

LAND SURVEYOR EXAMINATION - 1987 2/20/87

EXAMINATION ID NUMBER _____

PART A - 42.5 POINTS

TIME ALLOWED TO COMPLETE THIS SECTION - FOUR HOURS

WORKBOOK INSTRUCTIONS

This examination is given in two, four-hour periods on the same day. The subject matter relates to the principles and practice of land surveying. Part A is the first section of this two-part examination. **YOU ARE ASKED TO CONCENTRATE YOUR WORK ON THOSE PROBLEMS IN WHICH YOU MAY DO WELL. ALTHOUGH ALL PROBLEMS SHOULD BE ATTEMPTED, YOU ARE NOT EXPECTED TO EXCEL IN ALL OF THEM.**

Each test item is contained in a separate folder appropriately marked on the front. Your answers must be completed on the grid paper provided within each folder. **IMPORTANT: ALL GRID SHEETS MUST BE CONTAINED IN THE APPROPRIATE FOLDER WHEN YOU TURN IN YOUR EXAMINATION.** If you need additional grid sheets, ask your proctor. Be sure to secure these additional pages within the appropriate folder.

Enter your identification number in the upper right-hand corner on **EACH PAGE** of the answer sheets where space is provided and **INDICATE THE APPROPRIATE PROBLEM NUMBER.** Do not write your name on any part of this examination.

Show all work in the folder provided for each problem. **ANY WORK NOT CONTAINED IN THE APPROPRIATE FOLDER WILL NOT BE SCORED.** Use one side of the page and do not put more than one problem in a folder. Be sure to mark your pages 1 of 3, 2 of 3, etc. any work you do not want scored must be clearly lined through and marked "VOID" across it. Delineate the voided part clearly. Do not write in the margin on the right-hand side of the grid sheets.

Your work is a Land Surveyor report. Your solutions, findings, and statements should be arranged in an orderly manner which is organized and legible.

After you have completed this portion of the examination, check your work, assemble the folders containing your answer sheets, and turn it in to your proctor.

This portion of the Land Surveyor Examination consists of the following:

<u>Test Item No.</u>	<u>Subject Matter</u>	<u>Weight</u>	<u>Pages</u>
A1	Construction/Vert Curve	5.0	_____
A2	Geodetic/Theory	10.0	_____
A3	Public Lands	12.5	_____
A4	Boundary/Subdivision	10.0	_____
A5	Legal Description	5.0	_____

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Problem A1 Wt. 5 points

PROBLEM STATEMENT

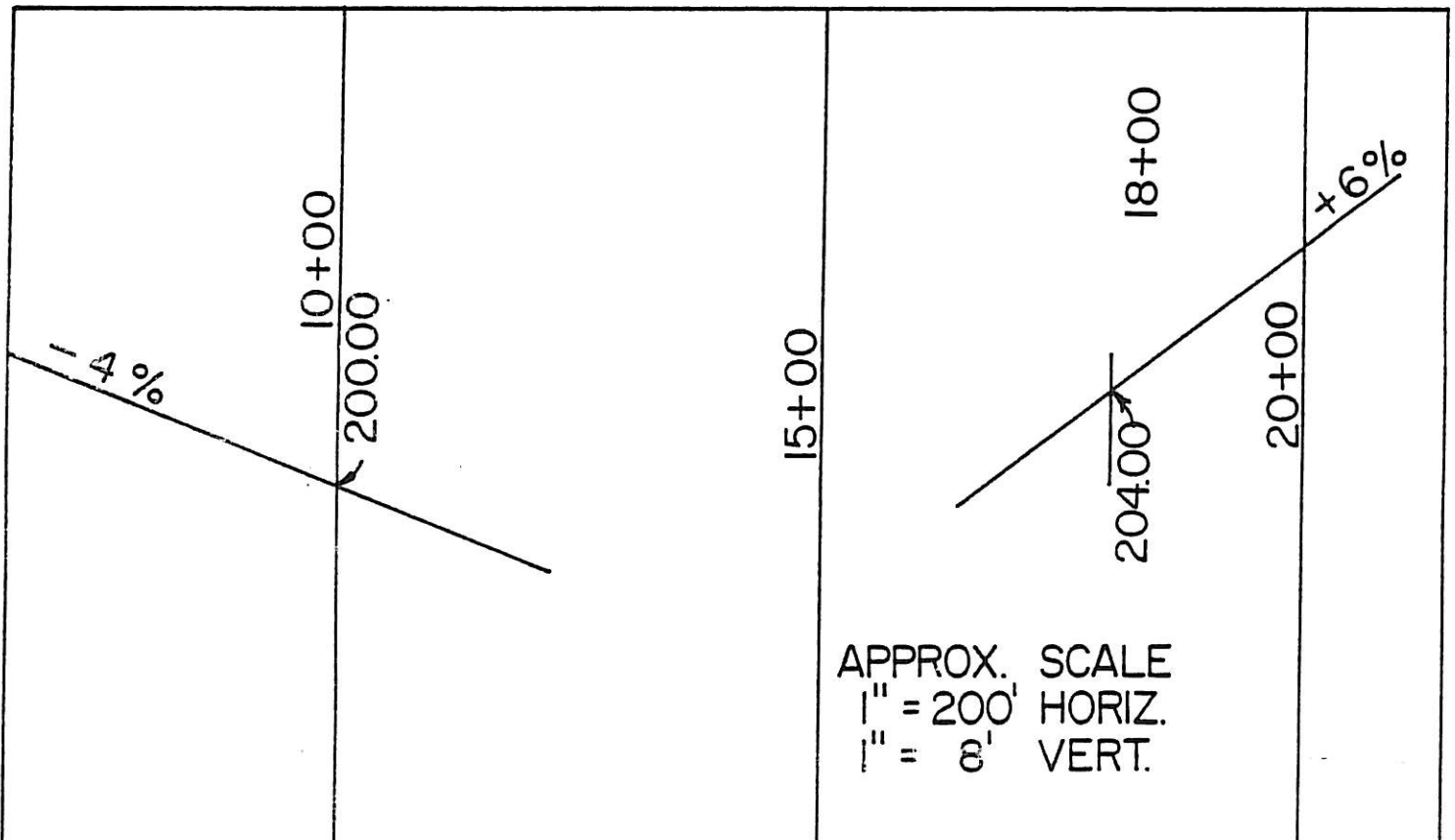
For a county road profile, a tangent of -4% passes through station $10+00$ at elevation 200.00 and intersects a tangent of $+6\%$ which passes through station $18+00$ at elevation 204.00 .

REQUIRED

Compute a symmetrical 200 -foot vertical curve connecting the two tangents.

Full credit given for work shown with correct answer. Half credit given for correct answer with no work shown. Partial credit given for correct method with incorrect answer.

- a) What is the station of the VPI?
- b) What is the elevation of the VPI?
- c) What is the elevation of the MVC?
- d) What is the station of the BVC?
- e) What is the elevation of the BVC?
- f) What is the station of the EVC?
- g) What is the elevation of the EVC?



Problem A2 - Wt. 10.0 points

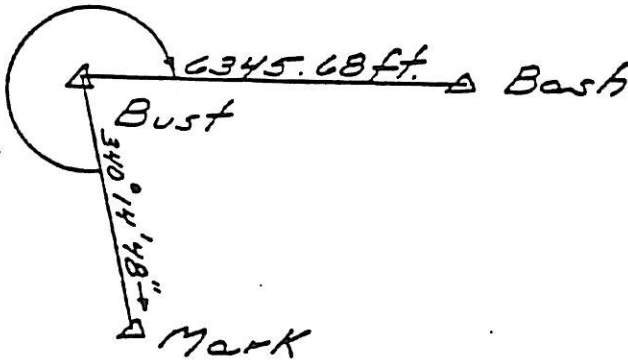
PROBLEM STATEMENT

The length of line from Bust to Bash, measured with an EDM, and corrected for slope, elevation and scale factor is 6345.68 feet. The standard error of the EDM equipment is ± 0.02 ft. ± 3 ppm. The observed clockwise angles at Bust, turned from Mark to Bash are shown below.

REQUIRED

Determine the Zone 5 coordinates of Bash and their probable error (i.e., $N = \text{xxxx.xx} \pm .\text{xx}$, $E = \text{xxxx.xx} \pm .\text{xx}$).

Assume the coordinates of Bust to be fixed. Show all calculations and formulae used.



	Observed Angles		
	Mark		Bash
1.	290°	36'	45"
2.	290°	36'	49"
3.	290°	36'	42"
4.	290°	36'	43"
5.	290°	36'	46"
6.	290°	36'	48"

Zone 5 Constants

C.M. = $118^{\circ} 00' 00''$
 C = 2,000,000
 $k = .57001 19219$

Station Bust

Latitude = $35^{\circ} 40' 47.076''$ N
 Longitude = $116^{\circ} 09' 42.671''$ W
 Northing = 798,283.13
 Easting = 2,545,947.50
 Geodetic azimuth to Mark, measured from the South, is $340^{\circ} 14' 48''$.

Problem A3 - Wt. 12.5 points

PROBLEM STATEMENT

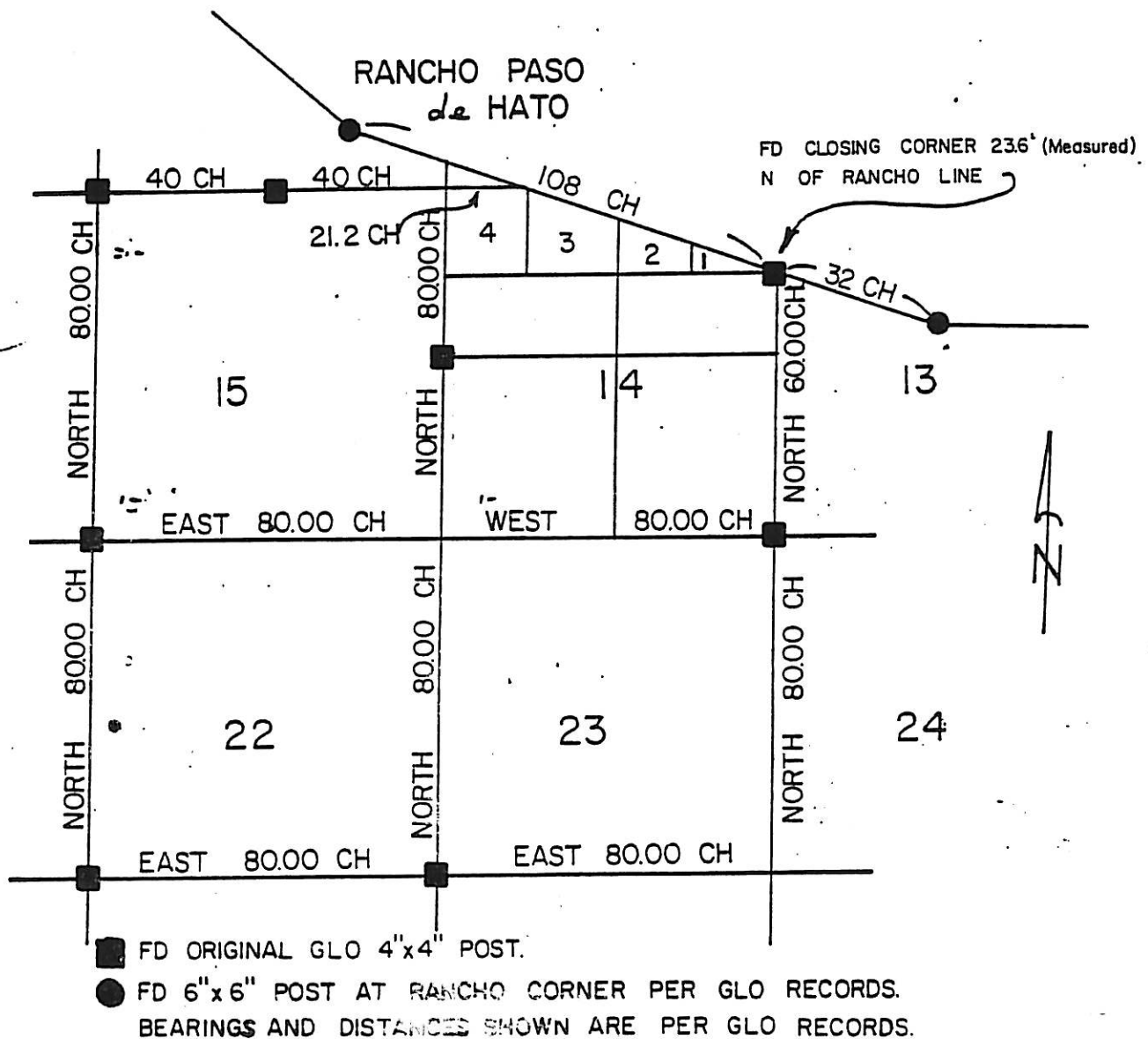
You are doing a boundary survey of Government lots 3 & 4 and the SE 1/4 of the NW 1/4 of Section 14 T12N, R15W, SBB&M.

GIVEN

All measured and record information for Section 14 as shown on the sketch below. All other corners necessary for the establishment of the boundary were searched for and determined to be lost.

REQUIRED

Indicate all of the corners that need to be established in order to determine your boundary and explain how you would determine those corners. If proportioning is used, show the elements of the proportioning.



Problem A4 - Wt. 10.0 points

PROBLEM STATEMENT

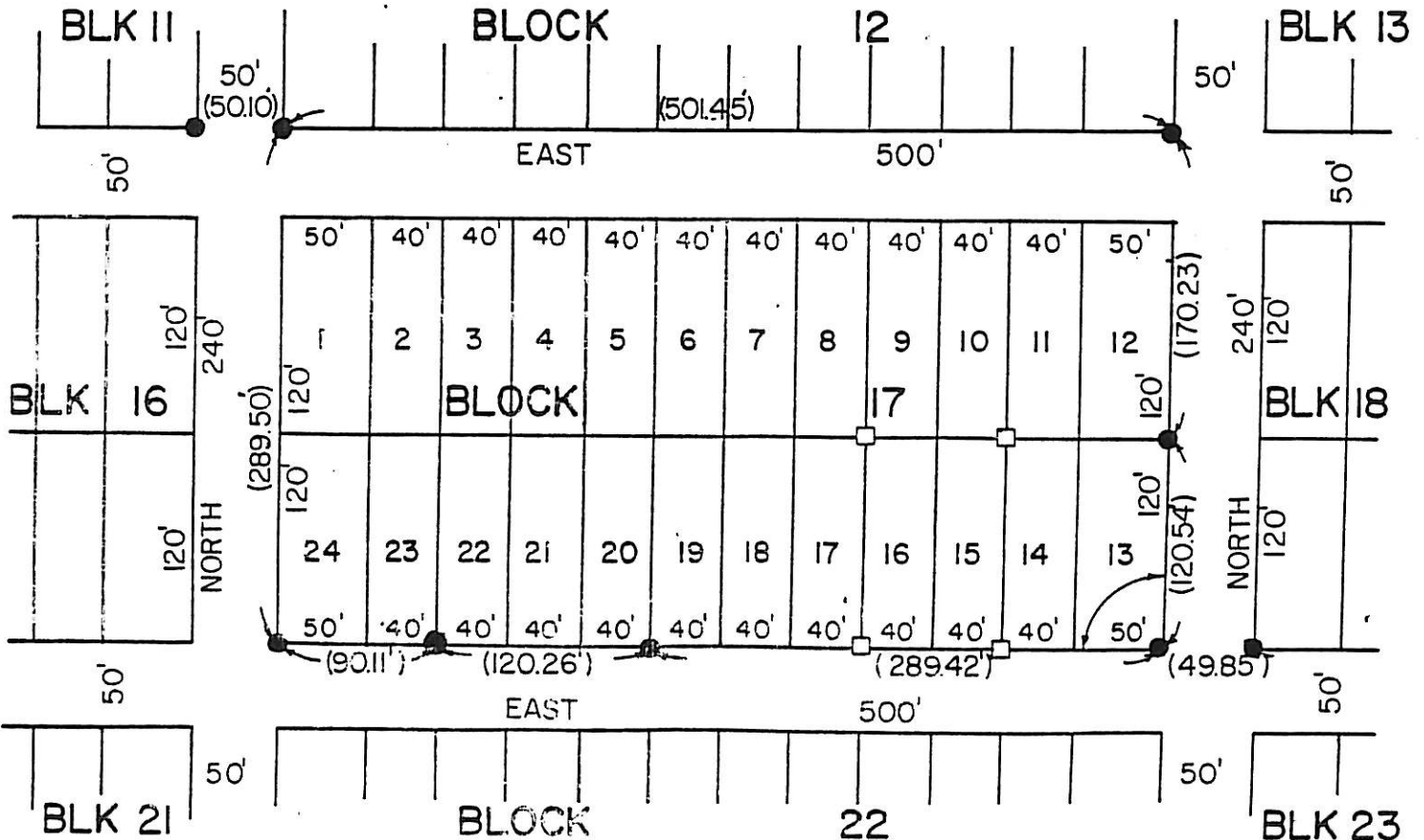
You have contracted to survey and monument the exterior corners of your clients building site which encompasses both Lots 15 and 16 in Block 17 of a subdivision which was first surveyed in 1932.

Upon your first visit to the site, you discover that there are no improvements in Block 17 and that someone has been using the entire block for a vegetable garden which has resulted in the destruction of most of the property corners. Through a very thorough search, you have recovered all of the remaining original undisturbed monuments in and adjacent to Block 17. These monuments are shown on the attached sketch with your measurements between them, shown in parentheses. The angle you measured at the southeast corner of the block is $89^{\circ} 52' 40''$. All other dimensions and directions shown on the sketch are from the original map.

REQUIRED

- a) Describe the steps you will take to fulfill your contract and legal obligations.
- b) Show the equations necessary to determine the corner positions; **DO NOT** compute the bearings or lengths of the sidelines of Lot 15 and 16.

- INDICATES FOUND UNDISTURBED ORIGINAL MONUMENTS
- INDICATES MONUMENTS TO BE SET BY YOUR SURVEY
- () INDICATES YOUR FIELD SURVEY



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PART B - 50.0 POINTS

TIME ALLOWED TO COMPLETE THIS SECTION - FOUR HOURS

WORKBOOK INSTRUCTIONS

This examination is given in two, four-hour periods on the same day. The subject matter relates to the principles and practice of land surveying. Part B is the second section of this two-part examination. **YOU ARE ASKED TO CONCENTRATE YOUR WORK ON THOSE PROBLEMS IN WHICH YOU MAY DO WELL. ALTHOUGH ALL PROBLEMS SHOULD BE ATTEMPTED, YOU ARE NOT EXPECTED TO EXCEL IN ALL OF THEM.**

Each test item is contained in a separate folder appropriately marked on the front. Your answers must be completed on the grid paper provided within each folder. **IMPORTANT: ALL GRID SHEETS MUST BE CONTAINED IN THE APPROPRIATE FOLDER WHEN YOU TURN IN YOUR EXAMINATION.** If you need additional grid sheets, ask your proctor. Be sure to secure these additional pages within the appropriate folder.

Enter your identification number in the upper right-hand corner on **EACH PAGE** of the answer sheets where space is provided and **INDICATE THE APPROPRIATE PROBLEM NUMBER.** Do not write your name on any part of this examination.

Show all work in the folder provided for each problem. **ANY WORK NOT CONTAINED IN THE APPROPRIATE FOLDER WILL NOT BE SCORED.** Use one side of the page and do not put more than one problem in a folder. Be sure to mark your pages 1 of 3, 2 of 3, etc. any work you do not want scored must be clearly lined through and marked "VOID" across it. Delineate the voided part clearly. Do not write in the margin on the right-hand side of the grid sheets.

Your work is a Land Surveyor report. Your solutions, findings, and statements should be arranged in an orderly manner which is organized and legible.

After you have completed this portion of the examination, check your work, assemble the folders containing your answer sheets, and turn it in to your proctor.

This portion of the Land Surveyor Examination consists of the following:

<u>Test Item No.</u>	<u>Subject Matter</u>	<u>Weight</u>	<u>Pages</u>
B1	Boundary	7.0	_____
B2	CA Coordinates	10.0	_____
B3	Public Lands	10.0	_____
B4	Boundary/Deed	10.0	_____
B5	Photogrammetry	5.0	_____
B6	Law	8.0	_____

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Problem B1 - Wt. 7.0 points

REQUIRED

Define the following five statements relative to Boundary Control as either True or False. If your answer is False, give a brief explanation why and cite references. Show all answers on answer sheet.

- T F (a) A call for an adjoiner is always a call for a senior right.
- T F (b) A deed reads "thence N.89°58'20"E., 200.00 feet to a 2" iron pipe located in the westerly line of Mr. Robinson's parcel, thence..." The 2" iron pipe, found, undisturbed and identified as the original, will always control the easterly terminus of the above call.
- T F (c) Lots in a subdivision are subject to senior rights determined by the order in which they are conveyed by the original subdivider.
- T F (d) Ownership of accretions normally reside in the adjoining riparian proprietor.
- T F (e) The extent of the boundary of a riparian owner on a non-tidal navigable lake is the high water mark.

Answer the following five questions in your own words and cite references, if used.

- (f) List three conditions that must exist for a found monument to be controlling.
- (g) List six items considered to be essentials of a deed.
- (h) A description of a parcel of land calling out only the adjoiners is what type of description?
- (i) The title conveyed by the government describing land which is disposed of by the government is called what?
- (j) Define extrinsic evidence.

Problem B2 - Wt. 10.0 points

PROBLEM STATEMENT

You have been hired to establish a control traverse to be the basis for mapping and design. The project extends over two different CA Coordinate Zones, Zone V and VII. The beginning control is in Zone V and the closing control is in Zone VII. As most of the project is in Zone VII, you will want to do your work in Zone VII Coordinates.

GIVEN

Zone V coordinates of Station START - N 288,864.325
E 1,808,633.375

REQUIRED

Convert the Zone V coordinates of Station START to Zone VII coordinates, (N & E). **EXPLAIN YOUR PROCEDURE AND SHOW YOUR CALCULATIONS.**

CONSTANTS FOR CALIFORNIA ZONES

CONSTANTS	V	VII
C	2,000,000	4,186,692.58
CENTRAL MERIDIAN	118° 00'	118° 20'
R_D	30,649,424.27	35,055,396.31
Y_0	455,278.73	4,164,014.21
l	0.57001 19219	0.56124 32071
$\frac{l}{2p \cdot 2 \sin 1''}$	2.361 x 10 ⁻¹⁰	2.361 x 10 ⁻¹⁰
$\log \frac{l}{2p \cdot 2 \sin 1''}$	0.373 0670 - 10	0.373 1254 - 10
$\log l$	9.75588 39391 - 10	9.74915 10977 - 10
$\log k$	7.63926 75454	7.64360 24625

Problem B3 - Wt. 10.0 points

PROBLEM STATEMENT

Your client engages you to survey the SE 1/4 of the NW 1/4 of Section 5, T2N R10E Mt. Diablo Meridian. The land has been used for farming for many years. Other than the original government survey, there is nothing of record to indicate it has ever been resurveyed.

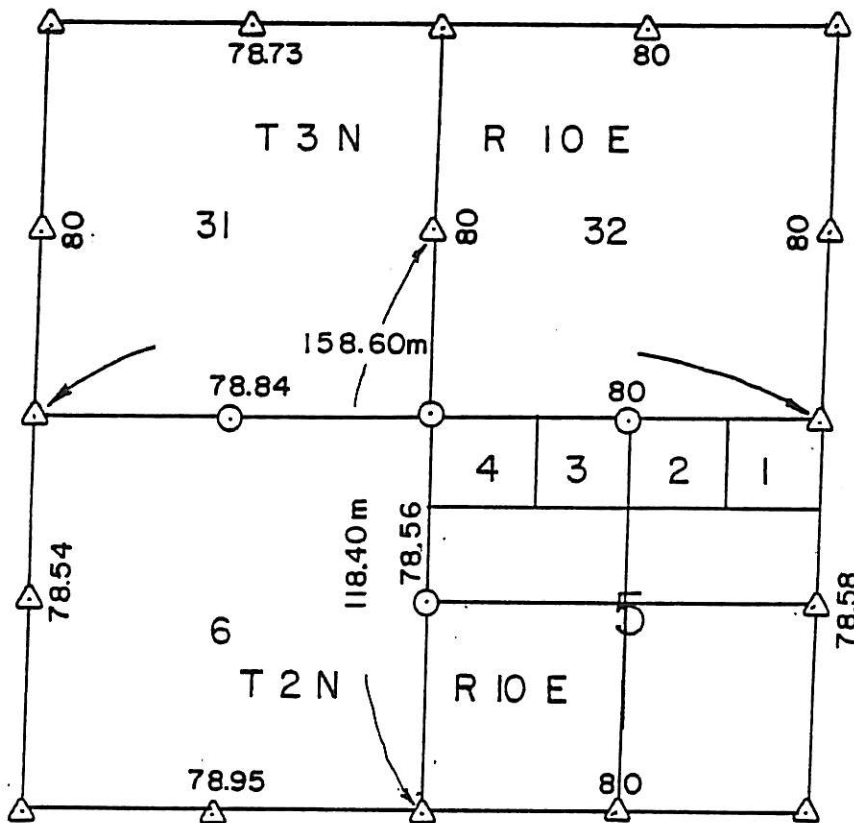
GIVEN

You may assume that you have the original survey notes and township plats and that they are consistent.

REQUIRED

Write the procedure you would use to establish the boundaries of your clients property, what monuments you would set, and what you would do to comply with California mapping requirements.

If any proportioning is required, show the elements of each proportion.



THE LAND IS LOCATED IN CALIFORNIA.

△ - FD ORIGINAL MONUMENT ACCEPTED AS CORNER

○ - LOST CORNER.

PROTRACTION LINES SHOWN ON PLAT ARE GIVEN ONLY FOR SECTION 5.

Dimensions shown are record except where marked "m", which are your 1987 measurements.

Problem B4 - Wt. 10.0 points

PROBLEM STATEMENT

Lot 6, in Block 100, of the Mountain View tract was originally purchased by Brown in 1940. In 1947, Brown conveyed a portion of his lot to Jones. In 1952, Jones conveyed a portion of his parcel to Smith. The descriptions used for the conveyances are shown below.

Brown's Deed (1940)

Lot 6, in Block 100, of the Mountain View tract, in the City and County of XXXXXX, State of California, as recorded in Book X of maps, at page 00.

Brown's Deed to Jones (1947)

That portion of Lot 6, in Block 100, of the Mountain View tract, in the City and County of XXXXXX, State of California, as recorded in Book X of Maps, at page 00, described as follows:

Commencing at the southeast corner of Lot 6; thence West along the South line of said lot, 100.00 feet, to the point of beginning; thence North and parallel with Fifth Avenue, 200.00 feet to the North line of said lot; thence West, 100.00 feet to the Northwest corner of said lot; thence South, 200.00 feet to the Southwest corner of said lot; thence East 100.00 feet to the point of beginning.

Jones' Deed to Smith (1952)

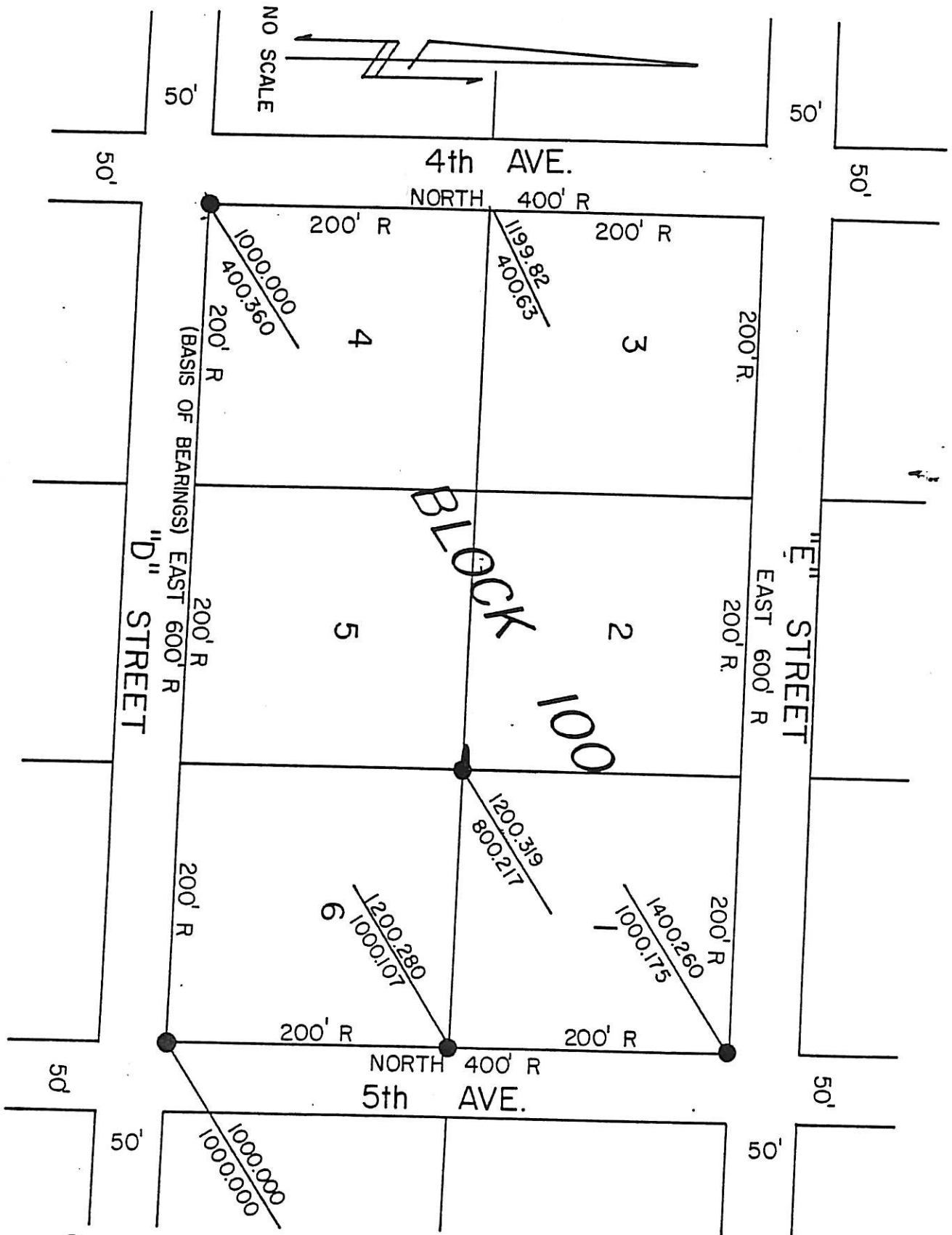
That portion of Lot 6, in Block 100, of the Mountain View tract, in the City and County of XXXXXX, State of California, as recorded in Book X of Maps, at page 00, described as follows:

Commencing at the Southwest corner of Lot 6; thence East, 50.00 feet to the point of beginning; thence north, 200.00 feet; thence East, 50.00 feet; thence South, 200.00 feet; thence West, 50.00 feet to the point of beginning.

The Smith parcel is being sold and you have been retained to survey and set the lot corners. The attached sketch shows the original bearings and dimensions of Block 100 with your surveyed coordinates of the found original undisturbed monumentation.

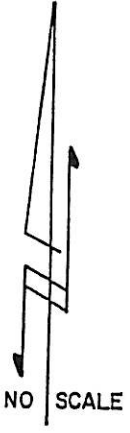
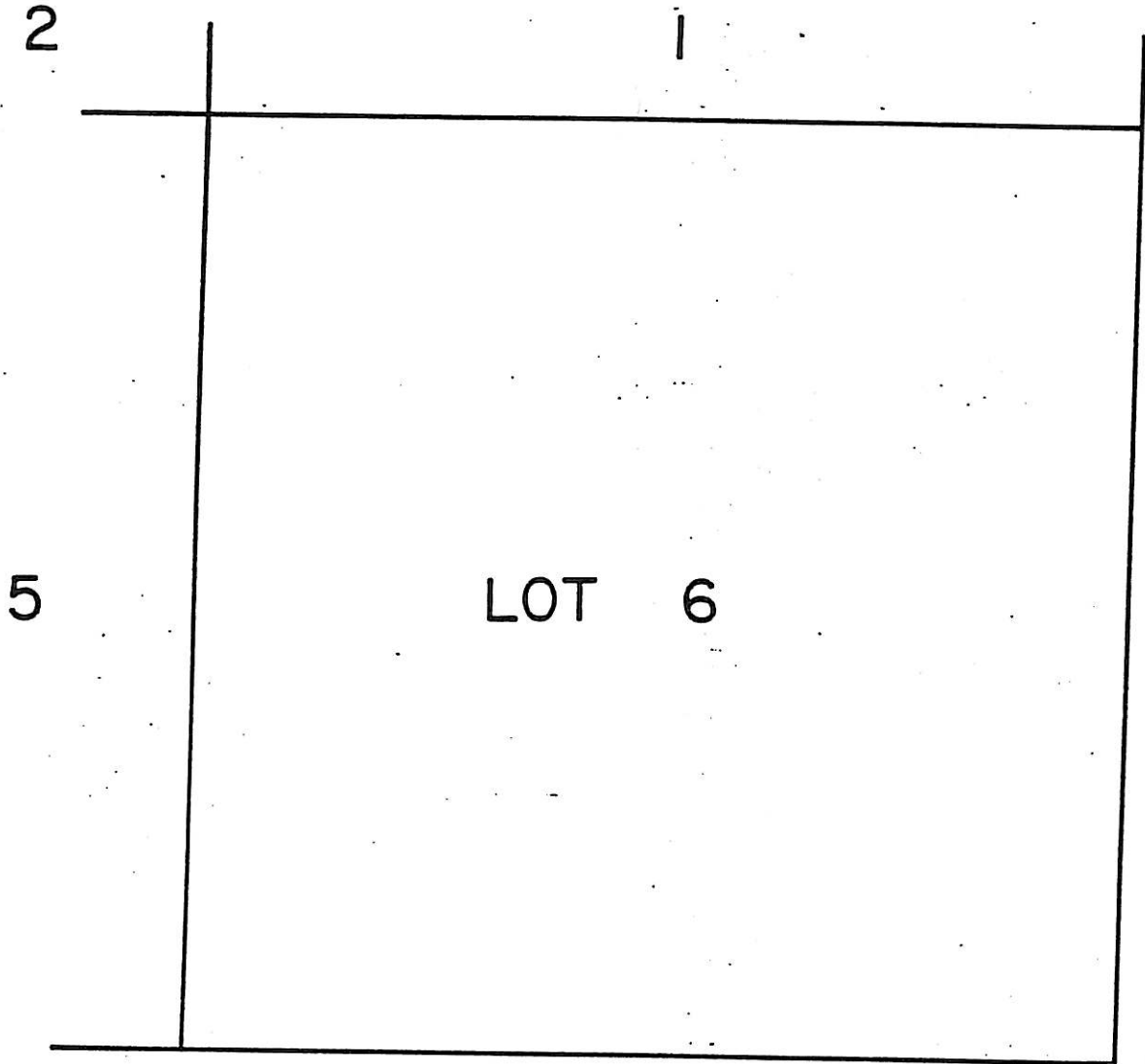
REQUIRED

- a) Show the bearings and distances of Lot 6 and the Smith Parcel, and its relationship to Lot 6, using the worksheet provided on Sheet 3 of 3.
- b) What mapping requirement must you satisfy? Give code sections.
- c) Which principles did you use to obtain your results?



● = FOUND ORIGINAL UNDISTURBED SUBDIVISION MONUMENTATION.
 R = RECORD BEARING & DISTANCE PER ORIGINAL SUBDIVISION.
 COORDINATES SHOWN ARE BASED UPON A FIELD SURVEY.

WORK SHEET



5th AVE.

D STREET

Problem B5 - Wt. 5.0 points

REQUIRED

Answer the following questions and show your calculations.

- a) The distance between two points scales 12.04 mm on a map whose scale is 1:24000. The corresponding distance measures 50.52 mm on an aerial photo. The elevation of both points is the same. The camera focal length is 209.55 mm; how high above the ground was the photograph taken?
- b) Complete stereo coverage is required for a site 5,000' x 5,000'. Your camera has a 6" focal length using 9" x 9" film. Average photo scale is to be 1" = 200' with 60% overlap and 25% sidelap. Flight lines and photos will be centered in the area. Calculate the total number of photos required.
- c) The flying height of a vertical photo above an urban area is 6,500'. The camera focal length is 8.25". The distance measured from the photo center to the image of the bottom of a building is 2.82" and the distance to the image of the top of the building is 3.04". Compute the height of the building.

Problem B6 - Wt. 8.0 points

REQUIRED

Answer the following questions True or False. Explain your answer. If your answer is contained in an applicable state code such as the LS Act, PE Act or Subdivision Map Act, **REFERENCE OF THE APPROPRIATE SECTION OF SAID ACTS SHALL CONSTITUTE A FULL EXPLANATION.**

- T F (1) Property separated by roads, streets, utility easements or railroad right-of-ways are not considered contiguous, even if under one ownership, for subdivision purposes.
- T F (2) A City may not require that a Parcel Map be based on a field survey.
- T F (3) No map is required if a parcel of land is subdivided into smaller parcels having a gross area of 20 acres and each having approved access to a maintained street or highway.
- T F (4) If dedications or offers of dedications are required, they may be made by separate instruments recorded prior to, or concurrently with, the Parcel Map.
- T F (5) An ALTA survey may be based solely on record data, i.e., no field survey shall be required.
- T F (6) A Record of Survey must be filed for any boundary survey made in conjunction with a final or Parcel Map being prepared.
- T F (7) A Record of Survey must be filed if a property corner of a lot in a recorded tract is to be reset, even though no "Material Discrepancy" exists.
- T F (8) A Memorandum of an Oath may be shown on a Record of Survey.
- T F (9) The County Surveyor need not present a Record of Survey to the County Recorder if the County Surveyor and the surveyor preparing the map disagree on the procedures used to establish the boundary shown on the map.
- T F (10) A legal description in a Title Report supersedes that which is written in the original Grant Deed.