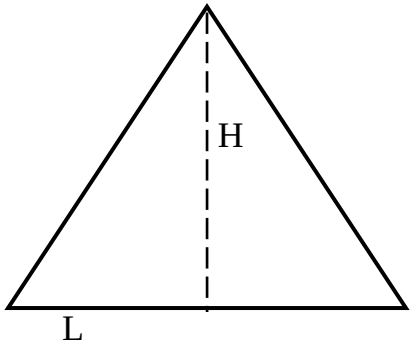
Cylindrical tanks:	**(inches)**	=	L x d^2 x 0.0034
	(feet)	=	L x d^2 x 5.875
Rectangle tanks:	**(inches)**	=	L x W x height x 0.004329
	(feet)	=	L x W x height x 7.48
Elliptical tanks:	**(inches)**	=	L x short diameter (sd) x long diameter (ld) x 0.0034
	(feet)	=	L x sd x ld x 5.875



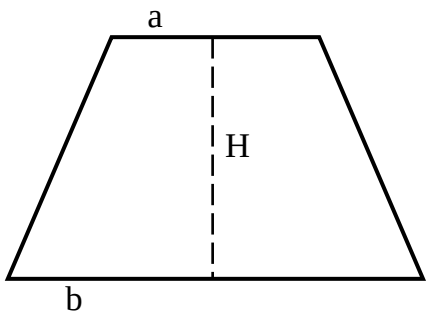
Parallelogram



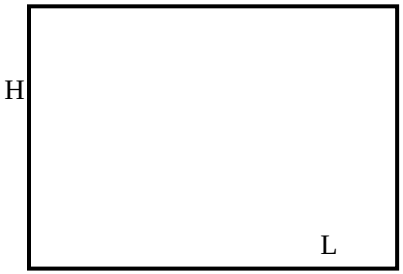
Circle



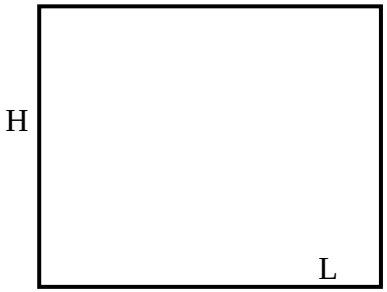
Triangle



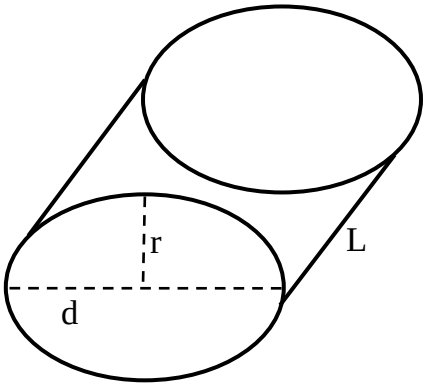
Trapezoid



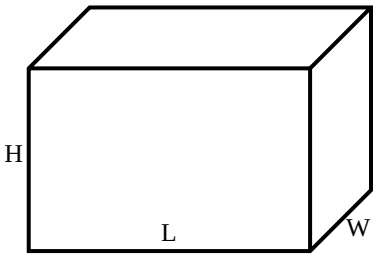
Rectangle



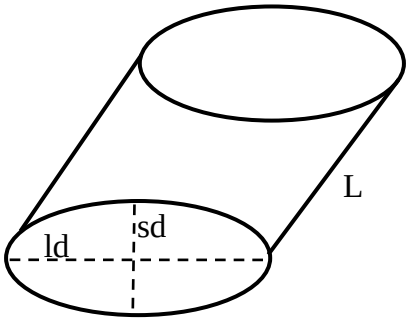
Square



Cylindrical Tank



Rectangular Tank



Elliptical Tank