Guidelines Specific to the On-screen 4-function Calculator

- When you use the computer mouse or the keyboard to operate the calculator, take care not to mis-key a number or operation.

- Note all the calculator's buttons, including Transfer Display.

- The Transfer Display button can be used on Numeric Entry questions with a single answer box. This button will transfer the calculator display to the answer box. You should check that the transferred number has the correct form to answer the question. For example, if a question requires you to round your answer or convert your answer to a percent, make sure that you adjust the transferred number accordingly.

- Take note that the calculator respects order of operations, as explained below.

A mathematical convention called *order of operations* establishes which operations are performed before others in a mathematical expression that has more than one operation. The order is as follows: parentheses, exponentiation (including square roots), multiplications and divisions (from left to right), additions and subtractions (from left to right). With respect to order of operations, the value of the expression $1 + 2 \times 4$ is 9 because the expression is evaluated by first multiplying 2 and 4 and then by adding 1 to the result. This is how the on-screen 4-function calculator performs the operations. (Note that many basic calculators follow a different convention, whereby they perform multiple operations in the order that they are entered into the calculator. For such calculators, the result of entering $1 + 2 \times 4$ is 12. To get this result, the calculator adds 1 and 2, displays a result of 3, then multiplies 3 and 4 and displays a result of 12.)

- In addition to parentheses, the on-screen calculator has one memory location and three memory buttons that govern it: memory recall MR memory clear MC and memory sum M+. These buttons function as they normally do on most basic calculators.

- Some computations are not defined for real numbers; for example, division by zero or taking the square root of a negative number. If you enter 6 ÷ 0 = the word **ERROR** will be displayed. Similarly, if you enter 1 ± √ then **ERROR** will be displayed. To clear the display, you must press the clear button C.

- The calculator displays up to eight digits. If a computation results in a number greater than 99,999,999, then **ERROR** will be displayed. For example, the calculation 10,000,000 × 10 = results in **ERROR**. The clear button C must be used to clear the display. If a computation results in a positive number less than **0.0000001, or 10^-7,** then 0 will be displayed.

Below are some examples of computations using the calculator.

1. Compute $4 + \dfrac{6.73}{2}$

    Explanation

    Enter 4 + 6.73 ÷ 2 = to get 7.365. Alternatively, enter 6.73 ÷ 2 = to get 3.365, and then enter + 4 = to get **7.365**.

2. Compute $-\dfrac{8.4+9.3}{70}$

Explanation

Since division takes precedence over addition in the order of operations, you need to override that precedence in order to compute this fraction. Here are two ways to do that. You can use the parentheses for the addition in the numerator, entering [(] 8.4 [+] 9.3 [)] [÷] 70 [=] [±] to get -0.2528571. Or you can use the equals sign after 9.3, entering 8.4 [+] 9.3 [=] [÷] 70 [=] [±] to get the same result. In the second way, note that pressing the first [=] is essential, because without it, 8.4 [+] 9.3 [÷] 70 [=] [±] would erroneously compute $-\left(8.4+\dfrac{9.3}{70}\right)$ instead. Incidentally, the exact value of the expression $-\dfrac{8.4+9.3}{70}$ is the repeating decimal $-0.25\overline{285714}$, where the digits 285714 repeat without end, but the calculator rounds the decimal to -0.2528571.

3. Find the length, to the nearest 0.01, of the hypotenuse of a right triangle with legs of length 21 and 54; that is, use the Pythagorean theorem to calculate $\sqrt{21^2+54^2}$.

Explanation

Enter 21 [×] 21 [+] 54 [×] 54 [=] [√] to get 57.939624. Again, pressing the [=] before the [√] is essential because 21 [×] 21 [+] 54 [×] 54 [√] [=] would erroneously compute $21^2+54\sqrt{54}$. This is because the square root would take precedence over the multiplication in the order of operations. Note that parentheses could be used, as in [(] 21 [×] 21 [)] [+] [(] 54 [×] 54 [)] [=] [√] but they are not necessary because the multiplications already take precedence over the addition. Incidentally, the exact answer is a nonterminating, nonrepeating decimal, or an irrational number, but the calculator rounds the decimal to 57.939624. Finally, note that the problem asks for the answer to the nearest 0.01, so the correct answer is **57.94**.

4. Compute $(-15)^3$.

Explanation

Enter 15 [±] [×] 15 [±] [×] 15 [±] [=] to get **–3,375**.

5. Convert 6 miles per hour to feet per second.

Explanation

The solution to this problem uses the conversion factors 1 mile = 5,280 feet and 1 hour = 3,600 seconds, as follows:

$$\left(\frac{6\text{ miles}}{1\text{ hour}}\right)\left(\frac{5,280\text{ feet}}{1\text{ mile}}\right)\left(\frac{1\text{ hour}}{3,600\text{ seconds}}\right)=\ ?\ \frac{\text{feet}}{\text{second}}$$

Enter 6 [×] 5280 [÷] 3600 [=] to get 8.8. Alternatively, enter 6 [×] 5280 [=] to get the result 31,680, and then enter [÷] 3600 [=] to get **8.8 feet per second**.

6. At a fundraising event, 43 participants donated $60 each, 21 participants donated $80 each and 16 participants donated $100 each. What was the average (arithmetic mean) donation per participant, in dollars?

Explanation

The solution to this problem is to compute the weighted mean $\dfrac{(43)(60)+(21)(80)+(16)(100)}{43+21+16}$. You can use the memory buttons and parentheses for this computation, as follows:

Enter 43 [×] 60 [=] [M+] 21 [×] 80 [=] [M+] 16 [×] 100 [=] [M+] [MR] [÷] [(] 43 [+] 21 [+] 16 [)] [=] to get 73.25, or **$73.25 per participant**.

When the **M+** button is first used, the number in the calculator display is stored in memory and an **M** appears to the left of the display to show that the memory function is in use. Each subsequent use of the **M+** button adds the number in the current display to the number stored in memory and replaces the number stored in memory by the sum. When the **MR** button is pressed in the computation above, the current value in memory, 5,860, is displayed. To clear the memory, use the **MC** button, and the **M** next to the display disappears.