Easy Nav by hand

Getting the required LHA and Dec by hand entails three multiplications involving the GMT
To make this easier, convert the GMT to decimal time by means of the decimal tables. *(pages 17 to 19)*
Use the Easy Nav almanac as usual but five lines require reckoning as follow:

In the sun example *(almanac page 2)*, the GMT is 3hrs 35min 19sec. Enter the decimal tables with 35min and 19sec and uplift the corresponding decimal number 5886… the complete decimal GMT is 3.5886 hrs

Line 9	to get the value for W	multiply	cor1 by GMT	.017	×	3.5886	equals	.0609962	round this to 0.1
Line 11	X		cor2 by yr	.273	×	8		2.184	round to 2.2
Line 13	A		15 by GMT	15	×	3.5886		53.8290	

↕

Convert 53.8290 back to degrees and min. by close matching of the fraction 8290 with the corresponding min. and seconds in the decimal tables. Find this as 49min 45 sec. *(divide 45 by 60)* The answer is 53° 49.8'

Line 18	Y	cor3 by GMT
Line 20	Z	cor4 by yr

Sight reduction instructions *(page 2)*

With the exception of line 1 and 6, the instructions stipulate whether the tables *(pages 4 - 16)*, should be read from the top down, or read from the bottom up.
For line 1 and 6 that is determined by the rule as shown *(page 2 top)*.
The same rule also shows the value for St, which is required for line 1

As per example *(page 3)*
Line 1: enter the tables with the value St… 43° 23.4' and read from the bottom up. Uplift the nearest number that corresponds with the 43° at the bottom and the 23.4 min. in the column to the far right.
Line 2 : enter the tables with the value Dec., read from the top down, use the min. column to the left. Uplift number.
The sum of line1 and 2 becomes the value for Number A
Line 3 : enter the tables with the Number A and locate the number that is closest to the Number A
The corresponding degrees *bottom*, and min. *to the right* are the value for Angle1.
And so on
Line 7 and 13 do have a simple condition to consider.

Normally, it is not necessary to interpolate. But if the LHA is close to 90° or if angle 2 is between 85 and 95, accuracy will be somewhat reduced. You should then interpolate or take a new sight.

Interpolation
If a required number is not in the tables select the two nearest numbers, one above and one below. Divide their difference in five equal parts. Add each part progressively to the lowest number. These new found numbers allow a closer matching and each represent one tenth of a minute.

Instructions to find the Hc and Azimuth by hand

First establish the start value **St**

If the LHA is between 90° and 180° then **St** = LHA - 90
If the LHA is between 180° and 270° then **St** = 270 – LHA
In either case, for line1and 6, read the tables from the **top** down

---------- Or ----------

If the LHA is between 0° and 90° then **St** = LHA
If the LHA is between 270° and 360° then **St** = 360 – LHA
In either case, for line1and 6, read the tables from the **bottom** up

1	find the number in the column of the value **St**	top or bottom? *check above*	number
2	find the number in the column of the value Dec	**top**	number +
		=	Number A
3	find the *degrees* & *minutes* in the column that has Number A	**bottom**	Angle 1
4	find the number in the column of the value Dec	**bottom**	number
5	find the number in the column of the value Angle 1	**top**	number –
		=	Number B
6	find the *degrees* & *minutes* in the column that has Number B	top / bottom *as in line1*	Angle 2
		add 90° only, if line 6 is read from the top down	90° +?
		=	……
7	*add if the Dec is across the equator*	*otherwise subtract (the smaller from the bigger)*	DRLat + or –
		=	Angle 3
8	find the number in the column of the value Angle 3	**top**	number
9	copy the number from line 5		number +
		=	Number C
10	find the *degrees* & *minutes* in the column that has Number C	**bottom**	Angle 4 (**Hc**)

Hc is the answer for line 22 in the almanac

11	find the number in the column of the value Angle 1	**bottom**	number
12	find the number in the column of the value Angle 4	**top**	Number –
		=	Number D
	Add, if the Dec is across the equator and the DRLat is less then Angle2 or,		
	Add, if the Dec is <u>not</u> across the equator but the DRLat is more then Angle2	*otherwise subtract* ↘	90°
13	find the *degrees* & *minutes* in the column that has Number D	**top**	Angle 5 + or –
		=	**Z**

If DR Lat. is N **and** LHA is over 180 then U = Z but if LHA is less, then U = 360 – Z
If DR Lat. is S **and** LHA is over 180 then U =180 – Z but if LHA is less, then U = 180 + Z

U is the Azimuth and the answer for line 25

Examples

If the LHA is between 90° and 180° then St = LHA − 90
If the LHA is between 180° and 270° then St = 270 − LHA ← *(STAR example)*
In either case, for line1 and 6, read the tables from the top down **top**

---------- Or ----------

If the LHA is between 0° and 90° then St = LHA ← *(SUN example)*
If the LHA is between 270° and 360° then St = 360 − LHA **bottom**
In either case, for line1 and 6, read the tables from the bottom up

SUN

LHA	43	23.4	
Dec	12	55.3	S
DRLat	43	20.0	S
St	43	23.4	*bottom**

Enter tables with					
1 St	bottom*		0375447		
2 Dec	top	+	0025663	+	
			0401110		*Num A*
3 Num A	bottom		42 02.0		*Angle 1*
4 Dec	bottom		1497559		
5 Angle 1	top	−	0297388	−	
			1200171		*Num B*
6 Num B	bottom*		17 31.5		
add 90 if line 6 = top			0	+	
			17 31.5		*Angle 2*
7	*see condition*		43 20.0	−	*DRLat*
			25 48.5		*Angle 3*
8 Angle 3	top		0105077		
9 number of line 5		+	0297388	+	
			0402465		*Num C*
10 Num C	bottom		41 58.0	**Hc**	*Angle 4*
11 Angle 1	bottom		0401130		
12 Angle 4	top	−	0296341	−	
			0104789		*Num D*
			90		
13 Num D	*see condition*		25 46.5	+	*Angle 5*
			115 46.5	**Z**	

STAR

LHA	255	53.1	
Dec	63	07.2	S
DRLat	42	58.4	S
St	14	06.9	*top***

Enter tables with					
1 St	top**		0030664		
2 Dec	top	+	0793685	+	
			0824349		*Num A*
3 Num A	bottom		26 00.5		*Angle 1*
4 Dec	bottom		0114369		
5 Angle 1	top	−	0106772	−	
			0007597		*Num B*
6 Num B	top**		7 03.0		
add 90 if line 6 = top			90	+	
			97 03.0		*Angle 2*
7	*see condition*		42 58.4	−	*DRLat*
			54 04.6		*Angle 3*
8 Angle 3	top		0533198		
9 number of line 5		+	0106772	+	
			0639970		*Num C*
10 Num C	bottom		31 49.5	**Hc**	*Angle 4*
11 Angle 1	bottom		0824391		
12 Angle 4	top	−	0162916	−	
			0661475		*Num D*
			90		
13 Num D	*see condition*		58 56.0	−	*Angle 5*
			31 04.0	**Z**	

Include all zero's to guarantee alignment and to enable easier table searching