This competency-based curriculum unit on tree identification is one of five developed for classroom use in teaching the landscape/nursery area of horticulture. The three sections are each divided into teaching content (in a question-and-answer format) and student skills that outline steps and factors for consideration. Topics covered include identifying plant material (by leaf), using proper storage techniques, and quality sorting nursery stock prior to shipment. A list of references precedes a section containing visual aids, student skill checklist, and student activities, such as field trips, handouts, discussion activities, worksheets, crossword puzzles, hands-on experiences, tests, and quizzes. Answer keys are provided. (YLB)
Tree Identification

Competency Based
Teaching Materials
in
Horticulture
Listed below are competency based curriculum units developed for classroom use in teaching horticulture. All units are indexed and include teaching content, references, student activities, a skill check list, and visual aids.

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<td>Insects, Diseases, and Weeds</td>
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</table>

**ACKNOWLEDGEMENT**

This material was prepared by: Jim Legacy, Fred Reneau, Thomas Stitt, Terry Savko, Amy Swigart, Kathy Cummings, Carole Paesch, Sharon Flanagan, and 42 Illinois teachers of horticulture, in cooperation with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, and the Department of Agricultural Education and Mechanization, Southern Illinois University.
TREES IDENTIFICATION

CONTENTS

IDENTIFYING PLANT MATERIAL (BY LEAF) ............................................. 1
- Leaf composition, leaf arrangement, leaf venation,
- Leaf characteristics
- Key a specimen

USE PROPER STORAGE TECHNIQUES ............................................. 5
- Selecting plant specimens
- Storage methods
- Storage of specimens

QUALITY SORT NURSERY STOCK PRIOR TO SHIPMENT ......................... 6
- Identify grade criteria, types of grading methods
- Categorize plants
- Label plants

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STUDENT ACTIVITIES ................................................................. 10
Tree Identification

IDENTIFYING PLANT MATERIAL (BY LEAF)

Teaching content: 4 questions; 7 student skills

Question 1: What are the five types of leaves?
- Simple
- Palmately compound
- Odd-pinnately compound
- Even-pinnately compound
- Bipinnately compound

Question 2: What are the 5 types of leaf arrangements?
- Fascicled
- Clustered
- Alternate
- Opposite
- Whorled

Question 3: What are the 5 major types of inflorescence (flower clusters)?
- Spike
- Raceme
- Catkin
- Cyme
- Umbel

Student Skill 1: Locate Bud Placement

<table>
<thead>
<tr>
<th>Steps</th>
<th>Factors for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hold twig or stem</td>
<td>2. Assuming tree is in-leaf</td>
</tr>
<tr>
<td>2. Locate a leaf</td>
<td>3. That is a bud</td>
</tr>
<tr>
<td>3. Look for a node at leaf stem's base</td>
<td></td>
</tr>
<tr>
<td>4. Look for others</td>
<td></td>
</tr>
</tbody>
</table>

Factors for Consideration:
2. Assuming tree is in-leaf
3. That is a bud
### Determine Leaf Composition

**Steps**

1. Locate bud
2. Determine if bud is located in axil of a single leaf and the stem
3. Determine if bud is located in axil of a structure with more than one leaf
4. Leaflet is attached to common point
5. Pinnately compound leaf with even number of leaflets
6. Pinnately compound leaf with odd number of leaflets
7. Pinnately compound leaf divided again. Leaflet is actually another leaf-bearing axis with additional leaflets
8. Simple, but not broad. Scale-shaped.
9. Simple, but not broad. Needle-shaped

**Factors for Consideration**

2. Simple: Ex: *Quercus*
3. Pinnately compound: Ex: *Robinia pseudacacia*
4. Palmately compound: Ex: *Hippocastanaceae*
5. Even pinnate: Ex: *Acer negundo*
6. Odd pinnate: Ex: *Carya*
7. Bipinnately compound: Ex: *Gleditsia triacanthos*
8. Scale-like. Ex: *Juniperus*
9. Needle-like. Ex: *Pinus*

### Determine Leaf Arrangement

**Steps**

1. Locate buds and leaves
2. Determine if leaves and buds are directly across from each other on stem.
3. Leaves and buds are spaced in alternating fashion along stem's axis.
4. Three buds and leaves are present at one node.

**Factors for Consideration**

2. Opposite
3. Alternate
4. Whorled
Question 4: What are the 4 major types of venation?
- Parallel
- Palmate
- Pinnate
- Arcuate

**Student Skill 4**

**DETERMINE LEAF VENATION**

**Steps**
1. Locate a leaf
2. Determine if one prominent vein (midrib) extends from (base) place where petiole attaches to blade to the tip.
3. Several main veins extend from base to tip of each lobe.

**Factors for Consideration**

**Student Skill 5**

**IDENTIFY LEAF CHARACTERISTICS**

**Steps**
1. Identify leaf shape
2. Identify leaf base
3. Identify leaf margin
4. Identify leaf tip

**Factors for Consideration**

1. Use visual aids
2. " 
3. " 
4. " 

### KEY A SPECIMEN

<table>
<thead>
<tr>
<th>Steps</th>
<th>Factors for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Obtain specimen to be identified</td>
<td>1. In this case, a leaf</td>
</tr>
<tr>
<td>2. Identify features</td>
<td>2. Composition, arrangement, venation, and other characteristics</td>
</tr>
<tr>
<td>3. Obtain a key</td>
<td>3. All keys differ, but are similar in procedure for operation</td>
</tr>
<tr>
<td>4. Use the key</td>
<td>4. Use this procedure:</td>
</tr>
<tr>
<td></td>
<td>a) Read statement #1. If it is true, go to the next #1 ... and so on ...</td>
</tr>
<tr>
<td></td>
<td>b) Read statement #8. If it is true, go to #9; if it is false, go to the next #8</td>
</tr>
<tr>
<td></td>
<td>c) Continue in this manner until you reach a species name—this is the identification</td>
</tr>
<tr>
<td>5. Identify specimen</td>
<td>5. Practice will improve efficiency</td>
</tr>
</tbody>
</table>

### CHECK IDENTIFICATION

<table>
<thead>
<tr>
<th>Steps</th>
<th>Factors for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Locate other characteristics helpful for identification.</td>
<td>1. Bark texture and color, fruit, bud and twig, flower or shape</td>
</tr>
</tbody>
</table>
USE PROPER STORAGE TECHNIQUES

Teaching content: 1 question; 3 student skills

**SELECT SPECIMENS**

**Steps**
1. Determine specimens for selection
2. Locate specimens
3. Identify specimens

**Factors for Consideration**
1. See supervisor for information
2. Use nursery map
3. By species, grade or geographically

**SELECT STORAGE METHOD**

**Steps**
1. Identify growth stage
2. Determine length of term for storage
3. Select storage method

**Factors for Consideration**
1. Will be "dormant" or "in-leaf"
2. For winter, or temporary
3. Several methods may apply

**Question 1**

What are the alternative methods that apply to storing trees?

**Alternatives**
1. Heel-in
2. Shade-house
3. Cooler
4. Poly-house
5. Leave in ground

**Factors for Consideration**
- Versatile-for either growth stage, but temporary
- For "in-leaf" trees
  - Reduce transplant shock
- For dormant
  - Best method to insure survival, if practical
STORE SPECIMENS (Heel-in*)

**Steps**  
1. Determine size of trench  
2. Dig trench  
3. Place trees in trench  
4. Cover roots with soil  
5. Compact soil  
6. Provide shade

**Factors for Consideration**  
1. Should be deep enough to cover roots. Should be long enough so roots of one plant won't intertwine with another plant's.  
2. Use a 45° angle  
3. Space to avoid intertwine which will cause damage when removed.  
4. Make certain roots are completely covered  
5. Lightly stamp on soil and roots  
6. Direct sunlight is undesirable since growth is not an objective

*Since most methods require just the transfer of materials, only heeling-in will be described.*

QUALITY SORT NURSERY STOCK PRIOR TO SHIPMENT

Teaching content: 1 question; 5 student skills

**IDENTIFY GRADE CRITERIA**

**Steps**  
1. Obtain purchase order  
2. Identify types of specimens  
3. Determine method for grading

**Factors for Consideration**  
1. See supervisor  
2. Read order  
3. Several methods may apply
What types of grading methods are there?

**Alternatives**

1. Caliper
2. Height of branching
3. Height relationship to caliper
4. Height
5. Form of growth
6. Spread of roots
7. Ball size and/or depth
8. Age (years in seed bed and number of transplants)
9. Container size
10. Spread

**Factors for Consideration**

- Most common since it is diverse and descriptive
- For "street trees"
- Helpful for selecting "shade trees"
- Special uses
- Important for specific landscape selection
- Indicates vigor of bare-root trees
- Related to height
- Common for "seedlings"
- In diameter (inches) or volume (quart/gallon)
- For conifers and broadleaf evergreens

---

**MEASURE SPECIMENS**

**Steps**

1. Hold caliper up to specimen
2. Read scale in inches

**Factors for Consideration**

1a. Take measurement 6" above ground level, if 4" diameter or less
1b. If more than 4", take at 12".
2. If a minimum and a maximum are specified; an average may be used for approximation.

---

**CATEGORIZE**

**Steps**

1. Measure specimens
2. Place specimens in groups

**Factors for Consideration**

1. Using caliper, tape, or by "eye-ballng"
2. Transfer to a specified area or label specimen.
### LABEL

<table>
<thead>
<tr>
<th>Steps</th>
<th>Factors for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Obtain materials</td>
<td>1. Tags, wire or tape, marker</td>
</tr>
<tr>
<td>2. Mark grade on tag</td>
<td></td>
</tr>
<tr>
<td>3. Affix tag to specimen</td>
<td>3. Wire to a branch or tape on container</td>
</tr>
</tbody>
</table>

### IDENTIFY DESIRED GRADE

<table>
<thead>
<tr>
<th>Steps</th>
<th>Factors for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Obtain purchase order</td>
<td>1. Same one used to identify grade criteria</td>
</tr>
<tr>
<td>2. Determine desired grade</td>
<td></td>
</tr>
<tr>
<td>3. Locate specimens</td>
<td>3. Find area where that group is located, or segregate those labeled specimens of that grade</td>
</tr>
<tr>
<td>4. Gather specimens</td>
<td>4. Place specimens together in an area where they may be easily picked up</td>
</tr>
</tbody>
</table>
TREE IDENTIFICATION

REFERENCES


IDENTIFICATION CHART - BROADLEAVED SPECIES (CONTINUED)

Section 1.--Leaves Oppositely Arranged on Twig

<table>
<thead>
<tr>
<th>Simple</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobed</td>
<td>No lobes</td>
</tr>
</tbody>
</table>

- **Lobed**
  - Rounded leaf crotches
    - SUGAR MAPLE
  - Sharp leaf crotches
    - SILVER MAPLE
  - Heart-shaped leaf
    - CATALPA
  - Oval-shaped leaf
    - FLOWERING DOGWOOD
  - 3 to 5 leaflets, green twigs
    - BOXELDER
  - 5 leaflets attached at one point
    - BUCKEYE
  - 7 or more leaflets, canoe-paddle seed
    - ASHES

- **No lobes**

Section 2.--Leaves Alternately Arranged on Twig and Compound

**Number of leaflets**

- **5**
  - Shaggy bark
    - SHAGBARK HICKORY
- **5 to 7**
  - Little buds
    - PIGNUT HICKORY
- **7 to 9**
  - Big buds, wavy bark
    - MOCKERNUT HICKORY
  - Yellow buds
    - BITTERNUT HICKORY
  - 7 to 17
    - Short thorns
      - BLACK LOCUST
    - 13 to 23
      - Chocolate-colored bark
        - BLACK WALNUT
    - 13 to 41
      - Gray bark
        - AILANTHUS (Heaven tree)

Section 3.--Leaves Alternately Arranged on Twig, Twice Compound

Long-branched thorns or spurs on twigs and trunk, some leaves once compound

- HONEY LOCUST

Section 4.--Leaves Alternately Arranged on Twig, Simple Long Leaf Stems

- **Flat stems**
  - Thick stems, deltashaped leaves
    - COTTONWOOD
  - Thin stems, circular shaped leaves
    - ASPEN
- **Rounded stems**
  - Clasps on leaf stems
    - Base of leaf stem swollen
      - SYCAMORE
    - Top of leaf notched
      - TULIPTREE
  - No clasps on leaf stem
    - Star-shaped leaves
      - RED GUM
    - Both ends of leaf stems swollen
      - REDBUD
    - Heart-shaped leaf, seed on wing
      - BASSWOOD

Section 5.--Leaves Alternately Arranged on Twig, Simple, Short Stems and No Teeth or Lobes

- **Oval-shaped**
  - Bark with small squares, deeply furrowed, plum-like fruit, generally small tree. Central and southern Illinois
    - PERSIMMON
  - See red oaks
    - Bark thin with shallow furrows, fruit an acorn
    - SHINGLE OAK
  - Broader near tip than at base
    - Bark with oblong blocks, also deeply furrowed, alligator-like skin, fruit in 2's or 3's, 1/3 inch long, large tree
      - BLACK GUM
      - TUPELO
      - SOUR GUM
CHART FOR IDENTIFYING CONIFEROUS FOREST TREES
PLANTED IN ILLINOIS - ALL EVERGREEN EXCEPT ONE*

Leaves needle-like (needles), scale-like, or awl-shaped

Needles in groups called bundles

Leaves attached singly to twig, scale-like, awl-like or needles -

2 to 5 needles in a bundle

PINE

2 or 3 needles, or 2 and 3 needles per bundle on same tree

AUSTRIAN PINE

2 needles per bundle

Needles 4 to 6 inches long

Needles, soft flexible to touch of hand, brown bud

RED PINE

Needles 1 to 1 1/2 inches long, stout, twisted, medium yellowish-green

JACK PINE

Needles 1 to 3 inches long, bluish- to whitish-green, some twisted needles

SCOTCH PINE

Either 2 or 3 needles per bundle, 7 inches long, dark grayish-green to yellowish-green, flexible

PONDEROSA PINE

2 needles per bundle, rarely

3, 1 1/2 inches long, stout, twisted, sparsely and irregularly arranged on branchlets

VIRGINIA PINE

3 needles per bundle

5 needles per bundle

10 to 20 needles in a cluster, needles drop in autumn

*EUROPEAN LARCH

4 to 8 inches long, needles, pale green, slightly stiff

LOBLOLLY PINE

5 needles per bundle

WHITE PINE

Needles 3 to 4 inches long, dark yellowish-green, stout, stand stiffly at right angles to branchlets

PITCH PINE

Both 2 and 3 needles per bundle on same tree. Needles 3 to 4 inches long, slender; flexible, not twisted, somewhat tufted at ends of branchlets

SHORTLEAF PINE
IDENTIFICATION CHART - CONIFEROUS TREES (CONTINUED)

ONE TREE DECIDUOUS

Leaves singly attached to twig or scale-like in form.

Needles (leaves) singly attached, arranged alternately, and either spirally or two-ranked

Needles 4-sided, diamond-shaped in cross section

Dark green needles, branchlets hanging from twigs, cones 4 to 6 inches long

NORWAY SPRUCE

Needles flat in cross section, lower sides with 2 white bands

All scale-like leaves, fan-like branchlets, sprays (larger twigs) flattened, cones about 1/2 inch long

(White Cedar)

ARBOR VITAE

Two types of leaves: awl-shaped (short-pointed and scaly), branchlets 4-sided, sprays not flattened, fruit a berry

RED CEDAR

Needles spirally arranged and more than two ranked

Needles 1/2 to 1 1/2 inches long, dark green to bluish-green, reddish-brown, sharp-pointed bud, cone with 3-pointed bracts on scales

DOUGLAS FIR

Needles 1/2 to 3/4 inch long, yellowish-green on both sides, feathery-like, drop off in winter with branchlets

*BALD CYPRESS

Needles 1/3 to 2/3 inch long, dark green except in spring, yellowish-green, tips of needles rounded

HEMLOCK

Silvery blue to bluish-green needles, stout, very rigid, and sharp-pointed

BLUE SPRUCE
EXTERNAL FEATURES OF A WOODY TWIG

- Terminal bud
- Bud scale
- Lenticels
- Vascular Bundle Scar
- Internode
- Node
- Leaf Scar
- Terminal bud scale scar
TYPES OF INFLORESCENCES

- Raceme
- Spike
- Capitulum
- Umbel
- Corymb
- Cyme
- Panicle
TYPES OF LEAF VENATIONS

PALMATE

PINNATE

PARALLEL
LEAF ARRANGEMENTS

ALTERNATE

OPPOSITE

WHORLED

ROSETTE
LEAF FORMS AND ARRANGEMENT

- SIMPLE
- OPPOSITE
- PINNATELY COMPOUND
- OBLANCEOLATE
- OBLONG
- PALMATELY COMPOUND
- OBOLANCEOLATE
- ELIPTICAL
- DOUBLY PINNATELY COMPOUND
- ALTERNATE
- OVATE
- WHORLED
- OBOVATE
WINTER TWIG CHARACTERS

- BUD SCALE
- TERMINAL BUD
- LATERAL BUD
- LENTICELS
- BUNDLE TRACES
- LEAF SCAR
- LEAF TIPS
- LEAF BASES

- ACUTE
- OBTUSE
- LONG-TAPERING
- PINNATELY LOBED
- HEART-SHAPED
- TRUNCATE
- ROUNDED
- TAPERING
- ASYMMETRICAL
- UPPER EPIDERMIS
- PALISADE LAYER
- RIBS AND VEINS
- Spongy Layer
- LOWER EPIDERMIS

LEAF EDGES

- DOUBLY TOOTHED
- WAVY
- TOOTHED
- SMOOTH
TYPES OF LEAVES

1. **The simple leaf**: It is the position of the bud that determines whether the leaf is simple or compound. Observe that the bud is located in the axil of a single leaf. When there is only one leaf on the petiole, the leaf is called simple.

2. **Pinnately Compound leaf**: Note that the bud is located in the axil of a structure with more than one leaf. When a leaf is made up of several leaf blades (called leaflets) attached to the petiole, the leaf type is called compound.

3. **Palmately Compound leaf**: Has a single petiole with each leaflet attached at a common point. Examples are the Buckeyes and the Virginia Creeper.

4. **Odd Pinnate leaf**: Has leaflets oppositely arranged along each side of a common axis with one leaflet at the end of the petiole. Examples are the Box Elder and the American Ash.

5. **Even Pinnate leaf**: Has leaflets oppositely arranged along each side of a common axis. Examples are the common Honey Locust and the Siberian Peashrub.

6. **Bipinnately Compound leaf**: Is composed of pinnate leaves oppositely arranged along a petiole. Examples are the Kentucky Coffee Tree and the Mimosa.

Note that the following are coniferous leaf types or cone-bearing plants.

7. **Awl-like needles or leaves**: Are shaped like a gardening trowel and stand outward away from the stem. They are very sharp to the touch. An example would be the Junipers.

8. **Scale-like foliage**: Overlaps like the shingles on a roof or the scales on a fish. Examples are Arborvitae and Falsecypress.

9. **Needle-like foliage**: Is usually straight and slender like a common needle. Examples are Firs, Pines, and Cedars.

LEAF AND BUD ARRANGEMENT

There are four leaf and bud arrangements but only the first two are the most commonly found.

1. **Opposite leaf arrangement**: The leaves and buds are directly across from each other on the stem. Examples are Maples, Honeysuckle, and the Viburnums.
2. **Alternate leaf arrangement:** The leaves and buds are spaced in alternating fashion along the axis of the stem. Examples are Birches, Beeches, and Oaks.

3. **Subopposite leaf arrangement:** Subopposite refers to a condition where the leaves and buds are not spaced far enough apart to be considered alternate, nor are they perfectly opposite; hence, the term subopposite. Examples are the Common Buckthorn and the Katsura Tree.

4. **Whorled leaf arrangement:** Refers to a condition where three buds and leaves are present at a node. Examples are the Catalpa Tree and Panicle Hydrangea "Grandiflora".

**TYPES OF LEAF VENATION**

There are four types of leaf venation; however, the first two types are most commonly found.

1. **Pinnate venation:** The vein pattern resembles that of a fish skeleton. Examples are Elms and Oaks.

2. **Palmate venation:** This pattern has several major veins of the same size which radiate out from the leaf base. The veins extend all the way to the apex of the leaf lobes. Examples are the Maples and the Sycamore.

3. **Dichotomous venation:** In this pattern, the vascular veins extend for a distance and then branch forming a "Y" type pattern. The one rare example is the Ginkgo Tree.

4. **Parallel venation:** This type is typical of many monocotyledonous plants. The veins run essentially parallel to each other along the long axis of the leaf. Examples are corn and the grasses.

**SHAPES OFTEN FOUND IN LEAVES**

1. **The lanceolate leafshape:** is shaped like a spear head.

2. **Ovate leafshape:** Is eggshaped in outline, broadest below the middle; like an oval.

3. **Cordate leafshape:** Is heart shaped. The term cordate is properly applied ONLY to the bases of leaves.

4. **Elliptical leafshape:** Has the outline of an ellipse, broadest at the middle and narrower at each end.

5. **Spatulate leafshape:** Is spoonshaped.

6. **Oblanceolate leafshape:** Is longer than it is wide; broadest at the middle and narrower at each end.

7. **Obovate leafshape:** The prefix "ob" indicates the inverse; thus, eggshaped but broadest at the top.
8. **Obcordate leafshape:** Is heartshaped, but broadest th the apex or leaf top.

9. **Oblong leafshape:** Is longer than broad, almost rectangular.

10. **Linear leafshape:** Is long and very narrow.

11. **Cuneate:** Is wedge-shaped with essentially straight sides. The leaf is attached at the narrow end.

12. **Peltate leafshape:** Is when the petiole is attached inside the leaf margin, thus being shield-shaped.

13. **Reniform leafshape:** Is kidney shaped.

14. **Hastate leafshape:** Is having the shape of an arrow head and the basal lobes are pointed outwards at or near a right angle to the leaf midrib.
TYPES OF BUDS

1. **Imbricate, Scaly**
   - Young shoot
   - X-section imbricate

2. **Valvate, Scaly**
   - Young shoot
   - X-section valvate

3. **Naked**
4. **Stalked**
The following characteristics of the leaf were identified:

<table>
<thead>
<tr>
<th></th>
<th>Pts. Possible</th>
<th>Student Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Leaf type</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Leaf arrangement</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Location of the bud</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Leaf venation</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Leaf margin</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Leaf shape</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Leaf base</td>
<td>10</td>
</tr>
<tr>
<td>8.</td>
<td>Noticeable twig characteristics</td>
<td>10</td>
</tr>
<tr>
<td>9.</td>
<td>Fruit types</td>
<td>10</td>
</tr>
<tr>
<td>10.</td>
<td>Deciduous or evergreen</td>
<td>10</td>
</tr>
</tbody>
</table>

TOTAL  100
LEAF KEY WORKSHEET - 60 pts.

#1-6 ARRANGEMENT - Fill in the appropriate blank with SIMPLE or COMPOUND, whichever represents the lettered leaf's arrangement. 3 pts. each.

#7-12 VENATION - Fill in the appropriate blank with PINNATE or PALMATE, whichever represents the lettered leaf's venation. 3 pts. each.

#13-15 LOBED - Fill in the appropriate blank with PINNATE or PALMATE, whichever represents the lettered leaf's type of lobing. 3 pts. each.

#16-20 EDGE - Fill in the appropriate blank with LOBED or TOOTHED, whichever represents the lettered leaf's type of edge. 3 pts. each.
LEAF WORKSHEET - 60 pts.

ARRANGEMENT - Simple or Compound
(Example C) - simple
1-H
2-B
3-E

VENATION - Pinnate or Palmate
(Example I) palmate
7-E
8-D
9-A

LOBED - Pinnate or Palmate
(Example J) palmate
13-A
14-I
15-D

EDGE - Lobed, Toothed, or Wavy
(Example F) toothed
16-G
17-J
18-K
19-D
20-A
LEAF WORKSHEET - Answer Key

ARRANGEMENT
1-H - Compound
2-B - Compound
3-E - Compound
4-D - Simple
5-F - Simple
6-L - Simple

VENATION
7-E - Pinnate
8-D - Pinnate
9-A - Pinnate
10-J - Palmate
11-C - Palmate
12-H - Pinnate

LOBED
13-A - Pinnate
14-I - Palmate
15-D - Pinnate

EDGE
16-G - Toothed
17-J - Lobed
18-K - Wavy
19-D - Lobed
20-A - Lobed
LEAF TEST - Answer Key

Matching

1. B

Arrangement

Lobed

Tips

2. E


3. D

7. False 17. False 27. False

4. A


5. C


10. True 20. True 29. False

Venation Edge

30. False


12. True 22. False Edge


15. False 25. True Shape

34. False 39. True

35. False 40. True

Keying - List all steps followed & species
(using National Audubon Hardwood Key or Cone-Bearing Key)

41. 1 1 17 17 21 22 22 23 Red Maple not strongly resinous when crushed.

42. 1 1 17 17 21 21 25 26 26 27 Tulip

43. 1 1 17 18 18 20 20 Dogwood

44. 1 1 17 17 21 21 25 25 28 28 34 34 43 43 45 Quaking Aspen

45. 1 2 2 3 3 4 4 Eastern White Pine
Do not write on this test. Use the answer sheet provided.

**Matching**
1. Lobe
2. Petiole
3. Base
4. Tip
5. Blade

**True-False** — Use the lettered leaf figures.
6. Figure B is simple.
7. Figure R is simple.
8. Figure J is simple.
9. Figure N is compound.
10. Figure I is compound.
11. Figure C is pinnate.
12. Figure F is pinnate.
13. Figure A is pinnate.
14. Figure D is palmate.
15. Figure N is palmate.
16. Figure Q is pinnate.
17. Figure O is pinnate.
18. Figure D is pinnate.
19. Figure B is palmate.
20. Figure C is palmate.
21. Figure J is toothed.
22. Figure A is toothed.
23. Figure E is wavy.
24. Figure M is lobed.
25. Figure D is lobed.
26. Figure O is long-tapering
27. Figure M is long-tapering
28. Figure P is obtuse.
29. Figure S is asymmetrical.
30. Figure C is heart-shaped.
31. Figure F is truncate.
32. Figure J is double-toothed.
33. Figure M is toothed.
34. Figure G is oblanceolate.
35. Figure B is obovate.
36. Gymnosperms do not have flowers.
37. Gymnosperms produce seeds in a vessel.
38. Pines are gymnosperms.
39. Monocots have parallel veins.
40. Dicots display vascular bundles in rings.

Keying
41. C
42. Q
43. P
44. E
45. K
**LEAF TEST - Answer Sheet**

**Matching**

1. ______
2. ______
3. ______
4. ______
5. ______

**True-False**  
- Use lettered leaf figures.

<table>
<thead>
<tr>
<th>Arrangement</th>
<th>Lobed</th>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>6: ___</td>
<td>16. ___</td>
<td>26. ___</td>
</tr>
<tr>
<td>7. ___</td>
<td>17. ___</td>
<td>27. ___</td>
</tr>
<tr>
<td>8. ___</td>
<td>18. ___</td>
<td>28. ___</td>
</tr>
<tr>
<td>9. ___</td>
<td>19. ___</td>
<td>Bases</td>
</tr>
<tr>
<td>10. ___</td>
<td>20. ___</td>
<td>29. ___</td>
</tr>
</tbody>
</table>

**Venation**  
- Edge  

<table>
<thead>
<tr>
<th>Edge</th>
<th>30. ___</th>
<th>Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. ___</td>
<td>21. ___</td>
<td>31. ___</td>
</tr>
<tr>
<td>12. ___</td>
<td>22. ___</td>
<td>Edge</td>
</tr>
<tr>
<td>13. ___</td>
<td>23. ___</td>
<td>32. ___</td>
</tr>
<tr>
<td>14. ___</td>
<td>24. ___</td>
<td>33. ___</td>
</tr>
<tr>
<td>15. ___</td>
<td>25. ___</td>
<td>Shape</td>
</tr>
</tbody>
</table>

**Shipe**  
- 34. ___
- 35. ___

**Keying**  
- List all steps followed & species (using National Audubon Hardwood Key or Cone-Bearing Key)

41. __________________________
42. __________________________ 26 (not strongly resinous when crushed)
43. __________________________
44. __________________________ 43 45
45 46 __________________________
45. __________________________
WOODY ORNAMENTALS

Quiz

Matching

D 1. Tree having milky sap.
L 2. Tree with simple leaf, woody strobile type fruits, good in wet locations.
M 3. Tree bearing attractive white flowers before leafing out.
H 4. Hybrid cross between the Ohio Buckeye and the Common Horsechestnut.
C 5. Palmate leaf type, leaves purple.
E 6. Tree having red petioles and samara fruit types.
G 7. Slow growing maple which turns brilliant yellow, orange, and red.
B 8. Exfoliating cinnamon brown bark.
A 9. Excellent small 15-18' tree, three-lobed leaf, turns red in fall.
F 10. Maple leaf with the deepest sinuses.

A. Acer ginnala
B. Acer griseum
C. Acer palmatum
D. Acer platanoides
E. Acer rubrum
F. Acer saccharinum
G. Acer saccharum
H. Aesculus carnea
I. Aesculus glabra
J. Aesculus hippocastanum
K. Ailanthus altissima
L. Alnus glutinosa
M. Amelanchier laevis
N. Aralia spinosa
O. Asimina triloba
Woody Ornamentals

MATCHING

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KEY TO CONE-BEARING TREES

(1) Leaves needle-like or scale-like. (2)

(2) Leaves scale-like. (3)

(3) Leaves dark-green, overlapping, 0.6". New foliage is pointed & prickly. - Eastern Red Cedar.

(3) Leaves yellowish-green, 0.1-0.3". - Northern White Cedar.

(2) Leaves needle-like (3)

(3) Leaves grow singularly. - Spruce

(3) Leaves in clusters of 2 or more. (4)

(4) Leaves in clusters of 10 or more, falling off in autumn. - Larch

(4) Leaves in clusters of 2. (5)

(5) Most or all leaves longer than 4". Cones oval-shaped, 1-2". - Red Pine

(5) Leaves stiff, dark-green, 1-2". Cones are slender shaped. Bark is dark gray. - Jack Pine

(5) Leaves stiff, yellowish-green, 1-2". Cones rounded. Bark is redish. - Scotch Pine
Red Oak
(*Quercus rubra*)

Spanish Oak, Southern Red Oak
(*Quercus falcata*)

Pin Oak
(*Quercus palustris*)