

Analyzing Numerical Data: Indices Using Weighted Sums and Averages

I.C Student Activity Sheet 10: Readability Indices

An *index* is a numerical scale. Characteristics of an index can be used for the following:

- to compare variables with one another or a reference number,
- to give information about general trends, and
- to help make comparisons and judgments.

It is often calculated as a weighted sum of various factors resulting in a single summary number.

Fog Index

The Fog Index, which was developed by Robert Gunning in 1952, measures the readability of a piece of writing. Calculation of the index produces a number that indicates the years of education a person needs to have to easily understand the text. For example, a passage with a Fog Index of 8 has an eighth-grade reading level. The following table provides more detail on the Fog Index.

Use	Writers can use the Fog Index to gauge whether or not their material is suitable for the targeted audience. The ideal Fog Index number for a writing piece for the general population is 7 or 8. Technical material usually has a Fog Index of 10 to 15.
Calculation	1. Select a block of text that is approximately 100 words. 2. Compute the average sentence length of the selected passage, dividing the number of words by the number of sentences. 3. Count words with three or more syllables (that is, complex words). Exclude proper nouns, compound words, words ending in suffixes such as <i>-es</i>, <i>-ed</i>, or <i>-ing</i> that result in a third syllable, terminology familiar to the audience, and hyphenated words. Divide the number of complex words by the total number of words. 4. Add the average sentence length and the percent of complex words. 5. Multiply the result by 0.4.
Formula	$FI = 0.4 \left(\frac{\text{number of words}}{\text{number of sentences}} + 100 \cdot \frac{\text{number of complex words}}{\text{number of words}} \right)$
Limitations	Considered an accurate indication of readability, the Fog Index has limitations. For example, some multisyllabic words are not considered to be complex by the general population, but the index does not take this into account.

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Flesch-Kincaid Grade Level Index

Another widely used measure is the Flesch/Flesch-Kincaid Readability Tests, which consist of the Flesch Reading Ease (developed by Rudolph Flesch in 1948) and the Flesch-Kincaid Grade Level (developed by John P. Kincaid in 1976). The Flesch-Kincaid Grade Level Index converts the Flesch Reading Ease into a number that indicates the years of education a person needs to have to easily understand the text.

Calculate the Flesch-Kincaid Grade Level Index (**FKGLI**) using the following formula:

$$FKGLI = 0.39 \left(\frac{\text{number of words}}{\text{number of sentences}} \right) + 11.8 \left(\frac{\text{number of syllables}}{\text{number of words}} \right) - 15.59$$

Declaration of Independence (excerpt)

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. — That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed. — That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness.

1. Find the Fog Index and the Flesch-Kincaid Grade Level Index of the excerpt of the *Declaration of Independence*.

Check your answer for the Flesch-Kincaid Grade Level Index using MS Word. (Go to the Help section and look up Readability to find how to access this score.)

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One of the most famous speeches in U.S. history is the *Gettysburg Address*—a 275-word speech that required only a few minutes to deliver.

Gettysburg Address

Four score and seven years ago our fathers brought forth on this continent a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation, so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we cannot dedicate—we cannot consecrate — we cannot hallow —this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did here. It is for us the living, rather, to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us — that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion — that we here highly resolve that these dead shall not have died in vain — that this nation, under God, shall have a new birth of freedom — and that government of the people, by the people, for the people, shall not perish from the earth.

2. Find the Fog Index and the Flesch-Kincaid Grade Level Index for the *Gettysburg Address*.

Check your answer for the Flesch-Kincaid Grade Level Index using MS Word.

3. Find the Fog Index and the Flesch-Kincaid Grade Level Index for a passage of around 100 words from one of your favorite books or short stories.
4. Find the Fog Index and the Flesch-Kincaid Grade Level Index for a passage of around 100 words from your science textbook.
5. Write the copy for a radio commercial advertising a real or imagined product. The potential buyers of the product are high school students requiring a Fog Index and a Flesch-Kincaid Grade Level Index of between 10 and 12.

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6. **EXTENSION:** There are several indices related to consumer spending. Two of them are the Consumer Price Index (CPI) and the Consumer Confidence Index (CCI). Find out how they are calculated and how they are used.
7. **REFLECTION:** When do you think it would be important to pay attention to the reading level of a passage you write? Think of careers that would be affected by reading levels.