MA10103: Foundation Mathematics I

Some common errors and bad style
in the first take-home problem sheet and the first class test

Things you should **not** do are surrounded by "☹ . . . ↯". Usually, they can be found on the left-hand side in the following, while the correct form is on the right-hand side (so "instead of" means "instead of the correct").

- lack of equality signs:

$$☹ \quad \begin{array}{l} x^2 - 7x + 10 \\ (x-5)(x-2) \\ x^2 - 2x - 5x + 10 \end{array} \quad ↯ \quad \text{instead of} \quad \begin{array}{l} x^2 - 7x + 10 \\ = (x-5)(x-2) \\ = x^2 - 2x - 5x + 10 \end{array}$$

  Use equality signs if you link two different (i.e., rewritten) forms of the same expression.

- extensive use of equality signs:

$$☹ \ \log_2 64 = 2^6 = 64 \ ↯ \quad \text{instead of} \quad \log_2 64 = 6 \text{ since } 2^6 = 64$$

$$☹ \ \log_2 64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 6 \ ↯ \quad \text{instead of} \quad \log_2 64 = 6 \text{ since } 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$$

$$☹ \ 5^3 = 125 = \log_5 125 = 3 \ ↯ \quad \text{instead of} \quad 5^3 = 125\text{therefore } \log_5 125 = 3$$

  The equality sign should only link two different forms of the same(!) expression (clearly, $\log_2 64$ is not the same as 64).

- it is bad style to use "+" instead of "and" and "=" instead of "is" in a text:
  ☹ "Using special values of x we can work out $A + B$." ↯ instead of "Using special values of x we can work out A and B." (here, why can work out A and B, and not only their sum $A + B$).

- substituting equality sign for some other sign:

$$☹ \ \frac{8}{x^2-4} \ ➔ \ \frac{8}{(x-2)(x+2)} \ ↯ \quad \text{instead of} \quad \frac{8}{x^2-4} = \frac{8}{(x-2)(x+2)}$$

$$☹ \ x^2 - 7x + 10 \ \rightarrow \ (x-5)(x-2) \ ↯ \quad \text{instead of} \quad x^2 - 7x + 10 \ = \ (x-5)(x-2)$$

- omission of mathematical operator:

$$☹ \ \frac{2-\sqrt{7}-7}{1-7} = \frac{-5\ \sqrt{7}}{-6} \ ↯ \quad \text{instead of} \quad \frac{2-\sqrt{7}-7}{1-7} = \frac{-5-\sqrt{7}}{-6}$$

$$☹ \ \frac{A}{x-2} + \frac{B}{x+2} = \frac{A(x+2)\ B(x-2)}{(x-2)(x+2)} ↯ \quad \text{instead of} \quad \frac{A}{x-2} + \frac{B}{x+2} = \frac{A(x+2)+B(x-2)}{(x-2)(x+2)}$$

  Only the multiplication sign "×" may be omitted.

- not using brackets:

$$☹ \ \frac{2+\sqrt{7}}{1+\sqrt{7}} \times 1 - \sqrt{7} \ ↯ \quad \text{instead of} \quad \frac{2+\sqrt{7}}{1+\sqrt{7}} \times \left(1 - \sqrt{7}\right)$$

  Actually, $\frac{2+\sqrt{7}}{1+\sqrt{7}} \times 1 - \sqrt{7}$ is the same as $\left(\frac{2+\sqrt{7}}{1+\sqrt{7}} \times 1\right) - \sqrt{7}$.
  Similarly, writing $\log p\ q^5$ can be confusing, since it may mean either "$(\log p) \times q^5$" or "$\log\left(p\ q^5\right)$", so use brackets here!

- no brackets around negative numbers:

$$\begin{array}{rcl} ☹\ 4\times 1\times -2 \ ↯ & \text{instead of} & 4\times 1\times(-2) \\ ☹\ 2\pm\sqrt{4--16}\ ↯ & \text{instead of} & 2\pm\sqrt{4-(-16)} \\ ☹\ 4\pm\sqrt{-4^2-4\times 1\times 1}\ ↯ & \text{instead of} & 4\pm\sqrt{(-4)^2-4\times 1\times 1} \end{array}$$

  The reason, why you should use brackets around negative numbers, can most clearly be seen at the last example: while $(-4)^2 = 16$, the expression -4^2 equals -16.

- disrespecting a minus sign in front of a bracket:

  $$☹\ x^2-(x^2+5x+3) = 5x+3\ ↯ \quad \text{instead of} \quad x^2-(x^2+5x+3) = x^2-x^2-5x-3 = -5x-3$$

  Also note that there is a "virtual" bracket around the numerator and the denominator of a fraction:

$$\begin{array}{lcl} ☹\ \dfrac{-5-\sqrt{7}}{-6} = \dfrac{5-\sqrt{7}}{6}\ ↯ & \text{instead of} & \dfrac{-5-\sqrt{7}}{-6} = -\dfrac{-5-\sqrt{7}}{6} = \dfrac{5+\sqrt{7}}{6} \\ ☹\ \dfrac{-5-\sqrt{7}}{-6} = \dfrac{5}{6}-\sqrt{7}\ ↯ & \text{instead of} & \dfrac{-5-\sqrt{7}}{-6} = \dfrac{5+\sqrt{7}}{6} \end{array}$$

- "virtual" brackets where there are none:

  $$☹\ \log p - \log q + r\log p = \log p - \log(qp^r)\ ↯ \quad \text{instead of} \quad \log p - \log q + r\log p = \log p + \log(p^r/q)$$

  Here, you can also write $\log p - \log q + r\log p = \log p + (-\log q) + r\log p$, i.e., you can interpret $-\log q$ as negative number.

- rationalising fractions without multiplying both numerator and denominator (which is an overall multiplication by "1"):

  $$☹\ \frac{2+\sqrt{7}}{1+\sqrt{7}}\times(1-\sqrt{7})\ ↯ \quad \text{instead of} \quad \frac{(2+\sqrt{7})}{(1+\sqrt{7})}\times\frac{(1-\sqrt{7})}{(1-\sqrt{7})}$$

- simplifying fractions without factoring

$$\begin{array}{rcl} ☹\ \dfrac{5\cancel{xy}+\cancel{x^2}\cancel{y^2}}{\cancel{x}\cancel{y^2}+\cancel{x^2}\cancel{y}} = \dfrac{5}{1}\ ↯ & \text{instead of} & \dfrac{5xy+x^2y^2}{xy^2+x^2y} = \dfrac{\cancel{xy}(5+xy)}{\cancel{xy}(y+x)} = \dfrac{5+xy}{x+y} \\ ☹\ \dfrac{-2+2\sqrt{5}}{8} = \dfrac{-2+\sqrt{5}}{4}\ ↯ & \text{instead of} & \dfrac{-2+2\sqrt{5}}{8} = \dfrac{2(-1+\sqrt{5})}{2\times 4} = \dfrac{-1+\sqrt{5}}{4} \\ ☹\ \dfrac{4+\sqrt{12}}{2} = 2+\sqrt{12}\ ↯ & \text{instead of} & \dfrac{4+\sqrt{12}}{2} = \dfrac{2(2+\sqrt{3})}{2} = 2+\sqrt{3} \end{array}$$

  If you have surds, factor correctly:

  $$☹\ \frac{-2\pm\sqrt{12}}{8} = \frac{-1\pm\sqrt{6}}{4}\ ↯ \quad \text{instead of} \quad \frac{-2\pm\sqrt{12}}{8} = \frac{-2\pm 2\sqrt{3}}{8} = \frac{-2\pm\sqrt{3}}{4}$$

  Also remember: If you simplify a fraction, the denominator should be rational and positive.

- partial fractions without factoring:

  $$☹\ \frac{8}{x^2-4} = \frac{A}{x^2}+\frac{B}{-4}\ ↯ \quad \text{instead of} \quad \frac{8}{x^2-4} = \frac{8}{(x-2)(x+2)} = \frac{A}{x-2}+\frac{B}{x+2}$$

- confusing factorisation of a quadratic with solving a quadratic equation:
  ☹ "$x^2 - 81 = (x+9)(x-9)$. Therefore $x = 9$ or $x = -9$." ↯ instead of "$x^2 - 9 = (x+9)(x-9)$."

- multiplying numbers with different indices: ☹ "$2 \times 10^{5.5} = 20^{5.5}$." ↯ instead of not changing it.

- in completing the square, not handling the coefficient of x^2-term first:

$$☹ \begin{array}{l} 4x^2+2x-1=0 \\ 4x^2+2x=1 \\ 4x^2+2x+1=2 \\ (4x+1)^2=2 \end{array} ↯ \quad \text{instead of} \quad \begin{array}{l} 4x^2+2x-1=0 \\ x^2+\frac{1}{2}x-\frac{1}{4}=0 \\ x^2+\frac{1}{2}x+\frac{1}{4}=1+\frac{1}{4} \\ \left(x+\frac{1}{2}\right)^2=\frac{5}{4} \end{array}$$

- in the solution-formula for a quadratic equation, changing the sign beneath the root (e.g., changing from the case with no real solution to the one with two solutions):

$$☹ \frac{-2 \pm \sqrt{4-16}}{8} = \frac{-2 \pm \sqrt{-12}}{2} = \frac{-1 \pm \sqrt{3}}{2} ↯ \quad \text{instead of}$$

$$\frac{-2 \pm \sqrt{4-16}}{2} = \frac{-2 \pm \sqrt{-12}}{2} \text{ no real solution!}$$

- multiplying square roots incorrectly:

$$☹ \sqrt{7} \times \sqrt{7} = 49 ↯ \quad \text{instead of} \quad \sqrt{7} \times \sqrt{7} = 7 \quad \text{or} \quad = \sqrt{49} = 7$$

- wrong division

$$☹\ 8 = 4\,B,\ \text{so } B = \frac{4}{8} = \frac{1}{2} ↯ \quad \text{instead of} \quad 8 = 4\,B,\ \text{so } B = \frac{8}{4} = 2$$

- answer to question not clear
  E.g., after having calculated partial fractions, explicitly state your answers as in the following example "Therefore we have obtained $\frac{8}{x^2-4} = \frac{2}{x-2} - \frac{2}{x+2}$."
  Contrary to common belief, it is almost never wrong to actually use language in a calculation. In fact, most often your solution will benefit from the use of words: You and any person that will read the solution (maybe at some later time) will know what you were thinking and doing when you wrote down the solution!

- sloppy notation (that might have a second meaning):

$$☹\ x\frac{4}{3} ↯ \qquad \text{instead of} \qquad x^{4/3}$$

$$☹\ {}^5\sqrt{5} ↯ \qquad \text{instead of} \qquad 5\,\sqrt{5}$$

  Also, make sure that the multiplication sign "×" can be distinguished from the variable "x" (therefore in handwriting the dot "·" is usually used as multiplication sign, however then make sure not to confuse "2.25" with "$2 \cdot 25$".).