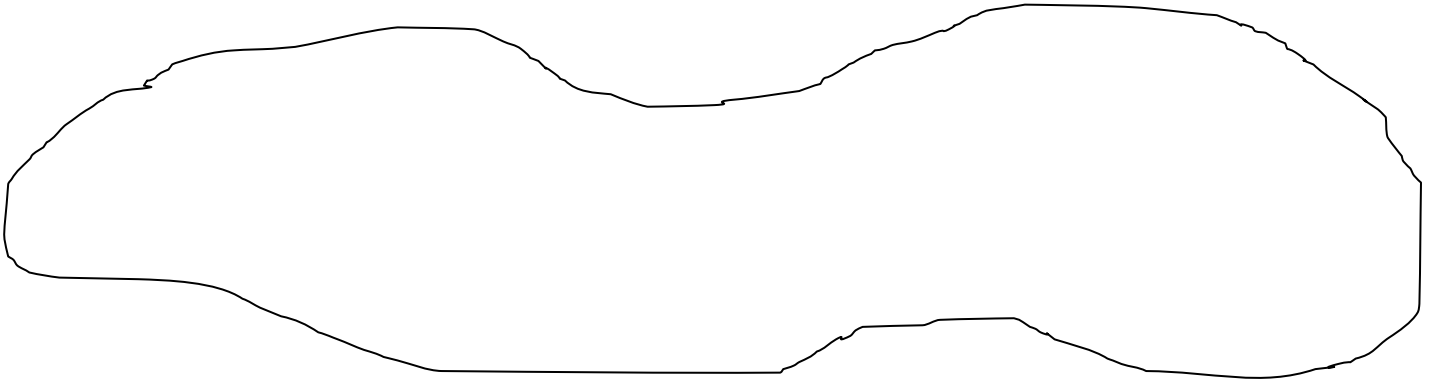


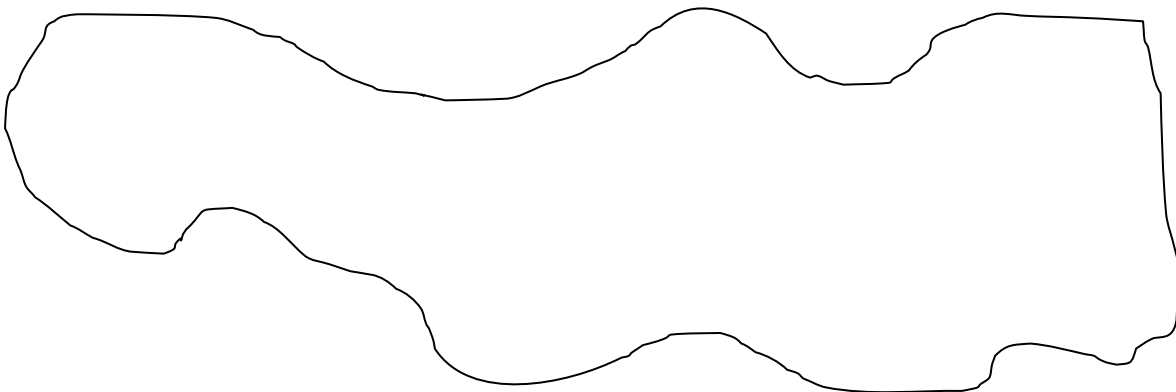
Complete the following calculations. **SHOW ALL CALCULATIONS!** CIRCLE YOUR ANSWER.

**AREA**

- Using the offset method (see attached sheet), calculate the square footage of lawn. Scale is 1" = 20'.

**VOLUME**

- The landscape architect recommends that the area to be sodded be amended with 2 inches of topsoil. How much topsoil do you need to cover an area 75' by 43' to a depth of 2 inches? What is the cost per yard, if it cost \$6.00 per yard?
- How much top dressing material is needed to cover a football field that is 160' by 360' to a 3/8-inch depth?
- A pond has a surface area of 0.75 ac and an average depth of 15 feet. What is the volume of water in the pond? This is used to calculate the amount of dye needed. There are 7.4805 gallons of water in 1 cf of water. 1 acre is equal to 43,560 sf. (Hint: *Step 1* calculate the volume of the pond in cf. *Step 2* convert the volume from cf to gal by multiplying the volume in cf by 7.4805.
- Using the offset method of calculating the square footage. Determine how much pine bark mulch is needed to mulch the area below to a depth of 3 inches. Scale 1" = 20'.



6. How much mulch is needed for a foundation bed that is 75 ft. long and 8 ft. wide? They are planning to use pine straw to a depth of 4 inches.
7. How many yards of concrete are needed to construct a walk 4 ft. by 15 ft.? The specs call for fiber reinforced concrete 4 inches deep.

### **LINEAR**

8. Rectangle bed that is 24 ft. by 60 ft. How much steel edging is needed?
9. Circular bed that is 10 ft. diameter. How much plastic edging is needed?

### **SURFACE**

10. How many *Liriope muscari* are needed for an area that is 45' by 58'? The specs call for 12" spacing on centers.
11. How many Blue Rug Junipers are needed for an area that is 32' by 200'? The specs call for 5' o.c.
12. How many pansy plants are needed for a bed that measure 8' by 11'? The specs call for 8" spacing on center.
13. How many Wax-leaf Ligustrums are needed for a hedge that is 8' by 47'? The specs call for them to be spaced 6' o.c.
14. How much sod is needed for a backyard that is 75' by 104'. There is a swimming pool and deck located in that area that is approximately 25' by 40'. This will not be sodded. Give the total spare footage of sod and the total number of pallets needed.
15. How much centipede seed is needed to seed an area 52' by 64' at the rate of 0.5 lbs per 1000 sf?

### **TIME**

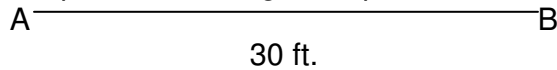
16. Annual planting of 6,000 sf can be installed at the rate of 75 plants per hour when spaced 1 foot apart. If the contract requires the bed to be planted 2 times per year, how many total man hours will be spent installing the seasonal color?
17. The job site is estimated to be 20 minutes from the company (expecting moderate traffic flow). The estimate time for prep., installation and clean-up is 3 days. How many man-hours are spent in route to and from the job site during this project. The crew consists of 3 people.
18. From your calculations you have determine it takes 15 minutes per 3 gallon container plant to dig the hole, prep hole, remove container, plant and form a saucer. How many man-hours will it take to plant a bed containing 38 plants?

A. **Area**

**Line Offset Method**

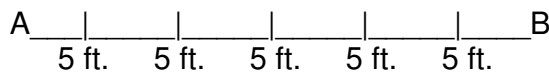
If a particular area does not lend itself to the use of geometric figures, then the *line-offset method* can be used. This method reduces large irregularly shaped areas to a series of smaller trapezoids spaced along a measured line. It is also useful for measuring areas of bodies of water. When done correctly, the line-offset calculations will determine the area to within 5 percent. Determining the area of an irregularly shaped figure involves the following steps.

1. Determine the *length line*. This is the longest axis of the figure. The endpoints are designated points *A* and *B*.

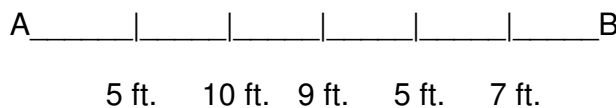


2. Mark the *offset lines* at right angles (90 degrees) to the length line. These lines should be equally spaced along the length line. The number of offset lines required or distance is somewhat arbitrary. If the shape of the area to be measured is relatively uniform then fewer offsets are needed. The more irregular in shape the area to be measured, the more offset lines will be required. Additionally, the greater the number of offset lines used, then the greater the measurement accuracy.

Choose the number of offset lines to be used so that they divide the length line (line A-B) into equal segments and define areas amenable to calculation. For example, if line A-B equals 50 feet and the figure is reasonably uniform in shape than an appropriate distance between offset lines might be 10 feet. If the figure is irregular in shape, then 5-foot intervals between offset lines would better estimate the area. For very large areas, where the length line may exceed 300 feet, the offsets can be spaced 30 feet (10 yards) or further apart, to facilitate calculations.



3. Measure the length of each offset line. Make sure to measure every offset line from A-B, including the offset lines on each edge, if appropriate.



4. Add up the lengths of all offset lines and multiply by the distance between offset lines on the length line.

$$5 + 10 + 9 + 5 + 7 = 36 \text{ ft.}$$
$$(36 \text{ ft.}) (5 \text{ ft.}) = 180 \text{ sf}$$

## Areas Formulas

A *rectangle or square* is a parallelogram with four right angles. The area is calculated by multiplying the length (L) by the width (W).  $AREA = (L)(W)$

A *trapezoid* is a quadrilateral with only two parallel sides. The area is found by multiplying the average length of the parallel sides (A+B) by the height (H).  $AREA = A+B \div 2(H)$

A *triangle* is a polygon with three sides. The area of a triangle is the base (B) multiplied by the height (H) divided in one-half.  $AREA = (B)(H) \div 2$

A *circle* is closed curve with an equal perimeter radius from the center. The area of a circle is the radius squared ( $R^2$ ) multiplied by pi (3.14). The radius is equal to one-half the diameter.  $AREA = (3.14)R^2$

An *oval* has an egg-like or elliptical shape. The area is the length (L) multiplied by the width (W), multiplied by 0.8.  $AREA = [(L)(W)]0.8$

B.

### Volume

**Rectangle** Length x width x height or area x height = volume

**Cylinder**  $3.14r^2$  x height or area x height = volume

**Cone**  $(3.14)(r^2)(h) \div 3$  or area x height  $\div 3$  = volume

**Sphere**  $4/3 \times 3.14 \times r^3$  = volume

### **Make sure all are in the same units**

27 cu. ft. = 1 cu. yd.

C. Linear (Perimeter)

Sum of side = perimeter

diameter x 3.14 = circumference

D. Time

60 min = 1 hr.            7 days = 1 wk.            365 days = 1 yr

24 hrs. = 1 day            52 wks. = 1 yr.

Thirty days has Sept., Apr, Jun, and Nov. All the rest have 31 except Feb., which has 28.

## E. Spacing and Plant Material Calculations

Consider a 10' by 10' bed that you want to fill with plants spaced 18 inches apart (approx. mature size of plant). Eighteen-inch spacing means each plant will take up an area 18 inches by 18 inches, or 1 ½ ft. by 1 ½ ft. or 2.25 square feet. The bed is 100 square feet. Therefore, divide 100 sf by 2.25 sf, and you will find you'll need 44.44 plants or 45 plants.

Always add a "fudge factor" to the plant materials total you calculate. An extra 5% or 10% will make up for weak or damaged plants or last minute design adjustments that require a few extra plants.

### Example

Bed area = 10' x 10' = 100 sf  
Spacing 18 in o.c. (on center)  
Plant spacing = 1.5' x 1.5' = 2.25 sf  
100 sf ÷ 2.25 sf = 44.44 or 45 plants  
45 x 5% = 2.25  
45 + 2.25 = 47.25 or 48 plants

If using 4-inch bedding plants or groundcovers then there are 18 plants per flat or tray and must be order by the tray.

### Example

48 plants needed ÷ 18 plants/flat = 2.67 flats or 3 flats

## F. Sod

Most "squares" of sod are sold by the pallet. There are approximately 504 sf of sod per pallet unless it is Zoysia which is much less. To determine the number of pallets needed, first calculate the area (sf) then divide by 504 sf. This will give you number of pallets needed to order.

Example: 50' by 28' area = 1400 sf  
1400 sf ÷ 504 = 2.77 or 3 flats

Sod producers will deliver a semi-truck, which contains 18 pallets or 9072 sf per truck. Sometimes they will pool with other orders and make deliveries. It is always best to check with your producer to find out exactly what is available, sizes, delivery, etc.

Sod producers may also have commercial rolls available for large areas. There 350 sf on a commercial roll. A truck will carry 26 rolls or 9100sf.

HORT 2241  
Attach ALL Work

Calculations Answer Sheet Name \_\_\_\_\_

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