Why is it that, when faced with a secondary port exercise, many Yachtmaster students are immediately overwhelmed with the enormity of the task? It’s not that they can’t – it’s that they can’t seem to get their heads around it. And with mastery of secondary ports comes confidence, which may well open up cruising grounds and anchorages that you might have been hesitant to try before. Keyhaven for example is a lovely place to anchor, or there’s Christchurch to explore, Bridport, Tenby, Llandaff... the list is endless. Further afield we have the Gulf of Morbihan in Southern Brittany – every bay, every delightful harbour is a secondary port to Brest. Not one of them difficult to work out, as you will see.

Of course, today we don’t have to work them out manually. There is a wealth of tidal height information online, in apps, embedded within chartplotter software, even on your wrist if you have a Quatix watch. So outside the classroom there is probably no need to work out a secondary port tidal height by hand. But how accurate is all this digital information? We compared seven secondary port tide heights, a whole new world of cruising awaits you trust them? Duncan Wells compares several methods to find out

Secondary ports using interpolation

The information for the secondary port of Yarmouth, Isle of Wight, is presented like this (see photo, right) in the almanac, it tells us where it is, what it’s like (red wheels rate ease of access, green thumbs facilities and purple rosettes ambience), which charts cover the area, the offset for the tides compared to Dover, mean sea level and duration of the tide, that the standard port is Portsmouth and which way to go in the almanac to find its tide table. Below that is the information we need to calculate tidal times and heights in this secondary port. So, when HW Portsmouth is 0000 1200, HW Yarmouth will be 0005, meaning one hour and five minutes (65 mins) earlier. When HW Portsmouth is 0600 1800, HW Yarmouth will be 0605, meaning five minutes later. This line from -0005 to +0005, which spans the six hours from 0000-0600 (and 0600-1200, 1200-1800, 1800-0000) is our time-differences line. It is 70 minutes long (-0105 to +0005). If we divide 70 minutes of interpolation in your head for LW interpolations in your head for LW

### Time of HW Portsmouth

<table>
<thead>
<tr>
<th>Time of HW Portsmouth</th>
<th>Differences at Yarmouth</th>
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<tbody>
<tr>
<td>0000 1200 2400 0600 1800</td>
<td>-0005 0000 0100 0200 0300 0400 0500 0600</td>
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<tr>
<td>0005 1205 2405 0605 1805</td>
<td>+0005 0005 0105 0205 0305 0405 0505 0605</td>
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</tbody>
</table>

### Differences at Yarmouth

-0005 +0005

**Say HW Portsmouth is 0230. This is 2.5 hours along from 0000 so we will move 2.5 x 65 mins, or 35 mins, along our time difference line from -0005 (or -65 mins), which is -35 mins. HW Yarmouth therefore is 0200-0535 mins, which is 0535.

#### Height differences

The almanac tells us that when MHWS (Mean High Water Springs) at Portsmouth is 4.7m, we have 1.7m less at Yarmouth. When MLWN (Mean Low Water Neaps) is 3.8m at Portsmouth we have 1.2m less at Yarmouth. The range between Portsmouth’s heights (4.7m to 3.8m) is 0.9m, and the range between Yarmouth’s differences (-1.7m to +1.2m), so always lower than Portsmouth) is 0.5m. Divide 0.9m by 0.5m to get 1.8, or 2 in my rounding world: a 2:1 ratio.

So if the height of HW Portsmouth is 4.4m, that’s 0.6m higher than HWNN (3.8m). Our 2:1 ratio means the height difference at Yarmouth is half that, or 0.3m lower than MHWN (-1.2m) so 1.5m lower. So the height of HW Yarmouth is 4.4m-1.5m = 2.9m. You can do the same interpolations in your head for LW times and heights.

As all secondary port times relate to the standard time zone of the country, GMT in Britain, we take the HW time from the tide table, establish the secondary port difference and then allow for BST.

**What’s the best way to find secondary port tide heights?**

The maths is easy, plotters, apps and websites are easier still, but can you trust them? Duncan Wells compares several methods to find out
Rule of Twelfths

In a perfect world, the tide uniformly follows the pull of moon and sun in a neat parabolic curve. Of course, continents and coastlines make the tide much less neat, but a generic tidal curve can still give us a rough of what the tide should be doing. The Rule of Twelfths is a simple way of converting this curve into meaningful numbers, for both tidal height and rate of flow. You might not want to risk your keel on the result, but it’s a good start, and it’s easy enough to do in your head while you are on the helm with mainsheet in hand.

Take the range of the tide and divide it by 12

So from HW (or LW) the tide will fall (or rise) by:

- 1/12 in HW+1 (1/12 of the range)
- 2/12 in HW+2 (1/6 of the range)
- 3/12 in HW+3 (1/4 of the range)
- 3/12 in HW+4 (3/4 of the range)
- 2/12 in HW+5 (1/6 of the range)
- 1/2 in HW+6 (1/12 of the range)

For example, if HW is 4.6m and LW is 1.0m, the range is 3.6m. Divide that by 12 and you get 0.3m. If we want to know the drop in tidal height at HW+4, it is (3/12 of the range) 0.3m. So at HW+4 the height will be (4.6-0.3)1.9m.

Chartplotter tide tables

Plotter tide tables will never be as accurate as the UKHO tables because UKHO supplies the plotter companies with simplified tidal data rather than the full harmonic information that’s available on UKHO’s own Easytide website. In places that might have two high waters, such as Southampton, simplified data might read as one HW. That said, the Garmin data in our comparison was quite accurate. It is very handy having this information available on our chartplotters and if we are in an area where there are tidal anomalies, we can always refer to the almanac.

App tide tables

There are several tidal prediction apps on the market and we decided to test two of them.

Navionics

The tidal data you get from Navionics depends on the area covered by the chart you buy (AS4.59 for Navionics Marine Europe HD). Predictions are given in local time and they seem to vary from the original UKHO data. Select a location and you can scroll through four days’ worth of predictions showing tidal heights and a simplified tidal curve without access to the internet.

Aye Tides

We also put the Aye Tides app to the test. It’s data was pretty close to that of the UKHO, although it comes from the USA.

Tide tables on the Web

There are three main tide tables online for UK data and they are all excellent:

- www.tntsf.org
- www.easyytide.ukho.gov.uk
- www.tidetimes.org.uk

AyeTides app

AyeTides (£5.49) is an iPhone app that also works on iPad, but for the same price you can get Aye Tides XL, which has some interesting features like a month’s tidal curves. Click on any one and you get a much bigger, but still simplified, curve. It’s a US app so, although it covers USA, it’s not much use if you live on the east coast for instance. The data is from NOAA-N (National Oceanographic and Atmospheric Administration).
Real time comparison

We went to Yarmouth on Tuesday 10 June and measured the flood tide from 1445 to 2145 using the tide gauge, which shows height of tide above the base level of 2.0m below Chart Datum. We tracked the heights according to our various sources and methods to find out how accurate their secondary port tide prediction was.

We also used a leadline. Our readings were on average 45cm deeper than the tide gauge readings, so depth of the berth where we sounded was not 2.00m but 2.45m below Chart Datum.

<table>
<thead>
<tr>
<th>Hour</th>
<th>UKHO*</th>
<th>Aye Tides</th>
<th>Navionics</th>
<th>Imray</th>
<th>Garmin</th>
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<th>1/4s</th>
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<tbody>
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<td>1.445</td>
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<td>2.159</td>
<td>2.9m</td>
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</table>

**Yarmouth Tide Gauge**

* Calculated using the Yarmouth tidal curve in the Almanac
** Every millibar (mb) above standard pressure (1013.25mb) lowers sea level by 1cm, and vice versa. The second set of figures shows what the height would have been if it were not for the high pressure on the day, which dropped levels by 6.75-8.75cm, throughout the tide. Yarmouth Harbourmaster confirmed that the south-westerly Force 4 breeze did not affect the water level in the harbour.

**Conclusion**

I would definitely use these web and app offerings but I would always check them by doing the secondary port calculation using the almanac. Interestingly, the Rule of Twelfths tracked the UKHO/almanac calculation remarkably closely, given that it ran over six hours and not the seven hours which was the actual duration of the tide. For those who dislike dividing by 12, there is also the Rule of Quarters, which also fared well.

There is quite a lot of variance in the results, so why am I happy to use inaccurate data? First, because the UKHO does not licence its harmonic data to apps and plotters, they will never be as accurate as the UKHO data, so I always double-check using the almanac. But how accurate do we really need to be? I am instantly suspicious of any man offering me a tidal height to the last centimetre. I am only really interested in tidal heights to the nearest 0.5m. Even if we have worked things out to the nth degree, a slight swell will still require us to add in a margin of safety, depth-wise. I call it the ‘ish’ factor. Does it matter that one app has a time of LW that is forty minutes after the UKHO time? As long as we understand that the more accurate data is available in our almanac, we can always check the instant information we get from our digital device against this. And now we can do secondary ports in our heads, there should be no stopping us.