

# *Introduction to Mapping for Assessors*

**May 2011**

PTAX 1-M (R-05/11)



# Course 1-M Outline

## Introduction to Mapping for Assessors

This course is designed to provide a basic working knowledge of mapping for the assessor. This course will cover various types of maps and their use, mapping terminology, math for mapping purposes, land measurements, interpreting and drawing legal descriptions and soil maps, Property Index Number (PIN) and its relationship to the Rectangular Survey System (Government Survey), computerized mapping, Geographic Information System (GIS), and aerial photography.

### Glossary

Unit 1: Basic Types and Uses of Maps

Unit 2: Math for Mapping

Unit 3: The US Rectangular Land Survey

Unit 4: Legal Descriptions

Unit 5: Metes and Bounds Legal Descriptions

Unit 6: Principles for Assigning Property Index Numbers

Unit 7: Computers and Mapping

### Answer Key

Exam 50 multiple choice questions

\* A score of 70 percent (35 correct answers) is necessary to pass this course.



# Glossary — 1-M

## Introduction to Mapping for Assessors

**Aerial photograph** — Any photograph taken from the air.

**Aerial mosaic** — An assembly of aerial photographs to form a continuous photographic representation of a portion of the earth's surface.

**Backsight** — Surveying sight taken backward; a sight or reading taken by a surveyor back toward a position from which a previous sight has been made.

**Base line, sectionalized land** — Base line is a parallel of latitude, or approximately a parallel of latitude, running through an arbitrary point chosen as the starting point for all sectionalized land within a given area.

**Bearing** — Direction of a line measured as the acute angle from a reference meridian; usually expressed in the form "S 30° E" or "N 58° W".

**Boundary** — A line that marks the outermost extent of an area, or a subdivision between areas.

**Cadastral map** — A map that shows the size, shape and extent of each land parcel in a prescribed geographical area, for purposes of describing and recording ownership.

**Call** — Specific directions to a point.

**Cartography** — The science and art of making maps.

**Chain** — A land surveyor's measure – 66 feet, or 100 links.

**Commencing** — Informative term of beginning and/or origin.

**Degree** — 1/360th of the circumference of a circle.

**Description** — The exact location of a piece of property stated in terms of lot, block, and tract, or by metes and bounds.

**Geodetic coordinate** — Marks a specific point on the earth's surface.

**Geographic Information System (GIS)** — A system developed for spatial analysis needs, such as planning, natural resources, and land records management.

**Grantee** — One to whom a grant is made (buyer).

**Grantor** — The person by whom a grant is made (seller).

**Index maps** — (1) A map of smaller scale on which are depicted the location (with accompanying designations) of specific data, such as larger-scale topographic quadrangles or geodetic control. (2) A map showing the location and numbers of flight strips and photographs, made by assembling individual photographs into their proper relative positions and copying the assembly photographically at a reduced scale.

**Lambert Grid** — An informal designation for state coordinate system based on a Lambert conformal map projection with two standard parallels.

**Latitude** - Angular arc distance north or south of the Equator along a meridian of longitude. Latitude lines are horizontal circles around the Earth and measure degrees north or south of the Equator.

**Line** —Boundary, course, or extension between points; may consist of straight or curvilinear segments.

**Link** —Linear measurement equivalent to 7.92” or .66 feet. A chain is made up of 100 links.

**Longitude** — Angular arc distance east or west of the Prime Meridian along a parallel of latitude. Vertical circles around the Earth measuring degrees east or west.

**Map** — A representation (usually on a flat medium) of all or a portion of the earth, showing the relative size and position of features to some given scale or projection. A map may emphasize, generalize, or omit the representation of certain features to satisfy specific requirements. Maps are frequently categorized and referred to according to the type of information which they are designed primarily to convey, to distinguish them from maps of other types.

**Map projection** — Involves the transformation of a 3-dimensional form into a 2-dimensional plane; they record the curved surface of the Earth on a flat display. They may be cylindrical, conical or planar. This is the field of cartography.

**Meridian line** — A meridian line is any line running due north and south. Since meridian lines converge at the North Pole, no two meridians are parallel. Practically within the limits of a property survey, all lines shown as north or south are considered parallel.

**Metes and bounds** — Precise description of the boundary lines of parcel of land. Not described by reference to a lot or block shown on a map, but described by starting at a known point and describing the bearings and distances of the lines forming the boundaries of the property.

**Monuments** — Monuments are tangible landmarks indicating boundaries.

- 1) Physical monument — A physical monument is an existing feature such as a stone or stake but not the line of an adjoining property.
- 2) Natural monuments — A natural monument is a naturally occurring object such as a lake, river, tree, boulder, or hill.
- 3) Artificial monument — An artificial monument is a man-made object such as stake, fence, set stone, *etc.*
- 4) Record monument — An adjoining property called for in a deed such as a street or particular parcel of land.
- 5) Legal monument — Any monument referenced in a legal description for the purpose of identifying property.

**More or less** — The words “more or less” in their ordinary use are to be taken as words of caution, denoting some uncertainty in the mind of one using them and a desire not to misrepresent. When used in connection with quantity and distance, “more or less” are words of safety and precaution, intended merely to cover some slight or unimportant inaccuracy.

**Natural boundary** — Any existing boundary that can be readily identified and located, *e.g.*, the boundary line of an adjacent parcel of land, a river boundary, ditch, wall, bluff, *etc.* Courses and distances, as a general rule, give way to a call for a natural boundary, because a natural boundary, if fixed, is unchangeable, and more likely to be the true call than courses and distances.

**Parallel lines** — Lines extending in the same direction and at the same distance apart at every point so as never to meet.

**Parcel** — In land ownership mapping for assessment purposes, a parcel is usually held to be a tract of land under one identical ownership. It may be a combination of two or more tracts acquired by separate deeds.

**Patent** — A document granting right to land.

**Planimetric map** — A map representing only the 2-dimensional, horizontal position of features measured on plane surfaces.

**Plat map** — Usually a survey drawing of an individual parcel of land showing special characteristics and the locations of any buildings thereon.

**Point** — “Point” in a boundary is the extremity of a line; spatial location without defined dimensions.

**Point of Beginning (POB)** — The reference point at the beginning location of a surveyed piece of land.

**Point of Commencement (POC)** — A remote established point from which the true point of beginning can be identified.

**Pole (or rod)** — A unit of measure equal to 16.5 feet. Four poles make up a chain.

**Political township** — Township units set up by government agencies. They can be changed at any time and do not necessarily correspond with congressional township boundaries.

**Prime Meridian (Principal Meridian)** — Zero Longitude at Greenwich, England. It is the line from which all other lines of longitude are measured. This includes the line that runs 180° away from Greenwich, also known as the International Date Line.

**Property Index Number (PIN)** — A series of groupings of numbers that describe the geographic location and use of a specific tax parcel.

**Public Lands Surveys, or Public Land Survey System (PLSS)** — In general, the survey of federal or state lands or the lands of any other public body. The term, however, is commonly used to designate the cadastral survey of the public lands of the U.S.; originally the Government Land Office (G.L.O.) surveys; the present surveys executed by the Bureau of Land Management (B.L.M.). Synonymous with rectangular surveys of the U.S. lands; or the rectangular survey system.

**Quarter section** — A 160 acre block of land, 1/4 of a section.

**Range** — A vertical column of townships in the rectangular survey system.

**Rod (or pole)** — A surveyor’s lineal measure of 16.5’, or 1/4 of a chain.

**Scale** — Relative ratio of map to ground distances.

**Section** — A one mile square block of land containing 640 acres, or 1/36th of a township.

**Section number** — These are numbers assigned to the one mile square units within a survey township. A standard survey township will contain 36 sections.

**Standard parallels** — Standard parallels, or correction lines, are parallels of latitude at intervals of 24 miles north or south of the base line.

**State Plane Coordinate Systems** — The plane-rectangular coordinate system established by the U.S. Coast and Geodetic Survey, one for each state in the union, for use in defining positions of geodetic stations in terms of plane-rectangular (X and Y) coordinates. Each state is covered by one or more zones, over each of which is placed a grid upon a conformal map projection.

**Subdivision** — A tract of land divided, by means of a map, into lots, or lots and blocks, for the purpose of resale, generally for residential or agricultural purposes.

**Survey** — The act or operation of making measurements for determining the relative position of points on, above, or beneath the earth's surface; also, the results of such operations. Photogrammetric survey — A method of surveying that uses either ground photographs or aerial photographs. Aerial survey — A survey using aerial photographs. Ground survey — A survey made by ground methods. A ground survey may or may not include the use of photographs.

**Tax map** — A picture of one or more parcels of land showing the boundaries of subdivisions of land, with the length thereof, and the areas of individual tracts for the purpose of describing and recording ownership. It is a graphical representation on a flat surface of some portion of the earth's surface. It shows the relative size and position of the land with respect to the other properties, roads, highways and major topographic features relating to the value and use of the land.

**Topographic map** — A map which represents the horizontal and vertical positions of the land features; distinguished from a planimetric map by the addition of relief in measureable form.

**Township (congressional township)** — Township is a nearly square area of land containing 36 sections.

**Traverse** — A method of surveying in which a sequence of lengths and directions of lines between points are measured.

**U.S. Rectangular Land Survey (Government Survey)** —

In 1785, the U.S. Congress authorized the first land survey of the United States. It specified that this survey should divide the land into portions approximately 36 miles square. These portions are referred to as townships. The townships are surveyed from an east-west base line and from north-south principal meridians. Townships are laid off from the base lines and meridians. To identify the townships, each is given an identification in which it was referred to by its relation to the base line and meridian. Horizontal tiers of townships are laid off north and south from the base line and numbered consecutively. Vertical columns of townships, called ranges, are laid off to the east and west of the principal meridians and numbered accordingly. The townships can be identified by listing the township tier number and the range number, such as Township 2 North, Range 2 West. Each township is usually divided into 36 sections, each approximately one mile square and containing approximately 360 acres. This may vary considerably at rivers or where base lines or meridians converge, *etc.*, but generally holds true.

## King Edgar's Thumb and Charlemagne's Foot

Our measurement system, which has been evolving since the time of the Egyptians, came to us by the way of the English. Here, according to National Geographic, is how some of the measuring units began.

(Note: You will not be responsible for the following eight definitions on your examination.)

**Acre** — The amount of land a yoke of oxen could plow in one day.

**Cubit** — The length of the arm from elbow to fingertip.

**Fathom** — The span of a seaman's outstretched arms; 880 fathoms make a mile.

**Foot** — The length of Charlemagne's foot, modified in 1305 to be 36 barleycorns laid end to end.

**Furlong** — The length of a furrow a team of oxen could plow before resting

**Inch** — The width across the knuckle on King Edgar's thumb, or 3 barleycorns.

**Mile** — 1,000 double steps of a Roman legionary. Later Queen Bess added some more feet so a mile would equal 8 furlongs.

**Yard** — The reach of King Henry I's nose to his fingertips, a distance twice as long as a cubit.



# Unit 1

## Basic Types and Uses of Maps

This unit covers the basic types and uses of maps.

The purpose of this unit is to provide a basic understanding of the different types of maps and what they are used for. Emphasis will be placed on maps that county officials will commonly work with.

### Learning Objectives

After completing the assigned readings, you should be able to

- identify the different types of maps
- locate sources for maps
- understand the limitations of maps

### Terms and Concepts

Aerial photograph

Boundary

Cadastral maps

Index map

Map

Plat map

Tax map

Topographic maps

It has been said that “a picture is worth a thousand words”. If that is true, then a map is worth a thousand pictures. A map can illustrate a vast amount of information, and that information can be very helpful to an assessor.

**The basic functions of maps are to provide:**

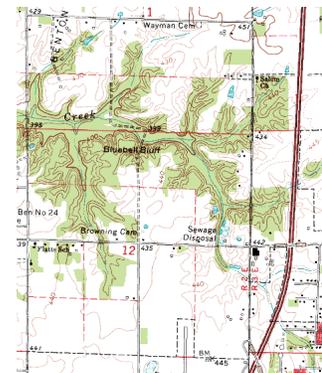
**Location.....where is it?**

**Identification.....what is it?**

**Inventory.....how is it categorized?**

Maps in general use today may be broadly categorized into the following types:

- 1 Topographic maps** - usually constructed on a planimetric base, which is a base representing only the 2-dimensional, horizontal positions of features measured on a plane surface, but are distinguished by the fact that changes in elevation (relief) are shown. It represents the horizontal and vertical positions of the land features.



Topographic maps have historically been created by the US Geological Survey (USGS), and are typically available from the USGS or from the library.

Relief, or elevation changes are represented by contour lines denoting the ground elevation as measured from mean sea level, usually in ten feet increments.

**2 Photographic maps** - are prepared directly on an aerial photographic base. The information stored varies widely with the use of overlays. The base photo may be black & white, color, or infrared; the size and scale variations are virtually limitless. Generally used for a large-scale small-area coverage. This means that an aerial photograph typically represents a small portion of a county rather than an entire county.

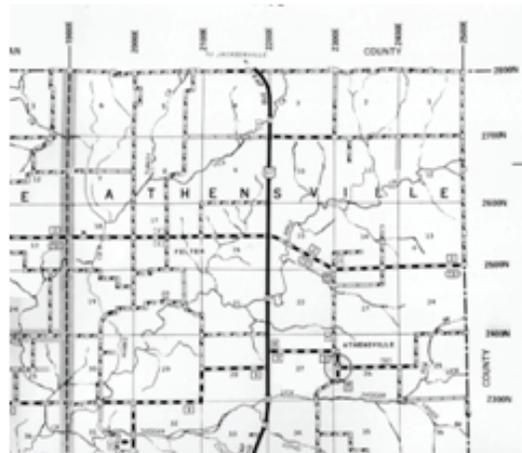
An aerial photograph is any photograph taken from the air. These photographs can be used to create an Aerial Mosaic. An Aerial Mosaic is an assembly of aerial photographs which form a continuous photographic representation of a portion of the earth's surface. It is somewhat similar to a patchwork quilt in which pieces of fabric are pieced together to form a quilt.

Aerial photographs are more commonly available from the county office, but can also be found on the internet.



**3 Highway maps** - are prepared on virtually every kind of base, but generally do not have highly accurate photographic or planimetric characteristics. Available mostly in small-scale wide-area formats.

These maps are typically made available through the Illinois Department of Transportation, and illustrate all publicly funded road ways (federal, state, county, or township).



**4 Boundary maps** - are usually prepared in combination with one of the previously mentioned types; the key feature being that some type of boundary information is provided. By definition, a boundary is “a line that marks the outermost extent of an area”. Examples of boundary maps include maps used for zoning, voting districts, or taxing districts. Most maps used in the assessment process would be of this type. Plat maps, found in most assessment offices, show property boundaries and ownership. Taxing district maps show the boundaries of taxing districts. Cadastral maps show the size, shape and extent of each land parcel in a specific geographic area for purposes of describing and recording ownership.



## Assessment Maps

Maps used by the assessor are known by a variety of names. The more commonly used terms being:

- 1 Appraisal map
- 2 Assessment map
- 3 Cadastral map
- 4 Plat map
- 5 Property map
- 6 Tax map

An assessment map has been defined as “a graphic representation of a portion of the earth’s surface, containing graphic descriptions of parcels of land indicating their size and position in relation to other geographic features.”

Assessment maps should be updated annually.

**Note:** This is not a substitute for a legal survey.

Because a parcel portrayed on a map is the graphic representation of a legal description, the assessment map system must accomplish the following:

- 1 Locate all parcels
- 2 Identify legal owner
- 3 Delineate boundaries
- 4 Inventory improvements
- 5 Provide administrative data
- 6 Provide for convenient updating and corrections
- 7 Provide for easy reproduction

Maps should be prepared and maintained in such a manner as to give them utility to other offices or agencies. Considering the property tax cycle, assessment maps should be updated at least annually to reflect property changes. The larger the number of users, the more easily justified is the acquisition and maintenance costs of the mapping system.

## Aerial Base Tax Maps

A base tax map is prepared using aerial photographs specifically created under controlled conditions. The aerial photographs clearly show all geographical features such as streets, roads, lakes, streams, railroad and utility lines, and provide a visual picture of all property in a jurisdiction. Points of reference (control points) on the ground will have been prominently marked so as to provide checkpoints on the photography. This photography is used as the foundation for preparing base maps and the features shown will assist with the plotting of parcels. These base maps are the base from which the final tax map is prepared. The aerial photographs should be taken either in early spring or late fall when foliage will not obstruct the view. There are several types of aerial photographs. Listed below are a few examples:



**Aerial photographic enlargement** is nothing more than a “blown-up” photograph. Neither tilt nor relief displacement are removed for these photographs. Because of this, accurate measurements from the photo cannot be made, or from maps made from the photograph. These photos are helpful for the inventory of parcels and locating structures.

**Rectified aerial photograph** is one in which distortions caused by tilt and yaw of the airplane have been removed. The objective is to project the image back to its correct shape and scale. Although relief displacement is not removed from rectified photographs, this type of photography provides acceptable accuracy for assessment mapping in areas of relatively flat terrain.



**Ortho-photograph** is an aerial or satellite image that has the accuracy of a map drawn from ground survey information because tilt and relief displacement have been eliminated. Measurements of a land surveyor on the ground should “fit” when plotted on a true-to-scale ortho-photograph. Distances and area calculations on an ortho-photograph are usually extremely accurate, and property lines will correspond closely to physical features.

Recommended map scales for aerial photographs should be **1” = 100’** for urban maps and **1” = 400’** for rural maps.

## Illinois Digital Orthophoto Quarter Quadrangle (DOQ) Data

Illinois Digital Orthophoto Quarter Quadrangles (DOQ) data have been produced by the US Geological Survey (USGS) via the USGS DOQ program from National Aerial Photography Program (NAPP) photography, in cooperation with the USGS National Mapping Division to produce DOQs for the entire state of Illinois. NAPP III photography for Illinois was collected in 2005. For more information about DOQs or to download images, visit: <http://www.isgs.illinois.edu/nsdihome/webdocs/doq05/>



**Dewitt County**



**LaSalle County**



**DuPage County**



## Soil surveys provide the following information:

<b>Soil location</b>	The geographic location and extent of a particular soil type
<b>Soil type</b>	A soil type is a group of soils having horizons similar in characteristics and arrangement in the soil profile and developed from a particular type of parent material.
<b>Slope</b>	<p>The inclination of the land surface from the horizontal. Percent slope is the vertical distance divided by the horizontal distance, then multiplied by 100 to change it to a percent.</p> <p>A = 0% - 2%</p> <p>B = 2% - 4%</p> <p>C = 4% - 7%</p> <p>D = 7% - 12%</p> <p>E = 12% - 18%</p> <p>F = 18% - 35%</p> <p>The values represented by these letters are a general rule of thumb.</p>
<b>Erosion</b>	<p>An estimate of the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.</p> <p>1 = Uneroded</p> <p>2 = Moderately Eroded</p> <p>3 = Severely Eroded</p>

The first set of numbers on the soil survey represent the type of soil. The letter following the number indicates the percent of slope. A number following the letter indicates the amount of erosion.

A soil identified as 171 B 2 on a soil map would indicate the following:

171 = soil type (Catlin silt loam)

B = a slope of 2% to 4%

2 = moderate erosion

## Summary

A map that shows the size, shape and extent of each land parcel in a prescribed geographical area for purposes of describing and recording ownership is called a tax (assessment) map or a cadastral map. These maps should be updated annually.

A map which represents the horizontal and vertical positions of the land features and shows the relief in a measureable form is a topographic map.

An aerial mosaic is an assembly of aerial photographs forming a continuous photographic representation of a portion of the earth's surface.

A soil survey provides information concerning soil type, slope, erosion and soil location information. Soil type is a group of soils having similar characteristics and arrangement in the soil profile and developed from a particular type of parent material.

Maps are available in different sizes and degrees of detail. A map taken from the air is called an aerial photograph. Aerial photographs are available at different scales which affect the degree of detail provided. The recommended map scale for aerial photograph is: 1" = 100' for urban maps and 1" = 400' for rural maps. Assessment maps should be updated every year.

# Unit 1

## Review Questions

- 1 Define an aerial mosaic. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 2 Define a topographic map. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 3 Define a cadastral map. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 4 What is the recommended scale for an urban aerial based tax map?  
\_\_\_\_\_
- 5 What is the recommended scale for a rural aerial based tax map?  
\_\_\_\_\_
- 6 What are the basic functions of maps?
  - a \_\_\_\_\_
  - b \_\_\_\_\_
  - c \_\_\_\_\_



# Unit 2

## Math for Mapping

This unit covers some of the mathematics used in mapping.

The purpose of this unit is to provide an understanding of basic mathematical concepts used in mapping.

### Learning Objectives

After completing the assigned readings you should be able to

- Calculate area for a square, rectangle, or triangle
- Recognize older units of measurement
- Calculate area for complex shapes

### Terms and Concepts

Acre

Chain

Link

Parcel

Rod

As the value of land often depends on its area (square foot), it is essential that the utmost care be taken when calculating acreage. The area of most odd shaped tracts will have to be calculated by dividing the tract into rectangles and triangles or portions of circles. Historically, tools used by surveyors dictated the units of measure for property descriptions. Even though modern technology provides more precise measurements, there are still thousands of legal descriptions filed at county offices that use these surveyor units.

1 chain	=	66' or 100 links
1 link	=	.66' = 7.92"
1 rod (or pole)	=	16.5' (4 rods = 1 chain)
1 acre	=	43,560 SF
1 furlong	=	660'
1 barleycorn	=	1/3" (3 barleycorns = 1")

**Square/rectangle**      **Area = length x width**

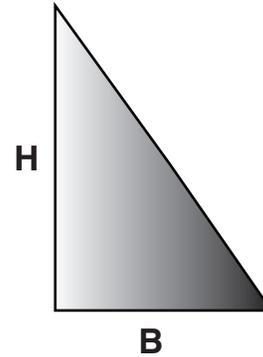
If the length of a rectangle is 100' and the width of the rectangle is 50', by multiplying 100' x 50', the area of the rectangle would be 5,000 square feet (SF).



**Right triangle**      **Area =  $\frac{\text{Base x height}}{2}$**

For right triangles, calculating the area is identical to that of calculating the area of a rectangle, except the area is divided in half because a right triangle is half of a rectangle.

If the base of the triangle is 75' and the height is 150' by multiplying 75' x 150', the area of the rectangle would be 11,250 SF. Dividing this area by 2 would give an area of 5,625 SF for the right triangle.



**Circle**      **Area =  $\pi$  x radius<sup>2</sup>**  
**[  $\pi$  = 3.1416 ]**

**Note:** For the purposes of this class, parcels containing portions of a circle will not be used. However, it should be noted that the area of a circle may be needed when calculating parcels located on cul-de-sacs.



The radius of a circle is the distance from the center of a circle to the periphery or outside of the circle. If the radius of the circle is 25', by taking 25' X 25', radius squared = 625. Multiplying 625 by 3.1416, the area of the circle is equal to 1,963.5 SF.

Once the square footage for a parcel has been determined, the acreage can be determined by dividing the square footage of the parcel by 43,560, the number of SF in an acre.

$$\text{Acreage} = \frac{\text{Square feet}}{43,560}$$

The rectangle above, which contained 5,000 SF, would equal .1148 of an acre.

$$5,000 \div 43,560 = .1148$$

The right triangle, which contained 5,625 SF, would equal .1291 of an acre.

$$5,625 \div 43,560 = .1291$$

The circle, which contained 1,963.5 SF, would equal .0451 of an acre.

$$1,963.5 \div 43,560 = .0451$$

## Unit 2, Exercise 1 — Land measurement

Please compute the square footage and the acreage for the following (assume all triangles are right triangles).

**Note:** “ch” refers to chains, “rds” refers to “rods”, “lks” refers to links.

When calculating some of the parcels, it will first be necessary to convert the measurements to feet.

<u>Parcel shape</u>	<u>Measurements</u>	<u>Square footage</u>	<u>Acreage</u>
1 Square	1,528' x 1,528'	_____	_____
2 Square	680' each side	_____	_____
3 Rectangle	1,250' x 1,000'	_____	_____
4 Rectangle	125' x 75'	_____	_____
5 Square	65 ch x 65 ch	_____	_____
6 Rectangle	30 ch x 48 ch	_____	_____
7 Triangle	475' x 986'	_____	_____
8 Triangle	680' x 360'	_____	_____
9 Triangle	22 ch x 48 ch	_____	_____
10 Triangle	38 ch x 46 ch	_____	_____
11 Square	5 rds x 5 rds	_____	_____
12 Rectangle	5 rds x 7 rds	_____	_____
13 Rectangle	200 lks x 300 lks	_____	_____
14 Square	(8 chains, 3 rods, 16 links)	_____	_____

Note: Each side is 8 chains + 3 rods + 16 links

1 chain = 66'

1 link = .66' (7.92")

1 rod (or pole) = 16.5'

1 acre = 43,560 SF

**Square feet**  
**Acreage = 43,560**

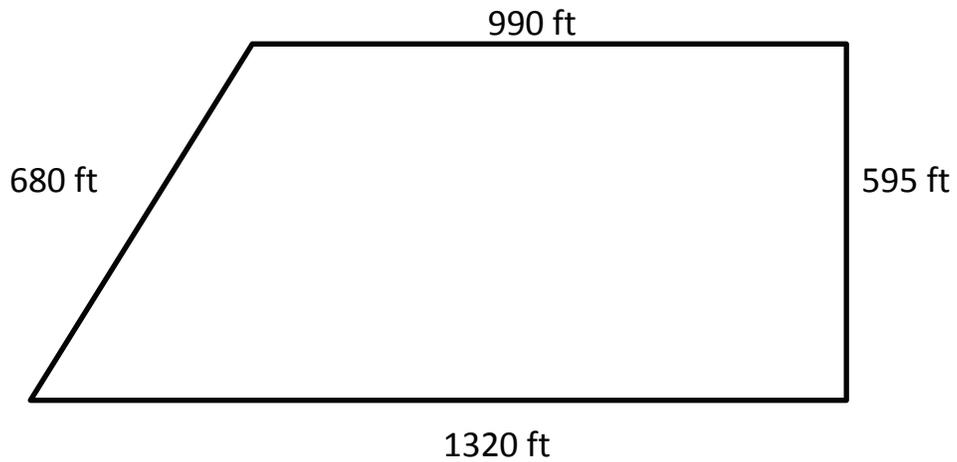
# Land Measurement

By breaking down parcels into series of rectangles and triangles and using the measurements provided, you would be able to calculate the area of almost any parcel.

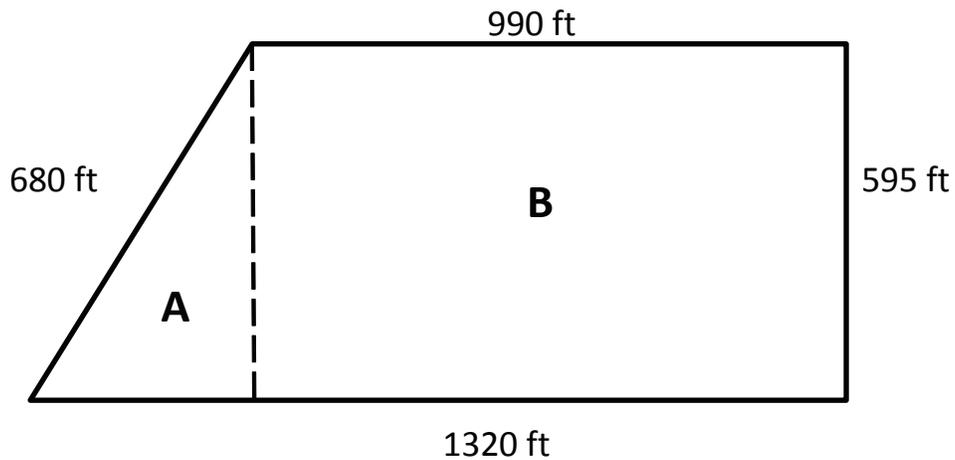
## How to calculate the area of odd shaped tracts

### Example 1

In this example, the parcel is drawn with the outer boundary measurements provided.



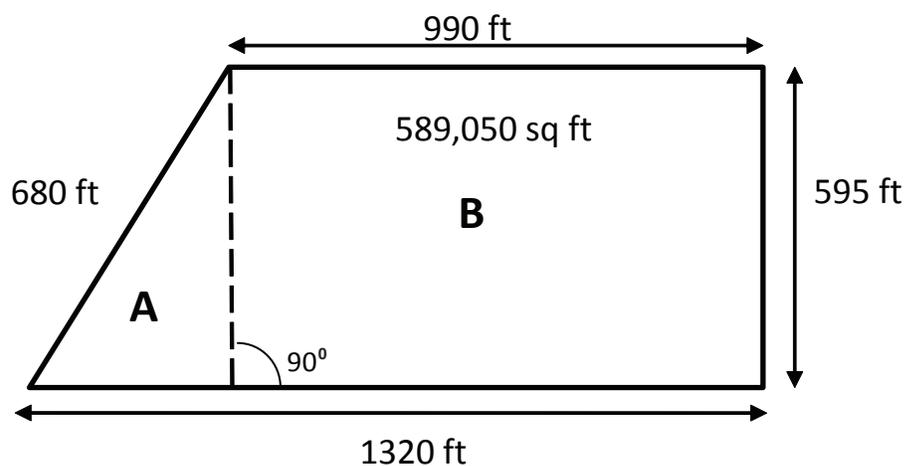
**Step 1** Create a rectangle. A right triangle (90°) can be created (triangle A) leaving rectangle B.



**Step 2** Using the values from the parcel perimeter, calculate the additional numbers needed. In this example, the area of rectangle B can be calculated using known values of 990' for the length and 595' for the width.

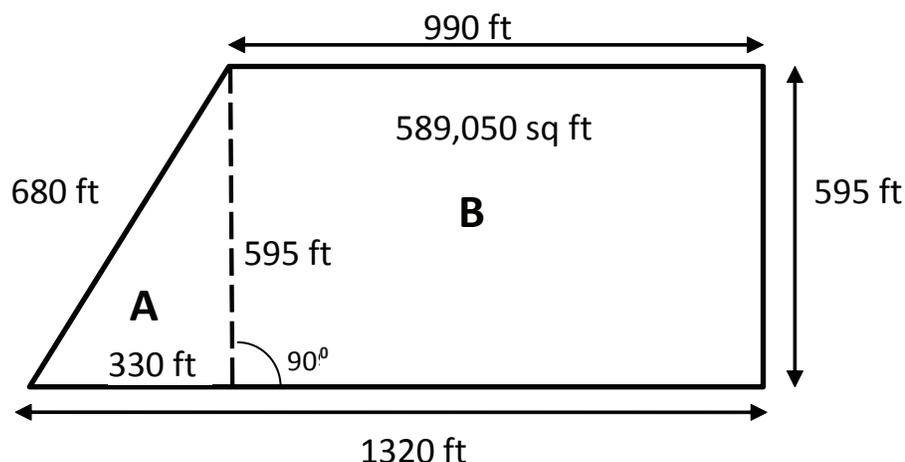
$$\text{Area of the rectangle} = 990 \text{ feet} \times 595 \text{ feet} = 589,050 \text{ SF.}$$

**Step 3** The remaining area of the parcel is that of right triangle A. However, looking at the triangle, there doesn't appear to be any usable values. This is a good opportunity to point out a very important note. The hypotenuse of the triangle (the long side, in this example the line labeled as 680') is not used in calculating the area of a triangle. Remember from the math examples on Page 2-2, the area of a right triangle is calculated by multiplying the base times the height and dividing the product by two. The hypotenuse (long side) is not used.



In this example, the base and height values must be determined from the other measurements provided. Recall that the opposite sides of a rectangle have the same measure. As a result, the height of right triangle A is the height of rectangle B (595'). For the base of the triangle, that value can be determined from the existing values as well. From Step 2, the base of rectangle B was 990'. Considering the entire length of the bottom of the parcel is 1,320' and knowing that triangle A is a right triangle, then the base of right triangle A is 1,320' minus 990', or 330'.

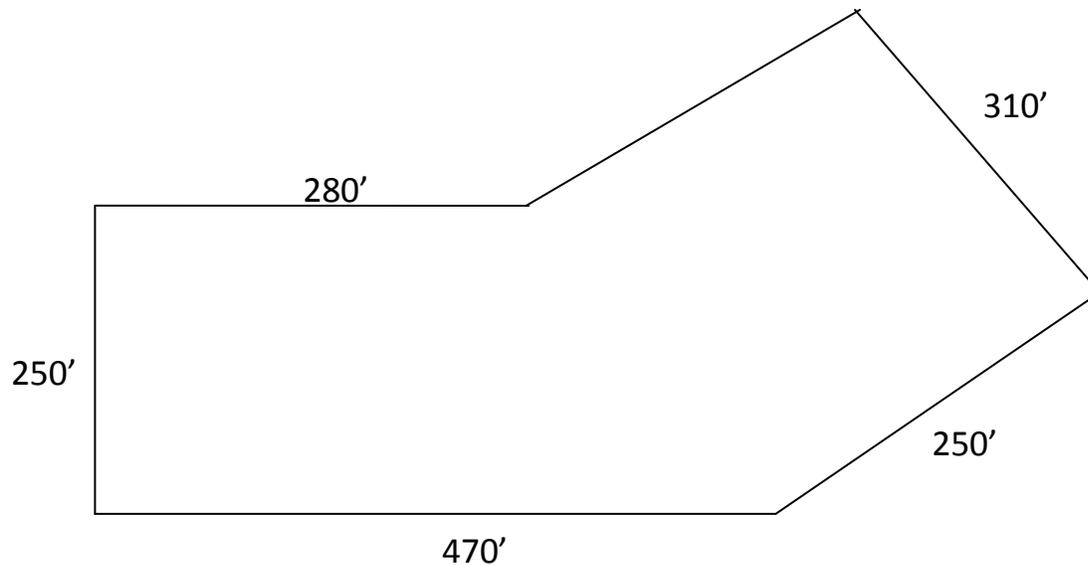
Therefore, the area of right triangle A is:  $\frac{595' \times 330'}{2} = 98,175 \text{ SF.}$



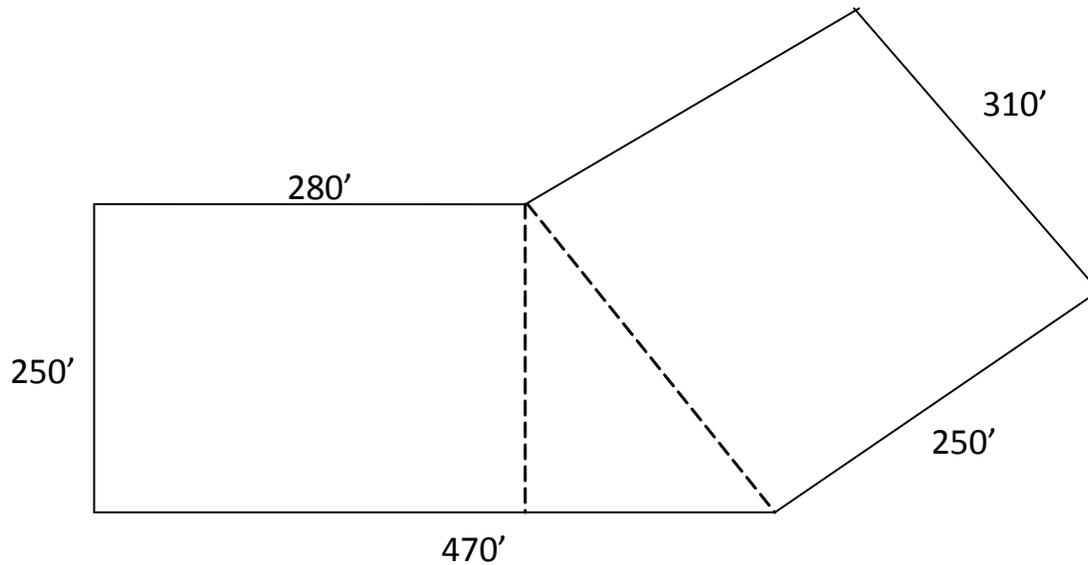
**Step 4** Calculate the total acreage of the parcel. By taking the square footage of right triangle A, which equals 98,175 SF, and adding the square footage of rectangle B, which equals 589,050 SF, we arrive at a total of 687,225 SF for the parcel. By dividing the total area of the parcel (687,225 SF) by 43,560 SF, the number of square feet in an acre, we arrive at a total of **15.78** acres for the parcel.

**Example 2**

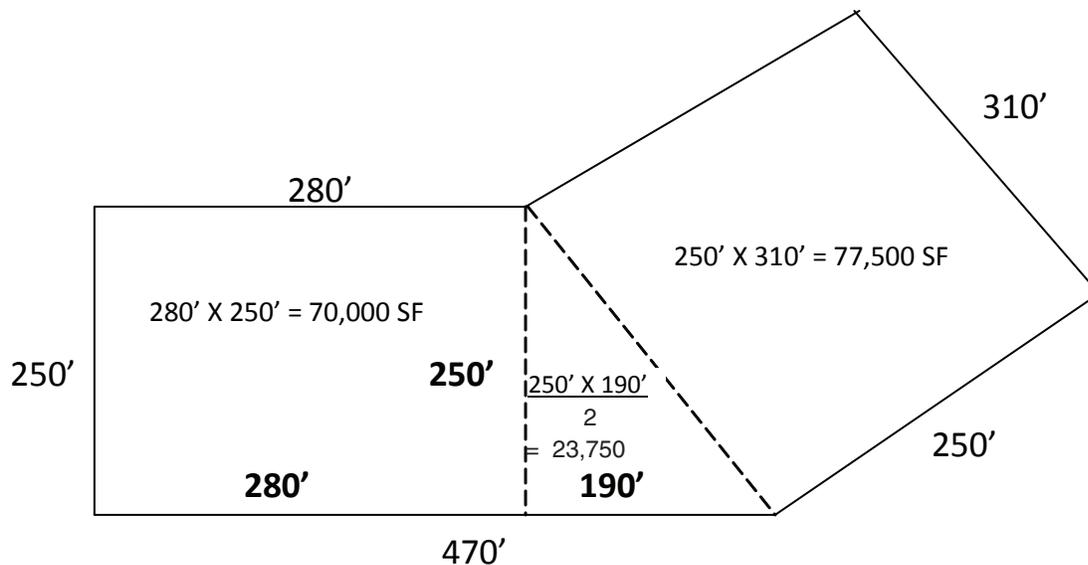
Find the area (in square feet and acres) of the figure below.



First divide the figure into rectangles and right triangles. See the next page.



Remember that the opposite sides of rectangles have the same measure. The base of the triangle is found by subtracting the length of the side of the rectangle from the length of the whole side.



$$\text{Total square feet} = 70,000 + 23,750 + 77,500 = 171,250$$

$$\text{Acreage} = 171,250 / 43,560 = \mathbf{3.93 \text{ acres}}$$

## Summary

Legal descriptions are often written using various measurements. The descriptions often describe tracts of land in various shapes. While modern surveys for legal descriptions use common terms of feet or inches, dimensions on older surveys were often given in chains, rods, or links. Also, all legal descriptions are not square. It is often necessary to convert to common units of measurement, or to apply simple geometry to calculate acreage.

A chain is equal to 66', a rod or pole is 16.5', and a link is equal to 7.92" or .66'. Convert all measurements to feet before calculating areas.

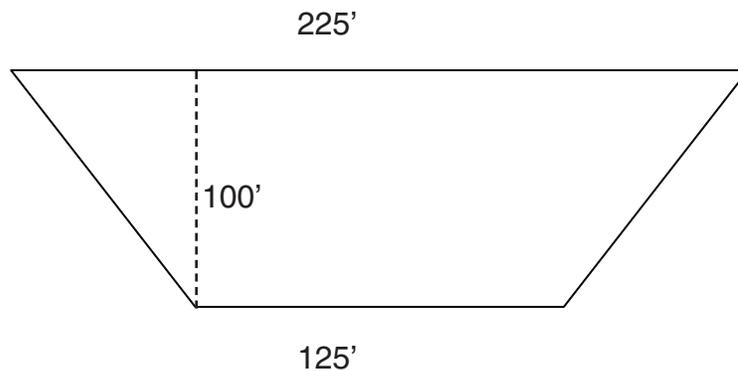
Once the square footage of a parcel has been calculated, the acreage can then be determined by dividing the square footage by 43,560 SF.

## Unit 2

### Review Questions

<u>Parcel shape</u>	<u>Measurements</u>	<u>Square footage</u>	<u>Acreage</u>
1 Square	1,742' x 1,742'	_____	_____
2 Rectangle	165' x 95'	_____	_____
3 Square	82 ch x 82 ch	_____	_____
4 Triangle	720' x 490'	_____	_____
5 Triangle	27 ch x 36 ch	_____	_____
6 Rectangle	9 rds x 6 rds	_____	_____
7 Rectangle	500 lks x 38 rds	_____	_____
8 Square	(6 chains, 2 rods, 23 links)	_____	_____

- 9 Calculate the square footage and the acreage for the following:  
 Note that the figure is the same on the right side as on the left side.



Square footage \_\_\_\_\_

Acreage \_\_\_\_\_



# Unit 3

## The U.S. Rectangular Land Survey

(adapted from McTigue & Spiewak)

This unit covers the U.S. Rectangular Land Survey.

The purpose of this unit is to provide a basic understanding of the history of the U.S. Rectangular Land Survey and how it influences our modern day maps.

### Learning Objectives

After completing the assigned readings, you should be able to

- Understand the history of the U.S. Rectangular Land Survey
- Define the components of survey system
- Locate a position using the system

### Terms and Concepts

Baseline	Prime meridian
Government survey	Quarter section
Latitude	Range
Longitude	Section
Meridian line	Section number
Political township	Township

Historically, land was surveyed using the indiscriminate metes and bounds system. This survey system used natural land features, such as trees and streams, as well as neighboring land owners, along with distances to describe plots of land. Realizing that metes and bounds descriptions would never prove satisfactory in the largely uninhabited Northwest Territory (what is now Ohio, Indiana, Illinois, Michigan, and Wisconsin), the Continental Congress knew it had to develop a plan for the orderly sale of individual tracts to the public. In 1784, a committee headed by Thomas Jefferson, developed a plan for dividing this public land into rectangles. The new system was based on a series of coordinates – meridians and base lines – plotted astronomically by surveyors.

The Continental Congress established the rectangular survey system in the Land Ordinance of 1785, also known as the Northwest Ordinance. Under terms of the ordinance, Congress was to appoint one surveyor from each state to serve under the direction of the geographer of the United States.

The basic plan called for by Jefferson's committee developed three theories:

- 1 the principal of "survey before settlement";
- 2 the principal of a mathematically designed plan to be followed throughout the entire public domain area;
- 3 the creation of a standard land unit, the section of uniform shape and area and with boundaries physically marked on the ground.

On October 1, 1796, Washington appointed Rufus Putnam as the first Surveyor General of the United States. He was the author of the present numbering system and placed the excess and deficiency in the north and west tiers of the townships. The Land Act of 1796 was the first law concerning surveys.

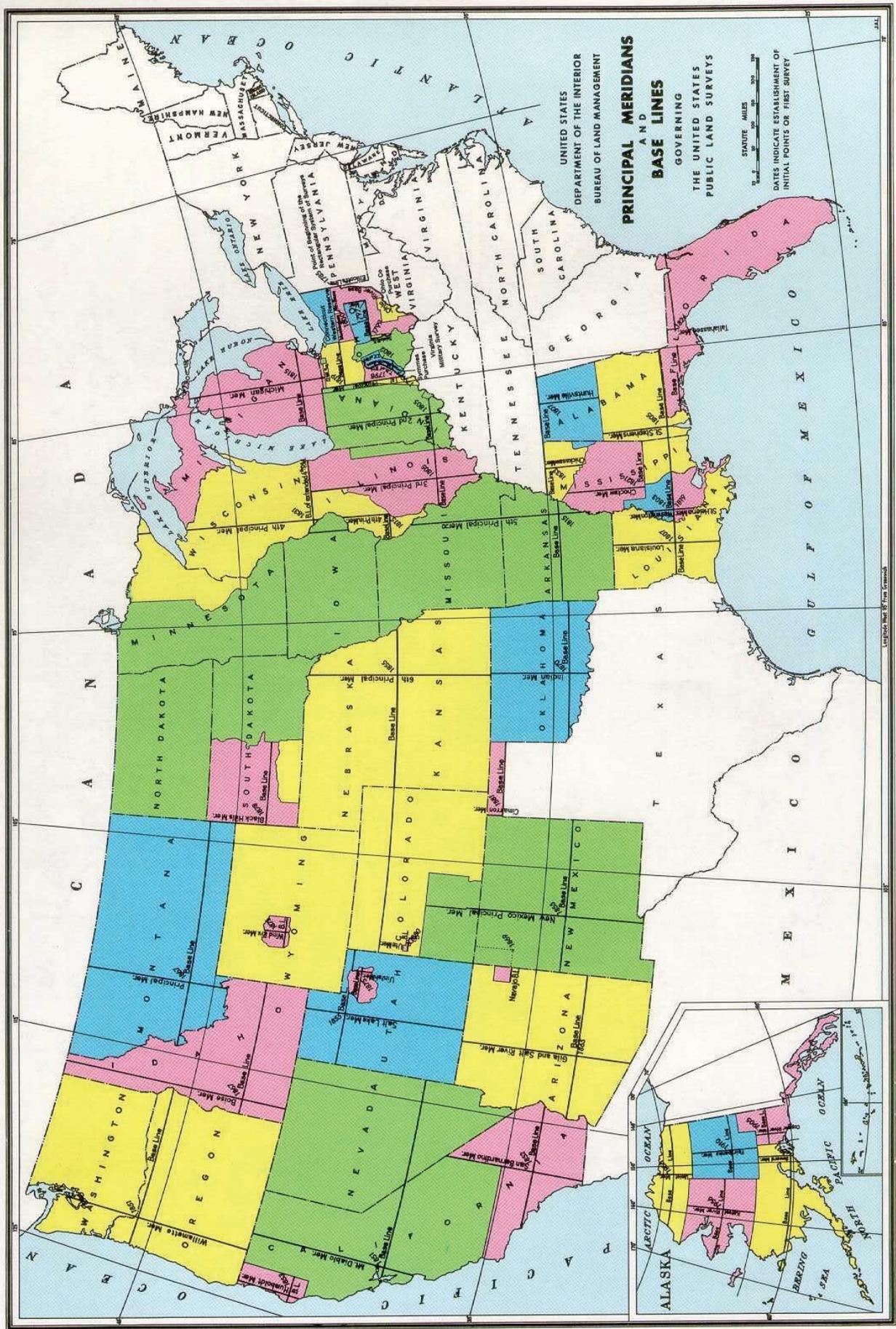
Between 1851 and 1855 the Land Act was amended several times, and set the pattern for the present-day survey system.

The Rectangular Survey System, as we know it today, is a system based on tiered townships and ranges that are tied to 35 established principal meridians located across the country.

Boundaries for the Rectangular Survey System were usually marked by placing markers or using prominent trees as boundary markers. These boundary markers are referred to as monuments.

Monuments are tangible landmarks indicating boundaries. There are 5 different types of monuments. A **physical monument** is an existing feature such as a stone or stake but not the line of an adjoining property. A **natural monument** is a naturally occurring object such as a lake, river, tree, boulder, or hill. An **artificial monument** is a man-made object such as a stake, fence, set stone, etc. A **record monument** is an adjoining property called for in a deed such as a street or a particular parcel of land. Finally, a **legal monument** is any monument referenced in a legal description for the purposes of identifying property.

The map on the following page illustrates the principal meridians and baselines within the United States.





## Illinois Meridians and Baselines

A latitude line is an east-west circle, measuring degrees north or south of the Equator. A baseline is a parallel of latitude running through an arbitrary point chosen as the starting point for all sectionalized land descriptions within a given area.

A longitude line is a north-south circle measuring degrees east and west of zero longitude at Greenwich, England. A principal meridian is an arbitrary line of longitude used as a starting point and reference for all sectionalized land.

In Illinois, there are two baselines and reference to three principal meridians. The most prominent meridian is the Third Principal Meridian, which virtually cuts Illinois in half.

Where a baseline and principal meridian intersect is considered a reference. The reference for the Third Principal Meridian exists at the intersection of the Centralia Baseline. This baseline runs east and west through Centralia, Illinois. The Second Principal Meridian, located in Indiana, shares the Centralia Baseline for its reference.

Property located in eastern Illinois is unique. Part of it is referenced to the Third Principal Meridian, and part of it is referenced to the Western Control of the Second Principal Meridian, which is actually located in Indiana.

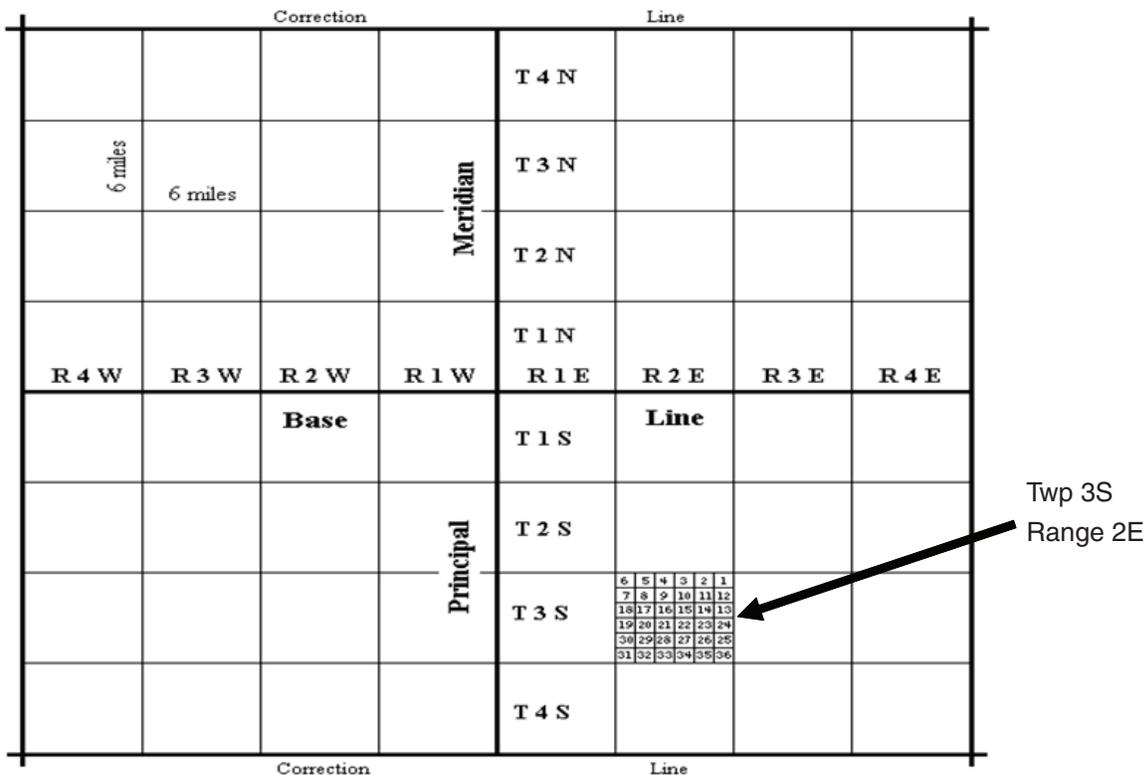
Finally, property in Illinois, west of the Illinois River or west of the Third Principal Meridian, is referenced to the Fourth Principal Meridian. The reference point for the Fourth Principal Meridian is the Beardstown Baseline. The baseline runs west of Beardstown, Illinois.

Once we know the meridian and the baseline for a property, we can determine the general location of any property anywhere in the country governed by the Rectangular Survey System.

## Congressional Townships and Ranges

Numbering of townships and ranges begins at the reference point of a principal meridian and a baseline. Township numbers increase away from the baseline using the direction from the baseline as an indicator (north or south). Range numbers increase away from a principal meridian using the direction from the principal meridian as an indicator (east or west).

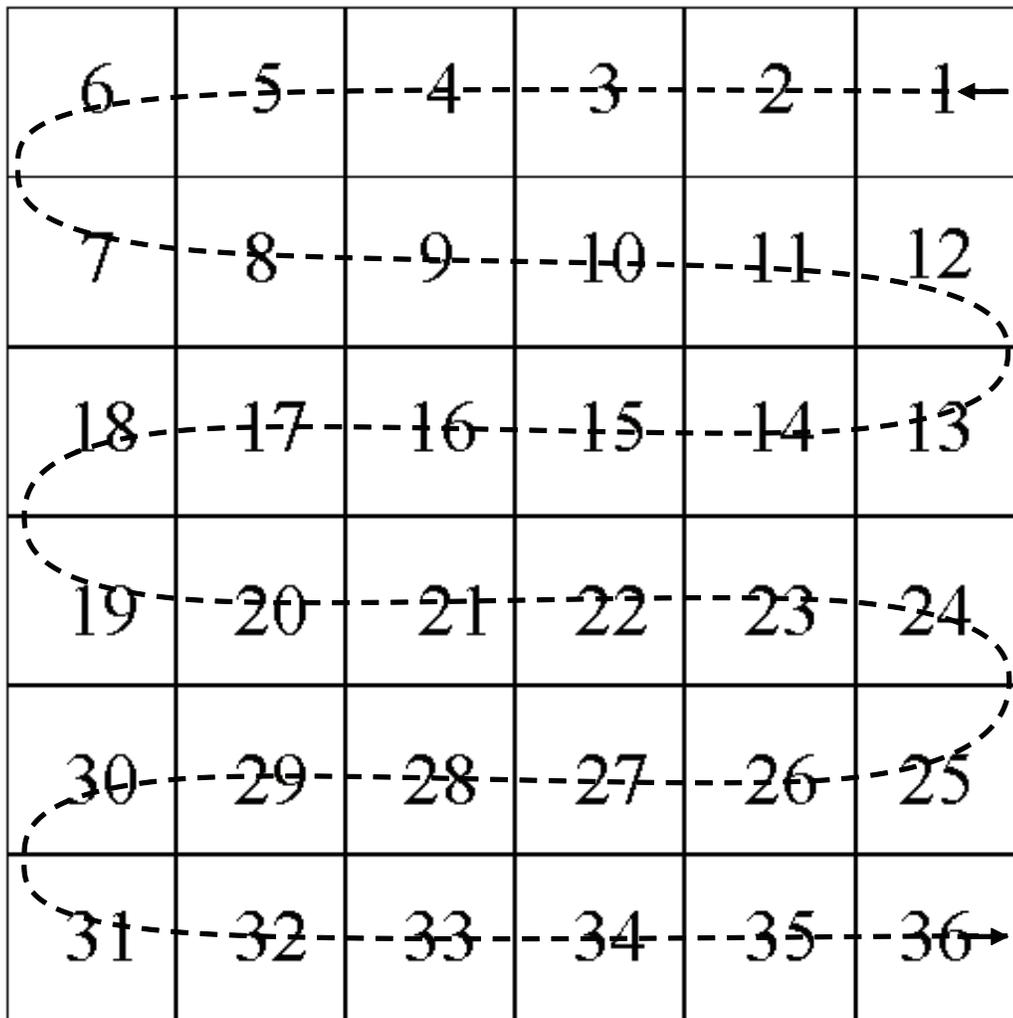
Each township is 6 miles by 6 miles, or 36 square miles in size (6 miles square). The township identified with the arrow is 3 townships south of the baseline and 2 ranges east of the principal meridian.



## Sections

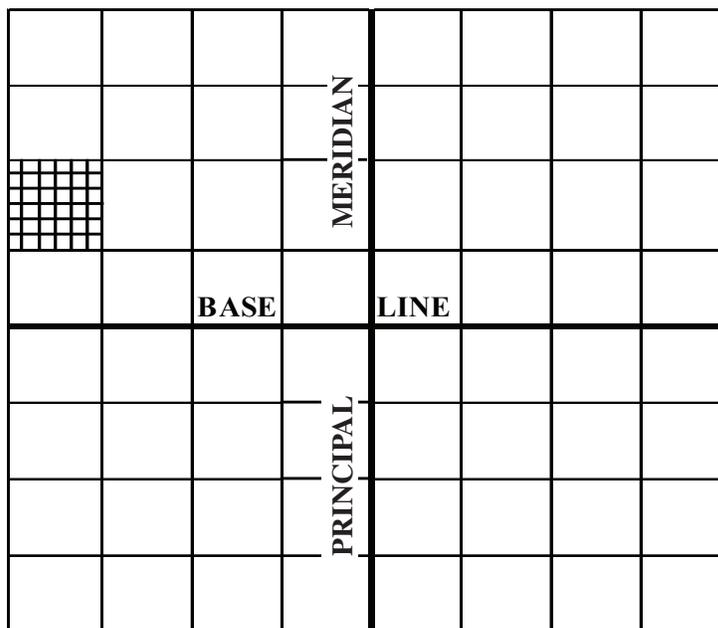
A section is a one mile square block of land containing 640 acres. There are 36 sections within each township. Numbering of the sections begins in the northeast corner of the township, and progresses west then east, back and forth in a serpentine manner as illustrated by the dashed line.

Any correction to the size of the township due to measuring error occurs along the western or northern side. As a result, the sections along the western and/or northern side of the township may not equal one mile square.



## Unit 3, Exercise 1 — Locating townships and sections

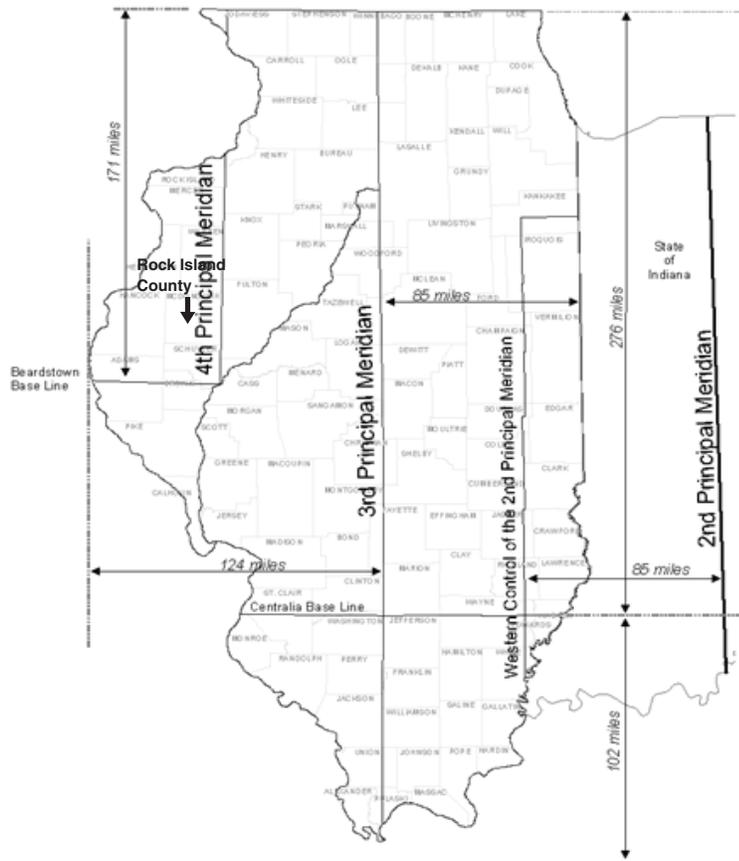
This exercise is designed to help you more precisely pinpoint areas or tracts of land. Please locate the following and place the appropriate letter in the proper location.



- A** Township 2 North, Range 4 East  
(to locate this tract, count two squares (townships) up from the baseline, and four squares (ranges) to the right of the principal meridian line).
- B** Township 4 South, Range 2 West
- C** Township 3 North, Range 2 West
- D** Township 1 South, Range 3 East
- E** Section 16, Township 2 North, Range 4 West
- F** Section 1, Township 2 North, Range 4 West
- G** Section 36, Township 2 North, Range 4 West
- H** Section 26, Township 2 North, Range 4 West

## Unit 3, Exercise 2 – Principal meridian and baseline

Remember that each township/range is 6 miles by 6 miles square. In the first question, since a township is 6 miles by 6 miles, 12 S = 72 miles south of Centralia and Range 1W is 6 miles west of the 3rd PM. This exercise is designed to familiarize you with the concept of baselines and principal meridians in locating property.



Distances are marked on the drawing.

Beardstown base line to northern border = 171 miles

Centralia baseline to northern border = 276 miles

Centralia baseline to southern border = 102 miles

2nd PM (in Indiana) to border of the western control = 85 miles

3rd PM to eastern border of Illinois = 85 miles

3rd PM to farthest western border of Illinois = 124 miles

- |   |                   |                    |
|---|-------------------|--------------------|
| 1 | T12S-R1W, 3rd PM  | South or Southwest |
| 2 | T43N-R10E, 3rd PM | _____              |
| 3 | T27N-R4E, 4th PM  | _____              |
| 4 | T20N-R3W, 3rd PM  | _____              |
| 5 | T2N-R11W, 2nd PM  | _____              |
| 6 | T3S-R7W, 4th PM   | _____              |

## Summary

Monuments are tangible landmarks that indicate boundaries. A physical monument is an existing feature such as a stone or a stake. A natural monument is an existing feature such as a lake, river, tree, boulder, or hill. An artificial monument is a man-made object such as a stake, fence, set stone, etc. A record monument is an adjoining property called for in a deed, such as a street or particular parcel of land. A legal monument is any monument controlling in a legal description.

A township is a nearly 6 mile square (36 square miles) area of land containing 36 sections. A section is a 1 mile square block of land containing 640 acres, or one thirty-sixth of a township. A range is a vertical column of townships in the rectangular survey system. Townships run north and south of a referenced baseline, ranges run east and west of a referenced principal meridian.

A section contains 640 acres.

A chain is a land surveyor's measure equal to 66', or 100 links. A foot is equal to 12 inches. There are 3' in a yard. A link is equal to 7.92" or .66'. A rod or pole is equal to 16.5'.

Using the U.S. Rectangular Survey System, once we know the section, township, range, principal meridian, and baseline, we can locate any piece of property to within one mile.

## Unit 3

### Review Questions

- 1 Sections are numbered in a \_\_\_\_\_ fashion, beginning in the \_\_\_\_\_ corner. There are \_\_\_\_\_ sections within a township.
- 2 Legal descriptions using the Rectangular Survey System are tied to base lines and meridians. In Illinois, these descriptions are governed by the \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_ Principal Meridians, and by the \_\_\_\_\_ Baseline or the \_\_\_\_\_ Baseline.
- 3 The \_\_\_\_\_ Principal Meridian virtually cuts Illinois in half. The \_\_\_\_\_ Principal Meridian is located in Indiana. Both of these are tied to the \_\_\_\_\_ Baseline. The \_\_\_\_\_ Principal Meridian is located in the northwest portion of the state, and is tied to the \_\_\_\_\_ Baseline.
- 4 A committee headed by \_\_\_\_\_ developed a plan for dividing public land into rectangles. This plan was the basis for the \_\_\_\_\_ Ordinance of 1785.
- 5 A township is a nearly square area of land. Each township is \_\_\_\_\_ miles square and contains \_\_\_\_\_ square miles. The first township north of a baseline would be referenced as township \_\_\_\_\_ \_\_\_\_\_.
- 6 T44 N – R2 E, of the 3rd Principal Meridian, is located in the \_\_\_\_\_ part of the state of Illinois.

# Unit 4

## Legal Descriptions

This unit covers different types of legal descriptions and how to properly read them.

The purpose of this unit is to provide a detailed understanding of how real property is described. In addition, this unit will describe how to locate real property using a legal description.

### Learning Objectives

After completing the assigned readings you should be able to

- Locate real property from a legal description
- Calculate acreage
- Define the different types of legal descriptions

### Terms and Concepts

Bearing	More or Less
Cadastral Map	Parcel
Commencing	Plat Map
Degree	Point of Beginning
Description	Quarter Section
Index Map	Range
Metes and Bounds	Subdivision
Monuments	

The goal of assessing property for ad valorem purposes is to:

- 1 find the property
- 2 set up a method to legally describe the property
- 3 value the property with an appropriate unit of comparison.

A legal description is defined as a description in words judged legally sufficient to locate and identify a specific parcel. There are several methods used for legally describing property.

## Lots and Blocks

These descriptions are often used in assessment books, typically referring to appropriate page numbers within those books. For example:

- Lots 1 and 4 in Block 30 in the Village of Good Hope, McDonough County, Illinois.
- Lot 4 in Block 28 in the City of Bushnell, according to Plat #2 of said City, County of McDonough, state of Illinois.

When locating a parcel written in a lots and blocks description, it is necessary to read the description backwards to specifically locate the property. In the first example above, if we were to read the description in the order written, we would start with Lots 1 and 4. The question becomes Lots 1 and 4 where? It could be anywhere in the world. By starting at the end of the description, we know that the lots are in the state of Illinois, the county of McDonough, the village of Good Hope, and in Block 30 of the village.

## Land Descriptions

Land descriptions are referenced to the government surveys described in Unit 3. A strength of the rectangular survey system is that the land has been, for the most part, divided evenly. This makes property descriptions more uniform and predictable. Under the rectangular survey system, land can be described one of three ways. When locating these parcels, the descriptions are read backwards to specifically locate the property.

**Fractional:** Describing property using fractions of rectangles. For example:  
E 1/2, NE 1/4, Section 6, Township 3 N, Range 4 West of the  
3rd Principal Meridian.

**Acreage:** Describing property using the acreage values associated with each fraction of a rectangle. For example:  
West 80 acres, NE 1/4 Section 6, Township 3 North, Range 4 West  
of the 3rd Principal Meridian.

**Lineal:** Describing property using the perimeter measurement of each fraction of a rectangle. For example:  
The East 400 feet of the Southeast Quarter of Section 7,  
Township 2 South, Range 1 East of the 3rd Principal Meridian.

The diagram on Page 4-4 illustrates how an individual section of the rectangular survey system can be dissected using land descriptions in order to describe property. The diagram shows section divisions and land measurements. A section is simply a large square that is one mile from east to west and one mile from north to south.

The large square, or section, can be divided into four equal parts creating the Northeast Quarter, the Northwest Quarter, the Southeast Quarter and the Southwest Quarter of the entire section.

Considering an entire section is 640 acres, by dividing the section by four (quartering the section), each quarter section is 160 acres ( $640 \div 4 = 160$ ). Therefore, if a property is described as the NW  $\frac{1}{4}$  section, the total acreage of that property is 160 acres. Property can be further divided into a quarter-quarter section. If the property is described as the NW  $\frac{1}{4}$  of the NW  $\frac{1}{4}$ , the section has been quartered twice ( $640 \div 4 = 160 \div 4 = 40$ ); the property contains 40 acres. This division by one-fourth can continue to a quarter-quarter-quarter which would contain 10 acres, and a quarter-quarter-quarter-quarter containing 2.5 acres. Tracts smaller than 2.5 acres are generally described using the metes and bounds description.

Property can be dissected using any combination of fractional portions. For example, a single parcel can be the equivalent of one half of a section, or 320 acres. The half section can be the north half or the south half or the east half or west half.

## Metes and Bounds

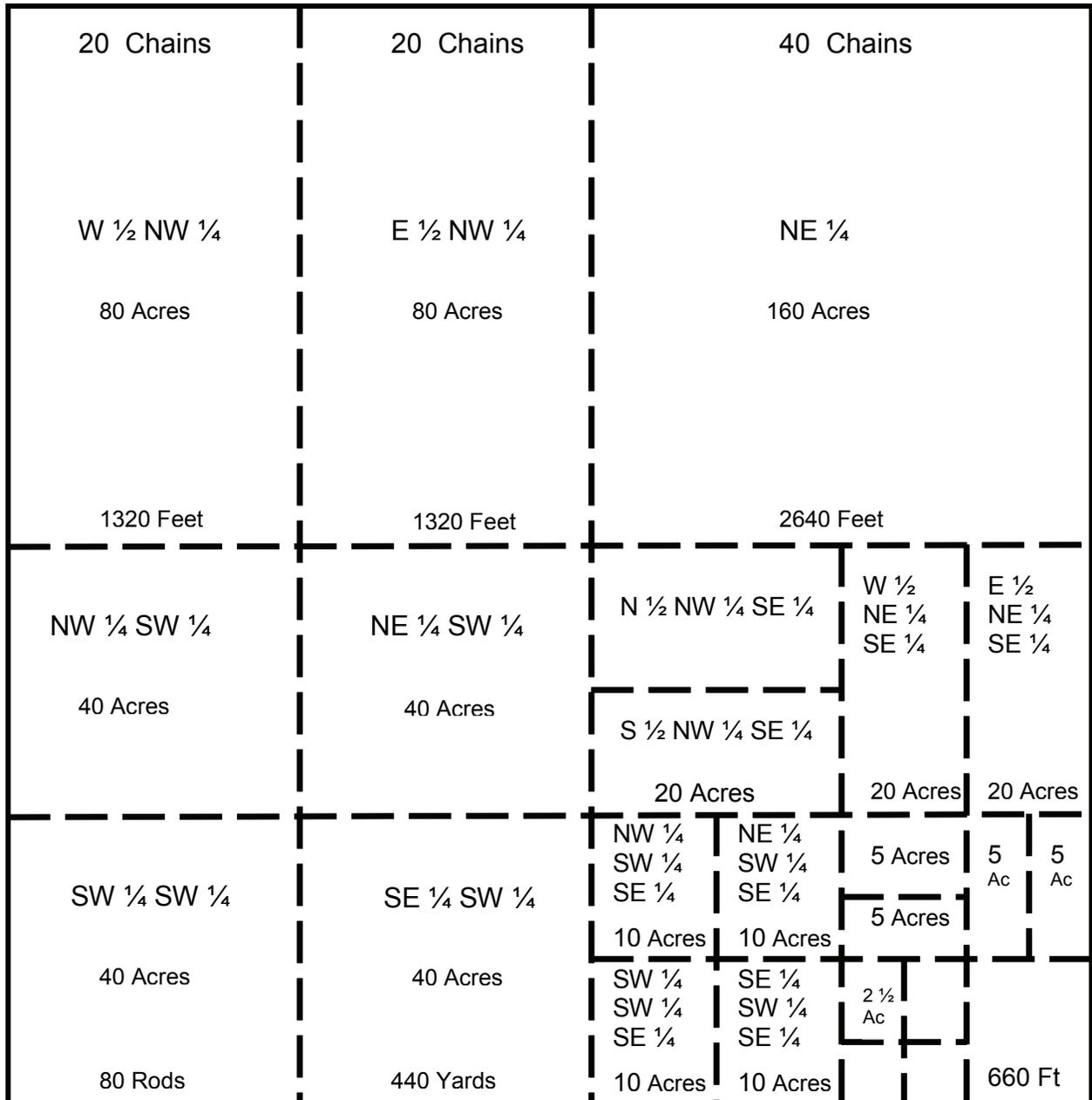
Metes and bounds are used to describe the perimeter of property. When locating a parcel written in a metes and bounds description, it is necessary to read the first part of the land description portion backward to locate the point of beginning. Once the point of beginning is determined, the metes and bounds portion of the description is read in the order written.

For example:

Commencing at the Southeast corner of the Northwest Quarter of Section 4, Township 7 North, Range 8 East of the 3rd Principal Meridian, thence North 50 feet to the point of beginning; thence West 550 feet; thence North 400 feet; thence East 550 feet; thence South 400 feet to the point of beginning.

In locating this property, we would first locate the 3rd Principal Meridian, and its governing Centralia Baseline. We would then find Range 8 East and Township 7 North. Within that Township and Range we would locate Section 4. We would then locate the Northwest Quarter of that Section 4, and finally the Southeast corner of the Northwest Quarter. The Southeast corner is the point of beginning for our metes and bounds description. We would then read the metes and bounds description in the order written to determine the property boundary lines. By starting at the Southeast corner and going North 50 feet to the point of beginning; thence West 550 feet; thence North 400 feet; thence East 550 feet; thence South 400 feet to the point of beginning, we would have the exact location and boundary lines for our parcel.

# Section Divisions and Land Measurement



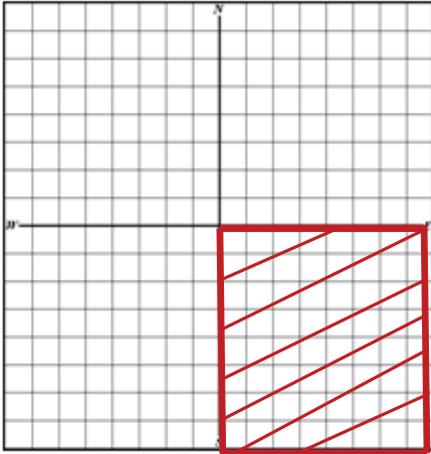
A section of land is one square mile (5280' by 5280') or 640 acres.

- 1 Link = 7.92" = .66'
- 1 Rod = 16.5'
- 1 Chain = 66' = 4 rods
- 1 Furlong = 660' = 40 rods = 1,000 links
- 1 Mile = 8 furlongs = 320 rods = 80 chains = 5280'
- 1 Acre = 43,560 SF

Quick reference	
1/4 section	= 160 acres
1/4 1/4 section	= 40 acres
1/4 1/4 1/4 section	= 10 acres
1/4 1/4 1/4 1/4 section	= 2.5 acres

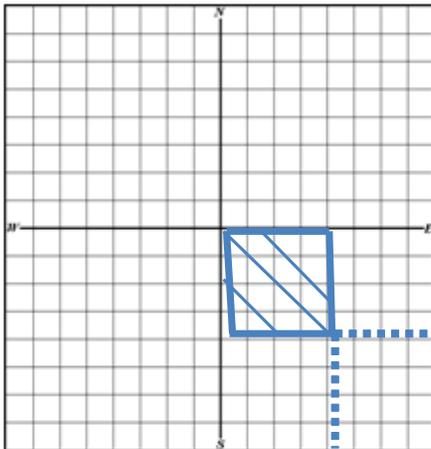
## Locating Legal Descriptions

When locating legal descriptions that are **fractional** (NE  $\frac{1}{4}$  of the NW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$ ), begin with the whole 640 acres of the section. Go to the end of the legal description for the last part of the section. In this example, the last part mentioned is "SE  $\frac{1}{4}$ ." Divide the section into 4 equal parts (since the SE  $\frac{1}{4}$  is described). Each part is 160 acres (640 acres in a section divided by 4). Now locate the SE  $\frac{1}{4}$  on the grid.



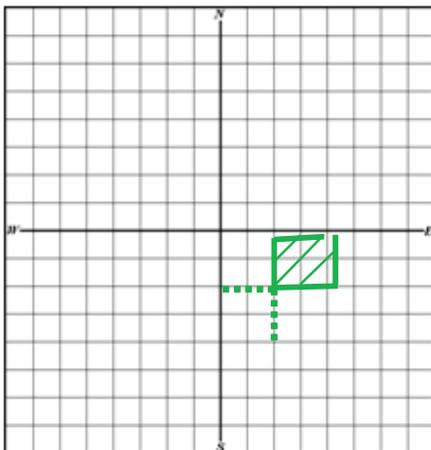
$$\text{SE } \frac{1}{4} = 640 \text{ acres} \div 4 = 160 \text{ acres}$$

Next, find the NW  $\frac{1}{4}$  of this SE  $\frac{1}{4}$ .



$$\begin{aligned} \text{NW } \frac{1}{4} \text{ of the SE } \frac{1}{4} &= \\ 160 \text{ acres (SE } \frac{1}{4}) \div 4 &= 40 \text{ acres} \end{aligned}$$

Now locate the NE  $\frac{1}{4}$  of the NW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$ .



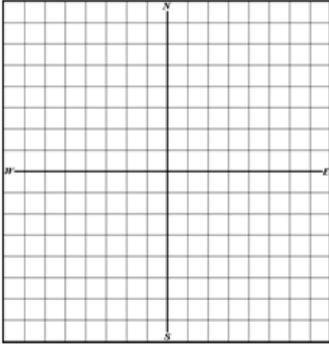
$$\begin{aligned} \text{NE } \frac{1}{4} \text{ of the NW } \frac{1}{4} \text{ of the SE } \frac{1}{4} &= \\ 40 \text{ acres} \div 4 &= 10 \text{ acres} \end{aligned}$$

## Unit 4, Exercise 1 — Locating legal descriptions

Identify these parcels on the grid provided by shading in the appropriate parts on the grid.

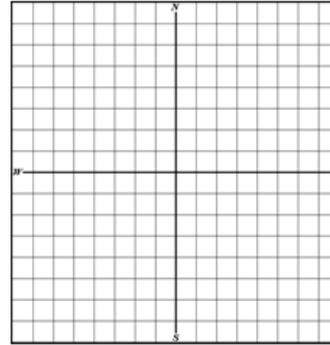
1 SE  $\frac{1}{4}$  of SE  $\frac{1}{4}$

\_\_\_\_\_ Acres



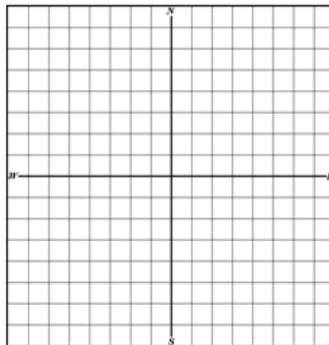
4 E  $\frac{1}{2}$  of NW  $\frac{1}{4}$  and NW  $\frac{1}{4}$  of NW  $\frac{1}{4}$

\_\_\_\_\_ Acres



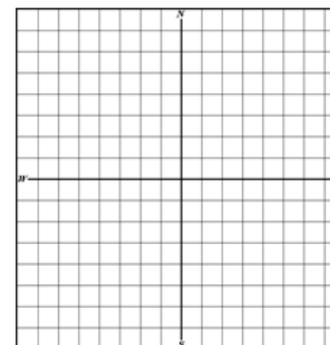
2 S  $\frac{1}{2}$  of NW  $\frac{1}{4}$

\_\_\_\_\_ Acres



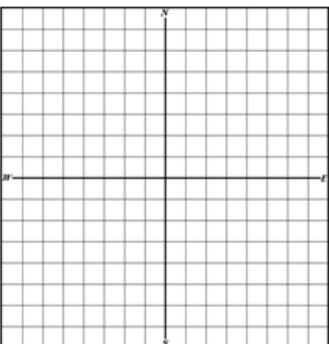
5 SW  $\frac{1}{4}$  of SE  $\frac{1}{4}$  of SW  $\frac{1}{4}$

\_\_\_\_\_ Acres



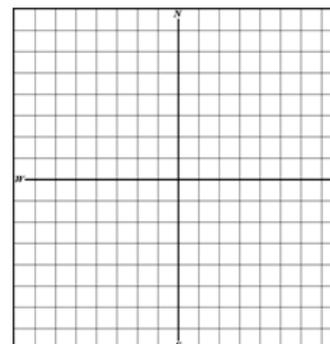
3 N  $\frac{1}{2}$  of NE  $\frac{1}{4}$  of SE  $\frac{1}{4}$

\_\_\_\_\_ Acres



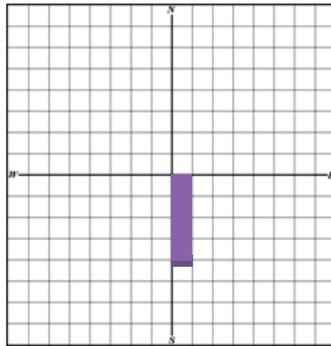
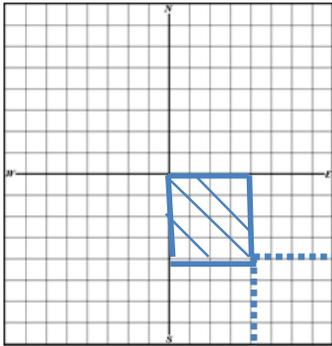
6 NE  $\frac{1}{4}$  of NW  $\frac{1}{4}$  of SW  $\frac{1}{4}$

\_\_\_\_\_ Acres



# Locating by Acreage

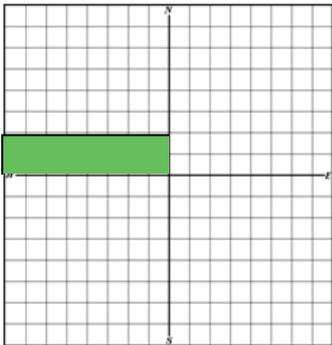
When locating legal descriptions that are by acreage (W 10 acres of the NW ¼ of the SE ¼), begin with the whole 640 acres of the section. Locate the NW ¼ of the SE ¼ as in the previous example.



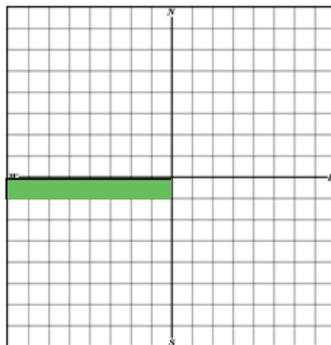
West 10 acres of the  
NW ¼ of the SE ¼

This NW ¼ of the SE ¼ contains 40 acres.  $640 \text{ acres} \div 4 \div 4 = 40 \text{ acres}$ . The legal description calls for the west 10 acres of this. These 10 acres will be on the west side of the 40 acres.

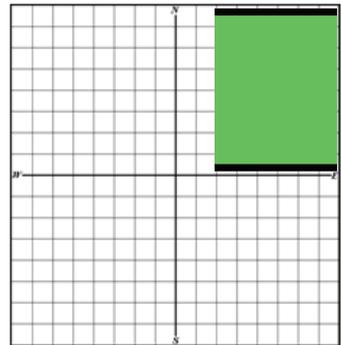
S 40 acres of NW ¼



N 20 acres of SW ¼



E 120 acres of NE ¼



## Unit 4, Exercise 2 — Legal description exercises

### Part I — Legal Description by Acreage

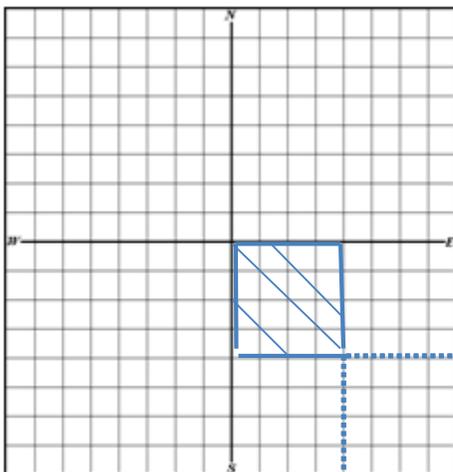
Using acreage land measurement description methods, please locate the following parcels on the grid on the following page for Section 30, Township 12 South, Range 1 East, 3rd PM.

- 1 The E 80 acres of the N 320 acres
- 2 The N 40 acres of the E 80 acres of the NW  $\frac{1}{4}$
- 3 The N 40 acres of the SW  $\frac{1}{4}$
- 4 The S 80 acres of the SW  $\frac{1}{4}$
- 5 The E 20 acres of the NW  $\frac{1}{4}$  of the NW  $\frac{1}{4}$
- 6 The S 5 acres of the SW  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$
- 7 The NE 10 acres of the NW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$

### Legal description by linear measurement

When locating legal descriptions that are by linear measurement (E 10 chains off of the NW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$ ), begin with the whole 640 acres of the section.

**Step 1:** Locate the NW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$  as in the previous example.

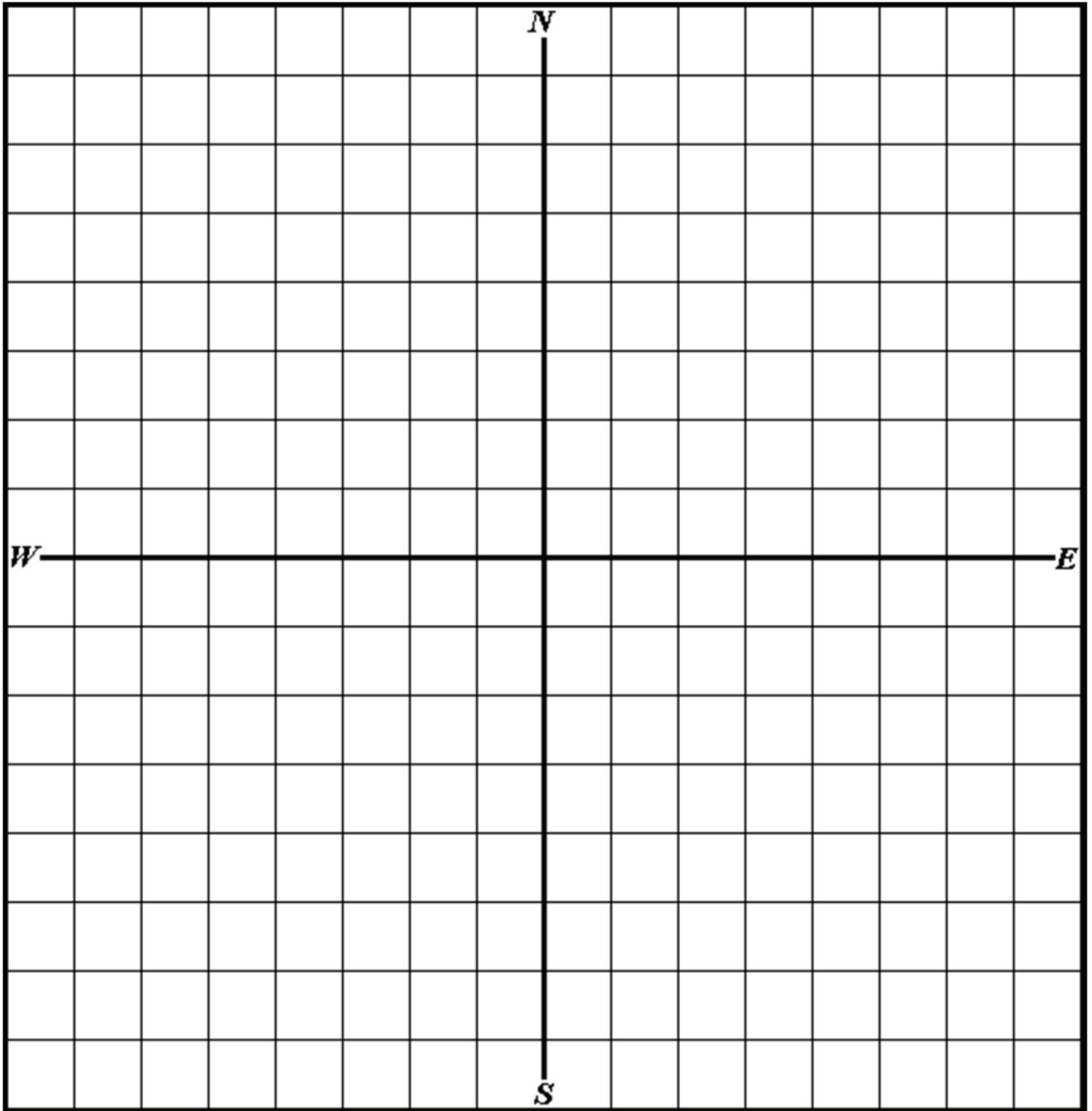


NW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$  which is 40 acres

(continued on Page 4-10)

Section 30 grid map

Unit 4, Exercise 2 – Part I



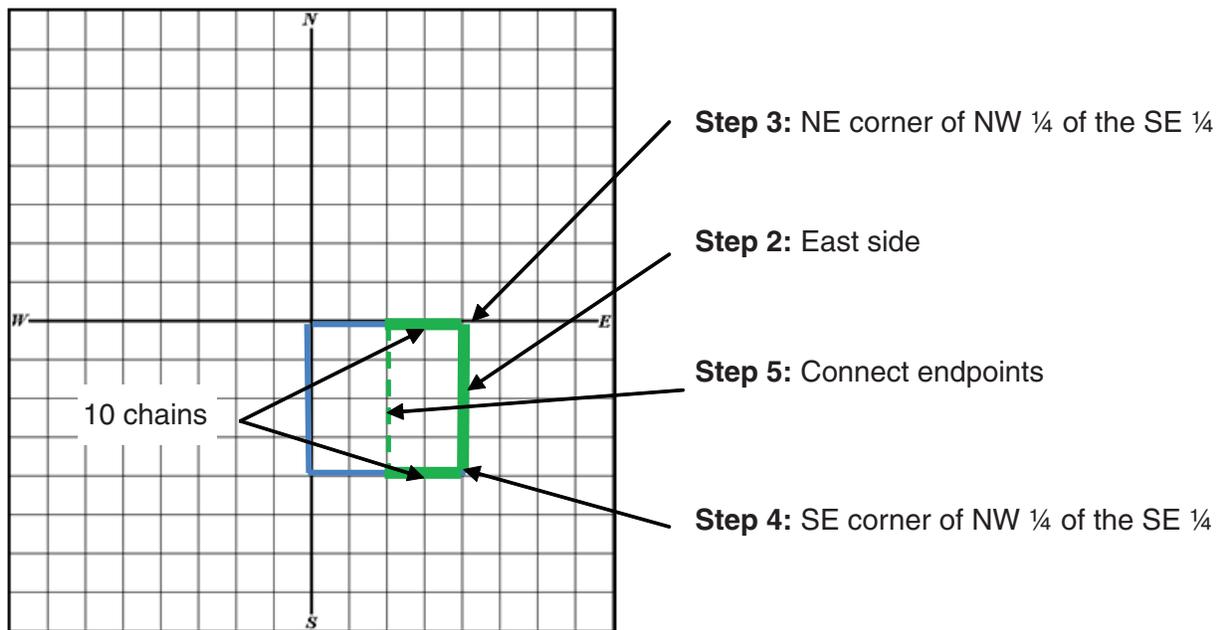
1 chain = 66' 10 chains = 660'

Each square on this grid is 330' by 330'

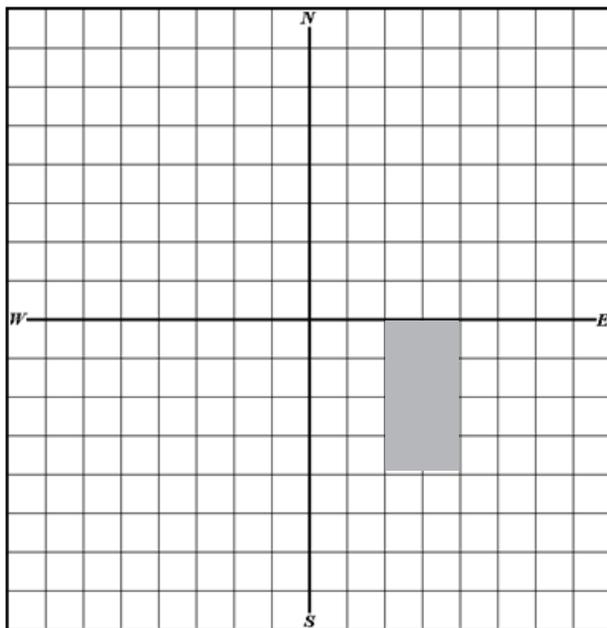
**Step 2:** Since the legal calls for the east 10 chains, locate the east side (marked with a thicker line).

**Step 3:** Make a horizontal line from the NE corner, of the part that has already been identified, west 10 chains ( 660').

**Step 4:** Make a horizontal line from the SE corner, of the part that has already been identified, west 10 chains (660').



**Step 5:** Connect the endpoints of the lines representing the 10 chains to make a rectangle.





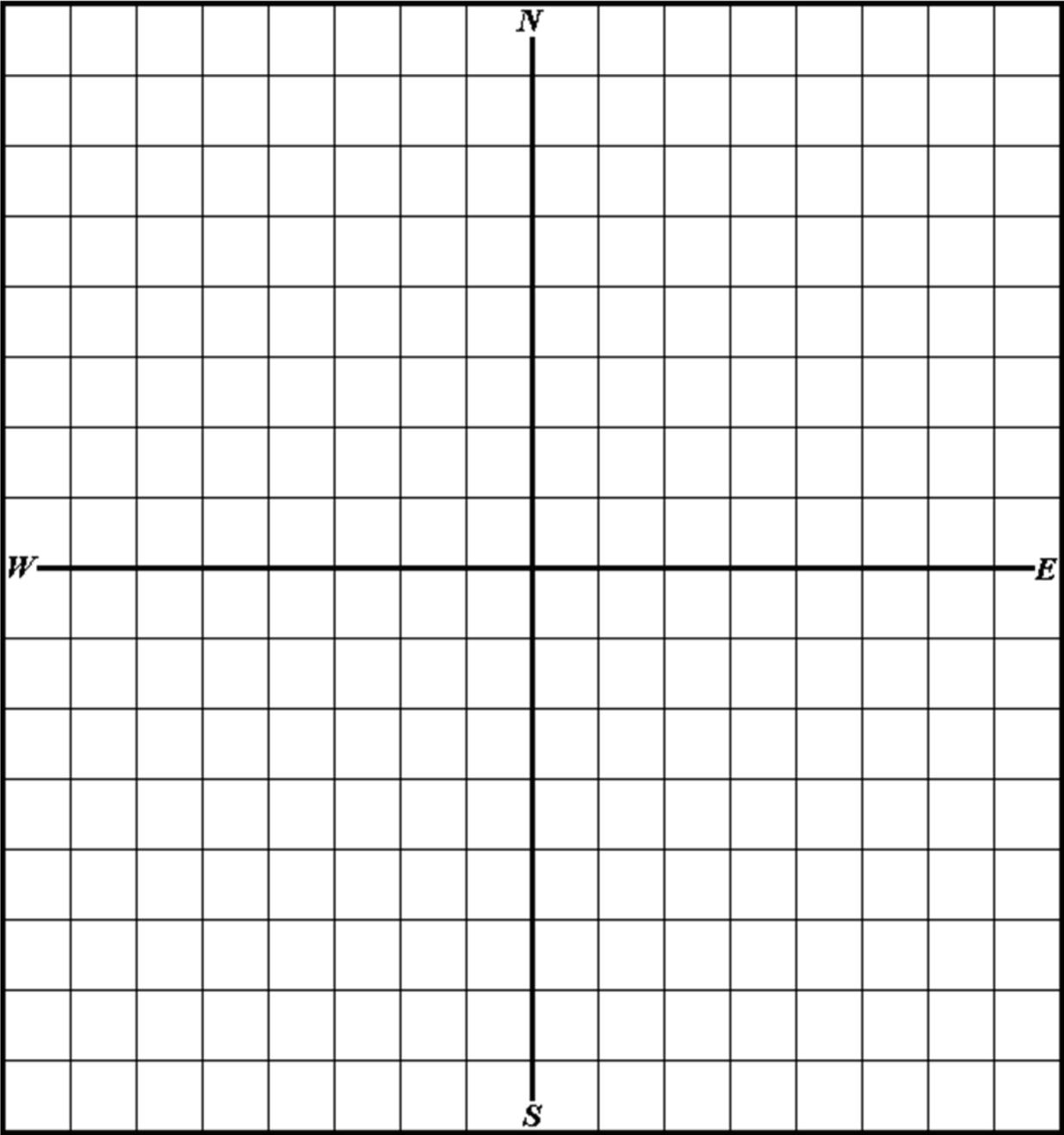
## Part II — Legal description by linear measurement

Using lineal land measurement description methods, please locate the following parcels on the grid on the following page for Section 32, Township 12 South, Range 2 West, 3rd PM.

- 1 The N 10 chains of the NW  $\frac{1}{4}$
- 2 The W 330 feet off of the SW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$
- 3 82.5 feet off of the S side of the NW  $\frac{1}{4}$
- 4 The East 330 feet off of the E  $\frac{1}{2}$  of the NW  $\frac{1}{4}$  of the NE  $\frac{1}{4}$

Section 32 grid map

Unit 4, Exercise 2 – Part II



## Unit 4, Exercise 3 — Calculation of acreage

Using the fractional land measure description method, the total acreage of a single legal description can be determined, even if the legal description contains several different parcels. In a legal description, the appearance of the words “and” or “also” and the punctuation mark “;” all mean “in addition to”. If these key words or the semi-colon appears, simply calculate the acreage for each parcel and then add the parcels together to determine the total acreage of the property described. In #1 below, the legal description has been written in such a way as to highlight that there are multiple parcels. Refer to the grid on Page 4-13 if you need assistance.

Please calculate the acreage for the following:

- 1 The Southeast Quarter of the Southeast Quarter of the Northwest Quarter 10 ; and the Southwest Quarter of the Southwest Quarter of the Northeast Quarter 10 ; and the Northwest Quarter of the Northwest Quarter of the Southeast Quarter 10 ; and the Northeast Quarter of the Northeast Quarter of the Southwest Quarter 10 .

40 acres (Note: each quarter-quarter-quarter contains 10 acres for a total of 40 acres in the entire parcel).

- 2 The East One-half of the Northeast Quarter of the Northeast Quarter of the Southeast Quarter; and the Southeast Quarter of the Northeast Quarter of the Southeast Quarter; and the North One-half of the Northeast Quarter of the Southeast Quarter of the Southeast Quarter.

\_\_\_\_\_ acres

- 3 The South One-half of the Southwest Quarter of the Southwest Quarter; and the South One-half of the Southeast Quarter of the Southwest Quarter; and the South One-half of the Southwest Quarter of the Southeast Quarter; and the Northeast Quarter of the Southwest Quarter of the Southeast Quarter; and the Northeast Quarter of the Northwest Quarter of the Southwest Quarter of the Southeast Quarter; and the Northwest Quarter of the Northwest Quarter of the Southwest Quarter of the Southeast Quarter.

\_\_\_\_\_ acres

- 4 The Northeast Quarter of the Northeast Quarter; and the North One-half of the Northwest Quarter of the Southeast Quarter of the Northeast Quarter; and the Northeast Quarter of the Northeast Quarter of the Southwest Quarter of the Northeast Quarter.

\_\_\_\_\_ acres

- 5 The Southwest Quarter of the Southwest Quarter of the Northwest Quarter; and the Northwest Quarter of the Southwest Quarter of the Northwest Quarter; and the Southwest Quarter of the Northwest Quarter of the Northwest Quarter.

\_\_\_\_\_ acres

- 6 The Northwest Quarter of the Northwest Quarter of the Southeast Quarter of the Northwest Quarter; and the Northeast Quarter of the Northeast Quarter of the Southwest Quarter of the Northwest Quarter; and the Southeast Quarter of the Southeast Quarter of the Northwest Quarter of the Northwest Quarter; and the Southwest Quarter of the Southwest Quarter of the Northeast Quarter of the Northwest Quarter.

\_\_\_\_\_ acres

## Summary

Legal descriptions describe the boundary and location of property. These descriptions can be either Lots and Blocks descriptions, Land descriptions (which can be either fractional, acreage, or lineal), Metes and Bounds descriptions, or a combination of these.

When reading a legal description for purposes of locating property, read all legal descriptions not written in metes and bounds backwards.

## Unit 4

### Review Questions

Locate the following on the section grid on Page 4-18, and calculate the acreage.

- 1 The NW  $\frac{1}{4}$
- 2 The SE  $\frac{1}{4}$  of the SE  $\frac{1}{4}$
- 3 The S 165' off of the SW  $\frac{1}{4}$
- 4 82.5' off of the E side of the NE  $\frac{1}{4}$
- 5 The East 40 acres of the W 80 acres of the NE  $\frac{1}{4}$
- 6 The North 10 chains of the SE  $\frac{1}{4}$

Calculate the acreage for the following.

- 7 The Northeast Quarter of the Northwest Quarter = \_\_\_\_\_ acres.
- 8 The Southeast Quarter of the Southeast Quarter of the Southeast Quarter  
= \_\_\_\_\_ acres.
- 9 The East Half of the Northwest Quarter of the Northeast Quarter  
= \_\_\_\_\_ acres.

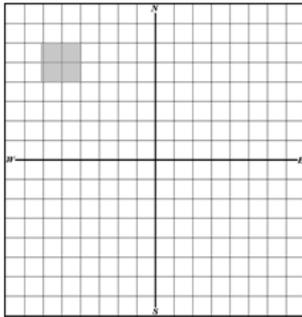
Complete the following.

- 10 To locate a parcel using a metes and bounds description, first read the land description portion of the legal description \_\_\_\_\_ and then read the metes and bounds portion of the description in the \_\_\_\_\_ written.

Read all legal descriptions not written in metes and bounds \_\_\_\_\_.

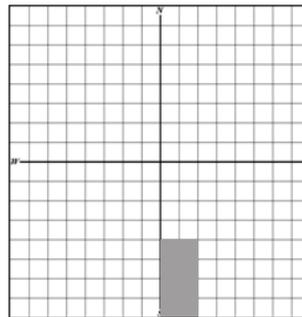
11 Write the legal description and calculate the acreage below each section map.

**A**



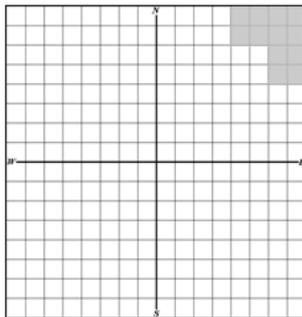
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Acres

**C**



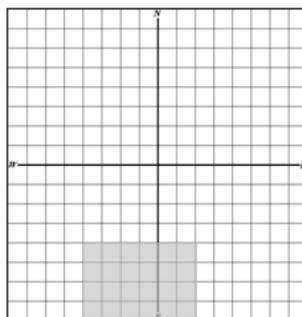
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Acres

**B**

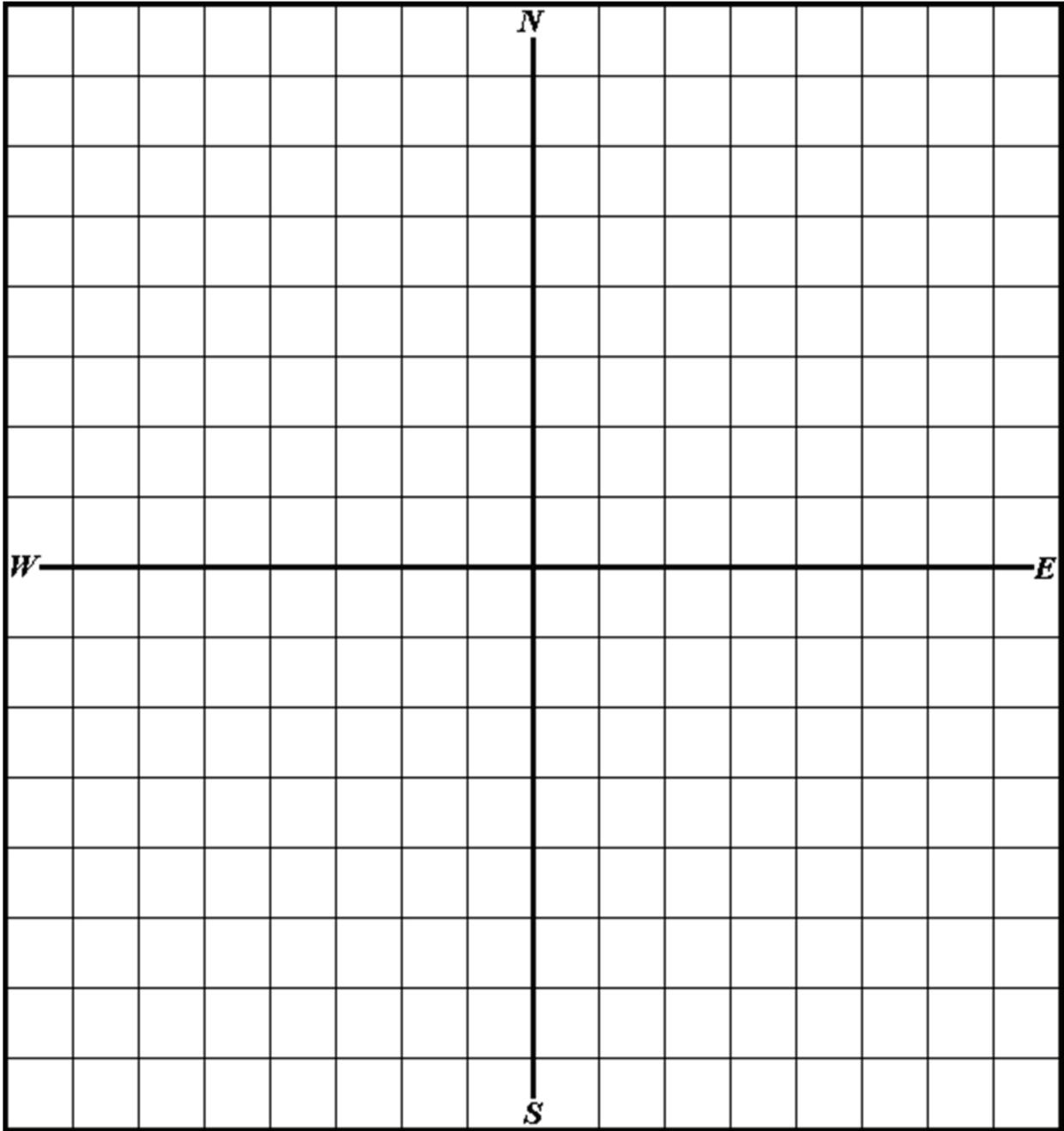


\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Acres

**D**



\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Acres



# Unit 5

## Metes and Bounds Legal Descriptions

This unit covers the drawing of metes and bounds legal descriptions.

The purpose of this unit is to provide a detailed understanding of how to describe real property using the metes and bounds system.

After completing the assigned readings you should be able to

- Draw parcels from a metes and bounds legal description
- Understand map scale
- Use a land measure compass

### Terms and Concepts

Backsight

Bearing

Commencing

Degree

Line

Metes and bounds

Monuments

Point

Point of Beginning (POB)

Scale

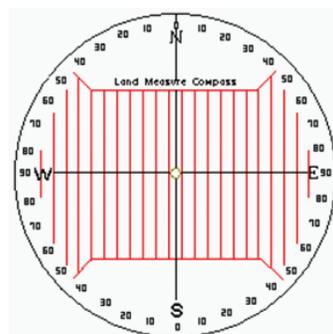
Traverse

For the drawing portions of this course, training and directions will be given based on the assumption that the tools identified below, or something similar, are being used.

Drawing legal descriptions can, however, be accomplished with other tools, such as protractors and rulers. These other tools may be purchased through local vendors. **The following drawing tools will be supplied for you for the exam, or you may use your own drawing tools.**

### Drawing tools

Land measure compass





This method is also necessary when the map scale is different than the map scale of your legal description. For example, historic maps were drawn at a scale of 1" = 660'. The only way to draw legal description measurements on a map is with a ruler. So, using the conversion method above:

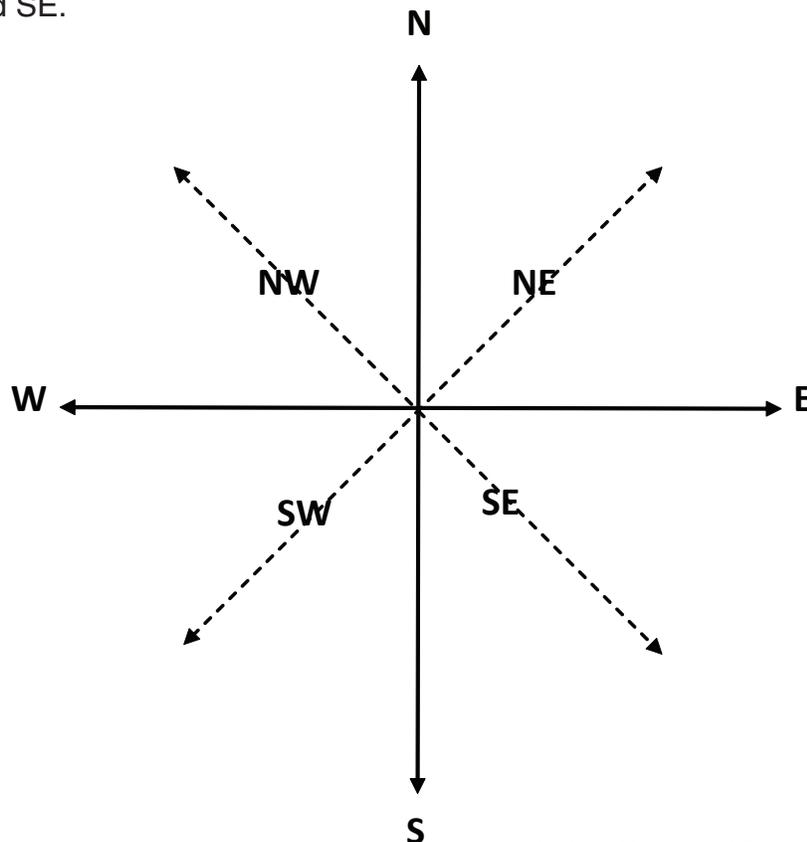
$$595' \div 660' = .90''$$

## Metes and Bounds Descriptions

As discussed in the previous chapter, metes and bounds descriptions are used to describe the perimeter of property. Beginning at a point located using the rectangular survey system, metes and bounds descriptions are read forwards, traversing from point to point until the entire property has been circumscribed, returning at the point of beginning. In metes and bounds descriptions “commencing,” “beginning at,” and “point of beginning” are all terms used to describe the starting point for the metes and bounds description.

## Compass Bearings

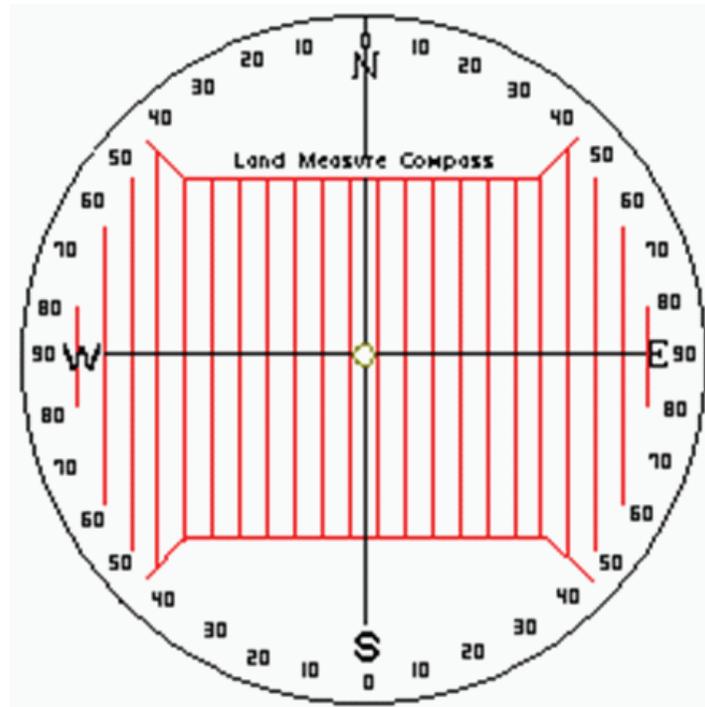
Line your compass up on the following diagram. The north and south arrows should indicate 0°. The east and west arrows should indicate 90°. If a legal description calls for a line North 45° West, you would first start with the North 0° point on your compass, then move along the compass to the West (your left), until you reach 45°. Your bearing would be the line of the arrow marked NW. If a legal description calls for a line South 45° East, you would first start with the South 0° point on your compass. Then, move along the compass to the east (your right) until you reach 45°. Your point would be the line of the arrow marked SE.



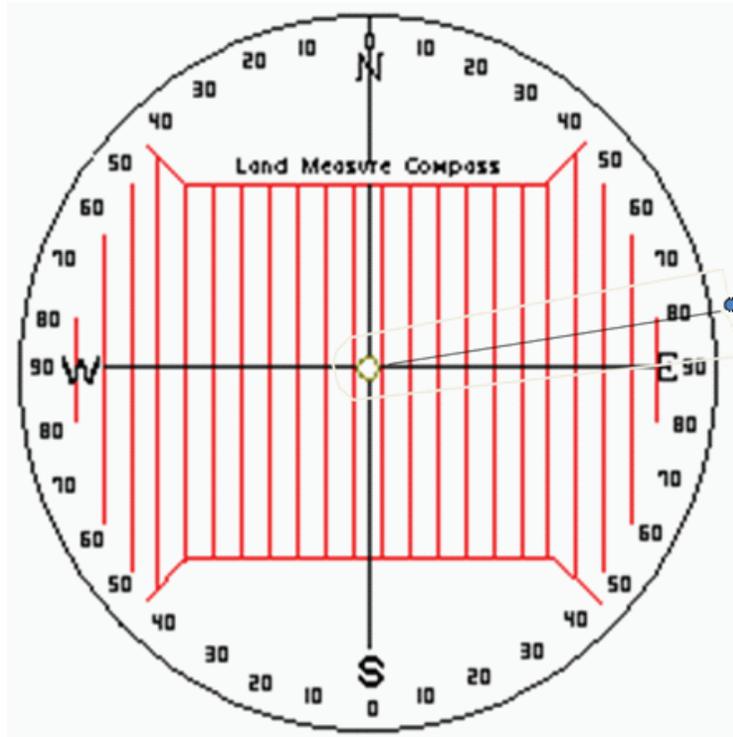
## Drawing Legal Descriptions

Here is a practice example in drawing a metes and bounds legal description. Follow along by tracing over the diagram on Page 5-11 using the legal description accompanying the drawing.

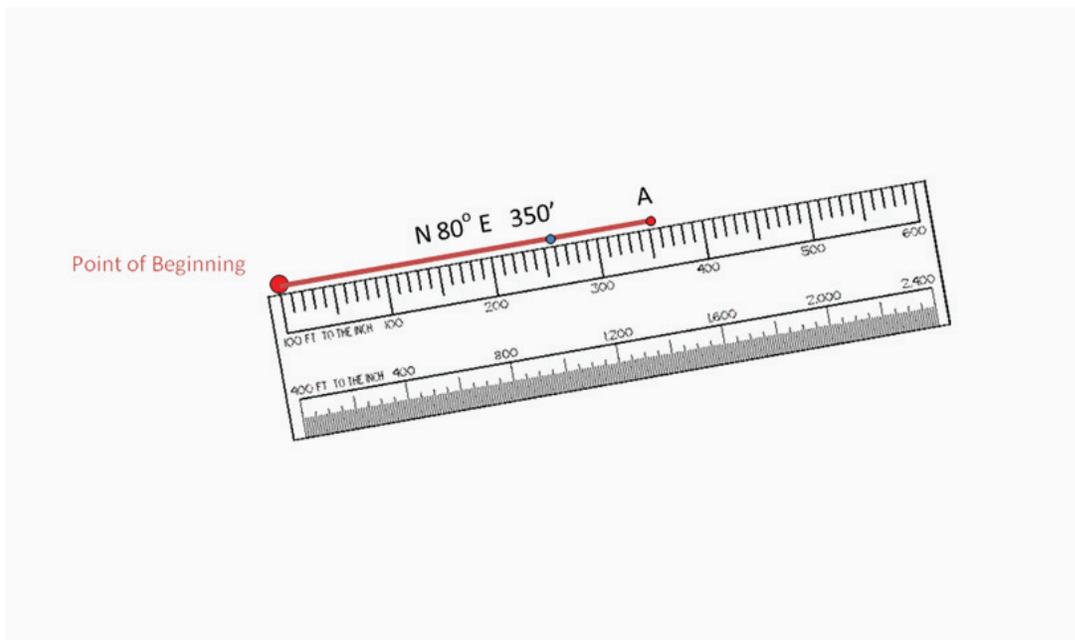
**Step 1:** Place the land measure compass on top of the point of beginning (POB) so that the center hole of the compass is directly over the POB and North (N) is up. Line up one of the red vertical lines with the edge of the paper to first orient the compass or use the two adjacent sides of the triangle to orient the compass.



**Step 2:** Reading the first measurement of the legal description, (N 80° E, 350 feet), make a mark on the paper at N 80° E.



**Step 3:** Remove the land measure compass, and using a drafting scale, place the “0” on the POB, and line up the scale with the mark made at the N 80° E bearing. Then draw a line that represents 350'. With a map scale of 1" = 100', that would be a line that is 3.5" long (to Point A). The mark you made at N 80° E only gives the direction (bearing) of the line. The drafting scale shows the length of the line.



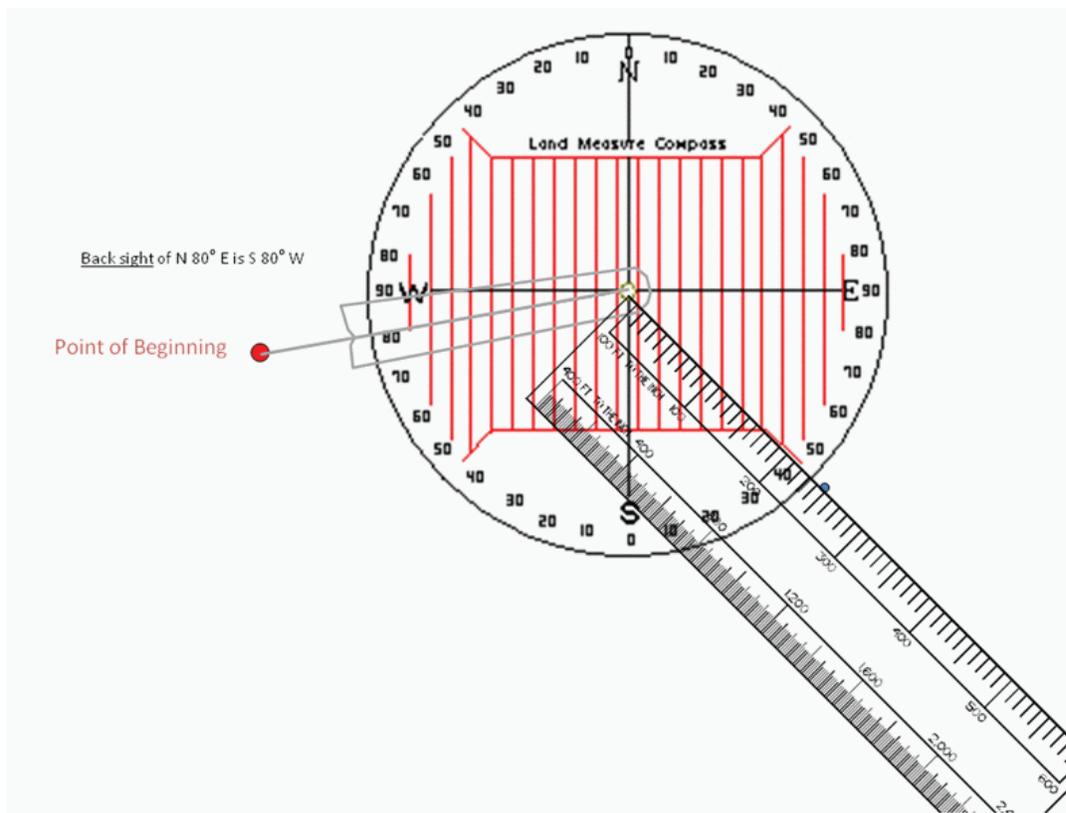
As you trace over the drawing on Page 5-11, the line from the point of beginning to Point A is actually 3.5" long.

**Step 4:** It is recommended that each line be labeled with both bearings and distances (traverse) as it is drawn, so that if a problem is discovered, the information from the legal description is right there on the drawing.

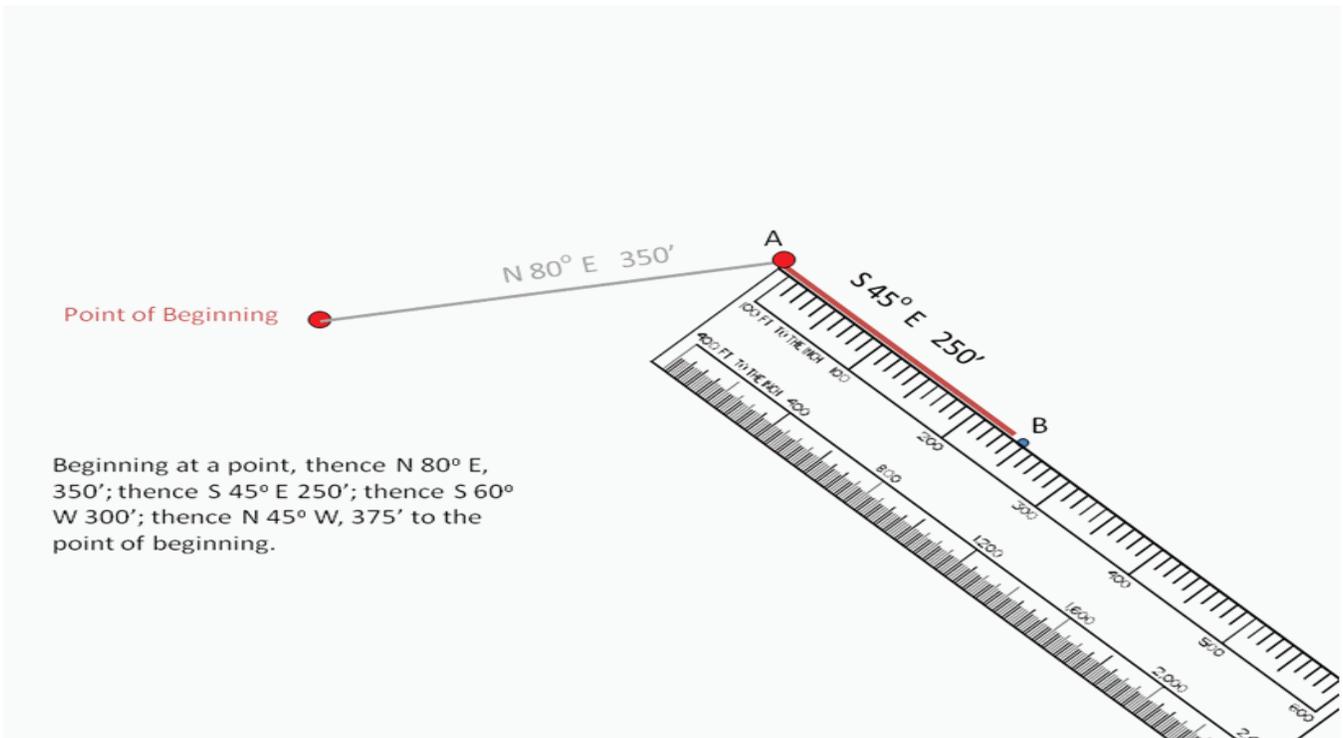
**Step 5:** Place the land measure compass on top of Point A, ready for the next measurement in the legal description. At this point, it is important to be sure that the land measure compass is oriented on the page the same way as it was when beginning the drawing. Otherwise, even a small twist in the compass could have dramatic effects. To avoid this problem, “backsighting” is used.

A backsight is defined as “reading taken by a surveyor back toward a position from which a previous sight has been made.” On the land measure compass, the backsight is the opposite of the bearing previously used. Since the previous bearing was N 80° E the backsight is S 80° W. So, orienting the land measure compass on the map with the center over Point A, and the line drawn matching up with S 80° W indicates that the compass is now sitting on the page the same way as when the drawing began.

Without moving the land measure compass, make a mark on the map using the second bearing (S 45° E). This time look at due South. Make the mark that is 45° East (counter-clockwise) of South.

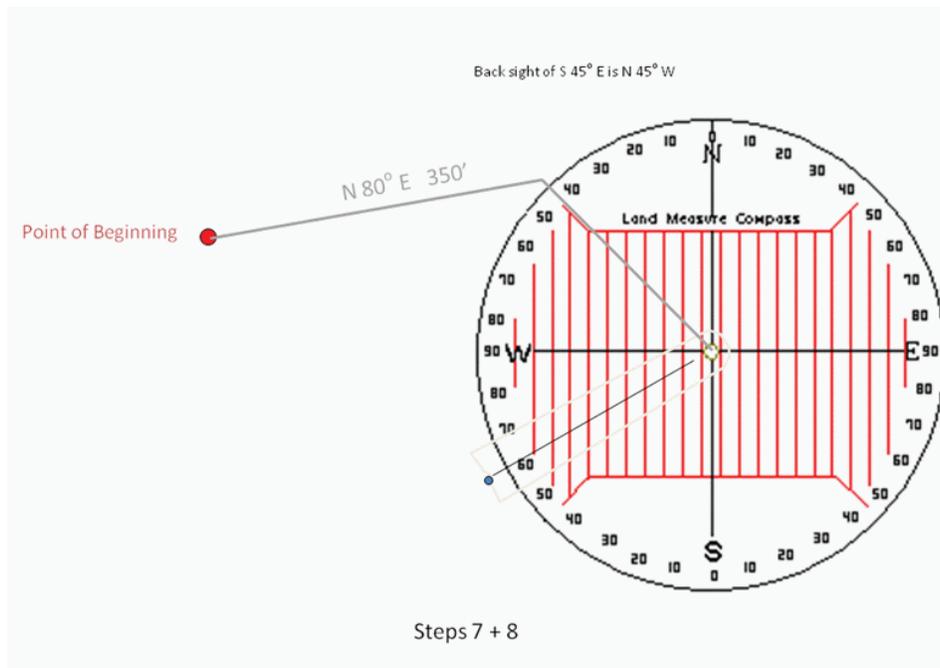


**Step 6:** Remove the land measure compass, and using a drafting scale, place the “0” on Point A, and line up the scale with the mark made at the S 45° E bearing. Then draw a line that represents 250’. With a map scale of 1” = 100’, that would be a line that is 2.5” long (to Point B).



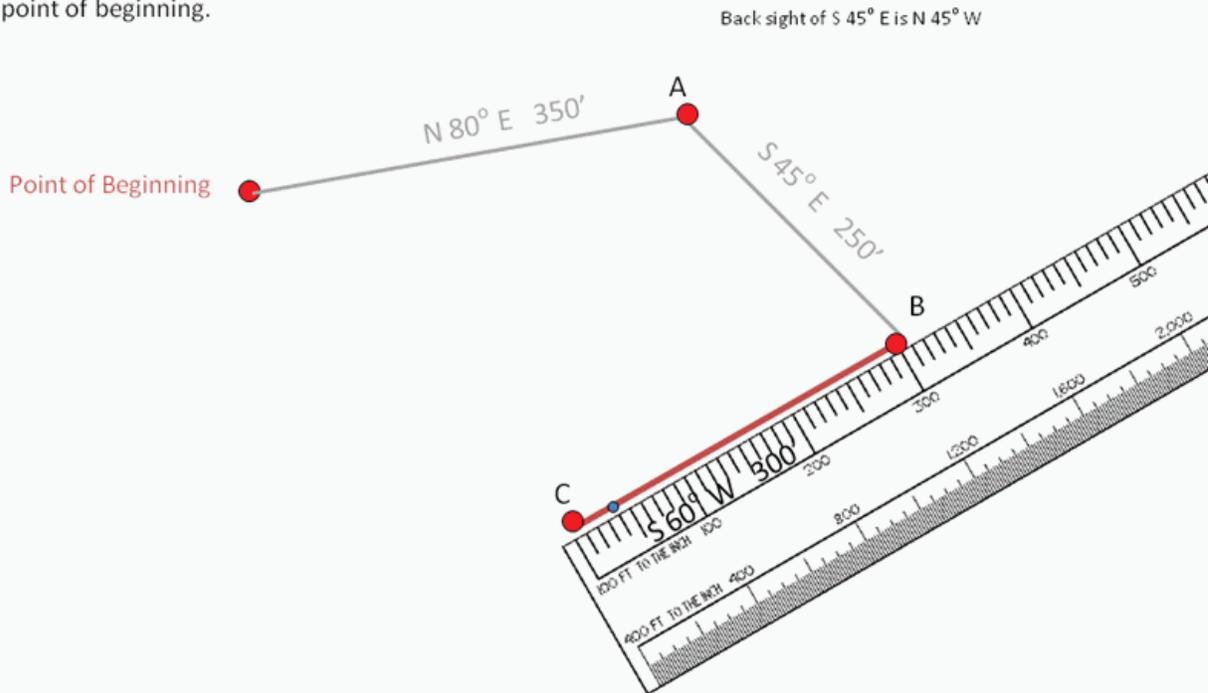
**Step 7:** Place the land measure compass on top of Point B. Backsight the previous line to be sure the compass is oriented correctly. The previous bearing was S 45° E, therefore the backsight is N 45° W. Turn the land measure compass until the last line drawn lines up with N 45° W.

**Step 8:** Without moving the land measure compass, make a mark on the map using the third bearing (S 60° W).



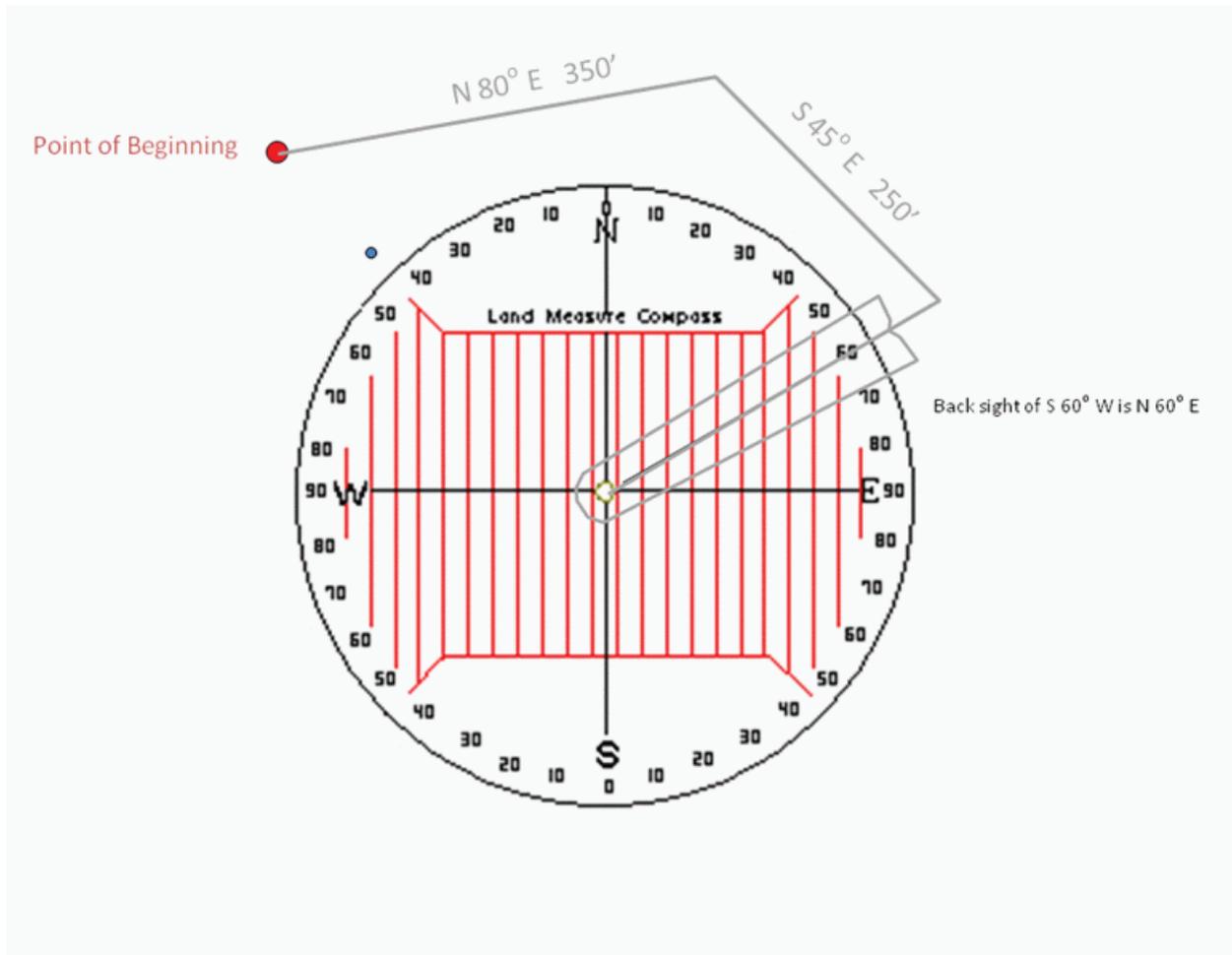
**Step 9:** Remove the land measure compass, and using a drafting scale, place the “300” on Point B, and line up the scale with the mark made at the S 60° W bearing. Then draw a line that represents 300'. With a map scale of 1" = 100', that would be a line that is 3" long (to Point C).

Beginning at a point, thence N 80° E, 350'; thence S 45° E 250'; thence S 60° W 300'; thence N 45° W, 375' to the point of beginning.



**Step 10:** Place the land measure compass on top of Point C. Backsight the previous line to be sure the compass is oriented correctly. The previous bearing was S 60° W. Therefore the backsight is N 60° E. Turn the land measure compass until the last line drawn lines up with N 60° E.

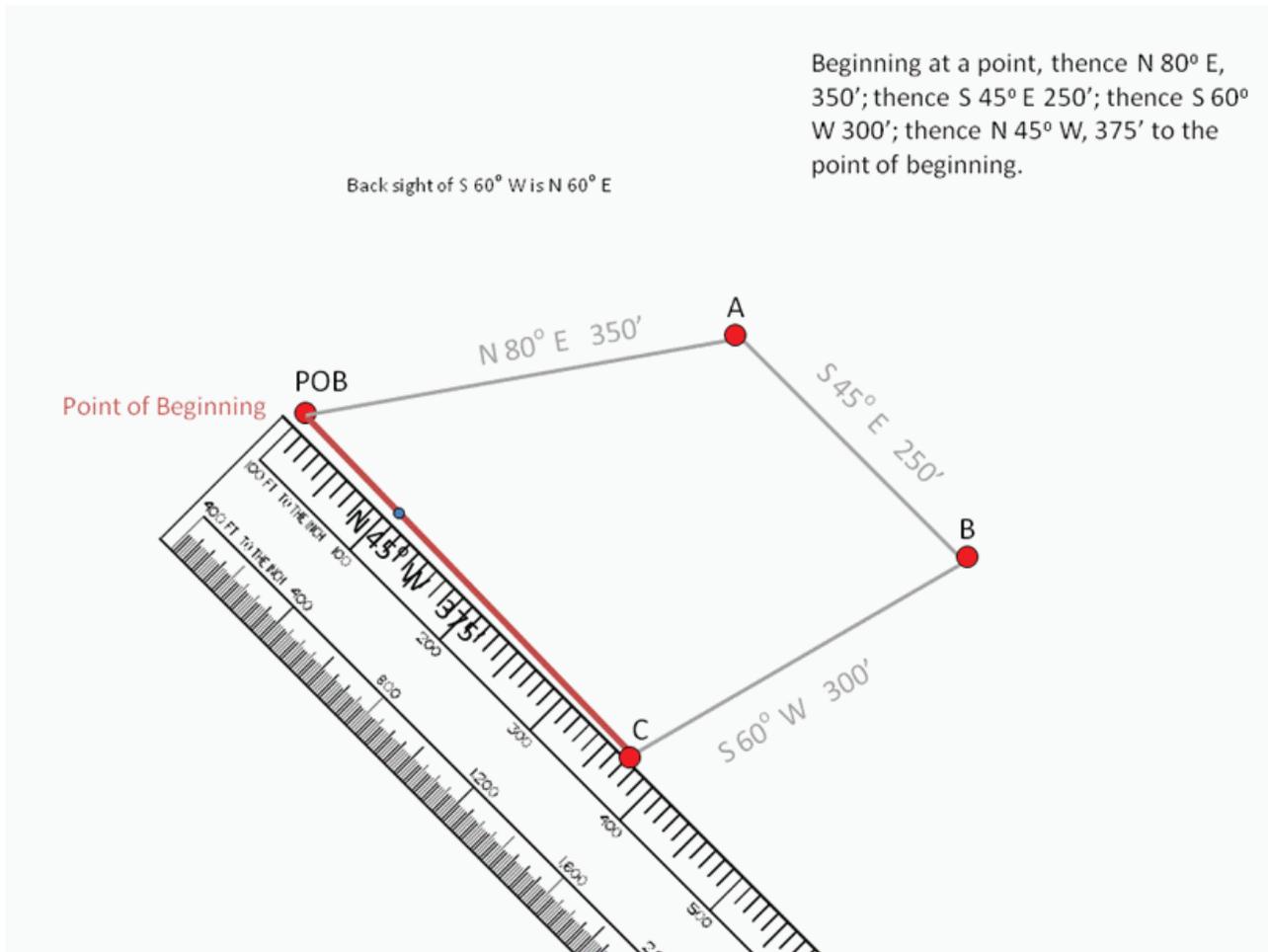
**Step 11:** Without moving the land measure compass, from Point C, mark a line on the map using the fourth and final bearing (N 45° W).



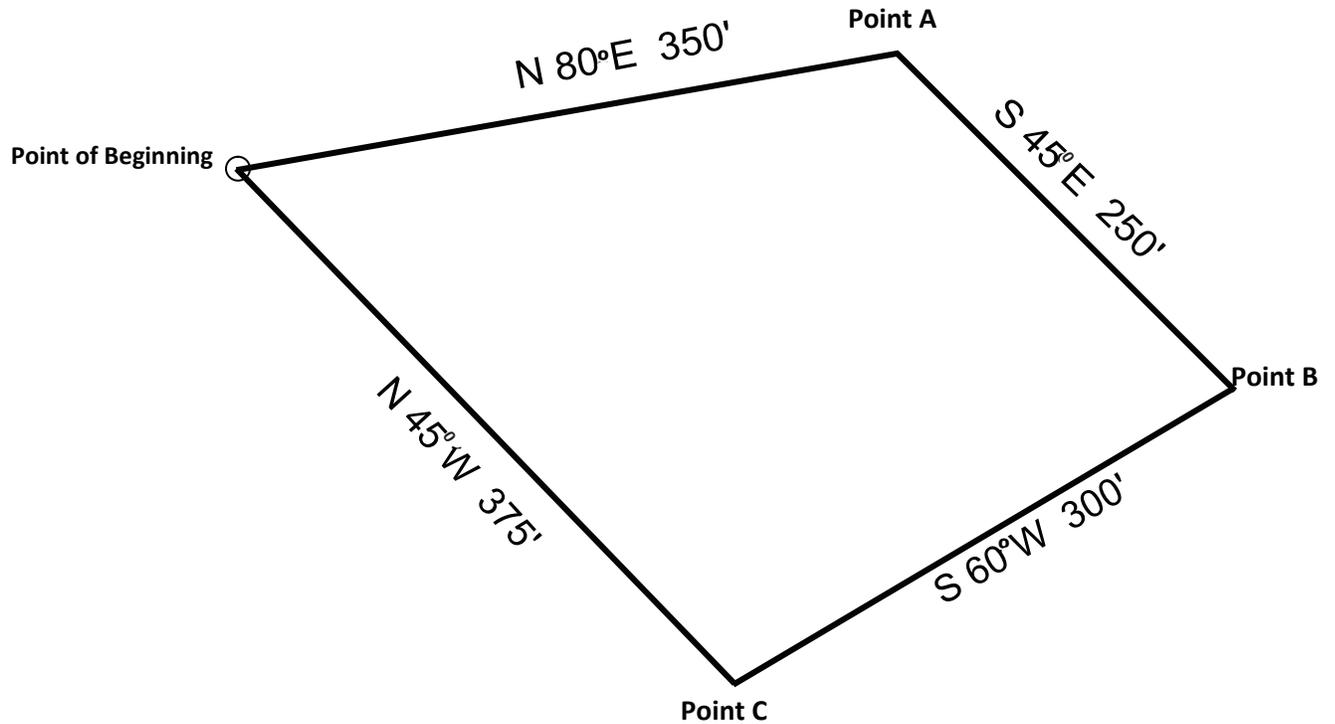
**Step 12:** Remove the land measure compass, and using a drafting scale, place the “375” on Point C, and line up the scale with the mark made at the N 45° W bearing.

Then draw a line that represents 375'. With a map scale of 1" = 100', that would be a line that is 3.75" long back to the POB.

**Note:** If this final line does not connect with the point of beginning, check the accuracy of each bearing and line length.



Beginning at a point, thence N 80° E, 350'; thence S 45° E 250'; thence S 60° W 300'; thence N 45° W, 375' to the point of beginning.



For additional practice, draw a large dot on another sheet of paper. Use the legal description above to make a copy. The copy should fit exactly on top of the drawing above. Other drawings will be completed on the following pages.

## Unit 5

### Exercise 1 — Drawing legal descriptions

Using a scale of 1" = 100', please draw the following legal descriptions. The dot represents the point of beginning for each description.

- 1 Beginning at a point, thence N 80° E, 400 feet; thence S 30° E, 300 feet; thence S 80° W, 300 feet; thence N 46° W, 350 feet, to the point of beginning.

Place your compass on the dot below and orient the compass so that North is straight up.

Beginning from the North on the compass, find the mark on the compass that is 46° to the West of North and mark this place on the paper.

Now place your drafting scale on the dot below and line it up with the mark that you just made. Draw a line from the dot along the ruler 4.0".

( $400' \div 100' = 4.0''$ )

Next, backsight in order to orient the compass. Place the compass on the end of the line you just drew. Orient the compass so that the line you just drew is at the place on the compass that has a bearing of \_\_\_\_ 46° \_\_\_\_.

Continue with the traverses. You should end up at the point of beginning.



- 2 Beginning at a point, thence N 82° E, 450 feet; thence S 10° W, 200 feet; thence S 82° W, 250 feet; thence N 43° W, 230 feet to the point of beginning.



- 3 Beginning at a point, thence S 77° E, 500 feet to a point; thence S 40° W, 250 feet to a point; thence N 65° W, 250 feet to a point; thence N 29° W, 220 feet to the point of beginning.



- 4 Beginning at a point, thence S 78° E, 425 feet to a point; thence S 15° E, 100 feet to a point; thence S 85° W, 550 feet to a point; thence N 25° E, 260 feet to the point of beginning.



- 5 Beginning at a point, thence N 23° E, 175 feet to a point; thence N 68° E, 350 feet to a point; thence N 88° E, 150 feet to a point; thence S 32° E, 250 feet to a point; thence S 53° W, 150 feet to a point; thence N 67° W, 150 feet to a point; thence S 83° W, 420 feet to the point of beginning.





## Unit 5

### Exercise 2

Use the following page to complete the drawing. You may want to turn the paper to landscape orientation and begin the “point of beginning” in the upper left corner. Draw the main metes and bounds description first, then draw the exception.

A part of the Southwest Quarter of section 12, and a part of the Southeast Quarter of Section 11, Township 11 South, Range 2 West of the 3rd P.M., more particularly described as follows: beginning at the Northwest corner of the Southwest Quarter of section 12, thence East 550 feet to a point, thence South 75 feet, thence West 50 feet, thence South 125 feet, thence West 100 feet, thence South 25 feet; thence West 25 feet, thence North 50 feet, thence West 25 feet, thence South 75 feet, thence West 100 feet, thence South 50 feet, thence West 150 feet, thence North 50 feet, thence West 100 feet, thence North 175 feet, thence West 50 feet, thence North 50 feet, thence East 50 feet, thence North 25 feet to the point of beginning.

Excepting there from the following parcel of land: commencing at the Northwest corner of the Southwest Quarter, thence East 200 feet to the point of beginning, thence South 50 feet, thence East 125 feet, thence North 50 feet, thence West 125 feet, containing \_\_\_\_\_ acres.

The parcel herein conveyed containing \_\_\_\_\_ acres, more or less.

**Note:** The acreage of the parcel conveyed will be equal to the acreage in the original parcel, minus the acreage in the exception. First draw the entire parcel and then draw the exception.

## Exercise 2



## Unit 5

### Exercise 3

All the Southwest Quarter of the Southeast Quarter of Section **20**; also 30 acres off the North end of the Northwest Quarter of the Northeast Quarter of Section **29**, **EXCEPT** 5 acres off the West end; and 10 acres off the South end of the Northwest Quarter of the Northeast Quarter of said Section 29, all in Township 15 North, Range 7 East of the Third Principal Meridian.

**EXCEPT** that part of the Southwest Quarter of the Southeast Quarter of **Section 20** as described as follows: Beginning at the Southwest corner of the Southeast Quarter of said Section 20, thence North 247.5 feet along the West line of the Southeast Quarter of said Section 20; thence East 440 feet; thence South 247.5 feet to a point on the South line of the Southwest Quarter of the Southeast Quarter of said Section 20; thence West 440 feet along said South line to the point of beginning.

**FURTHER EXCEPTING** that part of the Northwest Quarter of the Northeast Quarter of **Section 29**, described as follows: Beginning at the Southeast corner of the Northwest Quarter of the Northeast Quarter of said Section 29; thence West 495 feet along the South line of the Northwest Quarter of the Northeast Quarter of said Section 29; thence North 440 feet; thence East 495 feet to a point on the East line of the Northwest Quarter of the Northeast Quarter of said Section 29; thence South 440 feet along said East line to the point of beginning.

Total acreage of this conveyed parcel being \_\_\_\_\_ acres, more or less.

Use the next page for your drawing.

## Exercise 3

## Unit 5

### Exercise 4

Using a scale of 1" = 100', please draw the following legal description and **calculate** the total acreage. Complete the drawing on the following page.

Note that in this legal description "Commencing at" leads you to the point of beginning.

Commencing at the Northwest corner of Section 6, Township 11 South, Range 2 West of the 3rd Principal Meridian, thence East along the Section line 460 feet to the **point of beginning**. Thence continue East 90°, 200 feet to a point; thence S 0°, 45 feet to a point; thence East 90°, 50 feet to a point; thence S 0°, 40 feet to a point; thence W 90°, 110 feet to a point thence S 0°, 815 feet; thence N 38° W, 105 feet to a point; thence W 90°, 40 feet to a point; thence S 0°, 30 feet to a point; thence W 90°, 35 feet to a point; thence S 0°, 50 feet to a point; thence W 90°, 150 feet to a point; thence N 0°, 180 feet to a point; S 40° W, 235 feet to a point; thence W 90°, 45 feet to a point; thence N 0°, 470 feet to a point; thence E 90°, 195 feet to a point; thence N 58° W, 225 feet to a point; thence N 0°, 80 feet to a point; thence E 90°, 195 feet to a point; thence N 0°, 145 feet to a point; thence N 70° E, 160 feet to a point; thence N 0°, 45 feet to the point of beginning.

## Exercise 4

-

## Summary

Various tools are of assistance when drawing out metes and bounds descriptions. Since many descriptions are given in bearings and distances of each traverse listed, it is necessary to have some type of compass to measure the bearings or degree of angles. A right triangle drawing tool is helpful to keep parcel drawings square, as well as to identify right angles when calculating the area of a right triangle. A ruler or drafting scale is also a needed instrument to measure the distances. When drawing out legal descriptions, it is important to understand map scale. In order to convert property line distances into map scale to represent the line appropriately on the map, divide the legal description measurement by the map scale. If the paper to map scale is 1" = 100', then 1" on the map equals 100' on the ground. A bearing is the direction of a line measured as the acute angle from a reference meridian.



## Unit 5

### Review Questions

- I Use the paper on the following page to complete the following.

Beginning at the Northeast corner of Section 34, Township 12 South, Range 2 West, of the 3rd Principal Meridian, thence South 1,000 feet to a point, thence N 50° W 200 feet to a point, thence West 600 feet to a point, thence North 875 feet to a point, thence East 750 feet to the point of beginning.

EXCEPTING: Commencing at the Southwest corner of the above described parcel of land, thence East 200 feet to the point of beginning, thence North 150 feet to a point, thence West 100 feet to a point, thence North 200 feet to a point, thence East 175 feet to a point, thence South 350 feet to a point, thence West 75 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

FURTHER EXCEPTING: Beginning at the Southwest corner of the original parcel, thence North 350 feet to a point, thence East 100 feet to a point, thence South 200 feet to a point, thence East 100 feet to a point, thence South 150 feet to a point, thence West 200 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

FURTHER EXCEPTING: Beginning at the Southeast corner of the original parcel, thence North 50° W 200 feet to a point, thence West 50 feet to a point, thence North 175 feet to a point, thence East 200 feet to a point, thence South 300 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

FURTHER EXCEPTING: Beginning at the Northeast corner of the original parcel, thence South 525 feet to the point of beginning, thence South 175 feet to a point, thence West 200 feet to a point, thence South 175 feet to a point, thence West 275 feet to a point, thence North 350 feet to a point, thence East 475 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

FURTHER EXCEPTING: Beginning at the Northwest corner of the original parcel, thence East 300 feet to a point, thence South 300 feet to a point, thence S 53° W 375 feet to a point, thence North 525 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

FURTHER EXCEPTING: Commencing at the Northwest corner of the original parcel, thence East 300 feet to the point of beginning, thence East 450 feet to a point, thence South 300 feet, thence West 450 feet, thence North 300 feet to the point of beginning, containing \_\_\_\_\_ acres more or less.

**The herein conveyed parcel containing \_\_\_\_\_ acres, more or less.**



II Conversion — Draw the following legal description and calculate acreage.

Beginning at the Northwest corner of the Southwest Quarter of Section 12, Township 8 North, Range 3 West of the Third Principal Meridian, thence East 2 furlongs, thence South 6 rods, thence East 2 chains and 1 rod, thence South 26 degrees East 990 feet, thence West 2 furlongs and 34 rods, thence North 1000 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

Complete the drawing on the following page. Turn the page horizontally and use 1" = 200'.



- III Please draw and compute the acreage for the following parcel. Use the following page for your drawing. Turn the page horizontally and use 1" = 50'

**Harper Parcel**

Beginning at the SW corner of the SE  $\frac{1}{4}$  of the NE  $\frac{1}{4}$  of Section 27, Township 12 South, Range 2 West of the 3rd PM, thence N 275 feet to a white pine tree, thence East 38 feet to a stone, thence S 50 feet to a fence post at the corner of the Brown farm, thence E 200 feet to a maple tree 2 inches in diameter, thence S 28° E 250 feet to a wahoo, thence W 350 feet to the point of beginning, containing \_\_\_\_\_ acres, more or less.

Scale: 1" = 50'





# Unit 6

## Principles For Assigning Property Index Numbers (PINs)

This unit covers the principles for assigning property index numbers (PINs) and the concept of exceptions.

The purpose of this unit is to provide an understanding of a PIN as a legal description. Additionally the method for creating a PIN and exceptions will be described.

### Learning Objectives

After completing the assigned readings you should be able to

- Locate real property using a PIN
- Create a PIN
- Understand the use of exceptions

### Terms and Concepts

Description	Section
Parcel	Section Number
Property Index Number (PIN)	Subdivision
Range	Township

A PIN is another form of a legal description. This is due to the fact that, just like a written legal description, a PIN identifies one specific parcel. If a parcel splits, the description of the original and new parcel change. Therefore, the PIN must also change.

There are principles for assigning PIN numbers. When used consistently throughout the county, finding a parcel based on a PIN is equivalent to using a written legal description. When assigning PINs, these principles apply:

- 1** A change of ownership without any change in property boundaries does not necessitate a new parcel number.  
As long as the boundary of the property does not change, like a written legal description, the PIN does not change either.
- 2** Parcel splits require the original number to be retired. The original owner (**grantor**) would be assigned the next available number, and the new owner (**grantee**) would be assigned the next number after that assignment.

Once a parcel number is placed on the assessment roll, it becomes a legal description. Consequently, as stated above, when the boundaries of a parcel are changed, the resulting parcel must have a new number assigned to denote the new legal description.

- 3** Block numbers are assigned according to the lowest numbered block in which a person owns property. (Block numbers will be discussed in the following pages).

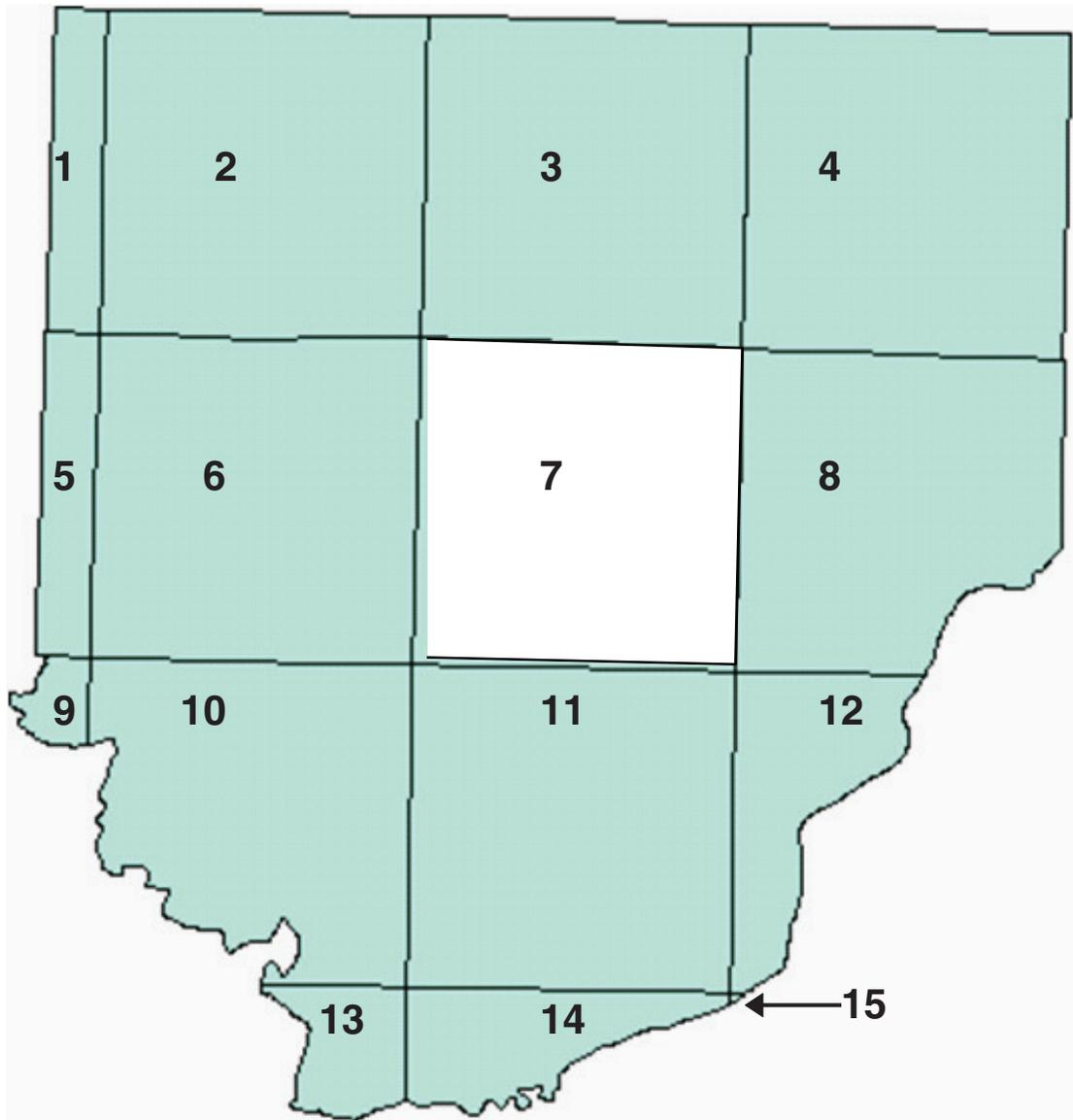
A PIN is a 14-character series of numbers that describe the geographic location and use of a specific tax parcel. No two parcels share the same PIN.

**Example    07 – 32 – 203 – 021 – 0040**

- 07     =     County Township Number
- 32     =     Township Section Number
- 203    =     Block Number
- 021    =     Parcel Number
- 0040   =     Use or Unit Number

## County Township Number Derivation

The county township number is assigned by overlaying the government survey townships over the county. Then, beginning in the northwest government survey



township of the county, and progressing west to east, and north to south each township is assigned a number. **Note:** These numbers **do not** correspond to the numbers of the congressional township or ranges (*i.e.* T12N or R 3E) that we discussed in Unit 3.

No matter how small an area of the county in the government survey township, it receives a number. Additionally, the government survey townships do not necessarily correspond to the political townships created with the county.

In this example, there are 15 county townships. Referring back to the example PIN on the previous page, County Township “07” is being highlighted. The first and second digits in the PIN indicate the county township in which the parcel is located.

## Section Number Derivation

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Section Number

07

32

000

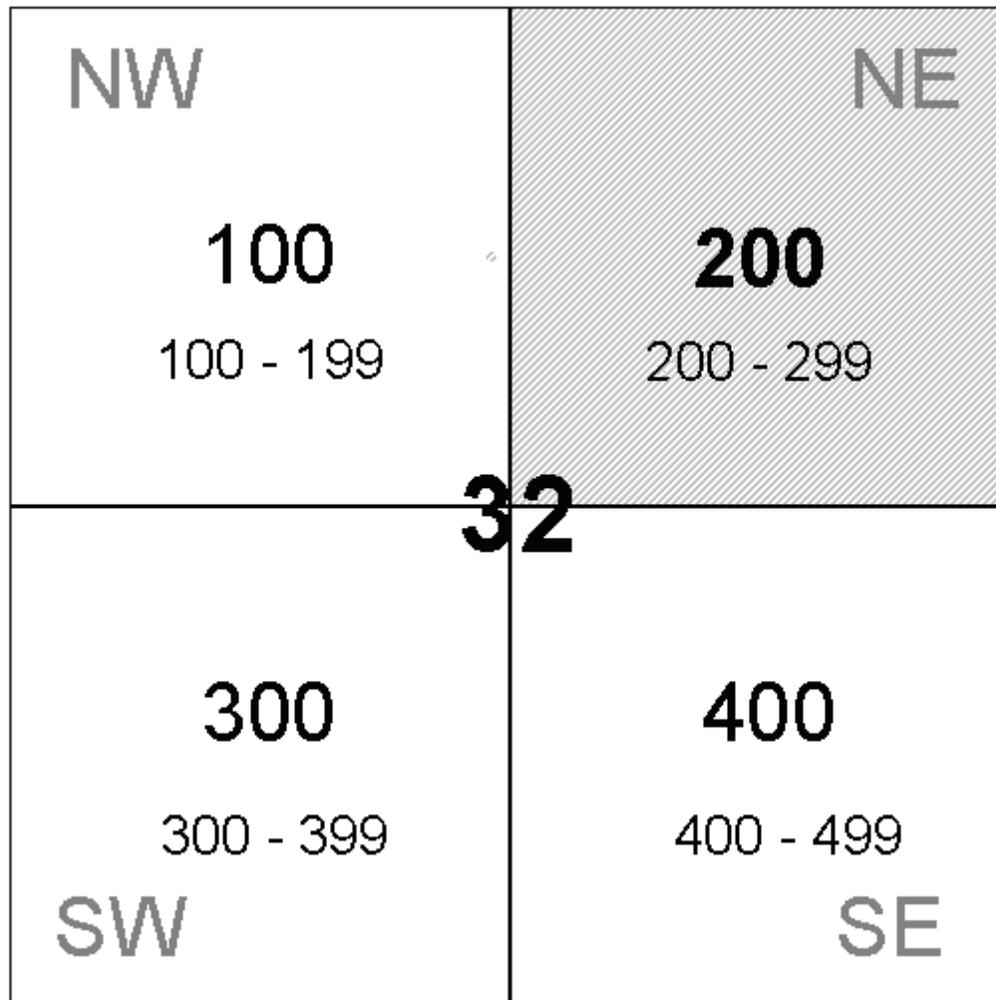
000

0000

The numbering of sections begins in the northeast corner of the township, and progresses west then east, back and forth in a serpentine manner.

Referring back to the example PIN on Page 6-2, Section “32” is highlighted. The third and fourth digits in the PIN indicate the section in which the parcel is located.

## Block Number Derivation



**Block Number**

07

32

203

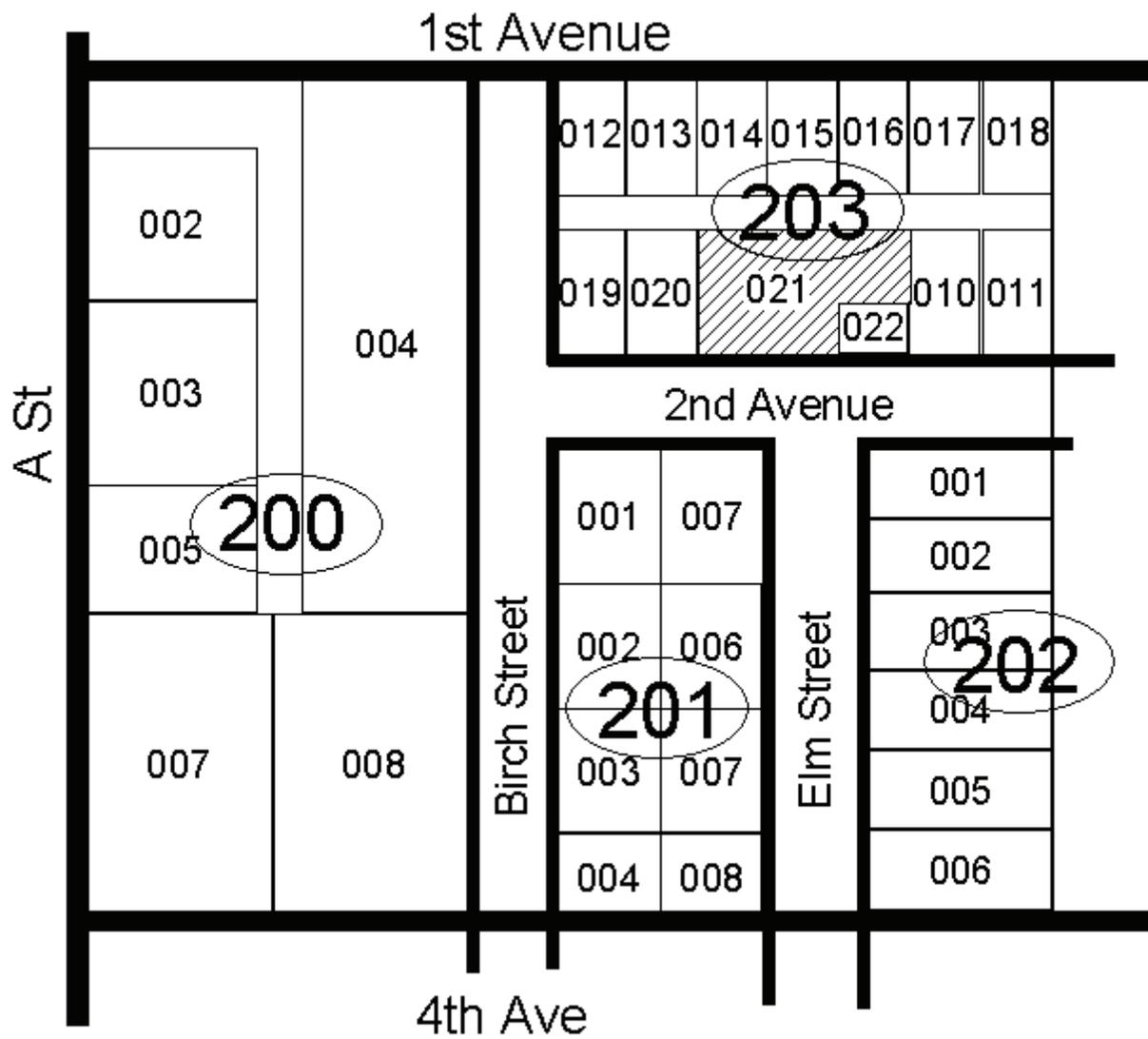
000

0000

The block number refers to the quarter section within the section. The numbering of the blocks begins in the northwest quarter of the section, and progresses west to east, north to south. As illustrated above, property in the northwest quarter of the section would receive a block number between 100 and 199, the northeast quarter 200 to 299, the southwest quarter 300 to 399, and the southeast quarter 400 to 499. The specific number is dependent upon any subdivisions with the quarter section. The subdivision numbers are typically assigned in order of creation. However, this varies within each county.

Referring back to the example PIN on Page 6-2, Block Number “200” is being highlighted, meaning the northeast quarter. The 5th, 6th and 7th digits of the PIN indicate the block (in the quarter section) in which the parcel is located.

## Parcel Number Derivation



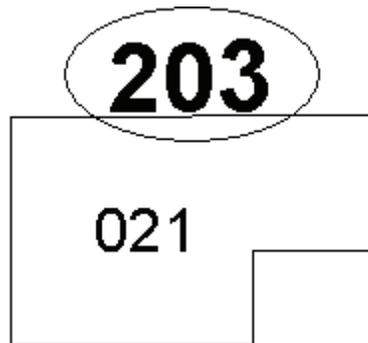
**Parcel Number**

<b>07</b>	<b>32</b>	<b>203</b>	<b>021</b>	<b>0000</b>
-----------	-----------	------------	------------	-------------

The parcel number is unique to the property within a block. Typically, parcel numbers are assigned in the order of creation.

Referring back to the example PIN on Page 6-2, Parcel Number “021” is highlighted. The 8th, 9th and 10th digits of the PIN indicate the particular legal description within the quarter section in which the parcel is located.

## Unit Number Derivation



**Unit Number**

**07**

**32**

**203**

**021**

**0040**

The unit or use number refers to the taxable use of the property, or in the case of condominiums, the unit number.

Referring back to the example PIN on Page 6-2, the Use Number “0040” is highlighted. The “0040” refers to a residential parcel, with a dwelling. The 11th, 12th, 13th and 14th digits of the PIN indicate the use of the property.

Common Use/Unit numbers:

- 0010 Rural property improved with buildings. Not assessed under the Farm Bill.
- 0011 Rural property improved with buildings. Assessed under the Farm Bill.
- 0020 Rural property not improved with buildings. Not assessed under the Farm Bill
- 0021 Rural property not improved with buildings, but assessed under the Farm Bill
- 0030 Residential vacant land
- 0040 Residential with dwelling**
- 0050 Commercial residence – under 6 units or more
- 0060 Commercial business
- 0070 Commercial office
- 0080 Industrial
- 0090 Miscellaneous

The PIN number has 14 digits. The first 10 digits refer to the geographical location and the last 4 digits refer to the use of the property.

## Unit 6

### Exercise 1 — PIN exercise

The goal of this exercise is to understand how to identify the correct PIN for parcels that are created when portions of the original parcel are sold. For this exercise, the original parcel is the entire section (640 acres). The County Township Number shall be 01.

Using the map of Section 26 on Page 6-10, identify the PINs for the following real estate transactions. Section 26 is the Rectangular Land Survey Section number while the 01 in the PIN refers to the first township in the NW corner of the county. As the transactions are completed, it is recommended that the areas of Section 26 are shaded in to assist with tracking the property associated with the original PIN. The use for the property will be “0021” designating “farmland.”

#### Transaction “A”:

Grantor: Thomas and Judy Bates

Grantee: Richard and Rebecca Heart

Date: November 25, 1984

Legal Description: Section 26, Twp. 4S., Range 3 West, 3rd PM (640 acres)

(A) 01-\_\_\_\_\_ (Heart Tract)

#### Transaction “B”:

Grantor: Richard and Rebecca Heart

Grantee: Thomas Johnson

Date: April 17, 1989

Legal Description: The SW ¼ of Section 26, Twp 4S, Range 3W, 3rd PM (160 acres)

01-\_\_\_\_\_ (Heart Tract)

(B) 01-\_\_\_\_\_ (Johnson Tract)

#### Transaction “C”:

Grantor: Richard and Rebecca Heart

Grantee: Christopher Freeman

Date: February 7, 1990

Legal Description: The NE 1/4 of the NE 1/4 of Section 26, Twp. 4S., Range 3 West, 3rd PM (40 acres)

01-\_\_\_\_\_ (Heart Tract)

(C) 01-\_\_\_\_\_ (Freeman Tract)

**Transaction “D”:**

Grantor: Richard and Rebecca Heart

Grantee: John and Mary Carter

Date: March 4, 1990

Legal Description: The NW 1/4 of the NW 1/4 of Section 26, Twp. 4S, Range 3 West, 3rd PM (40 acres)

01-\_\_\_\_\_ (Heart Tract)

(D) 01-\_\_\_\_\_ (Carter Tract)

**Transaction “E”:**

Grantor: Richard and Rebecca Heart

Grantee: Thomas Jones

Date: April 1, 1990

Legal Description: The SW 1/4 of the NW 1/4 of Section 26, Twp. 4S Range 3 West, 3rd PM (40 Acres)

01-\_\_\_\_\_ (Heart Tract)

(E) 01-\_\_\_\_\_ (Jones Tract)

**Transaction “F”:**

Grantor: Richard and Rebecca Heart

Grantee: Mike and Christine Weber

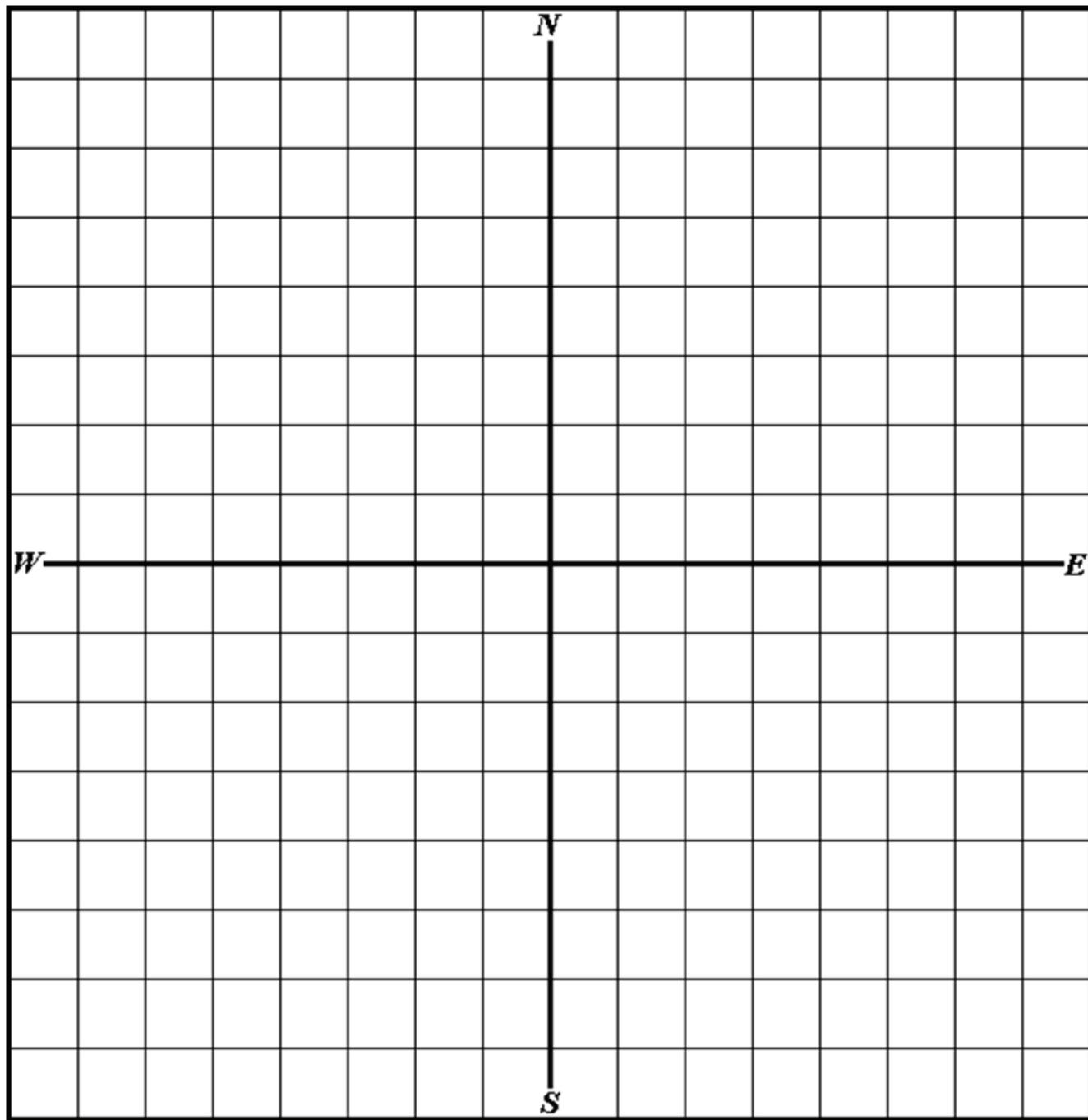
Date: June 1, 1991

Legal Description: The NE 1/4 of the NW 1/4 and the SE 1/4 of the NW 1/4 of Section 26, Twp. 4S., Range 3 West, 3rd PM (80 acres)

01-\_\_\_\_\_ (Heart Tract)

(F) 01-\_\_\_\_\_ (Weber Tract)

**Section 26, Township 4S, Range 3W of the 3rd Principal Meridian**



## Exercise 2 — Legal description exercise

This exercise combines the methods used to draw a metes and bounds legal description, and those used to assign property index numbers.

On the map provided on Page 6-13, identify the PINs for the following real estate transactions and calculate the acreage for each. For the purposes of the exercise, the county township number has been provided.

**Notes:** The map scale is 1" = 660'. Remember to convert the measurements in each of the legal descriptions. The township numbers that are the first 2 digits of the PIN numbers are township numbers within the county and not tied in to the geographic township numbers in the legal description. See the map on Page 6-3.

### Transaction "A"

Deed Record: 102, Page 470  
Grantor: Charles Freeman  
Grantee: Christopher and Rebecca Freeman  
Date: May 9, 1988

Legal Description: The Northeast Quarter; and the Northwest Quarter; and the Southeast Quarter; and the Southwest Quarter. Being all of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian.

Containing \_\_\_\_\_ acres, more or less.

PIN 07-\_\_\_\_\_ (Freeman Tract)

### Transaction "B"

Deed Record: 108, Page 669  
Grantor: Christopher and Rebecca Freeman  
Grantee: Richard Lee Heart  
Date: February 14, 1989

Legal Description: Commencing at the Northwest corner of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian, thence South 165 feet to the south side of County Highway 12; thence East 1,320 feet along the south side of County Highway 12 to the point of beginning thence South 561 feet to a point; thence East 462 feet to a point; thence North 561 feet to a point; thence West 462 feet along the south side of County Highway 12 to the point of beginning.

Containing \_\_\_\_\_ acres, more or less.

PIN 07-\_\_\_\_\_ (Freeman Tract)

PIN 07-\_\_\_\_\_ (Heart Tract)

**Transaction “C”**

Deed Record: 110, Page 238  
Grantor: Christopher and Rebecca Freeman  
Grantee: Thomas Johnson  
Date: May 12, 1989

Legal Description: Commencing at the Southeast corner of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian, thence North 132 feet to a point; thence West 1,254 feet down the centerline of County Highway 14 to the point of beginning. Thence North 660 feet to a point; thence West 1,375 feet to a point, thence South 660 feet to a point; thence East 1,375 feet to the point of beginning.

Containing \_\_\_\_\_ acres, more or less.

PIN 07-\_\_\_\_\_ (Freeman Tract)

PIN 07-\_\_\_\_\_ (Johnson Tract)

**Transaction “D”**

Deed Record: 150, Page 222  
Grantor: Christopher and Rebecca Freeman  
Grantee: Richard and Delores Kirby  
Date: November 25, 1989

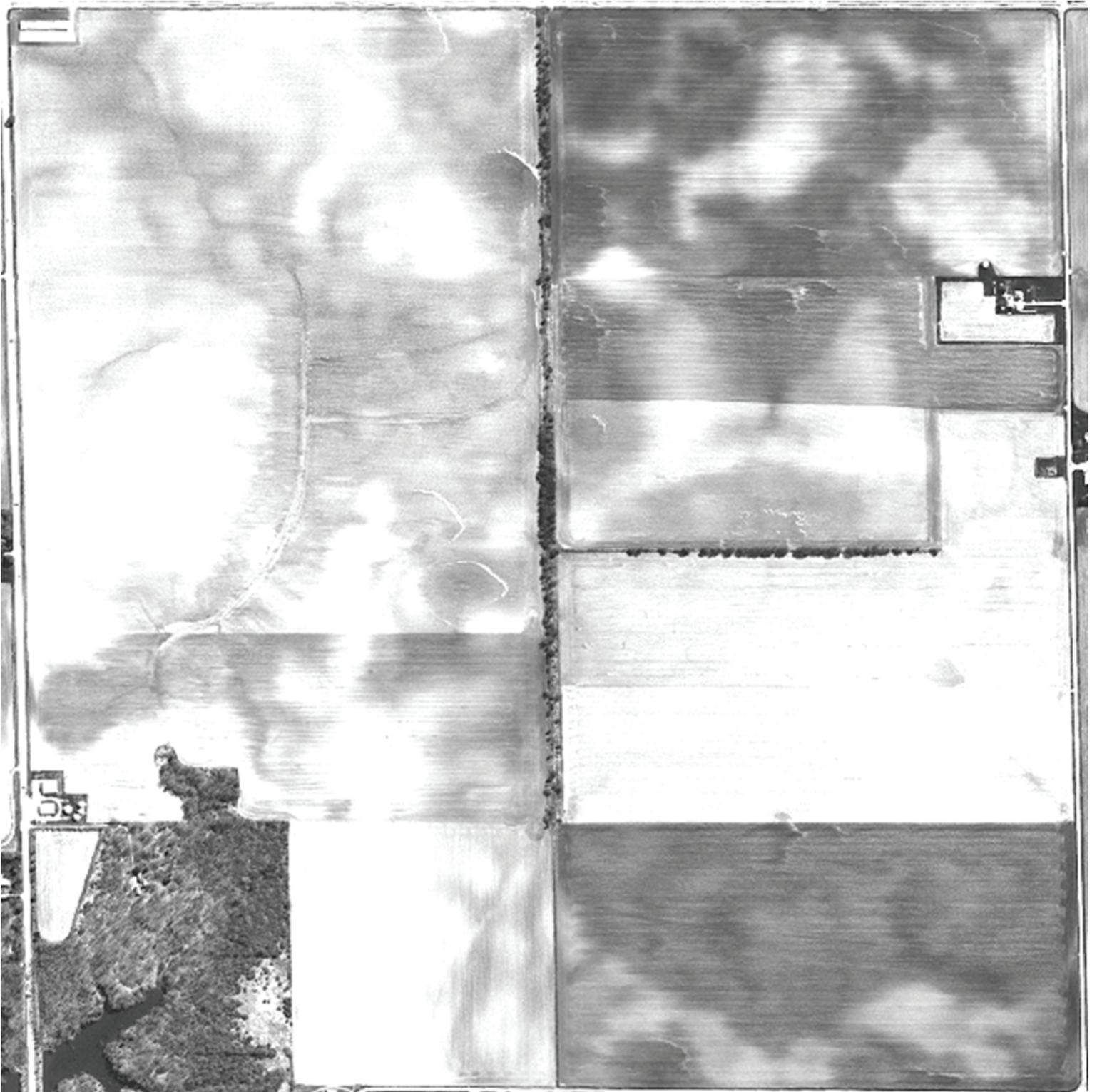
Legal Description: Commencing at the Northwest corner of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian, thence South 165 feet to the point of beginning on the south side of County Highway 12. Thence South 1,254 feet to a point; thence East 1,320 feet to a point; thence North 198 feet to a point; thence East 330 feet to a point; thence North 495 feet to a point; thence West 330 feet to a point; thence North 561 feet to a point; thence West 1,320 feet along the south side of County Highway 12 to the point of beginning.

Containing \_\_\_\_\_ acres, more or less.

PIN 07-\_\_\_\_\_ (Freeman Tract)

PIN 07-\_\_\_\_\_ (Kirby Tract)

How many acres remain in the Freeman tract? \_\_\_\_\_ acres.



Section 36

## Summary

There are principles for assigning PIN numbers. When used consistently throughout the county, finding a parcel based on a PIN is equivalent to using a written legal description. When assigning PINs, these principles apply.

- 1** A change of ownership without any change in property boundaries does not necessitate a new parcel number.  
  
As long as the boundary of the property does not change, like a written legal description, the PIN does not change either.
- 2** Parcel splits require the original number to be retired. The original owner (grantor) would be assigned the next available number, and the new owner (grantee) would be assigned the next number after that assignment.
- 3** Once a parcel number is placed on the assessment roll, it becomes a legal description. Consequently, as stated above, when the boundaries of a parcel are changed, the resulting parcel must have a new number assigned to denote the new legal description.
- 4** Block numbers are assigned according to the lowest numbered block in which a person owns property.

A PIN is a 14-character series of numbers that describe the geographic location and use of a specific tax parcel. No two parcels share the same PIN.

## Unit 6

### Review Question 1

On the section map provided on Page 6-17, identify the PINs for the following real estate transactions and calculate the acreage for each. For the purposes of this exercise, the township number has been provided.

#### Transaction "A"

Deed Record            104, page 570  
Grantor:                Larry L. Davis  
Grantee:                Patrick D. and Rebecca J. Joseph  
Date:                    May 9, 1988

Legal Description: The Northeast Quarter; and the Northwest Quarter; and the Southeast Quarter; and the Southwest Quarter being all of Section 36, Township 6 South, Range 1 East of the Third Principal Meridian.

Containing \_\_\_\_\_ acres, more or less. PIN 08-\_\_\_\_\_ (Joseph tract)

#### Transaction "B"

Deed Record            108, Page 669  
Grantor:                Patrick D. and Rebecca J. Joseph  
Grantee:                James Harris  
Date:                    February 14, 1989

Legal Description: The South 1320 feet of the entire NW 1/4, Section 36, Township 6 South, Range 1 East of the Third Principal Meridian.

Containing \_\_\_\_\_ acres, more or less.

PIN                      08-\_\_\_\_\_ (Joseph tract)

PIN                      08-\_\_\_\_\_ (Harris tract)

#### Transaction "C"

Deed Record            110, page 238  
Grantor:                Patrick D. and Rebecca J. Joseph  
Grantee:                Thomas Davis  
Date:                    May 12, 1989

Legal Description: Beginning at the Southwest corner of Section 36, Township 6 South, Range 1 East of the Third Principal Meridian, thence North 2,640 feet to a point; thence East 2,640 feet to a point, thence South 2,640 feet, thence West 2,640 feet to the point of beginning.

Containing \_\_\_\_\_ acres, more or less.

PIN                      08-\_\_\_\_\_ (Joseph tract)

PIN                      08-\_\_\_\_\_ (Davis tract)

**Transaction “D”**

Book 150, page 222  
Grantor: Patrick D. and Rebecca J. Joseph  
Grantee: Richard Charles  
Date: May 25, 1989

Legal Description: Beginning at the Northwest corner of Section 36, Township 6 South, Range 1 East of the Third Principal Meridian, thence South 1,320 feet to a point; thence East 1,320 feet to a point; thence North 1,320 feet to a point; thence West 1,320 feet to the point of beginning. Also the NE 1/4 of the NW 1/4 of Section 36.

Containing \_\_\_\_\_ acres, more or less.

PIN 08-\_\_\_\_\_ (Joseph tract)

PIN 08-\_\_\_\_\_ (Charles tract)

**Transaction “E”**

Deed Record 310, page 339  
Grantor: Patrick D. and Rebecca J. Joseph  
Grantee: Gary Hardy  
Date: November 25, 1989

Legal Description: South 1/2 of the West 1/2 of the SW 1/4 of the SE 1/4 of Section 36.

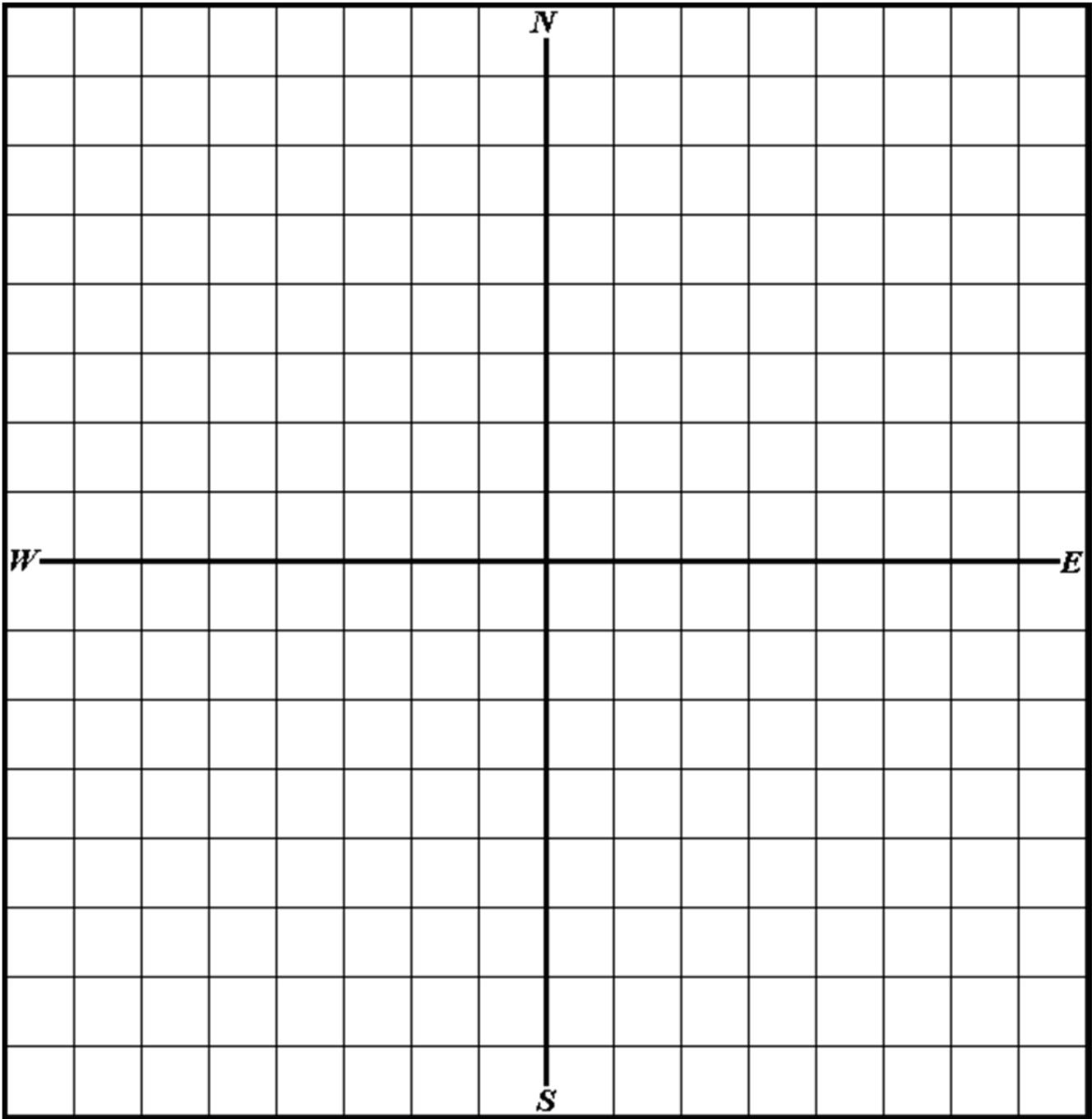
Containing \_\_\_\_\_ acres, more or less.

PIN 08-\_\_\_\_\_ (Joseph tract)

PIN 08-\_\_\_\_\_ (Hardy tract)

How many acres remain in the Joseph parcel? \_\_\_\_\_ acres.

Section 36, Township 6 South, Range 1 East of the Third Principal Meridian.





# Unit 7

## Computers and Mapping

This unit covers the use of computers and a GIS in mapping.

The purpose of this unit is to provide an understanding of how computers and a GIS are used in modern mapping.

### Learning Objectives

After completing the assigned readings you should be able to

- Explain the benefits of using computerized data
- Geographic Information System (GIS)
- Understand the uses of a GIS
- Graphic data

### Terms and Concepts

Automated Mapping/Facilities Management (AM/FM)

Computer-Assisted Drafting (CAD)

GIS

Computer technology is one of the greatest enhancements for mapping in recent history. Some advantages of using computers in a modern mapping program are speed, precision, flexibility, productivity, display capabilities, storage and retrieval efficiencies, and improved correction of errors and omissions. Possibly the two most notable specific advantages are ease of providing updates and elimination of shrinkage or quality deterioration of base material (transparency and paper) over time.

Linking assessment records and parcel maps improves assessment activity. For example, a map can be created to show which parcels have not been physically inspected within a specified period of time. The system can also produce a routing plan for field inspection.

### Benefits of Computerized Data

- Updating information
- Preservation of information
- Inventory information
- Analyze information
- Organize information
- Display information

## Computerized Mapping Systems

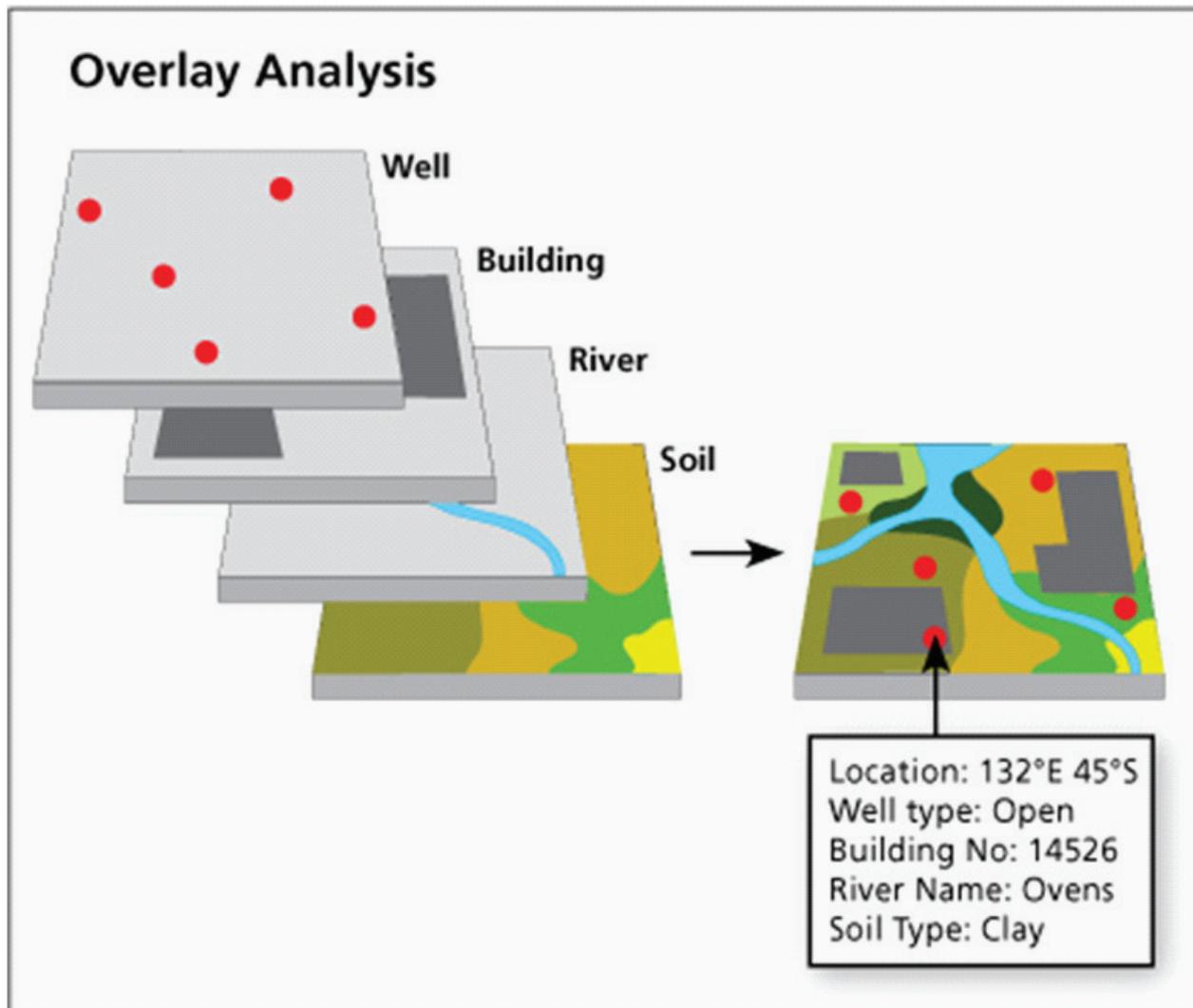
Computerized mapping system types can be classified, in ascending order of sophistication, Computer-Assisted Drafting (CAD), Automated Mapping/Facilities Management (AM/FM), and Geographic Information Systems (GIS) – and combinations.

CAD systems are suitable for traditional mapping functions, such as highway maps. CAD maps can be created either by scanning or digitizing a manually prepared map, or by direct data entry. Map maintenance is electronic. Many engineering departments use a CAD system for construction designs and blue prints.

AM/FM systems feature more sophisticated databases, capable of storing and manipulating related attribute information. However, because they were developed primarily for utilities, they best serve network-oriented functions, such as power grids, and are limited in the ability to analyze relationships between different layers (overlapping layers) other than by visual inspection.

GIS is currently the most sophisticated system type. It was developed for spatial analysis needs such as planning, natural resources, and land records management. It offers the ability to integrate spatial data (map layers) and attribute data (information from a database) among different layers, which makes it ideal for multi-purpose users.

Each layer in the GIS can be compared to a single map overlay. For example, planimetric features, such as bodies of water, soil types, geologic structure, land use, zoning, political boundaries, utilities, sewers, topography, property lines, and others can be overlaid.



### Data and Mapping Systems

Data, or information, can be stored and used by computer systems in many ways.

**Graphic data** are the basic points, lines, and polygons (enclosed areas) that make up the features of a map.



**Non-graphic data** are letters and numbers that relate to a specific geographic location and are not part of the map feature; for example, the parcel identification number, signage, block number, owner name and parcel address.



Distance	Time	Fuel	Rest	Light
0.10	0:00:23	00.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0.20	0:00:42	00.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0.30	0:00:55	00.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0.40	0:01:03	00.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0.50	0:01:06		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

In a GIS, relational databases of graphic and non-graphic information are not only linked by keys, but also by geographic location. The result is that information not related by keys is now related by location.

## GIS Uses for Assessors

- Map maintenance
- Data overlays
- Data location
- Information lookup



## Considerations for Developing a GIS

When the development of a computerized mapping system is under consideration, advance decisions must be made about:

- the level of mapping sophistication wanted, CAD, AM/FM, or GIS
- how many offices will be developing and maintaining the various map layers
- which office will have sole authority to change the base map
- the project implementation plan
- the accuracy level of the data (how close to reality the data is)

Computer mapping can be an expensive commitment to a long-term project. Purchasers must decide whether to develop the system entirely in house, contract for use of some services, or contract to purchase all services. Modification of these three basic choices is also possible. For example, in-house development can include hiring of specialized staff or consultant specialists, and computer hardware can be shared with other agencies to reduce capital investment costs.

In-house development has advantages and disadvantages. Customized design and capabilities will be tailored to the jurisdiction's special needs, but less flexible for adaptation to other systems or new technology. Mapping staff may have more involvement and thus more thorough training, but a contractor can provide mapping specialists who know what is current or out of date, what is good and what is not good. Only the jurisdiction itself can decide which works best.

## Summary

Graphic data are the basic points, lines, and polygons (enclosed areas) that make up the features of a map.

GIS refers to geographic information system.

# Unit 7

## Review Questions

1 Define GIS.

---

---

---

2 What are some of the uses of GIS for assessors?

---

---

---

---

3 Define geographic data.

---

---

---

# Answer Key

# Unit 1

## Review Questions

- 1 Define an aerial mosaic. *An assembly of aerial photographs to form a continuous photographic representation of a portion of the earth's surface*
- 2 Define a topographic map. *A map which represents the horizontal and vertical position of the land features*
- 3 Define a cadastral map. *A map that shows the size, shape, and extent of each land parcel for purposes of describing and recording ownership*
- 4 What is the recommended scale for an urban aerial based tax map?  
*1" = 100'*
- 5 What is the recommended scale for a rural aerial based tax map?  
*1" = 400'*
- 6 What are the basic functions of maps?
  - a *Location*
  - b *Identification*
  - c *Inventory*

## Unit 2, Exercise 1 — Land measurement

Please compute the square footage and the acreage for the following (assume all triangles are right triangles).

**Note:** “ch” refers to chains, “rds” refers to “rods”, “lks” refers to links.

When calculating some of the parcels, it will first be necessary to convert the measurements to feet.

<u>Parcel shape</u>	<u>Measurements</u>	<u>Square footage</u>	<u>Acreage</u>
1 Square	1,528' x 1,528'	<u>2,334,784</u>	<u>53.60</u>
2 Square	680' each side	<u>462,400</u>	<u>10.62</u>
3 Rectangle	1,250' x 1,000'	<u>1,250,000</u>	<u>28.70</u>
4 Rectangle	125' x 75'	<u>9,375</u>	<u>.22</u>
5 Square	65 ch x 65 ch	<u>18,404,100</u>	<u>422.50</u>
6 Rectangle	30 ch x 48 ch	<u>6,272,640</u>	<u>144.00</u>
7 Triangle	475' x 986'	<u>234,175</u>	<u>5.38</u>
8 Triangle	680' x 360'	<u>122,400</u>	<u>2.81</u>
9 Triangle	22 ch x 48 ch	<u>2,299,968</u>	<u>52.80</u>
10 Triangle	38 ch x 46 ch	<u>3,807,144</u>	<u>87.40</u>
11 Square	5 rds x 5 rds	<u>6,806.25</u>	<u>.16</u>
12 Rectangle	5 rds x 7 rds	<u>9,528.75</u>	<u>.22</u>
13 Rectangle	200 lks. x 300 lks.	<u>26,136</u>	<u>.60</u>
14 Square	(8 chains, 3 rods, 16 links)	<u>345,814.56</u>	<u>7.94</u>

Note: Each side is 8 chains + 3 rods + 16 links

1 chain = 66'

1 link = .66' (7.92")

1 rod (or pole) = 16.5'

1 acre = 43,560 SF

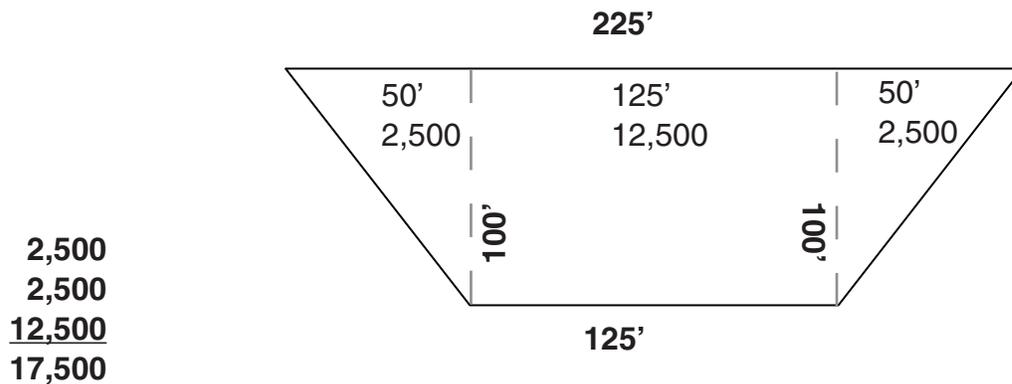
Acreage =  $\frac{\text{Square feet}}{43,560}$

# Unit 2

## Review Questions

<u>Parcel shape</u>	<u>Measurements</u>	<u>Square footage</u>	<u>Acreage</u>
1 Square	1,742' x 1,742'	<u>3,034,564</u>	<u>69.66</u>
2 Rectangle	165' x 95'	<u>15,675</u>	<u>.36</u>
3 Square	82 ch x 82 ch	<u>29,289,744</u>	<u>672.40</u>
4 Triangle	720' x 490'	<u>176,400</u>	<u>4.05</u>
5 Triangle	27 ch x 36 ch	<u>2,117,016</u>	<u>48.60</u>
6 Rectangle	9 rds x 6 rds	<u>14,701.5</u>	<u>.34</u>
7 Rectangle	500 lks x 38 rds	<u>206,910</u>	<u>4.75</u>
8 Square	(6 chains, 2 rods, 23 links) $396 + 33 + 15.18 = 444.18 \times 444.18 = 197,296$	<u>197,296</u>	<u>4.53</u>

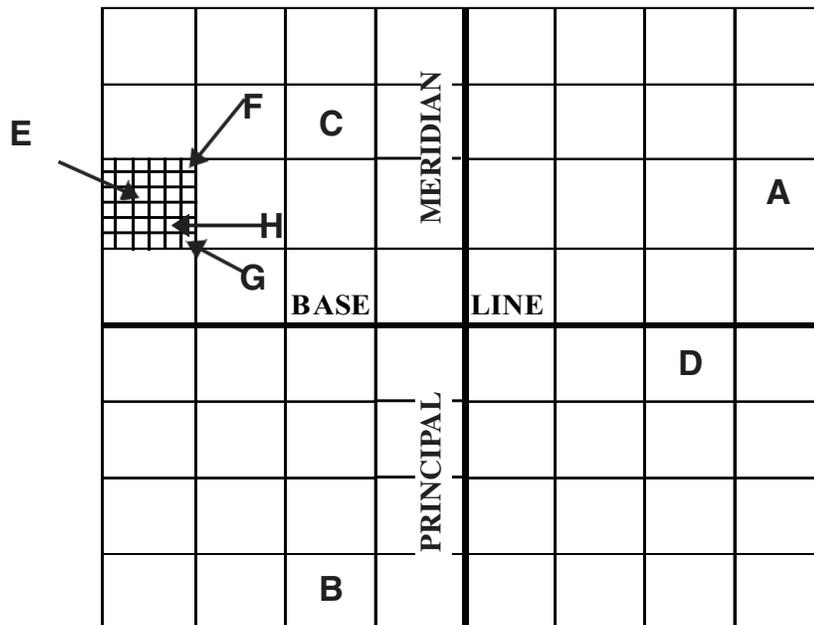
- 9 Calculate the square footage and the acreage for the following:  
Note that the figure is the same on the right side as on the left side.



Square footage 17,500                      Acreage .40

## Unit 3, Exercise 1 — Locating townships and sections

This exercise is designed to help you more precisely pinpoint areas or tracts of land. Please locate the following and place the appropriate letter in the proper location.



- A Township 2 North, Range 4 East
- B Township 4 South, Range 2 West
- C Township 3 North, Range 2 West
- D Township 1 South, Range 3 East
- E Section 16, Township 2 North, Range 4 West
- F Section 1, Township 2 North, Range 4 West
- G Section 36, Township 2 North, Range 4 West
- H Section 26, Township 2 North, Range 4 West

## Unit 3, Exercise 2 – Principal Meridian and Baseline

Remember that each township/range is 6 miles by 6 miles square. In the first question, since a township is 6 miles by 6 miles, 12 S = 72 miles south of Centralia and Range 1W is 6 miles west of the 3rd PM. This exercise is designed to familiarize you with the concept of baselines and principal meridians in locating property.



Distances are marked on the drawing.

Beardstown base line to northern border = 171 miles

Centralia baseline to northern border = 276 miles

Centralia baseline to southern border = 102 miles

2nd PM (in Indiana) to border of the western control = 85 miles

3rd PM to eastern border of Illinois = 85 miles

3rd PM to farthest western border of Illinois = 124 miles

- |   |                   |                           |             |
|---|-------------------|---------------------------|-------------|
| 1 | T12S-R1W, 3rd PM  | <u>South or Southwest</u> | <u>S/SW</u> |
| 2 | T43N-R10E, 3rd PM | <u>NE</u>                 |             |
| 3 | T27N-R4E, 4th PM  | <u>NW</u>                 |             |
| 4 | T20N-R3W, 3rd PM  | <u>C</u>                  |             |
| 5 | T2N-R11W, 2nd PM  | <u>E/SE</u>               |             |
| 6 | T3S-R7W, 4th PM   | <u>W/WC</u>               |             |

## Unit 3

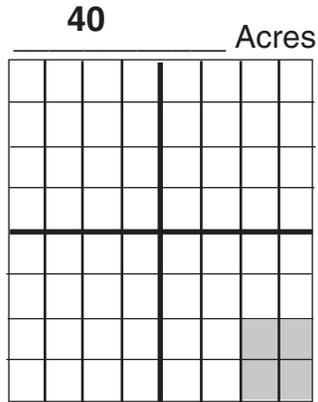
### Review Questions

- 1 Sections are numbered in a serpentine fashion, beginning in the NE corner. There are 36 sections within a township/range tier.
- 2 Legal descriptions using the Rectangular Survey System are tied to base lines and meridians. In Illinois, these descriptions are governed by the 2nd, 3rd, or 4th Principal Meridians, and by the Centralia Baseline or the Beardstown Baseline.
- 3 The 3rd Principal Meridian virtually cuts Illinois in half. The 2nd Principal Meridian is located in Indiana. Both of these are tied to the Centralia Baseline. The 4th Principal Meridian is located in the northwest portion of the state, and is tied to the Beardstown Baseline.
- 4 A committee headed by Thomas Jefferson developed a plan for dividing public land into rectangles. This plan was the basis for the Land Ordinance of 1785.
- 5 A township is a nearly square area of land. Each township is 6 miles square and contains 36 square miles. The first township north of a baseline would be referenced as township 1 N.
- 6 T44 N – R2 E, of the 3rd Principal Meridian, is located in the North part of the state of Illinois.

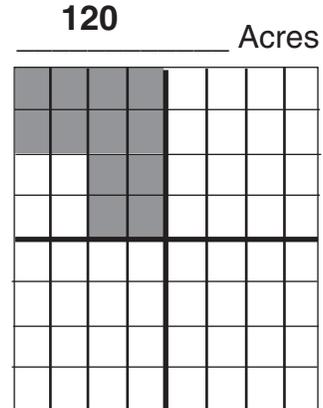
# Unit 4, Exercise 1 — Locating legal descriptions

Identify these parcels on the grid provided by shading in the appropriate parts on the grid.

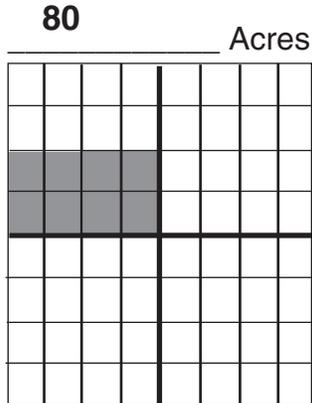
1 SE  $\frac{1}{4}$  of SE  $\frac{1}{4}$



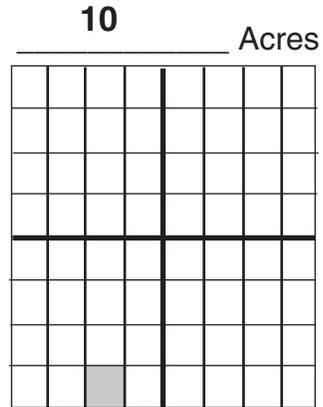
4 E  $\frac{1}{2}$  of NW  $\frac{1}{4}$  and NW  $\frac{1}{4}$  of NW  $\frac{1}{4}$



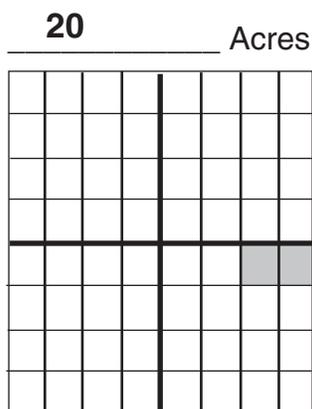
2 S  $\frac{1}{2}$  of NW  $\frac{1}{4}$



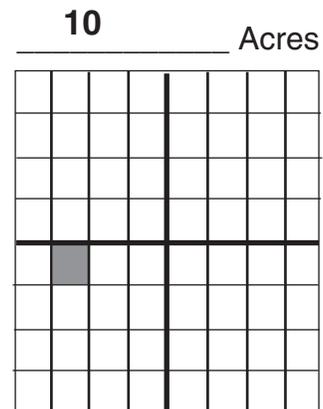
5 SW  $\frac{1}{4}$  of SE  $\frac{1}{4}$  of SW  $\frac{1}{4}$



3 N  $\frac{1}{2}$  of NE  $\frac{1}{4}$  of SE  $\frac{1}{4}$



6 NE  $\frac{1}{4}$  of NW  $\frac{1}{4}$  of SW  $\frac{1}{4}$

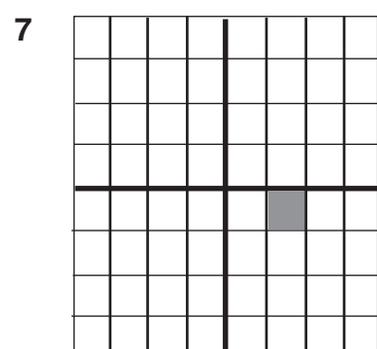
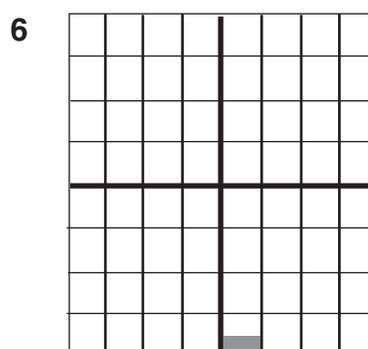
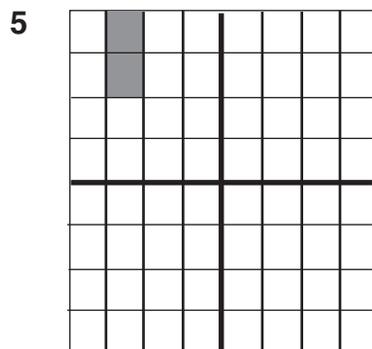
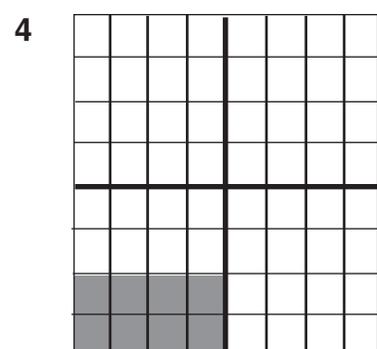
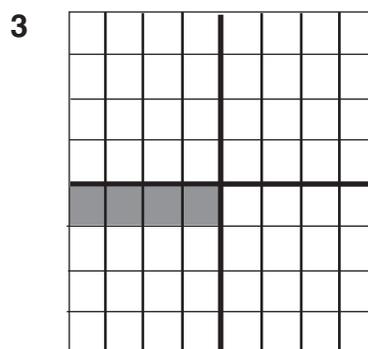
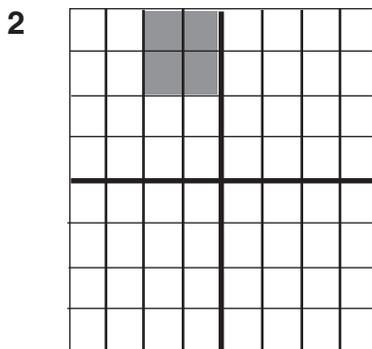
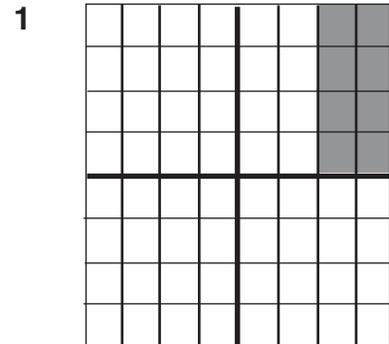


# Unit 4, Exercise 2 — Legal description exercises

## Part I — Legal Description by Acreage

Using acreage land measurement description methods, please locate the following parcels on the attached grid on the following page for Section 30, Township 12 South, Range 1 East, 3rd PM.

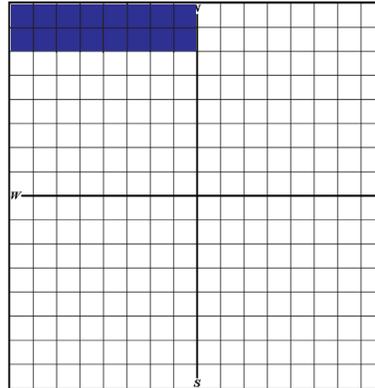
- 1 The E 80 acres of the N 320 acres
- 2 The N 40 acres of the E 80 acres of the NW ¼
- 3 The N 40 acres of the SW ¼
- 4 The S 80 acres of the SW ¼
- 5 The E 20 acres of the NW ¼ of the NW ¼
- 6 The S 5 acres of the SW ¼ of the SW ¼ of the SE ¼
- 7 The NE 10 acres of the NW ¼ of the SE ¼



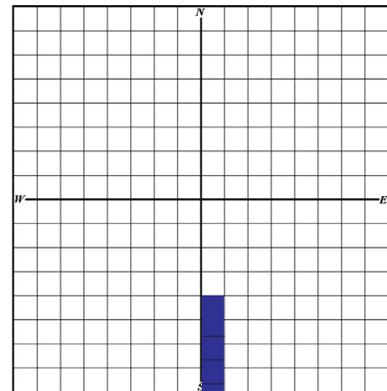
## Part II — Legal Description by Linear Measurement

Using linear land measurement description methods, please locate the following parcels on the grid on the following page for Section 32, Township 12 South, Range 2 West, 3rd PM.

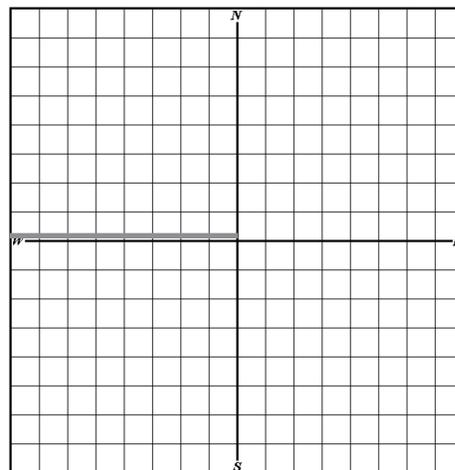
- 1 The N 10 chains of the NW  $\frac{1}{4}$



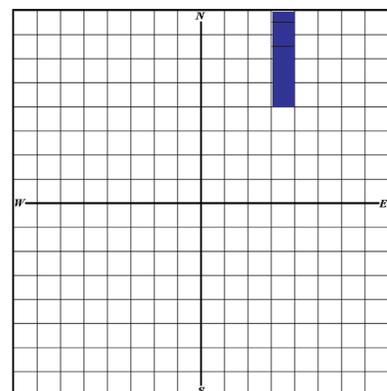
- 2 The W 330' off of the SW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$



- 3 82.5' off of the S side of the NW  $\frac{1}{4}$



- 4 The E 330' off of the E  $\frac{1}{2}$  of the NW  $\frac{1}{4}$  of the NE  $\frac{1}{4}$



## Unit 4, Exercise 3 — Calculation of acreage

Please calculate the acreage for the following:

- 1 The Southeast Quarter of the Southeast Quarter of the Northwest Quarter 10 ; and the Southwest Quarter of the Southwest Quarter of the Northeast Quarter 10 ; and the Northwest Quarter of the Northwest Quarter of the Southeast Quarter 10 ; and the Northeast Quarter of the Northeast Quarter of the Southwest Quarter 10 .  
40 acres
- 2 The East One-half of the Northeast Quarter of the Northeast Quarter of the Southeast Quarter; and the Southeast Quarter of the Northeast Quarter of the Southeast Quarter; and the North One-half of the Northeast Quarter of the Southeast Quarter of the Southeast Quarter.  
20 acres
- 3 The South One-half of the Southwest Quarter of the Southwest Quarter; and the South One-half of the Southeast Quarter of the Southwest Quarter; and the South One-half of the Southwest Quarter of the Southeast Quarter; and the Northeast Quarter of the Southwest Quarter of the Southeast Quarter; and the Northeast Quarter of the Northwest Quarter of the Southwest Quarter of the Southeast Quarter; and the Northwest Quarter of the Northwest Quarter of the Southwest Quarter of the Southeast Quarter.  
75 acres
- 4 The Northeast Quarter of the Northeast Quarter; and the North One-half of the Northwest Quarter of the Southeast Quarter of the Northeast Quarter; and the Northeast Quarter of the Northeast Quarter of the Southwest Quarter of the Northeast Quarter.  
47.5 acres
- 5 The Southwest Quarter of the Southwest Quarter of the Northwest Quarter; and the Northwest Quarter of the Southwest Quarter of the Northwest Quarter; and the Southwest Quarter of the Northwest Quarter of the Northwest Quarter.  
30 acres
- 6 The Northwest Quarter of the Northwest Quarter of the Southeast Quarter of the Northwest Quarter; and the Northeast Quarter of the Northeast Quarter of the Southwest Quarter of the Northwest Quarter; and the Southeast Quarter of the Southeast Quarter of the Northwest Quarter of the Northwest Quarter; and the Southwest Quarter of the Southwest Quarter of the Northeast Quarter of the Northwest Quarter.  
10 acres

## Unit 4

### Review Questions

Answers for questions 1 through 6 are on the section grid on Page 4-18.

- 1 The NW  $\frac{1}{4}$
- 2 The SE  $\frac{1}{4}$  of the SE  $\frac{1}{4}$
- 3 The S 165 feet off of the SW  $\frac{1}{4}$
- 4 82.5 feet off of the E side of the NE  $\frac{1}{4}$
- 5 The East 40 acres of the W 80 acres of the NE  $\frac{1}{4}$
- 6 The North 10 chains of the SE  $\frac{1}{4}$

Calculate the acreage for the following.

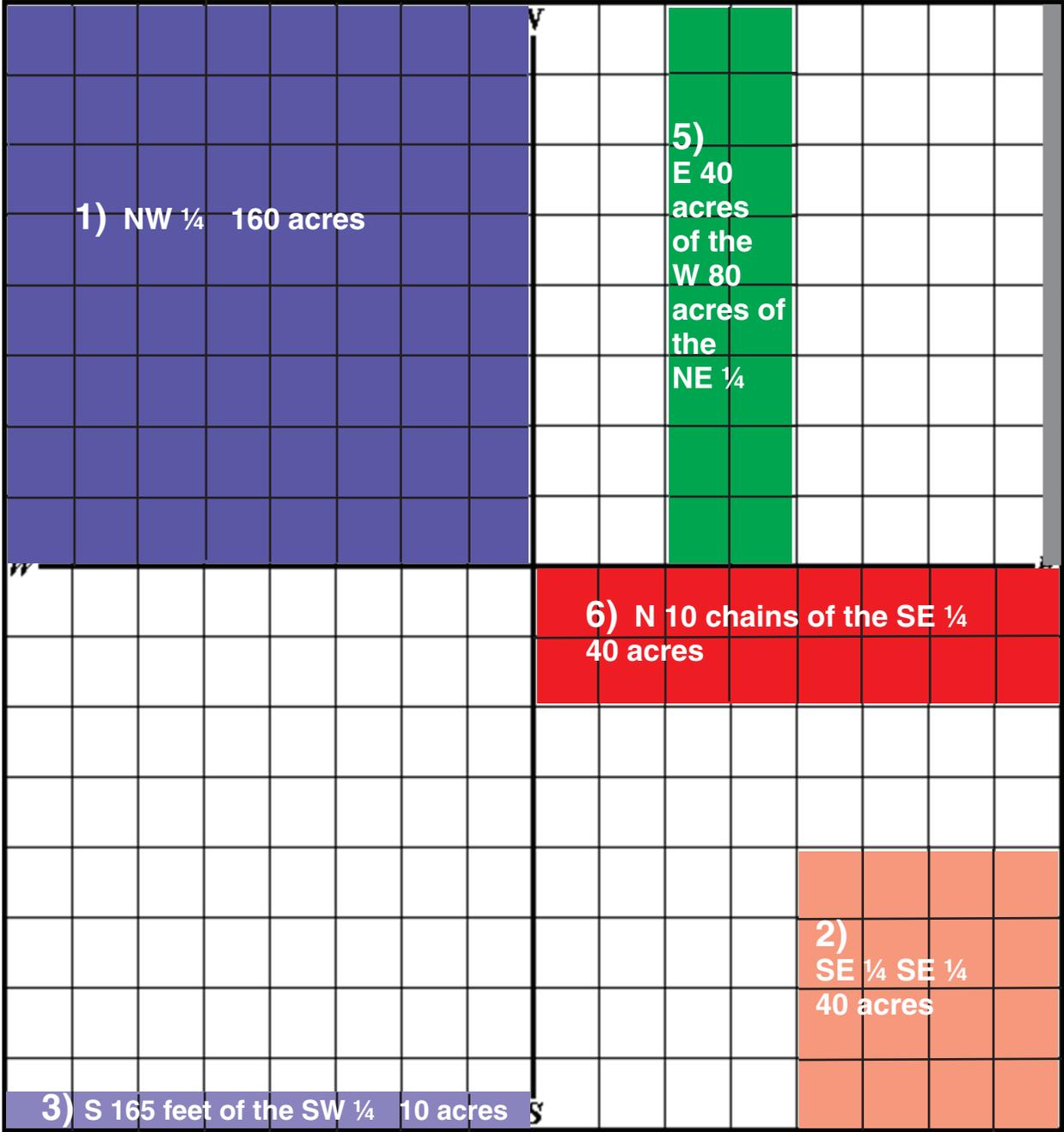
- 7 The Northeast Quarter of the Northwest Quarter = 40 acres.
- 8 The Southeast Quarter of the Southeast Quarter of the Southeast Quarter  
= 10 acres.
- 9 The East Half of the Northwest Quarter of the Northeast Quarter  
= 20 acres.

Complete the following.

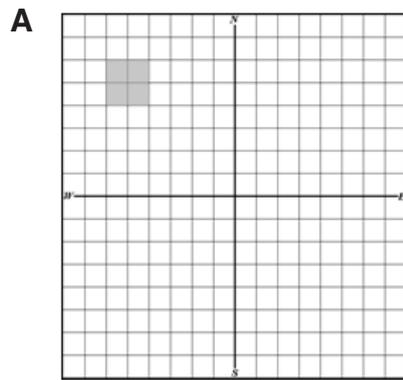
- 10 To locate a parcel using a metes and bounds description, first read the land description portion of the legal description backwards, and then read the metes and bounds portion of the description in the order written.  
Read all legal descriptions not written in metes and bounds backwards.

**Unit 4**  
**Review Questions**

**4) 82.5 feet off of the E side of the NE ¼ 5**

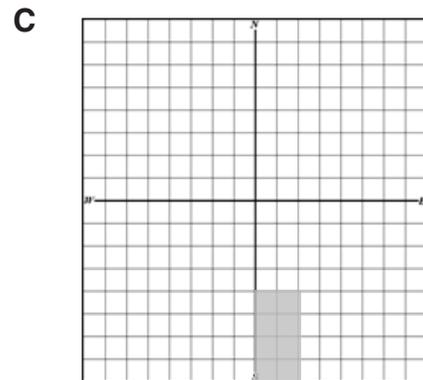


11 Write the legal description and calculate the acreage below each section map.



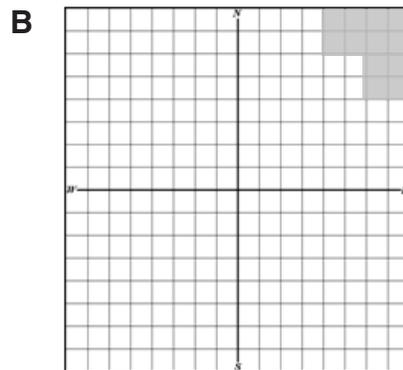
SE ¼ NW ¼ NW ¼

10 Acres



W ½ SW ¼ SE ¼

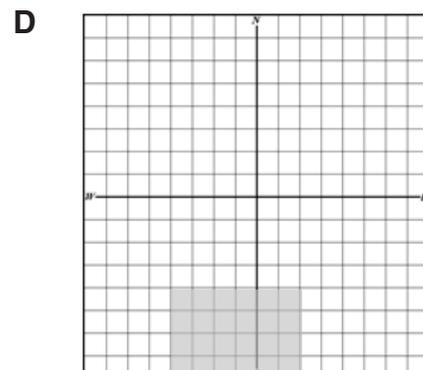
20 Acres



N ½ NE ¼ NE ¼ and

SE ¼ NE ¼ NE ¼

30 Acres



SE ¼ SW ¼ and the

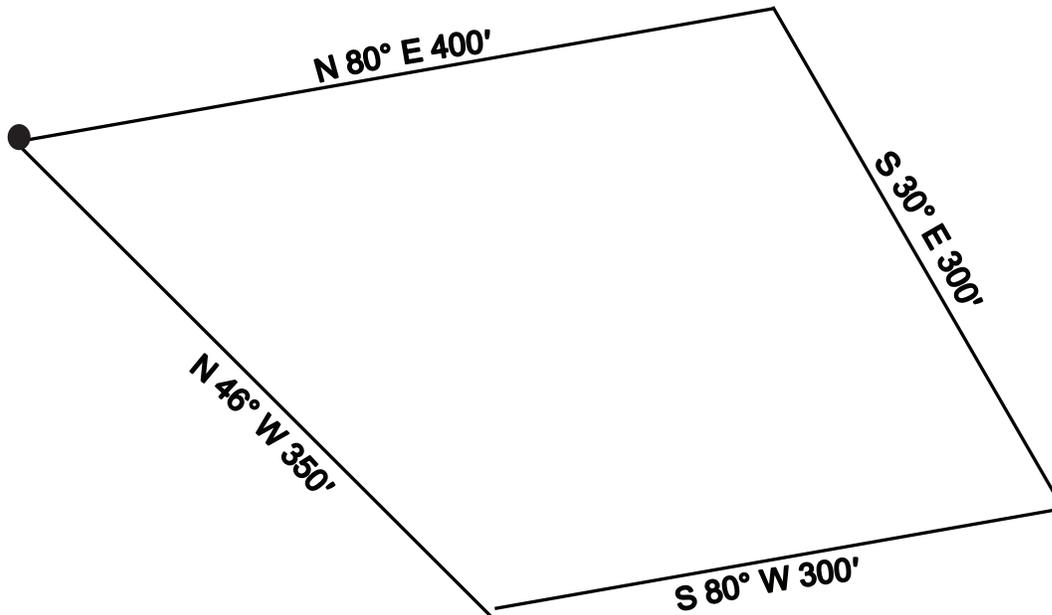
W ½ SW ¼ SE ¼

60 Acres

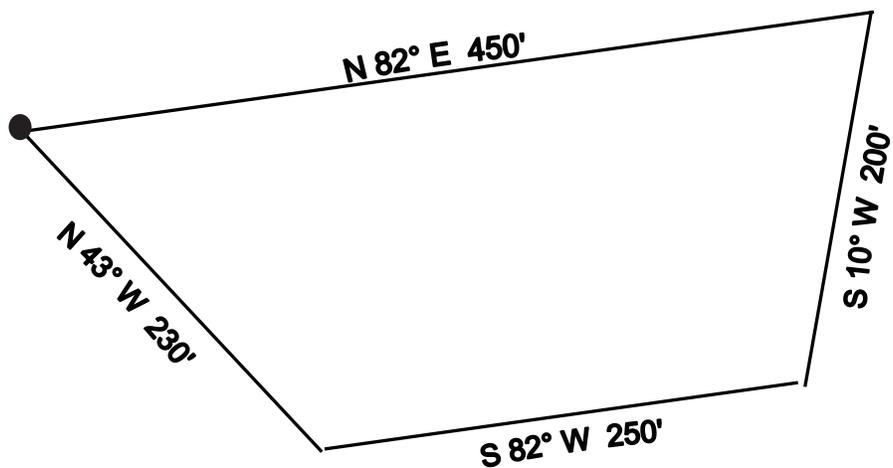
## Unit 5

### Exercise 1 — Drawing legal descriptions

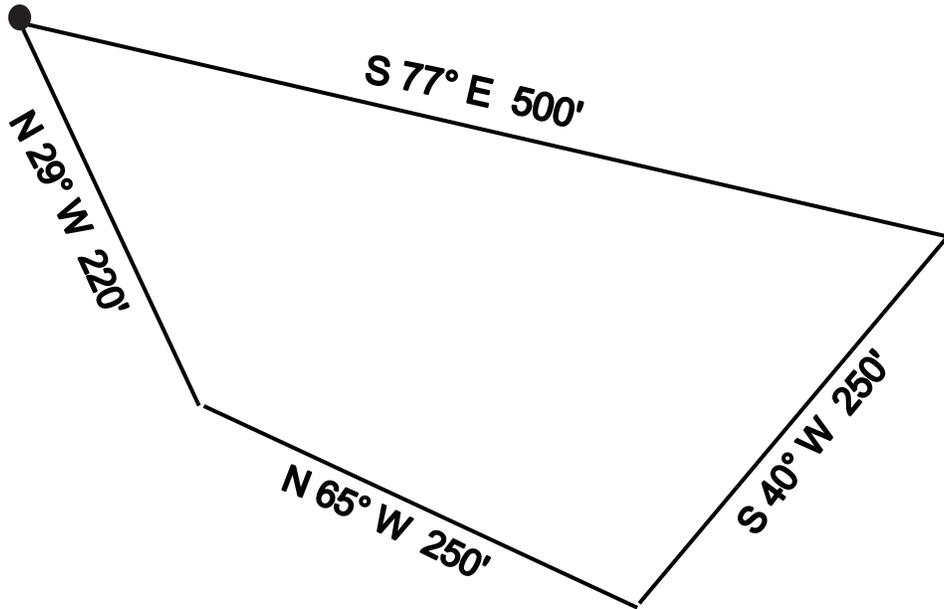
- 1 Beginning at a point, thence N 80° E, 400 feet; thence S 30° E, 300 feet; thence S 80° W, 300 feet; thence N 46° W, 350 feet, to the point of beginning.



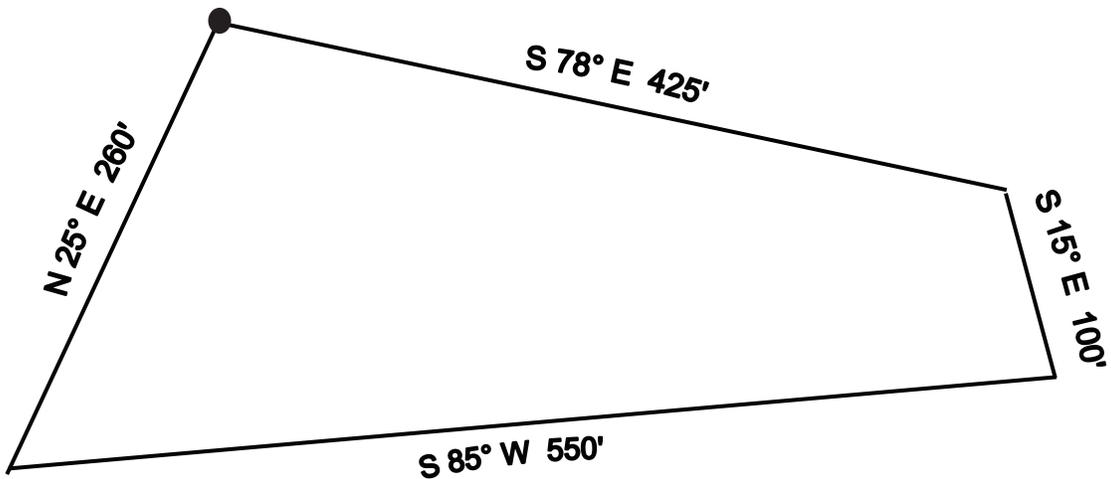
- 2 Beginning at a point, thence N 82° E, 450 feet; thence S 10° W, 200 feet; thence S 82° W, 250 feet; thence N 43° W, 230 feet to the point of beginning.



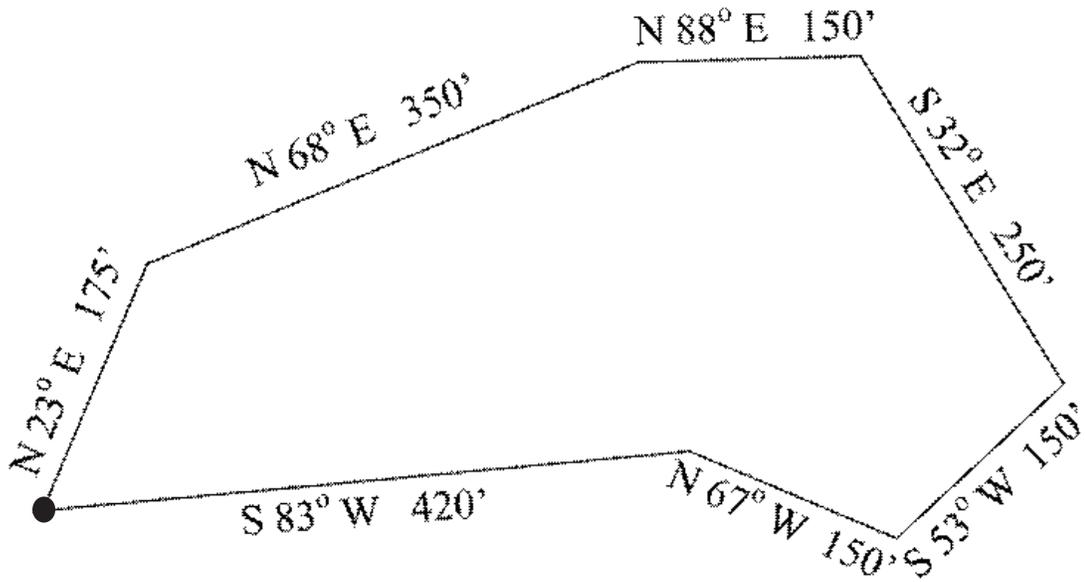
- 3 Beginning at a point, thence S 77° E, 500 feet to a point; thence S 40° W, 250 feet to a point; thence N 65° W, 250 feet to a point; thence N 29° W, 220 feet to the point of beginning.



- 4 Beginning at a point, thence S 78° E, 425 feet to a point; thence S 15° E, 100 feet to a point; thence S 85° W, 550 feet to a point; thence N 25° E, 260 feet to the point of beginning.



- 5 Beginning at a point, thence N 23° E, 175 feet to a point; thence N 68° E, 350 feet to a point; thence N 88° E, 150 feet to a point; thence S 32° E, 250 feet to a point; thence S 53° W, 150 feet to a point; thence N 67° W, 150 feet to a point; thence S 85° W, 400 feet to the point of beginning.



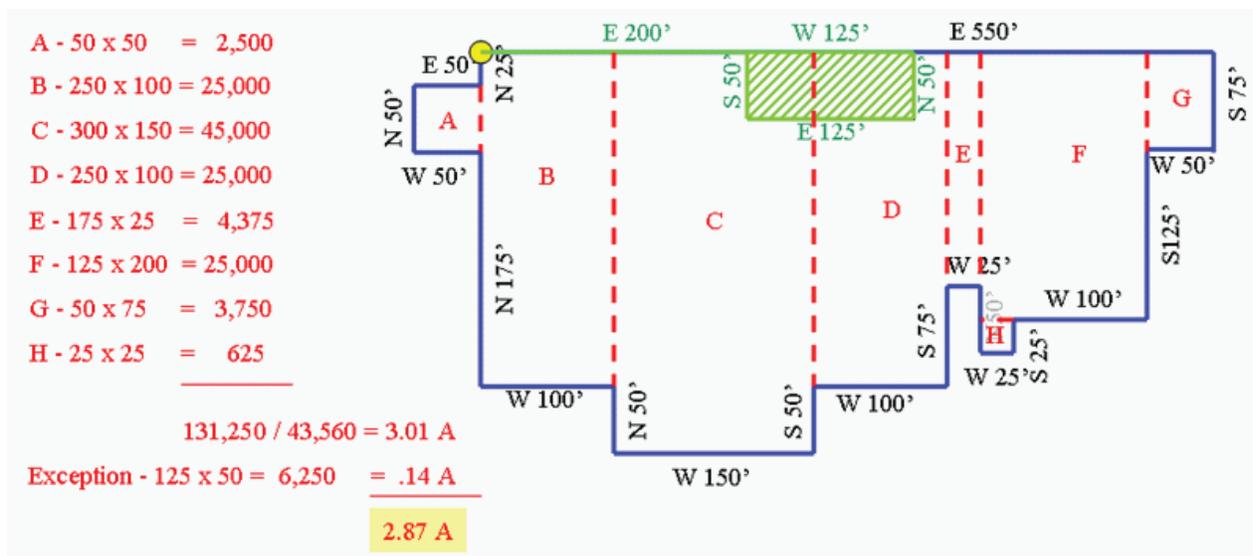
## Unit 5

### Exercise 2 — Drawing legal descriptions with exceptions

A part of the Southwest Quarter of Section 12, and a part of the Southeast Quarter of Section 11, Township 11 South, Range 2 West of the 3rd P.M., more particularly described as follows: Beginning at the Northwest corner of the Southwest Quarter of Section 12, thence East 550 feet to a point, thence South 75 feet, thence West 50 feet, thence South 125 feet, thence West 100 feet, thence South 25 feet; thence West 25 feet, thence North 50 feet, thence West 25 feet, thence South 75 feet, thence West 100 feet, thence South 50 feet, thence West 150 feet, thence North 50 feet, thence West 100 feet, thence North 175 feet, thence West 50 feet, thence North 50 feet, thence East 50 feet, thence North 25 feet to the point of beginning.

**Excepting** there from the following parcel of land: Commencing at the Northwest corner of the Southwest Quarter of section 12, thence East 200 feet to a point to a point of beginning, thence South 50 feet, thence East 125 feet, thence North 50 feet, thence West 125 feet, containing .14 acres.

The parcel herein conveyed containing 2.87 acres, more or less.



## Unit 5

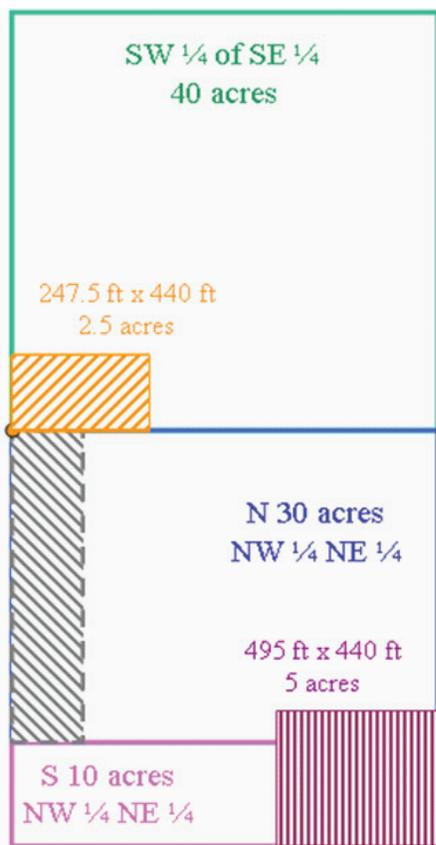
### Exercise 3

All the Southwest Quarter of the Southeast Quarter of Section **20**; also 30 acres off the North end of the Northwest Quarter of the Northeast Quarter of Section **29**, **EXCEPT** 5 acres off the West end; and 10 acres off the South end of the Northwest Quarter of the Northeast Quarter of said Section 29, all in Township 15 North, Range 7 East of the Third Principal Meridian.

**EXCEPT** that part of the Southwest Quarter of the Southeast Quarter of **Section 20** as described as follows: Beginning at the Southwest corner of the Southeast Quarter of said Section 20, thence North 247.5 feet along the West line of the Southeast Quarter of said Section 20; thence East 440 feet; thence South 247.5 feet to a point on the South line of the Southwest Quarter of the Southeast Quarter of said Section 20; thence West 440 feet along said South line to the point of beginning.

**FURTHER EXCEPTING** that part of the Northwest Quarter of the Northeast Quarter of **Section 29**, described as follows: Beginning at the Southeast corner of the Northwest Quarter of the Northeast Quarter of said Section 29; thence West 495 feet along the South line of the Northwest Quarter of the Northeast Quarter of said Section 29; thence North 440 feet; thence East 495 feet to a point on the East line of the Northwest Quarter of the Northeast Quarter of said Section 29; thence South 440 feet along said East line to the point of beginning.

Total acreage of this conveyed parcel being 67.5 acres, more or less.



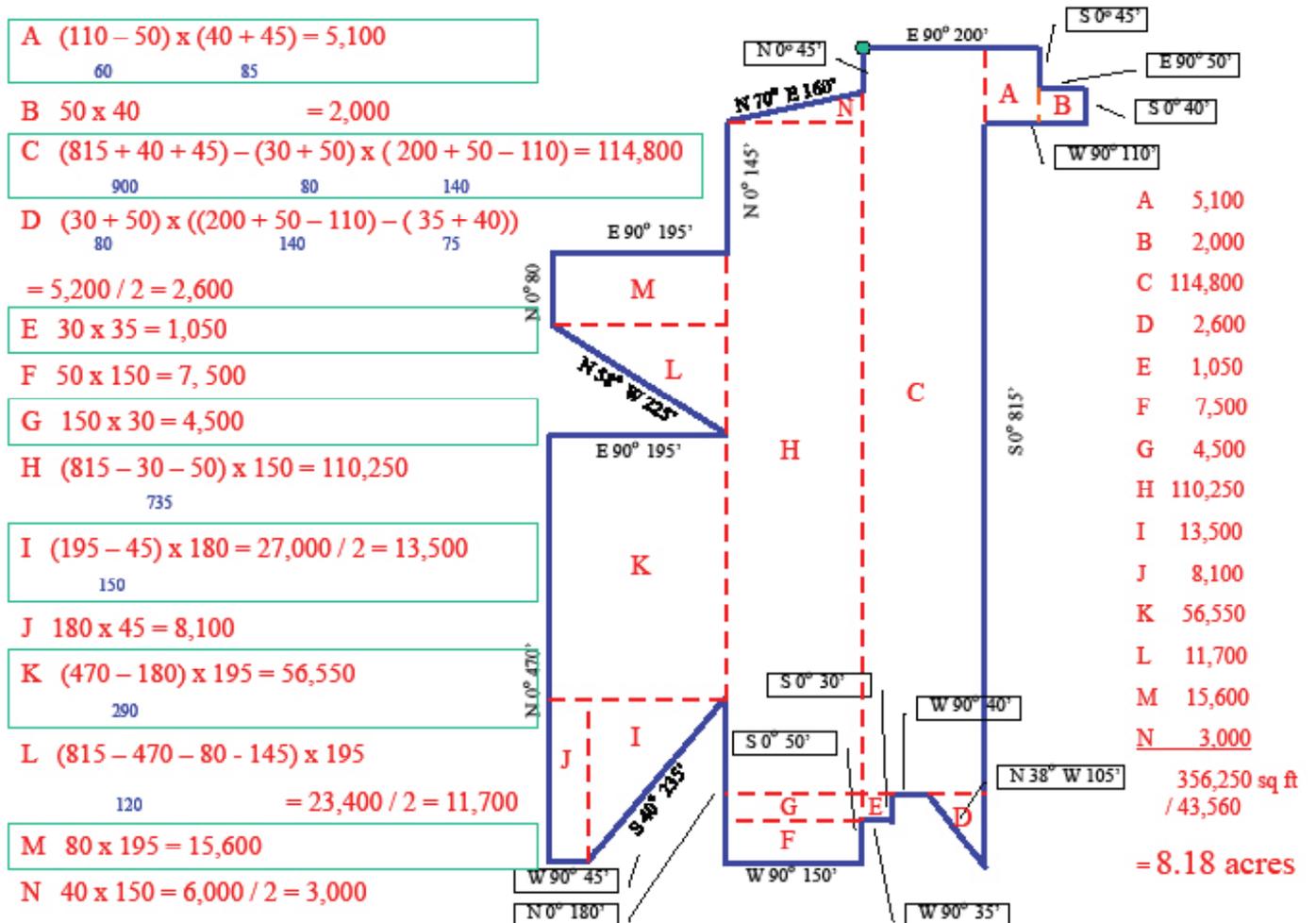
# Unit 5

## Exercise 4

Using a scale of 1" = 100', please draw the following legal description and **calculate** the total acreage. Complete the drawing on the following page.

Note that in this legal description "Commencing at" leads you to the point of beginning.

Commencing at the Northwest corner of Section 6, Township 11 South, Range 2 West of the 3rd Principal Meridian, thence East along the Section line 460 feet to the **point of beginning**. Thence continue East 90°, 200 feet to a point; thence S 0°, 45 feet to a point; thence East 90°, 50 feet to a point; thence S 0°, 40 feet to a point; thence W 90°, 110 feet to a point thence S 0°, 815 feet; thence N 38° W, 105 feet to a point; thence W 90°, 40 feet to a point; thence S 0°, 30 feet to a point; thence W 90°, 35 feet to a point; thence S 0°, 50 feet to a point; thence W 90°, 150 feet to a point; thence N 0°, 180 feet to a point; S 40° W, 235 feet to a point; thence W 90°, 45 feet to a point; thence N 0°, 470 feet to a point; thence E 90°, 195 feet to a point; thence N 58° W, 225 feet to a point; thence N 0°, 80 feet to a point; thence E 90°, 195 feet to a point; thence N 0°, 145 feet to a point; thence N 70° E, 160 feet to a point; thence N 0°, 45 feet to the point of beginning.



## Unit 5

### Review Questions

- I Beginning at the Northeast corner of Section 34, Township 12 South, Range 2 West, of the 3rd Principal Meridian, thence South 1,000 feet to a point, thence N 50° W 200 feet to a point, thence West 600 feet to a point, thence North 875 feet to a point, thence East 750 feet to the point of beginning.

EXCEPTING: Comencing at the Southwest corner of the above described parcel of land, thence East 200 feet to the point of beginning, thence North 150 feet to a point, thence West 100 feet to a point, thence North 200 feet to a point, thence East 175 feet to a point, thence South 350 feet to a point, thence West 75 feet to the point of beginning, containing 1.06 acres, more or less.

FURTHER EXCEPTING: Beginning at the Southwest corner of the original parcel, thence North 350 feet to a point, thence East 100 feet to a point, thence South 200 feet to a point, thence East 100 feet to a point, thence South 150 feet to a point, thence West 200 feet to the point of beginning, containing 1.15 acres, more or less.

FURTHER EXCEPTING: Commencing at the Southeast corner of the original parcel, thence North 50° W 200 feet to a point, thence West 50 feet to a point, thence North 175 feet to a point, thence East 200 feet to a point, thence South 300 feet to the point of beginning, containing 1.02 acres, more or less.

FURTHER EXCEPTING: Beginning at the Northeast corner of the original parcel, thence South 525 feet to the point of beginning, thence South 175 feet to a point, thence West 200 feet to a point, thence South 175 feet to a point, thence West 275 feet to a point, thence North 350 feet to a point, thence East 475 feet to the point of beginning, containing 3.01 acres, more or less.

FURTHER EXCEPTING: Beginning at the Northwest corner of the original parcel, thence East 300 feet to a point, thence South 300 feet to a point, thence S 53° W 375 feet to a point, thence North 525 feet to the point of beginning, containing 2.84 acres, more or less.

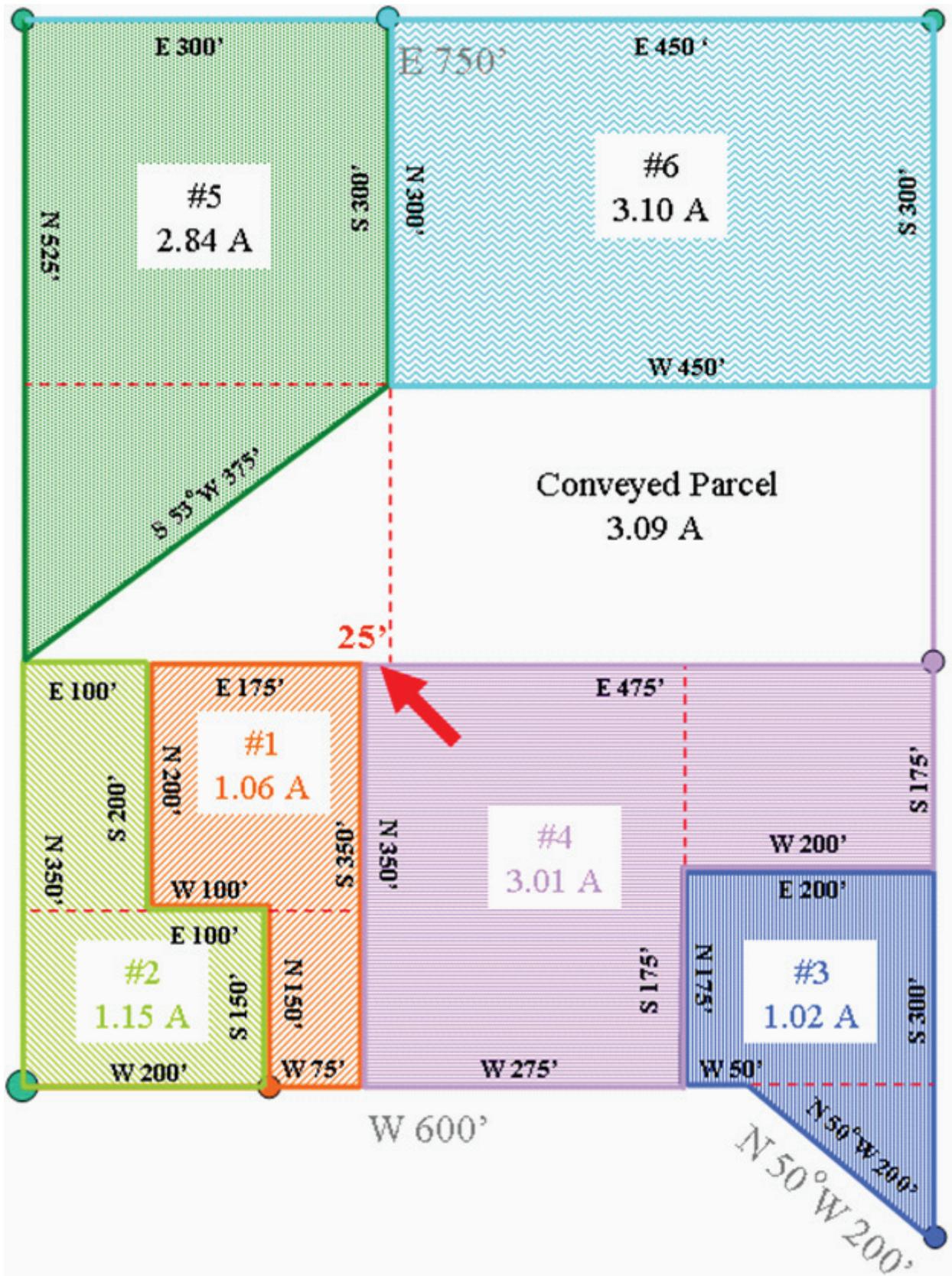
FURTHER EXCEPTING: Commencing at the Northwest corner of the original parcel, thence East 300 feet to the point of beginning, thence East 450 feet to a point, thence South 300 feet, thence West 450 feet, thence North 300 feet to the point of beginning, containing 3.10 acres more or less.

**The herein conveyed parcel containing 3.09 acres, more or less.**

The drawing for this parcel is on the following page.

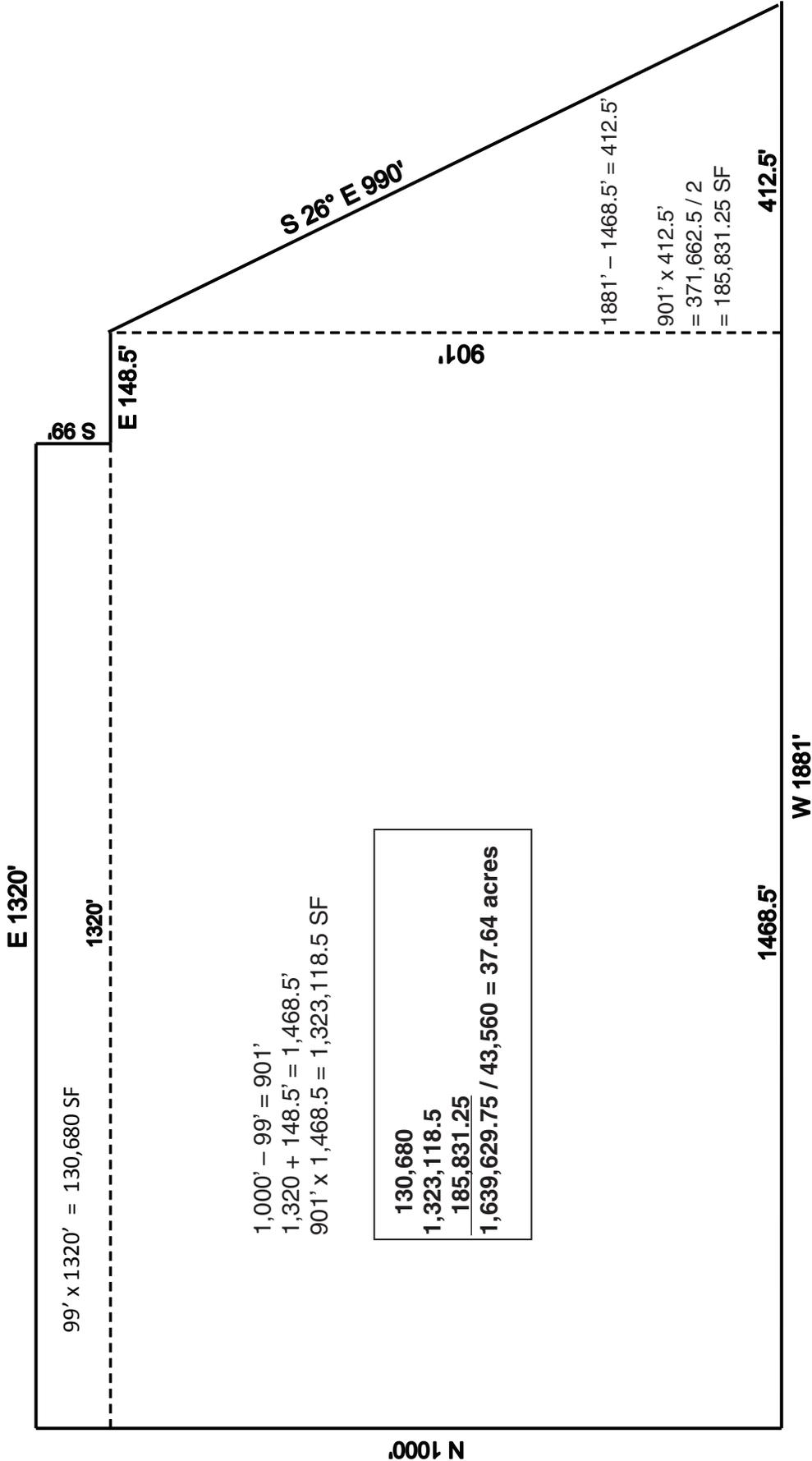
# Unit 5

## Review Questions



II Conversion — Draw the following legal description and calculate acreage.

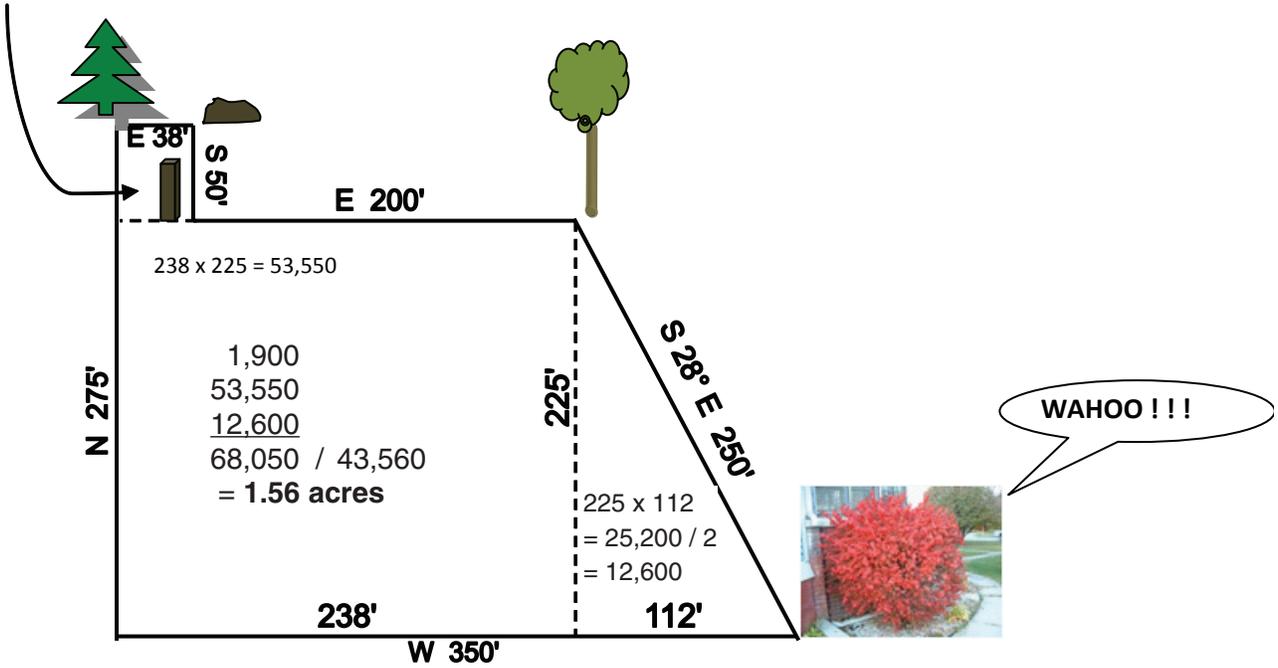
Beginning at the Northwest corner of the Southwest Quarter of Section 12, Township 8 North, Range 3 West of the Third Principal Meridian, thence East 2 furlongs, thence South 6 rods, thence East 2 chains and 1 rod, thence South 26 degrees East 990 feet, thence West 2 furlongs and 34 rods, thence North 1000 feet to the point of beginning, containing 37.64 acres, more or less.



1000' N

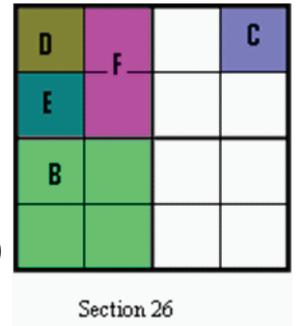
Complete the drawing on the following page. Turn the page horizontally and use  
 1" = 200'. III Conversions — The Harper Parcel

$38 \times 50 = 1,900$



## Unit 6

### Exercise 1 — PIN exercise



#### Transaction “A”:

Legal Description: Section 26, Twp. 4S., Range 3 West, 3rd PM (640 acres)

(A) 01 - 26 - 100 - 001 - 0021 (Heart Tract)

#### Transaction “B”:

Legal Description: The SW ¼ of Section 26, Twp 4S, Range 3W, 3rd PM (160 acres)

01 - 26 - 100 - 002 - 0021 (Heart Tract)

(B) 01 - 26 - 300 - 001 - 0021 (Johnson Tract)

#### Transaction “C”:

Legal Description: The NE 1/4 of the NE 1/4 of Section 26, Twp. 4S., Range 3 West, 3rd PM (40 acres)

01 - 26 - 100 - 003 - 0021 (Heart Tract)

(C) 01 - 26 - 200 - 001 - 0021 (Freeman Tract)

#### Transaction “D”:

Legal Description: The NW 1/4 of the NW 1/4 of Section 26, Twp. 4S, Range 3 West, 3rd PM (40 acres)

01 - 26 - 100 - 004 - 0021 (Heart Tract)

(D) 01 - 26 - 100 - 005 - 0021 (Carter Tract)

#### Transaction “E”:

Legal Description: The SW 1/4 of the NW 1/4 of Section 26, Twp. 4S Range 3 West, 3rd PM (40 Acres)

01 - 26 - 100 - 006 - 0021 (Heart Tract)

(E) 01 - 26 - 100 - 007 - 0021 (Jones Tract)

#### Transaction “F”:

Legal Description: The NE 1/4 of the NW 1/4 and the SE 1/4 of the NW 1/4 of Section 26, Twp. 4S., Range 3 West, 3rd PM (80 acres)

01 - 26 - 200 - 002 - 0021 (Heart Tract)

(F) 01 - 26 - 100 - 008 - 0021 (Weber Tract)

## Unit 6

### Exercise 2 — Legal description exercise

#### Transaction “A”

Legal Description: The Northeast Quarter; and the Northwest Quarter; and the Southeast Quarter; and the Southwest Quarter. Being all of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian.

Containing 640 acres, more or less.

PIN 07 - 36 - 100 - 001 – 0011 (Freeman Tract)

#### Transaction “B”

Legal Description: Commencing at the Northwest corner of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian, thence South 165 feet to the south side of County Highway 12; thence East 1,320 feet along the south side of County Highway 12 to the point of beginning thence South 561 feet to a point; thence East 462 feet to a point; thence North 561 feet to a point; thence West 462 feet along the south side of County Highway 12 to the point of beginning.

Containing 5.95 acres, more or less.

PIN 07 - 36 - 100 - 002 – 0011 (Freeman Tract)

PIN 07 - 36 - 100 - 003 – 0011 (Heart Tract)

#### Transaction “C”

Legal Description: Legal Description: Commencing at the Southeast corner of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian, thence North 132 feet to a point; thence West 1,254 feet down the centerline of County Highway 14 to the point of beginning. Thence North 660 feet to a point; thence West 1,375 feet to a point, thence South 660 feet to a point; thence East 1,375 feet to the point of beginning.

Containing 20.83 acres, more or less.

PIN 07 - 36 - 100 - 004 – 0011 (Freeman Tract)

PIN 07 - 36 - 400 - 001 – 0011 (Johnson Tract)

#### Transaction “D”

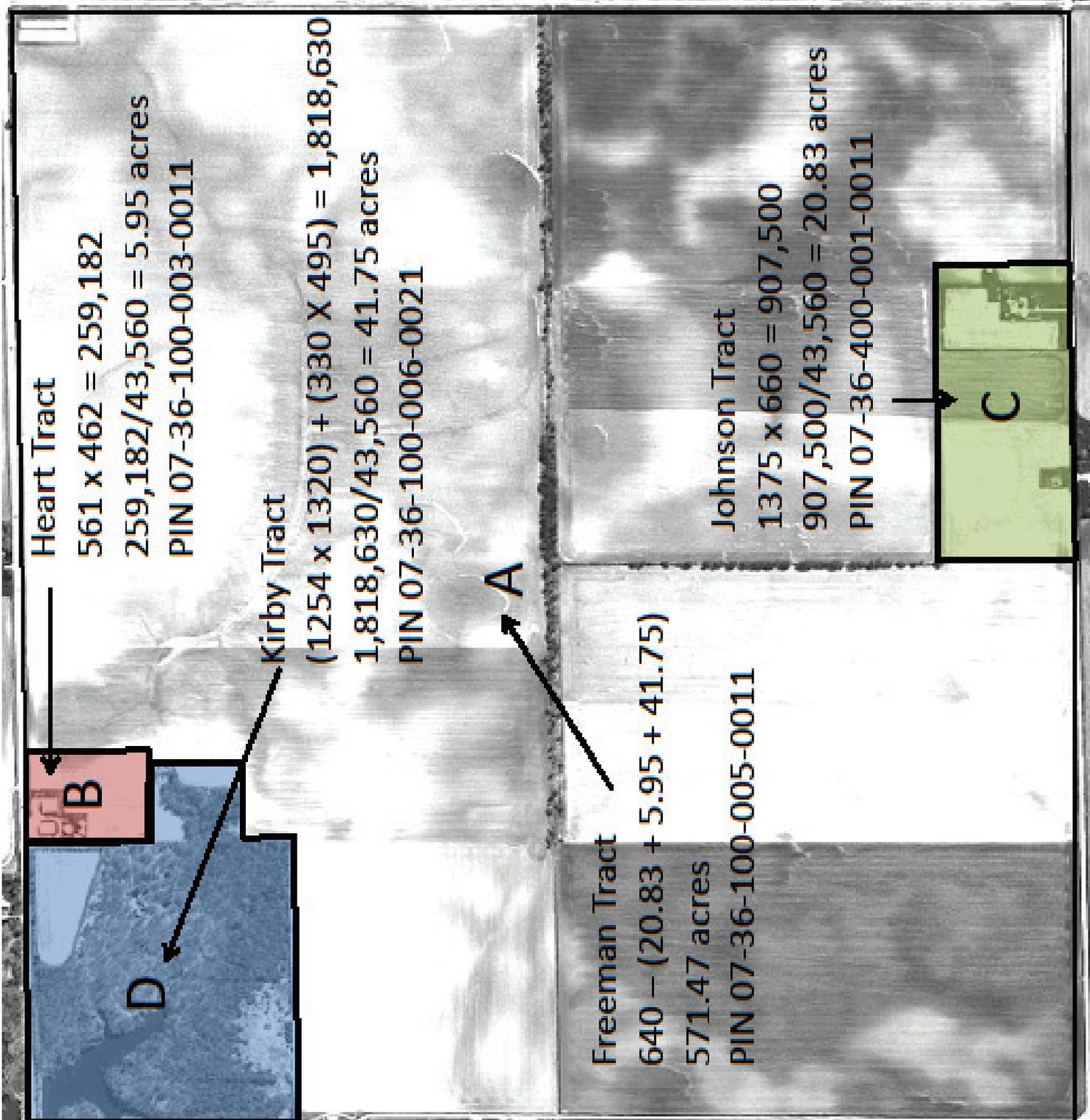
Legal Description: Commencing at the Northwest corner of Section 36, Township 12 South, Range 1 East of the Third Principal Meridian, thence South 165 feet to the point of beginning on the south side of County Highway 12. Thence South 1,254 feet to a point; thence East 1,320 feet to a point; thence North 495 feet to a point; thence East 330 feet to a point; thence North 495 feet to a point; thence West 330 feet to a point; thence North 561 feet to a point; thence West 1,320 feet along the south side of County Highway 12 to the point of beginning.

Containing 41.75 acres, more or less.

PIN 07 - 36 - 100 - 005 – 0011 (Freeman Tract)

PIN 07 - 36 - 100 - 006 – 0021 (Kirby Tract)

How many acres remain in the Freeman tract? 571.47 acres.



Section 36

## Unit 6

### Review Question 1

#### Transaction “A”

Containing 640 acres, more or less.

PIN 08 - 36 - 100 - 001 – 0021 (Joseph tract)

#### Transaction “B”

Containing 80 acres, more or less.

PIN 08 - 36 - 100 - 002 – 0021 (Joseph tract)

PIN 08 - 36 - 100 - 003 – 0021 (Harris tract)

#### Transaction “C”

Containing 160 acres, more or less.

PIN 08 - 36 - 100 - 004 – 0021 (Joseph tract)

PIN 08 - 36 - 300 - 001 – 0021 (Davis tract)

#### Transaction “D”

Containing 80 acres, more or less.

PIN 08 - 36 - 200 - 001 – 0021 (Joseph tract)

PIN 08 - 36 - 100 - 005 – 0021 (Charles tract)

#### Transaction “E”

Containing 10 acres, more or less.

PIN 08 - 36 - 200 - 002 – 0021 (Joseph tract)

PIN 08 - 36 - 400 - 001 – 0021 (Hardy tract)

How many acres remain in the Joseph parcel? 310 acres.

Write the legal description for the Joseph property **with** and **without** an exception.

#### Without an exception:

NE ¼; NE ¼ SE ¼; NW ¼ SE ¼; SE ¼ SE ¼; N ½ SW ¼ SE ¼; SE ¼ SW ¼ SE ¼

#### With an exception:

NE ¼; SE ¼ Except SW ¼ SW ¼ SE ¼

# Unit 7

## Review Questions

1 Define GIS.

*Geographic Information System – A system developed for spatial analysis needs such as planning natural resources and land records management.*

2 What are some of the uses of GIS for assessors?

*Shows bodies of water, soil types, geologic structures, land use, zoning, political boundaries, utilities, sewers, topography, property lines, and others.*

3 Define geographic data.

*Basic points, lines, and polygons that make up features of a map.*







Printed by authority of the State of Illinois  
(40 - 05/11 - PO number 2110652)