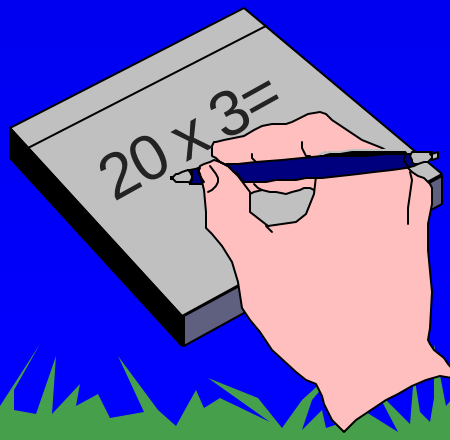
Turfgrass Pest Management (Category 3A)

Application Calculations and Calibration

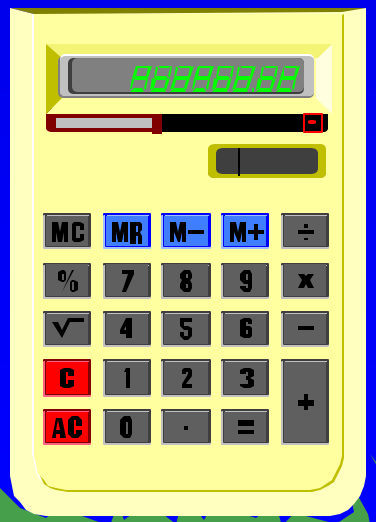
Chapter 5

Accurately mixing pesticides & calibrating equipment is critical to successful pest management.



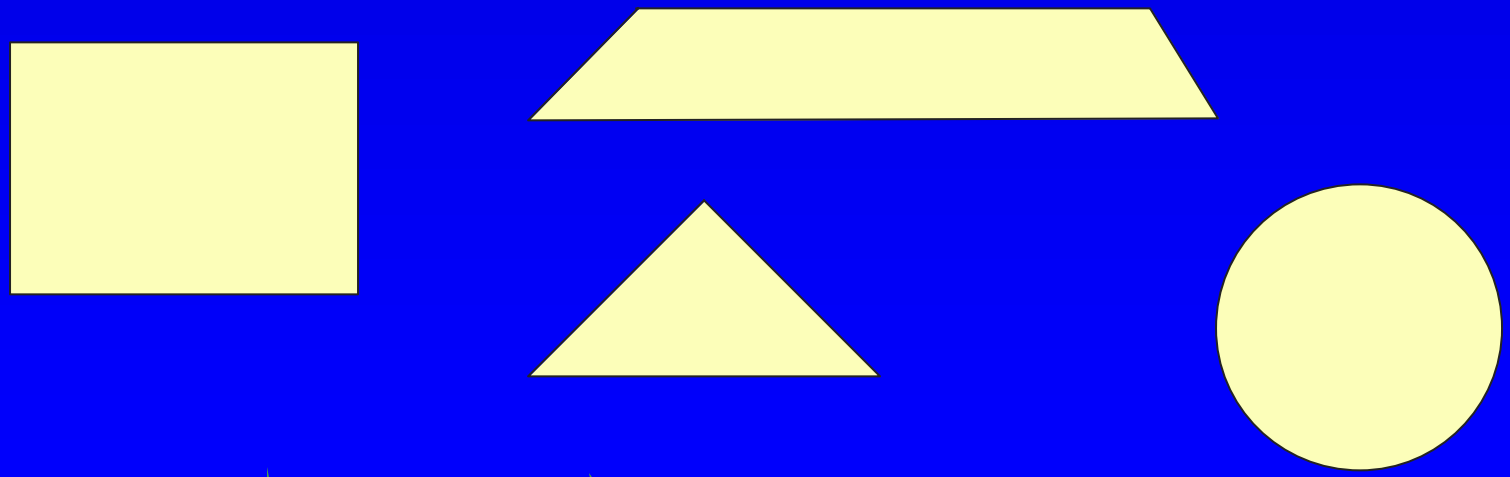
Area Measurement

- **Method 1: Divide & Conquer**
- **Method 2: Offset Lines**
- **Method 3: Average Radius**



Method 1: Divide & Conquer

- **Divide irregular shaped areas into groups of simple shapes that can be added together.**



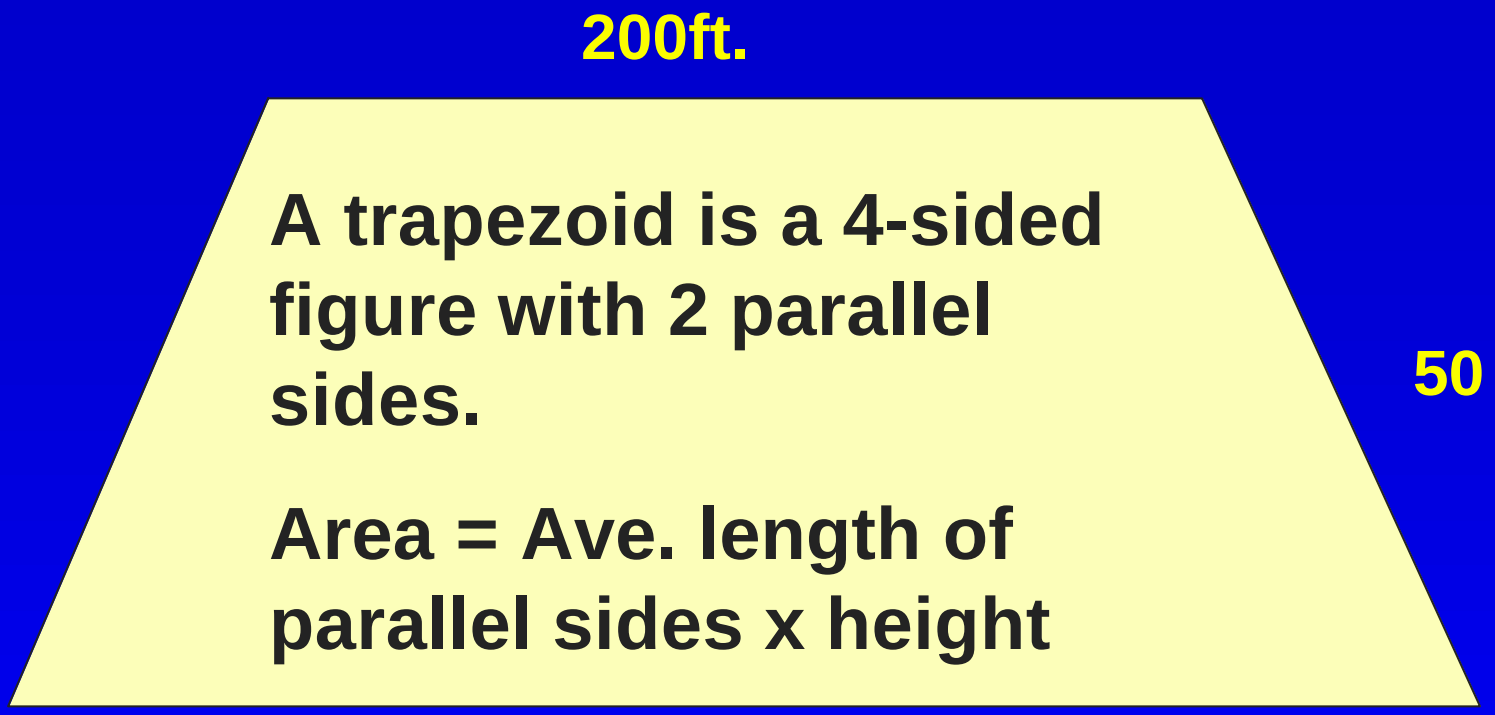
W =

50 ft.

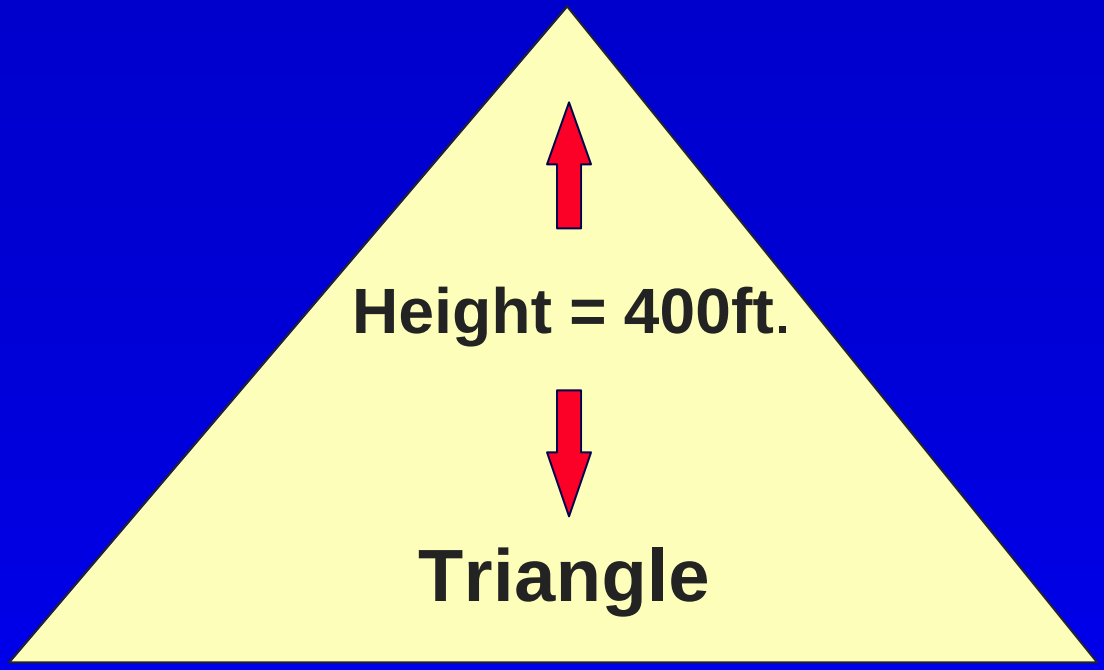
Area = length x width

L = 100 ft.

Area = 100 ft. x 50 ft.= 5,000 sq. ft.



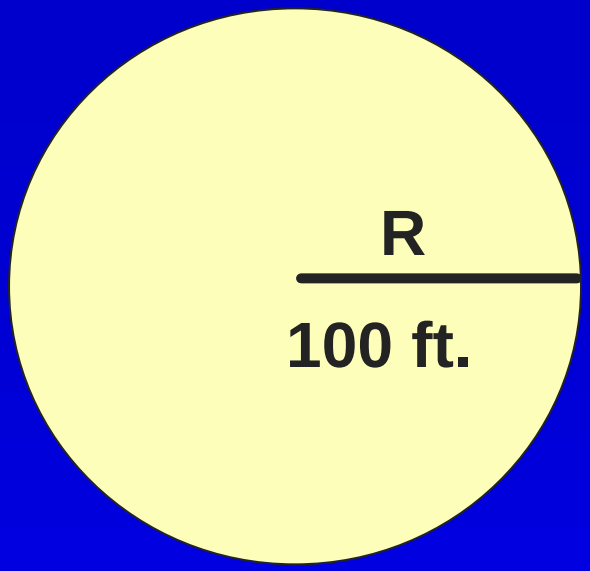
Area = (200 + 300)/2 x 50 = 12,500 sq. ft.



Base = 200 ft.

Area of a triangle = height x base/2

Area = 400 x 200/2 = 40,000 sq. ft.

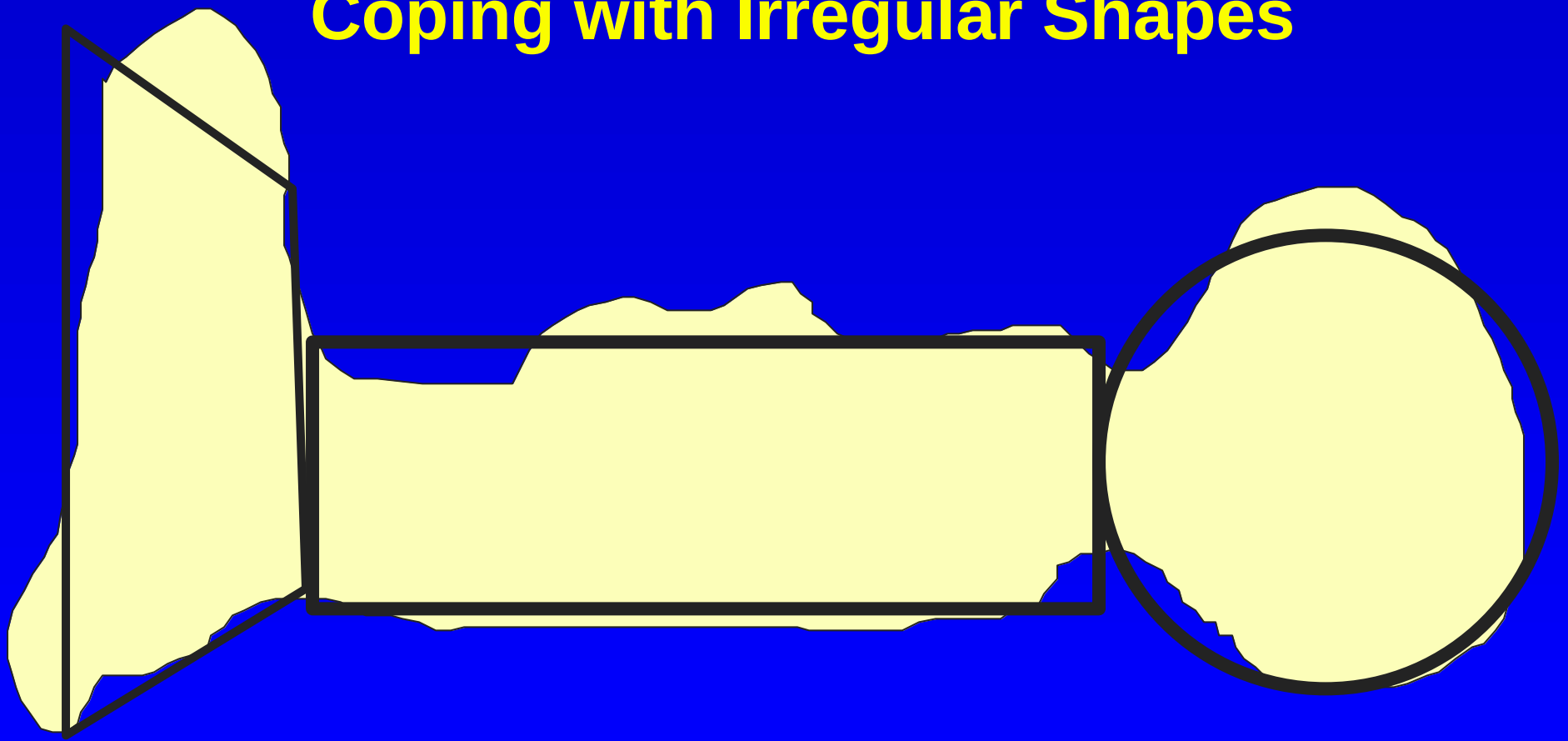


The radius (R) of a circle is 1/2 the diameter.
3.14 = π = pi

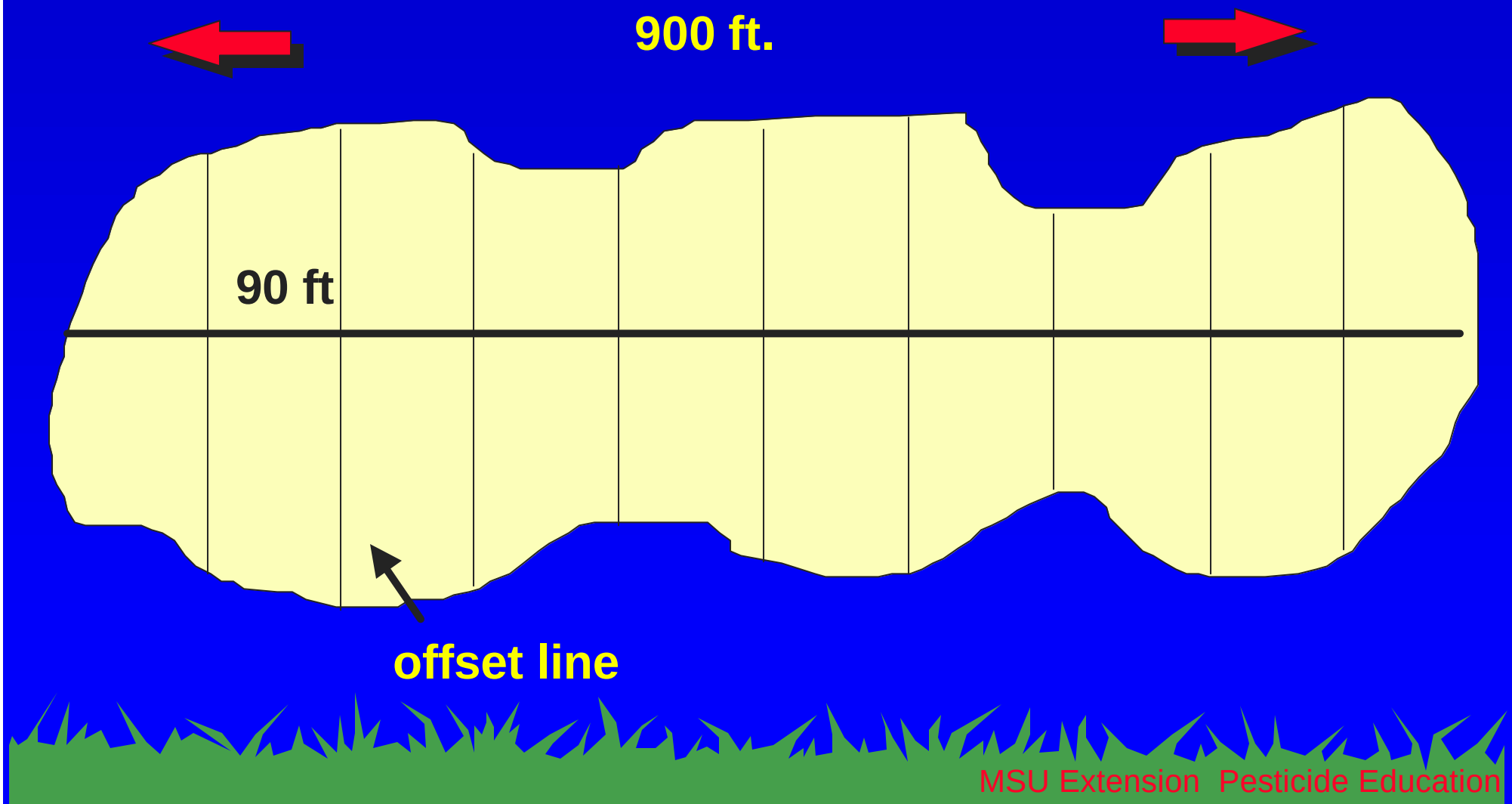
Area = Radius x Radius x 3.14

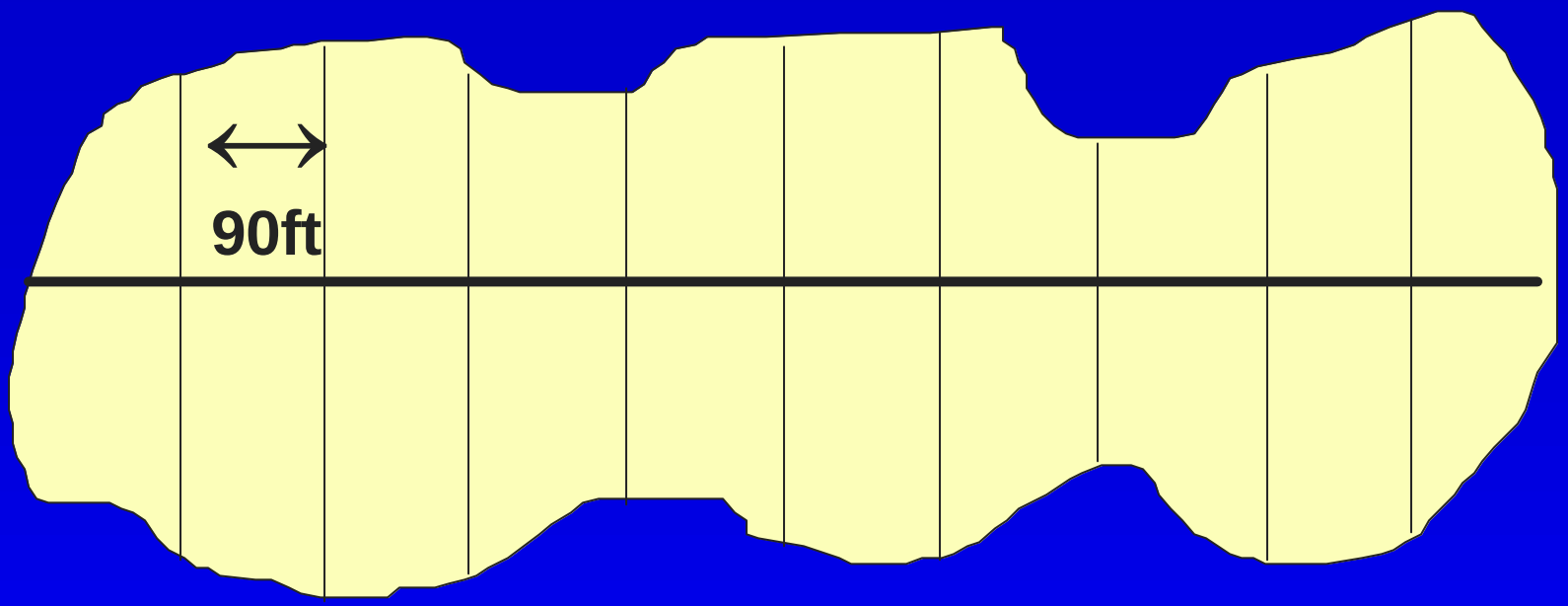
Area = (100 x 100) x 3.14 = 31,400 sq. ft.

Coping with Irregular Shapes



Method 2: Offset Lines



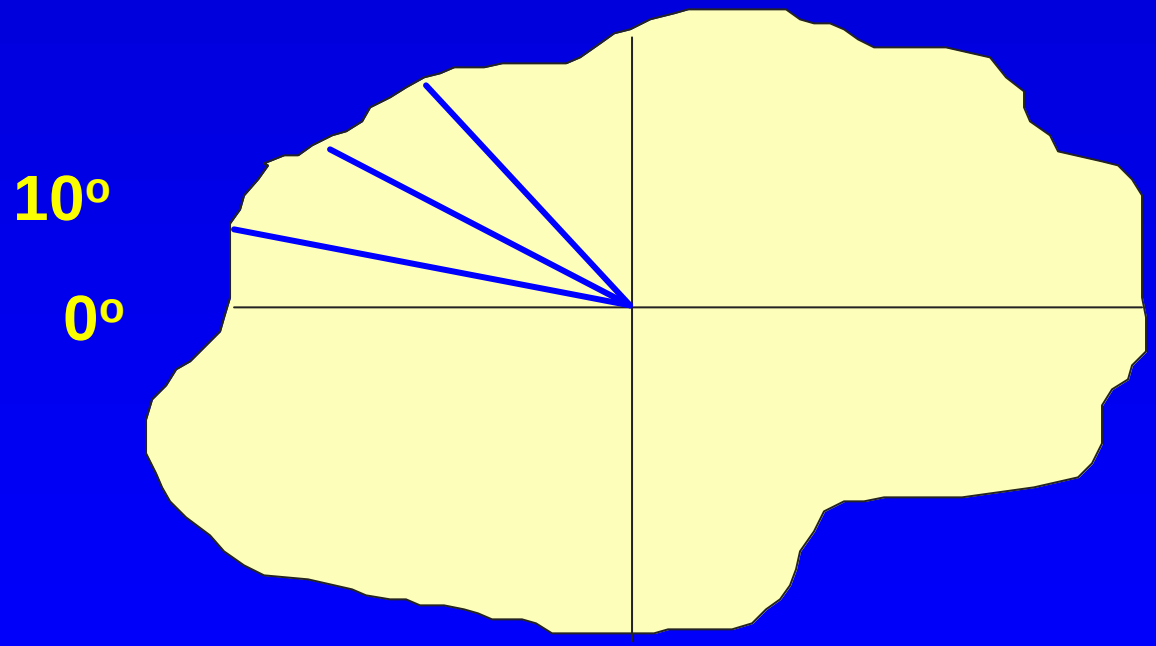


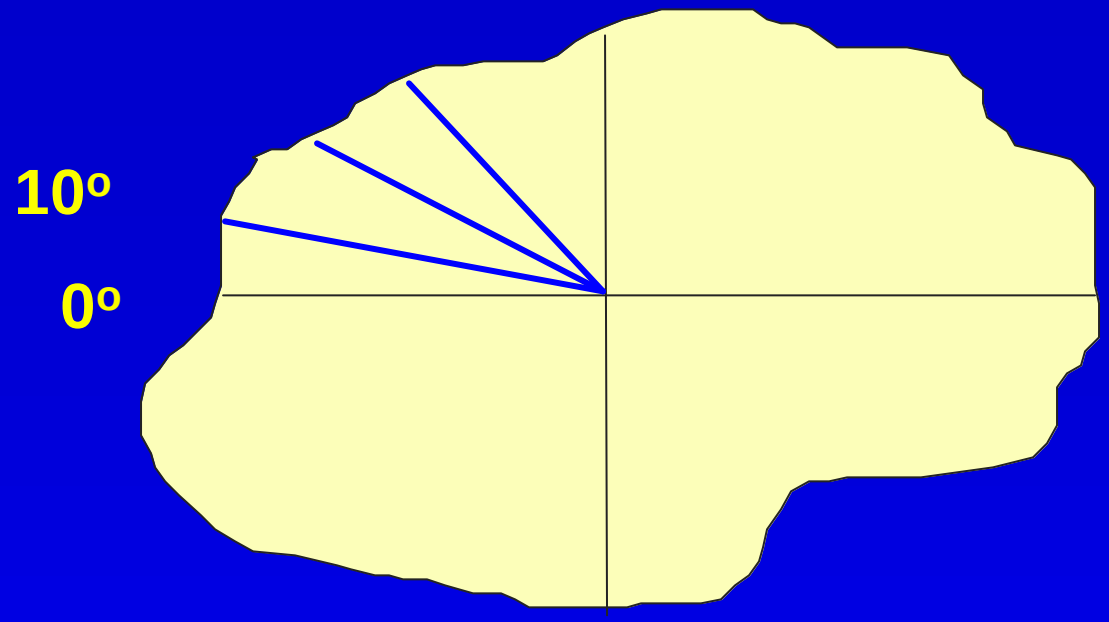
Area = sum of offset lengths x distance between offsets

Area = 1,155 ft. x 90 ft. = 103,950 sq. ft.

Method 3: Average Radius

Converts irregular area into a circle





Take measures (radius) every 10 degrees.

Area = (sum of radii/number of radii)^2 x 3.14

Start.... 1,731.6ft / 36 = 48.1ft.

Area = 48.1ft. x 48.1 ft. x 3.14 = 7, 264.7 sq. ft.

Calibrating

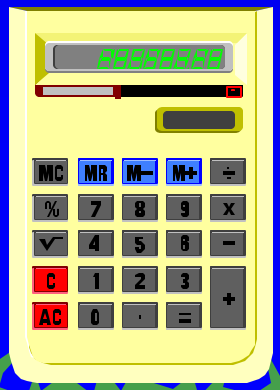
Application Equipment

Drop and rotary spreaders are the two most common granular spreaders used by the turf industry.

Spreader Output

- Size of the meter opening determines flow of the material from the spreader.
- Rate of flow through opening is affected by:
  - granule weight, size
  - shape, carrier material

You must recalibrate when you change from one material to another.



Ground speed must be consistent.

Doubling the ground speed does not always double the application rate!

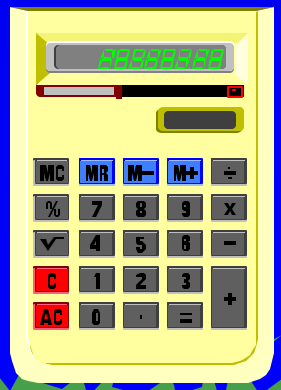
Calibration: Method 1

- Use pan to catch output
- Set suitable test course
  - similar terrain
  - 50 ft. long
- Cover course and catch output
  - weigh caught material
- Calculate area of the test course

Calibration: Method 1

- Weight of material caught/area of test course = amount per sq. ft.
- Amount per sq. ft. x 1,000 = application rate per 1,000 sq. ft.
- Application rate should be within

  + or - 5% of the labelled rate.



Calibration: Method 2

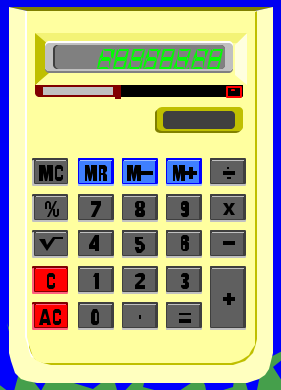
- Cover test area with plastic or similar material.
- Gather and weigh product applied on test area.
- Calculate as with method 1.

Example

You recover 4.75 lbs. of material from the test course. Your rotary spreader has a swath width of 8 ft. Test course 40 ft. long. What is the application rate per 1,000 sq. ft.?

Example

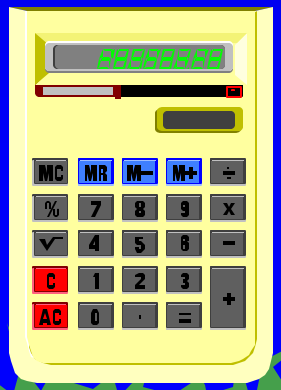
Test course is 40 ft. x 8 ft. = 320 sq. ft.



Example

Application rate per 1 sq. ft. is:

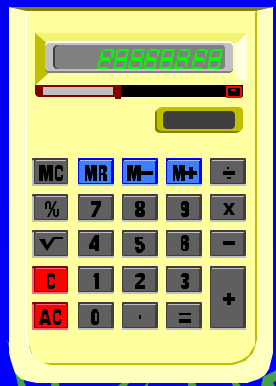
4.75 lbs./320 sq. ft. = .01484 lbs.



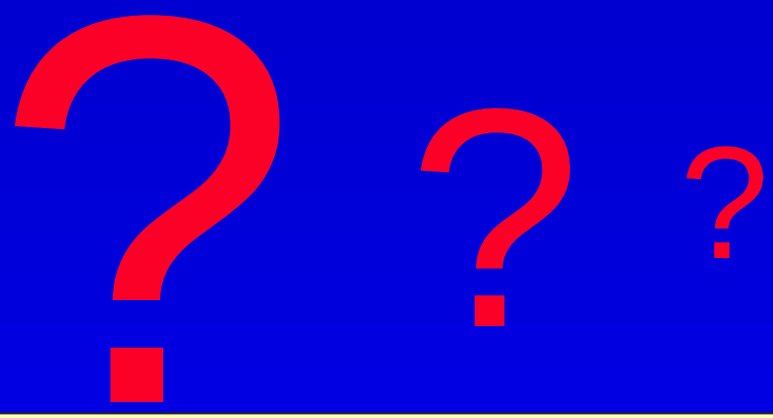
Example

Application rate per 1,000 sq. ft. is:

.01484 lbs. x 1,000 = 15 lbs.



Example



If the label states this product should be applied at 9 lbs. per 1,000 sq. ft., is your application rate acceptable?

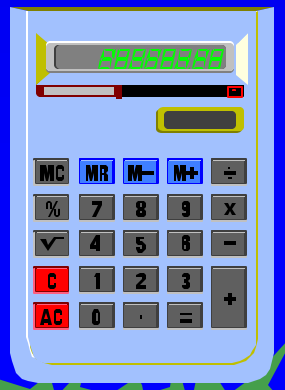
Example

First, find what 5% of 9 lbs. Is:

.05 x 9 lbs. = .45 lbs.

+ or - 5% = 8.55 to 9.45 lbs.

15 lbs. is over 5 lbs. too much



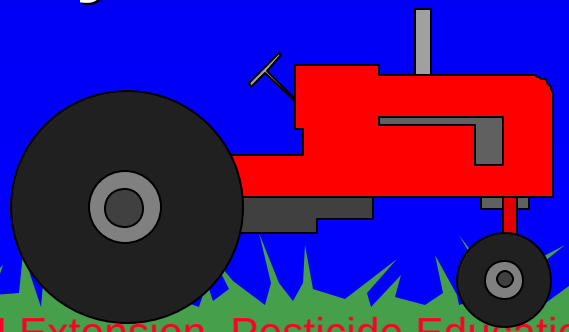
You must adjust the orifice and recalibrate.

Sprayers - Key Factors...

- **Involved in proper delivery and calibration:**
  - **ground speed**
  - **pressure**
  - **output**
    - **orifice size**

Ground Speed

- **Double the speed =**
  - **1/2 the application.**
- **Calibrate on similar terrain to application area.**
- **Bouncing equipment can vary application rates by 50%.**

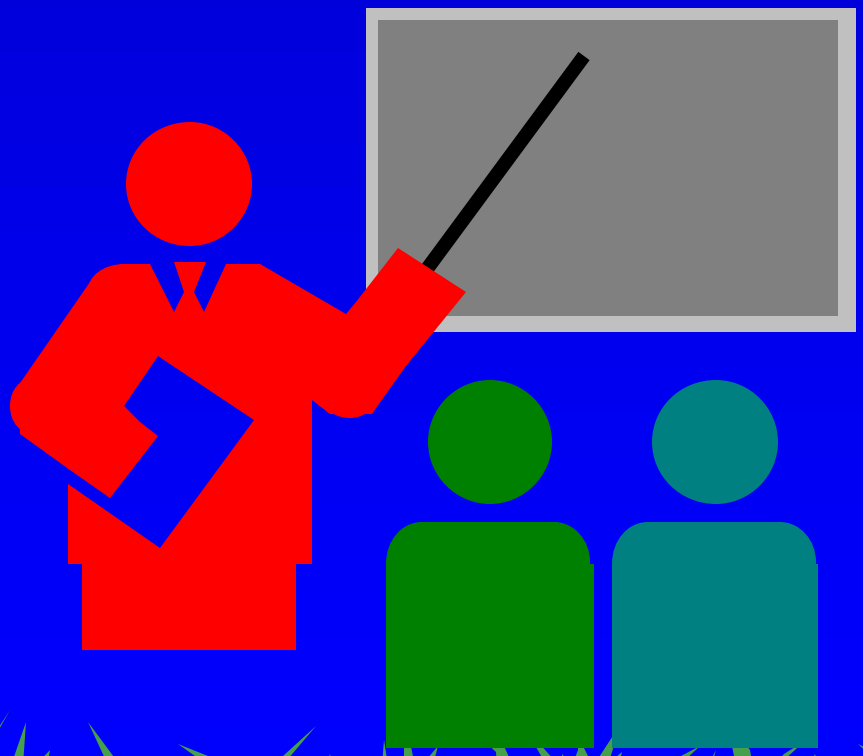


Pressure

- Changing pressure does not affect application rates like speed.
  - to double the rate, pressure must be increased 4x.
- Equipment is designed to work within certain guidelines.
- Long hose runs reduce pressure.

Output

- Output is determined by pressure and type of nozzle.
  - check with equipment suppliers for technical information on nozzle selection.
- Once the nozzle and pressure are determined, the calibration process can begin.



There are many methods used to calibrate sprayers. Find one you are comfortable with and use it often.

Small Manual Sprayers

- **Flow difficult to regulate because pressure changes constantly.**
  - **applications requiring a consistent flow are not recommended.**
  - **appropriate for "% solutions" applied as "spray until wet."**

Shower Head Nozzles

- **Accuracy depends on:**
  - **Uniform "swing" pattern with consistent and smooth hand motion.**
  - **Consistent walking speed.**
  - **Practice.**
  - **Equipment operating with manufacturer's guidelines.**

Showerhead Nozzles

- **Calibration**
  - **Step 1: Determine the output per 1,000 sq. ft. that is appropriate for the job based on product label, type of application and equipment used.**

Showerhead Nozzles

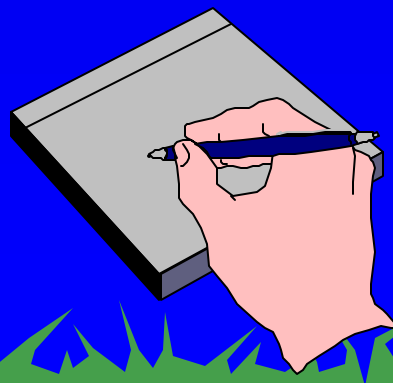
- **Calibration**
  - **Step 2: Mark off a test course at least 40 ft. long and determine your swath width. Calculate the area in square feet of your test course.**

Showerhead Nozzles

- **Calibration**
  - **Step 3:** **Spray the test course with water using the technique you will use during the actual application. Always begin spraying before entering the test course.**

Showerhead Nozzles

- **Calibration**
  - **Step 4: Record the number of seconds required to spray the test course. Average 3 test applications together for accuracy.**

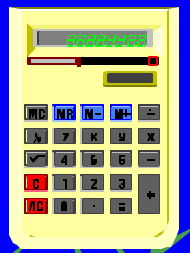


Showerhead Nozzles

- **Calibration**
  - **Step 5:** **Determine the volume of water applied to the test course by spraying into a bucket for the number of seconds required to cover the test course. Measure this output in gallons.**

Showerhead Nozzles

- **Calibration**
  - **Step 6: Divide the number of gallons collected by sq. ft. of the test course. This is the gallons applied per sq. ft. Convert to gallons per 1,000 sq. ft. or acre. This is your output.**



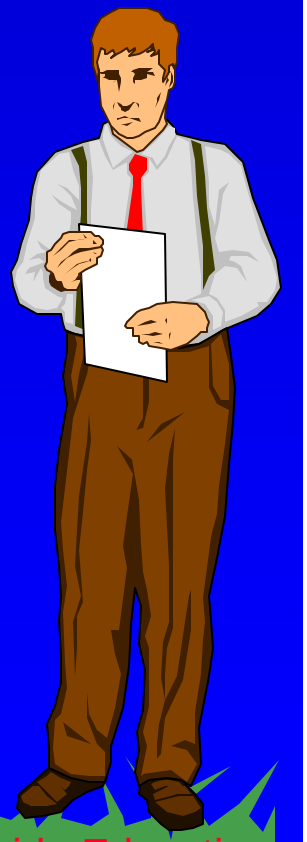
Showerhead Nozzles

- **Calibration**
  - **Step 7: Make any necessary changes in nozzles, walking speed, or pressure to achieve acceptable output. Recalibrate.**
  - **Step 8: Calculate the amount of pesticide to add to the tank.**

Example: Your test strip is 40 ft. long with a 6 ft. swath width. You sprayed the 240 sq. ft. course in an average of 45 seconds. You sprayed 1.25 gallons. What is the output per 1,000 sq. ft.?

1.25 gal./240 sq. ft. = .0052 gal. per sq. ft.

.0052 gal. x 1,000 sq. ft. = 5.2 gal per 1,000 sq. ft.



Backpack Sprayers

- **Should have pressure gauge or a pressure regulator to maintain a constant pressure.**
  - **Use “ounce” method.**
  - **Use “showerhead” method.**

Boom Sprayers

- Determine consistent output and pattern from all nozzles. Replace:
  - Nozzles not delivering with + or - 5% of the average output.
  - Nozzles not delivering a uniform pattern.
- Set pressure according to manufacturer.

Ounce Method

Distance Between Nozzles (inches)	Test Course Length in Ft.
10	408
12	340
14	291
16	255

Ounces dispensed = gallons applied per acre

Pesticide Calculations

You need to spray 10 acres of turf.

Your boom sprayer has a 100 gal. tank and is calibrated to apply 75 gal. per acre.

Rate for the pesticide is 2 qts. per acre.

How much spray mix per acre, and how much pesticide is added per tankful?

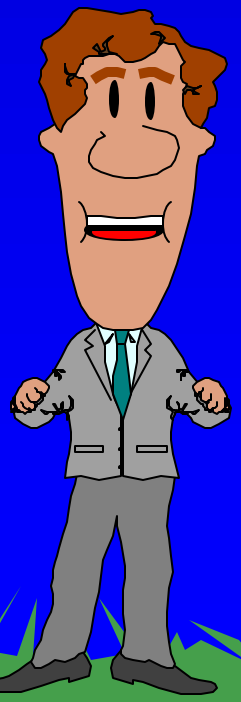
Pesticide Calculations

Total spray mix = 75 gal per acre x 10 acre = 750 gal

Area covered by one tank full is 100 gal./75 gal per acre = 1.33 acres

Pesticide per tank = 1.33 acres per tank x 2 qts per acre = 2.66 qts. per tankful

Suggestion: Consider using ratios to solve calculation problems. No formulas to remember! Logical!



$$\frac{75 \text{ gals.}}{2 \text{ qt}} = \frac{100 \text{ gal}}{x}$$

$75x \text{ gal} = 200 \text{ gal qt}$

$75x = 200 \text{ qt}$

$x = 200\text{qt} / 75$

$x = 2.66 \text{ qt}$