

**Gardener's Math**  
**Jeanna C. Godfrey, DVM, Master Gardener**

Regardless of how much you hated math in school, if you are a gardener you need to understand some basic mathematical calculations and formulas and be able to apply them in you garden. Simply figuring the square footage of your lawn is a very important -and basic- measurement, especially when it comes time to apply fertilizer. So here is a basic review of some of the common "math problems" encountered in gardening.

A square garden is the easiest to measure-simply take the length of one side and square it (for those of you especially "number-challenged" that means multiplying the number by itself). For example, if your square measures 6 feet on one side then the total square footage would be 6 times 6 or 36 square feet.

A rectangle requires you to measure 2 sides (one short and one long) then multiply those numbers to arrive at the square footage. So a bed 8 feet long and 6 feet wide would have 48 square feet.

Triangles present a little more complicated measuring problem, but one simple concept is to think of a triangle as half of a square or rectangle. Measure 2 sides, multiply them and then halve that number to get an approximate square footage of the triangle.

Measuring a circular bed dredges up memories of high school geometry and the mystical formula for determining the area within a circle. Remember pi? Well, multiply pi times the square of the radius of your circle to get the square footage. To illustrate, if your bed has a radius (half the diameter which is the distance from one side to the other) of 10 feet then 10 squared is 100 times pi (3.14) resulting in an area of 314 square feet.

Very few lawns or gardens have perfect geometric shapes, so some fudging is allowed in these calculations. Large areas can be broken up into smaller shapes, then the total added together to get approximate square footage. An imaginary shape such as a rectangle can be drawn around an irregular bed and the square footage calculated. Then subtract from that number the portion ( $\frac{1}{4}$ ,  $\frac{1}{2}$ , etc.) not in the bed. For example, if your bed is approximately 4 feet by 8 feet, the square footage would be 32, but you estimate  $\frac{1}{4}$  of that rectangle is not bed but lawn, so you would subtract  $\frac{1}{4}$  of the total (8 feet) for an approximate square footage of 24 feet.

Determining the perimeter or outer dimensions of a garden or bed can be important, especially if you are planning on edging with some type of fencing or hardscape. The perimeter of straight-sided shapes is simply the sum of all the sides. A circle, however, requires the use of our old pal pi to determine the circumference - pi times the diameter of the circle. So if you want to encircle your rose bed with bricks and the diameter of the bed is 15 feet, you'll need about 47 linear feet (15 times 3.14) of brick to do the job.

Now to measuring volumes. If you've ever bought a bag of potting mix or mulch you know it is

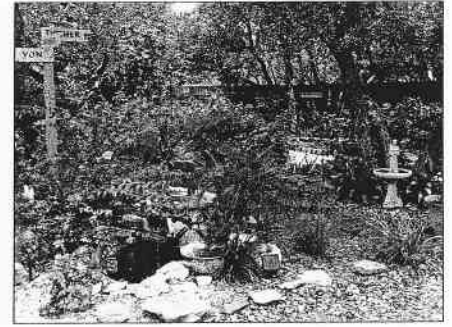
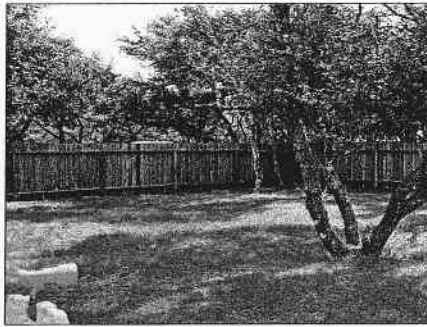
sold in cubic feet. If you really want to impress (and probably bore) your gardening friends you can measure the volume of any pot by using the formula of pi times the radius ( $\frac{1}{2}$  diameter) then multiply that number by the height of the pot to arrive at the number of cubic feet of mix needed to fill that pot. Fortunately, past gardeners have filled enough pots to now provide some very helpful rough estimates. A 1 cubic foot bag of potting mix will fill 18 six-inch pots, 3 ten-inch pots and 1 fourteen-inch pot.

Mulch is also sold by the cubic foot (usually 3) because gardeners are again concerned not only with how many square feet it will cover but also to what depth (i.e. height). One simple guideline to remember is 1 cubic yard is 27 cubic feet (3 ft long times 3 feet wide times 3 feet high) and will cover a 100 square foot garden to the depth of three inches. So you would need 9 of the 3 cubic foot bags to do the job.

Fortunately, many online horticulture websites now have calculators to help determine the amount of fertilizer, pesticide, or mulch appropriate for a given garden. There are also calculators which provide the number of plants to place in a particular area and the best spacing between plants. But you still have to be able to provide square footage and other mathematical information to get the correct answers. So get out your rulers and start measuring!

## The 7 Layers of Landscape Design

Jeanna Godfrey, DVM  
Master Gardener



There are RULES in landscaping....

- rules aren't meant to be broken, but you can have lots of fun bending them into 90 degree angles!!



PLAN, PLAN, AND THEN PLAN AGAIN!!



However...

- it is important to have a general idea or "theme" for your garden
- you can even have more than one theme if you have enough space to create different "rooms" in your garden
- "theme" can mean a type of plant (rose garden), a unique combination of plants (cottage garden), or a garden to serve a specific purpose (healing garden, wildlife garden). Your garden's theme is the "story" you want your garden to tell!

### Planning...

- can be done on paper
- on a computer
- or in the soil.



### On Paper...

- plans can be as in-depth as you wish
- usually show structures, directions, existing boundaries, existing plantings, utility/cable lines, etc.



### On a computer...



- Several computer programs available ranging from \$20 to \$75.
- *Make sure it has digital photo insert capability.* This allows you to landscape around an image of your house.

### In the soil... (now we're talking!)

- Should have a vague idea of a theme(s) for specific areas



tropical/woodland



Mediterranean



butterfly/hummer

### Landscape Design Principles

- Form... avoid too much or too little
- Scale... match landscape to house
- Rhythm... repeating elements to create "flow" through the garden
- Axis... visual orientation
- Color... cool recedes, hot is "in your face"  
cool looks larger, hot looks smaller
- Texture... smaller yard more delicate/  
larger landscape more coarse.
- More about this later :)

### Layer Number One HARDSCAPE

- yes, you do have to do SOME planning!
- analyze the site for any problems such as poor drainage, unsightly views, lack of privacy, etc. and devise a method for correcting it.



### Hardscape = Drainage



### Hardscape = Pathways

- Decide how you want to be able to tour your garden.
- Do you want a formal pathway on straight lines or a more casual walk using curves.



### Construct paths to enhance your theme

- Formal? (straight axis)
- Casual? (curves)



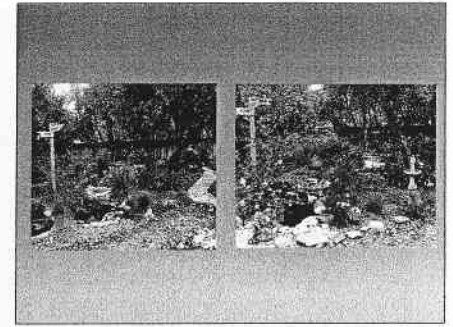
### Hardscape = Ponds

- It is much easier to add a water feature early then to have to move mature plantings to make room for it later. Especially if electrical wiring is required



### HARDSCAPE = FENCES/PRIVACY SCREENS

- Fences and privacy screens can define a boundary and afford a sense of enclosure to the garden. This is especially true with smaller gardens and zero lot line yards.



### Dark Fences Allow Plantings to Take Center Stage

### Our First Layer *Hardscape* includes

- structures to solve drainage issues
- pathways
- ponds or fountains
- patios or dining areas
- outdoor kitchens
- children play areas such as sandboxes/dollhouses/wading pools
- swimming pools

### Layer Number Two Shade Trees



- Provide the "bones" of your landscape.
- Planning is VERY important when planting trees which will reach heights over 20 feet. They're really hard to transplant later!!!

### Great Native Shade Trees for the Coastal Bend

- Live Oak
- Cedar elm
- Mesquite
- Pecan
- Anaqua
- Red bay (sweet bay)

### Live Oak

- Our best shade tree
- 40-60 ft tall and 30-60 ft wide
- Moderate growth rate
- Long-lived
- Cold hardy
- Drought tolerant
- Habitat for wildlife
- Dense shade/lawn?



### Mesquite

- Dappled shade
- 18-30 ft tall and 15-25 ft wide
- More rapid growth than oaks
- Cold hardy
- Drought tolerant
- Lawns/flowers can grow
- Wildlife eats seeds
- Thorns

### So far we have...

- Layer Number One - Hardscapes
- Layer Number Two - Shade Trees



Let's Party then!!!

### My Rule Number One in Landscape Design



- Your garden should celebrate *who* you are and *where* you are on life's journey.
- If you abide by this rule, regardless of anyone else's opinion, you have a successful landscape design!

### Layer Number Three Shrubs and Understory Trees



- these are the foundation plantings which set the tone or theme of the garden
- for example, butterfly bush makes you think cottage garden or wildscape

### More Decisions Now

- This is the where "color" starts to play a major role
- This layer also begins to shape the three major design elements of our garden...

Order (Balance)  
Unity (Theme)  
Rhythm (Flow)

### Color in the Garden (or yes you can put orange next to pink if it makes you happy!!)

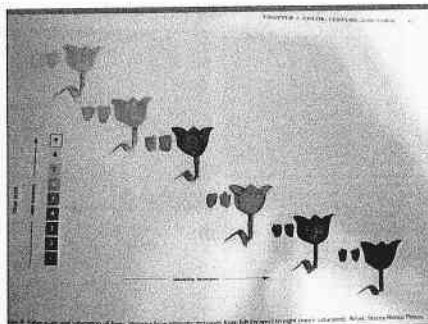
- A very short course in color theory  
Hue = pure color, no white, black, or gray  
3 primary colors: red, yellow, blue  
3 secondary colors made by combining primaries: orange, green, and violet (purple)  
6 tertiary colors mixing a primary and secondary: red-violet, red-orange, yellow-orange, yellow-green, blue-green and blue-violet  
All 12 colors together make a Color Wheel

### Cool Colors vs Warm Colors

- Generally speaking, cool colors such as blue and violet have shorter wavelengths and appear further away (recede) in the garden. Use these colors to make small areas appear larger. Put them at the end of pathways or along edges to make your garden appear larger.
- Warm colors, such as red and yellow have longer wavelengths and appear closer (advancing) in the garden. Use these colors to make a large garden more intimate.

### Color Value

- Value is the luminosity or amount of light reflected back by a color
- Lighter tints of a hue, also known as pastels, contain more white, reflect more light, and therefore have a greater value
- Darker shades of a hue, contain black, reflect less light, and have a lower value.
- The value of a color is indirectly related to its intensity. The higher the value (light yellow) the lower the intensity. The lower the value (deep purple) the greater the intensity.



### Why do I need to know this stuff?

- Mainly so you'll know why the "color police" arrest you if you mix orange and pink!
- The Rule is: keep light colors light and dark colors dark when combining. In other words, use tints of lighter colors like yellow and orange with shades of darker colors like red or blue. Pink is a tint of red, thus you shouldn't use with a lighter color i.e. orange. (Unless it makes you happy, of course!! Remember My rule # 1)

## Are you going bananas yet?



- Now that I have you totally confused about color, I thought I'd speak a little Greek to you...

## Those Ancient Greeks were pretty amazing!

- Theory of the *Golden Mean*
- Greeks believed it to be "the proportion of divine beauty"
- Much of nature has parts arranged according to this theory
- Ratio of 1 to 1.618 or the rule of thirds
- For example, a 13 ft long border should be about 8 ft wide to have "divine" proportions. ( $8 \times 1.618 = 12.944$  OR 13 divided by 1.618 = 8.034)

## Golden Mean continued...

- This rule of thirds works well when dealing with color, textures, or shapes in the garden
- Examples:  $\frac{2}{3}$  dark colors to  $\frac{1}{3}$  light colors gives most pleasing balance  
or  
 $\frac{2}{3}$  bold foliage to  $\frac{1}{3}$  fine-textured leaves  
or  
 $\frac{2}{3}$  ornamental grasses to  $\frac{1}{3}$  flowers

## Now that we're totally exhausted...



## Some Great Natives Shrubs and Small Trees to Use...



Tx. Mountain Laurel

## Firecracker (Russelia)



## Other great native small trees and shrubs

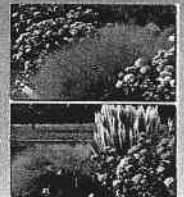
- American beautyberry (*Callicarpa americana*)
- Barbados cherry (*Malpighia glabra*)
- Guajillo (*Acacia berlandieri*)
- Kidneywood (*Eysenhardtia texana*)
- Red Yucca (*Hesperaloe parviflora*)
- Turk's Cap (*Malvaviscus arboreus* v. *Drummondii*)

## Layer Number 3 taking shape (waiting for Rita, 2005)



## Layer Number Four Perennials and Ornamental Grasses

- this layer helps define the garden or a specific space within a garden
- plants in this layer can accent a particular area with striking color or foliage
- beds and borders can make a large area feel more intimate.



### Remember... perennials like to be "odd".

- When planting perennials (and annuals, too) it is more pleasing to the eye to plant in odd numbered drifts or groups, preferably with at least three of each plant.



### However,

- Larger plants may require only a "drift" of one i.e. century plant



### Think *W* or *M* when planting perennials and grasses

- Try to avoid planting in straight lines.
- Use a staggered planting design



### Plants with specific, unique needs should be grouped in one area to minimize maintenance



### Use grasses to create movement in the garden.



### Great Perennials and Ornamental Grasses for the Coastal Bend

- Little bluestem (*Schizachyrium scoparium*)
- Mexican feather grass (*Stipa tenuissima*)
- Coastal cordgrass (*Spartina spartinae*)
- Muhly grass (*Muhlenbergia lindheimeri*)
- Autumn Sage (*Salvia greggii*)
- Cigar Plant (*Cuphea ignea*)
- Gayfeather (*Liatris mucronata*)
- Salvia "Indigo Spires" (*Salvia farinacea*)
- Shrimp plant (*Justicia brandegeana*)

### Now We Have...

- 1) Layer 1 = Hardscape
- 2) Layer 2 = Shade Trees
- 3) Layer 3 = Shrubs and Understory Trees
- 4) Layer 4 = Perennials and Ornamental Grasses



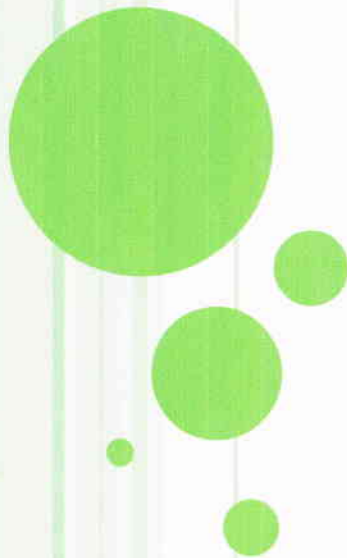
### Layer Number Five Annuals, Vines, Groundcovers and Container Plants



### Annuals are the frosting on the cake as well as the filling between layers.

- Use annuals to fill in between more permanent plantings, especially in an immature garden. They will provide a lush look while other plants are growing.
- Use annuals for instant color and texture.
- Use annuals as cut flowers for your home.

# COMPUTER AIDED DESIGN (CAD) FOR RESIDENTIAL LANDSCAPES



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# CAD PROGRAMS

Enter the address in orange into the box at the top left of your internet browser.

- FREE (\$0, but . . .)
  - Google Sketchup <http://sketchup.google.com>
  - The Virtual Garden  
[www.bbc.co.uk/gardening/design/virtualgarden\\_index.shtml](http://www.bbc.co.uk/gardening/design/virtualgarden_index.shtml)
- INEXPENSIVE (\$100 or less)
  - Plan A Garden (veggies only) [www.plangarden.com](http://www.plangarden.com)
  - Punch Next Gen Home Design [www.punchsoftware.com](http://www.punchsoftware.com)
  - Total 3D Home, Landscape & Deck [www.individualsoftware.com](http://www.individualsoftware.com)
  - Better Homes & Garden [www.homedesignersoftware.com](http://www.homedesignersoftware.com)
  - HGTV [www.homedesignsoftware.tv](http://www.homedesignsoftware.tv)
- NOT INEXPENSIVE (>\$100 to \$5,000)
  - Upgrades to the above programs
  - Dedicated CAD programs
  - AutoCAD, the industry leader (<http://usa.autodesk.com>)



# **Earth-Kind Landscape Course Homework**

## **Week 3**

Create a bubble diagram of activity areas. (Step 4 of “Planning the Perfect Landscape”)

Incorporate ideas from presentations into your design.

Locate the following documents on your computer for next week:

In Our Coastal Gardens  
Earth-Kind Plant Selector

[aspmastergardeners.org](http://aspmastergardeners.org)  
[Earthkind.tamu.edu](http://Earthkind.tamu.edu)