

## Mathematical Communication

*Successfully communicating mathematical material is a skill that only comes with patience and practice. However, it is an essential skill, whether you are writing an assignment, a scientific paper, or a technical report. Information in this flyer is designed to help improve your mathematical communication. In particular, this flyer covers how to present whole numbers, decimals and units.*

Tables 1 and 2 show the conventions used to communicate mathematically. Table 1 shows ways to type numbers and units. Table 2 shows ways to type mathematical expressions and variables, in-text or in display style.

**Table 1: Conventions used for communicating mathematically.**

<b>Concepts:</b>	<b>Examples:</b>
Numbers are used with units, ages, times, dates, page numbers, percentages, money, ratios and proportions.	5 metres, 10 seconds, 10 am, page 2, \$5 or 5:1
Numbers below 10 are written in words.	<ul style="list-style-type: none"> <li>• Seven cars</li> <li>• Zero faulty items</li> </ul>
Be consistent when writing numbers in mathematics or technical documents. <ul style="list-style-type: none"> <li>– Use the same style throughout the sentence               <ul style="list-style-type: none"> <li>○ If all of the numbers are under 10 then write them in words.</li> <li>○ If any of the numbers are over 10 then write them all as numerals.</li> </ul> </li> <li>– Alternatively, if you are writing about a quantity of objects, which have numbers in their names, then you need to write one and use numerals for the other, to avoid confusion.</li> </ul>	<ul style="list-style-type: none"> <li>• An irrigation system requires three water pumps and six water storage tanks. (All numbers under 10.)</li> <li>• An irrigation system requires 6 water pumps and 12 water storage tanks. (At least one number over 10.)</li> <li>• An irrigation system requires five water pumps and twelve 5 000 litre water storage tanks. (Combinations of numbers in one sentence, would be hard to read if it was 12 5 000 litre water storage tanks.)</li> </ul>
Numbers larger than 999 should be written with a space to indicate thousands of units.	<ul style="list-style-type: none"> <li>• 1 001</li> <li>• 100 000 001</li> </ul>
Always write decimals and fractions as numerals, not in words. <ul style="list-style-type: none"> <li>– A full stop should be used to represent the decimal point.</li> <li>– The zero should always be used before a decimal less than one.</li> <li>– When fractions are written in-line (as numeral), a slash (/) should be used.</li> </ul>	<ul style="list-style-type: none"> <li>• Seven point six, zero, four, two should be written as 7.6042</li> <li>• Point six seven should be written as 0.67</li> <li>• Four sevenths should be written as 4/7</li> </ul>
Units of measurement must be consistent within the document. <ul style="list-style-type: none"> <li>– Standard (SI) units should be used.</li> <li>– In text, always use lower case for the name, even if it is a person's name. Note: this standard changed in Australia in 1998.</li> <li>– Unit symbols are expressed in lower case, apart from litre (L).</li> <li>– If the unit is named after a person, the first letter is capitalised when abbreviated.</li> <li>– Symbols containing exa, peta, giga and mega use a capital letter.</li> <li>– Unit symbols should never be written in italics.</li> <li>– A small space is used between the number and the unit.</li> </ul>	Please see online links for examples of SI units. <ul style="list-style-type: none"> <li>• 16 newtons or 16 N</li> <li>• 21 gigawatts or 21 GW</li> <li>• 34 megalitres or 34 ML.</li> </ul>

The formatting you choose to use throughout your document should be:

1. consistent throughout the document;
2. in a format easily understood by your audience; and
3. suitable for any comparison you wish to make between numbers.

**Table 2: Conventions when typing Mathematical equations.**

<b>Concept</b>	<b>Examples</b>
Letters using a variable should be typed in <i>italics</i> . To be consistent, these should also be typed in Microsoft Equation, just like your formulas.	$a, x$ , etc.
Vectors or Matrix quantities should be typed in <b>bold</b> instead of <i>italics</i> .	Matrices: <b>A</b> , <b>X</b> , etc. Vectors: <b>x</b> , <b>y</b> , etc.
Equations can be in-text or display. <ul style="list-style-type: none"> <li>– In-text equations are used for short equations, which are in the text.</li> <li>– Display equations are formatted on their own line.</li> <li>– Display equations should be numbered, so that they can be referred to in the text around them.</li> </ul>	<ul style="list-style-type: none"> <li>• In-text equation: The area of a circle is <math>A = \pi r^2</math>, where <math>r</math> is the radius.</li> <li>• Display equation: The area of a circle is: <math display="block">A = \pi r^2, \quad (1)</math> where <math>r</math> is the radius. Using Equation (1) the area of the given circle becomes: ...</li> </ul>
When displaying equations, all equal signs, fraction lines and operators (+, −, ×, and ÷) should be horizontally aligned.	$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta) \quad (2)$
The equal signs should be aligned for a series of equations.	Using Equation (1): $\begin{aligned} A &= \pi r^2 \\ &= \pi \times 5^2 \\ &\approx 78.34 \end{aligned} \quad (3)$
Functions should not be written in <i>italics</i> .	See Equation 2 for how to write functions, such as $\sin x$ , $\cos \theta$ , $\tan \varphi$ , $\log a$ and $\ln x$ .

## REFERENCES

Butler, H., McDonald, C. & Passmore, T. (eds) 2008, *MAT1000 Mathematics Fundamentals Study Book*, USQ.