SECTION A

153 Points of 300 Total Points
Time Allowed to Complete This Section: 4 Hours

Examination Overview

The 1991 California Professional Land Surveyor examination is given in two, 4-hour periods on the same day. Section A is the first section of this two-part examination; Section B will be given in the afternoon. Section A consists of the following:

Test Problem No.	Subject Matter	Point Value
A1	Legal Description	30
A2	Subdivision Boundary	36
A3	Photogrammetry	30
A4	Error Analysis	21
A5	Public Lands	36

1.56 pts/minute

The scope of this exam relates to the principles and practice of land surveying in the various areas of practice. You will be graded on the answers specifically required and in certain cases your method of obtaining these answers as demonstrated in your solution. Therefore, show all your work including all formulae and calculations.

The questions have been designed to realistically reflect the actual conditions and practice of land surveying. The assignment of points to each question is not based on the time required to complete an answer. Instead, points have been assigned on the basis of the relative importance of each question to basic land surveying competence.

Examination Instructions

As you will take this test booklet with you when you complete the examination, do **not** write your answers in this test booklet. Solution booklets for each test problem have been provided with this test booklet. Present your answers on the sheets provided within each solution booklet. **Only** work in a solution booklet will be scored. Follow the steps listed below to present your solutions:

- Be sure to use the correct solution booklet for each test problem. The problem number is printed on the cover of each solution booklet.
- Enter the problem number in the space provided on each inside sheet of the solution booklet.
- Enter your identification number on the front cover of each solution booklet and in the upper right-hand corner of each page of the solution booklet in the spaces provided. **Do not write your name on any part of this examination.**
- Additional paper for your solution booklets can be obtained from your proctor. Enter the number of the test problem on every additional sheet you use.
- Number your solution pages 1 of 3, 2 of 3, etc.
- In addition to the answer, show all work pertinent to the problem's solution to demonstrate to the grader the method used.
- Certain problems require a specified number of answers. Where you are required to provide a specific number of answers, you must provide **only** the number of answers required. Any answers provided **beyond** the number required will not be graded.
- Clearly delineate any work that you do not want scored by lining through that part and marking VOID across it.
- When you have completed this portion of the examination, check your work, put your solution booklets in order in the envelope provided, seal your envelope, write your examinee ID number across the seal of the envelope, and give all material to your proctor.

PROBLEM A1

30 Points

PROBLEM STATEMENT

You have surveyed a pipeline route as shown on the plat on the facing page. Utilizing a property line tie that you made on the Northerly line of Sycamore Street, record map values, and the Tarantino deed, you calculated pipe lengths on the Tarantino property. You have been asked to prepare an easement description for the two pipelines as they relate to the Tarantino property.

The Tarantinos bought the Northerly 150.00 feet of the Easterly 200.00 feet of Lot 3 of Block 14 as shown on a deed recorded on August 9, 1943, in Book 27, Page 83 of Official Records.

The easement for pipeline "A" is 30.00 feet wide. The pipeline is 10.00 feet Southeasterly and Easterly of the Northwesterly and Westerly line of the easement.

Pipeline "B" is in the center of a 20.00-foot-wide easement.

PROBLEM REQUIREMENTS

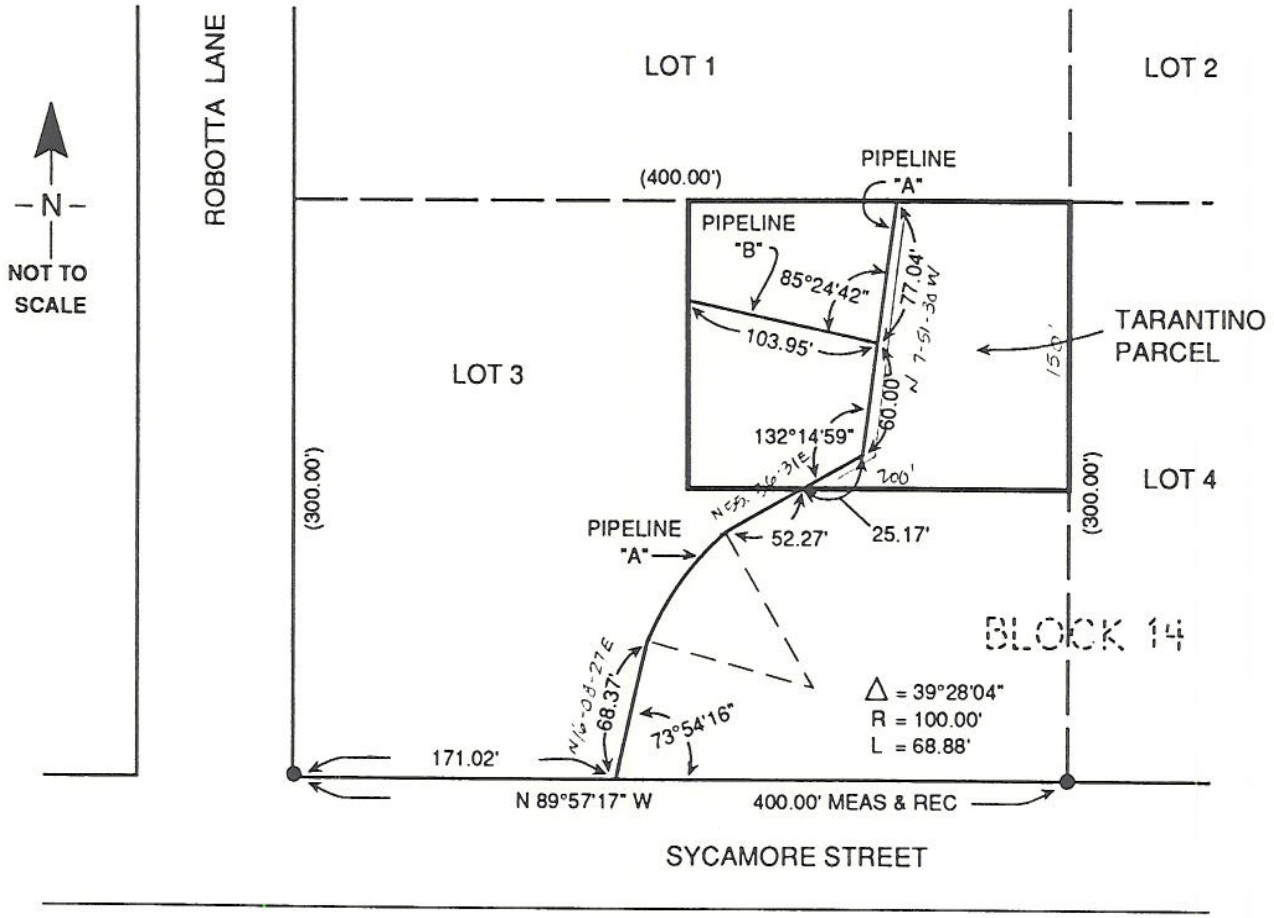
1. Calculate the bearings necessary to write the description for the two pipeline easements. **6 Points**

2. Utilizing the surveyed information, prepare a complete legal description entitled "Exhibit A" for the two pipeline easements on the Tarantino parcel. The legal description will be attached to a grant deed that reads, in part, that Tarantino grants the easements for pipeline purposes as described in Exhibit A. **24 Points**

   - **Begin your description at the Southwest corner of Lot 3.**
   - The TRUE POINT OF BEGINNING must be on the Southerly line of the Tarantino parcel.
   - No further surveying or property line calculations are required.

PROBLEM A1

A PORTION OF MAP 3619, BOOK 36, PAGE 54 OF MAPS, COUNTY OF TESTING SHOWING PIPELINES



LEGEND

● = FD 2" IP W/ DISK
LS 10,000 PER MAP 3619
( ) = RECORD VALUE
PER MAP 3619

PROBLEM A2

36 Points

PROBLEM STATEMENT

You have been retained to survey Lot 4, Tract No. 3500, MB 35–14, as shown on the plat of the block in your solution booklet. Tract 2000 and Tract 3500 as shown on the plats on pages 4 and 5 were both created from Lot 1, Tract No. 1000, MB 10–14. The original boundaries of Lot 1 are the centerlines of the streets adjacent to the newer tracts. The owner of Lot 1, Tract No. 1000, subdivided part of the property by recording Tract No. 2000, MB 20–7. The owner later sold the remainder of Lot 1, which was subdivided by Tract No. 3500, MB 35–14.

The distances and angles shown for the centerlines of the streets in your solution booklet are your measurements. All other distances and bearings shown on the plats are tract record values.

Public records indicate that the original two-inch pipes between the subdivisions set by Tract No. 2000 have not been recovered. Your field search has verified that the pipes are gone and no physical occupation exists.

PROBLEM REQUIREMENTS

Solve the following and **show all your work.**

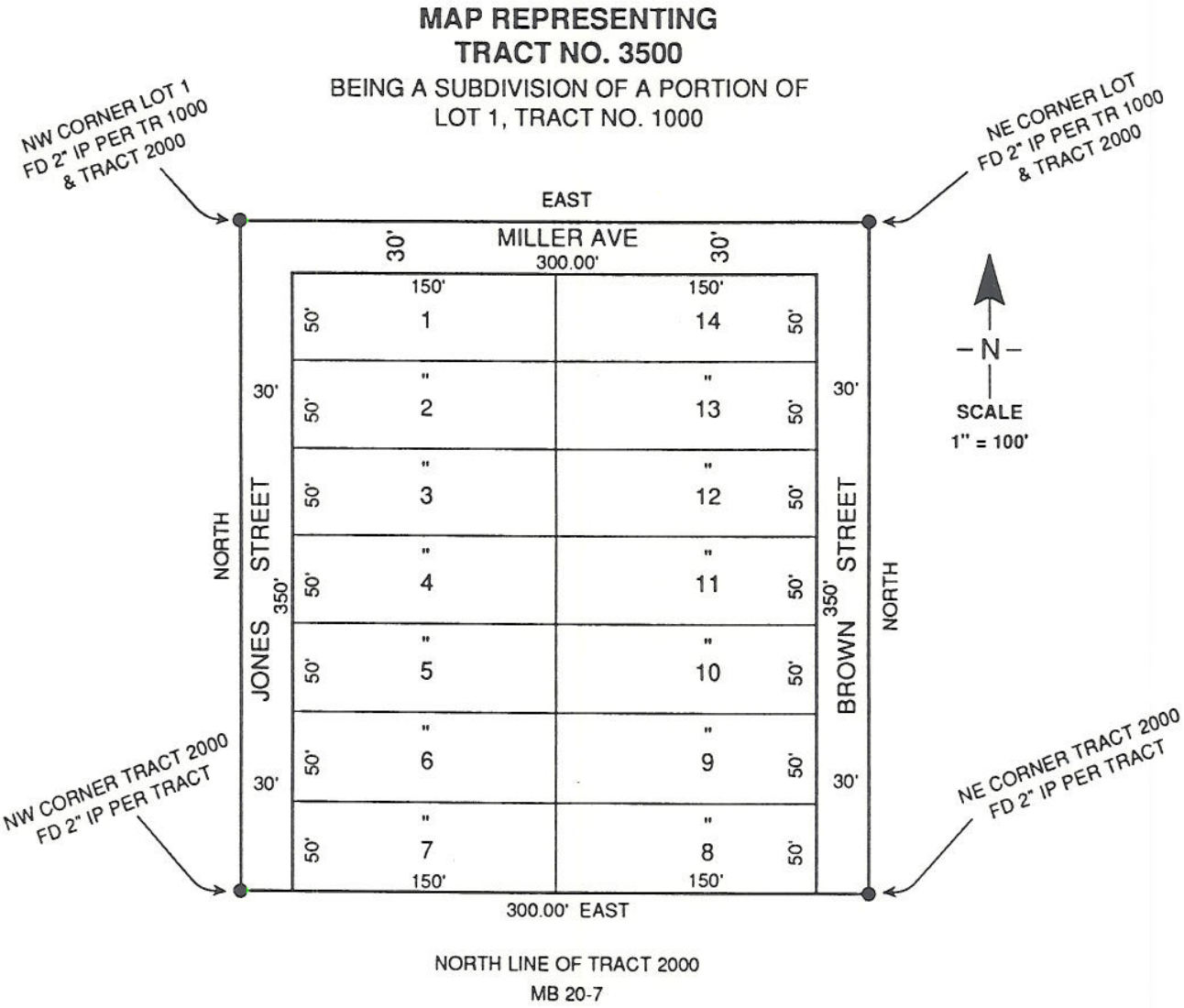
1. **a.** Using the plat in your solution booklet, show the calculated distances you would use to perform the survey of Lot 4, Tract No. 3500. **11 Points**

   b. Show the comparisons of your measured distances to tract record throughout the block. **10 Points**

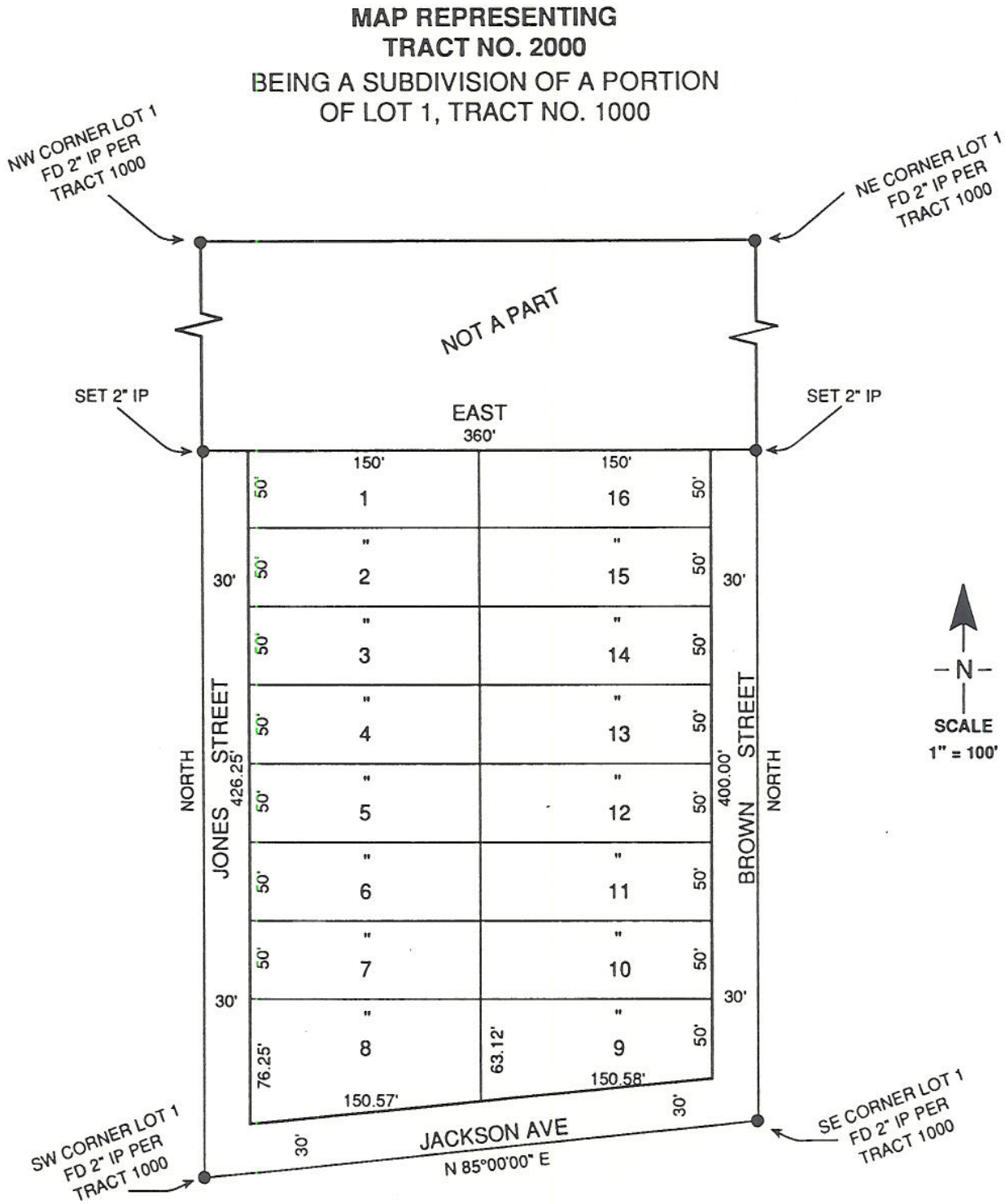
2. Describe the principles that you would use to complete the procedure required to establish the dimensions of Lot 4, Tract No. 3500 from the monuments as shown on the plat in your solution booklet. **9 Points**

3. Is a Corner Record or Record of Survey required by state law? Cite the statute section that verifies your answer. **6 Points**

PROBLEM A2


MAP REPRESENTING
TRACT NO. 3500
BEING A SUBDIVISION OF A PORTION OF
LOT 1, TRACT NO. 1000
NW CORNER LOT 1
FD 2" IP PER TR 1000
& TRACT 2000
NE CORNER LOT
FD 2" IP PER TR 1000
& TRACT 2000
EAST
30'
MILLER AVE
300.00'
30'
150'
150'
50'
1
14
50'
"
2
13
50'
"
3
12
50'
"
4
11
50'
"
5
10
50'
"
6
9
50'
"
7
8
50'
150'
150'
30'
30'
NORTH
JONES STREET
350'
BROWN STREET
350'
NORTH
30'
30'
N
SCALE
1" = 100'
NW CORNER TRACT 2000
FD 2" IP PER TRACT
NE CORNER TRACT 2000
FD 2" IP PER TRACT
300.00' EAST
NORTH LINE OF TRACT 2000
MB 20-7

PROBLEM A2


MAP REPRESENTING
TRACT NO. 2000
BEING A SUBDIVISION OF A PORTION
OF LOT 1, TRACT NO. 1000
NW CORNER LOT 1
FD 2" IP PER
TRACT 1000
NE CORNER LOT 1
FD 2" IP PER
TRACT 1000
NOT A PART
SET 2" IP
SET 2" IP
EAST
360'
150'
150'
50'
50'
1
16
"
"
2
15
3
14
4
13
5
12
6
11
7
10
8
9
30'
30'
JONES STREET
NORTH
426.25'
400.00'
BROWN STREET
NORTH
76.25'
63.12'
150.57'
150.58'
N
SCALE
1" = 100'
SW CORNER LOT 1
FD 2" IP PER
TRACT 1000
30'
JACKSON AVE
N 85°00'00" E
30'
SE CORNER LOT 1
FD 2" IP PER
TRACT 1000

PROBLEM A3

30 Points

PROBLEM STATEMENT

Your client owns Sections 9 and 16, and the Westerly 4000 feet of Sections 10 and 15, T4S, R23W, S.B.M. You have been asked to provide horizontal and vertical control for the topographic mapping that is to be used for planning purposes. Vertical photography, taken with a 6-inch focal length camera on a 9" x 9" focal plane, is to be used. Analytical bridging is not to be considered.

The following factors control the project. **Make no assumptions.**

1. A 5-foot contour interval is required.
2. Model size is 3.6" x 7.0" for a single flight line and 3.6" x 6.3" for two or more adjacent flight lines.
3. The "C" factor to be used for this project is 1,800'.
4. The map is to be compiled at a 5 to 1 ratio.
5. The average terrain elevation is 2,500' above sea level.
6. The minimum target size to be used for premarking the ground is not to be less than 0.001" x 0.01" at the photo scale.
7. Per a recent Record of Survey, each section has been found to be standard dimensions.

PROBLEM REQUIREMENTS

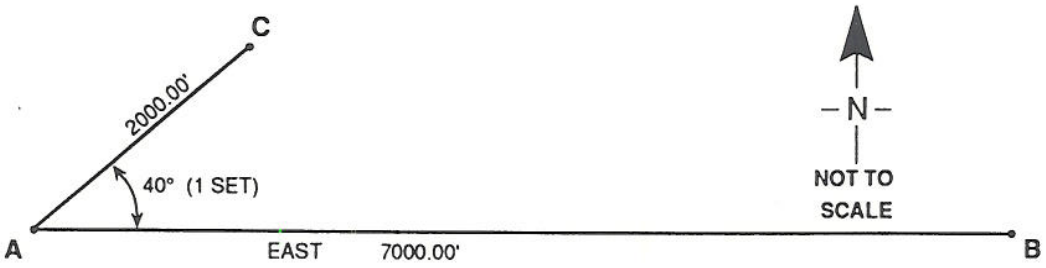
1. Based on the above specifications, determine the following; **show all work.**
   - a. The **minimum** number of flight lines required. — **3 Points**
   - b. The required flying height above sea level. — **3 Points**
   - c. The **minimum** number of models required. — **3 Points**
   - d. The **minimum** number of photographs required. — **3 Points**
   - e. The **minimum** number of horizontal and vertical control stations required to provide for adequate checks. — **5 Points**
   - f. The negative scale. — **3 Points**
   - g. The nominal map scale. — **3 Points**
   - h. The **minimum** length and width of the target placed on the ground as a premark. — **4 Points**
2. Give the accuracy requirements for each of the following based on requirements of the National Map Accuracy standards:
   - a. Contours — **1 Point**
   - b. Spot elevations — **1 Point**
   - c. Planimetric features — **1 Point**

PROBLEM A4

21 Points

PROBLEM STATEMENT

Your measurements to Point C are shown below. A 6" theodolite with a measured standard error of +/– 20" per angle set (direct and reverse) from all sources and an EDM with a standard error of +/– (.02 + 5 PPM) was used.



PROBLEM REQUIREMENTS

1. a. Compute and sketch the standard error ellipse for Point C. Label and dimension the semimajor axis, semiminor axis, and the orientation angle, θ. Assume uncorrelated measurements. **7 Points**

   b. What is the probability that your measured point is within or on the standard ellipse? **3 Points**

   c. What are the dimensions of the semimajor and semiminor axis if you want a probability of 95%? **2 Points**

   d. What is the minimum number of angle sets needed to decrease the semimajor axis to 0.12' on your standard error ellipse? **3 Points**

2. Each of the error ellipses shown in your solution booklet indicates the relative comparative accuracy of establishing a point location with one of the following instrument combinations, A through F. In the spaces provided in your solution booklet, indicate the letter corresponding to the instrument combination that best works with the ellipses.

	Angle Measured With:	Distance Measured With:
A	Transit	EDM
B	Compass	Steel Tape
C	Theodolite	EDM
D	Compass	Gunter's Chain
E	Transit	Steel Tape
F	Theodolite	Steel Tape

Assume the line is 2000' at an azimuth of 45°. **6 Points**

PROBLEM A5

36 Points

PROBLEM STATEMENT

You have been commissioned to survey fractional Section 8, T4S, R6W as shown on the official plat on the facing page, which was approved on April 3, 1893. Your client has requested that all corners be monumented.

PROBLEM REQUIREMENTS

1. Identify the method and the positions and/or monuments you would hold for control to establish each of the corners denoted as **a** through **f** below. No calculations are required.

   a. Southwesterly section corner — **4 Points**

   b. Northwesterly corner of government Lot 2 — **4 Points**

   c. North corner common to government Lots 1 and 2 — **4 Points**

   d. Northeasterly corner of government Lot 1 — **4 Points**

   e. East 1/4 corner — **4 Points**

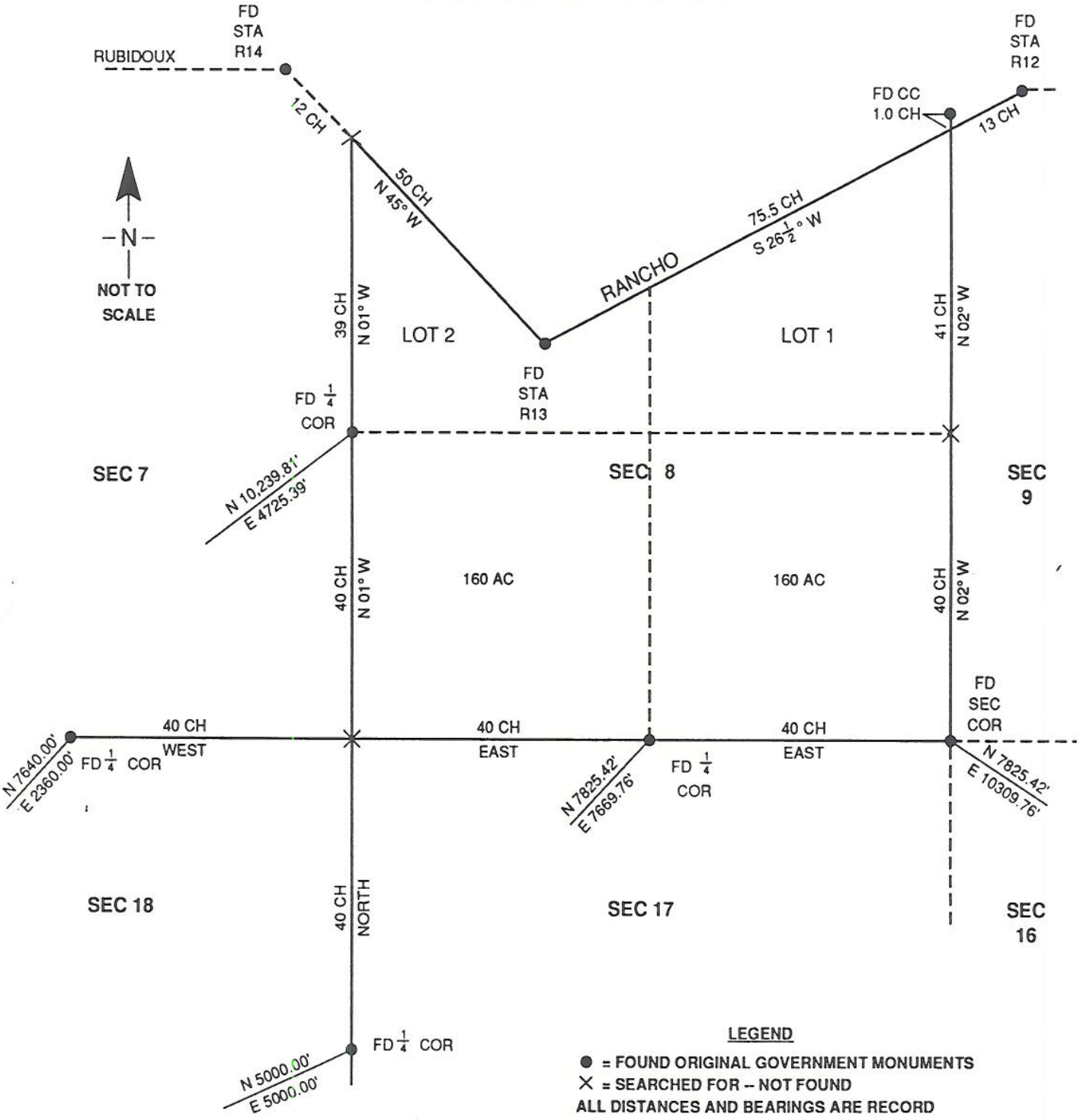
   f. Center 1/4 corner — **4 Points**

2. Cite the governing reference that verifies the method of establishing the corners. — **2 Points**

3. Calculate the coordinates for the Southwesterly corner of Section 8. **Show all work.** — **10 Points**

PROBLEM A5

PLAT APPROVED APRIL 3, 1893



LEGEND

● = FOUND ORIGINAL GOVERNMENT MONUMENTS

× = SEARCHED FOR -- NOT FOUND

ALL DISTANCES AND BEARINGS ARE RECORD