LESSON 1: PLANTS

CONCEPTS:

Scientific Observation
Scientific Names
Plant Identification
Life Cycle
Patterns (Similarities & Differences)

NGSS:

3-LS1 - Structures & Processes
3-LS3 – Variation of Traits
4-LS1 – Structure & Function
5-PS3 – Energy
5-LS1 – Energy Flow in Organisms

DURATION:

45 minutes

SUMMARY

Students will review plants parts and the life cycle. They will observe at least two different types of plants, drawing them and identifying their differences. They can use their imagination and name their plants.

OBJECTIVES

Students will participate in plant identification using observation skills. Students will learn the why we have scientific names for plants.

MATERIALS

- KWL Worksheet
- Plants Power Point
- Plant Part Worksheet
- Plant Observation Worksheet
- Pencils and/or Crayons
- Clipboards

ACTIVITY

Have students fill out the first two sections of the "Know, Want to Know, Learned" (KWL) worksheet. Encourage drawing for those with difficulty writing. Review the "Plants" Power Point.

Hand out the "Plant Observation" worksheets and take students outside to observe two different plants on campus. They will draw a detailed drawing (or rubbing) of the leaf, then draw the overall shape of the plant. Ask students to observe further and write down any unique features about the plant (flowers, hairy leaves, sap, spines, fruits, smells, etc.).

After they've finished observing two plants, have them write (or draw) the similarities and differences between the two.

Bonus: Remembering how scientific names are chosen, have students name their plants using their imagination. Revisit the "KWL" worksheet to fill in what they've learned. If there's time, ask volunteers to present their work to the class and explain why they chose their scientific name.

*Expanded Activity (additional 30 min):

Find the real names for the plants on your campus. Have the students look up one or both the meaning of the plant's scientific name and background of the plants. Look for special uses for the plants, whether it's from Hawai'i or elsewhere, does it grow is shade or sunny places, etc.

*Advanced Activity for 5th Grade (additional class period):

This activity is designed for classes that have learned about basic taxonomic classification and differences between native, non-native and invasive species. Instructions are at the end of this lesson.

Name: _____

Plant KWL

What do you **Know** about Plants, What do you **Want to Know,** and what did you **Learn?**

What I Know:

What I Want to Know:

What I Learned:

Plant Parts

I am often colorful.

_____ _____ _____ _____ _____ _____

I am below the ground and brown.

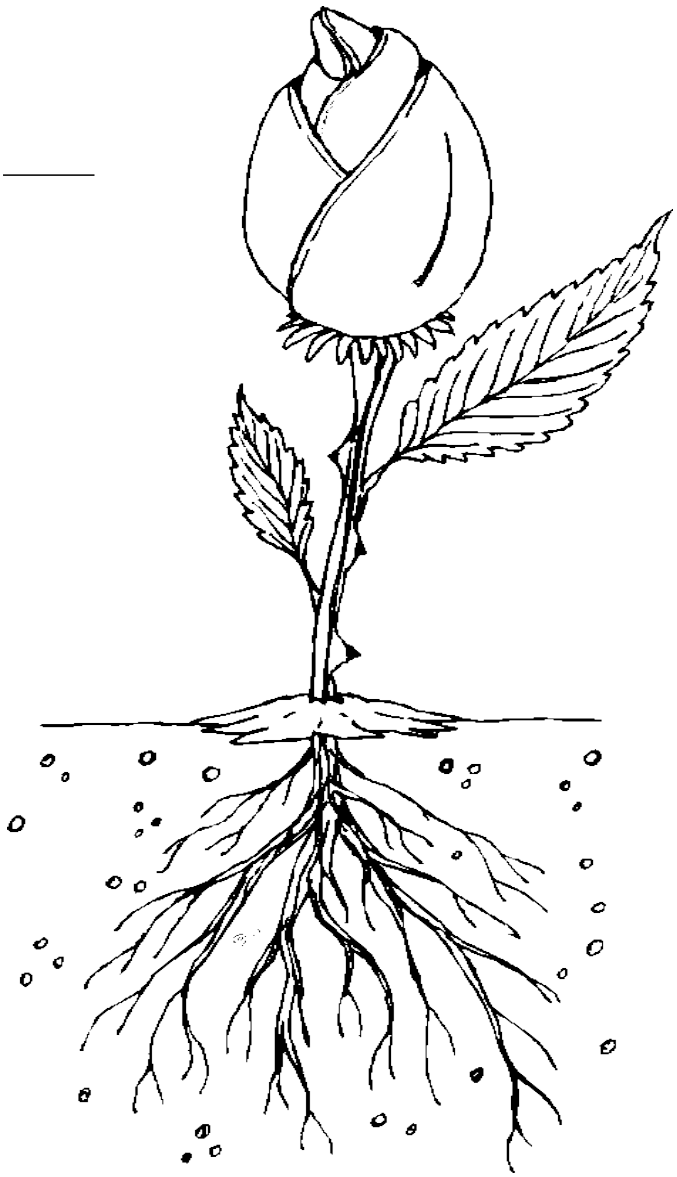
_____ _____ _____ _____

I am thin, green and grow upwards.

_____ _____ _____ _____

I am green and flat.

_____ _____ _____ _____



FLOWER **STEM** **SEED**

ROOT **THORN** **LEAF**

PLANT OBSERVATION WORKSHEET

Name: _____

Draw a single leaf

Draw the whole plant

Draw a single leaf

Draw the whole plant

What is the same?

What is different?

Name your plant:

ADVANCED ACTIVITY FOR 5TH GRADE (ADDITIONAL CLASS PERIOD)

This activity if for classes that have learned about basic taxonomic classification and differences between native, non-native and invasive species. This is an exercise in plant identification

MATERIALS

- Answer Key for Facilitator
- What's That Plant? Activity Sheet
- Leaf Characteristic Key
- Family ID Key
- Plant ID Key
- Printable Plant Specimen Numbers
- Pencils
- Rulers
- Field Guides for common Hawaii Plants or ability to use online searches
- Potted Plants or ore-determined plants on campus from different families.

TEACHER PREPARATION

Potted plants suggested for activity are common along roads, trails, and some yards. Non-invasive and native plants can be purchased at most commercial retailers. If you do not use these plants, you will need to alter the "Family ID Key" & "Plant ID Key" to include your choices.

- Ohai (Sesnbania tomentosa)
- Milo (Thespesia populnea)
- Aweoweo (Chenopodium oahuense)
- Clidemia (Clidemia hirta)
- Castor Bean (Ricinus commonis)
- White Shrimp Plant (Justica betonica)
- Coral Berry (Rivinia humilis)
- African Tulip sapling (Spathodea campanulata)

Part 1: Introduce the Activity:

Review the taxonomic chart and classification. Scientific names
Go over the key terms (leaf margin, leaf arrangement, habit). Discuss the observation skills needed when trying to ID a mystery plant (details, size, shape, color, leaf structure and arrangement).

Share some field guides with students. Familiarize them with types of information included in the guides: photos/drawing, information about the leaves, flowers, and fruits.

Part 2: Observation

Break students into groups of 2-4 and give each group a mystery plant. Spend 7-10 minutes observing the plants and writing and drawing key characteristics…including measurements.

Have students draw the plant; what's the shape of it, bushy or sparse, etc.? Then, have them draw a detailed sketch of a leaf. *HINT…students may get their vein pattern wrong. Having them refer back to their drawing is helpful to see what it most resembles to the vein pattern key.

ADVANCED ACTIVITY FOR 5TH GRADE (ADDITIONAL CLASS PERIOD)

Part 3: Leaf Characteristics

Students will answer the following questions using the LEAF ID KEY:

- What is the Leaf Shape?
- What is the Leaf Type: Simple or Compound?
- What is the Leaf Margin?
- What is the Leaf Veination?
- What is the Leaf Arrangement?

The Notes Section if for them to write unique feature of the plant and/or leaves. Looking for hairs on leaves, stems, thorns, flowers, fruits, sap, smells, etc.

Using the Facilitator's KEY FOR ACTIVITY, check the leaf characteristics to make sure they are correct for the plant, if not discuss with them the errors in either leaf characteristics.

Part 4: Family ID Key

Once the students have completed their leaf identifications, hand out the FAMILY ID KEY to match their leaf characteristics to all matching possible families. There will be more than one family possibility based on the leaf characteristics.

If there's time, use the Facilitator's KEY FOR ACTIVITY to make sure they have the family name as one of the possible families. If not, discuss their choices

Part 5: Plant ID Key

Once students have narrowed down their possible families, give them the PLANT ID KEY to match their information on the activity sheet. Have them fill in the common name, Hawaiian name if applicable, and scientific name.

Use the Plant Pono website (www.plantpono.org) to look up the Hawai'i Pacific Weed Risk Assessment (HPWRA) score and record it on the sheet.

If the plant is invasive, list alternative, healthy (pono) plants.

If the plant is not listed on the website, request a plant assessment be conducted. You can do this using the link on plant pono home page, or use this link: http://plantpono.org/hpwra-request.php

Use the field guides (if you have them), and have students write down some interesting notes about the plant.

ADVANCED ACTIVITY FOR 5TH GRADE (ADDITIONAL CLASS PERIOD)

Discussion Suggestions:

1. Why do we use scientific names?
2. What are the important elements to include in an illustration?
3. What information would help to know about the plant that you were not given?
4. What are some interesting facts about your plant?
5. When it was introduced?
6. Is your plant used for medicine?
7. Why do some plants have hairs on them?

Extensions Suggestions (minimum additional class or homework project)

1) Have the students present their plant to the class.
2) List the differences and similarities between the plant description and the field guide.
3) After getting the HPWRA score, have students investigate the plant:
   a. What is its habitat?
   b. What is its distribution?
   c. If native, what is it's Hawaiian name?
   d. If native, what are its uses in the Hawaiian culture?
   e. If non-native, when was it introduced?
   f. If non-native, why or how was it introduced?
   g. If non-native, is it invasive?
   h. Why is it invasive? (lack of predators/environmental stressors, variety of habitat, grows quickly, rapid reproduction).
   i. If invasive, what are the impacts? (human health, environment, economy, quality of life).
4) If the plant is invasive, is it being controlled or managed?
5) If students are identifying plants on campus, they can extend this into a mapping project.

ADVANCED ACTIVITY FOR 5TH GRADE (ADDITIONAL CLASS PERIOD)

Printable Plant Specimen Numbers

1 2 3

4 5 6

7 8

FAMILY KEY FOR STUDENTS: Leaf Characteristics

FAMILY	SHAPE	TYPE	MARGIN	VEINS	ARRANGEMENT
Euphorbiaceae		Simple or Compound (Palmate)			Mostly Alternate
Acanthaceae		Simple	Usually Entire		Opposite
Phytolaccaceae		Simple	Entire		Any Arrangement
Bignoniaceae		Compound (Pinnate)			Opposite or Whorled
Fabaceae		Mostly Compound			Mostly Alternate
Malvaceae		Simple		Mostly Palmate	Alternate
Amaranthaceae		Simple			Mostly Alternate
Melastomataceae		Simple		3-9 Distinct veins running from base to tip	Opposite

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Amaranthaceae		Simple			Mostly Alternate
Melastomataceae		Simple		3-9 Distinct veins running from base to tip	Opposite

PLANT KEY FOR STUDENTS

PLANT	SHAPE	TYPE	MARGIN	VEINS	ARRANGEMENT
Castorbean	Round	Simple	Deeply lobed	Palmate	Alternate
Shrimp Plant (White)	Ovate	Simple	Entire	Pinnate	Opposite
Coral Berry	Elliptical to oval	Simple	Entire	Pinnate	Alternate
African Tulip	Oval	Compound (pinnate)	Toothed	Pinnate	Opposite
Ohai	Oval	Compound (pinnate)	Entire	Pinnate	Alternate
Milo, Pacific Rosewood	Heart	Simple	Entire	Pinnate	Alternate
Aheahea, Aweoweo	Heart-Triangle	Simple	Shallowly lobed	Palmate	Alternate
Clidemia	Oval	Simple	Entire	Palmate(5 distinct veins)	Opposite

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Questions to ask…

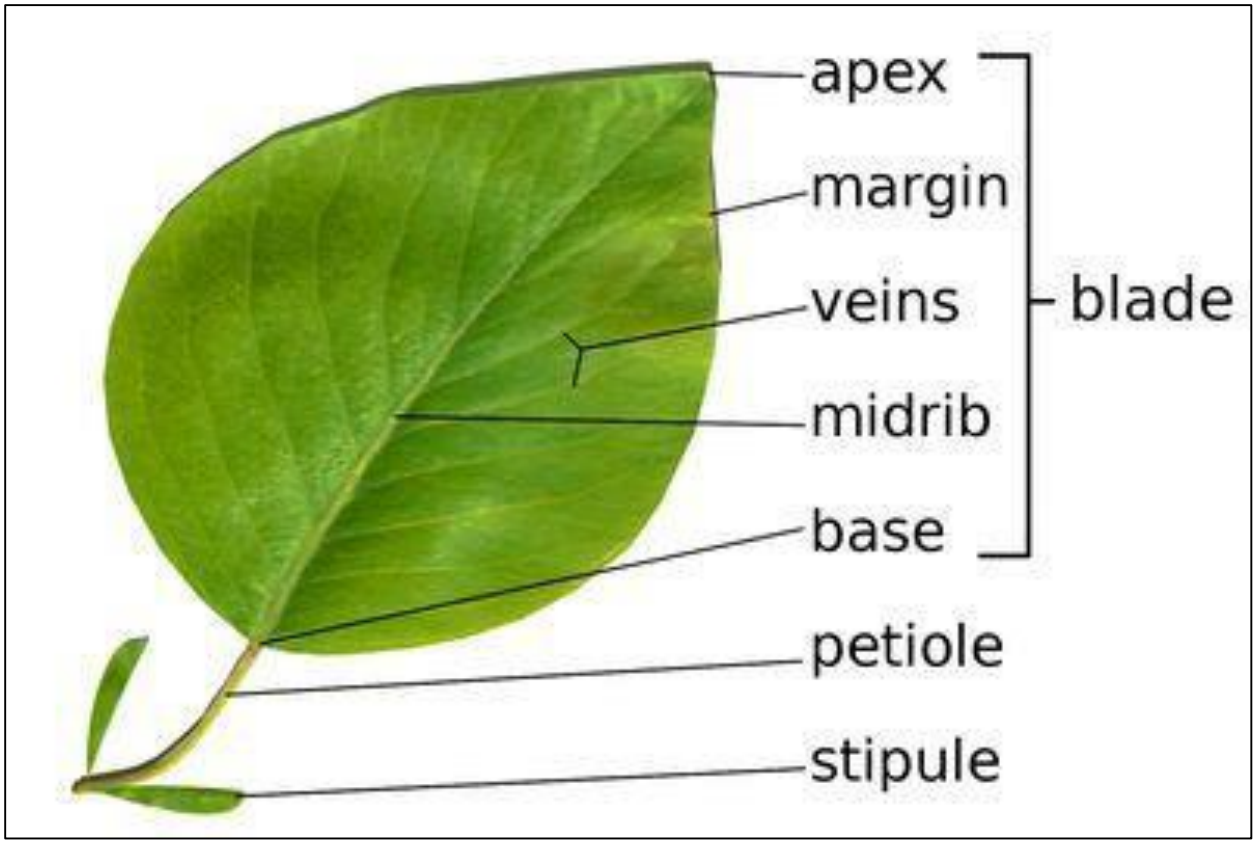
What's the leaf arrangement on stem?

What's the shape of the leaf?

What type of leaf…simple or compound?

What kind of leaf margin?

What kind of veination?



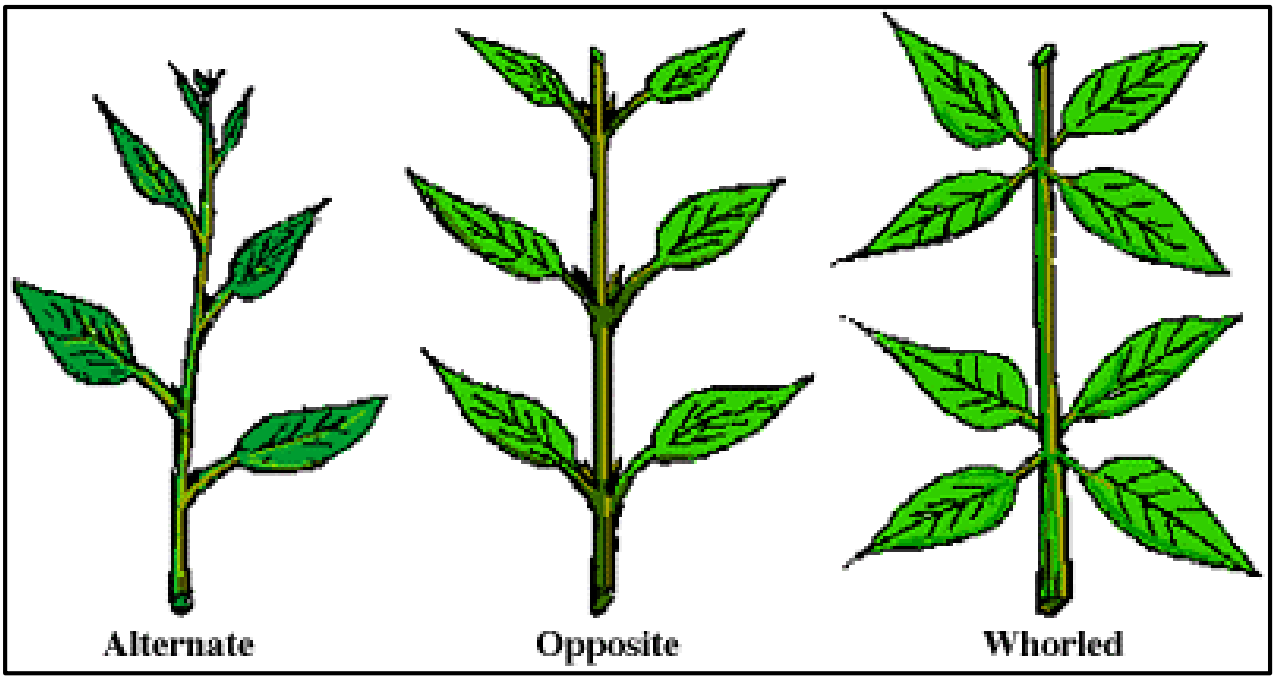
LEAF ARRANGEMENT

Alternate: a single leaf is attached at the node.

Opposite: a pair of leaves are attached at the node.

Whorled: three or more leaves are attached at the node.

***Node** – place on the stem where the leaf emerges.



LEAF MARGIN

Lobed: Has divisions that do not arrive at the center of the half blade.

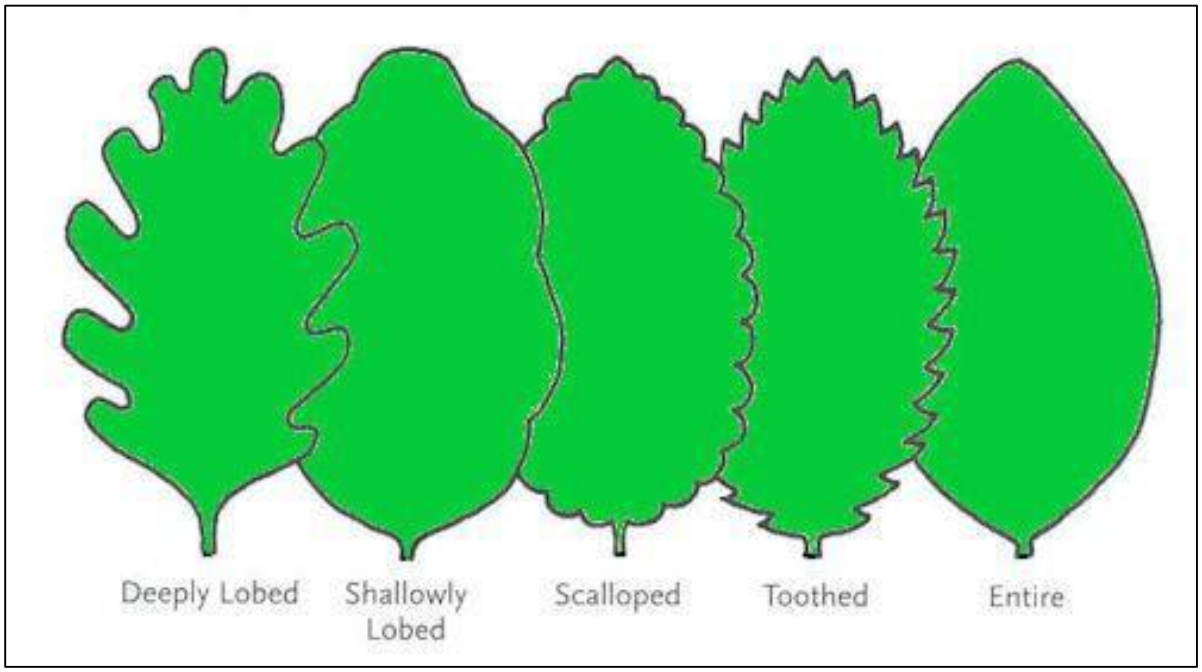
Deeply lobed

Shallowly lobed

Scalloped: has an edge with broad rounded "hills".

Toothed: Jagged, pointy leaf margin, like a saw.

Entire: Smooth leaf margin



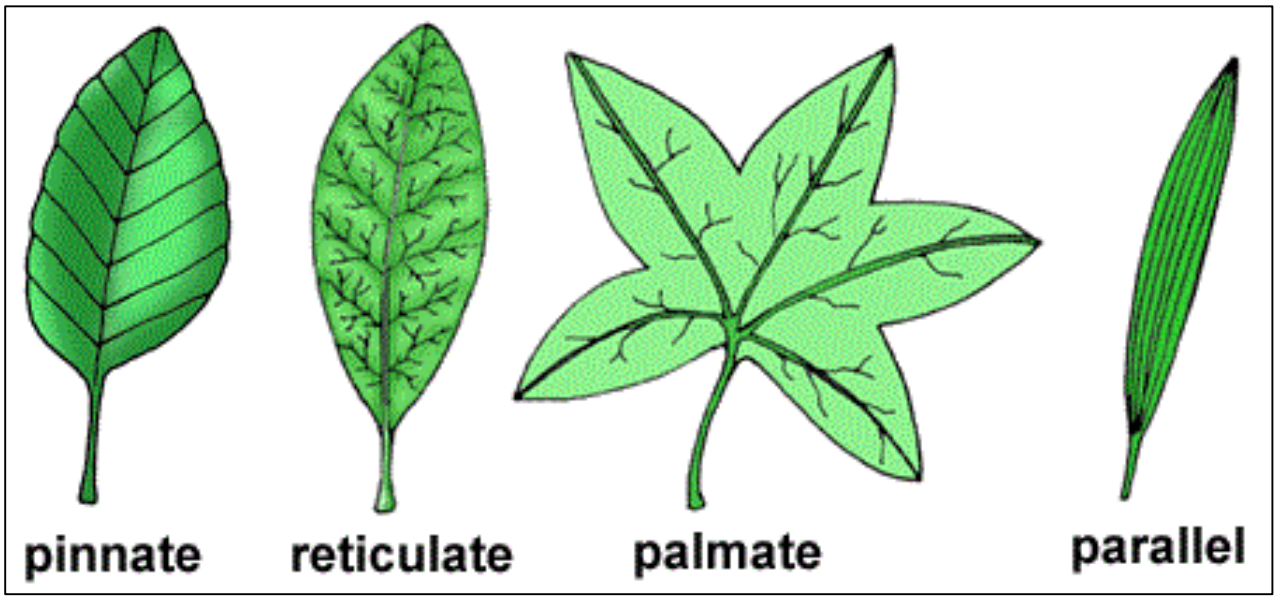
LEAF VEINS

Pinnate: Small veins branch out from the middle, like a feather.

Reticulate: Veins create a web-like pattern across the leaf.

Palmate: Veins have more than one major vein with smaller ones branching from it.

Parallel: Veins run side by side.



LEAF TYPE

Simple: Undivided, no divisions reach the midrib.

Entire Margin

Lobed Margin

Compound leaf: Fragmented, with divisions reaching the midrib.

Trifolate: three leaflets

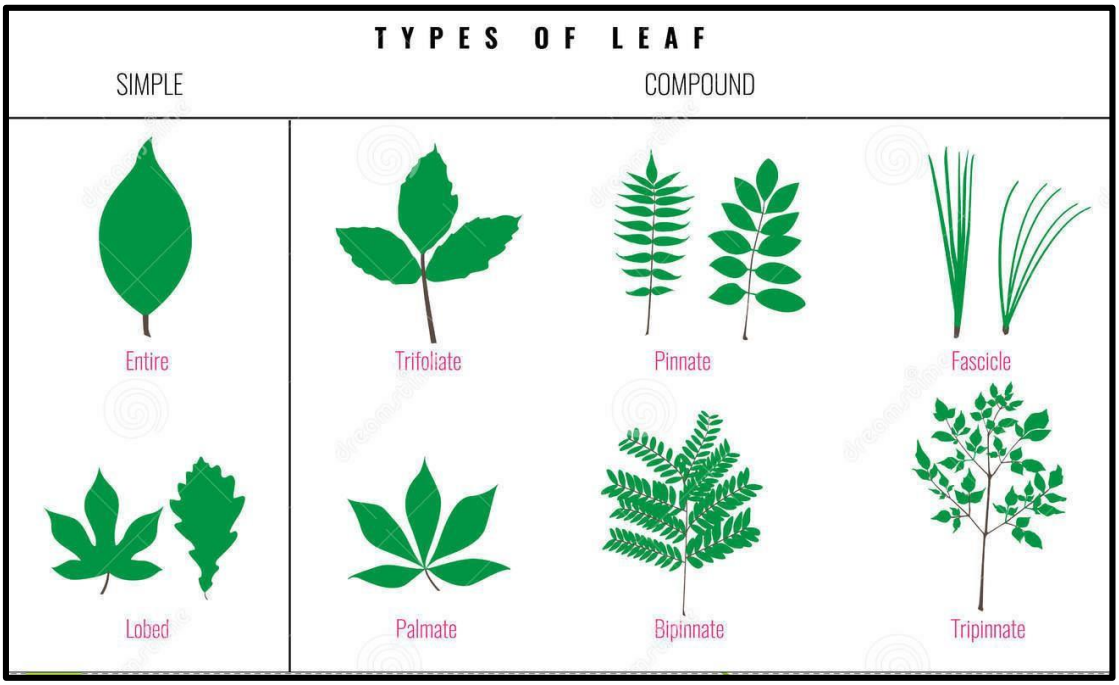
Pinnate: a row of leaflets forms on either side

Fascicle: a bundle of leaves growing crowded together.

Palmate: the leaflets radiate from a single point

Bipinnate: divided twice: each leaflet is subdivided into smaller leaflets.

Tripinnate:
Having bipinnate leaflets or lobes that are themselves pinnately di vided, often found in ferns.



LEAF SHAPE

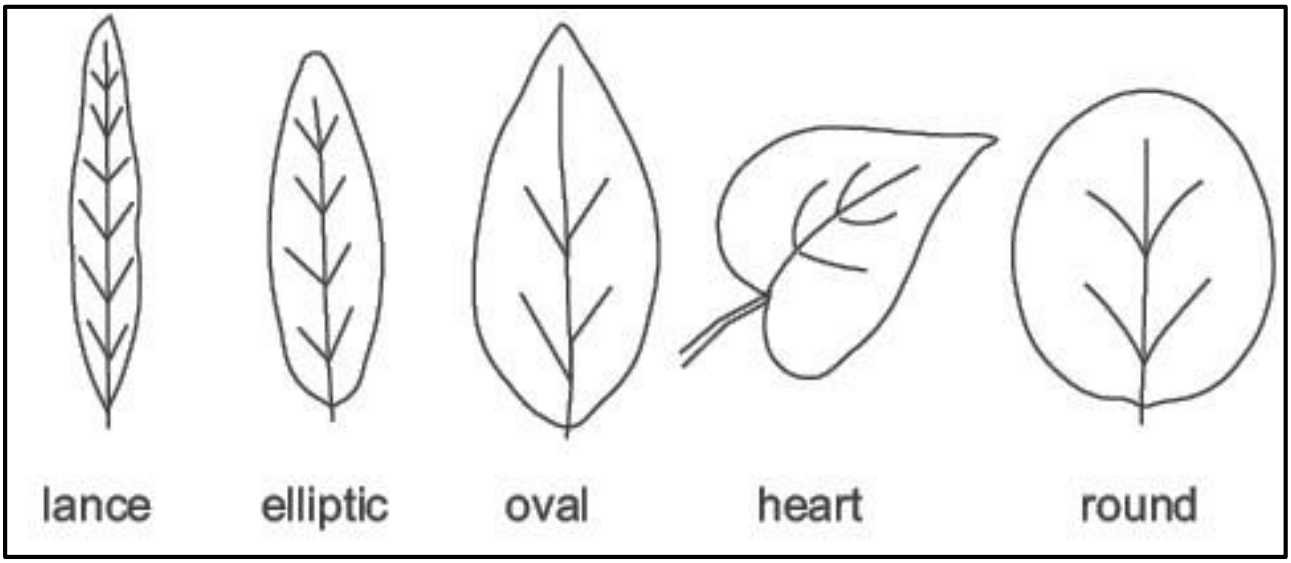
Lance: much longer than width…long and skinny.

Elliptical: longer than width, but leaf is wide in the middle.

Oval: Just like the shape, oval.

Heart: Similar shape to a heart.

Round: Leaf is similar to a circle.



PLANT #: _____ **NAME:** _____ **DATE:** _____

Examine your plant….identify key characteristics and note any unusual or outstanding characteristics, such as hairs, thorns, sap, odd smells, fruits, flowers…anything!

SHAPE	TYPE	MARGIN	VEINS	ARRANGEMENT	NOTES
FAMILY POSSIBILITIES					

COMMON NAME	SCIENTIFIC NAME	HAWAIIAN NAME	HWRA SCORE	NATIVE/INTRODUCED/INVASIVE

Draw the overall shape of the plant and a close view of an individual leaf.

PLANT	LEAF

Facilitator Key For Activity:

Common Name	**Plant No.**	**Scientific Name**	**Hawaiian Name**	**Family**	**Native/Non-native/Invasive**	**HWRA Score**
Castorbean	*1*	*Ricinus communis*	N/A	Euphorbiaceae	Invasive	21
Shrimp Plant (White)	*2*	*Justicia betonica*	N/A	Acanthaceae	Invasive	12
Coral Berry	*3*	*Rivina humilis*	N/A	Phytolaccaceae	Invasive	11
African Tulip	*4*	*Spathodea campanulata*	N/A	Bignoniaceae	Invasive	14
Ohai	5	*Sesbania tomentosa*	Ohai(Endemic)	Fabaceae	Native(Endemic)	0
Milo, Pacific Rosewood	6	*Thespesia populnea*	Milo	Malvaceae	Native (Indigenous?) Canoe Plant	9
Aheahea, Aweoweo	*7*	*Chenopodium oahuense*	Aheahea	Amaranthaceae	Native (Endemic)	0
Clidemia, Koster's Curse	*8*	*Clidemia hirta*	N/A	Melastomaceae	Invasive	28