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_	v

			Si	mp	ble σ calculation
	No.	Measurement	Resi- dual	Resi- dual ²	$\overline{\mathbf{\Sigma}}_{\mathbf{r}}^2$
	1	27° 43' 55"	2	4	$\sigma = \pm \sqrt{\frac{\sum V}{1}}$
	3	27 43 55 27° 43' 50"	-3	4 9	$\vee n-1$
	4	27°43'52"	-1	1	Sum of $v^2 = 146$
	5	27°44'00"	7	49	$n_{-}1 = 0$
	6	27°43'49"	-4	16	11-1 - 5
	7	27°43'54"	1	1	146/9 = 16.2
	8	27°43'56"	3	9	S_{α} rt of 16.2 - ± 4 "
	9	27°43'46"	-7	49	Sq. 11. 01 10.2 - ±4
	10	27°43'51"	-2	4	
Mean = 27° 43' 53"			3"	2	







Possible Errors Us	sing Com	mon Procedures						
Calibrated EDM (100 ft; accuracy 3 mm + 3 PPM)								
Source	Error (ft.)	Error ²						
Length	Known	0.00000						
Temp (10° F error)	5 PPM = 0.0005	0.0000025						
Pressure (1" Hg)	5 PPM = 0.0005	0.0000025						
Centering with pole	0.03	0.0009						
Centering w/O.P.	0.005	0.000025						
Mfr's error constant	0.003	0.000009						
Mfr's error scale	0.0003	0.0000009						
SUM	0.0393	0.000093459						
Sq Rt of	Sum of Errors ² = 0.0	0306 ft						
1:	3,000 OR 306 PPM							
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About seminar presenter Joseph V.R. Paiva

r. Joseph V.R. Paiva, is principal and CEO of GeoLearn, LLC (<u>www.geo-learn.com</u>), an online provider of professional and technician education since February 2014. He also works as a consultant to lawyers, surveyors and engineers, and international developers, manufacturers and distributors of instrumentation and other geomatics tools, as well being a writer and speaker. One of his previous roles was COO at Gatewing NV, a Belgian manufacturer of unmanned aerial systems (UAS) for surveying and mapping during 2010-2012. Trimble acquired Gatewing in 2012.

Selected previous positions Joe has held includes: managing director of Spatial Data Research, Inc., a GIS data collection, compilation and software development company; senior scientist and technical advisor for Land Survey research & development, VP of the Land Survey group, and director of business development for the Engineering and Construction Division of Trimble; vice president and a founder of Sokkia Technology, Inc., guiding development of GPS- and software-based products for surveying, mapping, measurement and positioning. Other positions include senior technical management positions in The Lietz Co. and Sokkia Co. Ltd., assist. professor of civil engineering at University of Missouri-Columbia for 11 years, partner in a surveying/civil engineering consulting firm.

Joe has continued his interest in teaching by serving as an adjunct instructor of online credit and non-credit courses at the State Technical College of Missouri, Texas A&M University-Corpus Christi and the Missouri University of Science and Technology. His key contributions in the development field are: design of software flow for the SDR2 and SDR20 series of Electronic Field Books, project manager and software design of the SDR33, and software interface design for the Trimble TTS500 total station. He holds several patents.

He is a Registered Professional Engineer and Professional Land Surveyor, was an NSPS representative to ABET serving as a program evaluator, where he also served as team chair and commissioner, and has more than 30 years experience working in civil engineering, surveying and mapping. Joe writes for has written for many publications including *POB*, *The Empire State Surveyor*, and the *Missouri Surveyor*, and many other publications and has been a past contributor of columns to *Civil Engineering News*. He has published dozens of articles and papers and has presented over 150 seminars, workshops, papers, and talks in panel discussions, including authoring the positioning component of the Surveying Body of Knowledge published in *Surveying and Land Information Science*. Joe has B.S., M.S. and PhD degrees in Civil Engineering from the University of Missouri-Columbia. Joe's past volunteer professional responsibilities have included president of the Surveying and Geomatics Educators Society (SaGES) 2017-19 and various *ad hoc* and organized committees of NSPS, the Missouri Society of Professional Surveyors, ASCE and other groups.

GeoLearn is the online learning portal provider for the Missouri Society of Professional Surveyors, and several other surveying professional societies in including New York and Oklahoma.

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