**Numbers, Units and Mechanics**

**Pre-Class Activities**

**Working with Numbers, Units and Mechanics**

As science communicators, you will often have to include highly specific information in your written materials. For example, you might be writing a lab report in which you provide numerical details about the method you used in your experiment, or you might wish to simplify complex sentences with abbreviations to make your text less clunky. There are some rules to follow if you want to do this effectively and achieve your basic goal of enhancing the readability of your work.

In a few cases, you might have to make a judgment call as to which rule should be followed; when working with numbers especially, there are sometimes occasions when rules from different style guides clash. Having said this, if you plan your work with clarity in mind, most sentences can be simplified to follow the important, universally accepted rules. When this is not possible, you should follow the one golden rule: **Always be consistent in your style**.

**Some Basic Rules**

1. Do not start a sentence with a numeral (e.g. write ‘Seventy’, not ‘70’)
2. Use numerals when writing about counted items, percentages, decimals, magnifications, and official scales (e.g. write: ‘We caught 27 mice, which we estimated to make up 40% of the local population. These data suggest there are 520 mice per km2. We viewed mouse hairs under a microscope at 40x magnification. These hairs measured 3.4 on the Rodent Hair Thickness scale.’)
3. Spell small numbers (e.g. write: ‘One, two, three’, all the way to nine)
4. Use numerals for larger numbers (e.g. use ‘10, 11, 12’ etc.)
5. Make much larger numbers easier to read with commas and periods; if a number has four or more digits, separate them with a comma and do this for every three numbers in the sequence (e.g. 2,546,457). If the number has six or more digits and it is appropriate to be slightly less accurate, simplify it further by using a period and the following format: ‘Approximately 2.5 million.’
6. Avoid having two distinct numbers next to one another, sometimes by using a mixture of writing and numbers (e.g. write: ‘We tested 15 different 19-year-olds’ or: ‘We tested fifteen 19-year-olds’, not ‘we tested 15 19-year-olds’)
7. Spell official names and true nouns (e.g. write about the ‘First’ Law of Thermodynamics, not the ‘1st’ Law)

**Always remember the golden rule of being consistent in your style.** If two rules clash in one sentence, you will have to favour one over the other. Make sure you continue to favour that one over the other throughout your text.

**Question 1 (5 marks)**

Read the sentences below and pay attention to the numerical-based errors, which have been **bolded** for you. Copy and paste the sentences and then edit the **bolded** sections to remove the errors (1 mark each). *Hint: Use the basic rules above to help you.*

In 2003, Hurricane Juan, one of the most powerful hurricanes to hit Nova Scotia and Prince Edward Island, made landfall on September 29th with winds of up to **one hundred and seventy** kilometres per hour. In Halifax harbour, storm surges of **one point five** to 2 metres were reported. Throughout Nova Scotia, **100,000,000** trees were damaged during the storm, resulting in blocked streets and downed power lines. Overall, Juan caused $200 million in damage and left **300000** Canadians without power for up to **2** weeks.

**Question 2 (5 marks)**

There are **five** numerical-based errors in total in the paragraph below, but these have not been highlighted for you this time; try to find and edit them appropriately (1 mark each). **Bold** the changes you make so it is easy to see what you changed. *Hint: Use the basic rules above to help you. Do not make more than five changes or you will be penalized!*

The 1929 Grand Banks earthquake is the 6th largest earthquake to have occurred in Canada or in surrounding Canadian waters. The epicentre of the earthquake was located on the edge of the Grand Banks, a group of underwater plateaus, 265 kilometres south of Newfoundland’s Burin Peninsula. The 7.2 magnitude earthquake caused an underwater landslide, resulting in the formation of a tsunami. 3 successive waves hit within 30 minutes of each other, traveling at approximately 40 kilometres per hour, 71.4% slower than the tsunami’s initial speed. The tsunami increased sea level approximately three to 7 metres above normal in most areas, with 1 area reaching 27 metres above normal. Communities along the Burin Peninsula were among the most affected by the tsunami as twenty-eight individuals were killed and hundreds more were left homeless.

**Questions 3, 4, and 5 (2 marks each, 6 marks total)**

Each of the following three questions feature sentences that are written awkwardly or in which there are competing style rules in play. For each sentence, you are told which rule you should follow to improve the clarity and will need to make **two** changes.

As you did in the earlier questions, copy and paste the sentences and edit the erroneous parts based on the rule you have been told to follow (2 marks for each question). Make sure you **bold** your changes.

**To answer Q3, follow the rule that states you should not write two distinct numbers next to each other.** *(Hint: In this case, it is acceptable to rearrange the sentence to address this issue.)*

**Q3:** Recently, a total of 151 individuals participated in two separate studies that assessed behaviours displayed while driving a car during a crash or near-crash incident. The participants in the novice-driver study consisted of 42 16-year-olds while participants in the experienced-driver study consisted of 109 18 – 72-year-olds.

**To answer Q4, follow the rule of consistency to use numbers for counts of one thing (crashes and near-crashes) and words for counts of another (months).**

**Q4:** In the experienced-driver study, 42 crashes and 476 near-crashes were recorded over nine months, whereas participants in the novice-driver study had 31 crashes and one hundred and thirty six near-crashes over 18 months.

**To answer Q5, follow the rule of consistency to use numbers for counts of one thing (months) and words for comparisons of another (probability).**

**Q5:** Data analysis showed that the experienced drivers with an average of 18 months of driving experience were more than two times as likely to crash if they were dialling a cell phone. Novice drivers who started the study with less than nine months of experience were 8 times more likely to be in a crash or near-crash while dialling a cell phone.

**Using Abbreviations (and Acronyms)**

Just as with numbers, there are multiple rules to learn about using abbreviations correctly. The good news is that these rules tend to be a little less ambiguous in terms of their application. There will still be occasions when you need to make a judgment call, but, as before, remember that the goals of consistency and clarity should guide you.

Acronyms work similarly to abbreviations (in a sense, they are a type of abbreviation). Acronyms are formed by using the first letters of each word in a phrase or compound word, whereas we usually think of abbreviations as shortened versions of a word or phrase. So, CIA is an acronym (for ‘Central Intelligence Agency), whereas ‘abbrev’ would be an abbreviation of ‘abbreviation’.

**Some Basic Rules**

With clarity in mind, a general rule of thumb is that you should abbreviate (make shorter) a particularly wordy phrase or compound word that will be used more than once in a body of text. For example, if you plan to mention the University of British Columbia more than once, it would be easier to digest as a reader if you use the acronym ‘UBC’. For abbreviations or acronyms that might not be widely known by members of the target audience, use them only **after** you have written the full form first. For example: ‘The University of Washington (UW) is one of the best universities in Washington State. Over 40,000 students attend the Seattle campus of UW.’

A few more general rules include:

1. Use a period, and shorten official titles before and after a person’s name (e.g. ‘Dr. Jones, Ph.D.’). Only use periods when a title has been shortened though.
2. Abbreviate common units of measurement (e.g. ‘g’ for grams, ‘kg’ for kilograms, ‘lb’ for pounds, ‘ml’ for millilitres, ‘ft’ for feet, ‘μg’ for micrograms etc.)
3. Abbreviate common latin terms (e.g. write ‘e.g.’ and ‘etc.’, not ‘*exempli gratia*’ and ‘*et cetera*’) but in scientific writing you should write the full name for a species the first time you write it before subsequently abbreviating the genus part of the name (e.g. ‘*E. coli*’ is only acceptable **after** you have told your audience that the ‘*E*’ stands for ‘*Escherichia*’).
4. Abbreviate very common words or phrases. Deciding whether something is sufficiently common can result in a judgment call, but a good rule of thumb is to ask whether someone would know what you mean if they have no specialist knowledge of your subject (e.g. it would be fine to say ‘TV’ rather than ‘television’, but it would not be fine to say ‘PCR’ instead of ‘polymerase chain reaction’ unless you were communicating with biochemists).
5. Abbreviate very famous organizations or institutions, as well as compound-worded countries (e.g. ‘BBC’, ‘CNN’, ‘CIA’, ‘NATO’, ‘USA’, ‘UK’). Whether or not the acronym uses a period to separate letters is usually up to you, but be consistent in your style.
6. **Do not** abbreviate words at the beginning of a sentence unless they are common acronyms or abbreviations.
7. **Do not** abbreviate days or months in formal writing (e.g. use ‘Tuesday’ instead of ‘Tues’, and ‘February’ instead of ‘Feb’.
8. **Do not** abbreviate words as you might in text messaging style (e.g. do not write ‘lol’, ‘nite’, ‘omg’ etc.)

**Questions 6, 7, and 8 (1 mark each, 3 marks total)**

The following multiple-choice questions each feature four sentences (answers), of which only one is written in the correct style for acronyms and abbreviations. Try to select the correct one.

**Question 6:** You are discussing new potential targets for drug development.

A: A compound that blocks Human Immunodeficiency Virus (HIV) deoxyribonucleic acid (DNA) synthesis could be the new target for potential drug development.

B: A compound that could be the new target for potential drug development blocks Human Immunodeficiency Virus deoxyribonucleic acid synthesis.

C: A compound that blocks the DNA synthesis of HIV could be the new target for potential drug development against the virus.

D: HIV (Human immunodeficiency virus) DNA synthesis is blocked by a compound that could be the new target for potential drug development.

**Question 7:** You are writing about the volunteer program you participated in.

A: The SMaRT (Scientific Methods and Research Training) outreach program allows undergrad volunteers to lead elementary school students through interactive science experiments that supplement the grade’s curriculum.

B: The Scientific Methods and Research Training (SMaRT) outreach program allows undergrad volunteers to lead elementary school students through interactive science experiments that supplement the grade’s curriculum.

C: The Scientific Methods and Research Training outreach program allows undergrad volunteers to lead elementary school students through interactive science experiments that supplement the grade’s curriculum.

D: The SMaRT outreach program allows undergrad volunteers to lead elementary school students through interactive science experiments that supplement the grade’s curriculum.

**Question 8:** You are now talking about a well-known model organism.

A: *Caenorhabdhitis elegans* has been used extensively as a model organism because it is one of the simplest organisms with a nervous system. The *C. elegans* genome was the first multicellular organism to be completely sequenced.

B: *Caenorhabdhitis elegans* has been used extensively as a model organism because it is one of the simplest organisms with a nervous system. *C. elegans* was the first multicellular organism genome to be completely sequenced.

C: The nematode *Caenorhabdhitis elegans* has been used extensively as a model organism because it is one of the simplest organisms with a nervous system. *C. elegans* was the first multicellular organism genome to be completely sequenced.

D: The nematode *Caenorhabdhitis elegans* has been used extensively as a model organism because it is one of the simplest organisms with a nervous system. The *C. elegans* genome was the first multicellular organism to be completely sequenced.

**Questions 9, 10, and 11 (2 marks each, 6 marks total)**

Consider the three sentences below (one for each question). Each one features **one** abbreviation or acronym-based error.

Copy and paste each sentence and then **bold** the error in each one (1 mark). Then copy and paste the sentence again but re-write it appropriately to remove the error (1 mark). Make sure you **bold** your changes. *Hint: Use the basic rules above to help you.*

**Q9:** Basking sharks (*Cetorhinus maximus*) are the world’s second largest living fish and can be found in all the world’s temperate oceans. These fish are fully protected in many countries, including the U.K., Malta, New Zealand, and USA, as populations have been rapidly declining.

**Q10:** On average, basking sharks grow to be 6 to 8 mts (20 – 26 ft) in length.

**Q11:** These fish are rarely spotted on the west coast; however, in August 2013, a shark was photographed off the west coast of Vancouver Island by researcher Wendy Szaniszlo. Ms. Szaniszlo did not know what species of shark she had photographed until shark expert Dr. Jackie King, PhD., identified it as a basking shark.