

THE MILLIDGE DL HANDICAPPING SYSTEM

For use with Portsmouth Numbers

1. Before the race, draw-up a table as shown in the worked example and enter the names of all entrants in order, lowest Numbers at the top, with their Portsmouth Numbers under N. If two or more yachts have the same Number, use a " sign for the second and subsequent ones. Check for revised Numbers.
2. During the race, enter elapsed times under E in any convenient units (using the same units throughout), divide by N and enter the quotient under C. Cross through any non-finishers. Langstone corrected times may be used instead of E/N, but the two must never be mixed.
- 3.1 Before grouping the finishers, put in parentheses any not suitable for calculating mass centres, e.g. late starters and yachts known to have been accidentally delayed.
- 3.2 Form the first group A, not counting yachts excluded under rule 3.1. Draw a full line through columns N, E and C above the figures for the first yacht, and mark it A. Group A will then comprise the first four Portsmouth ratings (which may include more than four yachts).
- 3.3 Check that none of the yachts has been accidentally delayed. For this purpose it is assumed that in a group of 4 or 5 yachts a yacht with C 16% or more above the average for the other yachts in its group has been delayed and should be excluded from the mass-centre calculations. Put such a yacht's N and C in parentheses and, if necessary, re-form the group to comply with rule 3.2 above. Draw a full line C below the last yacht in the group.
- 3.31 In a group of 6 or more yachts, a yacht with C 16% or more above the average C for the yachts with the lowest five C values should be excluded from the mass-centre calculations: i.e. any yacht will be excluded (and have its N and C in parentheses) if its C equals or exceeds 0.232 times the sum of the lowest five C values in the group.
- 3.32 A yacht excluded under rule 3.3 or 3.31 from the latter part of any group is automatically excluded from the next group following, even if it would not otherwise be so excluded.
- 3.33 A yacht not excluded under rule 3.3 or 3.31 from the latter part of any group must not be excluded from the next group following, even if it would otherwise be so excluded.
- 3.34 If, as is theoretically possible, a yacht excluded under rule 3.3 or 3.31 is found to have a quotient (see rule 11) greater than 1, its exclusion is cancelled, it must be included in its group, and subsequent groups may have to be rearranged. This is never likely to arise, but quotients should be calculated as soon as the necessary data are to hand. This rule does not affect yachts excluded under rule 3.1.
- 3.35 * If, as sometimes happens where performance drops sharply with rating, when extending a proposed group because of exclusions under rule 3.3 or 3.31 it is found that the next two yachts in succession would also be excluded, provisionally form the next-following group and apply rule 3.3 or 3.31. Either (or both) of the two yachts not then excluded will not be excluded from the original proposed group. This rule does not affect yachts excluded under 3.1.
4. If a yacht is given a time PENALTY, the actual elapsed time will be used in the mass-centre calculations (unless excluded under rule 3.1, 3.3 or 3.31), but time-plus-penalty will be used to determine the yacht's quotient (see rule 11).

5. Draw a broken line below the first two Portsmouth ratings (which may include more than two yachts) and mark it B.

6. Calculate the N co-ordinate of the mass centre of the points in group A (the group bounded by full lines A and C) by averaging their N co-ordinates, counting the points above the broken line B twice. Similarly, calculate the C co-ordinate. Enter in column m.c. N.B. This doubling of certain points occurs in the first and last groups only.

Example	89 x 2 = 178	22.776 x 2 = 45.552
	90 x 2 = 180	22.181 x 2 = 44.362
	92	22.251
	95	21.929
	95	21.284
	95	21.601
	95	21.375
	<u>9) 830</u>	<u>9) 198.354</u>
	<u>92.22 = N_A</u>	<u>22.039 = C_A</u>

7. From the broken line form group B, comprising four ratings, in the same way (applying rule 3.3 or 3.31), and draw a broken line below the last yacht and mark it D.

8. Calculate the co-ordinates of mass centre B, remembering that no points are counted twice, but that each yacht - not each rating - is a separate point. Enter in column m.c.

9. Calculate the slope of the line AB:-
 Slope AB = $\frac{C_A - C_B}{N_B - N_A}$ to three significant figures, observing the normal sign rules. Enter in the slope column level with C_B.

$$\text{Example. Slope AB} = \frac{22.039 - 23.079}{96.78 - 92.22} = -.228$$

10. Working from the lower mass centre B, calculate the mean value of C, the "expected performance", for each rating with N less than N_B.

$$\text{For any rating Y, mean } C_Y = C_B + \text{slope AB} \cdot (N_B - Y)$$

$$\text{Example. The mean C corresponding to rating 89 is} \\ 23.079 - .228(96.78 - 89) = 21.305$$

11. Calculate the quotient $\frac{\text{mean C}}{\text{yachts C}}$ for each yacht. Enter in the quotient column. This is the ratio of actual performance to expected performance, on which the yacht is placed.

12. Continue as above until all yachts are timed in or declared non-finishers, forming groups of four ratings overlapping by two ratings. The ratings left over by the penultimate group are doubled (as with the first two ratings of group A) and grouped with the latter two of the penultimate group to determine the co-ordinates of the mass centre of the last group. This is the only case in which there may be only one rating in the latter part of a group.

N.B. In the last group some values of N will be more than the value for the m.c., so when calculating mean C values the sign will be reversed.

13. The system applies only to races with enough finishers qualifying under the rules 3.1 and 3.3 to form two groups, i.e. at least 6 ratings. If there are not two groups, use the Millidge CI System.

Worked example based on a race under IOR rating

Yacht	N	E	C	m.c.	Slope	Mean C	Quotient	Place
Alpha	A 89	2027.1	22.7776			21.305	.935	18
Beta	B 90	1996.3	22.181	A		21.533	.971	16
Gamma	G 92	2047.1	22.251	N = 92.22		21.989	.988	13
Delta	(95)	2083.3	21.929	C = 22.039		22.673	1.034	6
Epsilon	(")	2404.2	(25.307)		B	"	(.896)	20
Zeta	"	2022.0	21.284			"	1.065	2
Eta	"	2052.1	21.601	N = 96.78	AB	"	1.050	4
Theta	"	2030.6	21.375	C = 23.079	-	"	1.061	3
Iota	g 96	2150.4	22.400		.228	22.901	1.022	8
Kappa	(97)	2630.2	(27.115)			23.206	(.856)	21
Lambda	101	2577.4	25.519	N = 100.86	BG	25.455	.997	9
Mu	"	2590.0	25.644	C = 25.410	-	"	.993	11
Nu	D "	2596.2	25.705			"	.990	12
Xi	102	2561.0	25.108		D	25.771	1.026	7
Omicron	"	2718.1	26.648	N = 103.60	GD	"	.967	17
Pi	F 103	2765.0	26.845	C = 26.277	-	26.087	.972	15
Rho	105	2749.3	26.184		.316	26.086	.996	10
Sigma	F 106	2819.5	26.599		E	25.950	.976	14
Tau	107	3033.0	28.346	N = 107.12	DE	25.814	.911	19
Upsilon	108	2658.4	24.615	C = 25.798	+	25.678	1.043	5
Phi	"	2574.7	23.840			"	1.077	1
							<u>19.074</u>	

As a check, all quotients (excepting those of delayed yachts) are added together. The sum should equal the number of quotients, within a margin of error yet to be established but believed not to exceed $\pm 0.8\%$.

Grouping Under rule 3.31 Kappa is excluded from group B, and the next two yachts in succession - Lambda and Mu - would also be excluded, but under rule 3.35 Lambda and Mu would both be included in the provisional group C, as would Nu, so these three yachts are not excluded from B. Kappa remains excluded from B and, under rule 3.32, from C. Group B now includes all yachts from Gamma to Nu excepting Epsilon and Kappa.

Units In the above example E is in minutes and $C = \frac{E}{N}$.

Re-Rating If 75% of the finishers are Yardsticks, each yacht's new number can be taken as the original Number divided by that yacht's quotient, and for the record the original Number will be increased or reduced by one-quarter the difference.

If there are not enough Yardsticks, correct the Yardsticks' times (for re-rating purposes) with the Langstone Tables, which are then used for re-rating in the ordinary way.

Accuracy In the worked example quotients are taken to three decimal places. The system may be used to any degree of accuracy - real or illusory - favoured by the organising club.