

Notes on first essay: final drafts

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February 22, 2009

1 Thou shalt:

Label your essays as draft or final and/or date them.

Proofread. For most of you running a spell-checker and grammar-checker will be valuable.

But the single most common mistake in the first essay, confusing principal and principle, can be caught only by reading the essay carefully yourself.

Read Strunk and White (see webpage for URL).

2 Mathematical problems

rule of 72:

Correct is: $it = \ln(2) \approx .693$. That is, it is exactly equal to $\ln(2)$ (when using continuous interest)

But neither it nor $\ln(2)$ is exactly .693. $\ln(2)$ is irrational, $\ln(2)$ is rational. Similarly $\frac{.05}{12} \approx .0042$; $\frac{.05}{12} = .042\overline{6}$, a repeating decimal.

Also $\ln(2) \approx .693$ while $\ln(2)\% \approx .00693$.

5% and .05 are two names for the same number. Per cent is not a unit; it is an abbreviation. Note that an interest rate for a given period is

$$\frac{\text{amount of interest paid in dollars}}{\text{amount of the loan in dollars}}$$

Thus it has *no* units.

In the rule of 72, it has no units. It is obtained by multiplying interest rate per year by number of years.

At different times in the essay several different properties of the variables were described. The variables are *defined* by saying what they represent, as the formula is described. For example, n is number of periods. In specific examples, definite values are *assigned* to the variables. Thus, in one case, n is 4 years. We may also express the latter by saying 4 is substituted for n .

3 Writing Mathematical expressions

I write out in detail with some comments the derivation of the rule of 72.

Derivation

Suppose first that we calculate the time to double an investment using continuous interest. We use the formula $A = Pe^{it}$ where P is the principal, i is the annual interest rate, t is the number of years, and A is the final amount. We want to estimate when the principal will be doubled. That is, when is

$$A = 2P?$$

Substituting,

$$2P = Pe^{it}.$$

Dividing by P (which is not 0),

$$2 = e^{it}.$$

Now we take the natural logarithm of each side of the equation to get

$$\ln(2) = it,$$

since as inverse functions $\ln(e^x) = x$ for any x . Since, $\ln(2) \approx .693$, we have

$$.693 \approx it.$$

Multiplying both sides of the equation by 100 gives

$$693 \approx it,$$

where the interest i is now written in per cent. Since this is a rough approximation, we can replace 69 by 72 to make it easier to divide.

Comments

The entire passage is written in complete sentences; usually, but not always, I am treating '=' as a verb in the sentence. The use of = vrs \approx follows the discussion in the previous section of this note. When I do a mathematical operation to move from one equation to another, I describe the operation in the sentence: 'divide', 'take the logarithm'. When equations are displayed, the appropriate punctuation goes on the same line.

Some conventions

We 'divide by P ' or 'divide P into'; we do not 'divide from'. But, it is correct to 'subtract from'.

The word cancel is used correctly in two cases: To denote that there is a common factor in a numerator and denominator or to denote that equal positive and negative terms occur in a sum. It is *not* correctly used to indicate the application of an inverse function.

In describing operations on an equation, describe the actual mathematical operations (e.g. subtracting 2 from both sides). Do not use words that describe the appearance on the paper such as 'bring down'.

Use 'replace' or 'substitute' rather than 'plug in'.

4 Expressing Reasoning

Phrases such as, ‘hence’ or ‘and so’ represent causation. Beginning a sentence with such a phrase indicates the second sentence is caused by the first. Don’t use such transitions unless such a causal relationship holds. If such a word is used, there needs to be a second clause.

5 Dicta on Style

Infinitives versus participles:

Use words that have meaning. ‘borrow to purchase something’. (What more does this say than ‘borrow’?)

Don’t write ‘a bank exercises compound interest’ but ‘a bank pays compound interest’

Two many words!

Don’t use extra words that add nothing (but confusion) to the message.

Don’t write ‘This is what the equation would look like’, but ‘This is the equation’.

Don’t write ‘We must not forget that the representation of percent is done in decimal form.’, but ‘The representation of percent is in decimal form.’.

Don’t write ‘We will now discuss an example of simple interest.’, but ‘Here is an example of simple interest.’.

Don’t write ‘which is a concept that is important to comprehend, before making any financial decision’, but ‘which is an important concept in making financial decisions’.

Don’t write ‘a method used to compute’, but ‘a method to compute’.

Don’t write ‘amount was allowed to be \$1000’, but ‘amount was \$1000’.

A little google search shows that PMI means *private mortgage insurance*. This is mandatory insurance if the amount of the loan is less than 80% of the value of the house.

6 Word Choice

87.238% of the time ‘utilize’ is a \$5 word for use.

Many times, use is a meaningless word that just drags out a sentence.

Instead of writing, ‘a method used for estimating’, write ‘a method to estimate’.

7 Verbs

Make sure there is only one main verb in a sentence. Proofread to make sure that when you changed to a better verb, you succeed in erasing the first choice. Unfortunately grammar check often misses this.

Make the verb, not the nouns, carry the meaning of the sentence.

Avoid the passive.

8 Uniformity across the essay

The *person* should be uniform. Third person is preferred; some transition between first and third can work well. Second person should be avoided.

Don't insert individuals into describing operations that have nothing to with who does them. Write 'Divide both sides by P ' rather than, 'Now, you divide both sides by P .'

(Exception. At least one student did a stellar job of reporting a dialogue between two people discussing the computation. In this case the individuals took on a role.)

Similarly, tense should be uniform unless the essay is describing events that happened at different times. In general, mathematical computations are done in present time. An exception might be to point out that the Pythagorean theorem was proved by at least 500. BC.