Phil Morris
4934 Bath Rd
RR3 Bath On K0H1G0

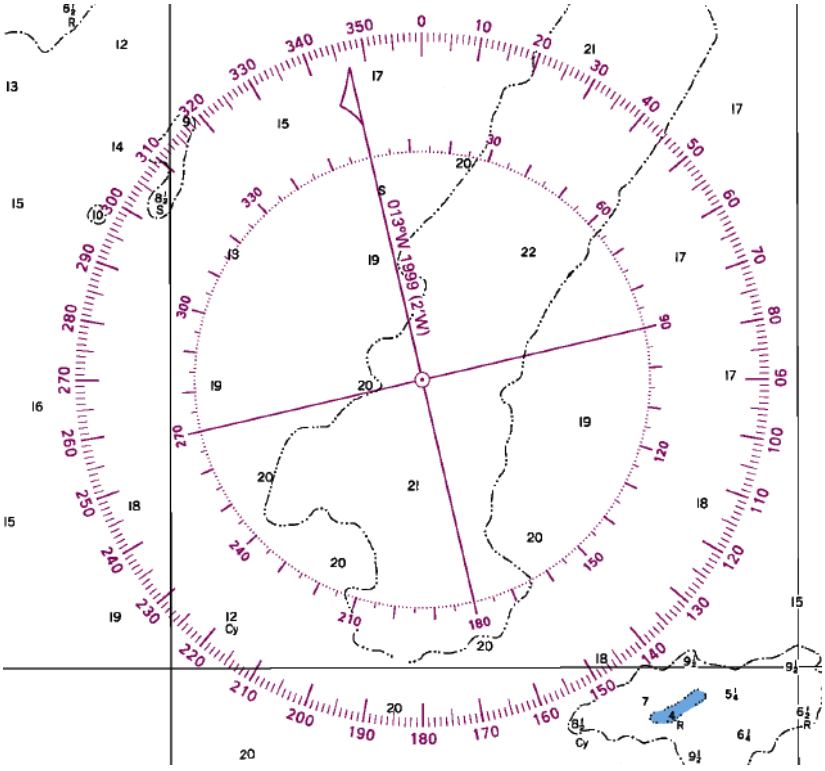
Keelboat Sailing Instruction to CYA standards

Wavelength

A quick primer on Variation Deviation and why a ships compass doesn't point North (even magnetic North)!

Most charts are printed so that the Earths North Pole (**True North**) is vertical. So if we plot a course on the chart we will usually measure the angle it makes from True North. We should always record that angle, the true course. We rely on a compass to steer the boat and unfortunately the North on the compass does not coincide with True North. There are two reasons for this:

First of all the Earths **Magnetic North** Pole doesn't coincide with the True North Pole of the earth. So depending where you are on the earth there will be a **variation,** which is the angle between the true North Pole and the magnetic North Pole, expressed as an angle West or East. To make life difficult the position of the magnetic North Pole varies slowly with time and so the variation changes slowly. The variation can be found on the compass rose on the chart as below.



The outer rose is oriented with respect to True North so zero is vertical. The inner rose is oriented with respect to magnetic north (when the chart was issued in 1999). The

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variation in this example is 13°West (of true North). The angle in brackets (2' W) means that each year the variation changes by 2' (or 2 /60°) in a westerly direction. So between 1999 and 2010 the variation changed by 0.22 ° W (11 years X 2/60 °). This change is so small that we can ignore it, so the variation for the area near the compass rose in 2006 is still 13° West. We can convert a true course as measured on the chart to a magnetic course by adding or subtracting the variation. Westerly variations are added Easterly are subtracted. So since the variation in this example is West we add the variation to the true course to calculate the magnetic course. So if we wanted to go true East (true course 90° we would have to steer a magnetic course of 103°. If the variation had been 13°East we would have had to steer a magnetic course of 77° (90 ° -13 °).

So the compass points to magnetic North right? Well the answer is unfortunately maybe. If the compass were away from all other sources of magnetic interference then it would point to magnetic North. However we have lots of sources of magnetism on the boat such as the cast iron engine block, electrical currents etc. which cause the compass to deviate from magnetic North. This **deviation** is expressed in degrees east or west like variation but is specific to the boat and the course the boat is on. It may also change with changes in stowage of tools or other magnetic materials or depend on which electrical circuits are on. The only way to find out what the deviation is to measure it on the specific boat with the boat headed on various courses. How deviation is measured is outside the scope of this article.
The deviation chart for Wavelength is below.

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Binnacle compass			
Magnetic Bearing	Deviation		Compass Bearing
0	0	W	0
15	0	W	15
29	1	W	30
46	1	E	45
60	0	E	60
74	1	W	75
90	0	W	90
106	1	E	105
122	2	E	120
137	2	E	135
154	4	E	150
170	5	E	165
184	4	E	180
198	3	E	195
214	4	E	210
229	4	E	225
245	5	E	240
255	0	W	255
270	0	W	270
284	1	W	285
299	1	W	300
315	0	W	315
330	0	W	330
345	0	W	345
360	0	W	360

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So assuming we wanted to steer a magnetic course of 103 ^{o} then since the deviation of the binnacle compass on Wavelength is 1 ^{o} East (at the nearest measurement 106 ^{o} magnetic) we would have to steer a compass course of 102 ^{o} (103 ^{o}-1 ^{o}).

Putting it all together to convert from **T**rue Course to **C**ompass Course we take the **T**rue course and add or subtract **V**ariation to get the **M**agnetic course and then add or subtract **D**eviation to get the **C**ompass Course. West variations or Deviations are added, East are subtracted.

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We can memorize the order using the phrase "**T V M**akes **D**ull **C**hildren", remembering in converting from True to Compass we add West variations or deviations and subtract East.

Alternatively we can put it all together in "**T**rue **V**irgins **m**ake **D**ull **C**ompany **A**t **W**eddings"!

So supposing we want to steer a true course of 180^{o}, what would be the course on the binnacle compass?
The calculation is below.

True	**V**ariation	**M**agnetic	**D**eviation	**C**ompass
180	13 W	193	3E	190

We simply reverse the calculation to convert from a compass bearing to true (noting that west variations or deviations are subtracted going in this direction)

What about a hand held compass? Well in principle it is the same except we do not know the deviation correction. So when using a hand held compass move as far away from all magnetic sources as possible (if it is safe to do so get up to the bow or shrouds) and we then assume deviation is zero so no correction for deviation need to be made.

Measurement of a bearing (for example to a landmark) is exactly the same the only thing that you need to remember is that if you sight over the binnacle compass to take the bearing the deviation correction you use is the one appropriate to the boats heading-not the bearing itself.