Using a Calculator or Maple to Calculate the Coefficients

We can use a calculator to calculate the coefficients f_{DC}, a_n and b_n. We will describe the process for the Sharp EL-520W shown in Fig. 10.10. This calculator has Memories A, B, C, D, E, F, X, Y and M where we can store numbers and memories F1, F2, F3 and F4 where we can store entire formulas. For example let's store the number 2 in memory B. Type 2 STO B. To store a formula in memory F1, create it and then press STO F1. To recall a number or a formula press RCL B or RCL F1.

When creating formulas, type ALPHA X to create the variable x. For example let's create $\frac{2}{\pi}\sin(x)\cos(bx)$ and then store it in memory F1. Type 2 ÷ 2ndF 3 sin ALPHA X cos (ALPHA B ALPHA X) STO F1.

To integrate this formula from 0 to π first make sure that memory B contains a value, say 2, and that the calculator is in radian mode. Then display the formula by recalling it from memory F1. Then press $\int dx$ 0 = 2ndF 3 = 20 = to integrate it using Simpson's rule with n=20 strip pairs.

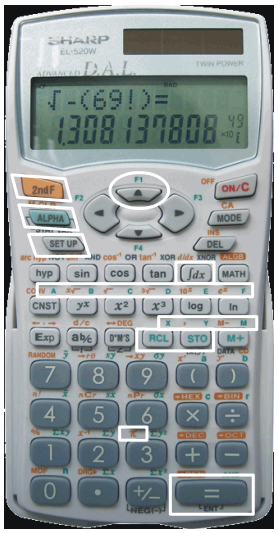

Figure 10.10 The Sharp EL-520W calculator. The relevant buttons are circled.

We get –0.4244. We have just evaluated (10.26) to get the coefficient a_2. In our formula we ignored A so actually $a_2 = -0.4244A$ $(= -\frac{4A}{3\pi})$. Storing any other value n in the B memory allows us to calculate any other a_n. Thus we calculate them one at a time.

Maple: We can also use Maple to calculate the Fourier coefficients. Let's again integrate $\frac{2A}{\pi}\sin(x)\cos(nx)$ from 0 to π to get a_n. Since Maple is a symbolic algebra program (rather than a numerical calculator) we can keep A and n in our formula and get all of the a_n's at once. We can use the **Int** command to set up the integral or the **int** command to actually evaluate the integral:

```
> a_sub_n_setup := 2*A/Pi * Int (sin(x)*cos(n*x), x=0..Pi);
```

$$a\_sub\_n\_setup := \frac{2A}{\pi}\int_0^{\pi}\sin(x)\cos(nx)\,dx$$

```
> a_sub_n_value := 2*A/Pi * int (sin(x)*cos(n*x), x=0..Pi);
```

$$a\_sub\_n\_value := -\frac{2A(1+\cos(\pi n))}{\pi(-1+n^2)}$$

To make Maple understand that n is an odd or even integer first use the **assume** command, then integrate. Note that in the answer $n\sim$ means "n with assumptions".

```
> assume(n::even);
```
Then we get $a\_sub\_n\_value := -\frac{4A}{\pi(-1+n\sim^2)}$

```
> assume(n::odd);
```
Then we get $a\_sub\_n\_value := 0$