LS - A

CALIFORNIA BOARD OF REGISTRATION FOR
CIVIL AND PROFESSIONAL ENGINEERS

August 11, 1967

PART A

1967 LAND SURVEYING EXAMINATION

Closed Book

Time Allowed - Four Hours

INSTRUCTIONS TO EXAMINEE:

The first day of this examination consists of two parts of four hours each (morning and afternoon). Each part will be weighted proportionately. The total grading weight for the first day is 100 points.

Part A consists of 75 problems. All problems are required.

Detach the last sheet from this booklet. This is your Answer Sheet for this part of the examination. Show only the appropriate answer in the space provided on the Answer Sheet. For multiple choice problems, enter only the appropriate letter in the space provided. For completion-type problems, enter the word(s), or the numerical answer, as appropriate. Your grade for Part A of this examination will be based only on the answers shown on your Answer Sheet. You may use any available space in this booklet for computations. When you have completed Part A, return only the Answer Sheet to the proctor. Be sure that your identification number is shown.

No texts, notes, or any other reference materials are permitted in this part of the examination. Calculators or computers of any type are prohibited in this part of the examination. Slide rules are permitted. No work will be accepted after you have turned in your paper to the proctor, or after the close of this examination.

You may keep the examination questions.

SHOW YOUR ANSWERS ON THE ANSWER SHEET

INSTRUCTIONS: Enter only the appropriate answer in the space provided on the Answer Sheet. Where a choice of answers is shown, enter only the letter which identifies the answer of your choice.

1. The component part of a survey instrument which contains the cross hairs, or the stadia hairs, is called the _____.

2. Would you say that the 30 second bubble is more or less sensitive than the 20 second bubble?

3. A line which runs due East and West, and is at every point at right angles to the meridian, is called a _____.

4. Evidence which is gained by a land surveyor from the testimony of various witnesses with respect to a land boundary is called _____.

5. Surveyor tapes which are made from a special nickel steel which has a low coefficient of expansion are designated by the special name _____.

6. A standard township will contain _____ acres.

7. In the layout of a circular curve, the distance from the P.I. to the mid-point of the long chord is _____.

   Give answer in terms of Δ and R.

8. The usual temperature at which a 100-foot steel tape is standardized is _____.

9. The term applied to the value of $\frac{360}{2\pi}$ is _____.

10. Colatitude bears the same relationship to latitude as does the Polar Distance to _____.

11. A borrow pit was subdivided into theoretical prisms of earth. The volume of each prism can best be found by

(A) the absolute volume method

(B) the average end area method

(C) the prismoidal method

(D) the compensated grade method

(E) the planimeter method

12. If the angular distance is measured from the equator to a star along the hour circle passing through the star, the measurement is called the _____.

13. A transparent image plate that is made in the positive by photographing a negative is called a _____.

14. If the summation of the three angles of a triangle on the surface of a sphere exceeds 180°, the difference between the summation and 180° is called the _____.

15. A man who owns a tract of land which borders on a watercourse is said to hold the _____ rights thereto.

16. When outside rays of light which are parallel to the axis of a lens give a different focal length from those parallel rays that enter near the center of the lens, a blurring condition occurs which is called _____.

17. When a tract of land is described by giving the respective bearings and lengths of the sides, the tract is then said to be described by

(A) the Public Land Survey procedure

(B) metes and bounds

(C) resurvey procedure

(D) lots and blocks

(E) coordinates

21. In a traverse, the length of a given sight is identified as L, and its bearing as B. If the departure of the course is identified as d, which of the following equations would enable you to compute the departure of the course?

(A) $\tan B = \frac{d}{L}$

(B) $\sin B = \frac{d}{L}$

(C) $\sin B = L/d$

(D) $\cos B = d/L$

(E) $\cos B = L/d$

22. A field party reported that their only available thermometer used while measuring an important base line indicated an atmosphere temperature of 47°C. What is the corresponding temperature in °F?

23. The projection identified as the Lambert Conformal Projection

(A) gives no distortion of the earth's surface

(B) employs a cylinder as the projection surface

(C) is based entirely on the use of the spheroid

(D) uses a cone as the projection surface

(E) is not suitable for states with a relatively short North-South dimension

24. The position of the sun on the ecliptic when it crossed the celestial equator on March 21, 1967 was called the _____.

25. The distance between two points of interest on a topographic map was scaled as 3-1/4" when the map scale was $\frac{1}{50000}$.

What distance (in feet) was represented by this scaled measurement? Give answer to the nearest 0.1 foot.

26. A profile grade that is flattened somewhat at curves to reduce frictional resistance is generally said to be

(A) articulated
(B) interpolated
(C) compensated
(D) superelevated
(E) transitioned

27. A running description which describes directions and lengths of boundary lines which also states the adjoiners is called a _____ description.

28. The astronomical, or PZS, triangle is composed of three sides which are the

(A) right ascension, polar distance, and zenith distance
(B) polar distance, colatitude, and zenith distance
(C) colatitude, polar distance, and declination
(D) zenith distance, altitude, and colatitude
(E) altitude, azimuth, and longitude

29. If the coordinates of a point on the surface of the earth are designated by the latitude and longitude, what are the corresponding coordinates that will designate the position of a star in the sidereal system?

30. A line of constant true bearing when superimposed on a Mercator projection would be called a

(A) plumb line
(B) line of longitude
(C) base line
(D) rhumb line
(E) line of collimation

18. When a steel tape is used for a route survey, and the tape is consistantly at a temperature greater than the standard of 68°F, a repeating error will be introduced that will be

(A) compensating

(B) systematic

(C) instrumental

(D) of no consequence

(E) standard

19. The algebraic difference of the grades of the two tangents to a vertical curve

(A) is equal to the rate of change in grade per station

(B) will determine the length of the curve

(C) will always have a negative sign

(D) will be based on a function of the square of the offsets from these same tangents

(E) is equal to the total change in grade at the intersection of the two tangents

20. A series of like observations have been recorded by a field party. It will then be true that

(A) the mode will be the most probable correct value

(B) the probable error in the mean value will be a function of the square root of the sum of the squares of the residuals

(C) that the probable error of one single observation will be zero

(D) that the probable error of one single observation will be maximum

(E) that the probable error of the set will be negligible

31. When the scale along the meridian, and the scale along the parallel is the same in both directions in a given map projection, the projection is said to be _____.

32. A tract of land which borders on a small stream which is not navigable usually has its boundary designated by

(A) the high waterline

(B) the low waterline

(C) the mean water level line

(D) the thread of the stream

(E) the line connecting the deepest parts of the stream

33. The right of eminent domain is primarily concerned with

(A) metes and bounds

(B) chains and links

(C) meander monuments

(D) transfer of property ownership

(E) resurvey procedures

34. A circular curve for a highway layout is subtended by a central angle identified as Δ. This angle is

(A) usually stated in terms of $\frac{\text{radians}}{2}$

(B) equal to 360° minus the deflection angle per foot

(C) equal to one-half the deflection angle between the tangents to the curve

(D) equal to the deflection angle between the tangents to the curve

(E) equal to twice the deflection angle between the tangents to the curve

35. A rectangular tract of land was variously reported to have the following listed dimensions. Which contains a land area of exactly one acre?

(A) 206.7 feet x 206.7 feet

(B) 209.7 feet x 209.7 feet

(C) 3.2 chains x 3.2 chains

(D) 5 chains x 2 chains

(E) 200 links x 495 links

36. Measurement in the field while surveying a lot in a recorded subdivision has disclosed an excess of distance. The excess should be taken care of by

(A) placing all the excess in the first lot

(B) placing all the excess in the lot being surveyed

(C) placing all the excess in the public street

(D) prorating the excess in the lots only

(E) prorating the excess in the lots and the streets simultaneously

37. Each of the following deeds has been properly executed. Which one would not necessarily convey title?

(A) gift deed

(B) deed of trust

(C) quit claim deed

(D) joint tenancy deed

(E) grant deed

38. The State has a right to use private property for specific purposes, provided the owner receives just compensation. This right is called _____.

39. When plotting by the use of rectangular coordinates, the projection of a line which is a measure of the length of that line multiplied by the sine of the bearing angle is called the _____.

40. A field party reported that the section corner common to Sections 7, 12, 13, and 18 has been declared lost. The other section corners of these four sections have been found. In order to reestablish the position of the missing corner, it would be set

(A) halfway between the N 1/4 corner of Section 13, and the N 1/4 corner of Section 18

(B) halfway between the E 1/4 corner of Section 12, and the E 1/4 corner of Section 13

(C) by double proportionate measurement

(D) by single proportion on line between the 1/4 corner common to Section 7 and 12, and the 1/4 corner common to Sections 13 and 18

(E) at a measured distance of 2640 feet from the 1/4 corner of Section 13

41. In the sexagesimal system of circular measurement, one circumference is measured as 360°. How many units are there in one circumference based on the centesimal system, and what is the name of the unit?

42. If a triangulation station is established as the steeple of a church, and a theodolite cannot be set up directly under the point, a correction must be made to compensate for the eccentricity. This correction procedure is called _____.

43. The shape of the geometric figure that most closely resembles the orbit of the earth is a _____.

44. The earth, as it moves along its own orbit, is at a point nearest the sun is early January of each year. This position is called _____.

48. A property grant may be deposited by the grantor with a third party, to be delivered on the performance of a prescribed condition, and, upon delivery by the depository, it will take effect. This condition will generally describe

(A) a fee simple

(B) an incumbrance

(C) a warranty deed

(D) a common law appurtenance

(E) an escrow

49. Where a Government survey extends beyond the limits of a land grant, the land contained in the overlap shall

(A) belong to the grant

(B) belong to the county of origin

(C) belong to the Government

(D) belong to the adjacent property owner with the larger portion adjoining

(E) be deemed in dispute until a ruling can be made by a court

50. Which of the following statements most nearly express the correct intent?

(A) A recorded plat takes precedence over any other evidence.

(B) A plat is an aid to the location of property.

(C) A plat will prevail over lines described in an instrument of service.

(D) Designated measurements will prevail over monuments which can be ascertained.

(E) A description of a line in a deed will control the courses and distances.

51. If the earth is assumed to be enclosed in a cylinder which touches at the line of the equator, a map that is prepared from the projections onto this cylinder would be called a _____ projection.

45. When a subtense bar is used, it is necessary to

(A) compensate for refraction and parallax

(B) measure the vertical angle in order to reduce to horizontal distance

(C) know the difference in elevation between the bar and the theodolite in order to complete the field notes

(D) orient the bar perpendicular to the line of sight

(E) determine the equation of time

46. On a topographic map which is drawn to a scale of 1/25000 the contour interval is

(A) a variable that is explained in the map legend

(B) equal to the difference in elevation between adjacent contours

(C) the dimension scaled on the map between adjacent contour lines

(D) is an averaged value determined by scaling the horizontal dimensions between five contour lines, and then taking the mean value

(E) equal to the map call of the elevation above the datum identified in the map legend

47. A description in a recorded deed referred to one of the boundaries of a tract of land as "due North". This should be taken to mean

(A) magnetic North

(B) compass North

(C) observed North corrected by the local variation

(D) astronomic North

(E) secular North

52. When using the State Plane Coordinate System, the argument for determination of the

(A) scale factor is longitude

(B) scale factor is the radius of the cone

(C) mapping angle is the radius of the cone

(D) mapping angle is longitude

(E) mapping angle is latitude

53. The factor known as the "equation of time" is measured in "h - m - s". This factor

(A) never amounts to more than $0^h\ 01^m\ 00^s$

(B) is the difference between the solar year and the sidereal year

(C) is the difference in the hour angle between the true sun and the mean sun

(D) is the difference between sidereal time and sun time

(E) is the difference in time between local mean time and the nearest standard time parallel of longitude

54. In a triangulation system, the procedure known as reduction to center is necessary to

(A) compensate for convergence of meridians

(B) determine whether or not the theodolite is directly over the point

(C) adjust the vertical collimator

(D) compensate for the occupation of an eccentric station

(E) compensate for spherical excess

55. When common logarithms are used, it is necessary

(A) to find the square root of a number by dividing the log of the number by 4

(B) to precede the mantissa by the characteristic

(C) to precede the index by the mantissa

(D) to find the log of a number by obtaining the difference between the dividend and the divisor

(E) to add the logs of the base numbers in order to find the dividend

56. When long geodimeter sights are corrected to a geodetic distance at mean sea level, what is the average value assigned to the radius of the Clark Spheroid?

57. The Geodimeter is developed for use in land surveying around the principle that involves

(A) a radiation impulse

(B) a microwave impulse

(C) direct sighting with precision optical components

(D) a modulated light-wave pulse

(E) a direct reckoning device

58. If a model is built at a scale of 1:[illegible],000, what would be the height of the model to represent a mountain that was 10,480 feet high?

59. The local meridian through Greenwich is at _____° longitude.
The International Date Line is generally at _____° longitude.
The Tropic of Capricorn is at _____° _____.

60. If you measure east from a principal meridian to the third [illegible] meridian, you would measure _____ miles.

61. The general equation for a quadratic is written as:

$$ax^2 + bx + c = 0$$

In the answer space, write the equation for the value of x in terms of the elements that appear in the general equation.

62. In a given triangle, the lengths of the three sides are known, and are designated as a, b, and c.

In the answer space, write the equation for the area of the triangle.

63. The wye level and the dumpy level are

(A) exactly the same

(B) used for turning vertical angles only

(C) differ in the ability of the respective eyepieces to invert the apparent image

(D) constructed slightly differently in that the telescope of one is fixed, and the telescope of the other is removable

(E) used for double rodding

64. When a geographical area is moderately rolling, and has many slopes that are fairly uniform, or constant, lines may be laid out in two directions. Levels can then be taken and the elevations determined at the intersections. From this data, a contour map can then be made of the area. The system described is called the

(A) trace point method

(B) hachure method

(C) cross-section method

(D) interpolation method

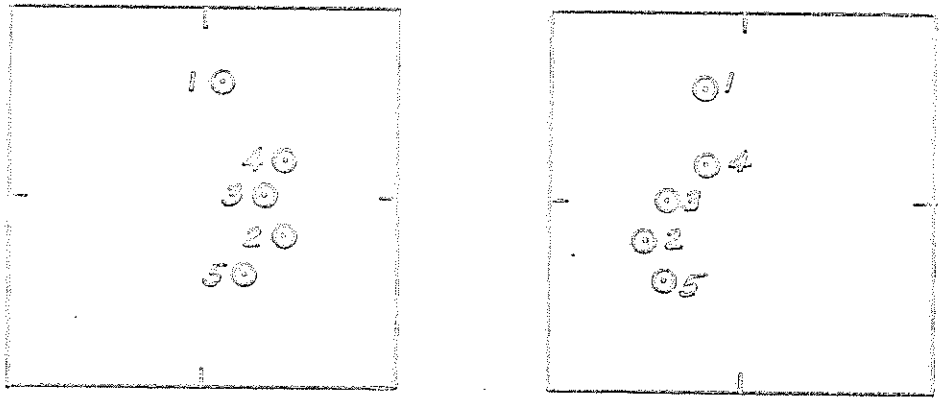
(E) grid method

65. A levee which parallels a river channel has a top width of 12'. On the river side, the side slope is 2:1, and on the land side it is 1-1/2:1. If the levee is 18' high on center line, what is the width at the base?

66. A ground point is imaged on two tilt-free aerial photographs of the same flying height. If the plate coordinates of the two image points are (2,3) and (-3,3), the stereoscopic parallax is:

(A) -1
(B) +5
(C) -6
(D) 0
(E) +9

67.



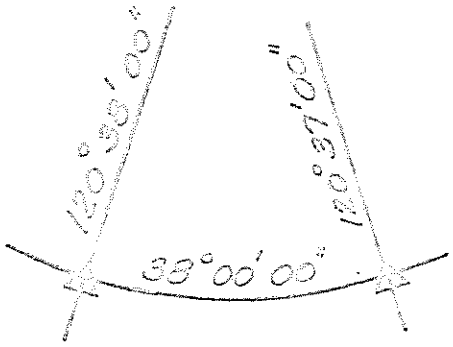
In this stereogram, which point is the second highest?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

68. Four different cameras were used at exactly the same point in space to photograph an object on the ground. The photo- exhibiting the least amount of relief displacement of the object was taken with which of the following focal length cameras?

(A) 12"
(B) 8.25"
(C) 6"
(D) 3.5"
(E) all would show same displacement

69. What is the angle of convergence of the two meridians passing through the two geographic positions given in the sketch?



Angle	Sin	Cos	Tan
38°00'00"	.61566	.78801	.78129
120°37'00"	.86039	.50929	1.68979
120°37'30"	.86052	.50942	1.68973
120°38'00"	.86045	.50954	1.68866

(A) 47.3"
(B) 30.6"
(C) 60.0"
(D) 36.9"
(E) 51.6"

70. The base-height ratio of 3.5-inch focal length photography on a 9-inch by 9-inch format with 60% overlap is:

(A) 1.03 to 1
(B) .60 to 1
(C) .40 to 1
(D) 3.6 to 1
(E) 5.4 to 1

71. A rectified aerial photograph is one which

(A) has all the relief displacement removed
(B) has been scaled to fit three or more horizontal control points
(C) can be used directly as a map
(D) has been corrected for tilt
(E) is a true vertical in which conditions for sharp focus have been satisfied

72. In procedures for relative orientation, rotational motions are made about the

(A) principal point
(B) nadir point
(C) focal point
(D) nodal point
(E) isocenter

73. A micron is

(A) 1/10,000 mm
(B) 1/10,000 meter
(C) 1/100,000 meter
(D) 1/50,800 inch
(E) 1/25,400 inch

74. The motion which is used primarily to impart a scale change in a stereoscopic model is commonly called

(A) BZ
(B) BY
(C) BK
(D) K-tilt
(E) Y-tilt

75. In the sketch representing a near-vertical aerial photograph taken with a 6-inch focal length camera, pi = .13092, in = .13104. The angle of tilt is

(A) arcsin .02182
(B) arctan .04366
(C) arctan .02182
(D) arcsin .04366
(E) arctan .02181

END OF PART A

CALIFORNIA BOARD OF REGISTRATION FOR CIVIL AND PROFESSIONAL ENGINEERS

1967 LAND SURVEYOR EXAMINATION

August 11, 1967

PART B

LS

B

Closed Book

Time Allowed - Four Hours

This booklet contains the problems for Part B of this examination.

The general instructions are shown on the cover page of the workbook which you have already received. Please read them.

All of the work which will be scored must be included in your workbook. No work will be accepted or considered that is not in the hands of the proctor at the close of the examination period.

No books, notes, or reference material may be used in this part of the examination. Slide rules and minor drafting aids, such as triangles, scales, french curves, and compasses are permitted.

You may keep this set of examination questions.

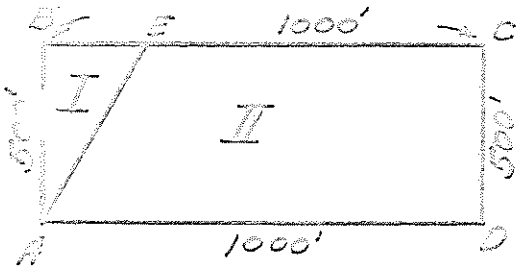
Work any combination of problems for a total of 50 points.

Problem B1 - Wt. 4

The figure shown represents a rectangular land parcel which will be subdivided along the line AE.

Determine the bearing, and the length, of line AE such that the area contained in parcel II is 9.0 acres.

Bearing of line BC is S87°31'E.



Problem B2 - Wt. 3

What is the purpose of double centering, and why is it done?

Problem B3 - Wt. 3

What is the distinctive property of each of the following?

(a) true meridian
(b) magnetic meridian
(c) meridian of place
(d) Greenwich meridian
(e) astronomic meridian

Problem B4 - Wt. 1

A map is drawn to a scale of 1" = 100', and it has a 5' contour interval. If a tangent line cuts a contour line every 0.6', as actually scaled, what is the grade of that section of tangent?

Problem B5 - Wt. 2

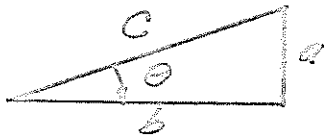
What establishes the stadia constant for a transit? How can this constant be determined in the field?

Problem B6 - Wt. 2

Describe the procedure called "waving the rod" - why it is sometimes necessary, and why it is used.

Problem B7 - Wt. 2

In the triangle shown, the value of the cosine of θ is equal to "x". What is the value of the tangent of θ in terms of x?



Problem B8 - Wt. 2

Describe the substance bar, and how it is used.

Problem B9 - Wt. 2

The quarter section corner on the East side of Section 6 is missing. The original notes show that the recorded length of the East side of Section 6 was originally 80.24 chains. The same side was measured in the field last week as 5308.72 feet. From this data, how may the quarter section corner be reestablished?

Problem B10 - Wt. 2

From a line AB, whose bearing is N70°27'15"E, a right deflection angle of 30°20'10" is turned to point C. At point C, another right deflection angle of 167°58'49" is turned to point D. What is the bearing of line CD?

Problem B11 - Wt. 3

A small subdivision was determined to have an area of 138.97 acres. The tape used for this survey work was later standardized, and was found to be 0.22' too short. What is the correct area contained within the subdivision?

Problem B12 - Wt. 3

A field traverse station identified as "K" is located at longitude 118°29'W. The grid bearing from K to another station "L" was recorded as N1°53'37"W. The mapping angle at this location was identified as +01°29'27.34".

What is the true bearing of the line "KL"? Show a diagram of the relationships that are important, and give your answer to the nearest second.

Problem B13 - Wt. 1

If two parties are in dispute with respect to an interpretation of a description of a land parcel, would the determining interpretation favor the grantor or the grantee? Explain your conclusion.

Problem B14 - Wt. 4

The California State Plane Coordinate System uses as the basis of its projection what named projection? How many zones does it have? Describe, and sketch, the basics of this system, and indicate the probable areas of distortion that may result from its use.

Problem B15 - Wt. 3

Describe the factors which will affect the accuracy of a geodimeter sight.

Problem B16 - Wt. 3

What is the rule for finding the true center of any section?

Problem B17 - Wt. 3

An owner holds a tract of land, one boundary of which is defined as the "thread of the river", and another boundary is described as the "thread of the lake". The river is nonnavigable, does not run into the lake and is not related to the lake. The lake is a sink and has no inlet or outlet. What is the meaning of the terms as they relate to this man's boundaries?

Problem B18 - Wt. 2

What is meant by a "common law dedication"?

Problem B19 - Wt. 3

If the PI of a circular curve is inaccessible, give the procedure, and the steps, to determine Δ, and the locations of the PC and PT.

Problem B20 - Wt. 3

If the end areas of a prismoid of earth work are identified as B_1 and B_2, write the equation for volume of the material by the

(a) average end area method

(b) prismoidal method

(c) prismoidal correction method

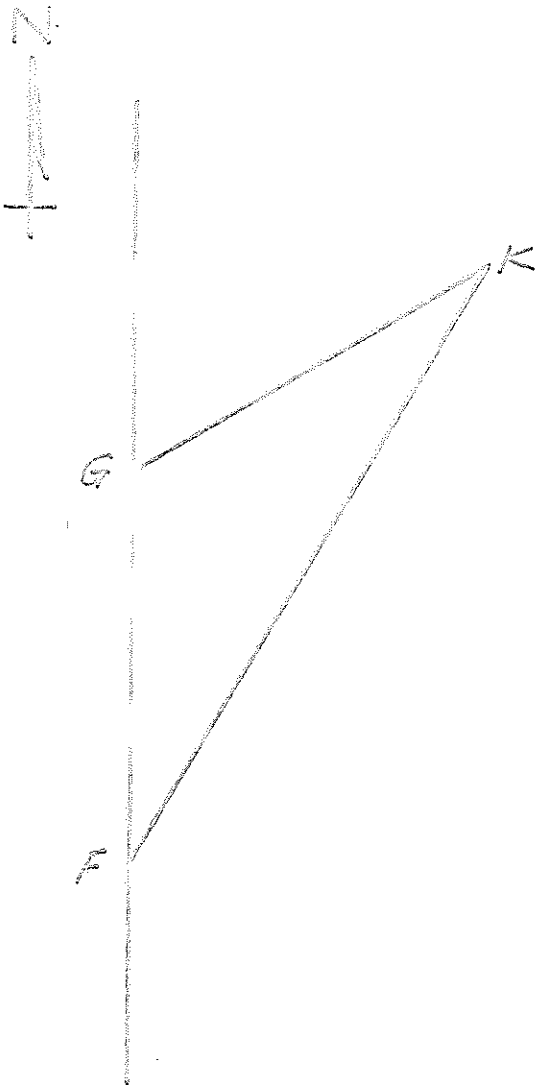
Assume L = 100 ft.

Define any additional factors that may be needed.

Problem B21 - No. 3

A surveyor was running a Northerly line, and at point F he observed point K as bearing N30°E from the foresight. Later, he observed point K again from point G and read a bearing angle of N60°E from the foresight. The distance traversed from F to G was recorded in the notes as 2 miles.

What will be the minimum perpendicular distance from the line FG extended to point K?



Problem B22 - No. 4

Two circular curves intersect as shown in the sketch below. The numerical values for the radii R_1 and R_2 are known, as are the values for the tangents T_1 and T_2. If the angle Δ_3 is also known, how would you determine the value of Δ_1?

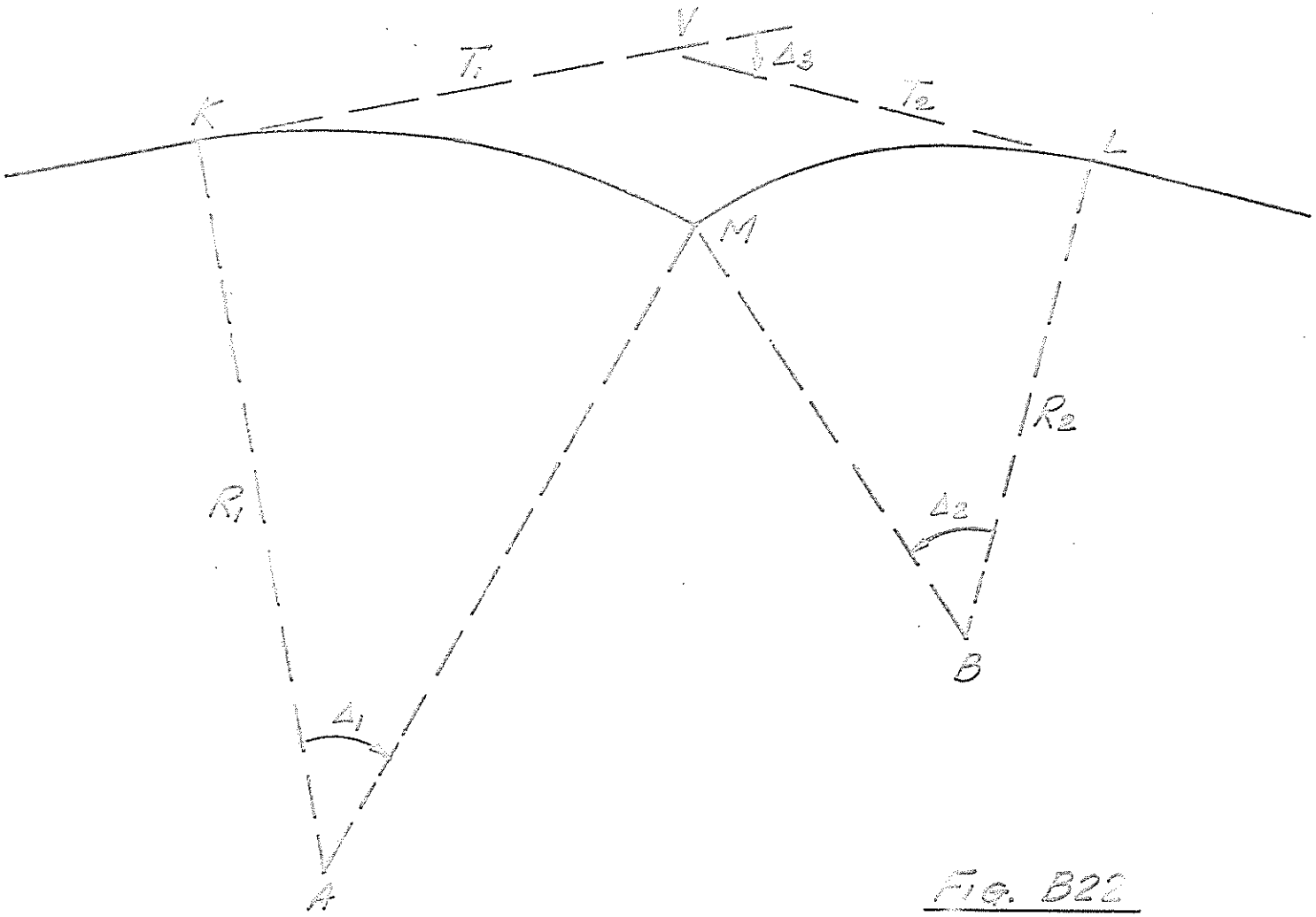


Fig. B22

Problem B23 - Wt. 2

What is particularly significant about Greenwich, and Greenwich time?

Problem B24 - Wt. 4

Define each of the following photogrammetric terms:

(a) tilt
(b) swing
(c) nadir point
(d) principal line
(e) line of constant scale
(f) isocenter

Problem B25 - Wt. 4

What are the general requirements of the state law with respect to a "Record of Survey" map?

(a) What does the map show?
(b) When is it required?
(c) What is the size of the map?
(d) What other requirements are noted as to materials, margins, etc.?

Problem B16 - No. 5

In the diagram of a nest model area, shown below, the numbered positions indicate the locations in the model at which y-parallax is observed. List, in sequence, the rotational motions to be given to each projector to remove y-parallax without the use of any translational motions.

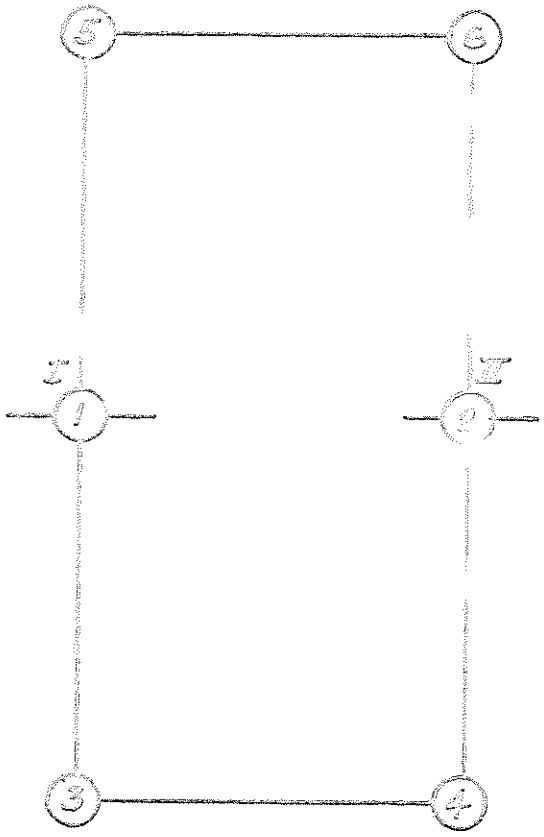
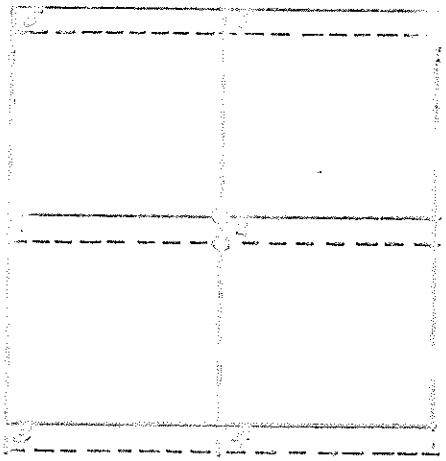


Fig. B26

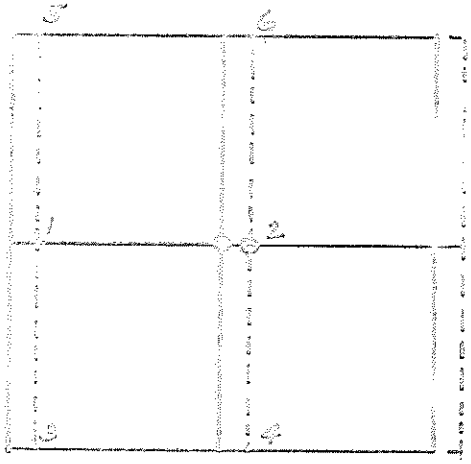
Problem B27 - Mk. 2

For each of the diagrams, name the projector motion which will correct the indicated condition. Assume stereomodel is formed in an instrument using the one-projector method.

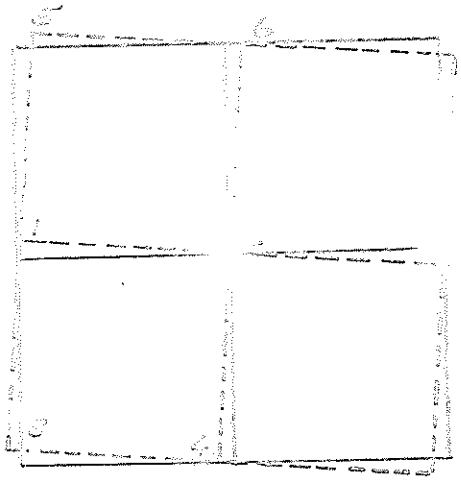
A



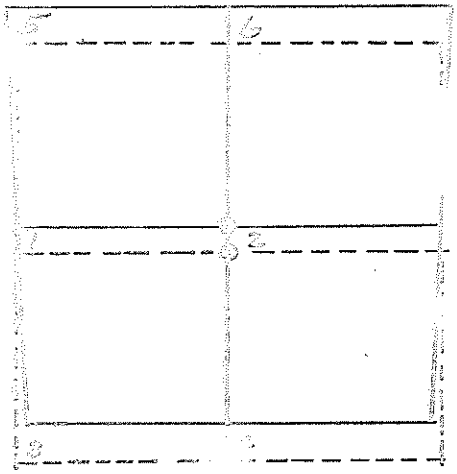
B



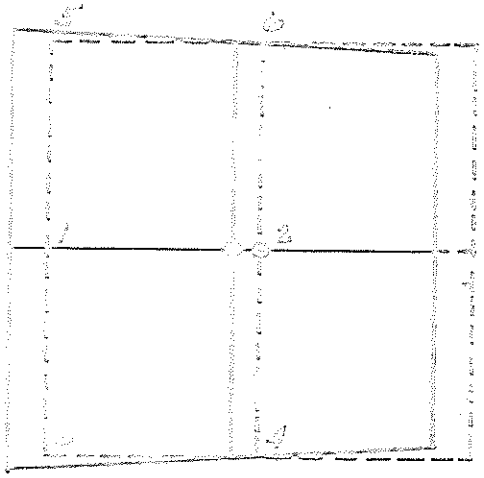
C



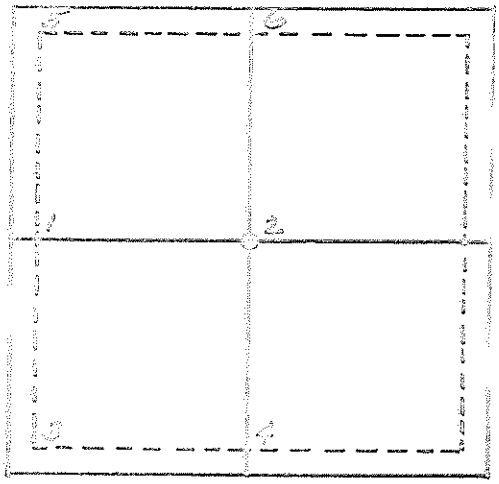
D



E



F



END OF PART B

Problem C1 - Wt. 10 (Required)

Wt.

5 (a) Your transit has been set up over a point with the HI at elevation 63.72 feet. What is the lowest elevation that you can observe through the transit telescope at a point on an island that is located 32.12 miles away? The sight is not obstructed.

5 (b) 1. Geodetic North, and Astronomic North are terms used in land surveying practice. Explain the relationship of these two terms, their difference, and why they are different.

2. Is the Lambert grid bearing established on a geodetic basis, or an astronomic basis? Explain.

3. If a description appears in a written deed without a basis of bearing mentioned, which basis would you assume? Explain.

Problem C2 - Wt. 10 (Required)

The equipment available to you consists of a pair of overlapping aerial photographs, and a small stereoscope.

(a) How would the photographs be an assist in finding, or relocating, a section corner?

(b) When viewing one of the photographs, a road appears on the photograph as a wavy line. See Figure C2 below. You have viewed this same road on the ground, and know that it is actually straight. Why does the road appear in the photograph to be curved?

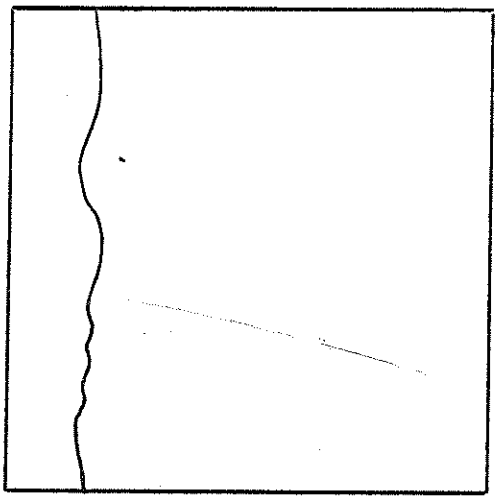


FIG. C2

Problem C3 - Wt. 10 (Required)

The following identification appeared on a USGS map:

"1927 North American Datum"

(a) What method was used to determine this datum?

(b) What does the definition mean?

(c) In the event that you were to use the method, as it was used to determine the 1927 datum, to make extensive observation now at a given point, would you expect your local datum to be identical with the 1927 North American Datum? Explain.

(d) When could you use the 1927 North American Datum in a legal description?

X Problem C4 - Wt. 10 (Optional)

A power line crosses the center line of a new freeway alignment at point B as shown in Figure C4 below.

The coordinates of points A and C are known, and are shown on the figure.

REQUIRED:

(a) What is the length of the arc "L"?

(b) What is the central angle "Δ"?

(c) What is the length of the line AB?

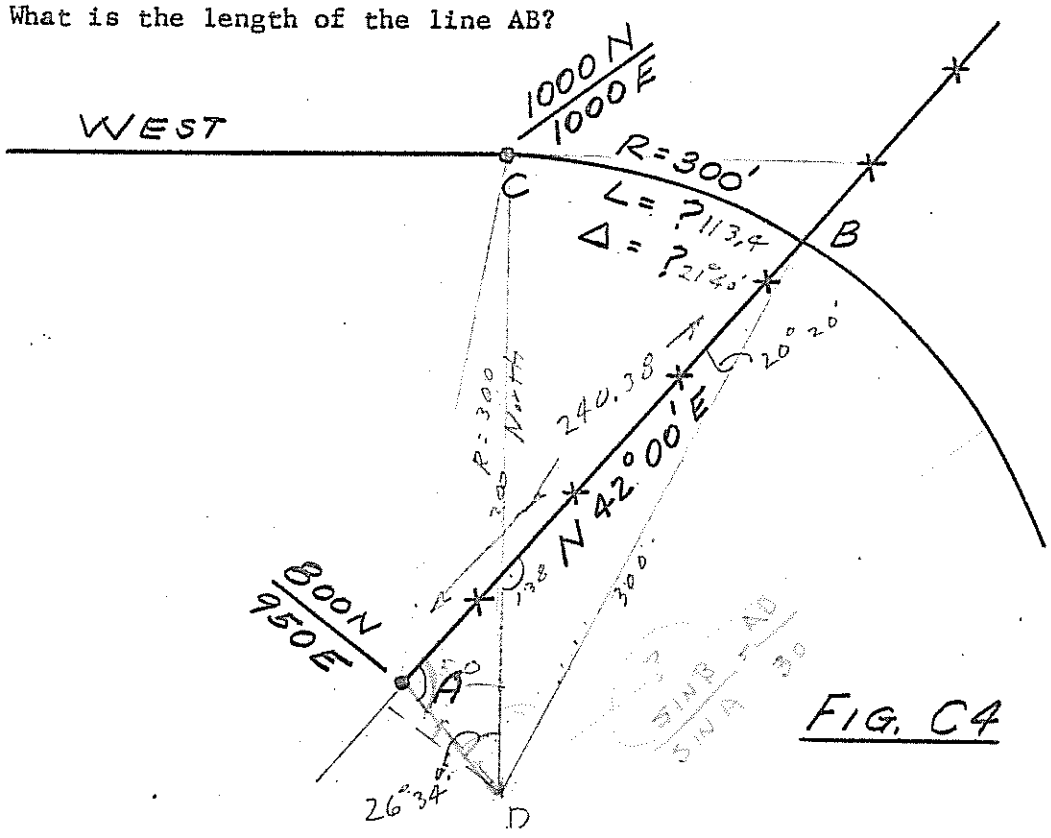


FIG. C4

Problem C5 - Wt. 10 (Optional)

Discuss each of the following statements. If the statement is true, explain why it is true. If the statement is false, explain why it is false. Your explanation of the reasons for your conclusions will be the basis for evaluation.

(a) Correct standard time is recorded when determining the declination of the sun. The standard time recorded is then corrected to local time. Local time is then increased by 8 hours to determine Greenwich time. Having the Greenwich time, the declination of the sun can then be looked up in an ephemeris. (Daylight saving time is not included in this problem.)

(b) The astronomical triangle has six elements - three sides and three angles. It is possible for a person to measure any three of the six elements, and to then develop three different methods to determine the meridian.

(c) The best time to make a solar observation for the determination of the meridian is 1/2 hour before noon, or 1/2 hour before sunset, or 1/2 hour after sunrise.

(d) A level line at sea level is parallel with a level line at 8,000 feet elevation.

Problem C6 - Wt. 10 (Optional)

The figure shown below is part of an alignment that is under study.

REQUIRED:

(a) What is the length of AB?

(b) What is the value of Δ_1?

(c) What is the value of Δ_2?

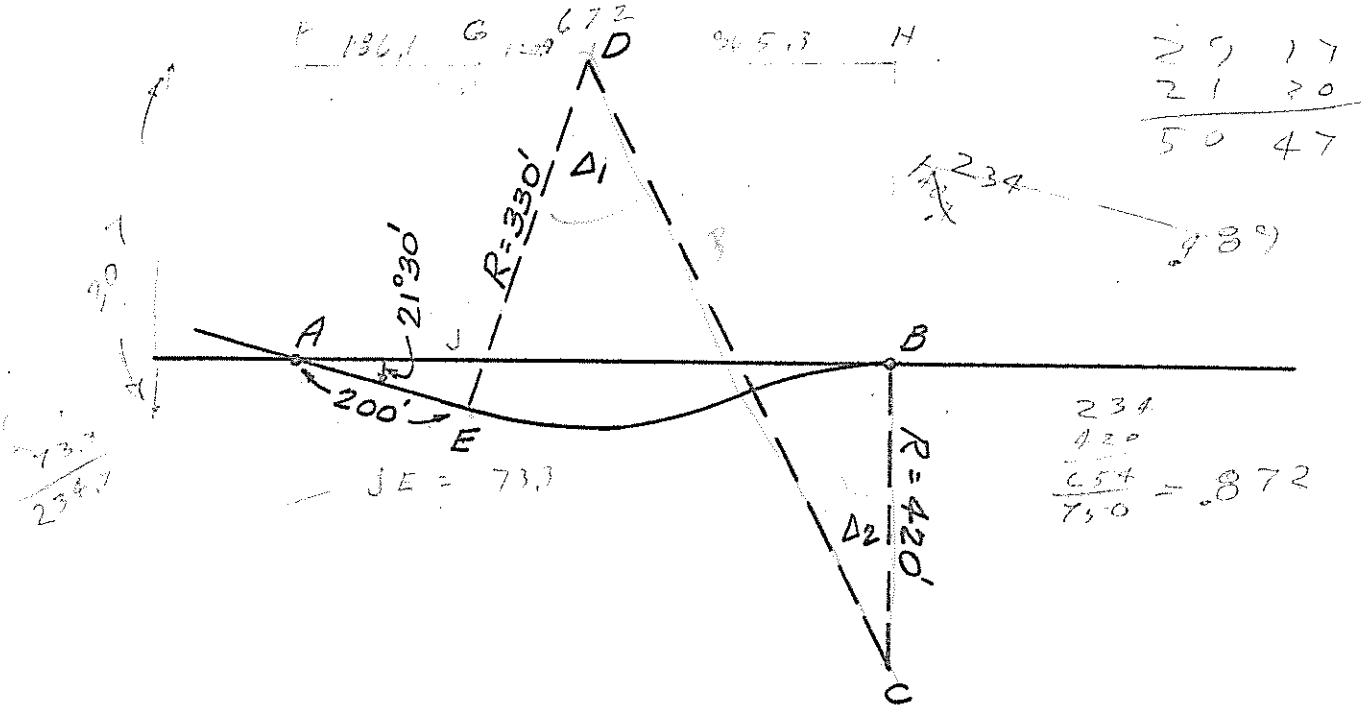


FIG. C6

Problem C7 - Wt. 10 (Optional)

(a) A direct-projection plotter has been calibrated to produce optimum focus at a projection distance of 30 inches when the principal distance is set at 153 mm. What is the focal length of the projection lenses?

(b) For this plotter, assign maximum and minimum projection distances. Describe how you arrived at these values, taking into account optical considerations, mechanical limitations, and geometric strength of the stereomodel.

END OF PART C

Problem D1 - Wt. 15 (Required)

The following questions pertain to the surveys of public lands which are now administered by the Bureau of Land Management, Department of the Interior, Washington, D. C.

(a) Which manual is applicable for a given resurvey of a section of land?

(b) The government surveyors set certain corners on correction lines. What are the correct names of the various types of corners set? Describe the respective location of each type.

(c) What are the types of evidence that might be mentioned in the original field notes, and that could be used to identify the original corner positions, and original line positions?

(d) Who determines the standards of accuracy that are necessary on

(1) an original survey of sectionalized lands, and

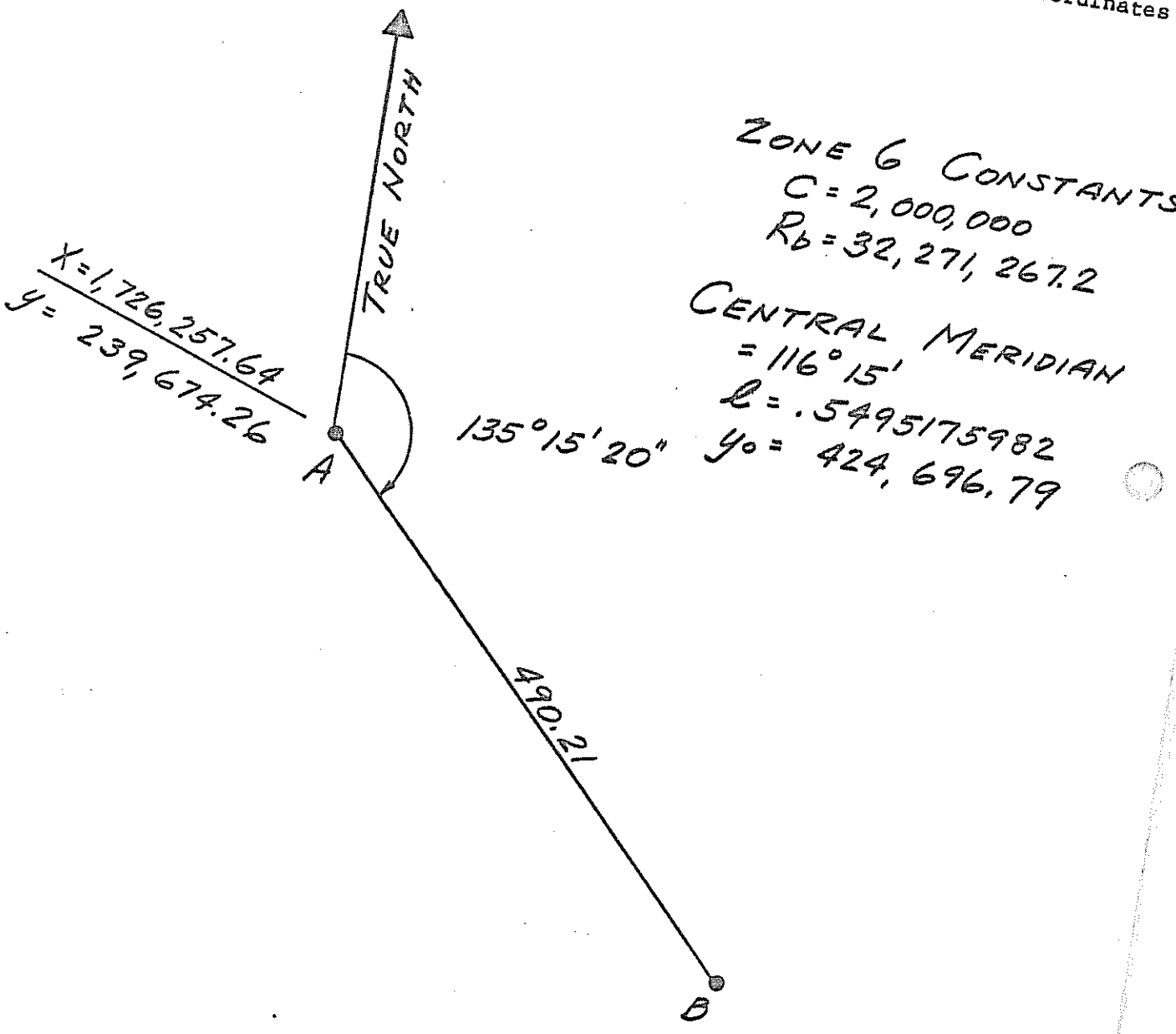
(2) on a resurvey of sectionlized lands (U.S.) and in California?

(e) What are the exceptions to the rule that the original position of an original corner is unalterable? This assumes that the corner can be identified by acceptable evidence.

NOTE: Choose Problem D2 or D3 for 10 points.

Problem D2 - Wt. 10

Using the information shown on the figure below, determine the Lambert Coordinates of point B in Zone 6.



NOTE: Choose Problem D2 or D3 for 10 points

Problem D3 - Wt. 10

In the spherical triangle shown below, what is the value of the angle "A"?

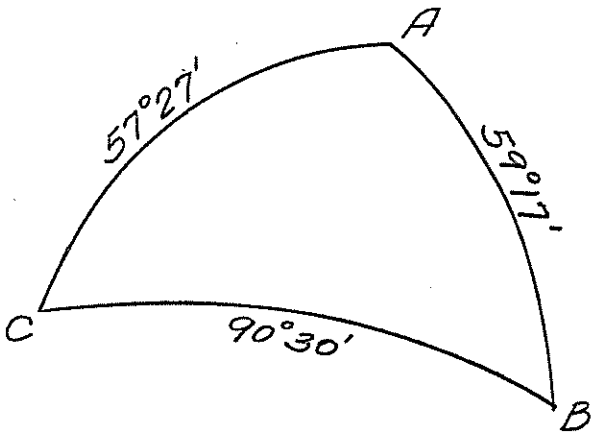


FIG. D3
Not to scale

NOTE: Choose Problem D4 or D5 for 25 points

Problem D4 - Wt. 25

You have been commissioned to make a survey of, and to prepare a legal description for, a part of a Rancho Land Grant.

The parcel of land to be described lies in theoretical Section 9 of the land grant, and your client owns all of Section 9.

REQUIRED:

Wt.

15 (a) How would you determine the limits of Section 9? Describe what you would do, and what steps are necessary to accomplish this commission.

10 (b) Refer to Figure D4b on next page, and assume that this represents the condition that you have found. Now, write a legal description of the new land parcel shown.

You may add fictional names, or places, so as to make the description complete.

Prob. D4 contd on next page

Problem D4 (contd)

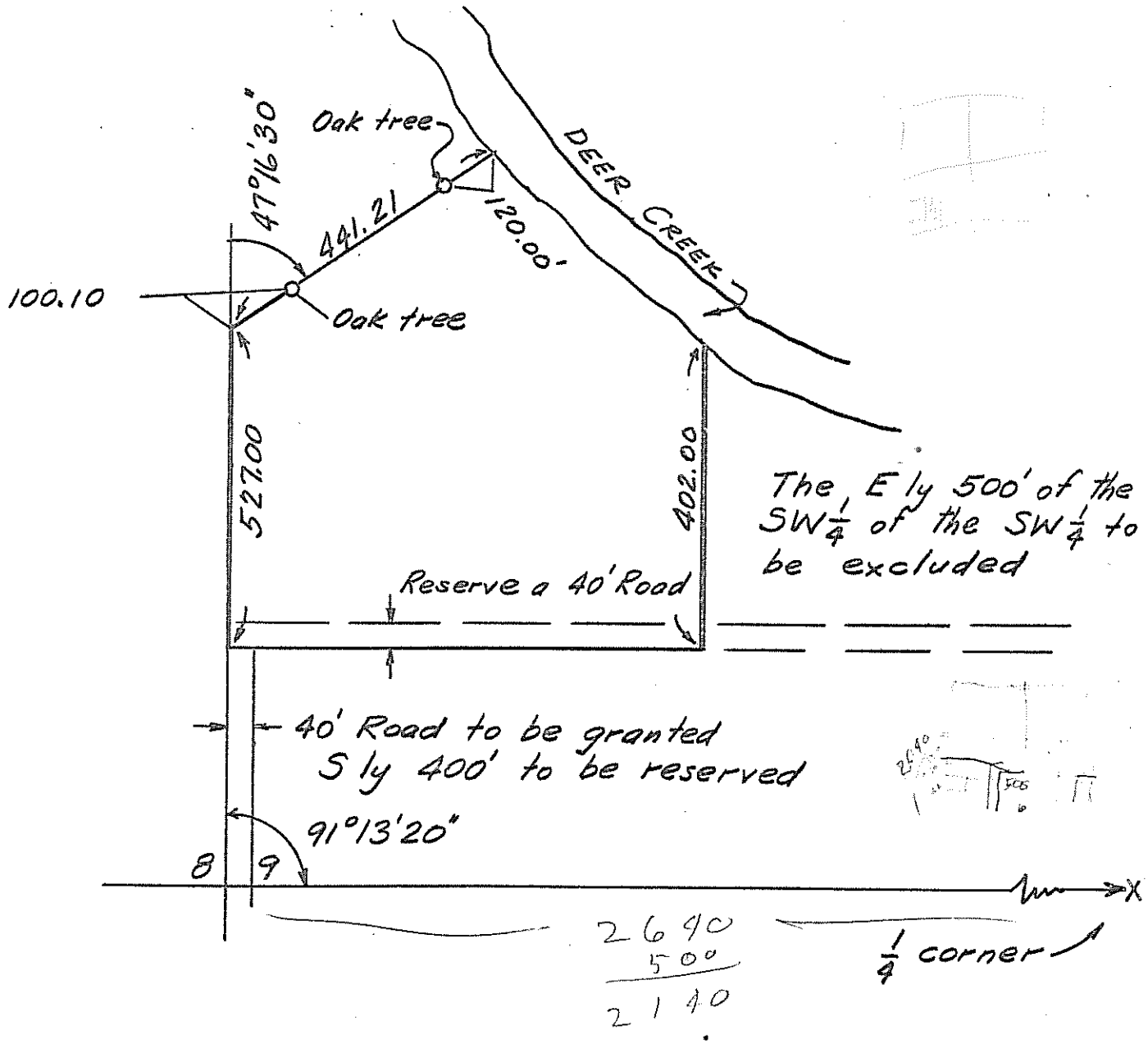


FIG. D4
Not to scale

Problem D5 - Wt. 25

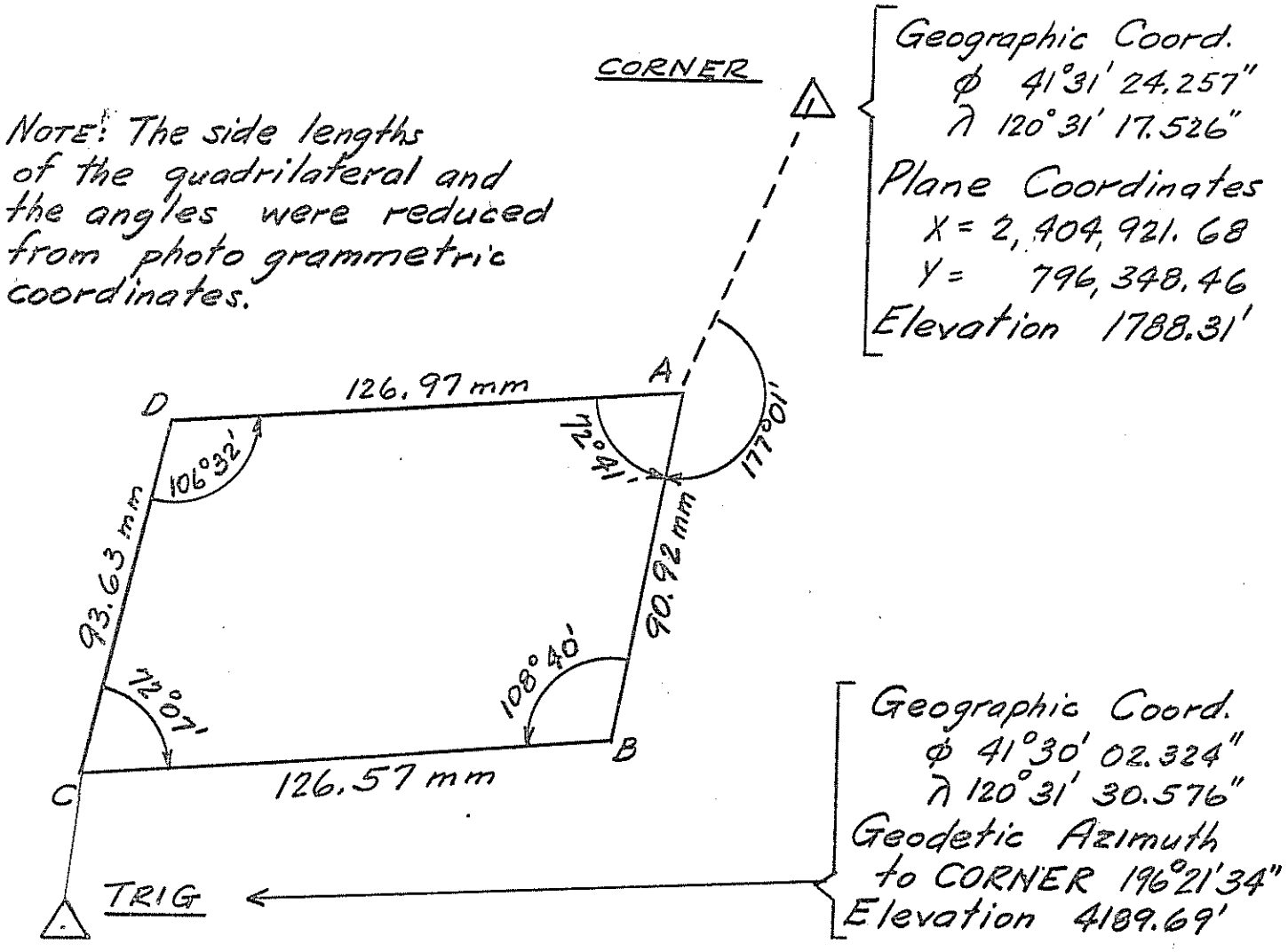
A photogrammetric survey was made in a remote area for locating a four-sided parcel, as shown in Figure D5.

The four corners of the parcel and the two triangulation stations were premarked before aerial photographs were taken. The aerial photographs were used in a first-order photogrammetric instrument, and the resulting coordinates are given as follows:

Point	X	Y	Z
Corner	393.88 mm	546.68 mm	151.41 mm
Trig.	225.86	300.01	354.05
A	375.90	480.87	146.81
B	356.53	392.04	152.39
C	230.74	378.01	155.56
D	249.42	469.76	148.03

REQUIRED:

Using grid north as the basis of bearings and corrected ground distances as course lengths, write a metes and bounds description of the parcel with station Corner as the point of beginning. Lengths should be given to nearest tenth ft. and bearings to the nearest minute.



Lambert Projection for California I

Table I

Lat.	R feet	Y' y value on central meridian feet	Tabular difference for 1 sec. of lat.	Scale in units of 7th place of logs	Scale expressed as a ratio
41° 06'	24,148,856.43	643,579.80	101.19900	-411.3	0.9999053
07	24,142,784.49	649,651.74	101.19950	-405.2	0.9999067
08	24,136,712.52	655,723.71	101.19983	-398.9	0.9999081
09	24,130.640.53	661,795.70	101.20033	-392.1	0.9999097
10	24,124,568.51	667,867.72	101.20083	-385.0	0.9999113
41° 11'	24,118,496.46	673,939.77	101.20117	-377.5	0.9999131
12	24,112,424.39	680,011.84	101.20183	-369.7	0.9999149
13	24,106,352.28	686,083.95	101.20217	-361.4	0.9999168
14	24,100,280.15	692,156.08	101.20283	-352.9	0.9999187
15	24,094,207.98	698.228.25	101.20317	-343.9	0.9999208
41° 16'	24,088,135.79	704,300.44	101.20383	-334.6	0.9999230
17	24,082,063.56	710,372.67	101.20433	-324.9	0.9999252
18	24,075,991.30	716,444.93	101.20483	-314.8	0.9999275
19	24,069,919.01	722,517.22	101.20533	-304.4	0.9999299
20	24,063,846.69	728.589.54	101.20583	-293.6	0.9999324
41° 21'	24,057,774.34	734,661.89	101.20650	-282.4	0.9999350
22	24,051,701.95	740,734.28	101.20717	-270.9	0.9999376
23	24,045,629.52	746,806.71	101.20767	-259.0	0.9999404
24	24,039,557.06	752,879.17	101.20817	-246.7	0.9999432
25	24,033,484.57	758,951.66	101.20883	-234.1	0.9999461
41° 26'	24,027,412.04	765,024.19	101.20950	-221.1	0.9999491
27	24,021,339.47	771,096.76	101.21000	-207.7	0.9999522
28	24,015,266.87	777,169.36	101.21067	-193.9	0.9999554
29	24,009,194.23	783,242.00	101.21133	-179.8	0.9999586
30	24,003,121.55	789,314.68	101.21183	-165.3	0.9999619
41° 31'	23,997,048.84	795,387.39	101.21267	-150.4	0.9999654
32	23,990,976.08	801,460.15	101.21317	-135.2	0.9999689
33	23,984,903.29	807,532.94	101.21400	-119.6	0.9999725
34	23,978,830.45	813,605.78	101.21450	-103.6	0.9999761
35	23,972,757.58	819,678.65	101.21533	-87.3	0.9999799
41° 36'	23,966,684.66	825,751.57	101.21600	-70.6	0.9999837
37	23,960,611.70	831,824.53	101.21667	-53.5	0.9999877
38	23,954,538.70	837,897.53	101.21733	-36.0	0.9999917
39	23,948,465.66	843,970.57	101.21817	-18.2	0.9999958
40	23,942,392.57	850,043.66	101.21883	0.0	1.0000000

Lambert Projection for California I

Table II

1" of Long. = 0".65388432 of θ

Long.	θ	Long.	θ	Long.	θ
119° 30'	+1° 38' 04".9589	120° 06'	+1° 14' 32".5687	120° 41'	+0° 51' 39".4117
31	+1 37 25.7258	07	+1 13 53.3357	42	+0 51 00.1786
32	+1 36 46.4928	08	+1 13 14.1026	43	+0 50 20.9456
33	+1 36 07.2597	09	+1 12 34.8696	44	+0 49 41.7125
34	+1 35 28.0266	10	+1 11 55.6365	45	+0 49 02.4794
35	+1 34 48.7936				
119° 36'	+1 34 09.5605	120° 11'	+1 11 16.4035	120° 46'	+0 48 23.2464
37	+1 33 30.3275	12	+1 10 37.1704	47	+0 47 44.0133
38	+1 32 51.0944	13	+1 09 57.9373	48	+0 47 04.7803
39	+1 32 11.8613	14	+1 09 18.7043	49	+0 46 25.5472
40	+1 31 32.6283	15	+1 08 39.4712	50	+0 45 46.3141
119° 41'	+1 30 53.3952	120° 16'	+1 08 00.2382	120° 51'	+0 45 07.0811
42	+1 30 14.1622	17	+1 07 21.0051	52	+0 44 27.8480
43	+1 29 34.9291	18	+1 06 41.7720	53	+0 43 48.6150
44	+1 28 55.6961	19	+1 06 02.5390	54	+0 43 09.3819
45	+1 28 16.4630	20	+1 05 23.3059	55	+0 42 30.1488
119° 46'	+1 27 37.2299	120° 21'	+1 04 44.0729	120° 56'	+0 41 50.9158
47	+1 26 57.9969	22	+1 04 04.8398	57	+0 41 11.6827
48	+1 26 18.7638	23	+1 03 25.6067	58	+0 40 32.4497
49	+1 25 39.5308	24	+1 02 46.3737	59	+0 39 53.2166
50	+1 25 00.2977	25	+1 02 07.1406	121° 00'	+0 39 13.9836
119° 51'	+1 24 21.0646	120° 26'	+1 01 27.9076	121° 01'	+0 38 34.7505
52	+1 23 41.8316	27	+1 00 48.6745	02	+0 37 55.5174
53	+1 23 02.5985	28	+1 00 09.4414	03	+0 37 16.2844
54	+1 22 23.3655	29	+0 59 30.2084	04	+0 36 37.0513
55	+1 21 44.1324	30	+0 58 50.9753	05	+0 35 57.8183
119° 56'	+1 21 04.8993	120° 31'	+0 58 11.7423	121° 06'	+0 35 18.5852
57	+1 20 25.6663	32	+0 57 32.5092	07	+0 34 39.3521
58	+1 19 46.4332	33	+0 56 53.2762	08	+0 34 00.1191
59	+1 19 07.2002	34	+0 56 14.0431	09	+0 33 20.8860
120° 00'	+1 18 27.9671	35	+0 55 34.8100	10	+0 32 41.6530
120° 01'	+1 17 48.7340	120° 36'	+0 54 55.5770	121° 11'	+0 32 02.4199
02	+1 17 09.5010	37	+0 54 16.3439	12	+0 31 23.1868
03	+1 16 30.2679	38	+0 53 37.1109	13	+0 30 43.9538
04	+1 15 51.0349	39	+0 52 57.8778	14	+0 30 04.7207
05	+1 15 11.8018	40	+0 52 18.6447	15	+0 29 25.4877

END OF PART D