1992 CALIFORNIA PROFESSIONAL LAND SURVEYOR EXAMINATION

SECTION A

109 Points of 222 Total Points
Time Allowed to Complete This Section: 4 Hours

Examination Overview

The 1992 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	Survey Law	14
A2	Boundary	20
A3	Photogrammetry	20
A4	California Coordinates	30
A5	Legal Description	13
A6	Construction	12

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, **when specified, your method of obtaining these answers as demonstrated in your solution.**

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.

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- 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 your identification number and the number of the test problem on every additional sheet you use.
- Number your solution pages 1 of 3, 2 of 3, etc.
- Where provided, use the portion of the grid paper labeled "Work Area" for any necessary computations. Use the portion labeled "Answer(s)" to record any numeric answers.
- 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 (i.e., if two answers are required and three answers are given, only the first two answers listed will be graded).
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PROBLEM A1

14 Points

PROBLEM STATEMENT

The following statements are based upon California law. Disregarding local ordinance where applicable, use the form in your Solution Booklet to circle True or False and cite a statute and section reference to support your decision for each statement. Both a T/F answer and a citation are required for credit.

PROBLEM REQUIREMENTS

1. A conveyance of land in fee to a governmental entity for road right-of-way shall be considered a division of land. 1 Point

2. All maps, plats, reports, descriptions, or other documents issued by a licensed land surveyor must be signed, sealed or stamped, and the expiration date of the license indicated. 1 Point

3. A corner record shall be filed for every corner established or restored for corners established by the survey of public lands of the United States. 1 Point

4. Except when filing a final or parcel map, a Record of Survey may be filed when a surveyor sets points or lines of any parcel described in any recorded deed or other instrument of title that is not shown on any subdivision map, official map, or Record of Survey. 1 Point

5. A tentative map shall expire 24 months after approval if a time extension is not approved. 1 Point

6. A Certificate of Correction may amend a final map for monuments set by a replacement surveyor. 1 Point

7. Only the owner, surveyor, county surveyor, and county recorder are required to sign statements on a Record of Survey. 1 Point

8. Additional information, such as flood hazard zones, required to be filed with an approved map shall be shown on the Subdivision Map Sheet. 1 Point

9. A Record of Survey may not show the division of a parcel of land shown on the latest adopted county assessment roll as a unit or as contiguous units unless there is attached thereto a certificate stating compliance with state and local ordinances regarding subdivisions. 1 Point

10. A parcel map, when compiled from record, must show at least two lines of the boundary as being monumented, but no survey need be made of those lines. 1 Point

11. A subdivision map filed for a condominium project must show the manner in which the airspace or buildings are to be divided. 1 Point

PROBLEM A1
14 Points

PROBLEM REQUIREMENTS (continued)

12. The county surveyor can require a licensed surveyor to revise a Record of Survey Boundary Establishment if he or she does not agree with the establishment. 1 Point

13. A licensed surveyor does not have the right of entry to utilize boundary or control monuments within access-controlled portions of freeways. 1 Point

14. A recorded final map, parcel map, official map, or an approved Certificate of Exception shall constitute a Certificate of Compliance. 1 Point

PROBLEM A2

20 Points

PROBLEM STATEMENT

The tract of land denoted on the sketch on the following page was owned entirely by Mr. Smith. Mr. Smith has conveyed three portions: one to Mr. Jones, one to Mr. Adams, and the other is now to be conveyed to Mrs. Brown. The sketch shows the record and measured information as well as the monuments found. The Jones' and Adams' properties are described as denoted on the sketch; Mrs. Brown's land is described as follows:

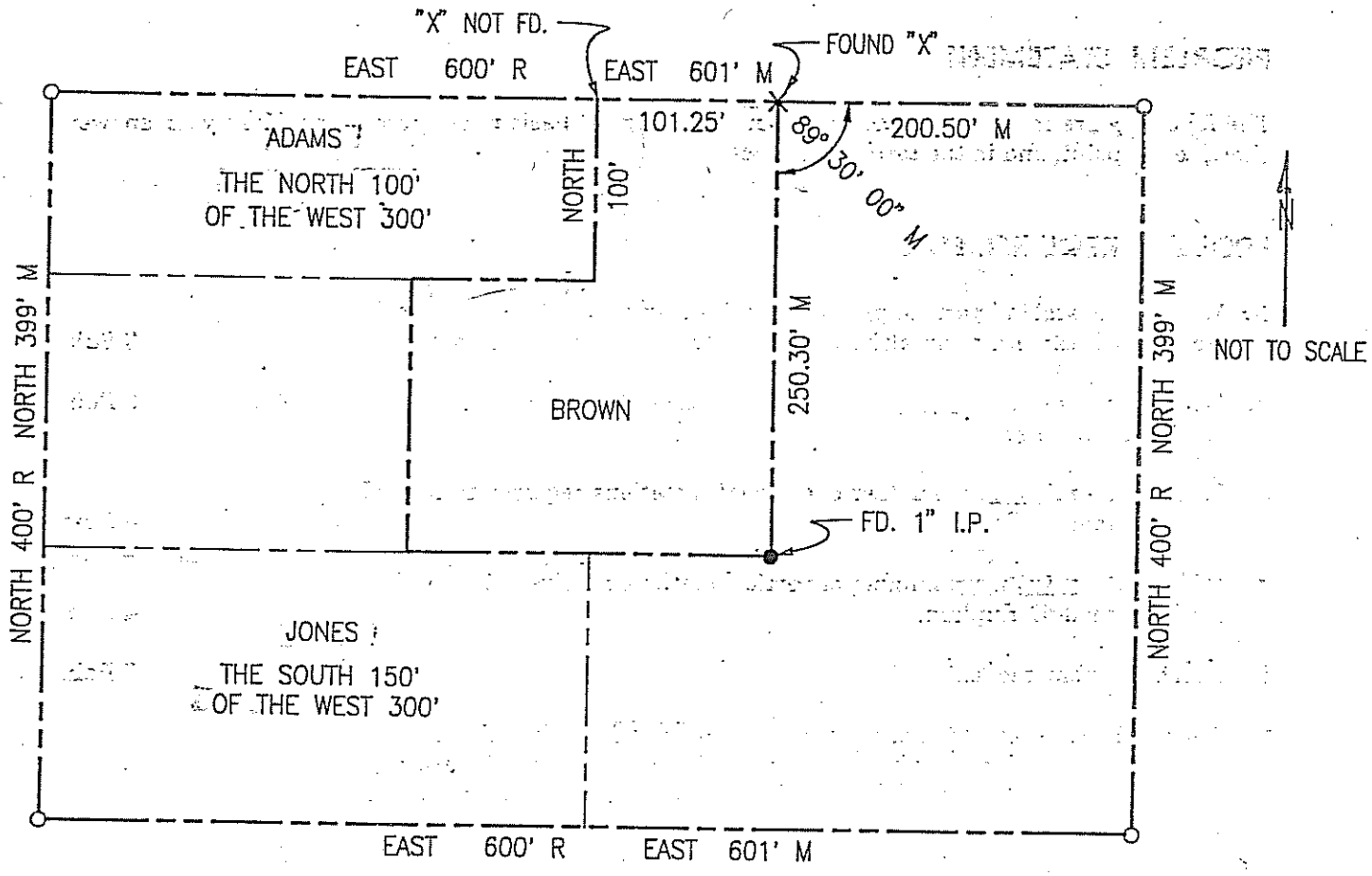
Beginning at a chiseled "X" from which the Northeast corner of the Smith land bears East 200 feet; thence South at right angles 250 feet to a one-inch iron pipe; thence West 100 feet to the Northeast corner of the land conveyed to Mr. Jones; along Mr. Jones' Northerly line 101 feet; thence, North 150 feet; thence, East 100 feet; thence North 100 feet to a chiseled "X" on the North line of the Smith land; thence East 100 feet to the point of beginning.

There are no established lines of occupation.

PROBLEM REQUIREMENT

Describe the elements controlling the establishment of each of Mrs. Brown's property lines. **20 Points**

PROBLEM A2



L E G E N D

- o DENOTES FOUND ORIGINAL PROPERTY CORNER
- ● DENOTES FOUND 1" IRON PIPE
- X DENOTES FOUND CHISELED "X"

PROBLEM A3

20 Points

PROBLEM STATEMENT

The following are intended to measure your knowledge of basic photogrammetry. Keep your answers short, to the point, and in the correct sequence.

PROBLEM REQUIREMENTS

1. What is the scale of vertical photography if taken with a 6-inch focal-length camera at an altitude of 4,500 feet above mean terrain? 3 Points

2. What is the absolute <u>minimum</u> number of exposures required for a single flight line? 3 Points

3. What is the <u>minimum</u> number of horizontal stations required to control a single model? Explain. 4 Points

4. What is the <u>minimum</u> number of vertical stations required to control a single model? Explain. 4 Points

5. Define a "neat model." 3 Points

6. The mean elevation of the terrain being mapped is 1,600 feet above sea level (ASL). Vertical photography is taken with a 6-inch focal-length camera at an ASL elevation of 4,000 feet. What is the nominal map scale utilizing an 8 to 1 plotting ratio? 3 Points

PROBLEM A4

30 Points

PROBLEM STATEMENT

You have been asked to locate a microwave tower (shown as B on the sketch on the following page). The only available control is a first order triangulation station at A. From each end of line AB you measured its length and determined its azimuth by astronomic observation. Your second microwave tower is at C. Its position was located earlier using GPS. Assume all data is California Coordinate System, Zone 2, NAD27 Adjustment (CCS27). In solving the Problem Requirements below, make no additional assumptions.

PROBLEM REQUIREMENTS

1. Compute the CCS27, Zone 2, coordinates of A. — 4 Points

2. Compute the CCS27, Zone 2, coordinates of B. — 4 Points

3. Compute the standard error of the coordinates of B. — 6 Points

4. Compute the geodetic azimuth of line BC assuming that the coordinates of B are:

   N = 321,816.00'
   E = 2,164,730.00'

   — 4 Points

5. a. What is the reference ellipsoid for CCS27 and its extent? — 1 Point

   b. What is the reference ellipsoid for CCS83 and its extent? — 2 Points

   c. Can points in CCS27 be transformed to CCS83 by a simple four parameter (scaling, rotation, translation in N and E) transformation? Give one reason for your answer. — 2 Points

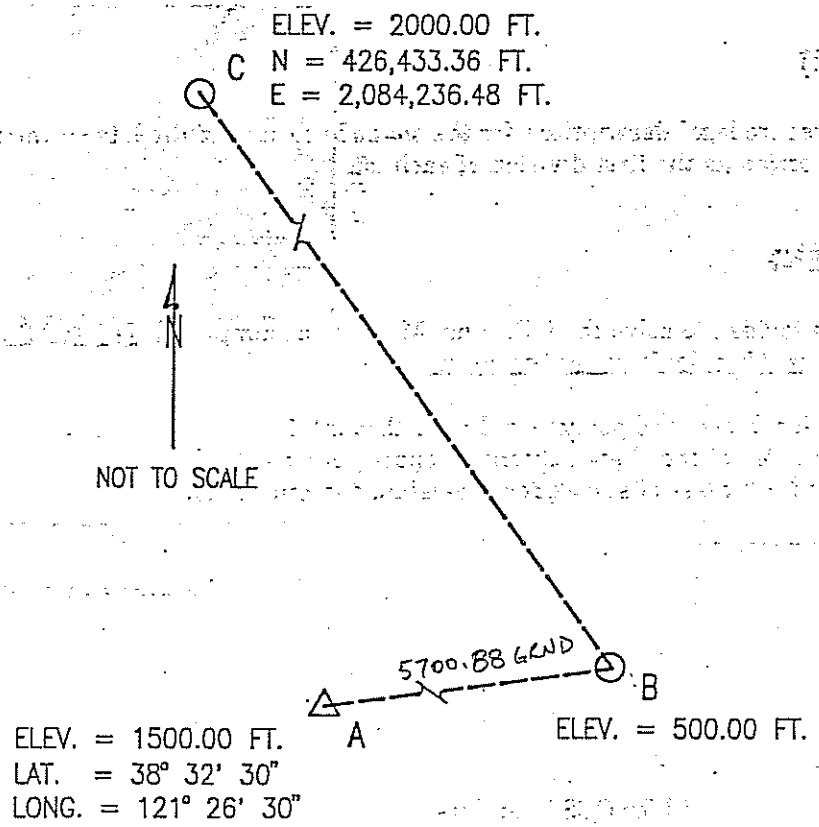
   d. When will use of CCS83 be required for new projects? — 1 Point

6. a. What is the minimum number of satellites that must be observed for control survey purposes to establish a horizontal position for a point? — 2 Points

   b. When a GPS receiver's position is being determined, what is actually being measured? — 2 Points

   c. GPS measurements are sometimes made on two frequencies. What is the reason for doing so? — 2 Points

PROBLEM A4



OBSERVED DATA

DIST. AB = 5700.98' ± 0.03'
DIST. BA = 5700.78' ± 0.03'
AZIM. AB = 62° 30' 22" ±5"
AZIM. BA = 242° 30' 28" ±5"

- ASSUME ALL APPROPRIATE CORRECTIONS HAVE BEEN MADE TO OBSERVED DATA.
- DISTANCES ARE HORIZONTAL.

PROBLEM A5

13 Points

PROBLEM STATEMENT

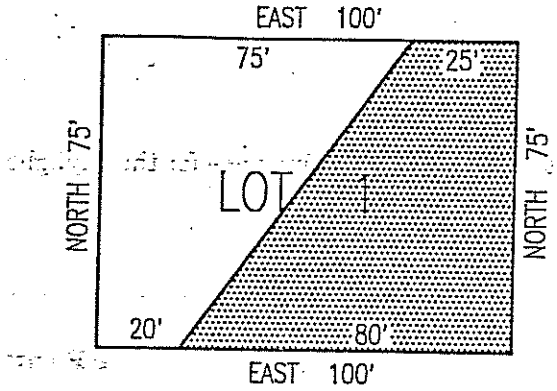
You have been asked to prepare legal descriptions for the shaded portions of the lots on the following page. Treat each shaded portion as the first division of each lot.

PROBLEM REQUIREMENT

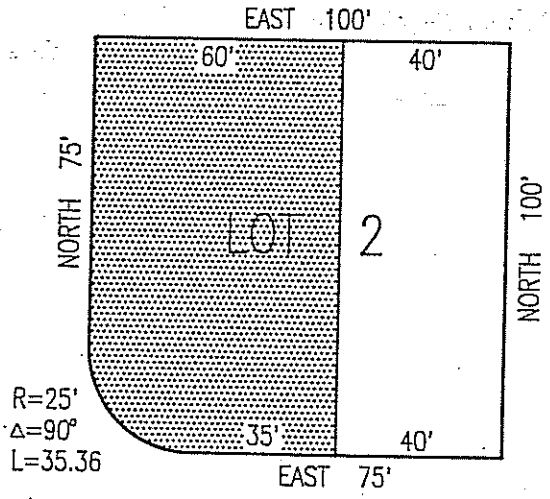
Use only the information provided to solve the following. Make no assumptions. DO NOT write a caption for your description. No calculations are required.

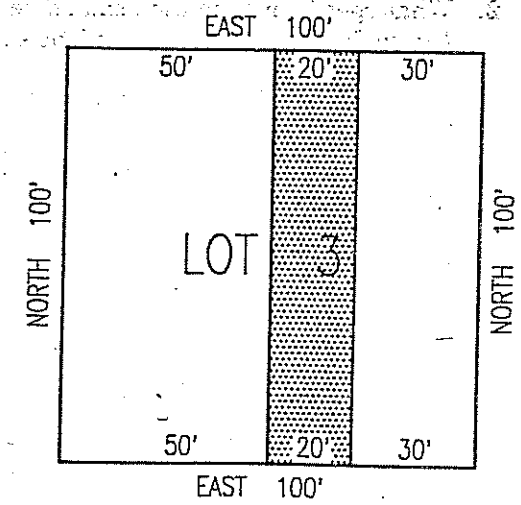
Prepare legal descriptions for the shaded portions of Lots 1 through 5.
The shaded areas of the lots depict the client's intent. Prepare your legal descriptions to ensure this regardless of subsequent re-establishments of lots. 13 points

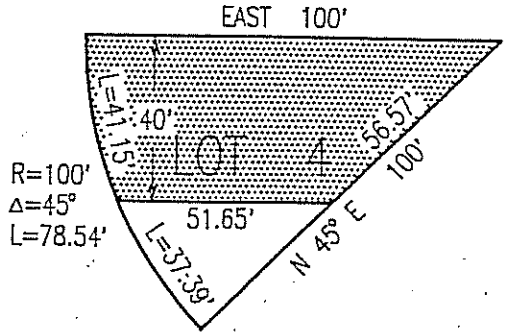
PROBLEM A5

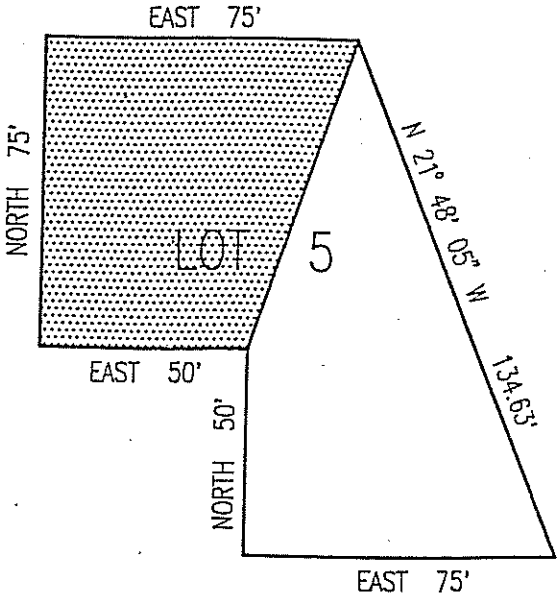


NOT TO SCALE





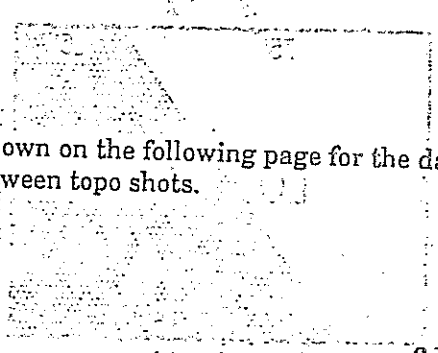




PROBLEM A6

12 Points

PROBLEM STATEMENT



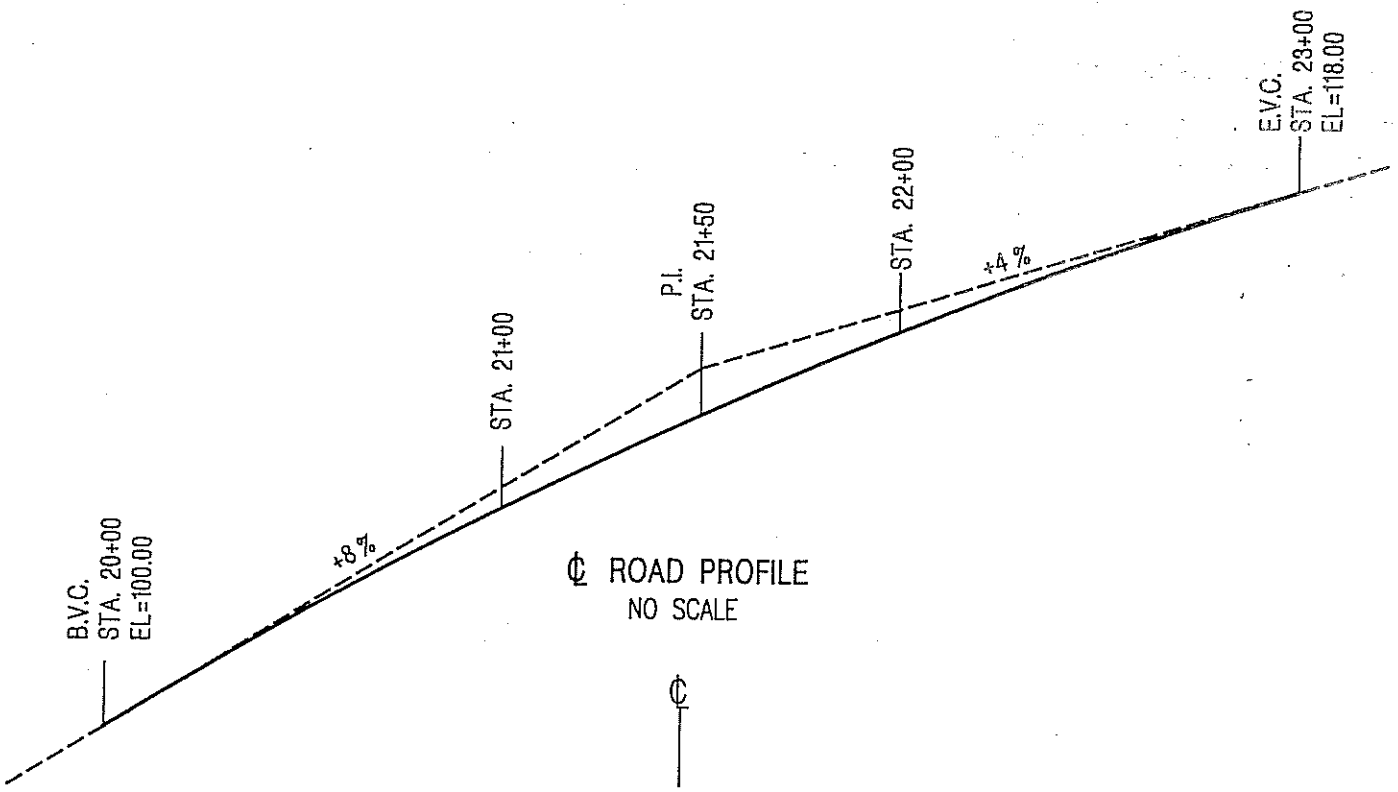
You have been asked to set a slope stake at a 5-foot offset as shown on the following page for the daylight cut at Station 21+00. Assume the slope has a uniform grade between topo shots.

PROBLEM REQUIREMENTS

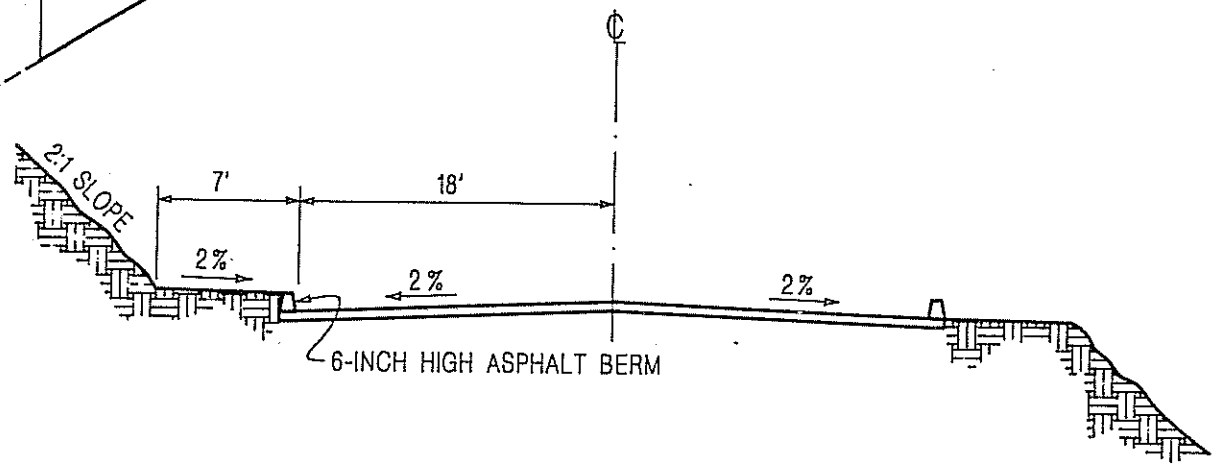
1. Determine the following for Station 21+00: **6 Points**
   a. centerline elevation
   b. hingepoint elevation (toe of 2:1 slope)
   c. distance left from centerline for offset stake

2. What specific information should be put on the stake for Station 21+00 to construct the daylight cut and the toe of the slope indicated above? **6 Points**

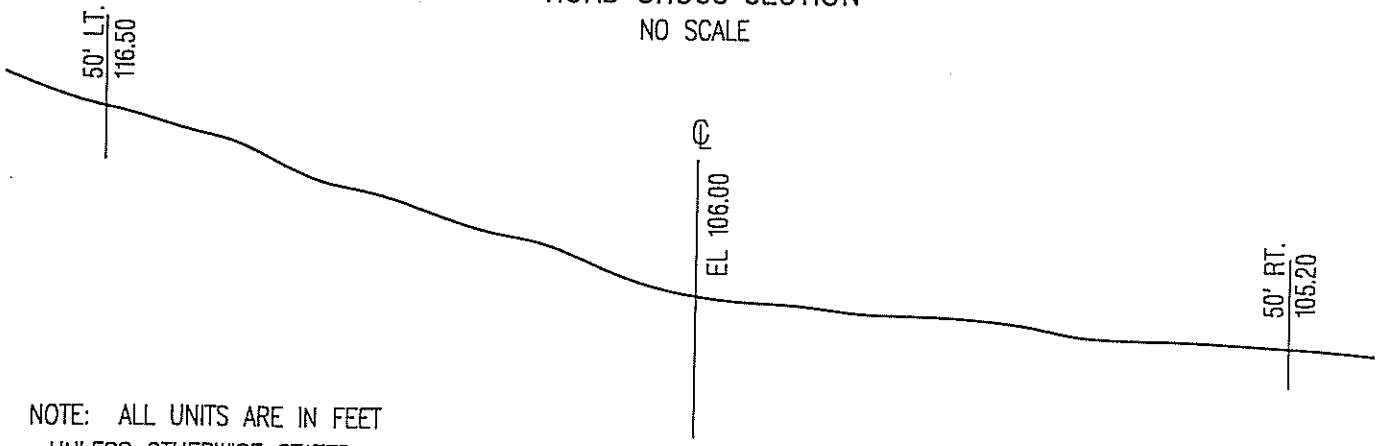
PROBLEM A6



℄ ROAD PROFILE
NO SCALE



ROAD CROSS SECTION
NO SCALE



NOTE: ALL UNITS ARE IN FEET
UNLESS OTHERWISE STATED.

EXISTING GROUND AT STA. 21+00
NO SCALE

SECTION B

113 Points of 222 Total Points
Time Allowed to Complete This Section: 4 Hours

Examination Overview

The 1992 California Professional Land Surveyor examination is given in two, 4-hour periods on the same day. Section B is the second section of this two-part examination. Section B consists of the following:

Test Problem No.	Subject Matter	Point Value
B 1	ALTA Survey	28
B 2	Description Analysis	30
B 3	Public Lands	30
B 4	Astronomy	25

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PROBLEM B1

28 Points

PROBLEM STATEMENT

You have entered into a contract with your client to perform an American Land Title Association (ALTA) survey on Lots 9, 10, 11, and 12 of Tract No. 1942 and to replace any missing property monuments.

The plat on page 3 shows the results of your field survey.

Your client has provided you with a copy of a current Preliminary Title Report covering this property.

PROBLEM REQUIREMENTS

Show all plotting and resulting calculations on the plat in your Solution Booklet.

1. Calculate the missing bearings and distances of your client's property. 5 Points

2. Plot the following easements described in the Preliminary Title Report. Show bearings and distances, as necessary, to relate the easements to your survey. 8 Points

   a. An easement for telephone vault purposes described as follows:

      Said easement shall provide three feet clearance measured at right angles to the exterior sides of telephone facilities installed on said Lot 9 of Tract No. 1942.

   b. An easement for open space purposes described as follows:

      Beginning at the Southeast corner of said Lot 12; thence
      North along the Easterly line thereof 15.00 feet; thence
      South 71° 39' 56" West 19.00 feet; thence
      South 86° 18' 35" West 15.00 feet; thence
      South 51° 07' 35" West 13.00 feet to the Southerly
      line of said Lot 11; thence East to the point of beginning.

   c. An easement for sewer purposes over the Westerly 5.00 feet of the Southerly 50 feet of Lot 13 of said Tract No. 1942. (This easement is a portion of the legal description of your client's property and is a private easement between your client and the owner of Lot 13.)

(Continued on Next Page)

PROBLEM B1

28 Points

PROBLEM REQUIREMENTS (continued)

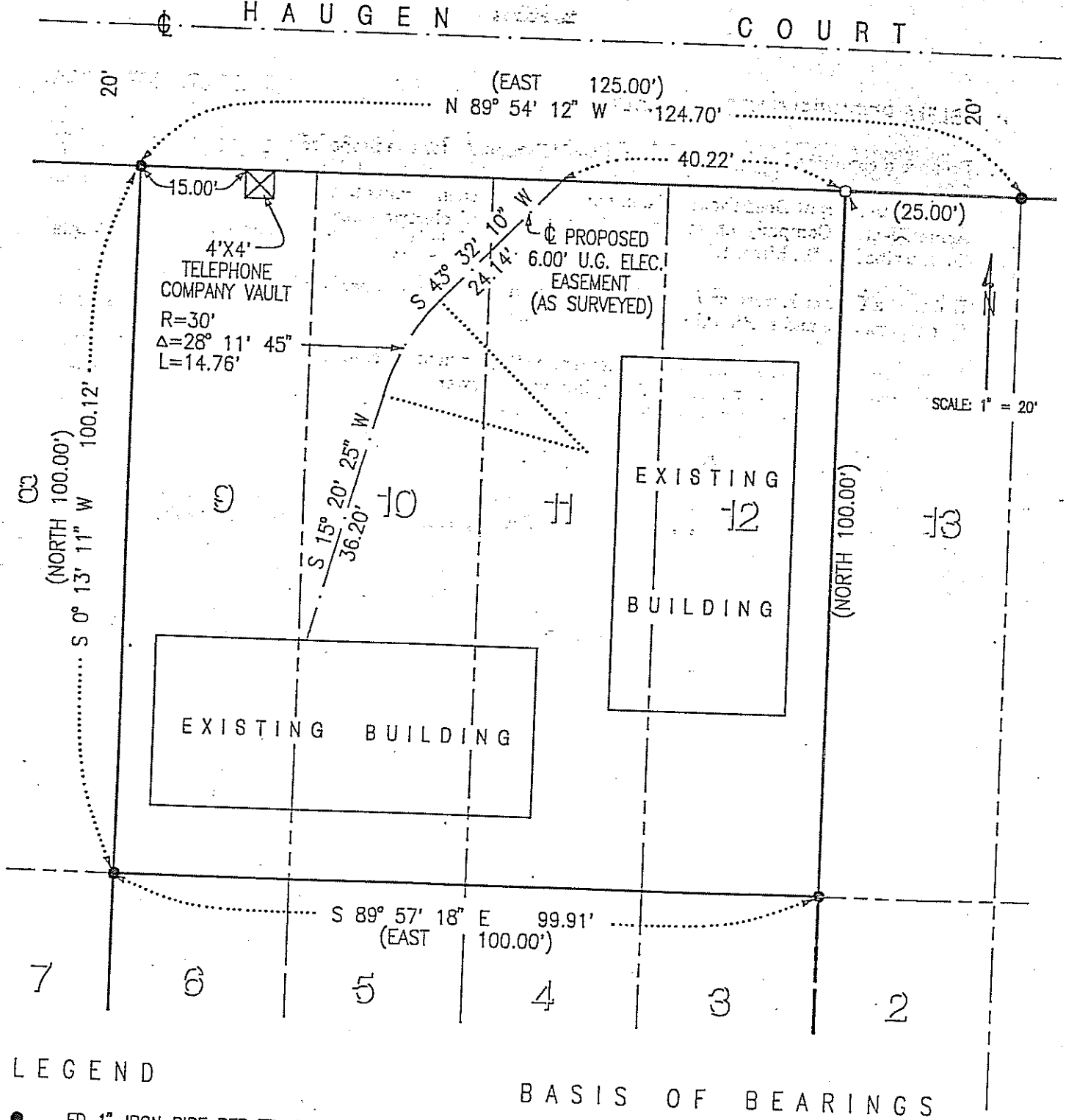
3. Prepare a complete legal description entitled "Exhibit A" for the proposed 6.00 foot underground electric easement. The legal description will be attached to a Grant Deed that reads, in part, that your client grants to the Acme Electric Company an easement for underground electric lines as described in "Exhibit A." **12 Points**

4. Is either a Corner Record or Record of Survey required by state law? Cite the statute and section that verifies your answer. **1 Point**

5. Is the owner of Lot 13 the dominant tenement or the servient tenement with respect to the sewer easement? Explain your answer. **2 Points**

(See Plat on Next Page)

PROBLEM B1



LEGEND

- ● FD 1" IRON PIPE PER TRACT 1942
- o SET 3/4" X 18" IRON PIPE TAGGED LS XXXX
- ( ) RECORD VALUE PER TRACT 1942

BASIS OF BEARINGS

THE BASIS OF BEARINGS OF THIS SURVEY IS THE WEST LINE OF TRACT 1942 "NORTH" (NOT SHOWN ON SKETCH)

AN ALTA SURVEY OF LOTS 9, 10, 11 AND 12 OF ARNESON'S ADDITION PER TRACT 1942, BOOK 8, PAGE 12, COUNTY OF TESTING

PROBLEM B2

30 Points

PROBLEM STATEMENT

You have been provided with the written description below for a parcel for which you are to perform a boundary survey. Prior to your field work you review the description for any course, distance, or deed calls that may be in conflict with others in the description.

Description

Preamble:

All that parcel of land located in Section 4, T14S, R6E, SBM, California, according to the United States Township Plat, dated December 1893, more particularly described as follows:

1. Beginning at the Southeast corner of Section 5, T14S, R6E, SBM;
2. thence N 0° 3' E along the East line of said Section 5, 820.23 feet to the centerline of Rocky Creek;
3. thence along said creek the following courses N 30° 30' E 55.3 feet, N 35° 10' E 27.6 feet, N 44° 15' E 30.3 feet to the Southerly line of Greene's land, described in Book 22, Page 11, of Official Records of Riverside County;
4. thence leaving said creek East 706.23 feet along said Southerly line to the Westerly line of Smith's land, described in Book 23, Page 10, of Official Records of Riverside County, California;
5. thence Southerly 200 feet along the Westerly line of Smith's land to the Southwest corner of Smith's land;
6. thence due East along the Southerly line of Smith's land to a 2-inch iron pipe on the North-South centerline of Section 4;
7. thence Southerly along said North-South centerline to the Northwesterly line of a county road, known as Miller's Road, 40 feet in width;
8. thence S 45° W along said Northwesterly line of a county road 300.00 feet;
9. thence S 89° 30' W 500.00 feet;
10. thence S 80° 0' W to the point of beginning.

PROBLEM REQUIREMENT

Each course in the description has been numbered. One or more conflicts may exist for each numbered course. Arrange your answers numerically to correspond to the number of the course in the description provided. Answer the following for each conflict found in the numbered course. Make no assumptions. No calculations are required.

(Continued on Next Page)

PROBLEM B2

30 Points

PROBLEM REQUIREMENT (continued)

If you believe that no conflict exists in a course, state "none" for your answer.

1. For each numbered course, state which bearing, distance, or deed call may be in conflict with another and, if a conflict exists, state what would be the controlling call. **30 Points**

PROBLEM B3

30 Points

PROBLEM STATEMENT

The plat of a portion of Township 2 South, Range 2 East, on the following page has been annotated to indicate found original U.S. Government monuments as well as those that are verified as lost. All of the found monuments match the descriptions contained in the notes of the original survey. Closing Corner 6 was found to be off line and Standard Closing Corner 10 was found to be on line per subsequent resurvey of the township line. All lines and positions were found to be within allowable limits.

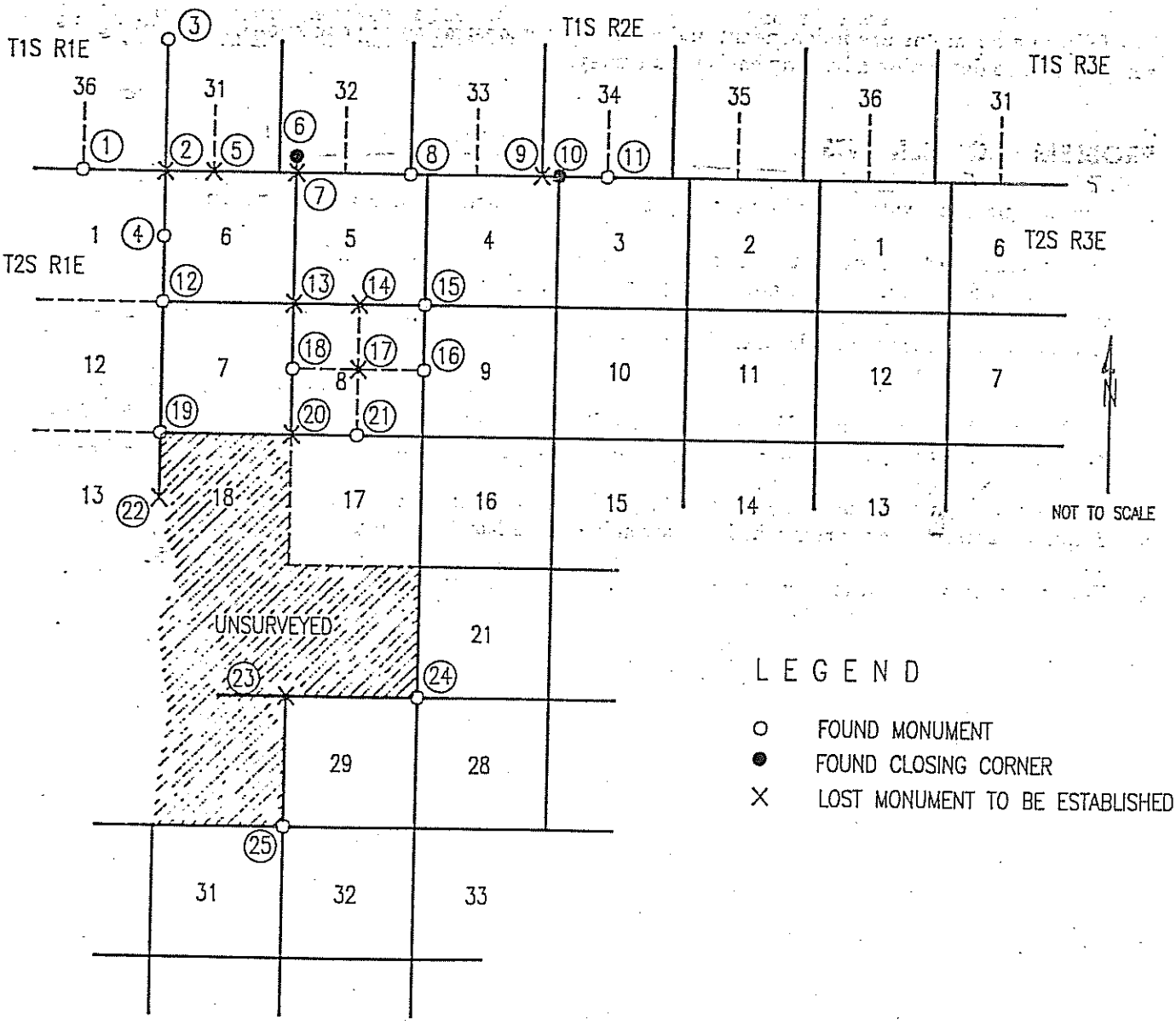
PROBLEM REQUIREMENTS

Solve the following requirements. Make no assumptions beyond that which is provided.

1. Describe how to perform:
   a. Double proportionate measurement. — 5 Points
   b. Single proportionate measurement. — 2 Points
2. Explain the method and list the controlling corners you would use to establish the positions listed: 2, 5, 7, 9, 13, 14, 17, 20, 22, and 23. — 15 Points
3. What record must be filed to meet the requirements of the Land Surveyor's Act in the cases above? — 1 Point
4. What is the difference between the terms "corner" and "monument"? — 4 Points
5. List three methods that you would employ prior to resorting to double proration to reset missing corners for interior sections. — 3 Points

PROBLEM B3

PLAT



PROBLEM B4

25 Points

PROBLEM STATEMENT

The following questions are independent and require a demonstration of your knowledge in using the sun or a star to determine a bearing basis for a survey.

PROBLEM REQUIREMENTS

Answer the questions with a brief sentence and show your calculations if any are required.

1. An observation on the sun is taken on Thursday, April 2, at 5:05:30.2 P.M. Pacific Standard Time (120 degrees West longitude). Afterward you turn to the radio time station and determine your observation clock to be 2.6 seconds fast and also note three double ticks between the ninth and the fifteenth second after the minute tone.

   a. What is the Coordinated Universal Time (UCT) time and date? 2 Points
   b. What is the correct UT1 time after applying the DUT correction? 2 Points

2. Precise time is not available. Name a stellar body and time to observe to obtain an astronomic bearing within 10 seconds of true North in North America. 2 Points

3. The following observations are recorded. Determine which one is inconsistent with the remaining shots.

	Time	Clockwise Horizontal Angle
a.	9:05:01	40° 10' 15"
b.	9:06:20	40° 12' 05"
c.	9:07:10	40° 13' 17"
d.	9:08:40	40° 14' 18"

3 Points

4. The star Sirius is observed for a basis of bearing using the Altitude method. The measured vertical angle is +45° 10' 10". The elevation is 1000-feet above sea level and the temperature is 60° F. What is the correction for parallax to be applied to the vertical angle? 2 Points

5. A horizontal clockwise angle of 135° 30' 30" is measured to the trailing edge of the sun. The vertical angle to the center is +38° 25' above the horizon. The sun's semi-diameter is 16' 45". What is the correct horizontal angle to the center of the sun? 3 Points

6. At a latitude of 40° 42' North, a Polaris observation is taken from which a traverse is run due West 6,000 feet. A second Polaris observation is then taken. Compute the correction of meridian convergence for the second observation. 4 Points

PROBLEM B4

25 Points

PROBLEM REQUIREMENTS (continued)

7. A solar observation is taken at 120° 15' 45" West longitude. Determine the Local Hour Angle of the sun at 12:00:00 UT1 on January 1, 1990, given:

Date	GHA(Sun)
January 1, 1990	179° 10' 39.5"
January 2, 1990	179° 03' 33.8"

3 Points

8. Given the following calculated azimuths of a line, determine the answers to a and b below.

Azimuths

1. 40° 21' 10"
2. 40° 21' 12"
3. 40° 21' 05"
4. 40° 20' 55"
5. 40° 20' 58"

a. The standard deviation of the set — 2 Points
b. The 90% error of the mean — 2 Points