Solution to Problem 73

First, calculate bearings from the given angles with the backsight bearing given (shown in strikeout type in column 2 in the table). There is no built-in check for this, so be careful!

Second, calculate the latitudes and departures for each course (shown in strikeout type in columns 4 & 6 in the table). Sum the latitudes and departures algebraically. The sum of the latitudes is -123.5569 and should be -125.4342, therefore the correction to the latitudes is -1.8773; the sum of the departures is +1192.5654 and should be +1193.4263, therefore the correction to the departures is +0.8609.

Third, calculate the correction to each course (columns 5 & 7 in the table). The correction to the latitude/departure of any course is to the total correction of the latitude/departure as the length of the course is to the total traverse. Note that the total correction in latitude /departure divided by the length of the traverse is a constant. The constant times the length of the course gives the correction for the course.

Fourth, apply the corrections to the latitudes and departures (columns 4 & 6 in the table). Verify that the sum is correct before continuing. Course 7-8, the longest, was given an additional -0.0001 correction in latitude due to rounding errors.

Fifth, calculate coordinates if needed (columns 8 & 9 in table).

Sixth, recalculate bearings and distances from corrected latitudes and departures (columns 2 & 3).

You may want to recalculate angles from corrected bearings and compare them to your original angles. (The corrected angles, in order, are 153°49'16", 173°35'26", 129°17'14", 142°27'52", 129°14'56", 100°04'25", and 39°44'13".)

(The gross misclosure for this problem is for illustrative purposes. This traverse closes worse than 1:1,000!)

PT. #	BEARING	DISTANCE	LATITUDE	Δ	DEPARTURE	Δ	NORTH	EAST
1							0.0000	0.0000
	~~N84°37'44"E~~	~~246.810'~~	~~23.1030~~	− 0.2301	~~245.7263~~	0.1055		
	N84°41'04"E	246.894'	22.8729		245.8318			
2							~~23.0103~~	~~245.7263~~
							22.8729	245.8318
	~~S88°57'33"E~~	~~159.136'~~	~~−2.8907~~	− 0.1483	~~159.1097~~	0.0680		
	S88°54'22"E	159.207'	− 3.0390		159.1777			
3							~~20.2123~~	~~404.8360~~
							19.8339	405.0095
	~~N40°19'40"E~~	~~345.678'~~	~~263.5292~~	− 0.3222	~~223.7088~~	0.1478		
	N40°22'52"E	345.528'	263.2070		223.8566			
4							~~283.7415~~	~~628.5448~~
							283.0409	628.8661
	~~N77°51'34"E~~	~~333.555'~~	~~70.1502~~	− 0.3109	~~326.0949~~	0.1426		
	N77°55'00"E	333.629'	69.8393		326.2375			
5							~~353.8917~~	~~954.6397~~
							352.8802	955.1036
	~~S51°21'31"E~~	~~309.903'~~	~~−193.5171~~	− 0.2889	~~242.0558~~	0.1325		
	S51°19'56"E	310.187'	− 193.8060		242.1883			
6							~~160.3746~~	~~1196.6955~~
							159.0742	1197.2919
	~~S28°38'28"W~~	~~411.119'~~	~~−360.8142~~	− 0.3833	~~−197.0583~~	0.1757		
	S28°35'39"W	411.371'	− 361.1975		− 196.8826			
7							~~−200.4396~~	~~999.6372~~
							− 202.1233	1000.4093
	~~N68°16'21"E~~	~~207.683'~~	~~76.8827~~	− 0.1936	~~192.9282~~	0.0888		
	N68°19'52"E	207.694'	76.6891		193.017			
8		SUM=2013.884	SUM=-123.5569		SUM=1192.5654		~~−123.5569~~	~~1192.5654~~
			SUM=-125.4342		SUM=1193.4263		− 125.4342	1193.4263
	~~S24°38'08"E~~	~~2.0653'~~		− 1.8773		0.8609		
8'							(− 125.4342)	(+1193.4263)

Solution to Problem 74

PT.#	ORIG. N.	ORIG. E.	CORREC. N.	CORREC. E.	BEARING	DISTANCE	STATION	STA x 2.0653 2013.884
1	0.0000	0.0000	0.0000	0.0000		0.000	0+00.00	0.0000
2	23.0103	245.7263	22.8729	245.8318	S 24°37'53" E	0.253	2+46.810	0.2531
3	20.2123	404.8360	19.8339	405.0095	S 24°37'55" E	0.416	4+05.946	0.4163
4	283.7415	628.5448	283.0409	628.8661	S 24°38'11" E	0.771	7+51.624	0.7708
5	353.8917	954.6397	352.8802	955.1036	S 24°38'15" E	1.113	10+85.179	1.1129
6	160.3746	1196.6955	159.0742	1197.2919	S 24°38'15" E	1.431	13+95.082	1.4307
7	− 200.4396	999.6372	− 202.1233	1000.4093	S 24°38'06" E	1.852	18+06.201	1.8523
8	− 123.5569	1192.5654	− 125.4342	1193.4263	S 24°38'08" E	2.065	20+13.884	2.0653

The original misclosure was S 24°38'08" E 2.0653'. The misclosure can be "proportioned" along the traverse in the direction of the original misclosure. Such is the geometry of the compass, or bowditch, adjustment.