

**PRAIRIE VIEW A&M UNIVERSITY
ROY G. PERRY COLLEGE OF ENGINEERING
DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING
CVEG 2102 SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

- I. COURSE DESCRIPTION IN ABET FORMAT**
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 - Average (Graded original work)**
 - Below Average (Graded original work)**
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 - Below Average (Graded original work)**

Course Description in ABET Format

CVEG 2102– SURVEYING AND GEOSPATIAL CONCEPTS

1.	Course number and name:	CVEG 2102 SURVEYING AND GEOSPATIAL CONCEPTS
2.	Credits and contact hours:	1 credit hour; 3 contact hours
3.	Instructor's Name	Dr. Abdul M. Choudhury
4.	Text book: Title:	Elementary Surveying: An Introduction to Geomatics
	Author:	Charles D. Ghilani
	Publisher, Year & Edition:	Pearson, 2018, 15 th Edition
	a. Other Supplemental material	Class Handouts and Notes; PPT
5.	Specific course information	
	a. Brief description of the content of the course (catalog description)	Introduction to plane surveying: leveling, horizontal distance and measurements, vertical and horizontal angles, azimuths and bearings, traverse calculations, earthwork and volume computations, stadia, topographical surveys, construction boundaries, coordinate systems; trigonometry applications in civil engineering and pertinent computer software. The Global Positioning System (GPS) and Geographic Information Systems (GIS) are introduced
	b. Prerequisites or Co-requisites	MATH 1124 and CVEG 2001 None
	c. *Indicate whether a required, elective, or selected elective (as per definition provided) course in the program	Required
6.	a. Specific goals for the course specific outcomes of instruction (e.g., The student will be able to explain the significance of current research about a particular topic.) <i>Students will be able to</i>	b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course. <i>The specific goals for the course specific outcomes listed on the left column will address the following student learning outcomes:</i>
	1. Make measurements of horizontal and vertical distances and angles using surveying equipment.	Outcome 6 (Introduced, not Measured) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	2. Preparing and presenting the laboratory result and report.	Outcome 3 (Reinforced, not Measured) an ability to communicate effectively with a range of audiences
	3. Compute coordinates and areas by coordinate geometry computations given specifications.	Outcome 6 (Introduced, not Measured) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

	4. Understand principles of topographic maps and the basic plane surveying techniques used to develop them.	Outcome 6 (Introduced, not Measured) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	5. Have an understanding of various areas of Geomatics Engineering	Outcome 6 (Introduced, not Measured) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	6. Students will be exposed to latest equipment used in field work	Outcome 6 (Introduced, not Measured) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7.	Brief list of topics to be covered	Introduction to the Fundamentals of Surveying (6 hours) Building a Topographic Map (6 hours) Levelling (9 hours) Total Station (6 hours) Horizontal Curve (3 hours) Vertical Curve (3 hours) Earthwork Analysis and Computations (3 hours) Geographic Information Systems (GIS) (3 hours) Global Positioning Systems (GPS) (3 hours)

II ASSESSMENT RESULTS FOR CURRENT AND PAST FOUR ASSESSMENT PERIODS

Program Outcomes Assessed in this course

- 6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

End of Semester Course Assessment Reports Fall 2021 and Last Three Assessment Periods.

Each summary contains the following Information

1. Performance Statistics

- Total number of students in class
- The class average performance (**stated as %**) in each course outcome assessed in this class and the **two previous times course was assessed**.
- The acceptable class average for the class in each outcome area as set by your Department.
- Percentage of students who scored below the expected average in each outcome.

2. Implementation Summary

- Brief summary of plans implemented during the semester based on last assessment report

3. Perceived Problems

- Instructor's **critical evaluation** of perceived problems that affected students' performance. **Realistic problems should be identified throughout the semester and summarized in this section of the report.**

4. New Plans for Addressing Problems

- Instructor's plans for addressing the perceived problems the next time the class is taught. **These should be specific enough for another instructor to implement. Most of these should be things that, you, the instructor can implement to help students to improve. Be creative.**

5. Overall Trend over last three assessment periods

- Instructors summary of overall performance trend for each outcome measured over the last three periods.

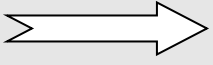
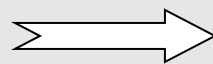
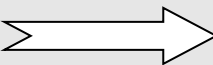
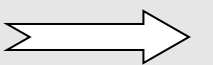
5. Were Expectations Met?

- Answer **YES** if the **class average was above the expected average** and the **stated percentage of students** scored at or above the expected average, else answer NO.

END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
CVEG 2102– SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021

Report Prepared by: Dr. Abdul M Choudhury

Report Date: Dec 19, 2021

Semester	Analysis Type	Number of Students	Outcome 6 An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions			
			Expected Class Average/	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average
Fall 2021	Direct	19	70	70	88.47	100
Fall 2020	Direct	7	70	70	88.5	100
Fall 2019	Direct	18	70	70	80.5	89.4
Fall 2017	Direct		70	70		
Implementation Summary	Items implemented from previous report or after meeting previous instructor 		Students should be encouraged to strengthen their geometric and trigonometric knowledge. One of the prerequisite test may be conducted to revise their knowledge of geometry and trigonometry.			
Perceived Problems	Perceived problems are directly related to the PC and the sub items under them 		In general, about 85-90% of the class was able to satisfy this outcome. Some of the students were not following all geometrical angular calculation and trigonometrical calculations which were needed in surveying.			
Plans for Addressing Problems	Plans for address specific measures to address PC and their sub areas 		Students should be encouraged to cover the basic physics, trigonometry and geometry. One of the prerequisite test may be conducted to revise their knowledge of geometry and trigonometry.			
Overall Trend over Periods	Ascertain if there were improvements over previous semesters 		The overall progress of the students was good in comparison to the previous year.			
Were Expectations Met?			Yes			

**Grade sheet showing outcomes CVEG 2102– SURVEYING AND GEOSPATIAL CONCEPTS
Fall 2021**

Student Roster no	Outcome 6		Average % of outcome 6
	Lab Report 1	Lab report 2	
1	99	85	92
2	99	85	92
3	99	85	92
4	99	85	92
5	93	86	89.5
6	93	93	93
7	93	93	93
8	95	78	86.5
9	95	78	86.5
10	95	78	86.5
11	95	78	86.5
12	91	95	93
13	91	95	93
14	83	80	81.5
15	83	80	81.5
16	83	80	81.5
17			
18	88	80	84
19			
Maximum Marks	100	100	100
% Average	92.58	84.35	88.47

SURVEYING AND GEOSPATIAL CONCEPTS FALL 2021

Title of Assignment: TEST 1

TOPICS COVERED IN TEST 1

Test 1 covered the following topics:

1. Introduction of surveying
2. Leveling- Theory, Methods and equipment
3. Leveling- Field procedure and computations
4. Distance measurement by taping

ABOVE AVERAGE

Name Markus HartfieldClass Roster Number 8**MID TERM TEST****CVEG 2102 (SURVEYING AND GEOSPATIAL CONCEPTS)**

Full Points-100 Time -2 Hours

Name Markus HartfieldClass Roster Number 8

Instructions: You need to submit your responses in the space provided for each question. Diagrams are not drawn to scale unless stated otherwise. **If you need additional space, please use the backside of the paper.** Your numerical answer should not go beyond two places after the decimal point.

POLICY TO ERADICATE CHEATING (PROTECT INTEGRITY OF EXAMS)

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- 4) There shall be **NO SHARING** of resources during the exam
- 5) Restroom Visit: if you need to use the restroom, do so before opening the exam. Once the exam begins, you must submit your work to the instructor if you leave the classroom to visit the rest room (your exam terminates).

1. Define surveying?

measuring large distances w/ many different
methods & techniques

3

2. Name the country which introduced surveying for the first time around 1400 B.C.?

2

Egypt

3. What is the difference between a benchmark and a turning point in differential leveling?

2

Benchmark is something already present when measuring.

Turning point is something added later.

4. Define Misclosure in differential levelling

2

That is when you subtract initial level from final level

5. What is the full form of NAVD88

1

National 1988

6. Name any three errors that may occur in Tape surveying

Human error, Computer error, incorrect tape measure

7. A 30 m steel tape was used for surveying a total distance of 81.151 m. The tape was found 30.012 m. Calculate correction required for this length

3

$$\frac{30.012 - 30}{30.012} = \frac{.012}{30.012} = .00039$$

$$.00039 (81.151)$$

$$= .0324 \text{ m}$$

8. When is it appropriate to use the reciprocal leveling procedure?

2

When you measure over any body of water

9. A differential leveling loop began and closed on BM Bridge (elevation 12.063 m). The plus sight and minus sight distances were kept approximately equal. Readings (in meters) listed in the order taken are 0.687 (+S) on BM Bridge, 1.109 (-S) and 2.843 (+S) on TP1, 0.866 (-S) and 2.708 (+S) on BM X, 2.752 (-S) and 1.064 (+S) on TP2, and 2.563 (-S) on BM Bridge. Prepare, check, and adjust the notes.

20+5+10

Station	BS(+)	H.I.	FS(-)	Elevation
BM	0.687	12.72	12.72 -	12.063m
TP1	2.843	14.484	1.109	11.641m
BMx	2.708	16.326	0.866	13.618m
TP2	1.064	14.638	2.752	13.574m
			2.563	12.075
	$\Sigma 7.302$		$\Sigma 7.290$	

Corrected
77
0

20+5+10
= 30
20

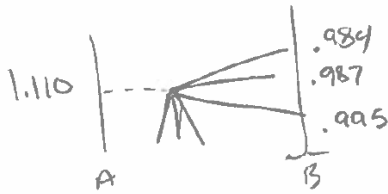
$$12.063 + 7.302 - 7.290 = 12.075 \checkmark$$

$$12.075 - 12.063 = 0.012 \leftarrow \text{level diff}$$

$$\frac{0.012}{4} = 0.003 \leftarrow \text{correction}$$

10. Reciprocal leveling gives the following readings in meters from a set up near A: on A, 1.110; on B, 0.987, 0.995, and 0.984. At the setup near B: on B, 1.549; on A, 1.673, 1.670, and 1.666. The elevation of A is 324.583 m. Determine the elevation of B.

20



$$1.110 - \frac{.984 + .987 + .995}{3}$$

$$= 1.110 - .9887$$

$$\text{for A} = .1213$$



$$\frac{1.666 + 1.670 + 1.673}{3} - 1.549$$

$$\text{for B} = .1207$$

20

$$324.583 + .121$$

$$= 324.704 \text{ elevation of B}$$

$$\frac{.1213 + .1207}{2} = .121$$

11. Prepare a set of three-wire leveling notes for the data given and make the page check. The elevation of BM X is 83.097 m. Rod readings (in meters) are (*U* denotes upper cross-wire readings, *M* middle wire, and *L* lower wire): +S on BM X: *U* = 1.076, *M* = 0.829, *L* = 0.573; -S on TP 1: *U* = 1.131, *M* = 0.858, *L* = 0.586; +S on TP 1: *U* = 0.989, *M* = 0.767, *L* = 0.555; -S on BM Y: *U* = 1.089, *M* = 0.851, *L* = 0.611. 20

Station	B.S. (+)	HI	F.S. (-)	Elevation	Stadia (+)	Stadia (-)
BM X	1.076 .829 .573 <u>2.478/3</u> .826	83.923		83.097	1.247 .256	
TP 1	.989 .767 .555 <u>2.311/3</u> .770	83.835	1.131 .858 .586 <u>2.575/3</u> .858	83.005	.222 .212	.273 .272
BM Y			1.089 .851 .611 <u>2.551/3</u> .850	82.985		.238 .240
83.097 + 1.596 - 1.708 = 82.985 ✓		1.596	1.708		.937	1.023

12. Assuming a stadia constant of 99.987, calculate the distance leveled in Problem 11. 10

$$D = K S$$

$$= 99.987 (1.96)$$

$$= 195.975 \text{ m}$$

$$.937 + 1.023 = 1.96$$

AVERAGE

Name Marshall Johnson

Class Roster Number _____

MID TERM TEST**CVEG 2102 (SURVEYING AND GEOSPATIAL CONCEPTS)**

Full Points-100 Time -2 Hours

Name Marshall Johnson

Class Roster Number _____

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1. Define surveying?

3

the definition of surveying is the study or practice of measuring altitudes, angles, and distances to measure lands

2. Name the country which introduced surveying for the first time around 1400 B.C.?

2

2/ Egypt introduced surveying first.

3. What is the difference between a benchmark and a turning point in differential leveling?

2

Benchmark - Existing reference point used to measure values.
(BM)

Turning Point - Referenced points that are used, then discarded because they are no longer needed.
(TP)

4. Define Misclosure in differential levelling

2

Misclosure is when the sum of all errors don't add up to the original value.

5. What is the full form of NAVD88

1

1/ North American Vertical Datum of 1988

6. Name any three errors that may occur in Tape surveying

1) Incorrect tape length

2) Temperature other than normal

3) Inconsistent pull

7. A 30 m steel tape was used for surveying a total distance of 81.151 m. The tape was found 30.012 m.

Calculate correction required for this length

3

$$C_c = \frac{l - l_1}{l_1} \cdot L \quad \begin{array}{l} l = \text{actual tape} \\ l_1 = \text{nominal tape} \end{array}$$

$$= \frac{30.012 - 30}{30} \cdot 81.151 \text{ m} = \text{Distance measured}$$

$C_c = \text{correction}$

$$C_c = .03246 \text{ m} \quad 81.151 \text{ m} + .03246 = 81.183 \text{ m}$$

$\xrightarrow{\text{Corrected tape}}$

8. When is it appropriate to use the reciprocal leveling procedure?

2

It is appropriate when the distance is large.

9. A differential leveling loop began and closed on BM Bridge (elevation 12.063 m). The plus sight and minus sight distances were kept approximately equal. Readings (in meters) listed in the order taken are 0.687 (+S) on BM Bridge, 1.109 (-S) and 2.843 (+S) on TP1, 0.866 (-S) and 2.708 (+S) on BM X, 2.752 (-S) and 1.064 (+S) on TP2, and 2.563 (-S) on BM Bridge. Prepare, check, and adjust the notes.

20+5+10

Station	BS	HI	FS	Elev.	Correction	Corrected Elevation
✓ BM Bridge	0.687m	$\frac{12.063 + 0.687}{12.75}$		12.063m ✓		12.063m ✓
✓ TP1	2.843	$\frac{11.641 + 2.843}{14.484}$	1.109	$\frac{12.75 - 1.109}{11.641m}$		$11.641 - (.003 \times 1)$ 11.638m
✓ BMX	2.708	$\frac{13.618 + 2.708}{16.326}$	0.866	$\frac{14.484 - 0.866}{13.618m}$		$13.618 - (.003 \times 2)$ 13.612m
✓ TP2	1.064	$\frac{13.574 + 1.064}{14.638}$	2.752	$\frac{16.326 - 2.752}{13.574m}$		$13.574 - (.003 \times 3)$ 13.565m
	7.302		2.563	$\frac{14.638 - 2.563}{12.075m}$		$12.015 - (.003 \times 4)$ 12.003m ✓
			7.21			

3h

$$\text{Misclosure} = 12.075 - 12.063 = 0.012m$$

$$= \frac{0.012}{4} = 0.003m$$

$$\text{Check} \Rightarrow 12.063 + 7.302 - 7.29 = 12.075m \checkmark$$

10. Reciprocal leveling gives the following readings in meters from a set up near A: on A, 1.110; on B, 0.987, 0.995, and 0.984. At the setup near B: on B, 1.549; on A, 1.673, 1.670, and 1.666. The elevation of A is 324.583 m. Determine the elevation of B.

$$Avg @ A = \frac{0.987 + 0.995 + 0.984}{3} = 0.9886 \text{ m}$$

$$Avg @ B = \frac{1.673 + 1.670 + 1.666}{3} = 1.6696 \text{ m}$$

$$\frac{(A_1 - B_1) + (A_2 - B_2)}{2} = \frac{(1.110 - 1.549) + (0.9886 - 1.6696)}{2}$$

$$= -0.55967 \text{ m}$$

$$Elev A = 324.583 \text{ m}$$

$$\text{right elev of B} = 324.583 - 0.55967 = \boxed{324.023 \text{ m}}$$

15

Bat higher
elevation

$$= 329 + 0.55$$

20

$$83.057 + 1.556 - 1.708 = 82.905 \checkmark$$

10

51

BELOW AVERAGE

Name Hunter RodgersClass Roster Number 16**MID TERM TEST**
CVEG 2102 (SURVEYING AND GEOSPATIAL CONCEPTS)

Full Points-100

Time -2 Hours

Name Hunter RodgersClass Roster Number 16

Instructions: You need to submit your responses in the space provided for each question. Diagrams are not drawn to scale unless stated otherwise. **If you need additional space, please use the backside of the paper.** Your numerical answer should not go beyond two places after the decimal point.

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1. Define surveying?

3

Surveying is ~~examining~~ and recording an area and its features.

2. Name the country which introduced surveying for the first time around 1400 B.C.?

2

2 Egypt introduced surveying

3. What is the difference between a benchmark and a turning point in differential leveling?

2

The difference between them is that a benchmark is a permanent known elevation

4. Define Misclosure in differential levelling

2

1 The last in the series fails to join with the first

5. What is the full form of NAVD88

1

1 North American Vertical Datum of 1988

6. Name any three errors that may occur in Tape surveying

1 incorrect tape length, temperature, misreadings

7. A 30 m steel tape was used for surveying a total distance of 81.151 m. The tape was found 30.012 m. Calculate correction required for this length

3

3

$$C_L = \frac{l - l'}{l'} \times L = \frac{30 - 30.012}{30.012} \times 81.151$$
$$= -0.032$$

8. When is it appropriate to use the reciprocal leveling procedure?

2

9. A differential leveling loop began and closed on BM Bridge (elevation ~~12.063~~ m). The plus sight and minus sight distances were kept approximately equal. Readings (in meters) listed in the order taken are 0.687 (+S) on BM Bridge, 1.109 (-S) and 2.843 (+S) on TP1, 0.866 (-S) and 2.708 (+S) on BM X, 2.752 (-S) and 1.064 (+S) on TP2, and 2.563 (-S) on BM Bridge. Prepare, check, and adjust the notes.

20+5+10

Station	BS	HI	FS	Elevation
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TP1	2.843	14.484	0.866	11.641
				13.618
BM X	2.708	16.326	2.752	13.574
				12.074
TP2	1.064	14.638	2.563	
	$\Sigma = 7.302$		$\Sigma = 7.29$	

22

$$\Sigma BS - \Sigma FS = 7.302 - 7.29 = 0.012$$

??
0

10. Reciprocal leveling gives the following readings in meters from a set up near *A*: on *A*, 1.110; on *B*, 0.987, 0.995, and 0.984. At the setup near *B*: on *B*, 1.549; on *A*, 1.673, 1.670, and 1.666. The elevation of *A* is 324.583 m. Determine the elevation of *B*.

20

A: 1.110



11. Prepare a set of three-wire leveling notes for the data given and make the page check. The elevation of BM X is 83.097 m. Rod readings (in meters) are (U denotes upper cross-wire readings, M middle wire, and L lower wire): +S on BM X: $U = 1.076$, $M = 0.829$, $L = 0.573$; -S on TP 1: $U = 1.131$, $M = 0.858$, $L = 0.586$; +S on TP 1: $U = 0.989$, $M = 0.767$, $L = 0.555$; -S on BM Y: $U = 1.089$, $M = 0.851$, $L = 0.611$. 20

Station	BS	HI	FS	Elevation
BM X	1.076			83.097
	0.829			
	0.573			
	Avg = .826	83.923	1.131	
TP ₁	0.989		0.858	82.792
	0.767		0.586	
	0.555		Avg = .858	
	Avg = .770	83.867	1.089	
BM Y			0.851	82.985
			0.611	
			Avg = 0.850	
	$\Sigma = 1.596$		$\Sigma = 1.708$	

15

Check?

12. Assuming a stadia constant of 99.987, calculate the distance leveled in Problem 9.

10

SURVEYING AND GEOSPATIAL CONCEPTS

FALL 2020

Title of Assignment: TEST 2

TOPICS COVERED IN TEST 2

Test 2 covered the following topics:

1. Introduction of surveying
2. Leveling- Theory, Methods and equipment
3. Leveling- Field procedure and computations
4. Distance measurement by taping
5. Angles, Azimuth and bearings
6. Magnetic declination
7. Total Station instrument, Angle and observations
8. Various methods of measuring area
9. Area by coordinates
10. Introduction to GPS and GNSS
11. Horizontal curves

ABOVE AVERAGE

CVGE 2102: SURVEYING AND GEOSPATIAL CONCEPTS

FINAL EXAMINATION

Last Name Hawa First Name Omar Class Roster Number 7

Total 8 Questions

Total points- 100

Time allotted- 2 Hour

Instructions: You need to submit your responses in the space provided for each question. If you need additional space, use the backside. All cell phones must be turned off and wrapped by a paper. Write your name and deposit the cell phone on the designated location. You will be ejected from the exam room if you are caught cheating or copying. This question paper contains 6 pages.

1. A differential leveling loop began and closed on BM Tree (elevation 323.48 ft). The plus sight and minus sight distances were kept approximately equal. Readings (in feet) listed in the order taken are 3.18 (+S) on BM Tree, 4.76 (-S) and 2.44 (+S) on TP1, 3.05 (-S) and 6.63 (+S) on BM X, 3.64 (-S) and 2.35 (+S) on TP2, and 3.07 (-S) on BM Tree. Prepare, check, and adjust the notes.

15+2+3=20 Points

Station	FS	HI	BS	EIV	Adj Elev
BM tree	3.18	326.66		323.48	323.48 ft
0.02 TP1	2.44	324.34	4.76	321.9	321.92 ft
2.04 BM X	6.63	327.92	3.05	321.29	321.33 ft
1.06 TP2	2.35	326.63	3.64	324.28	324.34 ft
1.08 BM tree			3.07	323.56	323.64 ft
check	$\Sigma = 14.6$	$f(t)$	$\Sigma = 14.52$	$(f+t)$	

loop misclosure : $14.6 - 14.52 = \frac{0.08}{4} = 0.02$

$323.48 + 14.6 - 14.52 = 323.56 \text{ ft}$

2. The following readings were taken using a three-wire leveling instrument. Rod readings (in meters) are (U denotes upper crosswire readings, M middle wire, and L lower wire): +S on BM X: $U = 2.959$, $M = 2.707$, $L = 2.454$; -S on TP 1: $U = 1.683$, $M = 1.453$, $L = 1.224$; +S on TP 1: $U = 2.254$, $M = 2.054$, $L = 1.854$; -S on BM Y: $U = 1.013$, $M = 0.817$, $L = 0.620$. Assuming a stadia constant of 99.987, Calculate the distance between BM X and BM Y? 10 Points

Station	BS	Stadia	FS	Stadia
BMX	2.959 2.707 <u>2.454</u> 2.706	0.252 <u>+0.253</u> 0.505		
TP1	2.254 2.054 <u>1.854</u> 2.054	0.2 <u>+0.2</u> 0.4	1.683 1.453 <u>1.224</u> 1.453	0.23 <u>0.229</u> 0.459
BM Y			1.013 0.817 <u>0.620</u> 0.817	0.196 <u>0.197</u> 0.393
check		$\Sigma = 9.05$ or 90.5		$\Sigma = 1.882$ or 88.2

$$D = KS$$

$$D = (99.987)(9.05 - 1.882)$$

$$D = 5.29m$$

$$\text{or } 529.93$$

3. Course AB of a five-sided traverse runs due north. From the given balanced interior angles to the right, compute and tabulate the azimuths from north for each side of the traverses. Interior angles are $A = 90^\circ 29' 18''$, $B = 107^\circ 54' 36''$, $C = 104^\circ 06' 37''$, $D = 129^\circ 02' 57''$, $E = 108^\circ 26' 32''$. Check your calculation. 15 Points

- ① $180^\circ 0' 0'' - 107^\circ 54' 36'' = 72^\circ 5' 24''$ ②
 ② $72^\circ 5' 24'' + 180 = 252^\circ 5' 24''$ ③
 ③ $252^\circ 5' 24'' - 104^\circ 06' 37'' = 147^\circ 58' 47''$ ④
 ④ $147^\circ 58' 47'' + 180 = 327^\circ 58' 47''$ ⑤
 ⑤ $327^\circ 58' 47'' - 129^\circ 02' 57'' = 198^\circ 55' 50''$ ⑥
 ⑥ $198^\circ 55' 50'' - 180 = 18^\circ 55' 50''$

(7)

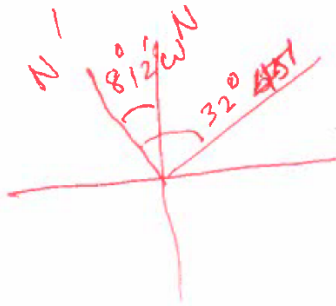
AB	$0^\circ 0' 0''$
BC	$72^\circ 5' 24''$
CD	$252^\circ 5' 24''$
DE	$327^\circ 58' 47''$
EA	$18^\circ 55' 50''$

15

4. Assume the magnetic bearing of a line AB read in 1875 was $N32^{\circ}45'E$. The declination at that time of the place was $8^{\circ}12'W$. The present declination is $2^{\circ}30'E$. Calculate the present magnetic bearing of line AB. 10 Points

$$\textcircled{1} N32^{\circ}45'E - 8^{\circ}12'W = N24^{\circ}33'E$$

$$\textcircled{2} N24^{\circ}33'E - 2^{\circ}30'E = \boxed{N22^{\circ}3'E}$$



10

5. Two tangents of a circular curve intersect at the point PI. The deflection angle is $I = 8^{\circ}24'$. The station of the PI is $64 + 27.46$ and the radius of the curve is 2864.79 ft. Calculate the PC and PT stationing. Use the formulae $L = RI$ (I in Radian) and $T = R \tan(I/2)$. 10 Points

$$PI = 64(100) + 27.46 = 6427.46 \text{ ft}$$

$$L = (2864.79)(8^{\circ}24') \times \frac{\pi}{180} = 420.0 \text{ ft}$$

$$T = (2864.79) \tan\left(\frac{8^{\circ}24'}{2}\right) = 210.37 \text{ ft}$$

$$PC = PI - T$$

$$PC = 6427.46 - 210.37 = \boxed{6217.1 \text{ ft}}$$

$$PT = PC + L$$

$$PT = 6217.1 + 420 = \boxed{6637.1 \text{ ft}}$$

6. A 30-m steel tape was standardized at 20°C and supported throughout under a tension of 5.45 kg was found to be 30.012m long. The tape had a cross sectional area of 0.05 cm². The tape was held with a constant tension of 9.09 kg to measure a distance of 81.151 m. The temperature during measurement was 20°C. Apply correction for tape length and pull and hence determine the corrected length. 15 Points.

Use the following formula

$$C_L = \frac{L - L'}{L'} \times L$$

$$\text{and } C_P = (P_1 - P) \frac{L}{AE}, \text{ Assume } E = 2,000,000 \text{ kg/cm}^2$$

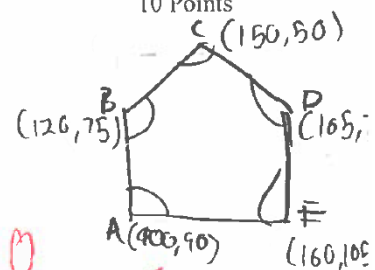
$$C_L = \frac{(30.012 - 30)}{30} \times 30 = 0.012$$

$$C_P = \frac{(9.09 - 5.45)}{(0.05)(2000000)} \times 81.151 \text{ m} = 2.95 \times 10^{-3}$$

or
0.00295
or
0.003

7. Calculate the area of the polygon bounded by ABCDEA with the following coordinates of the vertex. A(100,90), B(120,75), C(150,50), D(165,70) and E(160,105). All the coordinates are in feet. Draw the required graphs to arrive at your answer. 10 Points

X	100	120	150	165	160	100
Y	90	75	50	70	105	90



$$\frac{1}{2} \left((100 \times 75 - 120 \times 90) + (120 \times 50 - 150 \times 75) + (150 \times 70 - 165 \times 80) + (165 \times 105 - 160 \times 70) + (160 \times 90 - 100 \times 105) \right)$$

$$= \frac{1}{2} (-3300 + (-5250) + (2250) + (6125) + (3900))$$

$$\frac{1}{2} (3725) = 1862.5 \text{ ft}^2$$

8. The following angles were calculated by a total station for a pentagon. Calculate the corrected values of the angles 10 Points

Interior Angle	Calculated value of angle in degrees
A	110
B	105
C	112
D	96
E	119

$$(n-2)180$$
$$(5-2)(180) = 540$$

5

AVERAGE

CVEG 2102: SURVEYING AND GEOSPATIAL CONCEPTS

FINAL EXAMINATION

Last Name Pettis

First Name MAURICE

Class Roster Number 3

Total 8 Questions

Total points- 100

Time allotted- 2 Hour

Instructions: You need to submit your responses in the space provided for each question. If you need additional space, use the backside. All cell phones must be turned off and wrapped by a paper. Write your name and deposit the cell phone on the designated location. You will be ejected from the exam room if you are caught cheating or copying. This question paper contains 6 pages.

1. A differential leveling loop began and closed on BM Tree (elevation 323.48 ft). The plus sight and minus sight distances were kept approximately equal. Readings (in feet) listed in the order taken are 3.18 (+S) on BM Tree, 4.76 (-S) and 2.44 (+S) on TP1, 3.05 (-S) and 6.63 (+S) on BM X, 3.64 (-S) and 2.35 (+S) on TP2, and 3.07 (-S) on BM Tree. Prepare, check, and adjust the notes.

15+2+3=20 Points

Station	(+S)	(-S)	EVL	Cor	ADJ EVL
B.Mtree	3.18		323.48	0	323.48
			326.9	-0.02'	321.88
T.P1	2.44	4.76	320.76	-0.04'	320.66
			320	-0.06	319.94
B.M X	6.63	3.05	323.56	-0.08	323.48
T.P2	2.35	3.64			
		3.07			
B.Mtree					

Sum = 19.6 19.16

20

Page check

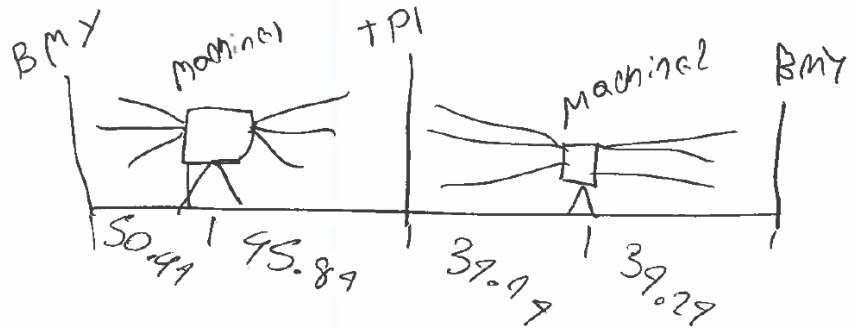
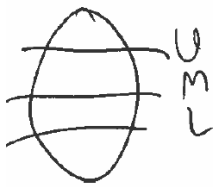
HI

Page
Check
323.48
419.6
338.08
19.52
323.56

$$\text{error: } 323.56 - 323.48 = \frac{0.08}{4} = 0.02$$

2. The following readings were taken using a three-wire leveling instrument. Rod readings (in meters) are (U denotes upper crosswire readings, M middle wire, and L lower wire): +S on BM X: $U = 2.959$, $M = 2.707$, $L = 2.454$; -S on TP 1: $U = 1.683$, $M = 1.453$, $L = 1.224$; +S on TP 1: $U = 2.254$, $M = 2.054$, $L = 1.854$; -S on BM Y: $U = 1.013$, $M = 0.817$, $L = 0.620$. Assuming a stadia constant of 99.987, Calculate the distance between BM X and BM Y? 10 Points

Rod Point	BS	D	FS	Distance
BM-X Benchmark	$U = 2.959$ $M = 2.707$ $L = 2.454$	$99.987(2.959 - 2.454)$ $= 50.49$	$U = 1.683$ $M = 1.453$ $L = 1.224$	$99.987 \times (1.683 - 1.224)$ $= 45.89$
TP1	$U = 2.254$ $M = 2.054$ $L = 1.854$	$99.987(2.254 - 1.854)$ $= 39.99$	$U = 1.013$ $M = 0.817$ $L = 0.620$	$99.987 \times (1.013 - 0.620)$ $= 39.29$
BM-Y				



Distance between BM-X and BM-Y

$$50.49 + 45.89 + 39.99 + 39.29$$

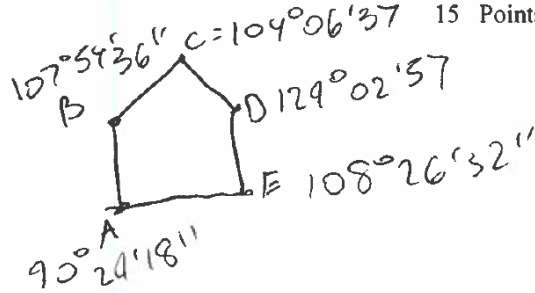
=

$$\boxed{175.66 \text{ m}} \approx 175.67 \text{ m}$$

10

3. Course AB of a five-sided traverse runs due north. From the given balanced interior angles to the right, compute and tabulate the azimuths from north for each side of the traverses. Interior angles are $A = 90^\circ 29' 18''$, $B = 107^\circ 54' 36''$, $C = 104^\circ 06' 37''$, $D = 129^\circ 02' 57''$, $E = 108^\circ 26' 32''$. Check your calculation. 15 Points

$$\begin{aligned} A &= 90^\circ 29' 18'' \\ B &= 107^\circ 54' 36'' \\ C &= 104^\circ 06' 37'' \\ D &= 129^\circ 02' 57'' \\ E &= 108^\circ 26' 32'' \end{aligned}$$



$$\boxed{\text{Azimuth of AB} = 0}$$

Forward bearing = FB
Back bearing = BB

15

$$\begin{aligned} \text{FB of BC} &= \text{BB of AB} - B = 180^\circ 0' 0'' - 107^\circ 54' 36'' = 72^\circ 05' 24'' \\ \text{BB of BC} &= 180^\circ + 72^\circ 05' 24'' = 252^\circ 05' 24'' \end{aligned}$$

$$\begin{aligned} \text{FB of CD} &= \text{BB of BC} - C = 252^\circ 05' 24'' - 104^\circ 06' 37'' = 147^\circ 58' 47'' \\ \text{BB of CD} &= 180^\circ + 147^\circ 58' 47'' = 327^\circ 58' 47'' \end{aligned}$$

$$\begin{aligned} \text{FB of DE} &= \text{BB of CD} - D = 327^\circ 58' 47'' - 129^\circ 02' 57'' = 198^\circ 55' 50'' \\ \text{BB of DE} &= 198^\circ 55' 50'' - 180^\circ = 18^\circ 55' 50'' \end{aligned}$$

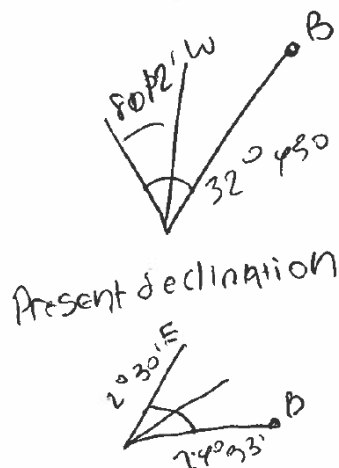
$$\begin{aligned} \text{FB of EA} &= 18^\circ 55' 50'' + 360^\circ - E = 18^\circ 55' 50'' + 360^\circ - 108^\circ 26' 32'' = 270^\circ 29' 18'' \\ \text{BB of EA} &= 270^\circ 29' 18'' - 180^\circ = 90^\circ 29' 18'' \end{aligned}$$

$$\text{FB of AB} = 90^\circ 29' 18'' - 90^\circ 29' 18'' = 0$$

Azimuth from north

$$\boxed{\begin{aligned} \text{AB} &= 0^\circ 0' 0'' & \text{BC} &= 72^\circ 05' 24'' \\ \text{CD} &= 147^\circ 58' 47'' & \text{DE} &= 198^\circ 55' 50'' \\ \text{EA} &= 270^\circ 29' 18'' \end{aligned}}$$

4. Assume the magnetic bearing of a line AB read in 1875 was $N32^{\circ}45'E$. The declination at that time of the place was $8^{\circ}12'W$. The present declination is $2^{\circ}30'E$. Calculate the present magnetic bearing of line AB. 10 Points



$$32^{\circ}45' - 8^{\circ}12' = N24^{\circ}33'E$$

$$24^{\circ}33' - 2^{\circ}30' = N22^{\circ}03'E$$

5. Two tangents of a circular curve intersect at the point PI. The deflection angle is $I = 8^{\circ}24'$. The station of the PI is $64 + 27.46$ and the radius of the curve is 2864.79 ft. Calculate the PC and PT stationing. Use the formulae $L = RI$ (I in Radian) and $T = R \tan(I/2)$. 10 Points

$$PI = 64 + 27.46 \quad (64 \times 100) + 27.46 = 6427.46$$

$$L = 840$$

$$n\theta/180 \quad 8^{\circ}24' \quad 8^{\circ} + 0.04 = 8.4^{\circ} \quad (L) R \cdot I \quad R \times I \times \frac{\pi}{180}$$

$$5729.5 \quad \frac{2864.79 \times 27.46 \times \pi}{180}$$

$$\text{Length curve} \quad 2864.79 \times 8.4^{\circ} \times \frac{\pi}{180} = 420$$

$$\text{Chainage of PT} = 6427.46 + 420 = 6847.46$$

$$\text{Chainage of PI} \cdot PT = 6427.46 - 210.4 = 6217.06$$

$$\text{Chainage of PT} = PT + L$$

$$= 6217.06 + 420 = 6637.06$$

6. A 30-m steel tape was standardized at 20°C and supported throughout under a tension of 5.45 kg was found to be 30.012m long. The tape had a cross sectional area of 0.05 cm². The tape was held with a constant tension of 9.09 kg to measure a distance of 81.151 m. The temperature during measurement was 20°C. Apply correction for tape length and pull and hence determine the corrected length. 15 Points.

Use the following formula

$$C_L = \frac{L - L'}{L} \times L = \frac{30.012 - 30}{30} \times 30.012 = 0.012$$

and $C_p = (P_1 - P) \frac{L}{AE}$, Assume $E = 2,000,000 \text{ kg/cm}^2$

$L = 30$ Temp = 20°C $L' = 30.012 \text{ m}$

pull = 5.45 Tension = 9.09

$$C_L = \frac{L - L'}{L} \times L = \frac{30.012 - 30}{30} \times 81.151 = 0.0232$$

$$C_p = (P_1 - P) \frac{L}{AE} = \frac{(9.09 - 5.45)}{0.05 \times 2,000,000} \times 81.151$$

$$C_p = 0.00295$$

7. Calculate the area of the polygon bounded by ABCDEA with the following coordinates of the vertex. A(100,90), B(120,75), C(150,50), D(165,70) and E(160,105). All the coordinates are in feet. Draw the required graphs to arrive at your answer. 10 Points

A(100,90)
B(120,75)
C(150,50)

D(165,70)
E(160,105)

X Y
A(100,90)
B(120,75)
C(150,50)
D(165,70)
E(160,105)
A(100,90)

Area of Polygon = $(x_1 y_1) - (y_2 x_2) + (x_2 y_3 + y_2 x_3)$
... $(x_n y_1 + y_n x_1)$

$$\frac{(100 \times 75) - (90 \times 120) + (120 \times 50) - (75 \times 150) + (150 \times 70) - (50 \times 165) - (70 \times 160) + (105 \times 160) - (105 \times 100)}{2} = 10$$

the back

Diagram on the back

8. The following angles were calculated by a total station for a pentagon. Calculate the corrected values of the angles 10 Points

Interior Angle	Calculated value of angle in degrees
A	110
B	105
C	112
D	96
E	119

$$(n-2) \times 180$$

$$(-250 \text{ or } -140)$$

$$A = (110-2) \times 180 = -250 + 110 =$$

$$(-255 \text{ or } -150)$$

$$B = (105-2) \times 180 = -255 + 105 =$$

$$(-246 \text{ or } -136)$$

$$C = (112-2) \times 180 = -248 + 112 =$$

$$(-244 \text{ or } -168)$$

$$D = (96-2) \times 180 = -264 + 96 =$$

$$(-241 \text{ or } -122)$$

$$E = (119-2) \times 180 = -241 + 119 =$$

BELOW AVERAGE

CVEG 2102: SURVEYING AND GEOSPATIAL CONCEPTS

FINAL EXAMINATION

Last Name Lodgers First Name Hunter Class Roster Number 16

Total 8 Questions

Total points- 100

Time allotted- 2 Hour

Instructions: You need to submit your responses in the space provided for each question. If you need additional space, use the backside. All cell phones must be turned off and wrapped by a paper. Write your name and deposit the cell phone on the designated location. You will be ejected from the exam room if you are caught cheating or copying. This question paper contains 6 pages.

1. A differential leveling loop began and closed on BM Tree (elevation 323.48 ft). The plus sight and minus sight distances were kept approximately equal. Readings (in feet) listed in the order taken are 3.18 (+S) on BM Tree, 4.76 (-S) and 2.44 (+S) on TPI, 3.05 (-S) and 6.63 (+S) on BM X, 3.64 (-S) and 2.35 (+S) on TP2, and 3.07 (-S) on BM Tree. Prepare, check, and adjust the notes.

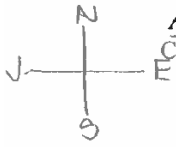
15+2+3=20 Points

	FS	HI	BS	Elevation
BM _{Tree}	3.18	—	3.07	323.48
TPI	2.44	326.55	4.76	324.11
BM _x	6.63	327.16	3.05	320.53
TP2	2.35	324.17	3.64	321.82
BM _{Tree}	3.18	324.89	3.07	321.71

2. The following readings were taken using a three-wire leveling instrument. Rod readings (in meters) are (U denotes upper crosswire readings, M middle wire, and L lower wire): +S on BM X: $U = 2.959$, $M = 2.707$, $L = 2.454$; -S on TP 1: $U = 1.683$, $M = 1.453$, $L = 1.224$; +S on TP 1: $U = 2.254$, $M = 2.054$, $L = 1.854$; -S on BM Y: $U = 1.013$, $M = 0.817$, $L = 0.620$. Assuming a stadia constant of 99.987, Calculate the distance between BM X and BM Y? 10 Points

+S BM X		BM X	BM Y	BM X	BM Y	BM X	BM Y
$U: 2.959$			U	M		L	
$M: 2.707$		2.959	-1.013	2.707	-0.817	2.454	-0.620
$L: 2.454$		1.946		1.89		1.834	
-S TP 1							
$U: 1.683$							
$M: 1.453$							
$L: 1.224$							
+S TP 1							
$U: 2.254$							
$M: 2.054$							
$L: 1.854$							
-S BM Y							
$U: 1.013$							
$M: 0.817$							
$L: 0.620$							

3. Course AB of a five-sided traverse runs due north. From the given balanced interior angles to the right, compute and tabulate the azimuths from north for each side of the traverses. Interior angles are $A = 90^\circ 29' 18''$, $B = 107^\circ 54' 36''$, $C = 104^\circ 06' 37''$, $D = 129^\circ 02' 57''$, $E = 108^\circ 26' 32''$. Check your calculation. 15 Points



(A) $90^\circ 29' 18''$

$N 90^\circ 29' 18'' E$

(B) $107^\circ 54' 36''$

$180 - 107^\circ 54' 36'' = E 72^\circ 0' 09'' S$

(C) $104^\circ 06' 37''$

$180 - 104^\circ 06' 37'' = E 75^\circ 04' 31'' S$

(D) $129^\circ 02' 57''$

$180 - 129^\circ 02' 57'' = E 50^\circ 0' 49'' S$

(E) $108^\circ 26' 32''$

$180 - 108^\circ 26' 32'' = E 71^\circ 20' 25'' S$

4. Assume the magnetic bearing of a line AB read in 1875 was $N32^{\circ}45'E$. The declination at that time of the place was $8^{\circ}12'W$. The present declination is $2^{\circ}30'E$. Calculate the present magnetic bearing of line AB. 10 Points

$2^{\circ} 30' E$

$N 2^{\circ} 30' E$



5. Two tangents of a circular curve intersect at the point PI. The deflection angle is $I = 8^{\circ}24'$. The station of the PI is $64 + 27.46$ and the radius of the curve is 2864.79 ft. Calculate the PC and PT stationing. Use the formulae $L = RI$ (I in Radian) and $T = R \tan(I/2)$. 10 Points

$$L = RI$$

$$(2864.79)(8^{\circ}24')$$

$$L = 24064.236$$

2

6. A 30-m steel tape was standardized at 20°C and supported throughout under a tension of 5.45 kg was found to be 30.012m long. The tape had a cross sectional area of 0.05 cm². The tape was held with a constant tension of 9.09 kg to measure a distance of 81.151 m. The temperature during measurement was 20°C. Apply correction for tape length and pull and hence determine the corrected length. 15 Points.

Use the following formula

$$C_L = \frac{l-l'}{l'} \times L$$

and $C_p = \frac{(P_1 - P)}{AE} \times L$, Assume $E = 2,000,000 \text{ kg/cm}^2$

$$5.45 = 30.012 \text{ m}$$

$$9.09 = 81.151 \text{ m}$$

$$0.05 \times 100 = 5 \text{ m}$$

30 m tape

5.45 kg - tension

30.012 - length

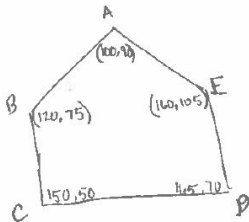
0.05 cm² - cross sect

9.09 kg - tension (constant)

81.151 m - length

$$C_L = \frac{81.151 - 30.012 \text{ m}}{5 \text{ m}} \times 30 \text{ m} = 306.834 \text{ m}$$

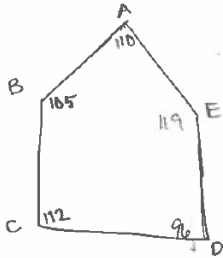
7. Calculate the area of the polygon bounded by ABCDEA with the following coordinates of the vertex. A(100,90), B(120,75), C(150,50), D(165,70) and E(160,105). All the coordinates are in feet. Draw the required graphs to arrive at your answer. 10 Points



8. The following angles were calculated by a total station for a pentagon. Calculate the corrected values of the angles 10 Points

Interior Angle	Calculated value of angle in degrees
A	110
B	105
C	112
D	96
E	119

542



$$(5-2) \cdot 180$$

$$3 \cdot 180$$

$$= 540$$

$$\frac{540}{2}$$

$$= 270$$

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

Title of Assignment: Quiz 1

TOPICS COVERED IN QUIZ 1

- 1. Safety**
- 2. Issues related to safety during lab work**

ABOVE AVERAGE

PRAIRIE VIEW A&M UNIVERSITY
Department of Civil & Environmental Engineering

FALL 2021

Instructor: Dr. A.M.Choudhury
Email: amchoudhury@pvamu.edu

QUIZ-1(Safety Quiz)
CVEG 2081 (Surveying & Geospatial Concepts)
TOPIC: Introduction & Safety
Full Point-20 Time -15 Minutes

Instructions: You need to submit your responses in the space provided for each question. All cell phones must be turned off and placed in your book bag, pocket or purse.

Name Jasen Garza

Class Roster Number _____

#	Question	Answer
1	"No student may work alone in the laboratory." Write whether the statement is true or False 2 Point	True ✓
2	What do you mean by PPE for laboratory work? 4 Points	personal protective eq ✓
3	What are the Expected Student Outcome from this course? 4 Points	learn to survey and about geo. concepts ✗
4	Write the name each of one appropriate clothing and personal protective equipment to be used in the laboratory. 4 Points	Close toed shoes Shielded goggles T-shirt Lab coat ✓
5	Write the name of two hazardous materials whose container must be labelled indicating its content, composition and appropriate hazard warning. 4 Points	Mercury oil gas ✓
6	"All acidic and alkaline waste should be neutralized prior to disposal." Write whether the statement is true or False 2 Point	True ✓

Total Score Out of 20 16

AVERAGE

PRAIRIE VIEW A&M UNIVERSITY
Department of Civil & Environmental Engineering

Instructor: Dr. A.M.Choudhury
Email: amchoudhury@pvamu.edu

FALL 2021

QUIZ-1(Safety Quiz)
CVEG 2081 (Surveying & Geospatial Concepts)
TOPIC: Introduction & Safety
Full Point-20 Time -15 Minutes

Instructions: You need to submit your responses in the space provided for each question. All cell phones must be turned off and placed in your book bag, pocket or purse.

Name Adetayo Aboderin

Class Roster Number 1

#	Question	Answer
1	"No student may work alone in the laboratory." Write whether the statement is true or False 2 Point	False True ✓
2	What do you mean by PPE for laboratory work? 4 Points	Personal protective Equipment ✓
3	What are the Expected Student Outcome from this course? 4 Points	Have a Great physical and mental understanding of Geospatial surveying ✗
4	Write the name each of one appropriate clothing and personal protective equipment to be used in the laboratory. 4 Points	① Closed toed shoes ② Non-slip close that is not loose. ③ Apron ✓ ④ Safety glasses
5	Write the name of two hazardous materials whose container must be levelled indicating its content, composition and appropriate hazard warning. 4 Points	① ✗ ② ✗
6	"All acidic and alkaline waste should be neutralized prior to disposal." Write whether the statement is true or False 2 Point	True ✓

Total Score Out of 20

12

BELOW AVERAGE

PRAIRIE VIEW A&M UNIVERSITY
Department of Civil & Environmental Engineering

FALL 2021

QUIZ-1(Safety Quiz)
CVEG 2081 (Surveying & Geospatial Concepts)
TOPIC: Introduction & Safety
Full Point-20 Time -15 Minutes

Instructor: Dr. A.M.Choudhury
Email: amchoudhury@pvamu.edu

* Late Enrollment

Instructions: You need to submit your responses in the space provided for each question. All cell phones must be turned off and placed in your book bag, pocket or purse.

Name Omar Haid

Class Roster Number 18

#	Question	Answer
1	"No student may work alone in the laboratory." Write whether the statement is true or False 2 Point	False. Most lab work is in groups, but things like test or quizzes are alone
2	What do you mean by PPE for laboratory work? 4 Points	Properly place equipment
3	What are the Expected Student Outcome from this course? 4 Points	To understand the method of surveying
4	Write the name each of one appropriate clothing and personal protective equipment to be used in the laboratory. 4 Points	The proper dress includes but not limited to no open toe shoes, hair must be tied, clothing should not be flimsy
5	Write the name of two hazardous materials whose container must be labelled indicating its content, composition and appropriate hazard warning. 4 Points	Acidic and Alkaline waste.
6	"All acidic and alkaline waste should be neutralized prior to disposal." Write whether the statement is true or False 2 Point	This statement is true

Total Score Out of 20 10

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

Title of Assignment: Quiz 2

TOPICS COVERED IN QUIZ 2

- 3. Introduction of surveying**
- 4. Tape surveying and corrections**
- 5. Basic concept of levelling instruments and calculation**

ABOVE AVERAGE

QUIZ-2

CVEG 2102 (SURVEYING AND GEOSPATIAL CONCEPTS)

Full Points-20 Time -20 Minutes

Name Denia Leroy

Class Roster Number 10

1. What is the difference between plain and geodetic survey?

Plane survey covers a smaller curvature area and the shape of the earth. ^{2 Points}

2. Which country in the world introduced surveying for the first time? ^{1 Point}

Egypt

3. What is the standard length of a chain used for "Chain surveying" we use in our laboratory? ^{2 Points}

100 ft

4. What do you mean by "Chainage" and "Offset" ^{2 Points}

Chainage is the length of the tap from point A to B.

offset is the vertical distance perpendicular to the chainage

5. Write down the name of six steps of taping on a level ground. ^{6 Points}

1. lining

2. Apply tension

3. Plumbing

4. marking

5. reading tape measure

6. recording data

6. Explain in your own language what do you mean by the correction of taping due to "incorrect length of tape". ^{2 Points}

Basically meaning that there was an error in tape length due to natural causes, personal error etc. and we need to find the correct length for our experiment.

7. Tape was used to survey a closed polygon ABCDE. To get the internal angle at B, a small triangle was constructed using the direction of lines BA and BC. This small triangle was named A'BC'. The measured sides were BA' = 10 ft, BC' = 10 ft and A'C' = 15 ft. Calculate the internal angle at station B. Use Cosine rule. ^{5 Points}

AVERAGE

QUIZ-2

CVGE 2102 (SURVEYING AND GEOSPATIAL CONCEPTS)

Full Points-20 Time -20 Minutes

Name Jacorian Lovell

Class Roster Number 12

1. What is the difference between plain and geodetic survey? 2 Points

Plain is on the surface, while geodetic can be

2. Which country in the world introduced surveying for the first time? 1 Point

Egypt

3. What is the standard length of a chain used for "Chain surveying" we use in our laboratory? 2 Points

90ft

4. What do you mean by "Chainage" and "Offset"? 2 Points

5. Write down the name of six steps of taping on a level ground. 6 Points

6
Lining in, Apply tension, plumbing, marking tape lengths,
recording tape, recording distance

6. Explain in your own language what do you mean by the correction of taping due to "incorrect length of tape". 2 Points

The length of tape could have been misread by yourself.

1
tape length could have been faulty

7. Tape was used to survey a closed polygon ABCDE. To get the internal angle at B, a small triangle was constructed using the direction of lines BA and BC. This small triangle was named A'BC'. The measured sides were BA' = 10 ft, BC' = 10 ft and A'C' = 15 ft. Calculate the internal angle at station B. Use Cosine rule. 5 Points

$$AC'^2 = AB'^2 + BC'^2 - 2 \cdot AB' \cdot BC' \cdot \cos B$$
$$15^2 = 10^2 + 10^2 - 2 \cdot 10 \cdot 10 \cdot \cos B$$

BELOW AVERAGE

QUIZ-2

CVGE 2102 (SURVEYING AND GEOSPATIAL CONCEPTS)

Full Points-20 Time -20 Minutes

Name Alonzo Banks

Class Roster Number 2

1. What is the difference between plain and geodetic survey?

2 Points

The difference between plain and geodetic survey is that one has a flat more standard type of land while the other is more diverse.

2. Which country in the world introduced surveying for the first time?

1 Point

1 Egypt

3. What is the standard length of a chain used for "Chain surveying" we use in our laboratory?

2 Points

1 The standard length is 100 ft

4. What do you mean by "Chainage" and "Offset"?

2 Points

Chainage is the 100 between point A and B while offset is the offset between the subject and point A.

5. Write down the name of six steps of taping on a level ground.

6 Points

Traveling, surveying, data collect, tainage

6. Explain in your own language what do you mean by the correction of taping due to "incorrect length of tape".

2 Points

What I mean by the correction of taping due to "incorrect length of tape" is the calculation of your own taping with the new collected data and recalculating it and knowing the difference between the two.

7. Tape was used to survey a closed polygon ABCDE. To get the internal angle at B, a small triangle was constructed using the direction of lines BA and BC. This small triangle was named A'BC'. The measured sides were BA' = 10 ft, BC' = 10 ft and A'C' = 15 ft. Calculate the internal angle at station B. Use Cosine rule.

5 Points

$$AC^2 = AB^2 + BC^2 - 2AB \cdot BC \cdot \cos B$$

$$15^2 = 10^2 + 10^2 - 2(10) \cdot 10 \cdot \cos B$$

$$225 = 100 + 100 - 20 \cdot 10 \cdot \cos B$$

$$225 = 180 - 10 \cdot \cos B$$

$$275 = 180 \cdot \cos B$$

$$15.75 = \cos B$$

$$\begin{array}{r} 7910 \\ 15750 \\ 225 \\ \hline 1575 \end{array}$$

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

Title of Assignment: Quiz 3

TOPICS COVERED IN QUIZ 3

- 1. Angles, Azimuth and Bearing**
- 2. Total Station instrument**
- 3. Calculation of internal angles for Azimuth/bearing**
- 4. Calculation of Azimuth from angles**

ABOVE AVERAGE

Fall 2021

QUIZ-3

CVGE 2101 (SURVEYING AND GEOSPATIAL CONCEPTS)

TOPIC: ANGLES, AZIMUTH AND BEARINGS

Full Points-20 Time -30 Minutes

Name Markus Hartfield

Class Roster Number 8

1. What is the relationship of a forward and back azimuth?

Back azimuth of a line is forward azimuth + 180°

If sum is $> 360^\circ$ then forward azimuth is back az - 180°

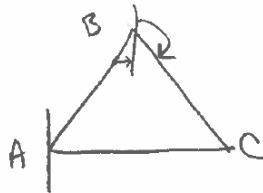
2. Convert the following two bearing to Azimuth:

$S38^\circ 42' 54'' E$, $S45^\circ 06' 02'' W$

$A = 180 - \text{Bearing}$
 $= 180 - 38^\circ 42' 54''$
 $= 141^\circ 17' 16''$

$A = 180 + \text{Bearing}$
 $= 180 + 45^\circ 06' 02''$
 $= 225^\circ 06' 02''$

3. Azimuth of two lines AB and BC are given as $43^\circ 00' 36''$, $141^\circ 25' 34''$. Calculate the angle B.



$\alpha = 43^\circ 0' 36''$

$\beta = 141^\circ 25' 34''$

$\angle B = 180 + \alpha - \beta$
 $= 180 + 43^\circ 0' 36'' - 141^\circ 25' 34'' = 81^\circ 35' 2''$

4. Calculate the measure of each internal angle of a regular hexagon.

$(n-2) \times 180$

$(n-6) \times 180$

$4 \times 180 = 720$

$\frac{720}{6} = 120^\circ$

5. Write the comparison of Azimuth and Bearing.

Azimuth

- whole circle bearing
- value from $0^\circ - 360^\circ$
- Angle taken from only true north

Bearing

- Reduced bearing
- value from $0^\circ - 90^\circ$
- Angle can be taken from North or South
- has Letter & # values

AVERAGE

Fall 2021

QUIZ-3

CVEG 2101 (SURVEYING AND GEOSPATIAL CONCEPTS)

TOPIC: ANGLES, AZIMUTH AND BEARINGS

Full Points-20 Time -30 Minutes

Name Noah Smith Jr.

Class Roster Number 19

1. What is the relationship of a forward and back azimuth?

line direction forward - Forward azimuth
line direction reversed - back azimuth

2. Convert the following two bearing to Azimuth:

S38°42'54"E. S45°06'02"W

$$190 - 38^{\circ}42'54''E$$

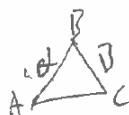
$$= 141.2 \text{ or } 142$$

$$180 + 45^{\circ}06'02''$$

$$= 225.1$$

$$\begin{aligned} NE &= 90 = 0 \\ SE &= -180 \\ SW &= +180 \\ NW &= -270 \end{aligned}$$

3. Azimuth of two lines AB and BC are given as $43^{\circ}00'36''$. $141^{\circ}25'34''$. Calculate the angle B.



$$180 + 43^{\circ}00'36'' - 141^{\circ}25'34''$$

$$= 81^{\circ}35'2.0'' \text{ or } 81.583$$

4. Calculate the measure of each internal angle of a regular hexagon.

$$\begin{aligned} n &= 2 \times 180 \\ &= 6 - 2 \times 180 \\ &= 720 \end{aligned}$$

5. Write the comparison of Azimuth and Bearing.

Bearing - 90

Azimuth - up to 360

BELOW AVERAGE

Fall 2021

QUIZ-3

CVEG 2101 (SURVEYING AND GEOSPATIAL CONCEPTS)

TOPIC: ANGLES, AZIMUTH AND BEARINGS

Full Points-20 Time -30 Minutes

Name Ariana Mangroo

Class Roster Number 13

1. What is the relationship of a forward and back azimuth?

By adding or subtracting 180 degrees

2. Convert the following two bearing to Azimuth:

S38°42'54"E. S45°06'02"W

$$180 - (S38^{\circ}42'54"E) = 141^{\circ}17'6"E$$

$$180 - (S45^{\circ}06'02"W) = 134^{\circ}53'58"W$$

3. Azimuth of two lines AB and BC are given as 43°00'36". 141°25'34". Calculate the angle B.



$$\angle B = AB - CB$$

$$\angle B = 43^{\circ}00'36'' - 141^{\circ}25'34''$$

$$\angle B = 101^{\circ}24'58''$$

4. Calculate the measure of each internal angle of a regular hexagon.

$$(n-2) \times 180$$

$$6-2 \times 180$$

$$4 \times 180 = 720^{\circ}$$



5. Write the comparison of Azimuth and Bearing.

Bearing is from 0-90 degrees

Azimuth is from 0-360 degrees

8/20

2

3

1

5

5

5

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

HOMEWORK 1

TOPICS COVERED IN HOMEWORK 1

- 1. Levelling concepts**
- 2. Differential levelling**
- 3. Reciprocal levelling**
- 4. Profile levelling**
- 5. Stadia intercept**
- 6. Three wire stadia reading**

ABOVE AVERAGE



Trinity Scott

Homework 1

Surveying and Geospatial Concepts

CVEG 2102

DUE OCT 11TH, 2021 ON PAPER

FINISHED OCT 10TH, 2021

95
100

5-14

In feet	(+)	(-)			
Station	B.S.	H.I.	F.S.	Elev.	Adj Elev.
BM tree	3.18	1317.26		1314.08	1314.08
TP2	2.44	1314.94	4.70	1312.5 (-.02)	1312.48
BM X	6.63	1316.52	3.05	1311.89 (-.04)	1311.85
TP2	2.35	1317.3	3.64	1314.88 (-.06)	1314.82
BM tree	$\Sigma=14.6$		$\Sigma=14.82$	1314.16 (-.08)	1314.08

H.I. = Elev + B

$$1314.08 + 3.18 = 1317.26$$

$$1312.5 + 2.44 = 1314.94$$

$$1311.84 + 6.63 = 1314.94$$

$$1314.88 + 2.35 = 1317.23$$

Loop misclosure

$$1314.16 - 1314.08 = -.08$$

$$Adj = -.08/4 = -.02$$

20

Page check

$$\begin{array}{r} 1314.08 \\ + 14.6 \\ \hline 1328.68 \\ - 14.52 \\ \hline \end{array}$$

In meters

5-17

Station	(+)	(-)			
	B.S.	H.I.	F.S.	Elev.	Adj Elev.
BM rock	1.849	647.746		645.899	645.879
TP1	2.777	649.97	.553	647.193 (-.002)	647.191
BM1	1.050	650.392	.634	649.836 (-.004)	649.832
BM2	.458	649.202	1.648	648.744 (-.006)	648.738
TP2	1.897	649.69	1.409	647.793 (-.008)	647.785
BM manhole	—		.803	649.169	649.59
	$\Sigma=8.037$		$\Sigma=9.747$		

Page check

$$\begin{array}{r} 645.879 \\ + 8.037 \\ \hline 653.916 \\ - 4.747 \\ \hline 649.169 \end{array}$$

Self check

$$649.169 - 645.879 = 3.29 - 8.037 - 4.747 = 3.29$$

$$649.159 - 649.169 = \frac{.01}{5} = -.002$$

5.23

Elevation difference for X

$$X = 3.182 - \frac{9.205 + 9.370 + 9.368}{3} = -6.186 \text{ m}$$

Elevation difference at Y

$$\frac{4.037 + 4.041 + 4.038}{3} - 10.223 = -6.184 \text{ m}$$

Avg. Elevation difference

$$\frac{-6.186 - 6.184}{2} = -6.185 \text{ m}$$

Elevation of X = elevation of Y + Avg. elevation diff

$$2245.819 - 6.185 = 2239.634 \text{ m}$$

5.25

Station	+ Sight	Stadia	- Sight	Stadia	Elev
BM X	4.898				543.56
	4.146	75.2			
	3.396	75			+4.146
1/3	12.44	150.2			547.706
	4.146				
TP1	6.504		5.875		+5.487
	5.487	101.7	4.948	92.7	553.193
	4.472	101.5	4.023	92.5	-4.948
1/3	16.463	203.2	14.844	185.2	548.245
	5.487		4.948		
BM Y			5.874		-5.025
			5.026	84.8	
			4.176	85	543.22
1/3			15.076	169.0	
			5.025		

$$\Sigma = 9.633$$

$$\Sigma = 9.973$$

Page check

$$543.56 + 9.633 - 9.973 = 543.22 \text{ check}$$

5.28

Station	rod readings (ft)			H.I.	Elev
	+S	-S	Irs		
BM - A 11+00	6.02		6.6	1219.67	1213.65 1214.07
TP1 12+00 12+50 13+00 14+00	8.18	3.28	6.6 5.3 5.8 6.3	1224.57	1216.39 1217.97 1219.27 1218.77 1218.27
TP2 14+73 15+00 16+00	8.76	2.98	4.1 4.9 6.3	1230.35	1221.59 1226.25 1225.45 1224.05
TP3	9.08	3.11		1237.12	1227.24
BM B		3.05			1234.07
	$\Sigma =$ 32.84	$\Sigma =$ 12.42			

Error of closure

Page check

$$\begin{array}{r}
 32.84 \\
 - 12.42 \\
 \hline
 20.42 \\
 + 1213.65 \\
 \hline
 1234.07
 \end{array}$$

20

AVERAGE

Prairie View A&M University
College of Engineering
Department of Civil & Environmental Engineering



CVEG 2102: Surveying and Geospatial

Submitted by: Jacorian Lovall

Submitted to: Dr. Abdul Choudhury

Date Assigned: October 4, 2021

Submitted on: October 11, 2021

Homework #1 Problems: 5-14, 5-17, 5-23, 5-25, 5-28

80
TW

5.14

Station	B.S	H.I	F.S	elevation in ft	Adjusted Elevation
Bm tree	3.18	$1314.08 + 3.18$ 1317.26			1314.08
	+				
TP ₁	2.44	1314.96		(-0.02) 1312.50	1312.48
		-	4.76		
Bm x	6.63	1318.52		(-0.04) 1311.89	1311.85
		-	3.05		
TP ₂	2.35	1317.23		(-0.06) 1316.88	1316.82
		-	3.64		
Bm tree		1317.23		(-0.08) 1314.16	1314.08
			3.07		
$\sum = 14.60$			11.52		

$$P.C = 1316.08 + 14.60 - 1652 = 1314.16$$

$$m.s.closure = 1314.16 - 1314.08 = 0.08$$

$$correction = (-) 0.08 / 4 = -0.02$$

20

✓
-5 for Engg paper

5.17

Point	B.S	H.I	F.S	elevation
Bm rock	1.899		—	645.879
Tp ₁	2.777	649.728	0.553	647.175
Bm ₁	1.056	649.952	0.634	649.318
Bm ₂	0.458	650.374	1.648	648.726
Tp ₂	1.897	649.189	1.409	647.775
Bm manhole	—	649.672	0.503	649.169
	8.037	Σ	4.747	

$\Sigma B.S =$

$\Sigma F.S$

$$[B.S - F.S = \text{last R.L} - \text{First R.L}]$$

$$8.037 - 4.747 = 649.169 - 645.879$$

$$3.29 = 3.29$$

$$\text{Error} = \text{R.L. elevation of Bm man.} - \text{elevation Bm. manhole}$$

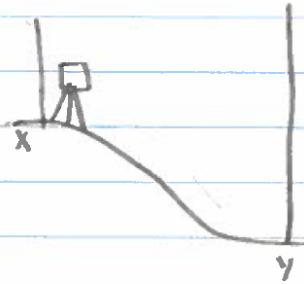
$$= 649.159 - 649.169$$

$$= -0.01$$

20

5.23

When instrument is set up at A,
reading on staff at x = $h_x = 3.182$
at y = $h_y = 10.223$



When set up at B,
reading on staff at x, = $h'_x = 9.368$
at y = $h'_y = 4.038$

True diff of AL between X & y

$$H = \frac{(h_y - h_x) + (h'_y - h'_x)}{2} = 4.038$$

$$= \frac{(10.223 - 3.182) + (4.038 - 9.368)}{2} = 0.8555 \text{ ft}$$

$$\text{El of x} = \text{El of y} + M$$

$$= 2265.879 + 0.8555 = 2266.7345 \text{ ft}$$

15

5.25

Station	ts	-S	Elevation
Bm x	1.076 0.829 0.573		83.097
+			
Tp ₁	0.989 0.767 0.555		
Lmk	2.311		
Bmy		1.81 0.858 0.555 2.544	
Check	??		??

10

5.28

20

Station	Staff Reading (fts)			H.I	C.I
	+S	-S	Fall (fts)		
B.M.A	6.020			1219.670	1213.650
11+00		5.600	0.420		1214.070
TP1	8.180	3.280	2.320	1224.580	1216.390
12+00		6.600	1.580		1217.970
12+50		5.300	1.300		1219.270
13+00		5.800		0.500	1218.770
14+00		6.300		0.500	1218.270
TP2	8.760	2.980	3.220	1230.350	1221.510
14+73		4.100	4.660		1226.250
15+00		4.900	0.800		1225.450
16+00		6.300	1.400		1224.050
TP3	9.880	3.110	3.190	1237.120	1227.240
B.M.B		3.050	6.830		1234.070
Σ	32.84	12.42	23.62	3.200	1234.150 - given

$$\begin{aligned}
 \text{Last level} - \text{First level} &= 1234.070 - 1213.650 = 20.420 \\
 \Sigma (+S) - \Sigma (-S) &= 32.840 - 12.420 = 20.420 \\
 \Sigma \text{rise} - \Sigma \text{fall} &= 23.620 - 3.200 = 20.420 \\
 \text{Error} &= 1234.150 - 1234.070 = 0.08
 \end{aligned}$$

BELOW AVERAGE

5.14
5.17.
5.23
5.25
5.28

HW 1

Chap 5

Denia Leroy
CVEG 2102

Problem 5.14

Sta.	B.S.	H.I.	F.S.	Elev.	Corrected
BM Tree	3.18			1314.08	= 1314.08
		$\begin{array}{r} 1314.08 \\ + 3.18 \\ \hline 1317.26 \end{array}$			
Tp1	2.44		$\begin{array}{r} 4.7 \\ 4.76 \end{array}$	$\begin{array}{r} 1317.26 \\ - 4.76 \\ \hline 1312.5 \end{array}$	$\begin{array}{r} 1312.5 \\ - .02 \\ \hline 1312.48 \end{array}$
		$\begin{array}{r} 1312.5 \\ + 2.44 \\ \hline 1314.94 \end{array}$			
BM X	6.63		3.05	$\begin{array}{r} 1314.94 \\ - 3.05 \\ \hline 1311.89 \end{array}$	$\begin{array}{r} 1311.89 \\ - .02 \\ \hline 1311.87 \end{array}$
		$\begin{array}{r} 1311.89 \\ + 6.63 \\ \hline 1318.52 \end{array}$			
Tp2	2.35		3.64	$\begin{array}{r} 1318.52 \\ - 3.64 \\ \hline 1314.88 \end{array}$	$\begin{array}{r} 1314.88 \\ - .02 \\ \hline 1314.86 \end{array}$
		$\begin{array}{r} 1314.88 \\ + 2.35 \\ \hline 1317.23 \end{array}$			
BM Tree			3.07	$\begin{array}{r} 1317.23 \\ - 3.07 \\ \hline 1314.16 \end{array}$	

$\Sigma = +14.6$

$\Sigma = -14.52$

$$\begin{array}{r} 1314.08 \\ + 14.6 \\ \hline 1328.68 \\ - 14.52 \\ \hline 1314.16 \end{array}$$

1314.16 ft checked

$$\begin{aligned} \text{loop misclosure} &= 1314.16 - 1314.08 \\ &= 0.08 \text{ ft} \end{aligned}$$

$$\text{Adjustment} = \frac{0.08}{4} = -0.02 \text{ ft}$$

Sta.	Adjusted elevation
BM tree	1314.08
Tp1	1312.48
BM X	1311.87
Tp2	1314.86

HW 1

Chap 5

Denia here
WEG 2102

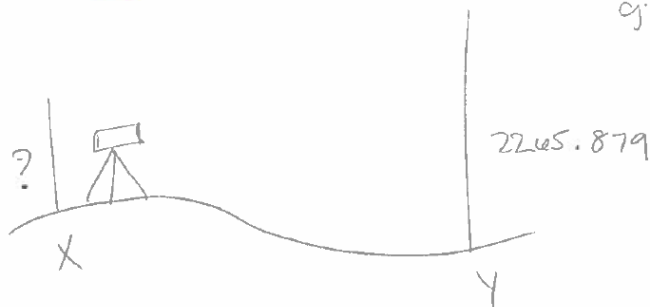
Problem 5.17

Sta	B.S.	H.I.	F.S.	Elev.	
BM rock	1.849	$\begin{array}{r} + 645.879 \\ 1.849 \\ \hline = 647.728 \end{array}$		645.879	loop misclosure =
Tp1	2.777		0.553	$\begin{array}{r} 647.728 \\ - 0.553 \\ \hline = 647.175 \end{array}$	$\begin{array}{r} 649.169 \\ - 645.879 \\ \hline = 3.29 \text{ m} \end{array}$
		$\begin{array}{r} 647.175 \\ + 2.777 \\ \hline = 649.952 \end{array}$			
BM 1	1.056		0.634	$\begin{array}{r} 649.952 \\ - 0.634 \\ \hline = 649.318 \end{array}$	25
		$\begin{array}{r} 649.318 \\ + 1.056 \\ \hline = 650.374 \end{array}$			
BM 2	0.458		1.648	$\begin{array}{r} 650.374 \\ - 1.648 \\ \hline = 648.726 \end{array}$	
		$\begin{array}{r} 648.726 \\ + 0.458 \\ \hline = 649.184 \end{array}$			
Tp2	1.897		1.409	$\begin{array}{r} 649.184 \\ - 1.409 \\ \hline = 647.775 \end{array}$	
		$\begin{array}{r} 647.775 \\ + 1.897 \\ \hline = 649.672 \end{array}$			
BM Manhole			0.503	$\begin{array}{r} \text{given} \\ 649.159 \end{array}$	$\begin{array}{r} 649.672 \\ - 0.503 \\ \hline = 649.169 \text{ m} \end{array}$
		$\Sigma = +8.037 \text{ m}$			$\Sigma = -4.747 \text{ m}$

Check $\begin{array}{r} 645.879 \\ + 8.037 \\ \hline 653.916 \end{array}$
 $653.916 - 4.747 = 649.169 \text{ m}$

$\begin{array}{r} 649.159 \text{ m} \\ - 649.169 \text{ m} \\ \hline = -0.01 \text{ m} \end{array}$
 for 5-10.01 error in elevation

Problem 5.23



given : elevation of Y = 2265.879.
elevation of X = ?

Instrument X :

elevation difference

$$X = 3.182 - \frac{9.365 + 9.39 + 9.378}{3}$$

$$X = -6.1957 \text{ m}$$

Instrument Y :

elevation difference

$$Y = 10.223 - \frac{4.037 + 4.041 + 4.038}{3}$$

$$Y = -6.1843 \text{ m}$$

Average elevation difference = $\frac{-6.1957 - 6.1843}{2} = -6.19 \text{ m}$

To find elevation of X

$$2265.879 - 6.19$$

Elev. of X = 2259.69 m

HW 1
Chap 5

Denia Leroy
~~2102~~
CVEG 2102

Problem 5.25



HW 1

Chap 5

Denia Leroy
CVEG 2102

Problem 5.28

Sta.	B.S.	I.S.	F.S.	HI	Elev.
BM A	6.02			$+1213.65 = 1219.67$	1213.65
1+00		5.6			1219.67 $- 5.6$ $= 1214.07$
Tp1	8.18		3.28	1216.39 $+ 8.18$ 1224.57	1219.67 $- 3.28$ $= 1216.39$
2+00		6.6			1224.57 $- 6.6$ $= 1217.97$
12+50		5.3			1224.57 $- 5.3$ $= 1219.27$
3+00		5.2			1224.57 $- 5.2$ $= 1218.77$
4+00		6.3			1224.57 $- 6.3$ $= 1218.27$
Tp2	8.76		2.98	1221.59 $+ 8.76 = 1230.35$	1224.57 $- 2.98$ $= 1221.59$
4+73		4.1			1230.35 $- 4.1$ $= 1226.25$
15+00		4.9			1230.35 $- 4.9$ $= 1225.45$
16+00		6.3			1230.35 $- 6.3$ $= 1227.24$
Tp3	9.88		3.11	1227.24 $+ 9.88$ $= 1237.12$	1230.35 $- 3.11$ $= 1227.24$
BM B			3.05		1237.12 $- 3.05$ $= 1234.07$
$\sum \text{B.S.} = 32.86 \quad \sum \text{F.S.} = 12.42$					

20
✓
 1234.07
 $- 1234.15$
 $- 0.08$
error in
elevation

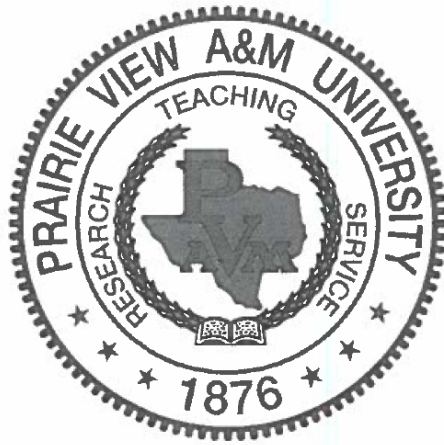
**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

HOMEWORK 2

TOPICS COVERED IN HOMEWORK 2

- 1. Azimuth and bearing**
- 2. Various types of meridian**
- 3. Magnetic declination**

ABOVE AVERAGE



Hw 2

Surveying and Geospatial concepts

Omar Hajo

Dr. Choudhury

100
100

problem 7.1

Magnetic meridian: Due the magnetic force the earth has the magnetic meridian is the imaginary line that goes through the magnetic South and magnetic North.

Geodetic meridian: The imaginary line that goes through the geographical North pole and geographical South pole. The point at where its at is the observe

Astronomic meridian: "the north-south reference line that passes through the instantaneous position of the earth's geographical pole."

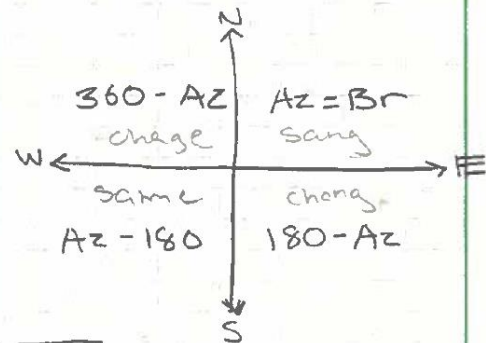
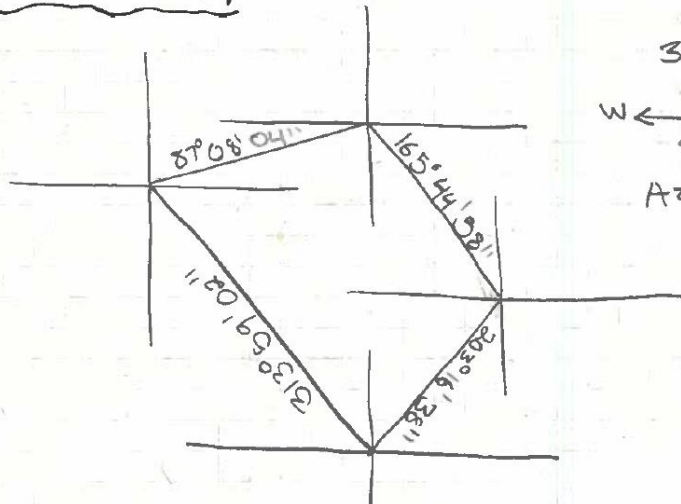
Grid meridian: "Survey based on a state on plane or other map projection coordinate systems employ a grid meridian for reference. Grid North is the direction of Geodetic North for a selected central meridian, and held parallel to it over the entire area covered by a map projection coordinate system"

Assumed meridian: "Can be established by merely assigning any arbitrary direction."

Definitions from textbook

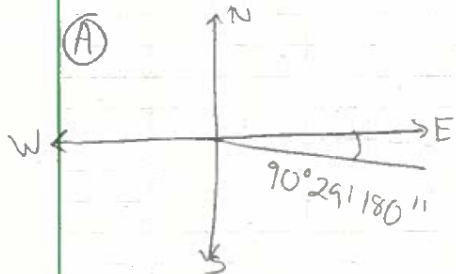
Problem 7.4 : the relation ship between the two is simply, to go from the front azimuth and back azimuth you add 180° ✓

Problem 7.7

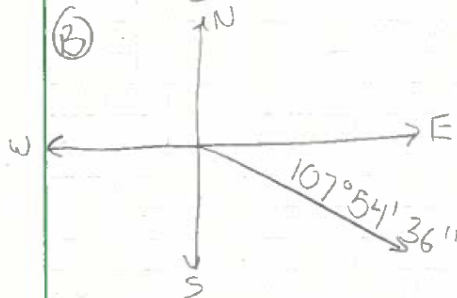


Azimuths	Bearings	Angles
$87^\circ 08' 04''$	$N 87^\circ 08' 04'' E$	$78^\circ 30' 54''$
$165^\circ 44' 58''$	$S 14^\circ 15' 2'' E$	$38^\circ 31' 40''$
$203^\circ 16' 38''$	$S 23^\circ 16' 38'' W$	$110^\circ 42' 24''$
$313^\circ 59' 02''$	$N 46^\circ 59' 58'' W$	$133^\circ 9' 2''$

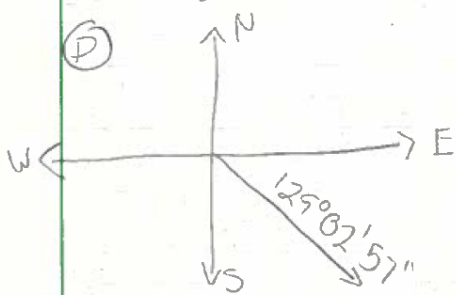
Problem 7.16



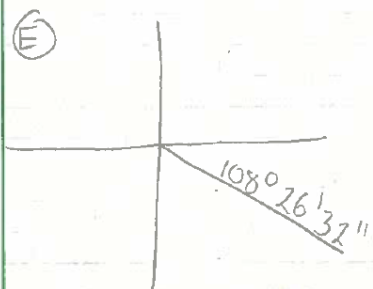
Azimuth
 $180^\circ - (90^\circ 29' 18.0'')$
 $= 89^\circ 30' 42''$ Bearing



Azimuth
 $180^\circ - (107^\circ 54' 36'')$
 $= 72^\circ 5' 24''$ Bearing



Azimuth
 $180^\circ - (129^\circ 02' 57'')$
 $= 50^\circ 57' 3''$ Bearing



Azimuth 75 53 23
 $180^\circ - (108^\circ 26' 32'')$
 $= 71^\circ 33' 28''$ Bearing



Azimuth
 $180^\circ - (104^\circ 06' 37'')$
 $= 75^\circ 53' 23''$ Bearing

AZ 212° 01' 13.11" Bearing 537

Problem 7.19

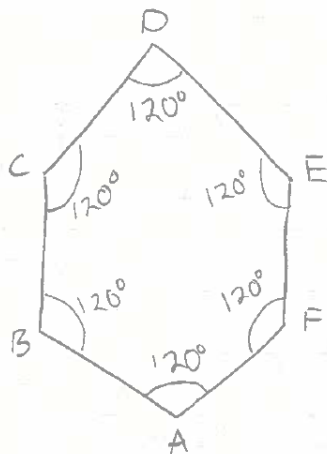
hexagon = 6 sides

$$(n-2)180^\circ$$

$$(6-2)180^\circ = (4)(180) = 720^\circ \text{ Angle}$$

$$\text{Interior Angle} : \frac{720^\circ}{6} = 120^\circ \text{ per angle}$$

$$360^\circ - (303^\circ 16' 22'') = 56^\circ 43' 38''$$



$$AB = 303^\circ 16' 22''$$

$$BC = 303^\circ 16' 22'' + (180 - 120)$$

$$BC = 363^\circ 16' 22'' - 360 = 3^\circ 16' 22''$$

$$CD = 3^\circ 16' 22'' + (180 - 120) = 63^\circ 16' 22''$$

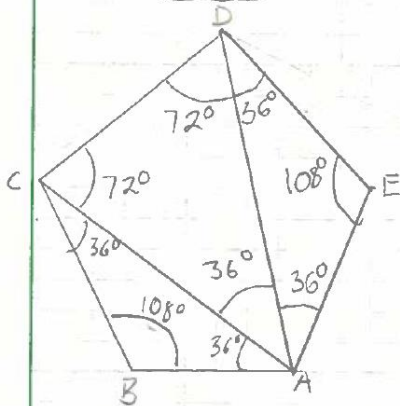
$$DE = 63^\circ 16' 22'' + (180 - 120) = 123^\circ 16' 22''$$

$$EF = 123^\circ 16' 22'' + (180 - 120) = 183^\circ 16' 22''$$

$$FA = 183^\circ 16' 22'' + (180 - 120) = 243^\circ 16' 22''$$

line	Interior $\angle$	Azimuth
AB	120°	303° 16' 22''
BC	120°	3° 16' 22''
CD	120°	63° 16' 22''
DE	120°	123° 16' 22''
EF	120°	183° 16' 22''
FA	120°	243° 16' 22''

Problem 7.25



$$(n-2)(180)$$

$$(5-2)(180)$$

$$(3)(180) = 540$$

$\frac{540}{3}$ = each interior angle
triangle

$$\frac{540}{3} = 180^\circ$$

Triangles ABC, ACD, ADE are 180° each.

Problem 7.34

1875 magnetic Bearing	1875 Declination	Present Declination
S $63^\circ 40' E$	$3^\circ 40' W$	$2^\circ 20' W$
Present Magnetic Bearing		
$(63^\circ 40' E) -$ $(3^\circ 40' W) + (2^\circ 20' W)$ $= \boxed{57^\circ 40' W}$		

AVERAGE



Maurice Betis

Homework 2

Surveying and Geo

CVEG 2102

DUE NOV 22TH, 2021 ON PAPER

FINISHED NOV 22TH, 2021

90
Tw

7.1

Geodetic Meridian - is the imaginary line passing through the Geodic (Geographical) North Pole and Geodetic (Geographical) South Pole at the point of the observer

Astronomic Meridian is the bigger circle passing through the North Celestial Pole, South Celestial Pole, the nadir and the zenith of the observer

Magnetic Meridian - is the imaginary line that passes through the magnetic north and magnetic south. Compass always points towards the magnetic north.

New lines are drawn parallel to the geodetic meridian in a zone for the preparing a local map

Called grid meridian

When a direction is assumed with reference to the permanent position of locality is called assumed meridian. This is applicable for small local places.

(7.4)

The difference between backward and forward azimuth is 180°

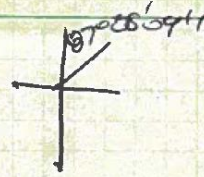
Forward azimuth $\neq$ backward

$\pm 180^\circ$

7.7

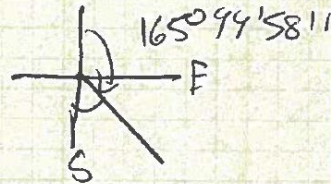
a) $87^{\circ}03'04''$

Bearing = $N87^{\circ}03'04''E$



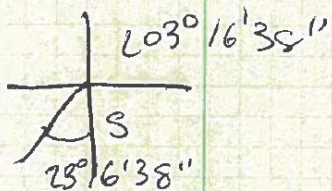
b) $165^{\circ}44'58''$

Bearing = $S(180 - 165^{\circ}44'58'')E$
 $= S 14^{\circ}15'2''E$



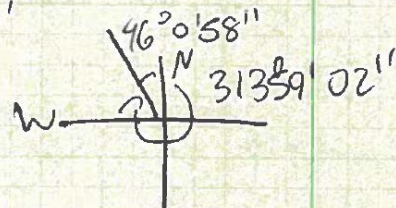
c) $203^{\circ}16'38''$

Bearing = $S(203^{\circ}16'38'' - 180)W$
 $= S 23^{\circ}16'38''W$



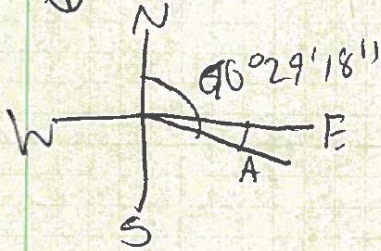
d) $313^{\circ}54'02''$

Bearing = $360 - 313^{\circ}54'02''$
 $= N46^{\circ}0'58''W$



7.16

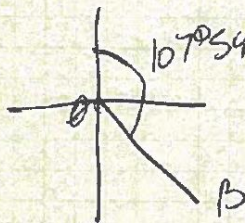
(A) = $90^{\circ}29'18''$



$$= 180^{\circ} - 90^{\circ}29'18''$$

$$= 89^{\circ}30'42''$$

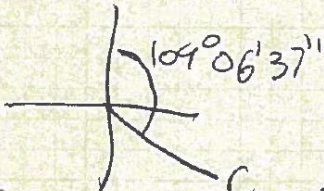
(B) $B = 107^{\circ}54'36''$ (WCB)



$$QB = S(180 - 107^{\circ}54'36'')E$$

$$= 572^{\circ}5'24''E$$

(C) = $104^{\circ}06'37''$ (WCB)



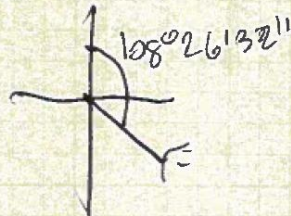
$$QB = S(180 - 104^{\circ}06'37'')E$$

$$= 75^{\circ}53'23''E$$

(D) = $124^{\circ}02'57''$ (WCB) $QB = S(180 - 124^{\circ}02'57'')E$

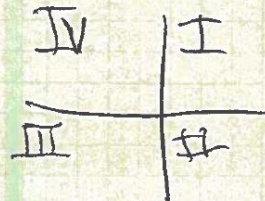
$$= 50^{\circ}57'3''$$

(E) = $108^{\circ}26'32''$



$$QB = S(180 - 108^{\circ}26'32'')E$$

$$= 571^{\circ}33'28''E$$



7.14

$$AB = 303^{\circ} 16' 22''$$

$$BC = 303^{\circ} 16' 22'' + (180^{\circ} - 120^{\circ}) = 363^{\circ} 16' 22''$$

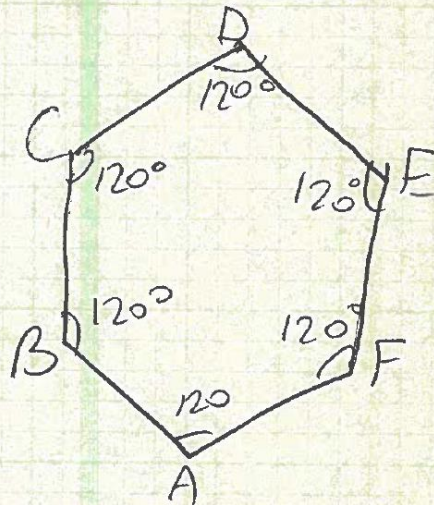
$$BC = 363^{\circ} 16' 22'' - 360 = 3^{\circ} 16' 22''$$

$$CD = 3^{\circ} 16' 22'' + (180 - 120) = 63^{\circ} 16' 22''$$

$$DE = 63^{\circ} 16' 22'' + (180 - 120) = 123^{\circ} 16' 22''$$

$$EF = 123^{\circ} 16' 22'' + (180 - 120) = 183^{\circ} 16' 22''$$

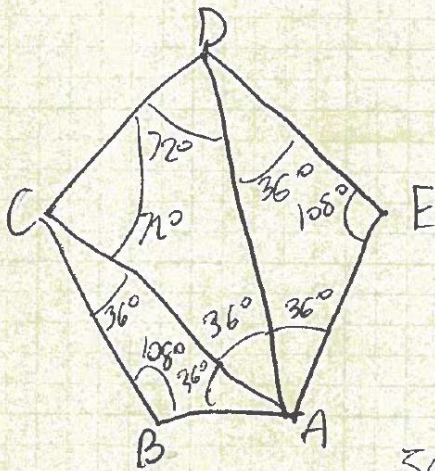
$$FA = 183^{\circ} 16' 22'' + (180 - 120) = 243^{\circ} 16' 22''$$



Line	Interior angle	Azimuth
AB	120°	303° 16' 22"
BC	120°	3° 16' 22"
CD	120°	63° 16' 22"
DE	120°	123° 16' 22"
EF	120°	183° 16' 22"
FA	120°	243° 16' 22"

7.25

SUM of interior Angle = $3 \times 180^\circ = 540^\circ$



each angle is equal to 108°

$$(5-2) \times 180$$

$$= 540^\circ$$

$$\frac{540}{5} = 108^\circ$$

7.34

$S 63^\circ 40' E$ $3^\circ 40' W$ $2^\circ 20' W$

$$S 53^\circ 40' W = 180^\circ - 63^\circ 40' = 116^\circ 20'$$

$$TIB = MIB + D = 116^\circ 20' + 3^\circ 40' = 120^\circ$$

$2^\circ 20' W$

$$TIB_1 = MIB \quad 2^\circ 20'$$

$$MIB = TIB + 2^\circ 20' = 120^\circ + 2^\circ 20'$$

$$= 122^\circ 20' \text{ or } S 69^\circ 40' W$$

BELOW AVERAGE

Emmanuel Botwe
CVEG 202 781
11/22/2021

Problem 7.1

- 1 Define the different reference meridians that can be used for the direction of a line
 - a) geodetic - north and south reference line between the period of 1900.0 and 1903.0.
 - b) astronomic - passes through the instantaneous position of the Earth's geographic poles.
 - c) magnetic $\rightarrow$ defined by a freely suspended magnetic needle only influenced by earth's magnetic field.
 - d) grid $\rightarrow$ state plane or other map projection coordinate system.
 - e) record-deed meridian used for a parcel system of land as recorded in a property deed.
 - f) assumed $\rightarrow$ established by merely assigning any arbitrary direction

Problem 7.4

What is the relationship of a forward and back azimuth?

- A line forward direction can be given by its forward azimuth, and its reverse direction by its back azimuth. In plane surveying, forward azimuths are converted to back azimuths, and vice versa, by adding or subtracting 180° .

7.19

$$AB = 303^{\circ} 16' 22''$$

$$BC = 303^{\circ} 16' 22'' + (180^{\circ} - 120^{\circ}) = 363^{\circ} 16' 22''$$

$$BC = 363^{\circ} 16' 22'' - 360 = 3^{\circ} 16' 22''$$

$$CD = 3^{\circ} 16' 22'' + (180 - 120) = 63^{\circ} 16' 22''$$

$$DE = 63^{\circ} 16' 22'' + (180 - 120) = 123^{\circ} 16' 22''$$

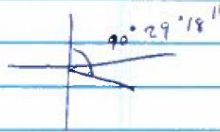
$$EF = 123^{\circ} 16' 22'' + (180 - 120) = 183^{\circ} 16' 22''$$

$$FA = 183^{\circ} 16' 22'' + (180 - 120) = 243^{\circ} 16' 22''$$

Line	Interior angle	az. meth
AB	120°	303° 16' 22"
BC	120°	3° 16' 22"
CD	120°	63° 16' 22"
DE	120°	123° 16' 22"
EF	120°	183° 16' 22"
FA	120°	243° 16' 22"

7.16

$$\begin{aligned} (A) &= 90^\circ 29' 18'' \\ 180^\circ - 90^\circ 29' 18'' \\ &= 89^\circ 30' 42'' \end{aligned}$$

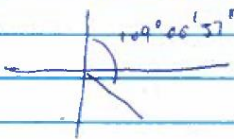


$$B \quad B = 107^\circ 54' 36''$$



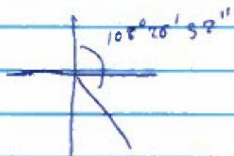
$$\begin{aligned} QB &= S (180 - 107^\circ 54' 36'') E \\ &= 572^\circ 5' 24' E \end{aligned}$$

$$(C) = 104^\circ 06' 37'' \text{ (WCB)}$$



$$\begin{aligned} QB &= S (180 - 104^\circ 06' 37'') \\ &= 75^\circ 53' 23' E \end{aligned}$$

$$D \quad 129^\circ 02' 57''$$



$$\begin{aligned} QB &= S (180 - 129^\circ 02' 57'') \\ &= 51^\circ 51' 28' E \end{aligned}$$

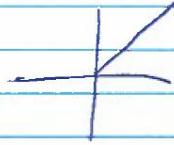


-10

7.7

(a) $87^{\circ} 03' 04''$

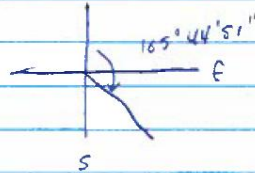
Bearing = $N 87^{\circ} 03' 04'' E$



(b) $165^{\circ} 44' 58''$

$= S (180^{\circ} - 165^{\circ} 44' 58'')$

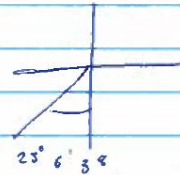
$= S 14^{\circ} 15' 02'' E$



(c) $203^{\circ} 16' 58''$

Bearing = $S (203^{\circ} 16' 58'' - 180^{\circ}) W$

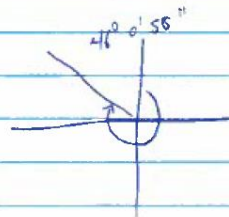
$= S 23^{\circ} 16' 58'' W$



(d) $313^{\circ} 59' 02''$

$= 360 - 313^{\circ} 59' 02''$

$= N 46^{\circ} 0' 58'' W$



7.34 ?
~~20~~

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

HOMEWORK 3

TOPICS COVERED IN HOMEWORK 3

- 1. Horizontal circular curve**
- 2. Degree of a circular curve**
- 3. Fixing the stationing of various points**
- 4. Field practice of plotting a circular curve**

ABOVE AVERAGE

Prairie View A&M University
Roy G. Perry College of Engineering
Civil & Environmental Engineering Department



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CV-3304 P01 *Surveying & Geospatial*
~~**structural analysis**~~

Fall 2021

Homework #6 ³

Maurice Bettis

Date assigned: November 10th, 2021 ^{22th}

Date submitted: November 23rd, 2021 ^{24th}

215
100

24.9

Maurice Bettis

① Arc def

$$R = \frac{5729.578}{D} \rightarrow D = \frac{5729.578}{R}$$

$$\textcircled{B} = D = \frac{5729.578}{900} = 6^{\circ}21'58''$$

$$\textcircled{C} = D = \frac{5729.578}{2500} = 2^{\circ}17'30''$$

② Chord def

$$R = \frac{50}{\sin(\frac{\theta}{2})} \rightarrow D = 2 \times \sin^{-1}\left(\frac{50}{R}\right)$$

$$\textcircled{B} = D = 2 \times \sin^{-1}\left(\frac{50}{90}\right) = 6^{\circ}22'10''$$

$$\textcircled{C} = D = 2 \times \sin^{-1}\left(\frac{50}{2500}\right) = 2^{\circ}17'31''$$

24.4

Maurice B. H. S.

Given data = $I = 24^\circ 00'$ $PI \text{ Station} = 36+45.00 \text{ ft}$
 $DC = 4^\circ 00'$



$$R = \frac{50}{\frac{\sin 4^\circ 00'}{2}} \rightarrow \boxed{R = 1432.68 \text{ ft}}$$

(i) Length of curve (L) - $L = \frac{\pi R I}{180^\circ}$

$$\rightarrow L = \frac{\pi \times 1432.68 \times 24^\circ}{180^\circ} \rightarrow \boxed{L = 600.12 \text{ ft}}$$

(ii) tangent Length (T) - $T = R \tan \frac{I}{2}$

$$\rightarrow T = 1432.68 \tan \frac{24^\circ 00'}{2} \rightarrow \boxed{T = 304.52 \text{ ft}}$$

(iii) external distance (E) - $E = (R \sec \frac{I}{2} - R)$

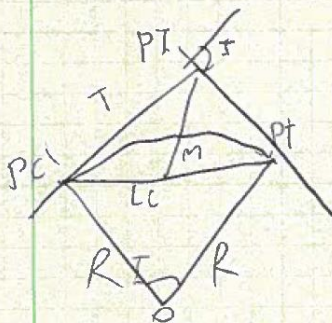
$$\rightarrow E = \frac{1432.68}{\cos \frac{24^\circ}{2}} - 1432.68 \rightarrow \boxed{E = 32 \text{ ft}}$$

(iv) middle ordinate (M) - $M = R(1 - \cos \frac{I}{2})$

$$\rightarrow M = 1432.68(1 - \cos \frac{24^\circ}{2}) = M = 31.30 \text{ ft}$$

(v) Length of long chord (LC) - $LC = 2 R \sin \frac{I}{2}$

$$LC = (1432.68 \times 2) \sin \left(\frac{24^\circ}{2}\right) \rightarrow \boxed{LC = 545.74 \text{ ft}}$$



Station PC - Station of PI - tangent Length
 $= (36+45.00) - 304.52$
 $= 33+40.48 \text{ ft}$

Station of PT = Station of PC + Length of curve
 $= 33+40.48 + 600.12$
 $= 39+40.6 \text{ ft}$

Q407

$$D2 = 2^\circ 30' \quad I = 10^\circ 30' \text{ PI Station} = 36+44.50 \text{ ft}$$

$$\text{Radius } R = \frac{5729.58}{D2} = \frac{5729.58}{2^\circ 30'} = 2291.83 \text{ ft}$$

$$\begin{aligned} \text{Length of the Curve } L &= \frac{R \cdot I \cdot \pi}{180} = \frac{2291.83 \times 10^\circ 30' \times \pi}{180} \\ &= 419.44 \text{ ft} \approx 420 \text{ ft} \end{aligned}$$

$$M = R(1 - \cos(I/2)) = 2291.83(1 - \cos(10^\circ 30'/2)) = 961 \text{ ft}$$

$$\begin{aligned} \text{in } E &= R \left(\frac{1}{\cos(I/2)} - 1 \right) = 2291.83 \left(\frac{1}{\cos(10^\circ 30'/2)} - 1 \right) \\ &= 4655 \text{ ft} \end{aligned}$$

$$\begin{aligned} \text{tangent Length, } T &= R \tan(I/2) = R \tan(10^\circ 30'/2) \\ &= 2291.83 \tan(10^\circ 30'/2) = 210.59 \text{ ft} \end{aligned}$$

$$\begin{aligned} \text{vi PC Station} &= \text{PI Station} - T \\ &= 36+44.50 - 210.59 \\ &= 34+33.91 \\ &= 34+33.91 \end{aligned}$$

$$\begin{aligned} \text{vii PT Station} &= \text{PC Station} + L \\ &= 34+33.91 + 420 \\ &= 38+53.91 \end{aligned}$$

$$\begin{aligned} \text{Length of chord} &= 2R \sin(I/2) = 2 \times 2291.83 \times \sin(10^\circ 30'/2) \\ &= 419.41 \text{ ft} \end{aligned}$$

$$\text{Whole Station from PC} = 35+00$$

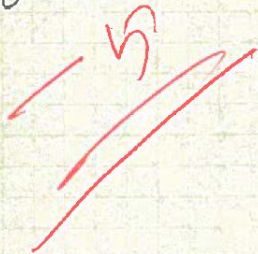
$$\begin{aligned} 35+00 - 34+33.91 \\ &= 66.09 \text{ ft} \end{aligned}$$

$$\frac{80}{\Delta} = \frac{2\pi R}{360}$$

$$\frac{66.09}{\Delta} = \frac{2 \times \pi \times 2291.83}{360} \rightarrow \Delta = 1^\circ 39' 51''$$

24.7 cont

Station	Offset Length from PCH	deflection angle from PC
PC	0	0
35+00	66.09	1°30'8.1"
36+00	166.09	4°9'5.11"
37+00	266.09	6°39'4.11"
38+00	366.09	9°9'5.12"
PT 38+53.91	420	10°30'



AVERAGE

Part B)

Given: 1500.00 ft

Find: Degree of curvature by (1) definition & (2) Chord definition

Approach:

Arc Definition:

$$D_a = \frac{5729.578}{1500} \Rightarrow 3.819 \Rightarrow 3^\circ 49' 10.99''$$

Chord Definition:

$$D_c = 2 \left(\sin^{-1} \left(\frac{50}{1500} \right) \right) = 3.820426 \Rightarrow 3^\circ 49' 13.535''$$

Part C)

Given: 2800.00 ft

Find: Degree of curvature by (1) arc & (2) chord definition

Approach:

Arc Definition:

$$D_a = \frac{5729.578}{2800} \Rightarrow 2.046 \Rightarrow 2^\circ 2' 46.6''$$

$$D_c = 2 \left(\sin^{-1} \left(\frac{50}{2800} \right) \right) \Rightarrow 2.04638607$$

$$\Rightarrow 2^\circ 2' 46.992''$$

90
100

10

Given: $D_c = 40^\circ$
 $I = 24^\circ$

PI station = $36 + 45$ ft

Find: Chord for railroad curve
arc for highway curves

Approach:

$$L = 100' \frac{I}{D_c} \Rightarrow 100' \times \frac{24}{4} = 600'$$

$$\Rightarrow R = \frac{5729.58}{D_c} = \frac{5729.58}{4} = 1432.35$$

$$\Rightarrow T = R \tan\left(\frac{I}{2}\right) = 1432.33 \times \tan\left(\frac{24}{2}\right) = 304.46'$$

$$\begin{aligned} PC &= PI - T \\ &\Rightarrow (33 + 40.54) + (6 + 00.00) \\ &\Rightarrow (39 + 40.54) \end{aligned}$$

$$LC = 2R \sin\left(\frac{I}{2}\right)$$

$$\Rightarrow 2 \times 1432.39 \sin\left(\frac{24^\circ}{2}\right) = 595.62$$

$$M = R \left(1 - \cos\left(\frac{I}{2}\right)\right)$$

$$\Rightarrow 1432.99 \left(1 - \cos\left(\frac{24}{2}\right)\right) = 31.30$$

$$E = R \left(\frac{1}{\cos\left(\frac{I}{2}\right)}\right) - 1 = 32.22$$


Given: $\Delta = 2^\circ 30'$ $I = 10^\circ 30'$ PI station: $36+44.50$ ft

Find: The deflection angles

Approach:

$$R = \frac{5729.58}{\Delta} = \frac{5729.58}{2^\circ 30'} = 2291.832$$

$$L = \frac{R I \pi}{180} = \frac{2291.83 \times 10^\circ 30' \times \pi}{180} = 419.99 \text{ ft} \approx 420 \text{ ft}$$

$$E = R \left(\frac{1}{\cos(I/2)} - 1 \right) = 2291.83 \left(\frac{1}{\cos\left(\frac{10^\circ 30'}{2}\right)} - 1 \right) = 9.655 \text{ ft}$$

$$m = R(1 - \cos(I/2)) = 2291.83(1 - \cos(10^\circ 30'/2))$$

$$T = R \tan(I/2) = 2291.83 \tan(10^\circ 30'/2) = 210.59 \text{ ft}$$

PC station: PI station - T

$$= 36+44.50 - 210.59 = 73433.91 = 734+33.91$$

PT station: PC station + L

$$= 734+33.91 + 420 = 738+53.91$$

Length of long chord = $2R \sin(I/2)$

$$\Rightarrow 2 \times 2291.83 \times \sin\left(\frac{10^\circ 30'}{2}\right) = 419.41 \text{ ft}$$

The whole first station from PC = $35+00$

PC to whole station: (lo)

$$\Rightarrow 35+00 - 34+33.91 = 66.09 \text{ ft}$$

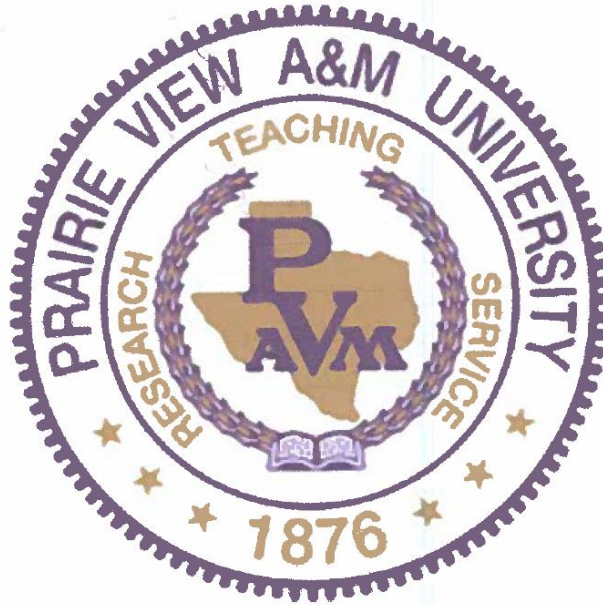
Deflection Angle: $\frac{La}{\Delta} = \frac{2\pi R}{360^\circ}$

$$\Rightarrow \frac{766.09}{\Delta} = \frac{2 \times \pi \times 2291.83}{360^\circ} \Rightarrow \Delta = 1^\circ 39' 8.1''$$

Continue →

BELOW AVERAGE

Prairie View A&M University



CVEG 2102 Surveying And Geospatial Concepts

Homework 3

Submitted by

Trinity Scott

On

November 29, 2021

To

Dr. Choudhury

70
/ 100

4.3(b)

1500 ft:

arc definition

$$D_a = \frac{5729.578}{1500} = 3.8197 = 3^\circ 49' 10.99''$$

chord definition

$$D_c = 2 \times \sin^{-1} \left(\frac{50}{1500} \right) = 3.820 = 3^\circ 49' 13.533''$$

4.3(c)

2800 ft:

arc definition:

$$D_a = \frac{5729.578}{2800} = 2.046^\circ = 2^\circ 2' 46.6''$$

chord definition

$$D_c = 2 \times \sin^{-1} \left(\frac{50}{2800} \right) = 2.046^\circ = 2^\circ 2' 46.99''$$

4.4

$$R = \frac{50}{\sin \frac{24^\circ}{2}} = \boxed{1432.68 \text{ ft}}$$

Length of curve (L)

$$= \frac{\pi \times 1432.68 \times 24^\circ}{180^\circ} = \boxed{600.12 \text{ ft}}$$

Tangent Length (T)

$$= 1432.68 \tan \frac{24^\circ}{2} = \boxed{304.52 \text{ ft}}$$

External Distance (E)

$$= \frac{1432.68}{\cos \frac{24^\circ}{2}} - 1432.68 = \boxed{32 \text{ ft}}$$

Middle Ordinate (M)

$$= 1432.68 \left(1 - \cos \frac{24^\circ}{2} \right) = \boxed{31.30 \text{ ft}}$$

Length of long chord (L_c)

$$= (1432.68 \times 2) \sin \left(\frac{24^\circ}{2} \right) = \boxed{595.74 \text{ ft}}$$

Station of PC

$$= (30 + 45.00) - 304.52$$

$$= (33 + 44.48 \text{ ft})$$

Station of PT

$$= 33 + 40.48 + 600.12$$

$$= 39 + 40.6 \text{ ft}$$

24.7

$$R = 301 \tan 2^\circ 30'$$

$$\Delta = \frac{2\pi R}{360} \times \Delta$$

$$120 = \frac{2\pi R}{360} \times \Delta$$

$$R = 687.54 \text{ m}$$

$$\begin{aligned} \text{Tangent length (L)} \\ &= 687.1129 \times \tan\left(\frac{10^\circ 30'}{2}\right) \\ &= 63.136 \text{ m} \end{aligned}$$

Length of curve (L).

$$= \frac{2\pi \times 687.112}{360} \times 10^\circ 30' = 125.92 \text{ m}$$

Length of long chord (Lc)

$$\begin{aligned} &= 2R \sin(\Delta/2) \\ &= 2 \times 687.1129 \sin\left(\frac{10^\circ 30'}{2}\right) \end{aligned}$$

Middle ordinate (m)

$$\begin{aligned} &= 687.1129 (1 - \cos 5^\circ 15') \\ &= 2.88 \text{ m} \end{aligned}$$

External distance (E)

$$\begin{aligned} &= 62.87 - 2.88 \\ &= 59.99 \text{ m} \end{aligned}$$

— 30 9 9

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

LABORATORY REPORT # 1

TOPICS COVERED IN LABORATORY EXPERIMENT #1

EXPERIMENT #1

Plotting of plan of Old chemical engineering building by tape surveying

Experiment 1 was used to plot the plan of Old chemical engineering department by tape surveying. Closed polygon was formed covering the building and chainage and offset was measured.

ABOVE AVERAGE



Course Name:

CVEG 2102 PO2 Surveying and Geospatial Concepts

LABORATORY REPORT #1:

Plotting the Plan of the Old Chemical Engineering Building by Tape Surveying

Submitted by Group 2:

Denia Leroy, Marshall Johnson, Antonio Little, and Markus Hartfield

Submitted On: October 4, 2021

Submitted to: Dr. Abdul M. Choudhury

95
100

Abstract

The purpose of this experiment was to plot the plan of the old chemical engineering building by measuring the distance between four points using tape measures. The experiment was conducted by using a 100 ft surveyor tape, used to measure the distance between the ranging poles. Also a 30 ft measuring tape was used to measure the offset of the building, 10 ft markers, and landmarks. The experiment resulted in students being able to draw a plan of a building using data from tape surveying.

*Write something
about tape?*

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Step by Step Description and Experimental Safety Issue.....	5
Data Analysis Methods and Models (Equations).....	6
Suitable Statistical Analysis Tools.....	6
Test Results and Analysis.....	7-10
Discussion, Synthesis and Interpretation of the Results and Findings.....	11
Summary- Conclusion and Recommendations.....	13
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Introduction

Surveying is the technique used to have an understanding of how each landmark and measurements should be taken. For this lab we were instructed to measure different angles around a building, starting from one corner of the building to the other 3 landmarks back to the starting point. Each landmark was measured with a 100ft measurement tape and also a 30ft measurement tape. During each measurement every data was being recorded.



Test Objective

The test objective of this experiment is to obtain measurements of the old chemical engineering building using tape surveying while also identifying possible human errors and inaccurate measurements.

Equipment and Apparatus

- Field notebook
- 30 ft tape measure
- 100 ft surveyor tape
- Four ranging poles

Materials and Test Conditions

- Several people involved to complete experiment
- Sunny weather
- Tape measure
- Ranging poles
- Two dimensional positions of points

Step by Step Description and Experimental Safety Issue

1. Plant ranging poles around the building so that the previous ranging pole is within line of sight.
2. Starting pole labeled A, second pole is B, third pole is C, and fourth pole is D.
3. 100 ft surveyor tape is used to measure the distance chainage.
4. Offsets from the surveyor tape are measured with the 30 ft tape measure.
5. Measurements are written down in the field notebook according to instructions laid out by the instructor.
6. In order to measure the angle between the lines of sights, a measurement of 10 ft is taken from the pole in the two directions and a third measurement from 10 ft on one line of sight to 10 ft on the other line of sight is taken.

Data Analysis Methods and Models

In order to find the angle at each marker, we need to use the Law of Cosines

$$c = \sqrt{a^2 + b^2 - 2ab\cos(\gamma)}$$

Solving for the angle γ

$$\gamma = \cos^{-1}\left(\frac{a^2 + b^2 - c^2}{2ab}\right)$$

In order to write the angle in proper format, we must use this conversion:

$$1^\circ = 60'$$

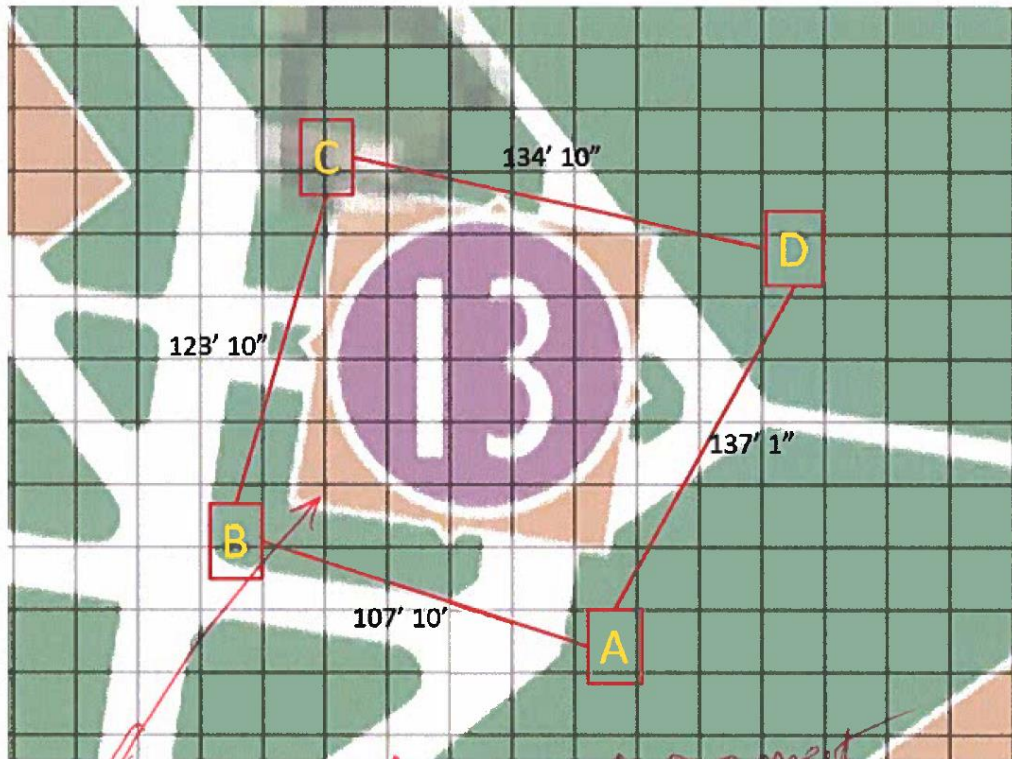
$$1' = 60''$$


Suitable Statistical Analysis Tools

For this experiment, there was no need for any statistical analysis tools, a calculator was used to obtain all data.

Test Results and Analysis

The following figure provides an overview of the scope of the experiment.



3 → plot every point of building and connect

The following four tables contain the measurements obtained from the tape survey. The measurements for the corners of the building have been labeled, and the unlabeled measurements are of various landmarks such as trees, poles and lampposts.

Table 1: Measurement from A to B

Line AB starts	
11'	34'
51' 4"	6'
94'	13' 2"
AB Ends: 107' 1"	

Table 2: Measurement from B to C

Line BC starts	
15'	42' 2"
30'	28' 8"
74.9'	12' 9"
BC Ends: 123' 10"	

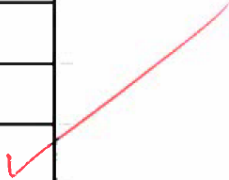


Table 3: Measurement from C to D

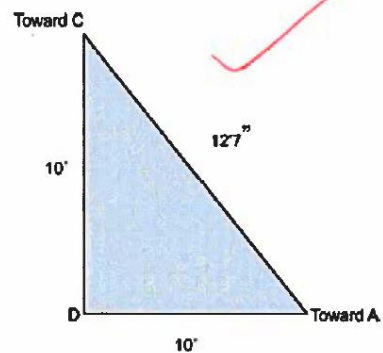
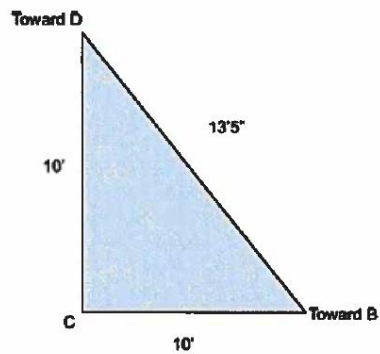
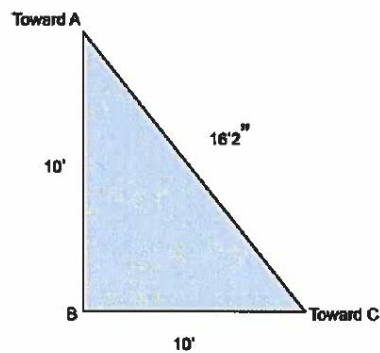
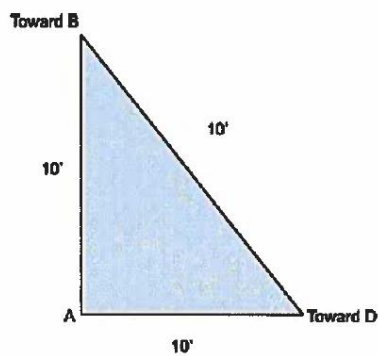
Line CD starts	
54'	16' 1"
66'	13' 1"
95' 3"	22'
CD Ends: 134' 10"	

Table 4: Measurement from D to A

Line DA starts	
29' 6"	11' 3"
61' 4"	11' 10"
91' 8"	7' 11"
101'	12' 9"
DA Ends: 137' 1"	

Measurements obtained from each Marker

Theory: Using the measurements from above we have the main points necessary to draw an outline of the building structure. In order to draw the perimeter of the building we had to find the angle at each pole from point A through D. The following 4 figures show the measurement obtained at each of the points.



Discussion, Synthesis and Interpretation of the Results and Findings

The purpose of this experiment is to plot a two-dimension plan for the old chemical engineering building by measuring the distance between the ranging poles via tape measuring. As we saw from the data in the previous section, we have four markers A, B, C and D. To measure the angle between the lines we use the law of cosines, in which we have three known distances and one unknown angle to be measured. So, if we have three lines, we can easily derive the unknown angle and also convert it to the proper format with minutes and seconds.

$$1^{\circ} = 60'$$

$$1' = 60''$$

To measure the angle at marker A, we take a measure of 10' in two directions from pole A and a third measurement from the 10' on one line of sight and 10' from the other line of sight. The distance between the two 10' measurements at marker A is 10'. By using the law of cosines, we calculate the angle at A to be 60° or $60^{\circ} 0' 0''$.

We repeat this process at markers B, C, and D.

The distance between the 10' measurements at marker B is 16.2'. By using the law of cosines, we calculate the angle at B to be 108.19° or $108^{\circ} 0' 0''$.

The distance between the 10' measurements at marker C is 13'5". By using the law of cosines, we calculate the angle at B to be 84.91° or $84^{\circ} 12' 36''$.

The distance between the 10' measurements at marker D is 12'7". By using the law of cosines, we calculate the angle at B to be 78.84° or $78^{\circ} 33'$.

The sum of angle of four marker for a close four-sided polygon is
 $\angle A + \angle B + \angle C + \angle D = 60^{\circ} + 108.19^{\circ} + 84.91^{\circ} + 78.84^{\circ} = 331.94^{\circ}$

This value is the interior angle of the measured quadrilateral surrounding the chemical engineering building and was found using simple trigonometry and without the use of any statistical analysis tool.

$$\begin{aligned}\% \text{ Error} &= (\text{Measured Angle} - \text{Actual Angle}) / \text{Measured Angle} * 100 \\ &= (331.94 - 360) / 331.94 * 100 = 8.4\%\end{aligned}$$

Summary- Conclusion and Recommendations

The purpose of land surveying is to allow people to understand the boundaries of the land. A survey is performed in order to locate, describe and map the monuments boundaries and corners of a parcel of the land. In this experiment we used the taping method to measure the distance between four markers and then calculated to find the angle at each marker. The distance between markers is measured by 100 ft tape and the perpendicular offset from the tape with the 30 ft tape. The angle measured tells us the accuracy of the marker point placements to the building also while calculating percent error that is due to human error.

It is recommended that we should use more accurate equipment to measure distance between two points and for this purpose we would have to use the advanced leveling instrument. The error can be minimized by using mathematical techniques. The most accurate instrument used today while surveying is called the GPS. We can also improve the results by minimizing the human error occurring during the measurements, in our experiment we had a lot of us measuring so the reading may not have been accurate. Lastly, recording our data using the field notebook would have been recommended..

References

Charles D. Ghilani, Elementary Surveying: An Introduction to Geomatics, 15th Edition, Pearson

file:///C:/Users/18325/Downloads/Typical_Lab_Report.pdf

<https://mcsteen.com/a-brief-guide-to-land-surveying/#~:text=Land%20surveying%20allows%20you%20to%20understand%20your%20land,made%20to%20the%20parcel.%20Who%20Are%20Land%20Surveyors%3F>

1
Add more
ref!

Appendices

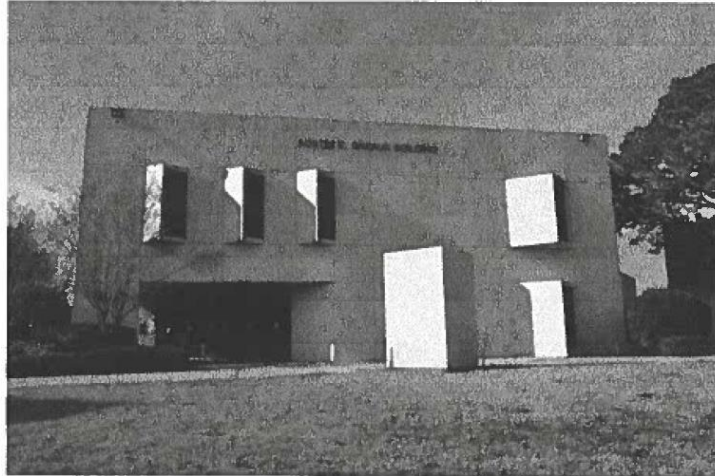
Surveying by Charles Ghilani

Chapter- 1

Chapter- 2

AVERAGE

Prairie View A&M University



Course Name: Surveying and Geospatial Concepts

Course: CVEG 2102 PO2

LABORATORY REPORT #1:

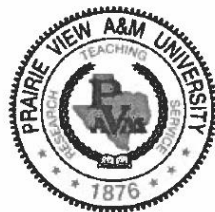
Plotting the Plan of the Old Chemical Engineering Building by Tape Surveying

Submitted by Group 4:

Jacorian Lovall, Ariana Mangroo, Olulayomi Ogunkile

Submitted On: October 4, 2021

Submitted to: Dr. Abdul M. Choudhury



91
12/12

Abstract

The purpose of this experiment was to plot the plan of the old chemical engineering building by measuring the distance between four points using tape measures. The experiment was conducted by using a 100 ft surveyor tape, used to measure the distance between the ranging poles. Also a 30 ft measuring tape was used to measure the offset of the building, 10 ft markers, and landmarks. The experiment resulted in students being able to draw a plan of a building using data from tape surveying.



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Test Objective

The test objective of this experiment is to obtain measurements of the old chemical engineering building using tape surveying while also identifying possible human errors and inaccurate measurements.

Equipment and Apparatus

- Field notebook
- 30 ft tape measure
- 100 ft surveyor tape
- Four ranging poles ✓

Materials and Test Conditions

- Several people involved to complete experiment
- Sunny weather
- Tape measure
- Ranging poles
- Two dimensional positions of points

Step by Step Description and Experimental Safety Issue

1. Plant ranging poles around the building so that the previous ranging pole is within line of sight.
2. Starting pole labeled A, second pole is B, third pole is C, and fourth pole is D.
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$$c = \sqrt{a^2 + b^2 - 2ab\cos(\gamma)}$$

Solving for the angle γ

$$\gamma = \cos^{-1}\left(\frac{a^2 + b^2 - c^2}{2ab}\right)$$

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$$1^\circ = 60'$$

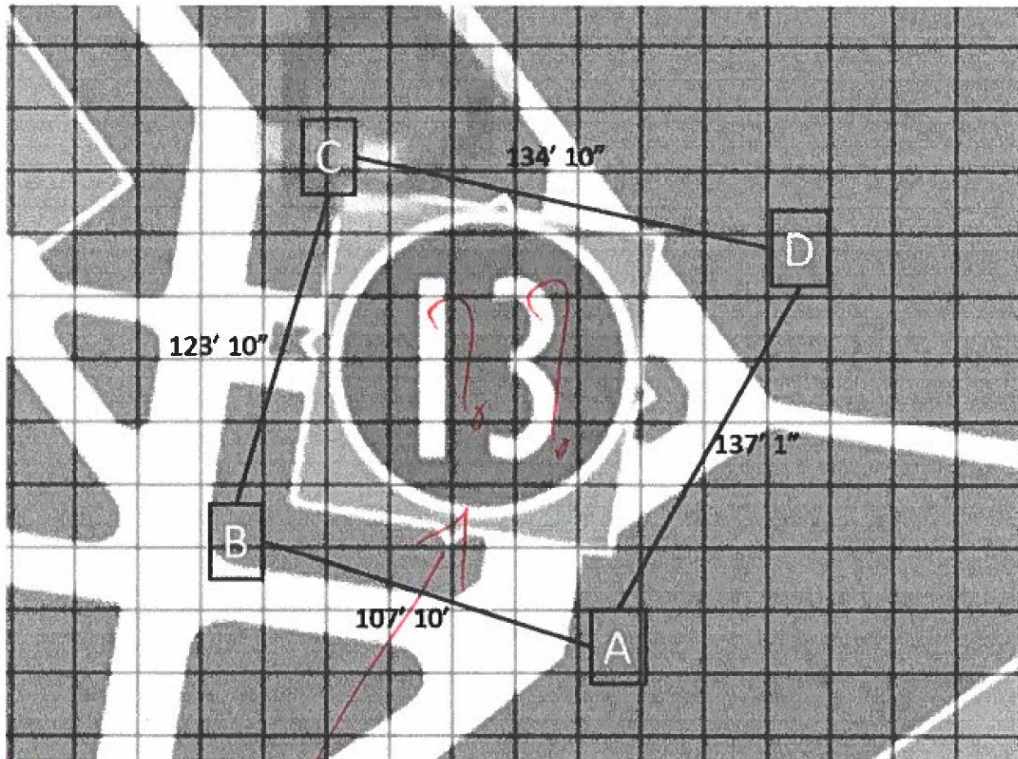
$$1^\circ = 60''$$

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Test Results and Analysis

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The following four tables contain the measurements obtained from the tape survey. The measurements for the corners of the building have been labeled, and the unlabeled measurements are of various landmarks such as trees, poles and lampposts.

Inside Building

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Line AB starts	
11'	34'
51' 4"	6'
94'	13' 2"
AB Ends: 107' 1"	

Table 2: Measurement from B to C

Line BC starts	
15'	42' 2"
30'	28' 8"
74.9'	12' 9"
BC Ends: 123' 10"	

Table 3: Measurement from C to D

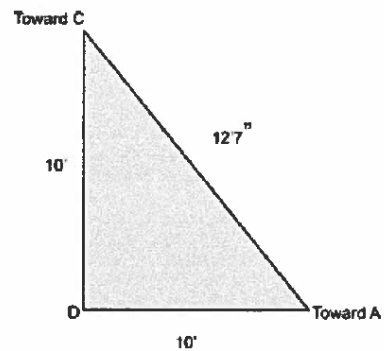
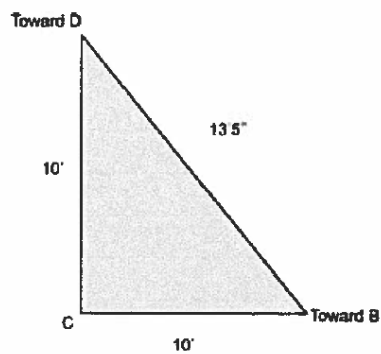
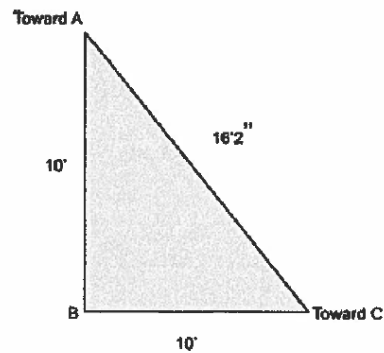
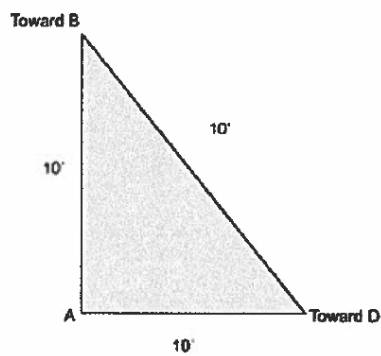
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Theory: Using the measurements from above we have the main points necessary to draw an outline of the building structure. In order to draw the perimeter of the building we had to find the angle at each pole from point A through D. The following 4 figures show the measurement obtained at each of the points.



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$$1^\circ = 60'$$

$$1' = 60''$$

To measure the angle at marker A, we take a measure of 10' in two directions from pole A and a third measurement from the 10' on one line of sight and 10' from the other line of sight. The distance between the two 10' measurements at marker A is 10'. By using the law of cosines, we calculate the angle at A to be 60° or $60^\circ 0' 0''$.

We repeat this process at markers B, C, and D.

The distance between the 10' measurements at marker B is 16.2'. By using the law of cosines, we calculate the angle at B to be 108.19° or $108^\circ 0' 0''$.

The distance between the 10' measurements at marker C is 13'5". By using the law of cosines, we calculate the angle at B to be 84.91° or $84^\circ 12' 36''$.

The distance between the 10' measurements at marker D is 12'7". By using the law of cosines, we calculate the angle at B to be 78.84° or $78^\circ 33'$.

The sum of angle of four marker for a close four-sided polygon is

$$\angle A + \angle B + \angle C + \angle D = 60^\circ + 108.19^\circ + 84.91^\circ + 78.84^\circ = 331.94^\circ$$

This value is the interior angle of the measured quadrilateral surrounding the chemical engineering building and was found using simple trigonometry and without the use of any statistical analysis tool.

$$\begin{aligned}\% \text{ Error} &= (\text{Measured Angle} - \text{Actual Angle}) / \text{Measured Angle} * 100 \\ &= (331.94 - 360) / 331.94 * 100 = 8.4\%\end{aligned}$$

Summary- Conclusion and Recommendations

The purpose of land surveying is to allow people to understand the boundaries of the land. A survey is performed in order to locate, describe and map the monuments boundaries and corners of a parcel of the land. In this experiment we used the taping method to measure the distance between four markers and then calculated to find the angle at each marker. The distance between markers is measured by 100 ft tape and the perpendicular offset from the tape with the 30 ft tape. The angle measured tells us the accuracy of the marker point placements to the building also while calculating percent error that is due to human error.

It is recommended that we should use more accurate equipment to measure distance between two points and for this purpose we would have to use the advanced leveling instrument. The error can be minimized by using mathematical techniques. The most accurate instrument used today while surveying is called the GPS. We can also improve the results by minimizing the human error occurring during the measurements, in our experiment we had a lot of us measuring so the reading may not have been accurate. Lastly, recording our data using the field notebook would have been recommended..

References

Charles D. Ghilani, Elementary Surveying: An Introduction to Geomatics, 15th Edition, Pearson

file:///C:/Users/18325/Downloads/Typical_Lab_Report.pdf

<https://mcsteen.com/a-brief-guide-to-land-surveying/#:~:text=Land%20surveying%20allows%20you%20to%20understand%20your%20land,made%20to%20the%20parcel.%20Who%20Are%20Land%20Surveyors%3F>

Add more
2

Appendices

Surveying by Charles Ghilani

Chapter- 1

Chapter- 2

BELOW AVERAGE

Prairie View A&M University



CVEG 2102 Surveying and Geospatial

Lab-Report 1

Plotting the Old Chemical Engineering Building tape surveying

Submitted by Group 5

Xavier J. Singleton

Trinity T. Scott

Hunter Rodgers

Tyrone Owens
On

October 4th, 2021

To

Dr. Choudhury

83
100

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Abstract

The purpose of the experiment was to plot the plan of the old chemical engineering building by measuring the distance between four points of the building via tape measuring.

The experiment was conducted by using 100ft and 30ft-tape measures. The 100 ft surveyor tape was used to measure the distance between the poles A, B, C and D which were placed around the building. The 10ft was used to measure the offset of the building markers.

The results were used to find and draw a plot of the building

Introduction

Lining in – shortest distance between two points is a straight line. Straight line. 2. Applying tension – rear chain is anchor and head Applying tension – rear chain is anchor and head chain applies required tension. Chain applies required tension. 3. Plumbing – horizontal distance requires tape to be Plumbing – horizontal distance requires tape to be horizontal. horizontal. 4. Marking tape lengths – each application of the tape Marking tape lengths – each application of the tape requires marking using chaining pins to obtain total requires marking using chaining pins to obtain total length. length. 5. Reading the tape – the graduated tape must be read Reading the tape – the graduated tape must be read correctly. correctly. 6. Recording the distance – the total length must be Recording the distance – the total length must be reported and recorded correctly.

Surveying: is the technique and science of determining the three-dimensional positions of points and the distances and angles between them. There are various ways to take measurements in surveying and one of these methods is chaining which is taking the linear measurements of the horizontal distance between two or more fixed points. Old surveys were often measured using a surveyor's surveys were often measured using a Surveyors Chain. These were literally chains made up of 100 Chain. These were literally chains made up of 100 links. Each Chain was 66 feet long. Each link was links. Each Chain was 66 feet long. Each link was 0.666 of a 0.666 of a foot.

Taping: applying the known length of a graduated: applying the known length of a graduated tape directly to a line several times. Tape directly to a line several times

Test Objective

The objective of this experiment is to plot the old chemical engineering building plan using two dimensional measurements obtained from tape surveying and identifying inaccuracies of human measuring error.

Data Analysis Methods and Models (Equations)

In order to find the angle at each marker, we need to use the Law of Cosines

$$c = \sqrt{a^2 + b^2 - 2ab \cos(y)}$$

Manipulating the formula to solve for the angle y gives us

$$y = \cos^{-1}(a^2 + b^2 - c^2 / 2ab)$$

In order to write the angle in the proper format, we need to convert the numbers after the decimal point to minutes and seconds. The conversion is simple as

$$1^\circ = 60'$$

And

$$1' = 60''$$

From the equations above, we can derive all we need from the measurements obtained.

Test Results and Analysis

The following four tables contain the measurements obtained from the tape survey. The measurements for the corners of the building have been labeled, and the unlabeled measurements are of various landmarks such as trees or poles.

21
Site Plan
Facing North?

Δ
AB Start

18' 11" 26' 10"

6' 33" 2' 6"

89' 9' 10"

90' 18' 8"

89' 9' 11"

46' 5'

33' 10' 6"

04' 10' 6"

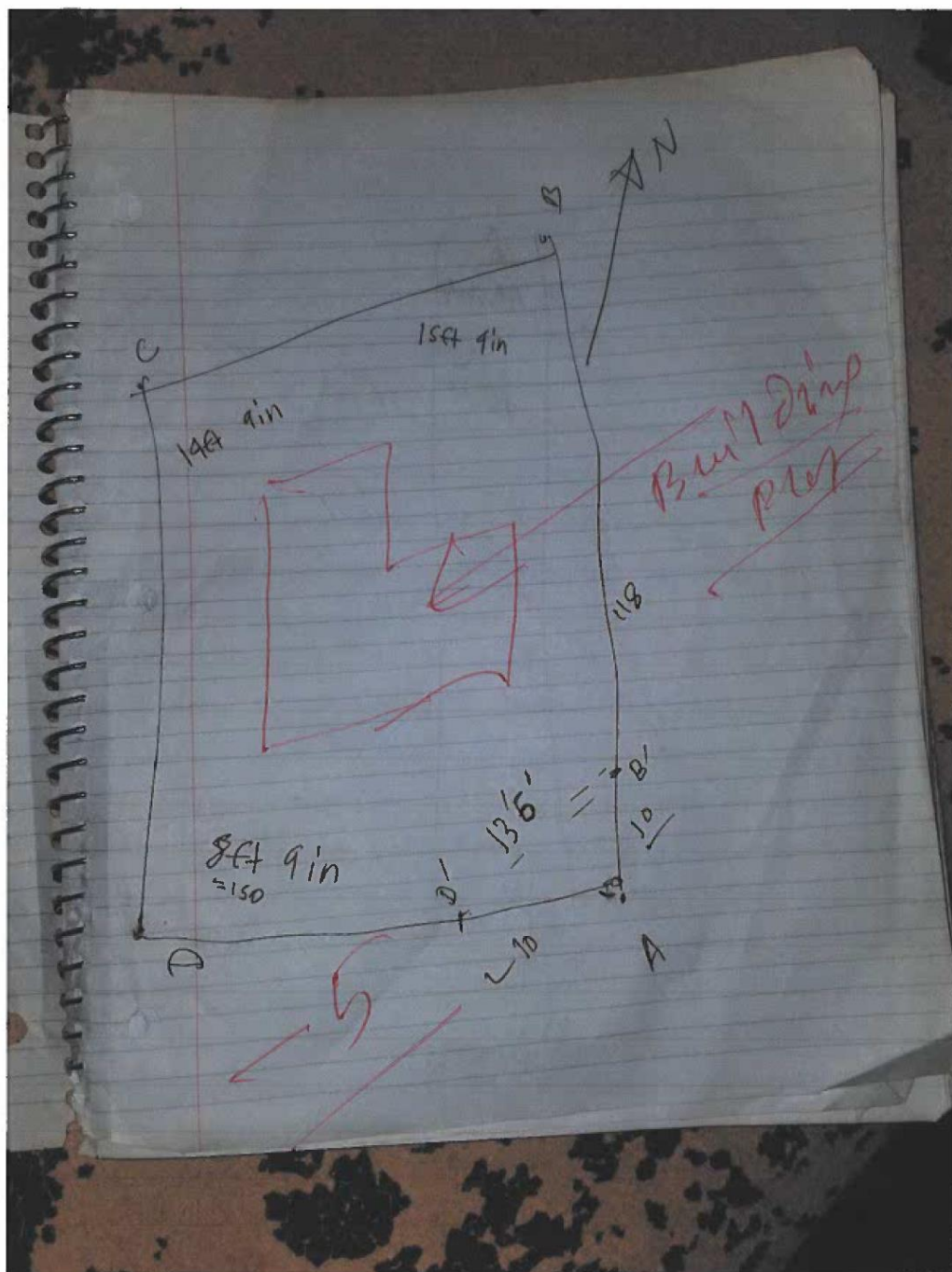
118
AB Ends

B

33' 7" 32'

57' 2" 8' 9"

75' 7" 8' 8"



The purpose of this experiment is to plot a two-dimension plan for the old chemical engineering building by measuring the distance between the ranging poles via tape measuring.

As we seen from the data in the previous section, we have four markers A, B, C and D. To measure the angle between the lines we use the law of cosines, in which we have three known distances and one unknown angle to be measured. So, if we have three lines, we can easily derive the unknown angle and also convert it to the proper format within minutes and seconds.

$$1^{\circ}=60'$$

$$1'=60''$$

To measure the angle at marker A, we take a measure of 10' in two directions from pole A and a third measurement from the 10' on one line of sight and 10' from the other line of sight. The distance between the two 10' measurements at marker A is 13' 6". By using the law of cosines, we calculate the angle at A 85.69

We repeat this process at markers B, C, and D.

The distance between the 10' measurements at marker B is 15' 4". By using the law of cosines, we calculate the angle at B to be 100.71".^{oo}

The distance between the 10' measurements at marker C is 14' 9". By using the law of cosines, we calculate the angle at C to be 96.32.^{oo}

The distance between the 10' measurements at marker D is 8' 9". By using the law of cosines, we calculate the angle at C to be 52.85.

The sum of angle of four marker for a close four-sided polygon is.335.57

This value is the interior angle of the measured quadrilateral surrounding the chemical engineering building and was found using simple trigonometry and without the use of any statistical analysis tool.

Angle calculator and formula used

$$A+B+C+D= 85.69+100.71+96.32+52.85=335.57$$

$$\%Error= (Measured-Actual/ Measured) *100$$

$$(335.57-360/335.57) *100= -7.28\%$$

-5

Summary and conclusion

The purpose of surveying is to find the elevation or depression of the land from the surface. Different techniques are used to measure the distances such as pacing, taping, chain or GPS system. In our experiment we choose the taping method to measure the distance between the four markers and then using trigonometry to find the angle at each marker. We learned that measuring distances and angles with aping is a less accurate method and does not give satisfying results. The most accurate instrument used nowadays for measuring distances is the GPS. We can also improve results by minimizing the human error that occurs during the measurements and It being recorded in the field book.

Ref
- 3
/

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

LABORATORY REPORT # 2

TOPICS COVERED IN LABORATORY EXPERIMENT #2

**EXPERIMENT #2
TO FIND THE ELEVATION OF OLD CHEMICAL ENGINEERING
BUILDING BY DIFFERENTIAL LEVELLING**

Experiment 2 was used find the elevation of Chemical Engineering department building by using levelling instrument. The floor f civil engineering building was used as Benchmark and four turning points were used to close the loop.

ABOVE AVERAGE



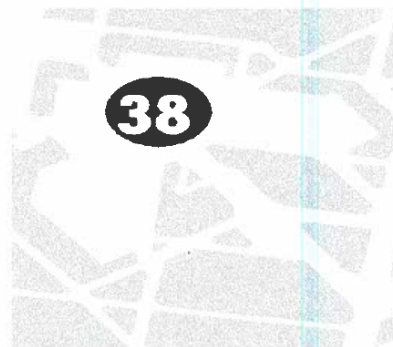
Lab Report #2

To find out the Elevation of Collins building by differential levelling

Omar Hajo, Amani Fontenot, Jason Garza

Dr. Choudhury

Nov 1, 2021



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100

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Abstract

The purpose of lab 2 is to use a surveying machine in order to determine the elevation of the Collins Building at Prairie View A&M University. The process of finding the following is by using the method of differential leveling. To conduct this experiment, we used the DL-502 Electronic Digital Level machine. Prior to starting the actual calculations, what is asked of us is to draw a sketch with the relevant station points. Acquiring this information, we can then use the distances of the backside, frontside, and initial elevation in order to calculate the misclosure, adjusted elevation, and the correction of the Collins Building.

Introduction

The technique of levelling has been around for over 100 years. The first mention of levelling in the historical documents according to Celebrating200years.noaa.gov was in 1854, but they also mentioned that the first research conducted using the spirit levels was in 1857 for the New York Bay and the Hudson River. The purpose of levelling is in order to find the elevation of points you and your team have established. What benefits engineers as a result of using this technique is that they can acquire a precise contour map of the land and sea surface according to civiljungle.com. For the following lab, instead of coming up with a contour map of the sea level or land we will level the distances of different datums of the Collins Building and from there we will calculate the elevation using the differential levelling method.

Test Objectives

1. Draw a sketch with relevant station points
2. Calculate the misclosure
3. Calculate correction
4. Adjust elevation

Description of Equipment and Apparatus

1. Field Notebook
2. "DL-502 Electronic Digital Leveling Machine
3. One Button Triggers Measurement and Data Storage
4. 0.6mm/0.8mm Height Accuracy
5. Advanced RAB Code Technology
6. Pre-installed Measurement Programs
7. Height Difference Measurement
8. Inverse Staff Reading for Ceiling Height
9. Internal Memory,,

Numbers 2-9 were taken from Topcon.co.jp

Material and Test Conditions

1. The DL-502 Electronic Digital Leveling machine
2. Height Difference Measurement staff
3. The DL-502 electronic digital leveling machine had trouble focusing and giving a clear sight of the height difference measurement staff.
4. The weather was hot

Step by step description and Experimental safety issue

1. Place a student with the height difference measurement staff at the B.S station established
2. Assemble the DL-502 Electronic Digital Leveling machine

3. Plant the device into the ground using the metal planks at the bottom of each leg and make sure it is firmly in place
4. Calibrate the device so that at every sight reference at which you turn the device the ball in the caliber is in the middle
5. Make sure when looking through the device to check the height at which the elevation is, the lens is focused on the item, and you have a clear sight of the accurate measurement
6. The first elevation should be labeled as 100 ft
7. Have one student take note of each B.S and F.S of each establish point where a distance was measured

The lab went smoothly, and no safety precautions were needed.

Data Analysis Methods and Models

In order to find out the elevation we had to first calculate:

- Back sight + elevation = Height of instrument
- Height of instrument - Foresight = Elevation
- Backsight - Foresight = Misclosure
- misclosure / #stations = Error Setup
- |error setup| * station# = Correction
- Correction + elevation = Adjusted elevation

No conversion was needed during the lab.

Suitable Statistical Analysis Tools

For this test there was no need for statistical analysis tools because all data could be calculated with simply a calculator.

Test Results and Analysis

Add figures from field

2

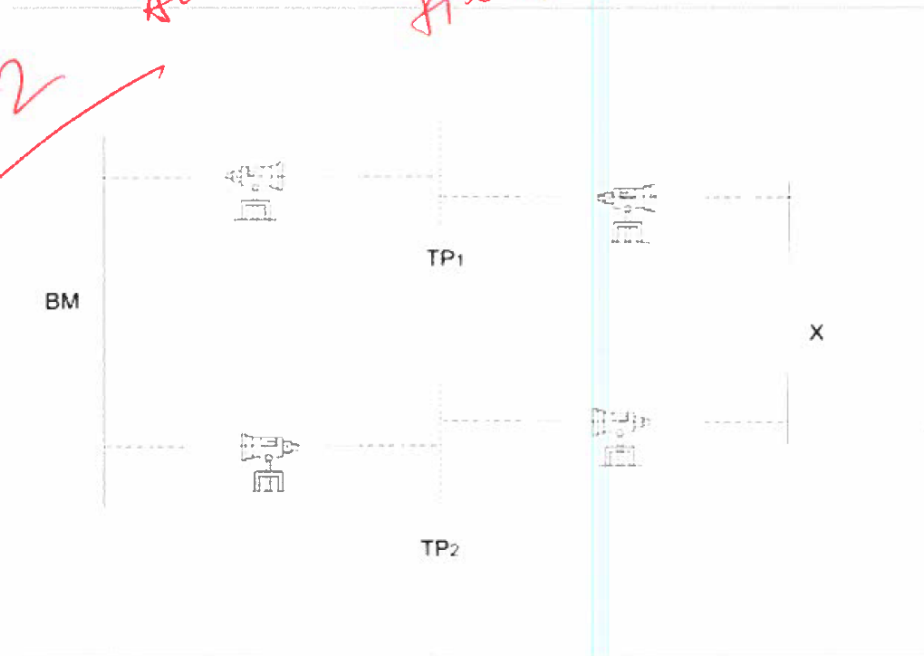


Table Bench Mark Elevation

Setup #	Points	B.S (ft)	H.I	F.S (ft)	Elevation (ft)	Correction	Adj Elevation
	Bm	3.52	103.52		100		100
1	TP1	5.91	104.13	5.3	98.22	0.02	98.24
2	X	4.19	103.72	4.6	99.53	0.04	99.57
3	TP2			3.78	99.94	0.06	100
	Total	13.62		13.68			
	Misclosure	-0.06					
	Error setup	-0.02					

5

Σ Range check

make different row for

H.I.

Page Check

To double check our calculations, the following equation can be used to check:

$$\text{First Elevation} + \text{BackSight} - \text{Foresight} = \text{Last Elevation}$$

$$\text{Last Elevation} = 99.94$$

$$= 100 + 13.62 - 13.68 = 99.94$$

$$99.94 = 99.94 \checkmark$$

Discussion, Synthesis, and Interpretations of the Results and Findings

The purpose of this lab was to determine the elevation of the Collins building using surveying tools that will allow them to be precise. We took measurements at different locations on the elevation field of the Collins Building. After we found the Backsight(s) and Foresight(s), and the initial elevations, we then used the calculation methods to find the values we needed. The calculations can be found below:

To find H.I. of BM, we calculated $\text{BM(B.S.)} + \text{BM(Elevation)}$

$$3.52 + 100 = 103.52$$

$$\text{BM(H.I.)} = 103.52$$

To find Elevation of TP1, we calculated $\text{BM(H.I.)} - \text{TP1(F.S.)}$

$$103.52 - 5.3 = 98.22$$

$$\text{TP1 Elevation} = 98.22$$

To find H.I. of TP1, we calculated $\text{TP1(B.S.)} + \text{TP1(Elevation)}$

$$5.91 + 98.22 = 104.13$$

$$\text{TP1(H.I.)} = 104.13$$

To find Elevation of X, we calculated $\text{TP1(H.I.)} - \text{X(F.S.)}$

$$104.13 - 4.6 = 99.53$$

$$\text{X Elevation} = 99.53$$

To find H.I. of X, we calculated $X(B.S.) + X(Elevation)$

$$4.19 + 99.53 = 103.72$$

$$X(H.I.) = 103.72$$

To find Elevation of TP2, we calculated $X(H.I.) - TP2(F.S.)$

$$103.72 - 3.78 = 99.94$$

$$TP2 \text{ Elevation} = 99.94$$

After finding all of our calculations, we found the totals of the Backsight(s), and Foresight(s) and found the total Misclosure.

$$\text{Total B.S.} = 3.52 + 5.91 + 4.19 = 13.62$$

$$\text{Total F.S.} = 5.3 + 4.6 + 3.78 = 13.68$$

$$\text{Misclosure} = \text{Backsight} - \text{Foresight}$$

$$13.62 - 13.68 = -0.06$$

We divided the total Misclosure by the number of stations to find the total Error Setup value.

$$\text{Misclosure} / \# \text{ of Stations} = \text{Error Setup}$$

$$-0.06 / 3 = -0.02$$

Next we took the absolute value of the Error Setup, and multiplied it by the station number for each position.

$$|\text{Error Setup}| * \text{Station \#} = \text{Correction}$$

$$TP1 = |-0.02| * 1 = 0.02$$

$$X = |-0.02| * 2 = 0.04$$

$$TP2 = |-0.02| * 3 = 0.06$$

And to find our adjusted Elevations, we calculated the sum of the Correction and the initial elevations for each position.

$$TP1 = 98.22 + 0.02 = 98.24$$

$$X = 99.53 + 0.04 = 99.57$$

$$TP2 = 99.94 + 0.06 = 100$$

$$\text{Adjusted elevation-initial elevation} = 100 - 100 = 0$$

With all of our total calculated elevation values, we could now formulate a precise contour map of the Collins Building.

Summary - Conclusion and Recommendations

The main purpose of this experiment was to determine the elevation of the land on Prairie View by plotting 4 points and measuring the distance between them. For this experiment we used an electronic digital leveling machine and the measurement staff. The use of these pieces of equipment was to help find the distance between each marked point. By using the equations we were able to find elevation, misclosure, height of instrument, and the differential error. In doing so we concluded that the ground on Prairie View was almost leveled to 100 ft above sea level. Our reasoning was that because the misclosure was minor, .06 ft, the elevation didn't fluctuate drastically staying mostly leveled.

After conducting the lab and finishing calculating the results, it is recommended that there be more data points so the results are more accurate. Due to a time crunch because of a malfunctioning of the electronic digital leveling machine this couldn't be done. The purpose for this correction is to obtain a more accurate elevation by increasing the plotted points on total land area.

Reference and Literature Citations

Rajput, Krunal. "What Is Levelling In Surveying | Types Of Levelling In Surveying | Advantages & Disadvantages Of Levelling In Surveying". *Civiljungle*, 2021,

<https://civiljungle.com/types-of-levelling-in-surveying/#~:text=Advantage%20of%20Levelling%20in%20Surveying,transit%20leveling%20and%20liquid.>

Mudavath, View. "Levelling | Principle, Purpose & Terms Used Levelling". *We Civil Engineers*, 2021,

<https://www.civildigital.com/2018/09/11/levelling/#~:text=PURPOSE%20OF%20LEVELLING&text=To%20find%20the%20elevations%20of%20the%20given%20for%20assumed%20datum.>

"NOAA 200Th: Foundations: Surveying Elevations". *Celebrating200years.Noaa.Gov*, 2021,

<https://celebrating200years.noaa.gov/foundations/leveling/welcome.html#:~:text=next-,The%20First%20Geodetic%20Level%20Lines,the%20Hudson%20River%20in%201857.>

Pvamu.Edu, 2021, <https://www.pvamu.edu/wp-content/uploads/2017/10/pvamu-campus-map-031617.pdf>.

"Electronic Digital Level DL-502 / 503 | Positioning | TOPCON". *Topcon.Co.Jp*, 2021,

https://www.topcon.co.jp/en/positioning/products/products/level/DL-500_E.html.

Appendices

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Appendix K

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TP1 Elevation = 98.22

X Elevation = 99.53

TP2 Elevation = 99.94

Misclosure= -0.02

Appendix L

Summary Conclusion and Recommendation: page 9

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AVERAGE

Prairie View A&M University



CVEG 2102 Surveying and Geospatial

Lab-Report 2: To find out the Elevation of Collins building by differential levelling

Submitted by

Trinity T. Scott

Tyrah Owens

Hunter Rodgers

On

November 1st, 2021

To

Dr. Choudhury

80/100

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Abstract

The purpose of this experiment was to determine the differences in elevation between points.

The experiment was conducted by using a telescope, to collect front side and backside readings.

The telescope was used to see the readings on the leveling rod and record data.

The significant results of this experiment is that students were able to use a telescope properly to calculate the difference in elevation at specific points.

-2 what is levelling?

Introduction

Differential leveling is the process of finding the difference in elevation between two or more points. When the two points are within the sight limits of the instrument, two readings are taken.

The difference in rod readings represents the difference in elevation between the two points.

When one or more of the points are beyond the range of the instrument turning points are used.

Test Objective

The objective of this lab was to find the elevation of a point by differential leveling.

Equipment and Apparatus



1. Field Notebook
2. Pen/Pencil
3. Telescope
4. Tripod
5. Stadia Rod
6. Leveling Instrument

Materials and test conditions

1. Tripod
2. Telescope
3. Level rod
4. Sunny Weather
5. 4 people needed to complete the experiment

Experimental Safety

1. Everyone had closed toes, no heel, and no holed soled shoes
2. All hair and dangling jewelry tied back and secured
3. Everyone is wearing long pants and not shorts or skirts

Experimental Procedures

1. An instrument is set up approximately halfway between BM Rock and point X.
2. After leveling the instrument, a plus sight taken on a rod held on the BM gives a reading
3. A plus sight, and also termed backsight (BS), is the reading on a rod held on a point of known or assumed elevation.
4. This reading is used to compute the height of instrument (HI), defined as the vertical distance from datum to the instrument line of sight.
5. If the telescope is then turned to bring into view a rod held on point X, a minus sight (−S), also called foresight (FS), is obtained.
6. Repeat steps till you get back to the BM
7. Check for misclosures, page check, and other errors.

Data Analysis Methods and Models (Equations)



Draw a site plan

Loop Misclosure = Initial elevation - final elevation

Page check = 1st Elevation + B.S. - F.S.

Elevation = H.I. - F.S.

H.I. = Elevation + B.S.

Correction = Misclosure / Number of points

Adjusted Elevation = Original Elevation - Correction

Test Results and Analysis

In the table below you will see the measurements obtained from the differential leveling. Underneath the table, you will find the calculation made to find the correction to the elevation and the page check.

Points	B.S (+)	H.I	F.S (-)	Elevation	Correction	Adj. Elevation
BM	3.52	103.52		100	0	100
TP1	5.91	104.13	5.3	98.22	-.015	98.205
X	4.19	103.72	4.6	99.53	-0.3	99.5
TP2			3.78	99.94	.06	99.88

Loop misclosure

$$100 - 99.94 = 0.06$$

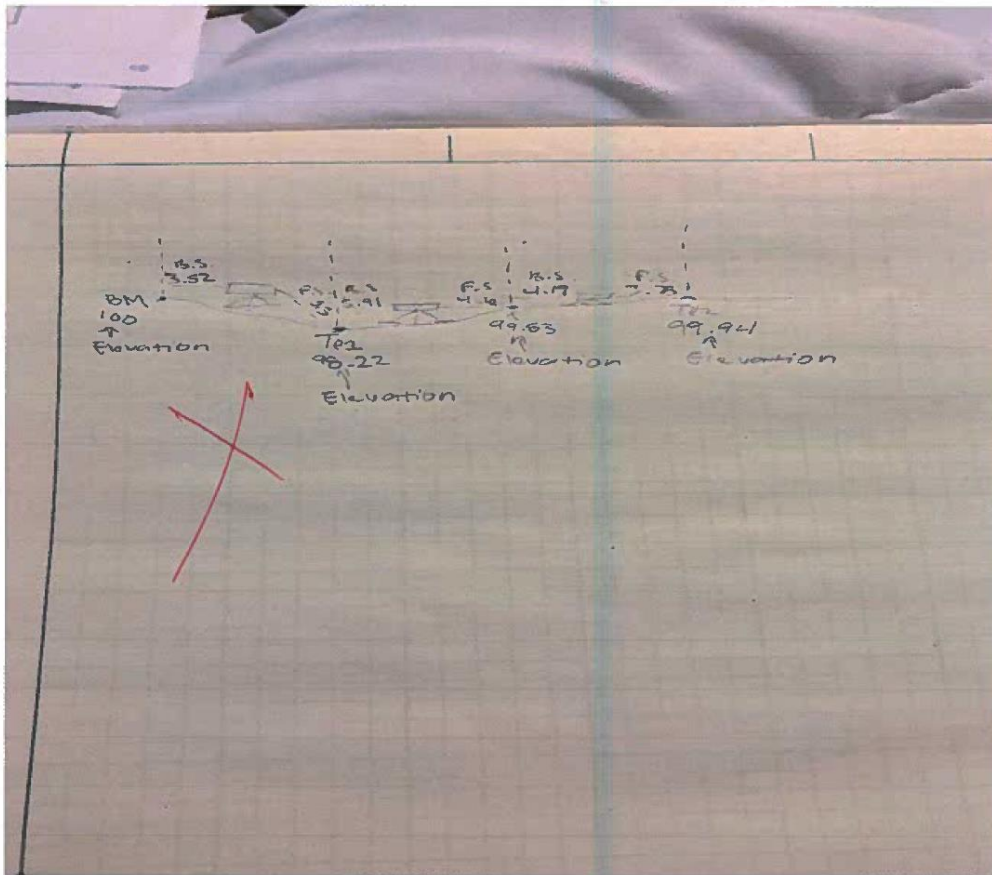
Correction

$$0.06/4 = .015$$

Page check

$$100 + 13.68 = 113.62 - 13.68 = 99.94$$

Sketch of leveling



Summary and conclusion

The purpose of the experiment was to find the elevation of the S.R. Collins building by the process of differential leveling. The equipment we used to find the distance lengths was a transit level tripod. A transit level tripod is an optical instrument, or a telescope, complete with a built-in spirit level that is mounted on a tripod. The experiment was conducted by assuming first the elevation of BM (Wilson Building) at 100ft.

The distance between each point is about 1 to 2 ft around the Wilson building and the S.R. Collins building. After, We determined the data points at each point and distance and then used those points to determine the elevation of the S.R. Collins building. After we found out the calculated elevation we looked up the actual elevation between the points. Using both calculated and actual we found the elevation errors between the elevations. After we found the errors we then used those to calculate the adjusted elevations.

Ref - ?
-3

BELOW AVERAGE

Prairie View A&M University
College of Engineering
Department of Civil & Environmental Engineering



CVEG 2102: Survey and Geospatial

Lab report 2: Differential Leveling

Submitted by:

Denia Leroy Markus Hartfield

Marshall Johnson Antonio Little

Due date: 11/01/2021

Submitted to: Dr. Abdul Choudhury

78/100

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Abstract

The purpose of this experiment is to use the differential leveling method to determine the difference in elevation from the C.L. Wilson building to the S.R. Collins building identified as point x in the experiment back to the starting point. This method requires a leveling instrument that is properly set up to collect the most accurate readings.

what is purpose of leveling

Introduction

The differential leveling method is a technique used for finding the difference in elevation between the benchmark and turning points. The benchmark point (BM) is the starting point of the experiment where the backsight (B.S.) reading is taken by the leveling instrument. The height of the instrument (H.I.) can now be calculated with the elevation given of 100 ft added to the backsight reading. The leveling instrument is then turned around to take the foresight reading these readings are defined as the turning points (Tp1, Tp2..etc) until we reach our benchmark point to take final foresight readings. It is important in differential leveling to run closed circuits so that the accuracy of the work can be checked.

Test objective

The test objective of this experiment is to use the differential leveling method to obtain the turning points and benchmark points from the C.L Wilson building to the S.R Collins building.

Equipment and apparatus

- Telescope



- Tripod



- Staff



- Notebook



Step by Step Description

1. Define the benchmark point that's being considered in the experiment.
2. The given elevation of the benchmark C.L. Wilson building is 100 ft.
3. Set up the leveling instrument in a horizontal position securely into the ground.
4. Once securely positioned, the telescope has to be leveled by adjusting the three screws to center the bubble.
5. Now we can proceed with the experiment that the leveling instrument is properly leveled.
6. We look through the telescope and adjust the focus as needed to read the staff.
7. Take recordings for the backsight and foresight positions, while making proper adjustments to leveling instruments to take the most accurate readings.
8. Steps 6 and 7 are repeated until we are back at starting position benchmark point.

Experimental safety

The experimental safety procedure requirements that need to be met during the lab are to always wear appropriate clothing such as closed-toed shoes, shirts, or blouses. No horseplay, eating, food, drinking, etc. in the laboratory. All safety measures were followed during the experiment.

Data Analysis methods

Given the elevation of BM, the C.L Wilson building is 100ft.

To find the height of the instrument (H.I.)

$$HI = \text{Elev.} + BS$$

To find the elevation

$$\text{Elev.} = HI - FS$$

To find the loop misclosure

$$\text{Calculated Elevation} - \text{Given Elevation}$$

5 site plan?

Test Results and Analysis

Field notes
Given elevation B.M. C.L. Wilson = 100 ft

Sta.	B.S.	H.I.	F.S.	Elevation	Correction	Adjusted Elevation
BM C.L. Wilson	3.52			100 ft		
Tp1	5.50	103.52	5.91	102.11		
Tp2	4.40	102.91	4.19	98.72		
point X	-	103.82	-	?	?	?
Tp3	-	-	-	?	?	?
BM C.L. Wilson	4		3.78	?	?	?
$\Sigma =$			$\Sigma =$			
Page check:			loop misclosure =		- 100 =	
			Adjustment =		$\frac{-100}{5} = -20$	

10 where are all calculations?

Discussion

In this experiment, the differential leveling method was used to measure the difference in elevation levels from the C.L Wilson building to the S.R. Collins building. 3 turning points were established to find the backsight and foresight readings. It is important in differential leveling to run closed circuits so that the accuracy of the work can be checked.

Possible errors that could have occurred in this experiment are inaccurate staff readings due to the position of staff, the leveling instrument has not properly leveled to the ground giving unstable results in readings, and natural errors.

The observer watches the readings increase and decrease alternately, and then selects the minimum value, the correct one.

Summary

& conclusions

In conclusion, No conclusion can be drawn from the experiment because of missing data.

5

Expand this!

References

Ghilani, Charles D. *Elementary Surveying: An Introduction to Geomatics*. NY, NY, Pearson, 2018.

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

LABORATORY REPORT # 3

TOPICS COVERED IN LABORATORY EXPERIMENT #3

**EXPERIMENT #3
TO PLOT THE CROSS SECTIONS OF AN EXISTING ROAD BY
PROFILE LEVELLING**

Experiment 3 was plot the cross section of an existing road at a regular interval of 100 feet. The given Bench mark was used to find the elevation of various points by taking intersights.

ABOVE AVERAGE

The Prairie View A&M University
College of Engineering
Department of Civil & Environmental Engineering



CVEG 2102: Survey and Geospatial

Lab report 3: Profile leveling

Submitted by: Denia Leroy, Marshall Johnson, Markus Hartfield, and Antonio Littl

Due date: 11/08/2021

Submitted to: Dr. Abdul Choudhury

as
Tw

Olulayomi Ogunkile

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Abstract

The purpose of this experiment is to use the profile leveling method to determine the readings of elevation along a road behind the electrical engineering building. A measurement of 50 ft was measured between each cross-section taking 5 intermediate foresight readings per section 1-4. In this experiment, students should be able to obtain field notes and make proper adjustments from recorded data to obtain the most accurate results.

Introduction

The profile leveling technique is used to define elevations at definite points along a linear line. Common Uses for this technique in engineering to accurately design facilities such as highways, railroads, sewers, canals, etc... Profile leveling and differential leveling are very similar using backsights (B.S.), foresight (F.S.), benchmarks (BM level), turning points (Tp1, Tp2...). The main difference in these methods is that profile leveling uses intermediate foresight (IFS) which is taken per section. The data generated by a profile survey can be used to determine the slope between points, depths of trenches, ground clearance for overhead power lines, and many other applications.

Test Objective

To plot the profile of road cross sections by leveling.

Equipment and Apparatus

- Telescope



- Tripod



- Staff



- Measuring tape



Step by Step Description and Experimental Safety Issue

1. First, an elevation of 100 ft at starting benchmark pole (BM pole) is given.
2. Secondly, the leveling instrument has to be properly set up in chosen position for the experiment.
3. Thirdly, a measurement of the road was taken using the measuring tape given a value of 32.3 ft
4. Next, Take a backsight reading of the BM pole.
5. The staff person stands at equal points along the first section of the road at 0ft, 8.075ft, 16.15 ft, 24.22 ft, and 32.3 ft.
6. 5 intermediate sight points are recorded at 4 different sections points on the road.
7. Once the first section of data is recorded. 50 ft is measured between each section.
8. Leveling instrument remains stationed and section 2 intermediate sights are taken.
9. Turning point 1 is now established and leveling instrument is being moved to a new position across the road at points 2-5.
10. A new benchmark is established.
11. Leveling instrument is properly set up in a new position for the continuation of the experiment.
12. The intermediate sights of sections 3 and 4 are recorded using the same steps as section 1.

Data Analysis Methods and Models (Equations)

In order to find the height of the instrument (HI) at starting position use the formula:

$$HI = BS + Elevation$$

To determine the elevation:

$$Elevation = HI - FS$$

BS = backsight readings

HI = Height of the instrument

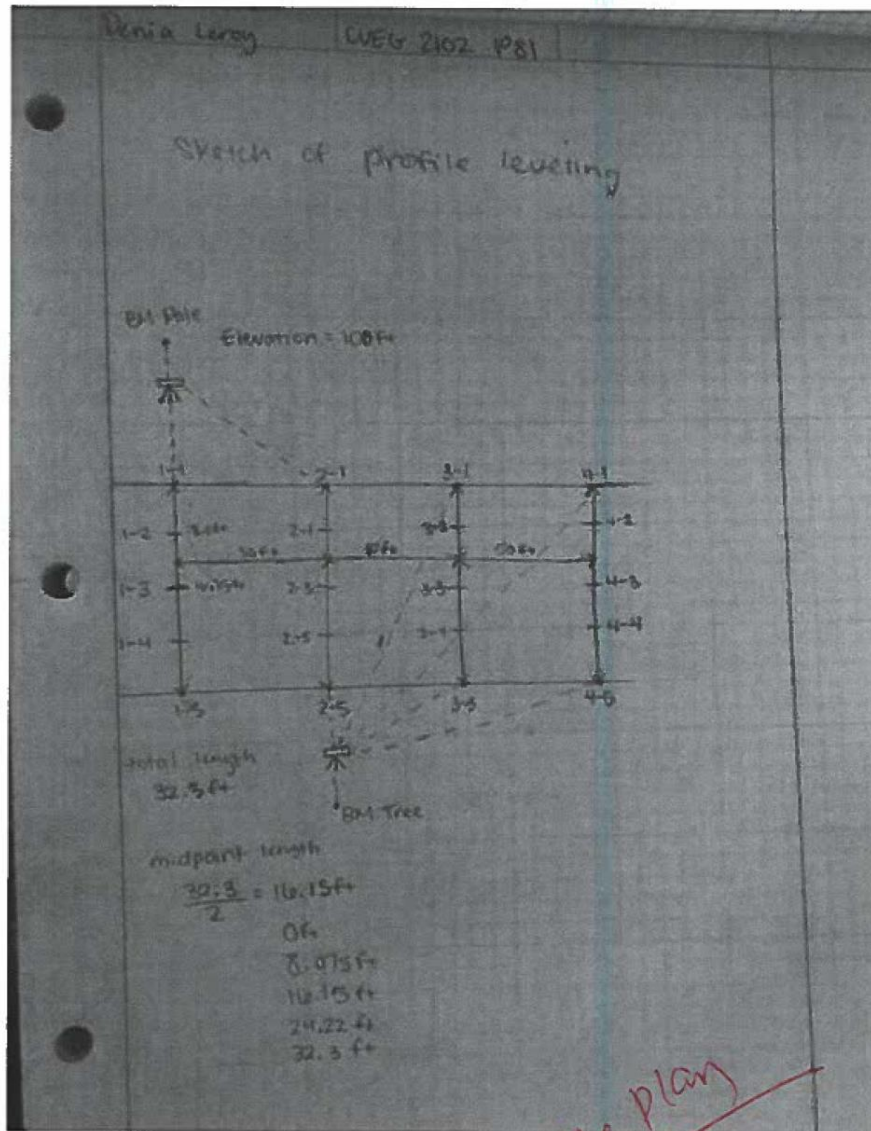
FS = foresight readings

IS = intermediate sight readings

Misclosure

Adjusted measurements

Test Results and Analysis



Denia Leroy CUEG 2002 Part 100 3

Points	B.S.	H.I.	I.S.	F.S.	(4-5) Elevation	HI
B.M. 100	3.19	102.19			100	100 + 2.19 102.19
1-1			5.0		99.19	← 102.19 - 3.0 =
1-2			4.40		98.79	102.19 - 4.40 =
1-3			4.15		99.04	102.19 - 4.15 =
1-4			4.41		98.78	102.19 - 4.41 =
1-5			4.55		98.64	
2-1			4.42		98.77	
2-2			3.7		99.49	
2-3			3.58		99.61	
2-4			4.02		98.17	
(100) 2-5	4.4	102.56		5.05	98.16	
3-1			4.2		98.36	
3-2			4.2		98.36	
3-3			3.57		98.92	
3-4			4.14		98.42	
3-5			4.46		98.1	
4-1			3.72		98.84	
4-2			3.4		99.46	
4-3			3.14		99.42	
4-4			3.38		99.18	
4-5				3.46	98.9	
$\Sigma 7.59$			$\Sigma 8.69$			

Page check: + 7.59
 $\begin{array}{r} - 8.49 \\ - 1.1 \\ \hline 100.00 \\ 98.9 \end{array}$

Misclosure: 100 - 98.9
 = 1.1

in
 87 ft
 300

The objective is to plot the profile of road cross sections by leveling. Plot the distance in ft vs elevation

Table 1. Section 1 elevation levels and distance of the cross-section of road evenly split in distance.

Distance (ft)	Elevation (ft)
0	98.19
8.075	98.79
16.15	99.04
24.22	98.78
32.3	98.64

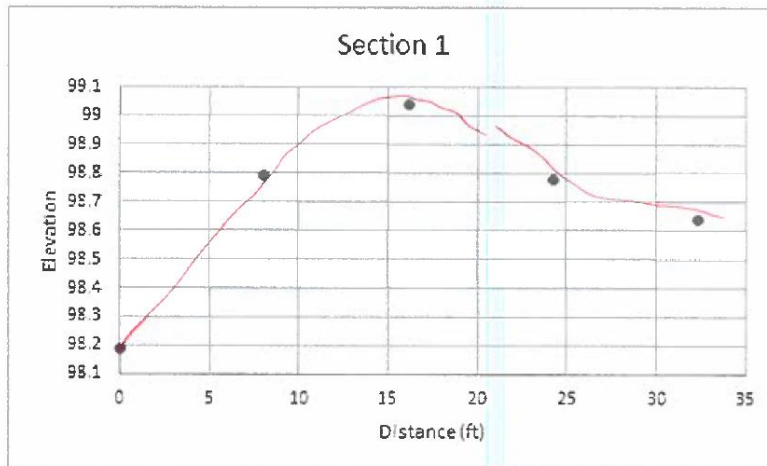


Figure 1.

Table 2. Section 2 elevation levels and distance of the cross-section of road evenly split in distance.

Distance (ft)	Elevation (ft)
0	99.01
8.075	99.39
16.15	99.61
24.22	99.17
32.3	98.16

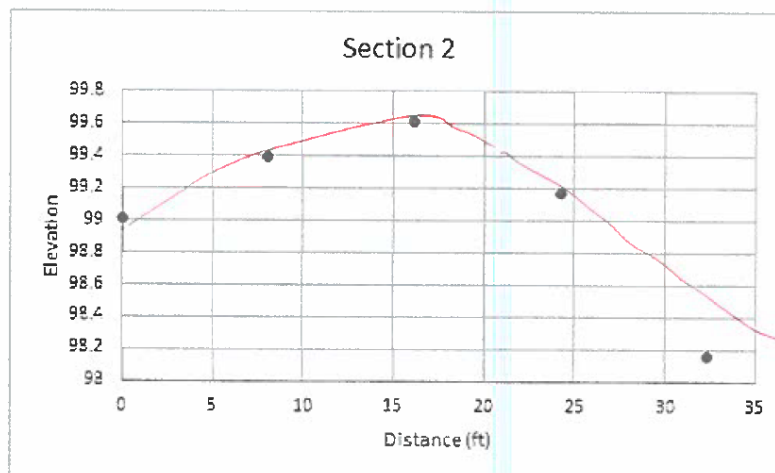


Figure 2.

Table 3. Section 3 elevation levels and distance of the cross-section of road evenly split in distance.

Distance (ft)	Elevation (ft)
0	98.36
8.075	97.76
16.15	98.69
24.22	98.42
32.3	98.1

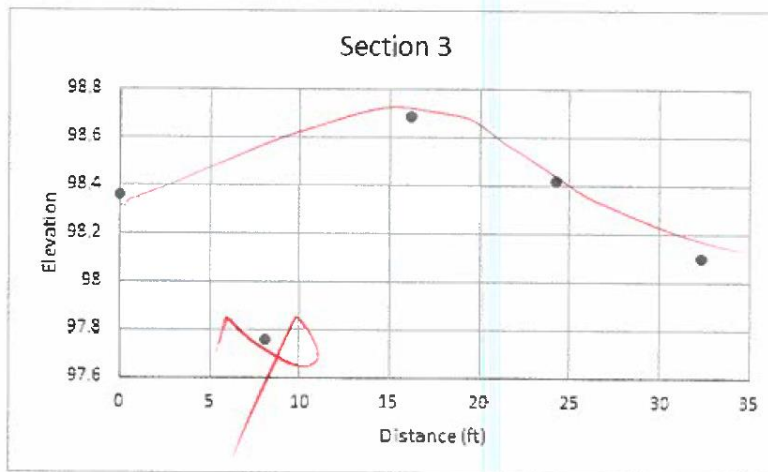


Figure 3.

Table 4. Section 4 elevation levels and distance of the cross-section of road evenly split in distance.

Distance (ft)	Elevation (ft)
0	98.34
8.075	99.16
16.15	99.42
24.22	99.18
32.3	98.9

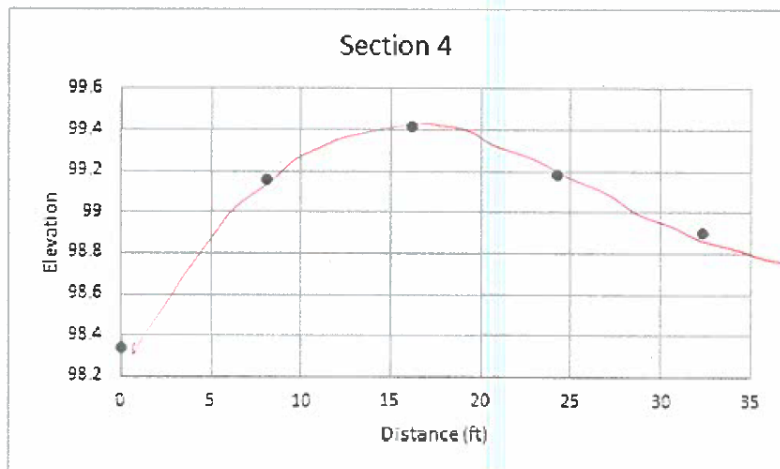


Figure 4.

Discussion

The purpose of this experiment is to plot the profile of road cross sections by leveling. Given an elevation of 100 ft at the starting position, BM flag pole. In order to obtain the most accurate data, we must properly level the leveling instrument into the ground. After this is done backsight readings are taken and intermediate sights are taken from each of the 4 sections. A measurement of 50 ft was obtained between each section and thereafter multiple intermediate sight readings were taken at that section. The height of the instrument is calculated twice in this

experiment using the formula $HI = BS + Elevation$. An elevation has to be calculated for all points recorded in the table.

An observation that can be made from all the data plots is that the highest elevation is in the center of the section. The plots show the difference in elevations as the distance of the intermediate sight readings decreases as they move further from the leveling instrument. A pattern in the design of the road is noticed from each section. After plotting the data for section 1 there is an observation of a slight quadratic curve. The data gradually increases to the highest elevation point and decreases thereafter. Data plot 2 shows a similar slight curve in data points as section 1. Data plot 3 shows a sudden drop in elevation there could have been human error in staff readings. Data plot 4 shows a curve similar to data plots 1 and 2.

A misclosure of 1.1 was calculated. If the allowable misclosure is exceeded, one or more additional runs must be made. When acceptable misclosure is achieved, final elevations are obtained by adjusting.

Summary

After completing the task at hand, this experiment can be considered a success. For each section we were to take a reading at, the reading was done correctly and efficiently. This can be confirmed by the fact that the data support such. The experiment conducted was also a helpful way to learn how to do certain surveying procedures hands-on in the field.

References

Ghilani, Charles D. *Elementary Surveying: An Introduction to Geomatics*. NY, NY, Pearson, 2018.

"Chapter 6 Profile Leveling." *The Free Library*,

<https://www.thefreelibrary.com/Chapter+6+Profile+leveling.-a0191392607>.

Add line
-2

AVERAGE



Surveying and Geospatial concepts

Lab 3

To Plot the Profile of Road Cross Sections by Levelling

Jason Garza, Amani Fontenot, Omar Hajo

Nov 8, 2021

Dr. Choudhury

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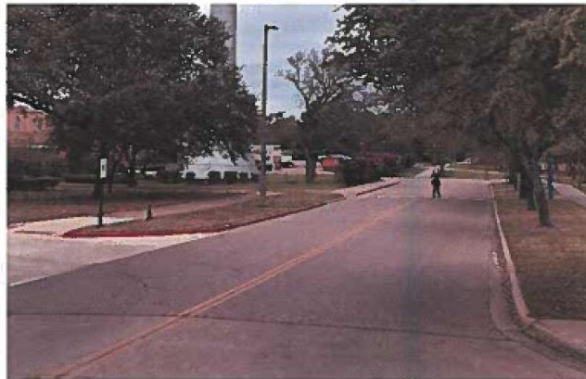


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Abstract

Abstract The purpose of this lab was to use levelling in order to “plot the profile of road crossing sections” for Anne Preston Street at Prairie View A&M University according to our lab prompt. The process of completing this lab was done by using three instruments. One being a 100 Ft tape measure, second the DL-502 Electronic Digital Level Machine, and the third was the Height Difference Measurement Staff. In order to complete this lab successfully the objectives that needed to be done were to sketch the initial points in your plan, make sure all notes are done in a field notebook, and after all distances are jotted down the group needs to plot each cross section they encountered.

Introduction

The type of levelling done for this lab is categorized as Profile levelling. According to civilseek.com Profile Levelling is “finding elevation points along the line like rails, rivers, roads, runways, etc. In this case, it collects every reading or each intermediate station to determine the level difference of each point”. Although the title is known as Profile levelling, the specific method of Profile Levelling we used is known as Cross Section Levelling. In this method the points of the line are identified where you want to take the measurements and the distances are taken perpendicular at a 90 degree angle to the midpoint line.

Test Objectives

- Draw a sketch plotting initial relevant points
- Collect information on field notebook
- Create page cheat
- Plot four cross sections

Description of Equipment and Apparatus

1. Field Notebook
2. “DL--502 Electronic Digital Levelling Machine

3. One Button Triggers Measurement and Data Storage
4. 0.6mm/0.8mm Height Accuracy
5. Advanced RAB Code Technology
6. Pre-installed Measurement Programs
7. Height Difference Measurement
8. Inverse Staff Reading for ceiling Height
9. Internal Memory"
10. 100 ft Tape measure

Numbers 2-9 are taken from Topcon.co.jp

Material and Test Conditions

1. The placement of the staff needed to be straight to get a accurate reading and at times it was not held properly
2. The weather was hot and windy

Step by step description and experimental safety issue

1. Use the 100 ft tape measure to find the distance of the total length then divide by 2 and then divide by 2 again to get the height at each point intermediate station
2. Assemble the DL-502 Electronic Digital Leveling Machine
3. Measure the distance across the street from the initial position to the final position
4. Used the yellow line splitting the road as a midpoint for our cross section
5. Find each point using the Height Difference measurement
6. At each turning point move the DL-502 Electronic Digital Leveling Machine

The only safety issue the group ran into was having to maneuver around the oncoming cars

Data Analysis Methods and Models

- H.I.- B.S.= Initial Elevation
- H.I - I.S = EI

- Initial H.I - I.S at each station = elevation
- H.I - F.S = EI

No conversions were needed during the lab

Suitable Statistical Analysis Tools

For this test there was no need for statistical analysis tools because all data could be calculated with simply a calculator

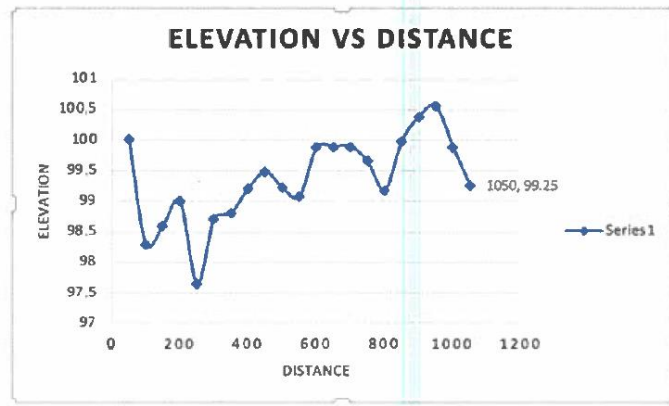
Test Results and Analysis

Station	B.S	H.I	I.S	F.S	Elevation
B.M	3.19	103.19			100
1.1			4.9		98.29
1.2			4.6		98.59
1.3			4.2		98.99
1.4			5.55		97.64
1.5			4.49		98.7
2.1			4.39		98.8
2.2			3.99		99.2
2.3			3.72		99.47
2.4			3.98		99.21
B.M tree	4.3	103.37		4.12	99.07
3.1			3.5		99.87
3.2			3.49		99.88
3.3			3.49		99.88
3.4			3.73		99.64
3.5			4.2		99.17
4.1			3.4		99.97
4.2			3		100.37
4.3			2.83		100.54
4.4			3.49		99.88
4.5				4.12	99.25

*separate
row*

2

5



Page Check

To double check our calculations, the following equation can be used to check:

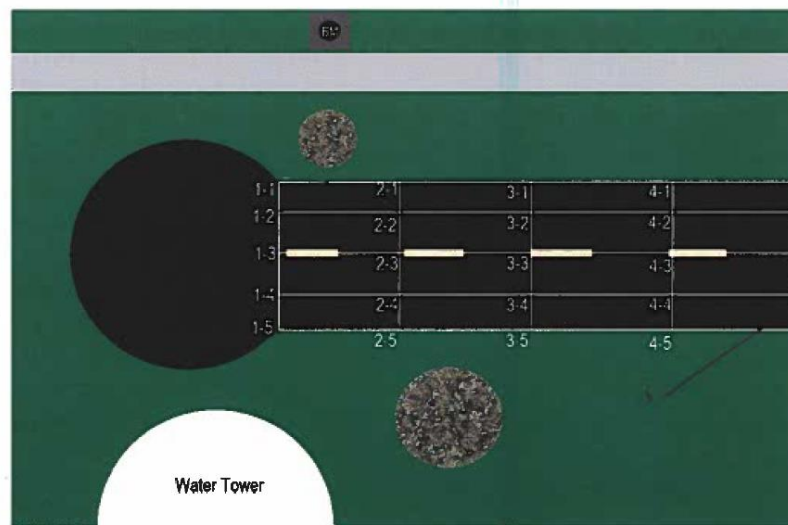
First Elevation + BackSight - Foresight = Last Elevation

Last Elevation = 99.07

= 100 + 3.19 - 4.12 = 99.07

99.07 = 99.07 ✓

Table 1 Plotted land



Discussion, Synthesis and Interpretations of the Results and Findings

The purpose of this lab was to determine the elevations of the road on each cross section on Prairie View using surveying tools that would allow the measurements to be precise. We took measurements at different points within each cross section of the street on Prairie View. After we found the Backsight(s), Foresight(s), and the Height of the Instrument, we then used the calculation methods to find the values we needed to find the elevations. The calculations using the methods can be found below:

To find *initial elevation for the first two sections*, we subtracted B.S. from H.I.:

$$103.19 - 3.19 = 100$$

$$\text{B.M. Elevation} = 100$$

To find the elevations for *each point within each section*, we subtracted I.S. from each station from H.I.:

$$1.1: 103.19 - 4.9 = 98.29$$

$$1.2: 103.19 - 4.6 = 98.59$$

$$1.3: 103.19 - 4.2 = 98.99$$

$$1.4: 103.19 - 5.55 = 97.64$$

$$1.5: 103.19 - 4.49 = 98.7$$

For Section 2:

$$2.1: 103.19 - 4.39 = 98.8$$

$$2.2: 103.19 - 3.99 = 99.2$$

$$2.3: 103.19 - 3.72 = 99.47$$

$$2.4: 103.19 - 3.98 = 99.21$$

For the *next two sections*, we used another benchmark across the street to measure the elevations at each station. We calculated B.M. Tree Elevation by subtracting B.S. from H.I.:

$$103.37 - 4.3 = 99.07$$

$$\text{B.M. Tree Elevation} = 99.07$$

To find the elevations for *each point within each section*, we subtracted I.S. from each station from H.I.:

$$3.1: 103.37 - 3.5 = 99.87$$

$$3.2: 103.37 - 3.49 = 99.88$$

$$3.3: 103.37 - 3.49 = 99.88$$

$$3.4: 103.37 - 3.73 = 99.64$$

$$3.5: 103.37 - 4.2 = 99.17$$

For Section 4:

$$4.1: 103.37 - 3.4 = 99.97$$

$$4.2: 103.37 - 3 = 100.37$$

$$4.3: 103.37 - 2.83 = 100.54$$

$$4.4: 103.37 - 3.49 = 99.88$$

To find the elevation of station 4.5, we used the Foresight subtracted from the Height of the Instrument to find Elevation:

$$4.5: 103.37 - 4.12 = 99.25$$

Station 4.5 Elevation = **99.25**

With all of our total calculated elevation values, we could now determine the elevation of the road on Prairie View.

Summary-Conclusion and Recommendation

The main purpose of this experiment was to determine the elevation of the road on Prairie View by plotting several points and calculating the elevation for them. For this experiment we used an electronic digital leveling machine and the measurement staff. The use of these pieces of equipment was to help find the distance between each marked point. By using the equations we were able to find elevation, foresight, hindsight, inter sight, and backsight .

While conducting the lab there weren't any issues with the equipment because we experimented while in the last lab. In closing the plotted street was recorded and calculated which gave us the curvature of the road. The findings showed that the center was higher relative to the other points but lower than the benchmark. The data we collected is reasonable because roads are dug into the ground which means flat surface roads cannot be higher than the benchmark. Of course this can change the further the road is built due to the curvature of the

earth and terrain. The purpose for this lab is to obtain a more accurate elevation by increasing the plotted points on the road.

plot sections?

10

Reference and Literature Citations

Ref.

- www.facebook.com/civilguides. "Types of Levelling in Surveying." *CivilSeek*, 28 June 2021, <https://civilseek.com/types-of-levelling-in-surveying/>.
- "Electronic Digital Level DL-502 / 503 | Positioning | TOPCON". *Topcon.Co.Jp*, 2021, https://www.topcon.co.jp/en/positioning/products/product/level/DL-500_E.html.

Add more

② - 2

Appendices

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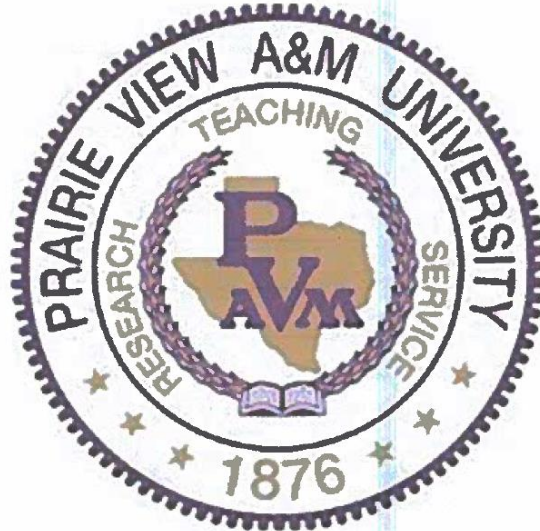
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BELOW AVERAGE

Prairie View A&M University



CVEG 2102 Surveying and Geospatial

To plot the profile of road cross sections by leveling

Submitted by

Trinity Scott

Hunter Rodgers

Tyrah Owens

On

November 8th, 2021

To

Dr. Choudhury

81/100

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Abstract

The purpose of this experiment was to plot the profile of road cross sections in front of EE by leveling. We are then asked to draw the initial planning showing with all of the relevant points, and make a page check, then plot the four cross-sections.

-2 what is profile leveling

Introduction

Surveying is an art of determining relative positions on, above or beneath the surface of earth by measuring the horizontal distances and angles for determination of any point on ground. Levelling is the art of determining the difference of elevations or levels of various points on the surface of the earth. Levelling deals with distances in a vertical plane. Differential leveling is the process of finding the difference in elevation between two or more points. Starting from point B.M. plot the next points which are B.S., H.I., F.S., Elevation, and correction.

Test Objective

The objective of this lab was to plot the profile of road cross sections by leveling.

Equipment and Apparatus

1. Field notebook
2. Stadia rod
3. Tripod
4. Leveling instrument
5. Tape
6. Leveling tape

Experimental Safety

Students must wear long pants and closed-toed shoes during lab activities. Students who do not wear appropriate clothing will not be allowed to be inside and conduct the lab which will result in points being deducted from the corresponding lab report.

Experimental Procedures

1. Set up the instrument.
2. Pick a point for B.M.
3. Place a ruler down and measure from the start of the road to the other end of the road.
4. Take the B.S. reading on BM1.
5. Establish the 1-1, and take the I.S. reading.
6. Establish the 1-2, and take the I.S. reading.
7. Establish the 1-3, and take the I.S. reading.
8. Establish the 1-4, and take the I.S. reading.
9. Establish the 1-5, and take the I.S. reading.
10. Establish the 2-1, and take the I.S. reading.
11. Establish the 2-2, and take the I.S. reading.
12. Establish the 2-3, and take the I.S. reading.
13. Establish the 2-4, and take the I.S. reading.
14. Change the instrument position
15. Place a ruler down and measure from the start of the road to the other end of the road.
16. Establish the 2-5 and find the B.S. and the F.S.
17. With both B.S. and F.S. calculate the H.I.
18. Establish the 3-1, and take the I.S. reading.
19. Continue steps until 4-4
20. At 4-5 find the F.S

Data Analysis Methods and Models (Equations)

Loop Misclosure = Initial elevation - final elevation

Page check = 1st Elevation + B.S. - F.S.

Elevation = H.I. - F.S.

Elevation = H.I. - I.S.

H.I. = Elevation + B.S.

Correction = Misclosure / Number of points

Adjusted Elevation = Original Elevation - Correction

Test Results and Analysis

In the table below you will see the measurements obtained from the differential leveling. Underneath the table, you will find the calculation made to find the correction to the elevation and the page check.

B.M.	B.S.	H.I.	I.S.	F.S.	Elevation
	3.7	103.7			100
1-1			4.9		98.8
1-2			4.6		99.1
1-3			4.2		99.5
1-4			4.55		99.15
1-5			4.49		99.21
2-1			4.39		98.71
2-2			3.99		99.71
2-3			3.72		99.98
2-4			3.98		99.729
2-5	4.3	103.58		4.12	99.58
3-1			3.5		100.38
3-2			3.49		100.39
3-3			3.49		100.39
3-4			3.73		100.15
3-5			4.2		99.68
4-1			3.4		100.48
4-2			3		100.88
4-3			2.43		101.85

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H.I. in
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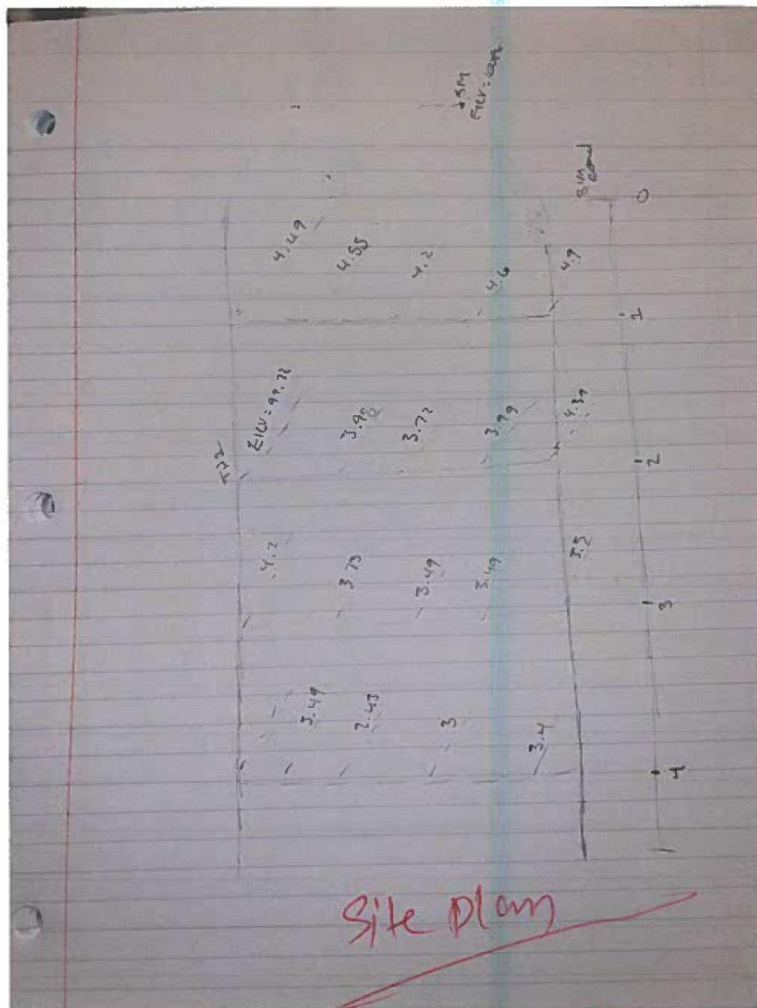
4-4			3.49			100.39
4-5					4.12	99.76
	$\Sigma = 8$				$\Sigma = 8.24$	

$$\text{Loop Misclosure} = 100 - 99.76 = 0.24$$

$$\text{Page check} = 100 + 8 - 8.24 = 99.76$$

$$\text{Correction} = .24 / 20 = .012$$

$$\text{Adjusted Elevation} = 100 - .012 = 99.98$$

Summary and conclusion

cross section?

The purpose of this experiment was to find the cross-sectional area of the section of the road by the process of differential leveling. The equipment we used to measure the distance was a transit level tripod, a leveling tape, and a Tape. A transit level tripod is an optical instrument, a telescope, complete with a built-in spirit level that is mounted on a tripod. The experiment was conducted by assuming first the first B.M. at elevation 100ft. The distance between each point is 50ft. After we determine the data points at each point as well as the distance between 4 intermediate points. Next, with the four points, we then find the elevations at each. After we

found 8 points after changing the positioning of the tape, we then changed the positioning of the instrument or tripod. We then repeated the previously mentioned steps and continued till we were at 4-5 the second 8th position. Lastly, using the info collected and calculating the data, we found out the calculated elevation as well as the actual elevation and used both to calculate the error, misclosure, and correction error of the experiment.

Ref
5

**SURVEYING AND GEOSPATIAL CONCEPTS
FALL 2021**

LABORATORY REPORT # 4

TOPICS COVERED IN LABORATORY EXPERIMENT #4

**EXPERIMENT #4
TO CALCULATE INTERNAL ANGLE OF A POLYGON BY TOTAL
STATION**

Experiment 4 was used to find internal angles of a polygon by measuring the Azimuths of various lines with total station. Internal angles were calculated from fore Azimuths and the closing error was adjusted to find the correct measure of angles.

ABOVE AVERAGE

The Prairie View A&M University
College of Engineering
Department of Civil & Environmental Engineering



CVEG 2102: Survey and Geospatial

Lab report 4: Total Station

Submitted by: Denia Leroy, Markus Hartfield, and Marshall Johnson

Due date: 12/06/2021

Submitted to: Dr. Abdul Choudhury

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Tw

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Abstract

The purpose of this experiment is to use the total station method to find the measurement of four different angles and distances. This experiment was conducted in the field located between the back side of CL Wilson and the front side of SR Collins. The students conducting this experiment are to take notes in the field and make proper adjustments from recorded data to obtain the most accurate results.

Introduction

Total station instruments combine three basic components: an electronic distance measuring instrument, an electronic angle measuring component, and a computer or microprocessor—into one integral unit. These devices can automatically observe horizontal and vertical angles, as well as slope distances from a single setup.

Test Objective

The objective of this experiment is to measure four different angles and distances.



Equipment and Apparatus

- Tripod



- Staff



- Notebook



- Standards

- Total stations



Step by Step Description

1. Extend the legs so that the scope of the instrument will be at an appropriate elevation for viewing, and then adjust the position of the tripod legs by lifting and moving the tripod as a whole until the point is roughly centered beneath the tripod head.
2. Firmly place the legs of the tripod in the ground and extend the legs so that the head of the tripod is approximately level
3. Roughly center the tribrach leveling screws on their posts;
4. Mount the tribrach approximately in the middle of the tripod head.
5. Focus the plummet properly on the point, making sure to check and remove any parallax
6. Manipulate the leveling screws to aim the plummet's pointing device at the point below;
7. Center the circular bubble by adjusting the lengths of the tripod extension legs
8. And level the instrument using the plate bubble and leveling screws; and
9. If necessary, loosen the tribrach screw and translate the instrument (do not rotate it) to carefully center the plummet's pointing device on the point
10. Take first readings from Azimuth of AB
11. Move instrument to position B and take readings Azimuth of BC
12. Move instrument to position C and take readings Azimuth of CD
13. Move instrument to position D and take readings Azimuth of DA



Experimental Safety Issue

All safety measures were met during this experiment to be conducted safely

Data Analysis Methods and Models (Equations)

Total station readings

Azimuth of AB=

Azimuth of BC=

Azimuth of CD=

Azimuth of DA=

Sum of internal angles

$$(n-2)*180$$

*5
give plan*

Test Results and Analysis

Total station readings

Azimuth of AB= 8 36' 56''

Azimuth of BC= 112 14' 00''

Azimuth of CD= 101 28' 08''

Azimuth of DA= 116 19' 13''

Sum of internal angles

$$(n-2)*180$$

$$(4-2)*180$$

$$=360$$

Find the angle of B

Az of BA = Az of AB $\pm$ 180

$\angle B = \text{Az of BC} - \text{Az of BA}$

$\angle B = 112 14' 56'' - (8 36' 56'' + 180)$

$\angle B =$

Find the angle C

$\angle C = \text{Az of CD} - \text{Az of BA}$

Find the angle D

$\angle D = \text{Az of DA} - \text{Az of DC}$

5 Adjustment

Discussion, Synthesis, and Interpretation of the Results and Findings

In this experiment while computing the calculations we notice that the angles come out negative. This can error can occur due to not properly adjusting the total station and not taking the proper readings while conducting the experiment causing error in calculations

Summary

In conclusion to the lab completed, the experiment was done successfully. Each angle measurement and distance measured was done correctly and it can be proven and supported by the data. As a result of completing this experiment, the students are allowed to learn a valuable method of surveying in a hands-on fashion.

References

Ghilani, Charles D. *Elementary Surveying: An Introduction to Geomatics*. NY, NY, Pearson, 2018.

AVERAGE



Lab Report #4

To find out the Elevation of Collins building by differential levelling

Omar Hajo, Jason Garza

Dr. Choudhury

Dec 6, 2021



85/100

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Abstract

The purpose of this lab is to find the Total Station of the space in front of Collins Building at Prairie View A&M University. The following instruments used for this lab are a Northwest Instrument NTS03 2 Second Reflectorless Total Station, AdirPro 5 meter dual sided aluminum stick, and a staff that penetrates the land so you can mark the points of position. Using these instruments, the objective of the lab is to find 4 station points in order to find the interior angle, the angles between each one, and then calculating the correction value.

Introduction

The use of total stations in surveying has become a very resourceful method to find the reflection from a distinct distance. According to Thomas Hughes the process of total station has been around since 1971. As time moves on the need for a large amount of workers for one job decreases. This instrument made a job that required multiple individuals to only require just one individual to get significant results for the job. Now it being 2021 the device has advanced in a number of different ways which resulted in the efficiency of getting the job done quicker. Total station is used for multiple different purposes in the engineering world, but for the purpose of this lab we will focus on discussing the method used to complete the lab. The purpose of this instrument during the lab was to calculate the angle, minutes, and seconds for us of 4 different station points.

Test Objectives

1. Find 4 positions in front of the Collin Building with a 90° between each one
2. Calculate the interior angle for a rectangle
3. Record all data from NTS03 in a field notebook
4. Find the Angle for all 4 points
5. Calculate the correction of the 4 angles

Description of Equipment and Apparatus

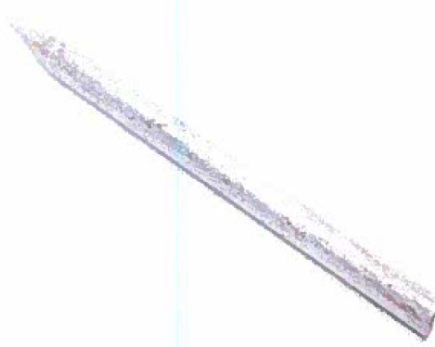
1. Field Notebook
2. Northwest Instrument NTS03 2 Second Reflectorless (figure 1)
3. AdirPro 5 meter dual sided aluminum stick (figure 2)
4. 4 staffs to place at each station (figure 3)



(Figure 1)



(Figure 2)



(Figure 3)

Material and Test Conditions

1. Field Notebook
2. Northwest Instrument NTS03 2 Second Reflectorless
3. AdirPro 5 meter dual sided aluminum stick
4. 4 staffs to place at each station
5. The land surface was not flat which caused difficulty placing NTS03
6. The weather was nice out

Step by Step Description and Experimental Safety Issue

1. Gather all materials needed for the lab
2. Set up NTS03 instrument and plant it into the ground

3. Let students find 4 stations that make the shape of a rectangle with a 90° between
4. Position a student at each station
5. The first station where the NTS03 is setup is to be labeled as station A
6. The second station the students found is labeled B
7. Measure the angle, minutes, and seconds from point A-B using NTS03
8. Record the result in your field notebook
9. Move the NTS03 to station be and measure the angle, minutes, and seconds from station B-C
10. Move the NTS03 to station be and measure the angle, minutes, and seconds from station C-D
11. Move the NTS03 to station be and measure the angle, minutes, and seconds from station D-A

DATA ANALYSIS METHODS AND MODELS

Interior angle:

$$(n-2)*180$$

$$\text{Angle correction}=360$$

$$IF=(B5>90,90-B5,450-B5)$$

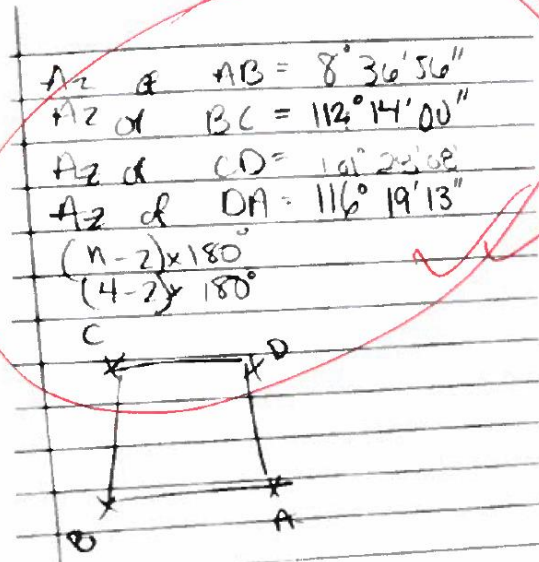
$$\text{COS(RADIANS(B5))}$$

SUITABLE STATISTICAL ANALYSIS TOOLS

For the calculations needed for this lab, no statistical analysis was needed since the NTS03 and a simple calculation was capable of doing everything.

Adrian J. [Signature]

TEST RESULTS



AB azimuth= 3.61 and bearings= 3°36'56"

BC azimuth= 107.23 and bearings= 107°14'0"

CD azimuth= 96.47 and bearings= 96°28'8"

DA azimuth= 111.32 and bearings= 111°19'13"

Angles:

<B 73.38, 90, -13.62

<C 190.76, 90, 100.76

<D 165.15, 90, 197.70

<A 287.7, 90, 197.70

Total= 720, 90, 360

(4-2)*180= 360

calculator & Adjustment

10

DISCUSSION, SYNTHESIS AND INTERPRETATION OF THE RESULTS AND FINDINGS

SUMMARY-CONCLUSION AND RECOMMENDATIONS

To find the total area of the plotted land. This can be extremely useful on the field because the plotted land can indicate where to build certain structures. Also from the calculations we can identify the total angle of the structure or the total angle of the plotted land. From our data the total angle can be 360degrees because the total number of sides minus 2 multiplied by 180 degrees will give us the answer.

REFERENCE AND LITERATURE CITATIONS

Rajput, Krunal. "What Is Levelling In Surveying | Types Of Levelling In Surveying | Advantages & Disadvantages Of Levelling In Surveying". *Civiljungle*, 2021,

<https://civiljungle.com/types-of-levelling-in-surveying/#:~:text=Advantage%20of%20Levelling%20in%20Surveyin,g.transit%20e.g%20water%20and%20liquid.>

Hughes, Thomas. "The History of the Total Station." Mechasys, 23 Sept. 2021,

<https://mechasys.ca/tools-tech/the-history-of-the-total-station/>.

Admin. "Uses of Total Station." *All Uses Of*, 15 May 2020, <https://allusesof.com/engineering/uses-of-total-station/>.

AdirPro 16 Ft Dual Sided Aluminum Grade Rod - Amazon.com.

<https://www.amazon.com/AdirPro-16-Foot-Aluminum-Grade-Rod/dp/B00KVJKS20>.

BELOW AVERAGE

Prairie View A & M University



Course Name:

CVEG 2102 P02 Surveying and Geospatial Concepts

LABORATORY REPORT #4:

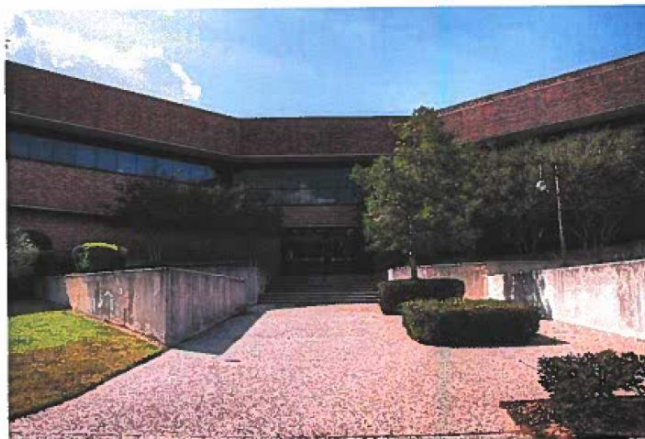
Total Station

Submitted by:

Ariana Mangroo

Submitted On: December 6, 2021

Submitted to: Dr. Abdul M. Choudhury



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100

Abstract

The purpose of this lab was to find the angle between four points by using the method of total stationing. Many geotechnical surveying projects consist of Total Stations which is a combination of an electronic theodolite and distance meter. This instrument measures the slope distance, horizontal angle, and vertical angle. The purpose of the instrument is to help reduce the amount of error by both the operator and the instrument. The more points that are taken between the points, the more accurate the readings will be.

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Introduction

A SET Total Station is an electronic/optical instrument used in modern surveying and building construction that uses electronic transit theodolite in conjunction with an electronic distance meter (EDM). It is also integrated with a microprocessor, electronic data collector, and storage system. This instrument helps to determine the coordinates of a reflector by aligning the instruments crosshairs on the reflector and simultaneously measuring the vertical and horizontal angles as well as the slope distances. The microprocessor in the instrument will take care of recording readings and the necessary computations. The data is easily transferred to a computer where it can be used to generate a map

Test Objective

The test objective of this experiment is to determine the angle at each point and find the distances of the slope. Another test objective was to analyze the techniques and results of the experiment through discussing possible sources of error and further differential leveling applications.

Equipment and Apparatus

- Field notebook
- Pencil
- Stadia Rod
- Northwest Instrument NTS03 2 Second Reflector less Total Station
- Marking rods
- Tripod

Materials and Test Conditions

- Several people involved to complete experiment
- Sunny weather
- Windy
- Leveling Staff
- Total Station

Experimental Safety

Students must wear long pants and closed-toed shoes during lab activities. Students who do not wear appropriate clothing will not be allowed to be inside and conduct the lab which will result in points being deducted from the corresponding lab report.

Step by Step Description and Experimental Safety Issue

1. We placed a student with a height difference measurement staff at the backside station established
2. Assemble the Northwest Instrument NTS03 2 Second Reflector less Total Station.
3. We assembled in the device into the ground using the metal planks at the bottom of each leg and made sure it was firmly set up.
4. Calibrate the device so that every sight of reference at which you turn the device, make sure the ball in the caliber is in the middle.
5. While looking through the device line up the device with the top of the point.
6. Make sure the modes are set to the appropriate forms.
7. Lastly have one student writing down the results of the degrees, minutes and seconds per point.

The lab went smoothly, and no safety precautions were needed.

Data Analysis Methods and Models

$$(n-2) * 180$$

$$\text{Angle correction} = \text{angle} = 360$$

Azimuth's, and the angles measured by a total station are measured in a clockwise sense from north. In mathematics, a positive angle is measured counterclockwise from the x-axis. In the calculations presented in this paper this would be the east direction. In order for the calculations to be correct, we have to represent HAR as an angle, not as an azimuth. The conversion is quite simple. For azimuths from 0° to 90° the angle is simply $90^\circ - \text{Azimuth}$. For azimuths from 90° to 360° the angle is $450^\circ - \text{Azimuth}$. If an azimuth is in cell B5, the correction can be entered using Excel's IF () function:

$$=IF(B5 > 90, 90-B5, 450-B5)$$

If the user converts azimuths from the total station to angles using the above functions, then the change in easting and change in northing will have the correct sign.

Worksheet functions tend to use radians, so angles must be expressed as radians. Excel provides the RADIANS () function for converting degrees to radians, and the DEGREES() function for converting radians to degrees. These functions can simply be used within a trigonometric function:

$$=COS(RADIANS(B5))$$

Suitable Statistical Analysis Tools

For this experiment, there was no need for any statistical analysis tools, a calculator was used to obtain all data.

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Site plan -

Summary- Conclusion and Recommendations

The purpose of this experiment was to determine the angles of four plotted points. We did so by plotting 4 points and measuring the distance between each point. For this experiment we used a Northwest Instrument NTS03 2 Second Reflector less Total Station machine, the measurement staff and post rod. We used these pieces of equipment to find the angles between each marked point. By using the equations given earlier in the report we were able to calculate the angle of each point and differential angle error.

After concluding the experiment, we concluded there should be more points taken for a more accurate calculations for the results. Due to the class period being so short and having trouble setting up the Total Station machine we couldn't do this. Lastly, the purpose of this correction is to obtain a more accurate reading to where the total degrees for the four points is 360 degrees.

References

Rajput, Krunal. "What Is Levelling In Surveying | Types Of Levelling In Surveying | Advantages & Disadvantages Of Levelling In Surveying". Civiljungle, 2021,

<https://ondeck.pdx.edu/geology/sites/g/files/znlchr3846/files/2020-10/Manuscript%20on%20Surveying.pdf>

https://www.researchgate.net/publication/329202011_Total_Station