Cooperative Extension Service
College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

PESTICIDE SAFETY EDUCATION PROGRAM

Calculating Size of Target Sites

August 2014

FOR PERSONS SEEKING CERTIFICATION BY
THE STATE OF HAWAII DEPARTMENT OF AGRICULTURE
TO BUY, USE, OR SUPERVISE THE USE OF
RESTRICTED USE PESTICIDES

Other study material

This study guide is just one of the items in a complete set of study guides, which may be viewed at this webpage:
http://pestworld.stjohn.hawaii.edu/studypackets/spcatgor.html

Introduction

To determine how much pesticide is needed for a job, you must measure and calculate the size of the site to be treated. The examples in this study guide show how to calculate the area of regularly shaped and irregularly shaped surfaces and the volume of some enclosed spaces.

Acknowledgement

This study guide is a modified version of pages 10–13 in Chapter 2 "Calculating Dilutions and Site Size" of the booklet *Applying Pesticides Correctly: Private Applicator Supplement* (Michigan State University Extension Bulletin E-2474, December 1993). *Mahalo* to staff of the Pesticides Branch, Hawaii Department of Agriculture for significant comments.

This study guide was developed for the Pesticide Risk Reduction Education program, a Cooperative Extension Service program of the College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. Please direct any question or comment about this guide to:

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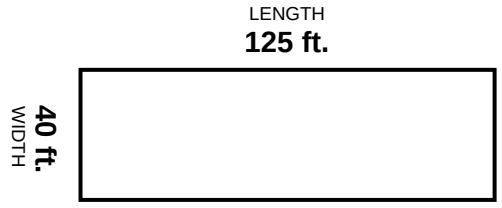
Areas of Regular Shapes



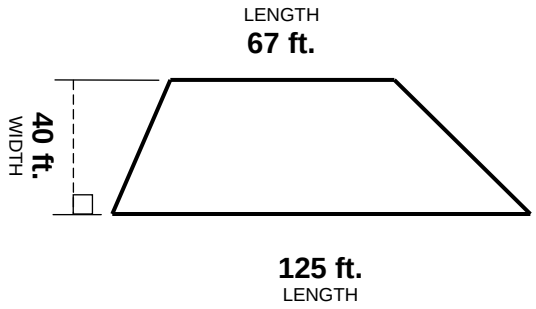
Rectangle

AREA = WIDTH × LENGTH

Example:

A) Area = 40 ft. × 125 ft.

B) Area = 5,000 sq. ft.



Trapezoid

AREA = WIDTH × AVERAGE LENGTH

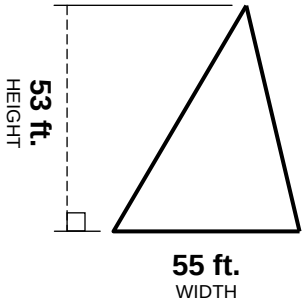
Example:

A) Average length = (67 ft. + 125 ft.) ÷ 2

Add numbers between parentheses before dividing by 2.

B) Average length = 192 ft. ÷ 2 = 96 ft.

C) Area = 40 ft. × 96 ft. = 3,840 sq. ft.



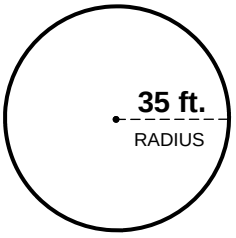
Triangle

AREA = WIDTH × HEIGHT ÷ 2

Example:

A) Area = 55 ft. × 53 ft. ÷ 2

B) Area = 2,915 sq. ft. ÷ 2 = 1,457.5 sq. ft.



Circle

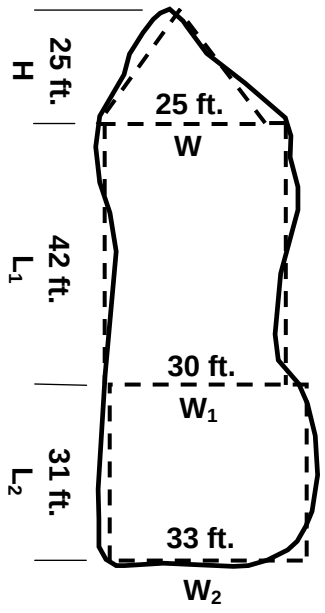
AREA = 3.14 × RADIUS × RADIUS

Example:

A) Area = 3.14 × 35 ft. × 35 ft.

B) Area = 3,846.5 sq. ft.

Areas of Irregular Shapes



Irregular Shape #1

Think of this shape as a combination of one triangle and two rectangles. Calculate the areas of the individual triangle and rectangles. Then add the three areas together to get an estimate of the total area.

AREA = **AREA OF TRIANGLE** + **AREA OF TALL RECTANGLE** + **AREA OF SHORT RECTANGLE**

AREA = (W × H ÷ 2) + (L_1 × W_1) + (L_2 × W_2)

Example:

A) Area = (25 ft. × 25 ft. ÷ 2) + (42 ft. × 30 ft.) + (31 ft. × 33 ft.)

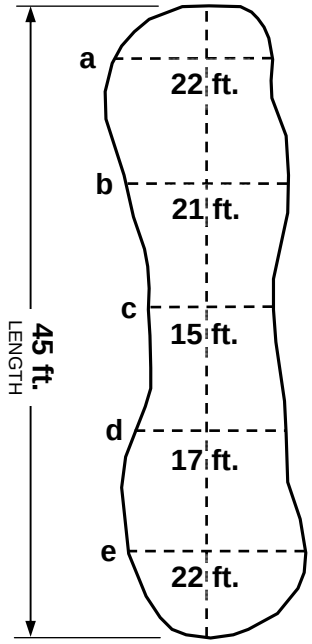
Multiply and divide numbers between parentheses before adding.

B) Area = (625 sq. ft. ÷ 2) + 1,260 sq. ft. + 1,023 sq. ft.

C) Area = 312.5 sq. ft. + 1,260 sq. ft. + 1,023 sq. ft.

D) Area = 2,595 sq. ft.

Irregular Shape #2



For a shape that resembles a rectangle, establish a line down the middle as the length. For the width, use the average of several side-to-side measurements along the middle line. To estimate the area, multiply the length and the width.

AREA = LENGTH × (a + b + c + d + e) ÷ NUMBER OF SIDE-TO-SIDE MEASUREMENTS

Example:

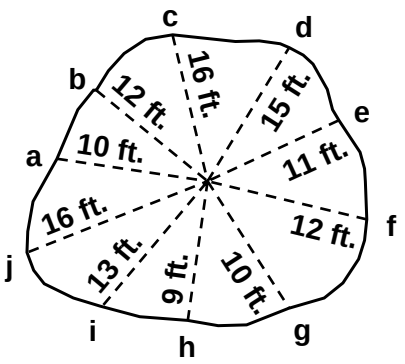
A) Area = 45 ft. × (22 ft. + 21 ft. + 15 ft. + 17 ft. + 22 ft.) ÷ 5

Add numbers between parentheses before multiplying and dividing.

B) Area = 45 ft. × 97 ft. ÷ 5

C) Area = 45 ft. × 19.4 ft.

D) Area = 873 sq. ft.



Irregular Shape #3

For a shape that resembles a circle, first estimate the radius by calculating the average of 10 or more measurements from an approximate center point to the edge of the area. Then estimate the area by using the formula for a circle.

RADIUS = (a + b + c + d + e + f + g + h + i + j) ÷ NUMBER OF MEASUREMENTS

AREA = 3.14 X RADIUS X RADIUS

Example:

A) Radius = (10 ft. + 12 ft. + 16 ft. + 15 ft. + 11 ft. + 12 ft. + 10 ft. + 9 ft. + 13 ft. + 16 ft.) ÷ 10

Add numbers between parentheses before dividing.

B) Radius = 124 ft. ÷ 10 = 12.4 ft.

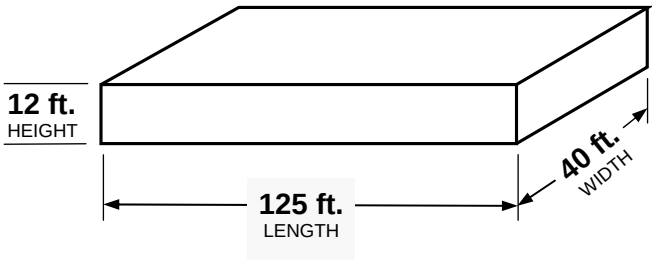
C) Area = 3.14 × 12.4 ft. × 12.4 ft.

D) Area = 483 sq. ft.

Volumes of Enclosed Spaces

Box

To calculate the volume, multiply the length, width, and height.



VOLUME = LENGTH × WIDTH × HEIGHT

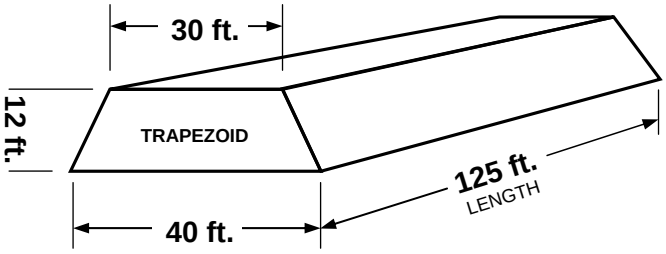
Example:

A) Volume = 125 ft. × 40 ft. × 12 ft.

B) Volume = 60,000 cubic ft.

Flat-top Tent

To find the volume, multiply the area of the TRAPEZOID (front surface) by the length.



VOLUME = AREA OF TRAPEZOID × LENGTH

Example:

A) Area of trapezoid = (40 ft. + 30 ft.) ÷ 2 × 12 ft.
Add numbers between parentheses before multiplying and dividing.

B) Area of trapezoid = 70 ft. ÷ 2 × 12 ft.

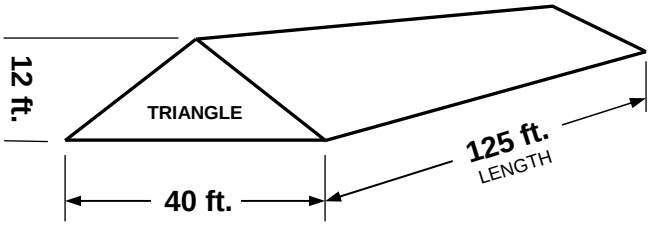
C) Area of trapezoid = 35 ft. × 12 ft. = 420 sq. ft.

D) Volume = 420 sq. ft. × 125 ft.

E) Volume = 52,500 cubic ft.

Tent

To find the volume, multiply the area of the TRIANGLE (front surface) by the length.



VOLUME = AREA OF TRIANGLE × LENGTH

Example:

A) Area of triangle = 40 ft. × 12 ft. ÷ 2

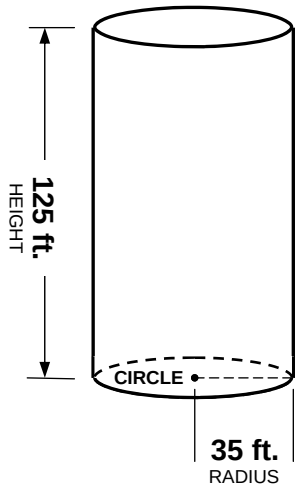
B) Area of triangle = 480 sq. ft. ÷ 2 = 240 sq. ft.

C) Volume = 240 sq. ft. × 125 ft.

D) Volume = 30,000 cubic ft.

Cylinder

To find the volume, multiply the area of the CIRCLE (base) by the height.



VOLUME = AREA OF CIRCLE × HEIGHT

Example:

A) Area of circle = 3.14 × 35 ft. × 35 ft.

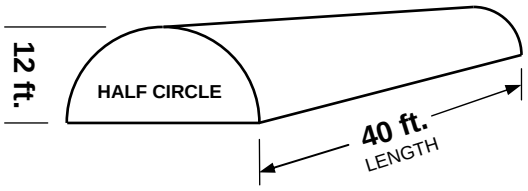
B) Area of circle = 3,846.5 sq. ft.

C) Volume = 3,846.5 sq. ft. × 125 ft.

D) Volume = 480,813 cubic ft.

Quonset Hut

This shape is half of a cylinder. To find the volume, multiply the area of the HALF CIRCLE (front surface) by the length.



VOLUME = AREA OF HALF CIRCLE × LENGTH

Example:

A) Area of whole circle = 3.14 × 12 ft. × 12 ft.

B) Area of whole circle = 452.16 sq. ft.

C) Area of half circle = 452.16 sq. ft. ÷ 2

D) Area of half circle = 226.08 sq. ft.

E) Volume = 226.08 sq. ft. × 40 ft.

F) Volume = 9,043 cubic ft.

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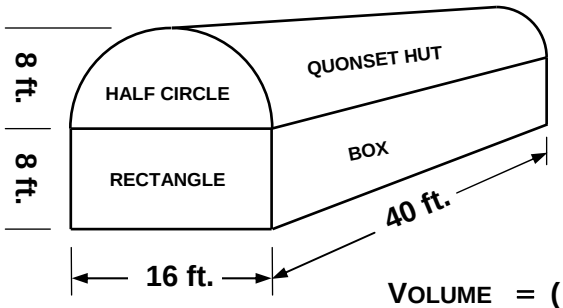


Half-circle-over-rectangle Ends

Calculate the area of the half circle as above. Also calculate the area of the rectangle. Add these two areas together and then multiply the sum by the length of the structure.

VOLUME = (AREA OF HALF-CIRCLE + AREA OF RECTANGLE) × LENGTH

Example:

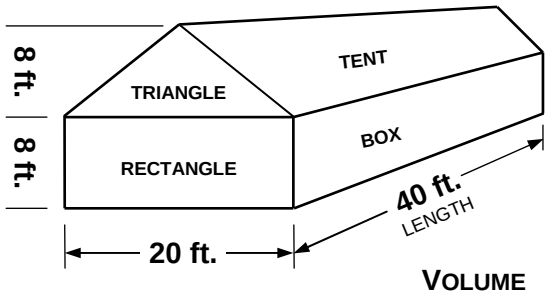
A) Area of half-circle = 3.14 × 8 ft. × 8 ft. ÷ 2 = 100.48 sq. ft.

B) Area of rectangle = 16 ft. × 8 ft. = 128 sq. ft.

C) Volume = (100.48 sq. ft. + 128 sq. ft.) × 40 ft.
Add numbers between parentheses before multiplying.

D) Volume = 228.48 sq. ft. × 40 ft.

E) Volume = 9,139 cubic ft.



Triangle-over-rectangle Ends

Calculate the area of the triangle as above. Also calculate the area of the rectangle. Add these two areas together and then multiply the sum by the length of the structure.

VOLUME = (AREA OF TRIANGLE + AREA OF RECTANGLE) × LENGTH

Example:

A) Area of triangle = 20 ft. × 8 ft. ÷ 2 = 80 sq. ft.

B) Area of rectangle = 20 ft. × 8 ft. = 160 sq. ft.

C) Volume = (80 sq. ft. + 160 sq. ft.) × 40 ft.
Add numbers between parentheses before multiplying.

D) Volume = 240 sq. ft. × 40 ft.

E) Volume = 9,600 cubic ft.