SUGGESTED ELIGIBILITY TEST FOR TECHNICAL OFFICERS (SURVEY)

GEODETIC TEST

DIVISION OF NATIONAL MAPPING

SUGGESTED TEST

ELIGIBILITY TEST FOR TECHNICAL OFFICERS (SURVEY)

PART "A" FIELD PROJECT.

The candidate would be required to complete one traverse station to second order standards, plus sufficient levelling to show his efficiency with that instrument. This involves:-

(a) Tellurometer measurements to 2 distant stations.

(b) Horizontal and vertical angles to the same stations.

(c) Reference mark ties and measurements.

(d) Azimuth on Sigma Octantis along one line.

(e) Completion of the Field Books involved.

(f) Two to three Kilometres of levelling, closed loop.

TIME

Time for completing the traverse station is one day, made up thus:-

(a) Tellurometer measurements in the morning.
(b) Vertical Angles between 1400 and 1600 hrs.
(c) RM ties and measurements as they can be fitted in; either immediately after the tellurometer measurements or between the vertical angles.
(d) Horizontal angles in the last two hours of daylight, depending on visibility.
(e) Azimuth on Sigma Octantis just on dark.
(f) The FB should be finalized as each task is completed, apart from the horizontal angles as no time will be available before starting the azimuth. About 1 hour, after observing the azimuth would be required to finalize all observations in the FB.

The levelling would take 2 to 3 hours on a second day.

SUGGESTED TEST

PART "B"   ORAL.

TIME ALLOWED:-   Approximately 1 hour.

Note:- The development of these questions may limit the number asked to approximately 10.

Also this oral test may have to cover parts of the Field Project which may not have been completed.

PART "B" - ORAL

Question 1. Why is a specified drill laid down for using the horizontal tangent screw on the Wild T2 theodolite, when observing second order horizontal angles?

2. The "Specifications for Ground Control Surveys" lay down a certain munber of times a tellurometer must cycle before measurements can commence. How many times is this?

3. Why is the plate bubble read when observing azimuth by Sigma Octantis and not when observing a sun azimuth?

4. What are the allowable limits of variation of the vapour pressure, between each end of the line, during second order traversing with the MRA2 Tellurometer?

5. Describe the 2 peg test with the Watts automatic level?

6. Explain briefly why a split hand stopwatch is normally used for Sigma Octantis azimuth observations, instead of an orthodox stopwatch?

7. What does the term "Right Ascention" mean?

8. Why does the approximate distance need to be known to the nearest 10 miles (or 15 Km) when using the MRA2 Tellurometer?

9. In theodolites, what is:- (a) collimation? (b) parallax?

10. In the Wild T2 theodolite, why are the ends of the alidade (split) bubble brought into coincidence just prior to reading the vertical scale?

11. Define:- (a) true bearing? (b) magnetic bearing? (c) grid bearing?

12. What is:- (a) a contour line? (b) contour interval? (c) hatchuring?

13. What are the advantages of a closed traverse over an unclosed traverse?

14. When identifying the position of a Ground Control Station on air photo's, in the field, why is it usually advisable to select Photo Reference Points rather than prick through the actual station site?

15. What is laid down in the "Specifications for Ground Control Surveys" as the allowable spread of arcs in a set of horizontal angles?

16. What is laid down in the same specifications for the number of sets of horizontal angles to be observed?

17. Explain briefly, the relative merits of:-
(a) Third order levelling.
(b) Trignometrical heighting?
(c) Barometric heighting?

18. How do you determine the approximate scale of an air photograph?

19. Why are map projections necessary?
Name the 2 projections mostly used by our field parties?

20. What are Geographical Co-ordinates?

SUGGESTED TEST

PART "C" WRITTEN TEST.

The following data is supplied in diagrammatic form:-

(a) Geographical Co-Ordinates and height of First Order station Mt Murchison. Also true bearing to First Order Station Comarto Hill.

(b) Directions and distances to four other staions on a second order traverse.

The requirement is to calculate the geographical co-Ordinates of these four stations as would be done in the field.

The proforma, method and tables required are from "Specifications for Ground Control Surveys"

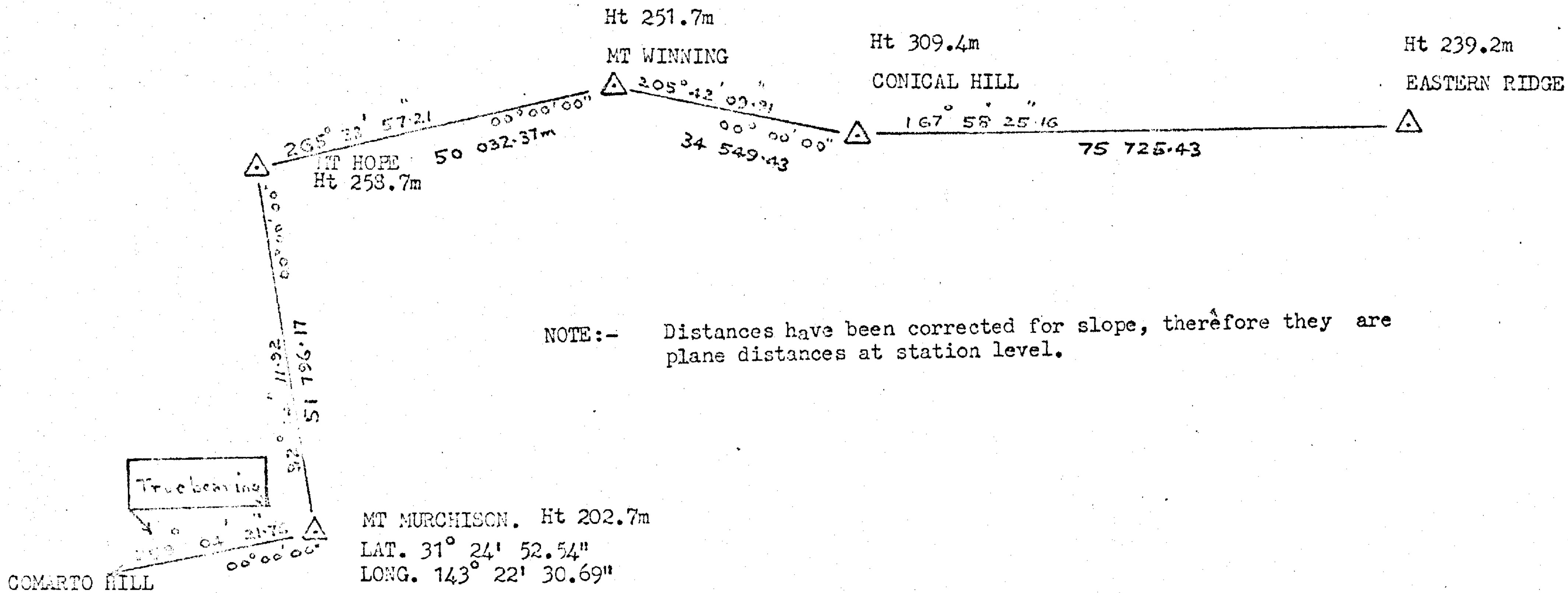
TIME

Time allowed:-

(a) Using natural tables and a calculating machine, 2½ hours plus 10 minutes for reading the paper.

(b) Using Chambers and Shortredes Log tables, 3 hours plus 10 minutes for reading the paper.

EXTRACTS FROM FIELD BOOKS REQUIRED TO COMPUTE LAT. & LONG. OF NEW STATIONS.



NOTE:- Distances have been corrected for slope, therefore they are plane distances at station level.

SUGGESTED ELIGIBILITY TEST FOR TECHNICAL OFFICERS (SURVEY)

ANSWERS TO PART "B" AND PART "C".

ANSWERS.

PART "B" ORAL

Question 1. This is to keep tension against the spring, and so prevent "backlash" if the thread is worn.

2. The tellurometer must cycle four times.

3. When observing azimuth on Sigma Octantis, a reasonably accurate correction for mis-levelment can be calculated if the bubble is read carefully.
With the sun beating down on both instrument and tripod during Sun observations, it is not possible read the bubble accurately enough to work out any correction. In any case, the accuracy of the sun observations does not warrant minor corrections.

4. 13 millibars.

5. Set up the level midway between 2 pegs which are about 100 metres apart. Stand a staff on each peg, in turn, read staff and calculate the difference height of the two pegs.
Move the level close to 1 peg, and repeat. If the two difference heights so obtained, do not agree the level is out of adjustment.

6. By setting the split-hand stopwatch to within a few seconds of standard time and recording the exact difference to 0.10 seconds (using WWV, WWVH? or VGN radio time signals), the split-hand stopwatch becomes both chronometer and stop-watch.
An ordinary pocket watch, which has been syncronised with the stopwatch, is read to the nearest second, by the booker. This checks for gross error, both the minute and second called out by the observer.

7. Stars have co-Ordinates, the same as positions on the earth. RIGHT ASCENSION is the co-Ordinate which gives the East-West position of the star. (Similar to Longitude for a point on the earths surface.) Right Ascension is measured eastward, in Hours, Minutes, and Seconds from an imaginary point called the First Point of Aries.

8. MRA2 Tellurometers read transit times in milli-microseconds up to 99, 999.99 milli-microseconds. As the transit time is the out and back time, the one way time for the above would be approximately 50,000 milli-microseconds(about 50,000ft or 10 miles or 15 Kilometres) This means that for measurements scaled from the map which are greater than the above, only that part of the measurement below a transit time of 100,000milli-microseconds shows on the tellurometer as the instrument does not record the sixth figure nominating the correct hundred thousand. Thus if the scaled distance lies between 10 & 20 miles (15 & 30Km)the transit time will lay between 100,000 and 200,000 milli-microseconds, i.e. 100,000 mm's is added, and if the scaled distance is between 20 & 30 miles(30 & 45 Km) the transit time will lay between 200,000 mm's and 300,000 mm's, i.e. 200,000 mm's is added, and so on.

9. Collimation. When reading either horizontal or vertical angles with the theodolite, the difference, if any, between FL and FR observations is called collimation.

Parrallax. This is the apparent movement of the distant target in relation to the crosswires, when the target is viewed through the telescope.

10. The alidade bubble ends are viewed through a prism. When the ends are brought into co-incidence the bubble is level. As the vertical circle is attached to the bubble adjusting screw the act of bringing the ends of the bubble into coincidence means that, in effect, the levelled bubble is the Reference Object for the Vertical Angle being redd. To eliminate any slight "wandering" of the bubble or any "flat" spots in its grinding, the bubble is relevelled each time the instrument is pointed, just proir to reading the scale.

ANSWERS

PART "B" ORAL (CONTINUED)

Question 11. True bearing. Is the angle between true north and any point, from any given position.
Magnetic bearing. Is the angle between magnetic north and any point, from any given position.
Grid bearing. Is the angle between grid north and any point, from any given position.

12. Contour line. A line joining points of equal height.
Contour Interval. The distance, or interval between contour lines.
Hatchuring. Method of representing hill features by shading with short disconnected lines.

13. A closed traverse tends to prove the quality of the work, and will disclose any errors except an almost exactly compensating one. An unclosed traverse is always suspect for both angular and measuring errors.

14. In most cases the Station Mark will not be on an exactly identifiable point on the photo and the only way of pricking it through would be by proportional estimation of distances from other identifiable points in the vicinity.
It is therefore much more accurate prick through at least one of these identifiable points and make a connection by bearing and distance from the Station Mark.

15. Range within each set shall not exceed 10 seconds of arc.

16. Minimum 4 sets(of 6 arcs) of horizontal angles.

17. Third Order Levelling. The most accurate of the three methods mentioned, and should be used in preference to Trignometrical and Barometric heighting where possible. Unless a Bench Mark is within 5 miles of the point to be levelled, the time required will make third order levelling un-economic.
Trignometrical Heighting. This term now really means reading Simultaneous Reciprocal Vertical Angles along lines which have been measured by electronic distance measuring equipment such as the Tellurometer and calculating the difference height from this data. Over reasonable distances, say under 30 Km, and reading 2 separate sets of angles about 2 hours apart, 2 difference heights within a metre should be obtained.
Barometric Heighting. This is the least accurate of the three methods. The minimum requirements are a set or readings taken hourly at both the base station and the distant point, over a whole day. Readings on two days are to be preferred. Good results depend on stable weather conditions. Barometric heighting techniques are usually confined to remote areas where no other method is economic, and quite good results can be achieved if proper care is taken with all the details.

18. $$\text{Scale} = \frac{\text{Focal Length of Camera Lens.}}{\text{Height of Camera above ground.}}$$

19. As the Earth is a sphere, a "projection" is necessary to represent an area of its surface, when it is drawn to scale, on paper. The two most used projections in our field work are:-

ICAO Series, Lambert Conical Projection.
1:250,000 and 1:100,000 Series, Transverse Mercator Projection.

20. Geographical Co-ordinates are the Latitude and Longitude of a position on the earths surface.

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Naturals

Figure of the Earth used:
Field Books:
Computed by:
Date:

Back Azimuth at A	259° 04' 21.71"
Obs. Angle at A	92 14 11.92
Fwd. Azimuth at A	351 18 33.63
Lat of A	31° 24' 52.52"
Long of A	143° 22' 30.69"
	M 202.7 } 461.4 H 258.7 }
Mean Altitude A & B	231m.
Dist A to B	51 796.17
Sea Level Corr'n	X. 999 9633
Dist S	51 794.30

To Find First Approximate Mid-Latitude

Approximate Distance = 52 ~~Miles~~ KM

Value from Table for Fwd Azimuth A = 11

Correction = 27 x 52 ~~Miles~~ KM / 10 =

Approximate Mid-Latitude = 31° 11

S	51 794.30	
K. (from Table)	0.019 55	1012.579
Sin (Azimuth at A)	0.151 0994	
Diff in Azimuth (1)= + 153.000		
½ of (1) + 76.50	+ 01 16.50	
Fwd. Az. at A	351° 18' 33.63	
Mid Az. (Zm)	351 19 50.18	
S	51 794.30	
Cos Zm	0.988 5745	51 202.524
$\frac{1}{\rho \sin 1''}$	0.032 4696	
Diff in Latitude (2)= -1662.525	- 27' 42.52"	
Latitude of A	31° 24' 52.54	
Latitude of B	30° 57 10.02	
Mean (Mid Latitude)	31 11 01.28	
S	51 794.30	
Sin Zm	0.150 7328	7807.100
Sec (Mid Lat)	1.168 8910	9125.649
$\frac{1}{v \sin 1''}$	0 032 3099	
Diff in Longitude (3)= -294.849	- 04' 54.85	
Longitude of A	143° 22' 30".69	
Longitude of B	143 17 35.84	
Sin (Mid Lat)	0.517 7835	
(Sin Mid Lat X (3) (= Diff Azimuth (4)= + 152.668	+ 02 32.67	
Azimuth A ± 180°	171 18 33.63	
Reverse Azimuth	171 21 06.35	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	-	-	+	+
	(2)	-	+	+	-
	(3)	+	+	-	-

A Mt Hope to B Mt Winning

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Naturals

Figure of the Earth used:.........................

Field Books:.........................

Computed by:.........................

Date:.........................

Back Azimuth at A	171 21 06.[illegible]
Obs. Angle at A	265 33 57.[illegible]
Fwd. Azimuth at A	76 55 03.56
Lat of A	30 57 10.02
Long of A	143 17 35.[illegible]
Mean Altitude A & B	255m
Dist A to B	50 032.37
Sea Level Corr'n	·999 9608
Dist S	50 030·41

To Find First Approximate Mid-Latitude

Approximate Distance = ... ~~Miles~~ km

Value from Table for Fwd Azimuth A = 00.7

Correction = 00.7 x $\frac{50 \text{ Miles}}{10}$ = −3.5'

Approximate Mid-Latitude = 30° 53' 40"

S	50 030·41	
K (from Table)	0·01 933	967·088
Sin (Azimuth at A)	0·974 0458	941·988
Diff in Azimuth (1)= − 941·988		
½ of (1) − 470·994	− 07 50·99	
Fwd. Az. at A	76 55 03·56	
Mid Az. (Zm)	76 47 12·57	
S	50 030·41	
Cos Zm	0·228 5747	11 435·686
$\frac{1}{p \text{ Sin } 1''}$	0·032 4710	
Diff in Latitude (2)= − 371·328	− 06 11·33	
Latitude of A	30 57 10·02	
Latitude of B	30 50 58·69	
Mean (Mid Latitude)	30 54 04·35	
S	50 030·41	
Sin Zm	0·973 5264	48 705·925
Sec (Mid Lat)	1·165 4277	56 763·234
$\frac{1}{v \text{ Sin } 1''}$	0·032 3107	
Diff in Longitude (3)= +1834·060	30 34·06	
Longitude of A	143 17 35·84	
Longitude of B	143 48 09·90	
Sin (Mid Lat)	0·513 5594	
(Sin Mid Lat X (3) (= Diff Azimuth (4)= − 941·899	− 15 41·90	
Azimuth A ± 180°	256 55 03·56	
Reverse Azimuth	256 39 21·66	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	−	−	+	+
	(2)	−	+	+	−
	(3)	+	+	−	−

A Mt Winning to B Conical Hill

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Figure of the Earth used:..............................

Field Books:..............................

Computed by:..............................

Date:..............................

<u>To Find First Approximate Mid-Latitude</u>

Approximate Distance = ... ~~Miles~~ Km

Value from Table for Fwd Azimuth A = 0·5

Correction = 0·5 x 35 ~~Miles~~ Km / 10 = + 1·75

Approximate Mid-Latitude = 30° 52'·75

Naturals

Back Azimuth at A	256 39 21·66
Obs. Angle at A	205 42 09·91
Fwd. Azimuth at A	102 21 31·57
Lat of A	30 50 58·69
Long of A	143 48 09·90
Mean Altitude A & B	281m
Dist A to B	34 549·43
Sea Level Corr'n	·999 9560
Dist S	34 547·91

S	34 547·91	
K (from Table)	·019 33	667·811
Sin (Azimuth at A)	·976 8266	652·336
Diff in Azimuth (1) = − 652·336		
½ of (1) − 326·168	− 05 26·17	
Fwd. Az. at A	102 21 31·57	
Mid Az. (Zm)	102 16 05·40	
S	34 547·91	
Cos Zm	0·212 4875	7340·992
$\frac{1}{p \sin 1''}$	0·032 4711	238·370
Diff in Latitude (2) = + 238·370	+ 03 58·37	
Latitude of A	30 50 58·69	
Latitude of B	30 54 57·06	
Mean (Mid Latitude)	30 52 57·88	
S	34 547·91	
Sin Zm	·977 1638	33758·967
Sec (Mid Lat)	1·165 2031	39 336·053
$\frac{1}{v \sin 1''}$	0·032 3107	
Diff in Longitude (3) = + 1270·975	+ 21 10·98	
Longitude of A	143 48 09·90	
Longitude of B	144 09 20·88	
Sin (Mid Lat)	0·513 2323	
(Sin Mid Lat X (3) (= Diff Azimuth (4) = − 652·370	− 10 52·37	
Azimuth A ± 180°	282 21 31·57	
Reverse Azimuth	282 10 39·20	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	−	−	+	+
	(2)	−	+	+	−
	(3)	+	+	−	−

A Conical Hill to B Eastern Ridge

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Naturals

Figure of the Earth used:.................................

Field Books:.................................

Computed by:.................................

Date:.................................

Back Azimuth at A	282 10 [illegible]
Obs. Angle at A	167 58 25·16
Fwd. Azimuth at A	90 09 04·36
Lat of A	30 54 57·06
Long of A	144 09 20·83
Mean Altitude A & B	274 m
Dist A to B	75 725·43
Sea Level Corr'n	·999 9570
Dist S	75 722·17

To Find First Approximate Mid-Latitude

Approximate Distance = 76 ~~Miles~~ Km

Value from Table for Fwd Azimuth A = –

Correction = – x $\frac{76 \text{ Km}}{10}$ =

Approximate Mid-Latitude = 30° 55'

S	75 722·17	
K (from Table)	0·019 35	1465·224
Sin (Azimuth at A)	0·999 9965	
Diff in Azimuth (1)= – 1465·219		
½ of (1) – 732·61	– 12 12·61	
Fwd. Az. at A	90 09 04·36	
Mid Az. (Zm)	89 56 51·75	
S	75 722·17	
Cos Zm	0·000 9127	69·112
$\frac{1}{\rho \text{ Sin } 1''}$	0·032 4709	
Diff in Latitude (2)= + 02·244	+ 02·24	
Latitude of A	30 54 57·06	
Latitude of B	30 54 59·30	
Mean (Mid Latitude)	30 54 58·1[illegible]	
S	75 722·17	
Sin Zm	0·999 9996	75 722·140
Sec (Mid Lat)	1·165 6098	88 262·468
$\frac{1}{\nu \text{ Sin } 1''}$	0·032 3106	
Diff in Longitude (3)= + 2851·813	+ 47 31·81	
Longitude of A	144 09 20·83	
Longitude of B	144 56 52·69	
Sin (Mid Lat)	0·513 7833	
(Sin Mid Lat X (3) (= Diff Azimuth (4)= – 1465·214	– 24 25·21	
Azimuth A ± 180°	270 09 04·36	
Reverse Azimuth	269 44 39·1[illegible]	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	–	–	+	+
	(2)	–	+	+	–
	(3)	+	+	–	–

A Mt Murchison to B Mt Hope

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Figure of the Earth used:..............................

Field Books:..............................

Computed by:..............................

Date:..............................

To Find First Approximate Mid-Latitude

Approximate Distance = 52 ~~Miles~~ Km

Value from Table for Fwd Azimuth A = 02.7

Correction = 02.7 x $\frac{52 \text{ Km}}{10}$ = 14'

Approximate Mid-Latitude = 31° 11'

	Logs
Back Azimuth at A	259° 04 21.76
Obs. Angle at A	92 14 11.92
Fwd. Azimuth at A	351 18 33.68
Lat of A	31 24 52.54
Long of A	143 22 30.69
Mean Altitude A & B	231m
Dist A to B 51796.17	4.714 2976
Sea Level Corr'n	9.999 9843
Dist S	4.714 2819

S	4.714 2819	
K (from Table)	5.291 1468	0.01 955.
Sin (Azimuth at A)	9.183 3752	
Diff in Azimuth (1)= + 154.46	2.188 8039	
½ of (1) + 77.23	+ 01 17.23	
Fwd. Az. at A	351 18 33.68	
Mid Az. (Zm)	351 19 50.91	
S	4.714 2819	
Cos Zm	9.995 0097	
$\frac{1}{p \sin 1''}$	8.511 4768	
	3.220 7684	
Diff in Latitude (2)= − 1662.52	− 27 42.52	
Latitude of A	31 24 52.54	
Latitude of B	30 57 10.02	
Mean (Mid Latitude)	31 11 01.28	
S	4.714 2819	
Sin Zm	9.178 1976	
Sec (Mid Lat)	0.067 7741	
$\frac{1}{v \sin 1''}$	8.509 3397	
	2.469 5933	
Diff in Longitude (3)= − 294.845	04 54.85	
Longitude of A	143 22 30.69	
Longitude of B	143 17 35.84	
Sin (Mid Lat)	9.714 1482	
(Sin Mid Lat X (3)	2.469 5933	
(= Diff Azimuth (4)= + 152.666	2.183 7415	
Azimuth A ± 180° 02' 32".67	171 18 33.68	
Reverse Azimuth	171 21 06.35	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	−	−	+	+
	(2)	−	+	+	−
	(3)	+	+	−	−

A Mt Hope to B Mt Winning

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Figure of the Earth used:.................................

Field Books:.................................

Computed by:.................................

Date:.................................

To Find First Approximate Mid-Latitude

Approximate Distance = ... ~~Miles~~ Km

Value from Table for Fwd Azimuth A = 00·7

Correction = 00·7 x $\frac{50 \text{ ~~Miles~~ Km}}{10}$ = − 3·5

Approximate Mid-Latitude = 30° 53' 40"

	Logs
Back Azimuth at A	171 21 06·35
Obs. Angle at A	265 33 57·21
Fwd. Azimuth at A	76 55 03·56
Lat of A	30 57 10·02
Long of A	143 17 35·94
Mean Altitude A & B	255m
Dist A to B 50 032·37	4.699 2511
Sea Level Corr'n	9.999 9829
Dist S	4.699 2340

S	4·699 2340	
K (from Table)	$\bar{2}$·286 2318	0·01 933
Sin (Azimuth at A)	9·988 5794	
Diff in Azimuth (1)= − 941·99	2·974 0452	
½ of (1) − 471·00	07 51·00	
Fwd. Az. at A	76 55 03·56	
Mid Az. (Zm)	76 47 12·56	
S	4·699 2340	
Cos Zm	9·359 0283	
	8·511 4961	
$\frac{1}{p \text{ Sin } 1"}$	2·569 7584	
Diff in Latitude (2)= − 371·329	06 11·33	
Latitude of A	30 57 10·02	
Latitude of B	30 50 58·69	
Mean (Mid Latitude)	30 54 04·35	
S	4·699 2340	
Sin Zm	9·988 3477	
Sec (Mid Lat)	0·066 4853	
$\frac{1}{v \text{ Sin } 1"}$	8·509 3461	
	3·263 4131	
Diff in Longitude (3)= + 1834·058	+ 30 34·06	
Longitude of A	143 17 35·94	
Longitude of B	143 48 09·90	
Sin (Mid Lat)	9·710 5913	
(Sin Mid Lat X (3)	3·263 4131	
(= Diff Azimuth (4)= − 941·90	2·974 0044	
Azimuth A ± 180° −15' 41·90	256 55 03·56	
Reverse Azimuth	256 39 21·66	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention Lat. is positive	Z =	0°-90°	90°-180°	180°-270°	270°-360°
	(1) & (4)	−	−	+	+
	(2)	−	+	+	−
	(3)	+	+	−	−

A Mt Winning to B Conical Hill

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Figure of the Earth used:..........

Field Books:..........

Computed by:..........

Date:..........

To Find First Approximate Mid-Latitude

Approximate Distance = 35 ~~Miles~~ Km

Value from Table for Fwd Azimuth A = 0.5

Correction = 0.5 x 35 ~~Miles~~ Km / 10 = 1.75

Approximate Mid-Latitude = 30° 52.75

Logs

Back Azimuth at A	256 39 21.6?
Obs. Angle at A	205 42 09.9?
Fwd. Azimuth at A	102 21 31.57
Lat of A	30 50 58.69
Long of A	143 48 09.90
Mean Altitude A & B	291m
Dist A to B 34 549.43	4.538 4409
Sea Level Corr'n	9.999 9808
Dist S	4.538 4217

S	4.538 4217	
K (from Table)	2.286 2319	.019 33
Sin (Azimuth at A)	9.989 8175	
Diff in Azimuth (1) = − 652.335	2.814 4711	
½ of (1) − 326.168	− 05 26.17	
Fwd. Az. at A	102 21 31.57	
Mid Az. (Zm)	102 16 05.40	
S	4.538 4217	
Cos Zm	9.327 3334	
	8.511 4971	
$\frac{1}{\rho \sin 1''}$	2.377 2522	
Diff in Latitude (2) = + 238.370	+ 03 58.37	
Latitude of A	30 50 58.69	
Latitude of B	30 54 57.06	
Mean (Mid Latitude)	30 52 57.88	
S	4.538 4217	
Sin Zm	9.989 9673	
Sec (Mid Lat)	0.066 4016	
$\frac{1}{\nu \sin 1''}$	8.509 3464	
	3.104 1370	
Diff in Longitude (3) = + 1270.975	+ 21 10.98	
Longitude of A	143 48 09.90	
Longitude of B	144 09 20.88	
Sin (Mid Lat)	9.710 3567	
(Sin Mid Lat X (3)	3.104 1370	
(= Diff Azimuth (4) = − 652.369	2.814 4937	
Azimuth A ± 180° − 10' 52.37	282 21 31.57	
Reverse Azimuth	282 10 39.20	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	−	−	+	+
	(2)	−	+	+	−
	(3)	+	+	−	−

A Conical Hill to B Eastern Ridge.

LATITUDE LONGITUDE AND REVERSE AZIMUTH

GAUSS MID LATITUDE FORMULAE

Logs.

Figure of the Earth used:..............................

Field Books:..............................

Computed by:..............................

Date:..............................

To Find First Approximate Mid-Latitude

Approximate Distance = ...Miles

Value from Table for Fwd Azimuth A = –

Correction = – x 74 Miles / 10 =

Approximate Mid-Latitude = 30° 55'

Back Azimuth at A	282 10 3[illegible]
Obs. Angle at A	1[illegible]
Fwd. Azimuth at A	90 [illegible]
Lat of A	30 54 57·[illegible]
Long of A	144 09 20·8[illegible]
Mean Altitude A & B	[illegible]
Dist A to B 75725·43	4·[illegible]
Sea Level Corr'n	9·999 9818
Dist S	4 879 [illegible]231

S	4·879 2231	
K (from Table)	2·286 6810	0·019 3[illegible]
Sin (Azimuth at A)	9·999 9985	
Diff in Azimuth (1) = –1465·219	3·165 9026	
½ of (1) – 732·610	– 12 12·61	
Fwd. Az. at A	90 09 04·36	
Mid Az. (Zm)	89 56 51·75	
S	4·879 2231	
Cos Zm	6·960 3087	
	8·511 4946	
1 / p Sin 1"	0·351 0264	
Diff in Latitude (2) = + 02·244	+ 02·24	
Latitude of A	30 54 57·06	
Latitude of B	30 54 59·30	
Mean (Mid Latitude)	30 54 58·18	
S	4·879 2231	
Sin Zm	9·999 9998	
Sec (Mid Lat)	0·066 5532	
1 / v Sin 1"	8·509 3456	
	3·455 1217	
Diff in Longitude (3) = + 2851·817	+ 47 31·82	
Longitude of A	144 09 20·88	
Longitude of B	144 56 52·70	
Sin (Mid Lat)	9·710 7799	
(Sin Mid Lat X (3)	3·455 1217	
(= Diff Azimuth (4) = –1465 216	3·165 9016	
Azimuth A ± 180° –24 25·22	270 09 04·36	
Reverse Azimuth	269 44 39·14	
From Plot:		
(Latitude of B)		
(Longitude of B)		

Sign Convention	Z =	0°-90°	90°-180°	180°-270°	270°-360°
Lat. is positive	(1) & (4)	–	–	+	+
	(2)	–	+	+	–
	(3)	+	+	–	–