ASSIGNMENT 6

Textbook Assignment: "Indirect Leveling/Level and Traverse Computations." Page 7-1 through 7-30.

Learning Objective: Recognize characteristics and procedures associated with barometric and trigonometric leveling and compute elevations.

6–1. Barometric leveling is used to measure the difference in elevations by which of the following methods?

1. By measuring the slope angle
2. By measuring the atmospheric pressure
3. By measuring the slope distance
4. By measuring the vertical offset

6-2. Barometric leveling is used mostly in which of the following types of surveys?

1. Layout
2. Route
3. Reconnaissance
4. Navigational

6-3. The minimum number of altimeters required for a two-base method of barometric leveling is

1. five
2. two
3. three
4. four

6-4. Barometric leveling should be performed at what time of day?

1. Midday
2. 2 to 4 hours before sunrise or 2 to 4 hours after sunset
3. 2 to 4 hours after sunrise or 2 to 4 hours before sunset
4. 2 to 4 hours before sunset or 2 to 4 hours after sunset

6-5. You are to determine the difference in elevation between two points by trigonometric leveling. In doing so, you should measure

1. the horizontal distance and the azimuth angle
2. the vertical angle and then take the stadia intercept
3. the vertical and azimuth angle and then take the rod reading
4. the slope distance and then take the stadia intercept

6-6. When the horizontal distance is measured, what trigonometric function is used to help determine the difference in elevation?

1. Cosecant
2. Secant
3. Tangent
4. Cotangent

6-7. When the slope distance is measured, what trigonometric function is used to help determine the difference in elevation?

1. Tangent
2. Cosine
3. Sine
4. Cotangent

6-8. When the horizontal or slope distance is measured by chaining, which of the following corrections must be computed before you determine the difference of elevation?

1. Repair adjustment, sag, and temperature
2. Standard error, sag, and tension
3. Sag, temperature, and standard error
4. Tension, heat, and number of movements

6-9. When you do trigonometric leveling with an electronic distancing measuring device, what other instrument is used to measure your angles?

1. Transit
2. Theodolite
3. Level
4. Alidade

6-10. Before beginning computations based on your field notes, you should perform which of the following actions?

1. Reduce slope measurements
2. Reduce angles to mean angles
3. Check notes for completeness
4. Each of the above

6-11. When you are discussing computations, the term *adjustment* refers to

1. fudging of the numbers
2. alignment of columns
3. equal distribution of the total error

6-12. What are you verifying by checking the difference in foresights and backsights?

1. Balanced foresights and backsights
2. Arithmetic accuracy
3. Error of closure
4. BM elevation

6-13. The term *error of closure* is defined as the difference between

1. the beginning elevation and the ending elevation of two different points
2. the beginning elevation and ending elevation of a level loop
3. the ending elevation of a level circuit and measured elevation of that point

6-14. Since the error of closure is distributed proportionally, what information must be obtained while running the level loop or circuit?

1. Distance of foresights and backsights
2. Distance of foresights only
3. Distance of backsights only
4. Temperature and humidity

6-15. You have just completed a level circuit run of 2,640 feet. The error of closure was .021 feet. What order of precision is this leveling work?

1. First
2. Second
3. Third
4. Fourth

6-16. When adjusting a level net, you adjust each leg only once, regardless of a leg being in more than one circuit.

1. True
2. False

6-17. The terms *elevation angle* and *depression angle* refer to which of the following situations

1. The rod location in relation to the instrument
2. The value of the vertical angle
3. The instrument location in relation to the rod
4. Each of the above

6-18. In first- or second-order leveling, which of the following statements is true?

1. These level circuits never close on themselves
2. The actual distance leveled is the length of the circuit
3. These level circuits close on the beginning bench mark
4. These circuits are less precise than third-order level circuits

Rod EA2 PISTOL
EA3 DOOR
EA3 BOAT

LEVEL CIRCUIT FROM B.M. 35 to B.M. 19

B & B Dumpy #31057

STA.	B.S.+	H.I.	F.S.-	ELEV	SIGHTS			CLOUDY	MODERATE	WIND		
					B.S.	F.S.		JUNE 30	3 HRS			
B 35	6.35			100.02	220			CONCRETE	MONUMENT	BM		
⊖ 16	4.66		4.67		250	220		PEG				
⊖ 17	4.20		7.15		310	250		PEG				
⊖ 18	1.11		5.55		100	310		PEG				
TP 1	6.77		0.98		190	100		ROCK OUTCROP	TURNING	POINT		
B 19			1.48			190		CONCRETE	MONUMENT	BM =	103.20	

Figure 6A

IN ANSWERING QUESTIONS 6-19 THROUGH 6-23, REFER TO FIGURE 6A.

6-19. What is the error of closure of the level circuit?

1. -0.08
2. +0. 08
3. -3.26
4. +3.26

6-20. What is the distance form (a) BM 16 to BM 17 and (b) the total adjustment applied to the computed elevation?

1. (a) 990 ft (b) 0.01 ft
2. (a) 990 ft (b) 0.07 ft
3. (a) 500 ft (b) 0.01 ft
4. (a) 500 ft (b) 0.07 ft

6-21. What is the adjusted elevation of TP 1?

1. 97.98
2. 98.00
3. 97.92
4. 98.06

6-22. This level circuit meets the requirements for third-order work.

1. True
2. False

6-23. This level circuit was conducted according to the requirements for first-order or second-order work.

1. True
2. False

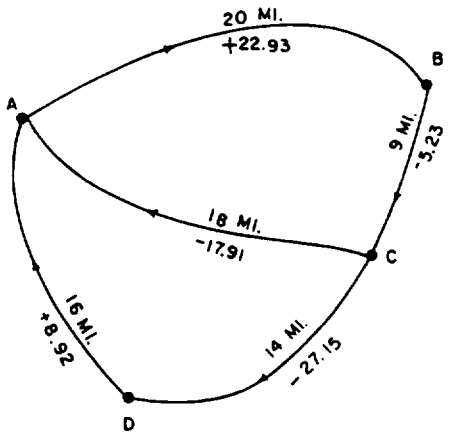

Figure 6B

IN ANSWERING QUESTIONS 6-24 THROUGH 6-30, REFER TO FIGURE 6B.

6-24. If you adjust the level net ABCDA, the adjustment of the level circuit will affect the adjustment of the level circuit ACDA.

1. True
2. False

6-25. What is the error of closure (E_c) in level circuit ABCA?

1. -0.21
2. +0.21
3. -0.32
4. +0. 32

6-26. What is the corrected difference of elevation (Corr DE) for line AB (cycle I)?

1. -23.02
2. +23.02
3. -21.84
4. +21.84

6-27. What is the corrected difference in elevation (cycle I) for line CA?

1. +17.83
2. -17.83
3. +17.91
4. -17.91

6-28. What is the value of the difference in elevation of line AC that you will use to adjust level circuit ACDA?

1. +17.83
2. -17.83
3. +17.91
4. -17.91

6-29. What is the corrected elevation of line AC in level circuit ACDA?

1. +17.83
2. -17.83
3. +17.93
4. -17.93

6-30. What is the corrected difference in elevation for line DA?

1. +9.08
2. -9.08
3. +8.92
4. -8.92

Learning Objective: Perform traverse computation in such areas as adjusting angles, locating a point horizontally by its plane coordinates, figuring error of closure, closing a traverse, calculating departure of a traverse, and adjusting bearings and distances.

6-31. What is the first step in traverse computations?

1. Calculating mean angles
2. Checking notes for all data
3. Correcting distance measurements
4. Verifying the crew members

6-32. Distribution of angular error of closure is performed

1. proportionally by angle size
2. proportionally by distance between angles
3. equally among all angles
4. subtracting the error from all angles

IN ANSWERING QUESTIONS 6-33 THROUGH 6-35, USE THE FOLLOWING INFORMATION. YOU HAVE MEASURED A CLOSED TRAVERSE HAVING FOUR ANGLES. THE SUM OF THE LEFT DEFLECTION ANGLES EQUALS 435°03′00″, AND THE SUM OF THE RIGHT DEFLECTION ANGLES EQUALS 75°01′12″.

6-33. What is the sum of the exterior angles?

1. 360°
2. 510°
3. 1,080°
4. 1,260°

6-34. What is the angular error of closure?

1. -01′12″
2. +01′12″
3. -01′48″
4. +01′48″

6-35. How is the amount of adjustment distributed among the angles?

1. By subtracting 27″ from the right deflection angles only
2. By adding 27″ to the right deflection angles and by subtracting 27″ from the left deflection angles
3. By subtracting 27″ from each angle
4. By adding 27″ to each deflection angle

6-36. You are giving the location by plane coordinates of a point. In what terms should you give the location of that point in relation to the point of origin?

1. Its distance east
2. Its distance south
3. Its distance north or south and the distance east or west
4. Its distance south and west

6-37. What is the latitude of a 100-foot-long traverse line running due east?

1. 0 ft
2. 1 ft
3. 50 ft
4. 100 ft

6-38. What is the departure of a 100-foot-long traverse line with bearing N 40°E?

1. 100 ft
2. 100 ft cos 40°
3. 100 ft sin 40°
4. 100 ft tan 40°

6-39. A positive latitude and a negative departure characterize a traverse line bearing

1. NE
2. NW
3. SE
4. SW

6-40. The linear error of closure is determined by

1. the sum of the departures
2. the difference in the departures and latitudes
3. the error of latitude
4. the use of the Pythagorean theorem with error of closure in latitude and departure

6-41. What is the most commnon method of balancing a traverse?

1. Rule of thumb
2. Compass rule
3. Closure rule
4. Grid rule

IN ANSWERING QUESTIONS 6-42 THROUGH 6-44, USE THE FOLLOWING INFORMATION.

TOTAL LENGTH OF TRAVERSE = 2,541.35
ERROR OF CLOSURE IN LATITUDE = -1.73
ERROR OF CLOSURE IN DEPARTURE = +2.01

6-42. What is the linear error of closure?

1. 0.24 ft
2. 0.57 ft
3. 1.93 ft
4. 2.65 ft

6-43. What is the ratio of error of closure?

1. 1/959
2. 1/1320
3. 1/4500
4. 1/10600

6-44. What is the corrected latitude for a traverse line of 485.35 ft with a bearing of N 35°30′E?

1. +394 .80
2. +395.13
3. +395.39
4. +395.46

IN ANSWERING QUESTION 6-45, REFER TO FIGURE 7–15.

6-45. Compute the departure of a traverse line 647.85 feet long, bearing N 15°45′W.

1. -613.56
2. +613.56
3. -175.89
4. +175.89

6-46. What is meant by the term *inversing?*

1. Computing the latitude and departure of a traverse line from its bearing and length
2. Computing the bearing and length of a traverse line from its latitude and departure
3. Computing the ratio of linear error of closure of a traverse from its length and error of closure
4. Computing the latitude and departure from the corrected angles and distances

6-47. Plane coordinates describe the location of a point in what manner?

1. By a distance north or south and east or west from a point of origin
2. By bearing north or south and east or west from a point of origin
3. By bearing and distance from a point of origin
4. By the line of sight from a point of origin

Learning Objective: Compute coordinates from latitude and departure; compute latitude and departures from coordinates.

IN ANSWERING QUESTIONS 6-48 THROUGH 6-50, ASSUME THAT A TRAVERSE LINE HAS THE FOLLOWING PLANE COORDINATES

STATION A X = 627.42 Y = 326.87

STATION B X = 864.81 Y = 542.50

6-48. What is the latitude of the traverse line?

1. -215.63 ft
2. +215.63 ft
3. -237.39 ft
4. +237.39 ft

6-49. What is the departure of the traverse line?

1. -215.63 ft
2. +215.63 ft
3. -237.39 ft
4. +237.39 ft

6-50. What is the bearing of the traverse line?

1. N47°45′E
2. N42°15′E
3. S47°45′W
4. S42°15′W

POINT	LATITUDE		DEPARTURE		COORDINATES	
	NORTH	SOUTH	EAST	WEST	Y	X
A					50.75	120.47
	202.56		41.55			
B						
		170.15		145.84		
C						
		32.41	104.29			
A					50.75	120.47

Figure 6C

IN ANSWERING QUESTIONS 6-51 AND 6-52. REFER TO FIGURE 6C. THE FIGURE SHOWS THE ADJUSTED LATITUDES AND DEPARTURES OF STATIONS A, B, AND C OF A CLOSED TRAVERSE. IT ALSO SHOWS THE PLANE COORDINATES OF STATION A.

6-51. What are the plane coordinates of station B?

1. Y = 248.28 X = 156.04
2. Y = 250.32 X = 158.22
3. Y = 253.31 X = 160.88
4. Y = 253.31 X = 162.02

6-52. What are the plane coordinates of station C?

1. Y = 83.16 X = 14.32
2. Y = 83.16 X = 16.18
3. Y = 85.24 X = 16.18
4. Y = 85.24 X = 14.32

Learning Objective: Compute areas by double meridian distance. double parallel distance, from coordinates, by trapezoidal formula, by counting squares, and by planimeter. Compute meridian and double meridian distance. Compute areas by segmented and external parcels.

6-53. The reference meridian passes through what traverse station?

1. Most easterly
2. Most westerly
3. Most northerly
4. Most southerly

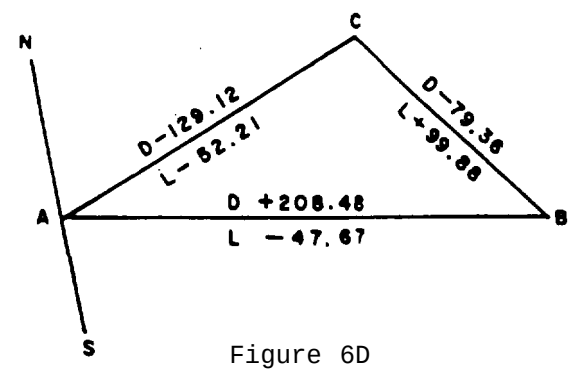

Figure 6D

IN ANSWERING QUESTIONS 6-54 THROUGH 6-56, REFER TO THE FIGURE 6D. THE INITIAL TRAVERSE LINE IS *AB* AND THE SUBSEQUENT TRAVERSE LINES ARE *BC* AND *CA.* RESPECTIVELY.

6-54. What is the meridian distance of traverse line *BC?*

1. 79.36 ft
2. 104.24 ft
3. 143.92 ft
4. 168.80 ft

6-55. What is the double meridian distance of traverse line *CA?*

1. 337.60 ft
2. 258.24 ft
3. 129.12 ft
4. 79.36 ft

6-56. What is the approximate area contained within the closed traverse?

1. 8,520 sq ft
2. 17,040 sq ft
3. 25,200 sq ft
4. 50,400 sq ft

6-57. What is the major difference between the DMD method of determining area and the DPD method?

1. The DPD of the initial traverse line is twice the departure
2. A reference parallel is used instead of a reference meridian
3. The distances are calculated using latitude instead of departure
4. Both 2 and 3 above

STATION	COORDINATES	
	Y	X
A	20 FT	10 FT
B	30 FT	0 FT
C	25 FT	20 FT

FIGURE 6E

IN ANSWERING QUESTION 6-58, REFER TO FIGURE 6E.

6-58. The coordinates of stations *A, B,* and *C* of a closed straight-sided traverse are given. What is the area contained within the closed traverse?

1. 75 sq ft
2. 100 sq ft
3. 125 sq ft
4. 150 sq ft

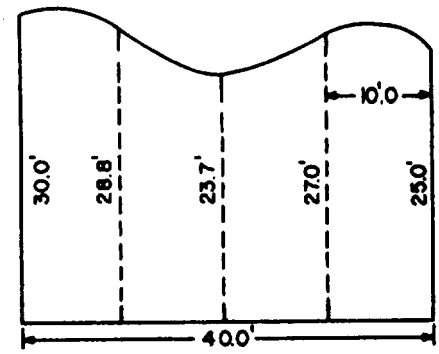

Figure 6F

IN ANSWERING QUESTIONS 6-59 AND 6-60, REFER TO FIGURE 6F.

6-59. Using the trapezoidal rule, the area of the figure equals

1. $10\left(\frac{30 + 28.8 + 23.7 + 27 + 25}{5}\right)$
2. $10\left(\frac{28.8 + 23.7 + 27}{3} + 30 + 25\right)$
3. $10\left(\frac{30 + 25}{2} + 28.8 + 23.7 + 27\right)$
4. $40\left(\frac{30 + 28.8 + 23.7 + 27 + 25}{2}\right)$

6-60. What is the initial step in finding the area of the figure by counting squares?

1. Plot it to scale on graph paper
2. Use a planimeter to determine the area
3. Divide it into 100-foot squares
4. Determine the bearings of the lines

6-61. You have a planimeter but do not know the constant for the instrument. How may you determine an area with this instrument?

1. By measuring the drum
2. By measuring a known area of the same scale and establishing a ratio
3. By measuring the area you want to know and calculate using the drawing scale

6-62. Once you have determined the segmental areas, what do you do with this information to find the area of the whole parcel?

1. Always subtract the areas from the area of the parcel
2. Always add the areas to the area of the parcel
3. Determine if the segmental areas are inside or outside the parcel straight-line and chord boundaries, then add or subtract as required

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Learning Objective: Recognize correct procedures for plotting angles by the protractor-and-scale method, tangents, and coordinates.

A. Protractor

B. Tangent

C. Coordinates

Figure 6G

IN ANSWERING QUESTIONS 6-63 THROUGH 6-66, SELECT FROM FIGURE 6G THE METHOD OF PLOTTING TRAVERSES THAT IS BEST DEFINED BY THE QUESTIONS. SOME RESPONSES MAY BE USED MORE THAN ONCE.

6-63. This method uses a *NS* meridian to lay out each angle.

1. A
2. B
3. C

6-64. This method uses linear distances from reference lines, locates points, and then connects them with lines.

1. A
2. B
3. C

6-65. This method uses deflection angles and a reference meridian.

1. A
2. B
3. C

6-66. This method uses a single meridian to lay out each bearing line. Then you use parallel lines to transfer these directions to the plot.

1. A
2. B
3. C

Learning Objective: Identify surveying computation mistakes, their causes, and methods to correct them. Also, identify ways to prevent future mistakes.

6-67. A bearing that has the correct angular value, but the wrong compass direction is usually caused by which of the following surveying mistakes?

1. Viewing the direction of a traverse line from the wrong station
2. Dropping a traverse line
3. Taking a reading from a wrong column of a traverse table
4. Omitting the plus or minus sign of a written value

6-68. You may prevent direction error by

1. placing directional arrows on the traverse diagram
2. quickly adding up the angles to ensure the traverse lines were not dropped
3. making both readings and field note entries with deliberation
4. never writing a value without including the appropriate sign

6-69. Which of the follwing errors uses the same prevention method as direction error prevention?

1. Dropped signs
2. Dropped traverse lines
3. Wrong azimuths
4. Missing decimal points

6-70. When you have an outsized linear error of closure, what should you check first?

1. Your latitudes and departures are correct
2. A dropped traverse line
3. Your arithmetic
4. The bearings computations

6-71. In your traverse containing five interior angles, you compute a final sum of the angles of 500°. What mistake, if any, was probably made?

1. One of the angles was probably dropped, since the sum of the angles should be 540°
2. The angles were probably added incorrectly, since the sum should be 360°
3. You will have to return to the field to find the mistake
4. None

6-72. After you check computations and ensure that no angle was dropped in the process, you still have a large error of closure. What further check, if any, should you attempt at this time?

1. See if an angle is exactly equal to the error of closure; if so, there is a deflection angle error
2. Construct a perpendicular bisector from the line of the linear error of closure to indicate possibly the erroneous measurement involved
3. Construct a line parallel to the suspected erroneous line to find the error
4. None; you must return to the field

6-73. When you have an outsized error of closure for latitudes but not departures, what should you check?

1. A mistake in an angle
2. A mistake in a distance
3. An arithmetic error
4. A dropped traverse line

6-74. When you have an outsize linear error of closure but an acceptable angular error of closure, you should check to see whether you used the

1. sine of the bearing when finding the latitude of the course
2. sine of the bearing when finding the departure of the course
3. cosine of the bearing when finding the departure of the course
4. tangent of the bearing when finding the latitude of the course

6-75. You cannot locate your error and the traverse will not close. You must rerun the traverse, so where should you begin?

1. With a traverse line parallel to the linear error of closure
2. With the initial traverse line
3. With the final traverse line
4. With a line perpendicular to the line of linear closure at its midpoint