

Conversions/Formula Sheet

1 mL = 0.034 fl oz

1 gallon = 3.785344 liters

1 hectare = 2.471 acres

1 fl oz = 29.573 mL

1 pint = 16 oz

1 ft = 30.48 cm

1 mph = 88 ft/min

1 mile = 5280 ft

1 pound = 454 grams

1 acre-inch = 27,154 gallons

1 acre = 43,560 ft²

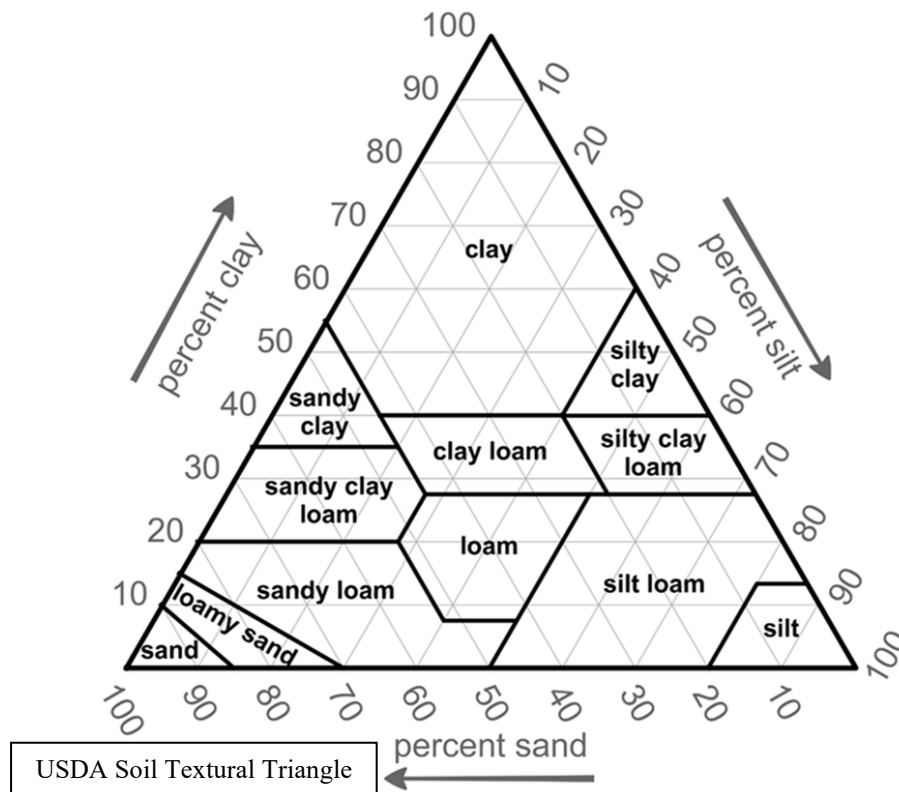
1 kg = 2.205 lbs

$A = (\pi)r^2$

$C = (\pi)2D$

$\pi = 3.14$

$A^2 + B^2 = C^2$



1. **EPTC** may be chemigated on potatoes for control of shattercane and other problematic grassy weed species. The grower wants to apply 7 pints/ac to their pivot that sits on a 160-acre square field with no corner watering system, while also applying 0.75 acre-inches of water via irrigation. The producer's well has an output of 750 gpm, which dictates the speed of the pivot
 - A. How many hours will it take to make this application?
 - (A. 72.4 hr)
 - (B. 48.6 hr)
 - (C. 56.8 hr)**
 - (D. 48.6 hr)
 - B. IF EPTC is sold in 2x2.5 gallon cases, how many cases of EPTC will be needed for this application?
 - (A. **22 cases**)
 - (B. 28 cases)
 - (C. 11 cases)
 - (D. 18 cases)
 - C. At what GPM should the chemigation pump be set for this application?
 - (A. 1.93 GPM)
 - (B. 0.041 GPM)
 - (C. 0.025 GPM)
 - (D. 0.032 GPM)**
2. For relay-cropped of soybean in wheat, banded herbicide applications are often required to ensure crop safety for wheat. Prior to the planting of soybean, the grower wants to apply 15 fl. oz/ac of **Verdict® herbicide (BASF)** to the strips in the field where the wheat was not drilled to ensure a good burndown. If the wheat was drilled with 7.5-inch spacings and every third hole was plugged to allow for soybean planting, how many gallons of Verdict® will be needed to apply to this 430-acre field?
 - (A. 33.6 gal)
 - (B. 16.8 gal)**
 - (C. 50.4 gal)
 - (D. 21.0 gal)
3. An applicator wants to speed up their spraying because of incoming weather. They found some AIXR11008 nozzles to swap out with their AIXR11004 nozzles. If they had applied 15 GPA before at 6.6 mph, what speed will they need to apply with the new nozzles, assuming both nozzles will be run at the same 40 psi and are not damaged.
 - (A. 9.9 mph)
 - (B. 13.2 mph)**
 - (C. 15.8 mph)
 - (D. 18.4 mph)

4. An applicator was spraying and listening to the radio at the same time. When “Even Flow” by Pearl Jam came on, they tried to turn up the radio to better understand Eddy Vedder. In this process, the applicator unknowingly and inadvertently increased the PSI on their sprayer from 38 psi to 57 psi. If the sprayer was applying 15 gpa before “Even Flow” came on, what was the gpa after the applicator turned up the radio?
- (A. 12.2 GPA)
(B. 16.7 GPA)
(C. **18.4 GPA**)
(D. 22.5 GPA)
5. As a part of their chemigation, a grower needs to add Rosie’s Wizard Water™ to their chemigation tank to pump in their water at 0.025% v/v of the application. If the grower is applying 0.15 acre-inches of water to their pivot that spans 745 ft, how many gallons of Rosie’s Wizard Water™ must be added to the tank?
- (A. 20.4 gal)
(B. 407.4 gal)
(C. **40.7 gal**)
(D. 81.5 gal)
6. An applicator is applying an approved dicamba herbicide to their field of soybeans. Due to the location of this field and the crops grown in adjacent fields, a 240 ft buffer must be left unsprayed around all edges of the field. If the field dimensions are 1320 ft by 5280 ft, what percentage of the field must be left unsprayed?
- (A. **42.2%**)
(B. 92.6%)
(C. 22.0%)
(D. 57.9%)
7. Eastern Red Cedar is an invasive woody species that is increasingly diminishing the natural prairie of Western Nebraska. After prescribed burning two years ago, a rancher is spot spraying seedling cedars. If the recruits are infesting rangeland at a rate of 157 seedlings per acre and each seedling occupies 0.25 ft², how many 16 fl oz bottles of CedarEater™ will be needed at a rate of 18 fl. oz/ac on a 970 acre pasture.
- (A. 13)
(B. 2)
(C. **1**)
(D. 34)
8. Rancher George realizes he has an exceptionally prolific musk thistle problem in his managed pasture. Being the frugal cowboy he is, he discovers that he can impregnate his fertilizer with Grazon NTX to save on application costs.
- a. If George is to apply 150 lbs N/ac using 46-0-0 dry urea and 2.1 pts/ac of GrazonNext®, how many gallons of GrazonNext® does George need to mix with his urea if his spreader can hold 3.25 tons of fertilizer?
- (A. 11.4 gallons)
(B. 12.4 gallons)
(C. 1.2 gallons)
(D. **5.2 gallons**)

- b. If George's ground driven spreader throws fertilizer at a width of 45 ft and the tire diameter is 42 inches, how many lbs of impregnated fertilizer should George collect with six revolutions of the tire to ensure proper calibration?

(A. **22.2 lbs**)
 (B. 10.2 lbs)
 (C. 62.2 lbs)
 (D. 28.6 lbs)

9. A producer is comparing two different herbicide programs to utilize on their farm this spring.

Program A			Program B		
Product	Rate	Price (\$)/gal	Product	Rate	Price (\$)/gal
Celsius XTRA	2.5 qt/ac	50.89	Bridel Max	55 oz/ac	87.98
ME-STAR	3 oz/ac	57.44	Atrazine 4L	1 lb/ac	15.34
Gly-FO'-Sate	2 pts/ac	14.78	Gly-FO'-Sate	2 pts/ac	14.78
OutLandis	3 oz/ac	679.68	DiWeed DUO	1 qt/ac	117.47
DiWeed	12 oz/ac	257.29	GatherUp PRO III	30 oz/ac	24.15
GatherUp PRO III	30 oz/ac	24.15			
TOTAL		\$	TOTAL		\$

- A. What is the cost of program A?

(A. \$68.42/ac)
 (B. \$74.73/ac)
 (C. **\$82.56/ac**)
 (D. \$96.18/ac)

- B. What is the cost of Program B

(A. \$72.49/ac)
 (B. **\$80.36/ac**)
 (C. \$85.11/ac)
 (D. \$95.47/ac)

- C. Which is the lower cost program?

(A. Program A)
 (B. **Program B**)
 (C. Both Programs Cost the Same)

10. Esmeralda is loading her 1300 gallon sprayer to apply soybean pre-emergence herbicides. If Esmeralda were to apply ABUZIN 75DF at 0.5 lbs ai/ac and Me-Too-Le'chlor II 7.8EC at 1.3 lbs at/ac, how much of each product will she need to add to the tank to achieve an application volume of 17 GPA.

- a. ABUZIN 75DF

(A. **51.0 lb**)
 (B. 38.2 lb)
 (C. 45.9 lb)
 (D. 66.7 lb)

- b. Me-Too-Le'chlor II 7.8EC

(A. 9.8 gal)
(B. 11.4 gal)
(C. 16.6 gal)
(D. **12.7 gal**)

11. Buzzy's Drone Spraying is planning to spray a new field. The field is triangular in shape with the hypotenuse measuring 1236 ft, the angle of the field at the entry point is 37.6 degrees, and the short side of the field is 754 ft (assume a right triangle).

- a. What is the area of the field Buzzy is spraying in acres?

(A. 16.96 acres)
(B. 10.70 acres)
(C. **8.48 acres**)
(D. 13.60 acres)

- b. Buzzy's drones can carry 50L of spray solution. If the application is to be made at 4 GPA, how many times will Buzzy need to fill his tank?

(A. **3**)
(B. 6)
(C. 2)
(D. 1)

12. You intend to spray PREs prior to planting soybeans for some postemergence herbicide trials. When you get out to load your MudMaster® Sprayer, you find your intern forgot to pack the **Fierce® MTZ herbicide** before heading downstate. Luckily, you do have the components of Fierce® MTZ herbicide (0.5 lb/gal flumioxazin, 0.64 lb/gal pyroxasulfone, and 1.5 lb/gal metribuzin). If you intended to apply 12 fl. oz of Fierce® MTZ herbicide, how much **Zidua® SC(4.17SC)**, **Valor® SX (51WDG)**, and **ABUZIN® HARDR 95DF** will you need to mix to achieve the same rate?

- a. **Zidua® SC(4.17SC)**

(A. **1.84 fl oz/ac**)
(B. 7.68 fl oz/ac)
(C. 0.47 fl oz/ac)
(D. 18.4 fl oz/ac)

- b. **Valor® SX (51WDG)**

(A. 0.78 oz/ac)
(B. **1.47 oz/ac**)
(C. 2.94 oz/ac)
(D. 6.00 oz/ac)

- c. **ABUZIN® HARDR 95DF**

(A. 1.5 oz/ac)
(B. **2.37 oz/ac**)
(C. 1.78 oz/ac)
(D. 18.95 oz/ac)

13. You are applying **Convintro™ herbicide** to your soybean 1 day after planting them. The rates for Convinto are as follows:

Application Timing	Maximum Rate in Fluid Ounces of Diflufenican SC500 Herbicide per Acre					
	Coarse Soils		Medium Soils		Fine Soils	
	Sand, Loamy Sand, Sandy Loam		Loam, Silt Loam, Silt, Sandy Clay Loam		Silty Clay Loam, Clay Loam, Sandy Clay, Silty Clay, Clay	
	< 1.5% O.M.*	>=1.5% O.M.	< 1.5% O.M.	>=1.5% O.M.	< 1.5% O.M.	>=1.5% O.M.
Preplant 8 to 30 days prior to planting	2.4 (0.0784 lbs ai/A)	3.3 (0.1076 lbs ai/A)		4.1 (0.1334 lbs ai/A)		4.9 (0.1597 lbs ai/A)
Preemerg (0 to 7 days prior to planting or within 3 days of planting)	2.4 (0.0784 lbs ai/A)		3.3 (0.1076 lbs ai/A)	4.1 (0.1334 lbs ai/A)	4.1 - 4.9 (0.1334 lbs - 0.1597 lbs ai/A)	

*Organic Matter

Application of Diflufenican SC500 Herbicide at less than listed rates for the appropriate soil will only provide suppression of sensitive weeds.

Your soil textural properties are: 70% sand, 22% clay, and 1.3% Organic Matter

- What rate of **Convintro™ herbicide** will you use for this field?
 - 2.4 fl oz/ac
 - 3.3 fl oz/ac**
 - 4.1 fl oz/ac
 - 4.9 fl oz/ac
 - If the field is circular in shape, with a circumference of 10,280 ft, how many fluid ounces of **Convintro™ herbicide** will be needed to spray the field?
 - 203.0 fl oz
 - 2001.5 fl oz
 - 318.7 fl oz
 - 637.5 fl oz**
14. You notice that you have a relatively robust Palmer amaranth encroachment on your farm. You count 28 female Palmer amaranth with seedheads in a 17.4 ft by 17.4 ft square in your 35 acre field. While worrying about what to do, you come across the following functions:
- One female Palmer amaranth can produce 580,000.
 - Palmer amaranth seed viability is 76% viable after 3 months on the soil surface
 - 81% of Palmer amaranth seed are lost to predation
- Given the previous functions, what is the expected emergence population per acre in this field, assuming no Palmer amaranth in the soil seedbank?
 - 337 million/ac**
 - 2.34 billion/ac
 - 1.78 billion/ac
 - 444 million/ac

- B. This winter, the Bayer rep boasted 98% efficacy with their weed control program using **Convintro™ herbicide**, **Warrant® herbicide**, and **Stryax® dicamba herbicide**. Knowing that you cannot possibly manage weeds near as good as your local Bayer Field Agronomist, you assume you will achieve an 88% reduction in seed bearing Palmer amaranth compared to the non-treated. Based on emergence found in A and your hypothesized weed control, how many seed producing Palmer amaranth will be in this field?
- (A. 40.5 million)
(B. 1.4 billion)
 (C. 11.8 billion)
 (D. 337 million)
- C. To achieve a zero-tolerance management strategy, you plan to hire a hand-weeding crew to clean up your field of weeds that escape your chemical herbicide program. The hand weeding crew works for \$25/hour and can clear Palmer amaranth with the following function: $y = \text{time to hand weed an acre (hours)}$ and $x = \text{number of Palmer amaranth in an acre as determined in B}$; $y = 0.00006x + 2.09$. How much will it cost to hand-weed this field?
- (A. \$60,783.90)
(B. \$2,127,436.58)
 (C. \$505,552.25)
 (D. \$73,591,828.75)
- D. You find some research from 2021 that suggests that moldboard plowing can reduce Palmer amaranth emergence by up to 82%. Rather than using **Convintro™ herbicide** or hire expensive hand-crews, you opt instead to utilize a moldboard plowing in the fall of 2026. What should you expect as the emergence population in the spring of 2027? **(NOTE: this is independent of the answer in both B and C, but retains the same assumptions as functions from part A)**
- (A. (A. 40.5 million/ac)
 (B. 276.7 million/ac)
 (C. 337.4 million/ac)
(D. 60.7 million/ac)
15. **Rogue® herbicide** (3.40 SC) is a herbicide product used in rice production, applied post-flood in rice bays. If a producer's bay measures 265 ft long by 230 ft wide and the flood is 8 inches deep, how many fluid ounces of Rouge will the producer need to apply to achieve a 13.6 fl oz/ac rate?
- (A. 13.6 fl oz)
 (B. 26.6 fl oz)
(C. 19.0 fl oz)
 (D. 142.3 fl oz)
16. As a commercial sprayer operator, your chemical salesman recommends that you use this new and improved sprayer adjuvant that you only need to mix at 20 fl oz/ac and costs \$14.8/gal. You had typically utilized an adjuvant that cost \$15.4/gal at a 1% v/v rate when applying 15 gpa of spray 36,000 acres.
- a. What is the total cost of the new adjuvant?
- (A. \$86,625)
(B. \$83,250)
 (C. \$106,560)
 (D. \$51,145)

b. What is the total cost of the old adjuvant?

- (A. \$54,000)
- (B. \$79,920)
- (C. **\$83,160**)
- (D. \$106,920)

c. Did the “new and improved” adjuvant save you any money?

- (A. Yes)
- (B. **No**)

17. In an effort to control operating costs on your popcorn operation, you decide to invest in a brand new “Smart Sprayer” that only sprays emerged weeds.

a. Your typical post-emergence broadcast program has been as follows:

Product	Use Rate/ac	Cost/Gal
Degree® Xtra herbicide	3 qt	50.89
Banvel® herbicide	8 fl oz	36.14
Impact® herbicide	0.85 oz	14.27 (per oz)
Laudis® herbicide	3 fl oz	679.68

What is the cost per acre of your typical broadcast POST application?

- (A. **\$68.49/ac**)
- (B. \$56.45/ac)
- (C. \$31.51/ac)
- (D. \$45.73/ac)

b. If your “smart sprayer” applies a 30 inch by 15 inch square around each weed and you have an evenly distributed (assuming no overlapping weeds) weed population of 2.3 weeds per square meter, how many treated acres do you have per field acre?

- (A. 0.33 ac treated/ac)
- (B. 0.48 ac treated/ac)
- (C. 1.34 ac treated/ac)
- (D. **0.67 ac treated/ac**)

c. What is the cost savings per acre from operating this smart sprayer?

- (A. \$45.73/ac)
- (B. \$83.16/ac)
- (C. **\$22.76/ac**)
- (D. \$68.49/ac)

d. If the “Smart Sprayer” cost you \$450,000, how many acres would you need to spray for this machine to break even?

- (A. 6570 ac)
- (B. **19,776 ac**)
- (C. 29,664 ac)
- (D. 9840 ac)

18. You are calibrating your six nozzle plot boom and catch the following amounts in a 30 second time period:

Nozzle	N1	N2	N3	N4	N5	N6
Amount (ml)	221	233	293	227	241	223

A. What is your average GPM from this calibration?

- (A. 0.380 GPM)
- (B. 0.239 GPM)
- (C. 0.133 GPM)
- (D. **0.127 GPM**)

B. What GPM would you expect from the following parameters: 15 GPA, 20 inch nozzle spacing, 3 mph walking speed?

- (A. 0.182 GPM)
- (B. 0.227 GPM)
- (C. **0.152 GPM**)
- (D. 0.303 GPM)

C. What is the percentage difference between targeted and actual GPM?

- (A. **16.4%**)
- (B. 19.7%)
- (C. 24.8%)
- (D. 8.2 %)

D. If the original calibration was done at 38 psi, what psi should you adjust to in order to achieve the targeted spray parameters?

- (A. 54.5 psi)
- (B. **45.0 psi**)
- (C. 49.9 psi)
- (D. 64.9 psi)

*****END*****