

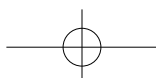


Unit 1

Tree identification and measurement

In this unit, you will learn:

- **Subject-related knowledge:** Tree identification
Measurement of tree diameter
- **Academic skill:** Collecting data
- **Reading strategy:** Dealing with unknown words (Part I)



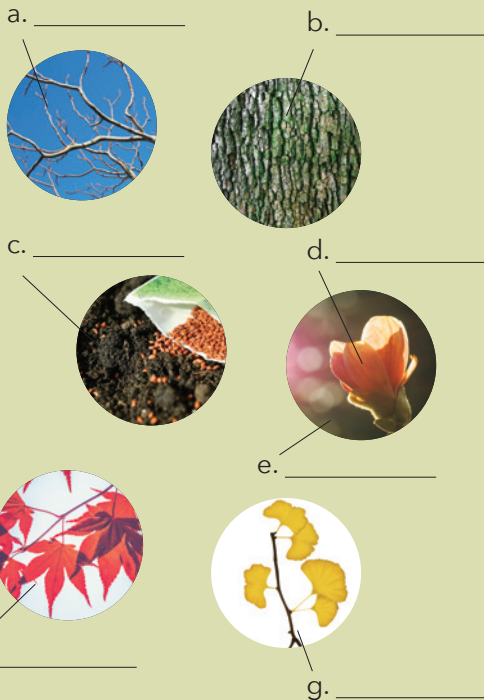


Section A

Pre-reading

1 Tree identification is of great importance in the knowledge of dendrology (树木学) and the study of each organ in trees is reliable in tree identification. Fill in the blanks in the following pictures with the given words below.

seeds maple leaves sepal (萼片)
ginkgo leaves (银杏叶) petal (花瓣)
bark (树皮) twig (枝条)



2 Discuss the following questions in groups.

1. Make a list of at least five organs in a plant.
2. Different organs have different functions. Give an introduction to one specific organ in a plant, including its name, functions and form.

1 Trees are classified into groups primarily by their fruits and flowers, but the leaves and twigs are usually more accessible for identification. Tree identification in urban locations requires knowing many trees because of the numerous exotics that have been introduced from around the country and the world. The most important features to look for in identifying a tree are: leaves, twigs and stems, bark, flowers, fruits and seeds, cones.

Leaves

2 One way to identify a tree is by its leaves. Leaves have many distinguishing characteristics and these characteristics can be used for identification. The following aspects of leaves have features used for identifying a tree. They are: part, type, shape, arrangement on the stem, venation, shape of apex and base, margin, and surface.





Tree identification

Text A

Twigs and stems

³ Twigs are useful in identifying trees except for a short period during the spring when the buds are opening and shoots are elongating on these small branches. Several features of twigs, including buds, leaf scars, lenticels, pith, spurs, thorns, spines, and prickles, can help describe them. Other factors to consider are color, taste, and odor. The color of the bark can be a most important feature on young stems.

Bark

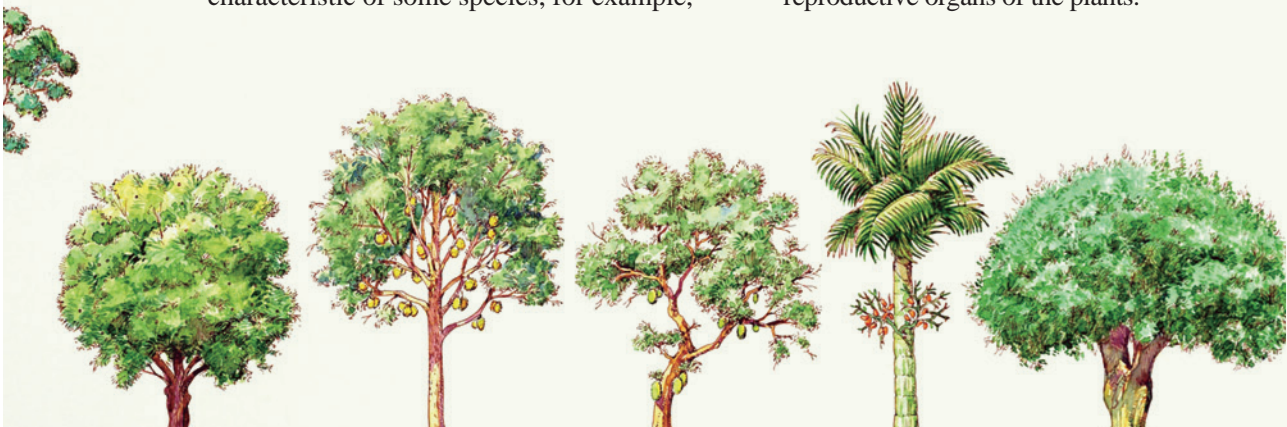
⁴ Bark is one of the most important features for tree identification because of its year-round accessibility. It is especially useful when the tree leaves and twigs are inaccessible or unavailable during the fall and winter. The shape of the bark is characteristic of some species, for example,

the small, rectangular plates on flowering dogwood. Bark on young trees differs from that on more mature trees. Experience is the best way to learn bark characteristics.

Flowers

⁵ Flowers are the best feature for identifying trees, but are available only for a short period each year. Leaves, twigs, and bark are usually available for identification, but if there is doubt about a certain tree, the flower is the surest way to identify it.

⁶ Although not always noticeable to the casual observer, all hardwoods bear flowers. Some produce flowers annually, while others flower less often. Flowers are modified leaves that have undergone change to the point that they have become or support the reproductive organs of the plants.





Complete and incomplete flowers

⁷ A complete flower has four parts: sepals, petals, stamens, and pistils. An incomplete flower is one that lacks any of these parts.

Perfect and imperfect flowers

⁸ A perfect flower includes actively functioning organs of both sexes but may lack sepals or petals. The stamen is the male reproductive structure, and the pistil is the female reproductive structure. A perfect flower may be either complete or incomplete.

⁹ A flower lacking either functional stamens or pistils is imperfect. These flowers may also be known as unisexual flowers, meaning they are either pistillate (female) or staminate (male). These may occur on the same tree, or the male and female parts may be on separate trees, as in the ginkgo.

Arrangement of flower blooms

¹⁰ Flowers bloom in different arrangements. Individual or single bloom flowers are typical of many woody plants, for example the magnolia.

¹¹ A cluster or an inflorescence is a collection of individual flowers arranged in a specific pattern. One that blooms at the end of a central stalk, or rachis, is referred to as a determinate flower. The dogwood tree has a determinate flower. If the flowers open progressively from

the base to the apex or from the outside to the center in flat-topped clusters, the flower is indeterminate. The flowering crab apple has an indeterminate flower.

¹² A flower at the end of a twig is a terminal flower. An inflorescence that appears in a leaf axil, or bud, is described as axillary. Flowers may also appear from separate flower buds, which are normally located near the tips of the twigs.

Fruits and seeds

¹³ Another key to identifying a hardwood is its fruit or seed. A fruit is the seed-bearing organ of the plant. Using fruit is somewhat limited, however, because some trees do not bear fruit and others do so only for a short time or at irregular intervals. Fruits develop from flowers. Solitary flowers that have a single pistil produce a single fruit. A cluster of flowers with multiple pistils produces a cluster of fruit or a compound fruit. Some fruits have only one seed, and others develop many seeds. In most species, pollination and fertilization must occur for fruit to develop. Fruit development can take from a week or two in elms to two growing seasons in red oaks.

Simple fruits

¹⁴ Simple fruits develop in various forms. There are two basic types, dry and fleshy, each of which has a wide range of variations.



15 The two primary forms of dry fruit are indehiscent, meaning not split open at maturity, and dehiscent, meaning split open when ripe. Indehiscent fruits are usually one-seeded with the seed enclosed in various types of coverings. Species with this type of fruit include maples and oaks. Dehiscent fruits are usually many-seeded and are enclosed in a covering that splits when the fruit is ripe, such as the redbud, magnolia, and rhododendron.

16 Fleshy fruits are usually multi-seeded; the seeds are surrounded by a fleshy pulp, or pericarp, which is sometimes edible. These may be classified as a berry (blueberry and persimmon), drupe (cherry, plum, and holly), or pome (apple or pear).

Compound fruits

17 Fruits that develop from multiple pistils are called compound. Two types of compound fruit are aggregate and multiple.

18 Aggregate fruits develop from a single flower that has many pistils that form many fruitlets in a single mass, such as the magnolia or tulip tree.

19 When several flowers together contribute to the development of a single fruit, it is called a multiple fruit. The fig tree and the mulberry produce examples of this type of fruit.

Cones

20 Seeds for softwoods (conifers) are found in cones. Most conifers are monoecious. Monoecious means that both male and female reproductive parts are located in separate structures on the same tree. A few conifers are dioecious: The male and female reproductive parts are on separate trees. Male and female structures are called cones or strobile. Cones consist of an egg or pollen-bearing scales attached to the central stem. The scales may be arranged spirally or they may appear in pairs.





New words and expressions

exotic /ɪg'zɒtɪk/ *n.* 外来植物; 外来树种

stem /stem/ *n.* 茎

cone /kəʊn/ *n.* (松树、冷杉树等的) 球果

venation /vi:'neɪʃən/ *n.*

the system or pattern of the veins in a leaf 叶脉

apex /'eɪpeks/ *n.*

the highest point (of sth.) 顶点; 尖端

elongate /'i:lɒŋgeɪt/ *vi.*

to become longer 伸长

lenticel /'lentɪsel/ *n.* 皮孔

pith /pɪθ/ *n.*

a soft white substance that fills the stems of some plants (某些植物茎中的) 髓

spur /spɜ:(r)/ *n.*

a short fruit-bearing tree branch (枝) 距

spine /spain/ *n.*

a long, sharp point on a plant 刺

prickle /'prɪkl/ *n.*

a sharp pointed part on a plant (植物的) 刺, 棘

rectangular /rek'tæŋgjʊlə(r)/ *adj.*

having four right angles 矩形的

dogwood /'dɒgwʊd/ *n.*

山茱萸科; 木属植物

hardwood /'hɑ:dwʊd/ *n.*

a tree that takes a long time to grow and that produces strong heavy wood 硬木树; 阔叶树

incomplete flower 不完全花

complete flower 完全花

imperfect flower 单性花

perfect flower 两性花

stamen /'steɪmən/ *n.*

the male reproductive organ of a flower (花的) 雄蕊

pistil /'pɪstɪl/ *n.*

the female seed-producing part of a flower (花的) 雌蕊

pistillate /'pɪstɪlɪt/ *adj.* 只有雌蕊的

staminate /'stæmɪnɪt/ *adj.* 只有雄蕊的

woody plant 木本植物

magnolia /mæg'nəʊliə/ *n.*

a tree with large white, yellow, or pink flowers 木兰树

inflorescence /,ɪnflɔ:'resəns/ *n.*

a cluster of flowers 花; 花序

rachis /'reɪkɪs/ *n.* 花序轴; 叶轴

determinate /dɪ'tɜ:mɪnət/ *adj.* (花序) 有限的

crab /kræb/ **apple** *n.*

花红(树); 沙果(树)

terminal flower 顶生花

axillary /æksɪ'lɪəri/ *adj.*

situated in, or rising from an axil; of or pertaining to an axil 叶腋的; 腋生的

solitary /'sɒlɪtəri/ *adj.*

(of plants and animals) not growing or living in groups or colonies 单生的

single fruit 单果

compound fruit 复果

pollination /,pɒlɪ'neɪʃən/ *n.*

the act of causing (a flower or plant) to be able to produce seeds by adding or bringing pollen 授粉 (作用)

fertilization /,fɜ:tɪlə'zeɪʃən/ *n.* 授粉

elm /elm/ *n.* 榆树

oak /əʊk/ *n.* 栎树; 橡树

indehiscent /,ɪndɪ'hɪsənt/ *adj.*

(of fruits) not opening to release seeds (果实等成熟)



时) 不开裂的

dehiscent /dɪ'hɪsənt/ *adj.*

(of fruits) opening spontaneously to release seeds
(果实等成熟时) 开裂的

redbud /'redbʌd/ *n.* 紫荆

rhododendron /rəʊdə'dendrən/ *n.*

(植物) 杜鹃

pulp /pʌlp/ *n.* 果肉

pericarp /'perɪkɑ:p/ *n.*

the part of a fruit enclosing the seeds 果皮

persimmon /pɜ:'sɪmən/ *n.*

a soft orange-colored fruit that grows in hot countries 柿子

drupe /dru:p/ *n.*

any type of fruit with a hard stone surrounded by juicy flesh 核果

plum /plʌm/ *n.* 李子

holly /'hɒli/ *n.* 冬青

pome /pəʊm/ *n.*

the fruit produced by trees like apples and pears
梨果

aggregate fruit 聚合果

fruitlet /'fru:tlt/ *n.* 小果实

tulip tree 北美鹅掌楸

multiple fruit 聚花果

fig tree 无花果树

mulberry /'mʌlbəri/ *n.* 桑树

softwood /'sɒftwʊd/ *n.*

a tree that has soft wood 软木树; 针叶树

conifer /'kɒnɪfə(r)/ *n.*

a tree that has needle-shaped leaves which it does not normally lose in winter, and produces brown cones that contain its seeds 针叶树

monoecious /mɒ'ni:ʃəs/ *adj.*

(of some flowering plants) having the male and female reproductive organs in separate flowers on the same plant 雌雄同株的

dioecious /daɪ'i:ʃəs/ *adj.*

(of some plant) having the male and female reproductive organs in separate flowers on separate plants 雌雄异体的

strobile /'strəʊbaɪl/ *n.* 球果; 孢子叶球

pollen /'pɒlən/ *n.*

the fine powder produced by flowers, which makes them produce seeds 花粉

scale /skeɪl/ *n.* 鳞片

spirally /'spɪərəli/ *adv.* 成螺旋形地





Reading comprehension

- 1** Read Text A and complete the table with the words or expressions in the text.

Feature in tree identification	
Leaves	The features used for identifying trees: part, shape, 1) _____, venation, shape of apex and 2) _____, margin, and surface
Twigs and stems	<ul style="list-style-type: none"> The time that twigs cannot be used for tree identification: the short period during the 3) _____ A most important feature on young stems: 4) _____
Bark	<ul style="list-style-type: none"> The reason that bark is one of the most important features for tree identification: 5) _____ The best way to learn bark characteristics: 6) _____
Flowers	<ul style="list-style-type: none"> The surest way to identify a certain tree: the flower
Fruits and seeds	<ul style="list-style-type: none"> The characteristic of a fruit: 7) _____ The production of solitary flowers that have a single pistil: 8) _____ The production of a cluster of flowers with multiple pistils: 9) _____
Cones	<ul style="list-style-type: none"> The findings in cones: 10) _____ The composition of cones: 11) _____ or 12) _____ attached to the central stem

- 2** Write down the botanical characteristics of the following plants mentioned in Text A.

Example

flowering crab apple

The flowering crab apple has an indeterminate flower.

- flowering dogwood _____
- ginkgo _____
- red oak _____
- maple _____
- rhododendron _____
- fig tree _____



Language focus

1 Fill in the blanks with the antonyms of the underlined words based on the information from Text A.

1. The shape and form of the bark differ not only in the variety of trees but also in age. In other words, the bark on young trees may appear distinctively from that on more _____ trees.
2. The _____ flower lacks either functional stamens or pistils, while the perfect flower contains actively functioning parts of both sexes.
3. The unisexual flowers usually occur in the ginkgo, where the male and _____ parts may grow on separate trees.
4. As one of the primary form of dry fruits, the most difference between dehiscent fruits and _____ fruits is that the former will split open when ripe and are usually many-seeded.
5. Cherry and plum can be classified as _____ fruits. In opposite to dry fruits, their seeds are commonly surrounded by edible and full pulp or pericarp.
6. _____ fruits, including aggregate and multiple, are developed from multiple pistils, which differ from the single fruits in many areas.

2 Summarize the meanings of the following terms based on the information from Text A and consult a dictionary for their Chinese translations.

	Meaning	Chinese translation
twig		
unisexual flower		
indeterminate flower		
fleshy fruit		
aggregate fruit		
dioecious		



3 The following pairs of words are categorized with the same prefixes or word roots. Summarize the meanings of them and write down other examples with the same prefixes or word roots.

1. A few conifers are **dioecious**: The male and female reproductive parts are on separate trees.

Studying the light in each image could also reveal physical characteristics, such as the presence of water or carbon **dioxide**.

meaning of the prefix:

examples with the same prefix:

2. Trees are classified into groups primarily by their fruits and flowers, but the leaves and twigs are usually more **accessible** for identification.

When the chairman of Campbell's retired, McGovern was named as his **successor**.

meaning of the word root:

examples with the same word root:

3. Twigs are useful in identifying trees except for a short period during the spring when the buds are opening and shoots are **elongating** on these small branches.

The fall in inflation is the silver lining of the **prolonged** recession.

meaning of the word root:

examples with the same prefix:

4. Dehiscent fruits are usually many-seeded and are **enclosed** in a covering that splits when the fruit is ripe, such as the redbud, magnolia, and rhododendron.

The new students only stand aside while their parents are busy helping them **enroll**.

meaning of the prefix:

examples with the same prefix:



4 Translate the following paragraph into English.

火炬松 (loblolly pine), 常绿 (evergreen) 针叶树, 自然分布于美国东南部。在美国南部, 它是一种具有木材 (lumber) 和纸浆用材 (pulpwood) 价值的主要用材树种 (timber tree)。常种植于道路两旁、住宅边缘和种植园中。火炬松生长速度中等, 在俄亥俄州 (Ohio) 的开阔地域能生长到 50 英尺高、30 英尺冠幅。其原产地冬季较温暖, 在这样的气候条件下, 火炬松生长速度较快, 在孤植的情况下通常能长到 80 英尺高、40 英尺冠幅。



Critical thinking

1 If the foreign species is not planted but transferred into a new environment, how and when should a tree be moved? Write down a few basic steps with which a tree can be safely moved to another habitat.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

2 Trees play an important role in our lives and come in many different features, such as shapes, sizes, types of leaves and so on. Botanists pour a great deal of time and energy into assisting people in identifying the various types of trees that exist. Discuss the following questions in groups:

- Is it worth putting efforts into identifying different types of trees? Why or why not?
- What is the importance of tree identification?

3 As is mentioned in Text A, in urban locations there exist numerous exotics that have been introduced from around the country and even the world. Discuss the question in groups: What aspects should be taken into consideration when bringing a foreign species to a new environment?



Research task

Academic skill: Collecting data

Data collection is one of the most important stages in conducting research. Accurate and systematic data collection is critical to conducting scientific research. There are many methods to collect data, depending on the research design and the methodologies employed. Some of the common methods are questionnaire, interview and observation.

1. How to design a questionnaire

A questionnaire is designed for both descriptive and analytical surveys. In a descriptive survey, the questionnaire will normally use nominal and ordinal scales because it concerns primarily with the particular characteristics of a specific subject.

Example of nominal scale:

A questionnaire form with a yellow background. At the top, there are two sets of three small circles, one on the left and one on the right. The first question is "What is your gender?" with two options: "Male" and "Female", each preceded by a small square checkbox. The second question is "What is your hair color?" with five options: "Brown", "Black", "Blonde", "Gray", and "Other", each preceded by a small square checkbox.

Example of ordinal scale:

A questionnaire form with a yellow background. At the top, there are two sets of three small circles, one on the left and one on the right. The first question is "How do you feel today?" with five options: "Very unhappy", "Unhappy", "OK", "Happy", and "Very happy", each preceded by a small square checkbox. The second question is "How satisfied are you with our service?" with five options: "Very unsatisfied", "Somewhat unsatisfied", "Neutral", "Somewhat satisfied", and "Very satisfied", each preceded by a small square checkbox.



Rating scale is always used to measure the attitude or opinion of the respondents in an analytical survey. The most popular one is Likert scale. Usually you would use a 1-5 rating scale where: 1 = strongly disagree; 2 = somewhat disagree; 3 = undecided; 4 = somewhat agree; 5 = strongly agree.

Example of Likert scale – The employment self-esteem scale:

The screenshot shows a digital questionnaire interface with three items, each followed by a 5-point Likert scale. The scales are represented by horizontal bars with five segments, and the numbers 1 through 5 are positioned below each segment. The first item is "I am proud of my relationship with my supervisor at work." The second is "I am confident that I can handle my job without constant assistance." The third is "When I feel uncomfortable at work, I know how to handle it." The rating bars for all three items are filled with a gradient from light orange to dark orange, indicating a rating of 4.

1 I am proud of my relationship with my supervisor at work.

1 2 3 4 5

2 I am confident that I can handle my job without constant assistance.

1 2 3 4 5

3 When I feel uncomfortable at work, I know how to handle it.

1 2 3 4 5

When designing a questionnaire, you have to pay attention to the following issues:

- Are the instructions clear and unambiguous?
- Can the questions be understood, and are they free from jargon, terminology, unsuitable assumption and ambiguity?
- Do the respondents have required knowledge to answer the questions?
- Do the questions appear offensive or embarrassing to the respondents?
- Do the questions lead the respondents to particular answers?



2. How to conduct an interview

Since an interview involves bi-directional communication, there are certain rules and guidelines to be followed:

- Ask one question at a time.
- Attempt to remain as neutral as possible. Don't show strong emotional reactions to the responses of the interviewee.
- Verify understanding through raising and confirming questions.
- Let the interviewee do most of the talking.
- Maintain control over the subject matter.

3. How to conduct observation

There are generally two ways of conducting observation, namely non-participant observation and participant observation. The researcher in non-participant observation does not involve in the subject being studied. Data are collected by observing the behavior or phenomenon. In contrast, the researcher in participant observation immerses into ongoing activities and makes observation records. Data are collected by interacting with or experiencing the phenomenon being studied. Here are some tips for conducting observation:

- The collection of detailed field notes is key to successful observation.
- Audio recorders or cameras can be used to aid with capturing raw data.
- Participant observation researchers should state their intentions openly.
- Non-participant observation researchers should adopt a more separate and distant role than that of the participant observers.
- Non-participant observation can be overt or covert.



Task

In Text A, the author informs us of several methods to identify a tree with explanations and illustrations. Now it is your turn to explore the campus and choose one part of a certain tree which you think is particular enough for identifying tree species. Then use the observation method introduced above to collect data and make a description of the specific part by using the collected information. Discuss your searching results and description with your classmates. Descriptions of three different types of leaves are listed here as models.

The tree bears cones and has leaves that are needle-like.

Features: These trees are called CONIFERS (cone-bearing) and most are EVERGREEN (trees with needles or leaves that remain alive and on the tree through the winter and into the next growing season).



The tree bears cones that are sometimes berry-like and has leaves that hug the twig and are scale-like or awl-shaped.

Features: These trees are called CONIFERS (cone-bearing) and most are EVERGREEN.



The tree has leaves that are flat and thin and generally shed (落叶) annually.

Features: These trees are called BROADLEAF (a tree with leaves that are flat, thin and generally shed annually), and most are DECIDUOUS (shedding all leaves annually) and bear a variety of fruits and flowers.



Section B

Reading strategy

Dealing with unknown words (Part I)

The ability to deal with unknown words is a key reading skill in the reading process. It is a vital skill because you are almost certain to find unknown or unfamiliar words in any text. The skill is not necessarily to “know” the words, but to guess the meaning of them so that you can read and understand the whole text. Here are several different ways that can help you guess the meaning of an unknown word.

Guessing by explanation

Sometimes, you will find that the meaning of an unfamiliar word is given to you in the text. In this case, what you need to do is keep on reading and do not stop at the moment when you find an unfamiliar word. Typically, the way to deal with this word is that you have a phrase in commas immediately after the unfamiliar word:

The two primary forms of dry fruit are indehiscent, meaning not split open at maturity, and dehiscent, meaning split open when ripe.

Here you should understand that “indehiscent” is of dry fruits that do not split open at maturity, and “dehiscent” is of dry fruits that do split open when ripe.

Guessing by synonyms and antonyms

This is a very useful skill to learn. What you should do here is look at other words which

relate to that word and work out what it may mean. These words may be either synonyms (words with a similar meaning) or antonyms (words with an opposite meaning). For example:

Twigs are useful in identifying trees except for a short period during the spring when the buds are opening and shoots are elongating on these small branches.

Here you can work out the meaning of “twig” by its synonym “branch”. All you need to do is to read the next sentence and think of the meaning of it.

Guessing by examples

Sometimes you may find out examples which often follow the signal words “for example” “such as” etc., or are in brackets around the unfamiliar word. The examples provide more details that can help you infer the meaning of the unfamiliar word. For example:

Fleshy fruits are usually multi-seeded; the seeds are surrounded by a fleshy pulp, or pericarp, which is sometimes edible. These may be classified as a berry (blueberry and persimmon), drupe (cherry, plum, and holly), or pome (apple or pear).

Here the word “pome” can be easily inferred that it may be the term of a fresh fruit like apple or pear.

Task

Read Text B and apply the skills above to deal with the underlined words.



Text B

Measurement of tree diameter

- ¹ Many people are concerned with the adequacy of the use of our forest land and want to make sure it produces a maximum of wood and related services useful in our livelihood. With continuing increase in the value of forest products, more attention is being paid to accurate forest measurement.
- ² Measurements play a significant role in the management of a forested area, with the intent to achieve such objectives as the production of more wood, forage, game

animals, water, or recreational benefits. Periodic inventories of forested land are required for determining amounts and quality of wood available for yearly use, for tax records, and for justifying management expenditures. The sawtimber, pulp, and plywood industries have become more adept at using various qualities of wood for different products; hence log weighing has become a common practice. In brief, measurement is a strategic part of forest management.

pulp *n.* 纸浆

sawtimber *n.* 锯材



- 3 The diameter of a tree is most commonly determined at breast height, which is an established reference point (standard taken at 4½ feet <137 cm> above average ground level). The diameter breast height, abbreviated dbh, is taken outside the bark to the nearest 1/10 inch (0.25 cm) when making volume-growth determination, and to the nearest 2 inches (5 cm) when estimating total volume of a stand, which is a close-enough measurement in that case. In instances of abnormal growth shapes, leaning trees, and trees growing on slopes, adjustments are made in measuring diameters to avoid any unusual influence on the measurement.
- 4 In measuring tree diameters the basic instruments are referred to as dendrometers. The three most common ones are the diameter tape, the tree caliper, and the Biltmore stick. The instrument selected for use usually depends upon the degree of closeness of measurement desired, the convenience of the use of the instrument, and the place on the tree to be measured.
- 5 Trees are not perfect cylinders. The diameter of most trees is greater in one direction than in another, and the trees taper and become narrower in the vertical direction. These irregularities in shape necessitate measuring both the short and long diameters and averaging the two measurements to obtain the average diameter. An error in diameter measurement may have a great effect upon the computation of volume; a 1-inch (2.5 cm) loss in diameter measurement has the same effect as an 8-foot (2.4 m) error in height measurement.
- 6 The diameter tape is a device for converting the circumference of a tree to its diameter, and its readings are direct and precise. The tape may have a bark hook at its zero end. Correct use is to hold the case in the right hand with the winding handle up. When the tape is pulled tightly around the tree, the diameter scale is right side up and the diameter value lies directly below the zero of the scale. A common length is 20 feet (6 m), scaled on one side in feet, tenths, and hundredths of feet to indicate circumference, and on the other side to give diameter

diameter breast height 胸径
caliper *n.* 卡尺; 卡钳

cylinder *n.* 圆柱状物
circumference *n.* 周长



equivalents inches and tenths of in inches up to 76.5 diameter inches (194 cm).

- 7 The tree caliper is made either of wood or metal and provides a quick and simple method of measuring dbh on trees that are nearly cylindrical. It is a rather simple device consisting of a bar and two legs, one fixed and the other free to slide along a graduated scale on the bar. When the legs are located tightly against the opposite sides of a tree, the instrument gives measures of dbh to the nearest tenths of an inch. Calipers are used conveniently for trees up to about 20 inches (50 cm) dbh. For bigger trees, the diameter tape is preferred because large calipers are cumbersome and awkward to handle.
- 8 The Biltmore stick was designed by C. A. Schenck for use by his students in the first forestry school in the United States, the Biltmore Forest School near Asheville, North Carolina. Schenck called it the “Biltmore stick” after the name of his school. (The site of this old forestry school and its general proximity are often referred to as “the cradle of forestry in the United States”.)
- 9 The standard Biltmore stick is made of wood, 25 or 30 inches (63.5 or 76.2 cm) long. It is so scaled that when held horizontally against a tree trunk at the customary height (4½ feet or 137 cm) with the cruiser’s (timber volume inventory specialist) eyes 25 inches (63.5 cm) from the tree, the diameter may be read to a closeness of 1 inch for smaller trees and 2 inches for larger ones. The observer must hold his or her head still until the left end of the stick is exactly in line with one side of the tree. The graduation which is then in line with the other side of the tree corresponds to the diameter. The diameter scale is marked in inches in ½-inch (1.27 cm) steps.
- 10 The Biltmore stick is not an accurate instrument because the 25-inch (63.5 cm) distance from the eye is difficult to control, but it is convenient to use. It is accurate enough for dbh measurements in estimating 1-inch (2.54 cm) and 2-inch (5 cm) diameter classes if it is employed carefully. Many experienced timber cruisers can estimate a tree’s diameter within an inch or so, but they usually check their accuracy with one of the instruments discussed above.

cradle *n.* 摇篮; 发源地

